

CONTRACT N40085-12-B-0066

NAVFAC SPECIFICATION
NO. 05-12-0066

REPAIR THE MCAS NEW RIVER POLICE STATION, BLDG AS302

AT THE

MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

DESIGN BY:

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New Bern, NC

A/E Contract: N40085-10-D-3533

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05120066

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LIST OF DRAWINGS

Contract drawings are as follows:

NAVFAC DWG NO.	SHEET NO.	TITLE
60011810	G-001	TITLE SHEET
60011811	C-101	SITE PLAN
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60011830	FA-101	FLOOR PLAN: FIRE ALARM - NEW WORK
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60011832	FA-502	FIRE ALARM DETAILS
60011833	FP-001	FIRE PROTECTION GENERAL NOTES AND LEGEND
60011834	FP-101	FLOOR PLAN: FIRE PROTECTION - NEW WORK
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60011842	M-103	FLOOR PLAN -HVAC NEW WORK
60011843	M-104	ATTIC PLAN -HVAC NEW WORK
60011844	M-105	ATTIC PLAN -HVAC PIPING NEW WORK
60011845	M-201	ENLARGED PLAN -MECHANICAL ROOM
60011846	M-501	MECHANICAL DETAILS
60011847	M-502	MECHANICAL DETAILS
60011848	M-601	MECHANICAL SCHEDULES
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NAVFAC DWG NO.	SHEET NO.	TITLE
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60011854	E-103	TRAILER PLANS -POWER
60011855	E-501	ELECTRICAL DETAILS
60011856	E-601	ELECTRICAL DETAILS
60011857	E-602	ELECTRICAL DETAILS

SECTION 01 11 00

SUMMARY OF WORK

09/08

PART 1 GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

1.1.1 Project Description

The work includes the demolition of interior finishes, plumbing, mechanical and electrical systems; new interior finishes, new plumbing, mechanical, electrical systems, and incidental related work.

1.1.2 Location

The work shall be located at the Marine Corps Base, Camp Lejeune, North Carolina approximately as shown. The exact location will be indicated by the Contracting Officer.

1.2 EXISTING WORK

In addition to "FAR 52.236-9, Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements":

- a. Remove or alter existing work in such a manner as to prevent injury or damage to any portions of the existing work which remain.
- b. Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as approved by the Contracting Officer. At the completion of operations, existing work shall be in a condition equal to or better than that which existed before new work started.

1.3 LOCATION OF UNDERGROUND FACILITIES

The Contractor will be responsible for obtaining the services of a professional utility locator to scan the construction site with electromagnetic or sonic equipment, and mark the surface of the ground where existing underground utilities are discovered. Verify the elevations of existing piping, utilities, and any type of underground obstruction not indicated or specified to be removed but indicated or discovered during scanning in locations to be traversed by piping, ducts, and other work to be installed. Verify elevations before installing new work closer than nearest manhole or other structure at which an adjustment in grade can be made.

1.3.1 Notification Prior to Excavation

Notify the Contracting Officer 48 hours prior to starting excavation work in order to permit making arrangements with public works personnel to scan the area for unmarked utilities. Obtain station digging permits prior to starting excavation work.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 12 00

CUTTING AND PATCHING

01/07

PART 1 GENERAL

1.1 CUTTING

Shall be done by sawing along straight lines. The amount cut out shall be the minimum necessary to accommodate the new work. No flame cutting will be permitted without written permission of the Officer in Charge of Construction.

1.2 HOLES

Shall be rotary drilled. The size shall be the minimum necessary to accommodate the new work.

1.3 PATCHING

Shall be done with materials which match the existing in color, quality and surface texture when finished.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 14 00

WORK RESTRICTIONS

01/07

PART 1 GENERAL

1.1 CONTRACTOR ACCESS AND USE OF PREMISES

1.1.1 Station Regulations

Ensure that Contractor personnel employed on the Station become familiar with and obey Station regulations. Keep within the limits of the work and avenues of ingress and egress as directed. Do not enter restricted areas unless required to do so and until cleared for such entry. Wear hard hats in designated areas. Do not enter any restricted areas unless required to do so and until cleared for such entry. The Contractor's equipment shall be conspicuously marked for identification.

1.1.2 Working Hours

Regular working hours shall consist of an eight and one-half hour period established by the Contracting Officer, Monday through Friday, excluding Government holidays.

1.1.3 Work Outside Regular Hours

Work outside regular working hours requires Contracting Officer approval. Provide written request at least 15 calendar days prior to such work to allow arrangements to be made by the Government for inspecting the work in progress. During periods of darkness, the different parts of the work shall be lighted in a manner approved by the Contracting Officer.

1.1.4 Occupied and Existing Buildings

The Contractor shall be working in an existing building and around existing buildings which are occupied. Do not enter the buildings without prior approval of the Contracting Officer.

The existing buildings and their contents shall be kept secure at all times. Provide temporary closures as required to maintain security as directed by the Contracting Officer.

Provide dust covers or protective enclosures to protect existing work that remains during the construction period.

The Government will remove and relocate other Government property in the areas of the buildings scheduled to receive work.

1.1.5 Utility Cutovers and Interruptions

- a. Make utility cutovers and interruptions after normal working hours or on Saturdays, Sundays, and Government holidays. Conform to procedures required in the paragraph "Work Outside Regular Hours."
- b. Ensure that new utility lines are complete, except for the

connection, before interrupting existing service.

- c. Interruption to water, sanitary sewer, storm sewer, telephone service, electric service, air conditioning, heating, fire alarm shall be considered utility cutovers pursuant to the paragraph entitled "Work Outside Regular Hours." This time limit includes time for deactivation and reactivation.
- d. Operation of Station Utilities: The Contractor shall not operate nor disturb the setting of control devices in the station utilities system, including water, sewer, electrical, and steam services. The Government will operate the control devices as required for normal conduct of the work. The Contractor shall notify the Contracting Officer giving reasonable advance notice when such operation is required.

1.2 SECURITY REQUIREMENTS

Contract Clause "FAR 52.204-2, Security Requirements and Alternate II,"
"FAC 5252.236-9301, Special Working Conditions and Entry to Work Area."

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES

04/12

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE EP-1110-1-8 (1995) Construction Equipment Ownership and Operating Expense Schedule

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-01 Preconstruction Submittals

Schedule of prices

1.3 SCHEDULE OF PRICES

1.3.1 Data Required

Within 15 calendar days of notice of award, prepare and deliver to Contracting Officer a schedule of prices (construction contract) on the forms furnished by the Government. Provide a detailed breakdown of the contract price, giving quantities for each of the various kinds of work, unit prices, and extended prices therefor. Schedule of prices shall be separated by individual building numbers with subtotals for each building.

1.3.2 Schedule Instructions

Payments will not be made until the schedule of prices has been submitted to and approved by the Contracting Officer. Identify the cost for site work, and include incidental work to the 5 foot line. Identify costs for the building(s), and include work out to the 5 foot line. Workout to the 5 foot line shall include construction encompassed within a theoretical line 5 feet from the face of exterior walls and shall include attendant construction, such as cooling towers, placed beyond the 5 foot line.

1.3.3 Schedule Requirements for HVAC TAB

The field work Section 23 05 92, "HVAC Testing/Adjusting/Balancing" shall be broken down in the Schedule of Prices and in the Construction Progress Documentation by separate line items which reflect measurable deliverables. Specific payment percentages for each line item shall be determined on a case by case basis for each contract. The line items shall be as follows:

- a. Approval of Design Review Report: The TABS Agency is required to conduct a review of the project plans and specifications to identify any feature, or the lack thereof, that would preclude successful testing and balancing of the project HVAC systems. The resulting findings shall be submitted to the Government to allow correction of the design. The progress payment shall be issued after review and approval of the report.
- b. Approval of the pre-field engineering report: The TABS Agency submits a report which outlines the scope of field work. The report shall contain details of what systems will be tested, procedures to be used, sample report forms for reporting test results and a quality control checklist of work items that must be completed before TABS field work commences.
- c. Season I field work: Incremental payments are issued as the TABS field work progresses. The TABS Agency mobilizes to the project site and executes the field work as outlined in the pre-field engineering report. The HVAC water and air systems are balanced and operational data shall be collected for one seasonal condition (either summer or winter depending on project timing).
- d. Approval of Season I report: On completion of the Season I field work, the data is compiled into a report and submitted to the Government. The report is reviewed, and approved, after ensuring compliance with the pre-field engineering report scope of work.
- e. Completion of Season I field QA check: Contract QC and Government representatives meet the TABS Agency at the jobsite to retest portions of the systems reported in the Season I report. The purpose of these tests are to validate the accuracy and completeness of the previously submitted Season I report.
- f. Approval of Season II report: The TABS Agency completes all Season II field work, which is normally comprised mainly of taking heat transfer temperature readings, in the season opposite of that under which Season I performance data was compiled. This data shall be compiled into a report and submitted to the Government. On completion of submittal review to ensure compliance with the pre-field engineering report scope, progress payment is issued. Progress payment is less than that issued for the Season I report since most of the water and air balancing work effort is completed under Season I.

1.4 CONTRACT MODIFICATIONS

In conjunction with the Contract Clause "DFARS 252.236-7000, Modification Proposals-Price Breakdown," and where actual ownership and operating costs of construction equipment cannot be determined from Contractor accounting records, equipment use rates shall be based upon the applicable provisions of the [COE EP-1110-1-8](#).

1.5 CONTRACTOR'S PAYMENT REQUEST

1.5.1 Proper Payment Request

A proper request for payment/invoice shall comply with all requirements specified in this Section and the contract payment clauses. If any invoice

does not comply with these requirements, it shall be returned with a statement of the reasons why it was not a proper invoice. A proper payment request/invoice includes the following information, completed forms, and number of copies indicated. Upon request, the Contracting Officer will furnish copies of Government forms.

- a. Contractor's Invoice on NAVFAC Form 7300/30, which shall show the basis for arriving at the amount of the invoice. Submit one original and two copies.
- b. Contractor's Monthly Estimate for Voucher (LANTNAVFACENGCOM Form 4-4330/110. Submit original and two copies.
- c. Payment Certification. Furnish as specified in "FAR Clause 52.232-5 (c) Payments under Fixed-Price Construction Contracts." Submit one original.
- d. QC Invoice Certification. Furnish as specified in Section 01 45 10, "Quality Control." Submit one original.

1.5.1.1 Progress Payments

In addition to the requirements stated in Paragraph 1.5.1, "Proper Payment Request" above, the Contractor's request for progress payments shall include the following:

- a. Updated Progress Schedule: Furnish an updated progress schedule as specified in contract clause FAR 52.236-15 "Schedules for Construction Contracts" and Section 01 32 16, "Construction Progress Documentation." Submit one copy.

1.5.1.2 Final Payments

The request for final payment is submitted after completion and acceptance of all work and all other requirements of the contract. Before submitting the final invoice the Contractor shall meet with the appropriate Government representatives to determine the final invoice amount, including the assessment of liquidated damages, if any, and to make sure the final release is complete and accurate. In addition to the requirements in Paragraph 1.5.1, "Proper Payment Request" above, the Contractor's request for final payment shall include the following:

- a. A final release executed on the standard form provided by the Contracting Officer. Submit two originals with final payment request.
- b. NC Tax certified statement and report for the prime and each subcontractor (FAR 52.229-7). Submit two copies.
- c. As-built drawings (if applicable).
- d. Warranties (if applicable).
- e. O&M manuals (if applicable).
- f. Final payrolls (FAR 52.222-6).
- g. A release for an assignment of claims (if applicable). Submit three originals.

1.5.2 Procedures for Submitting Payment Request

- a. The Contractor may submit only one invoice for payment each month as the work progresses.
- b. The invoice shall be delivered to the ROICC Office, Administrative Branch, between five calendar days before and five calendar days after the contract award date. Invoices received outside this schedule shall be returned to the Contractor unprocessed. The Contractor will have to wait until the following month to submit their next invoice.
- c. Invoices shall be delivered during normal work hours from 7:30 AM up to 4:00 PM (EST), Monday through Friday, excluding holidays.

1.6 PAYMENTS TO THE CONTRACTOR

Payments will be made on submission of a proper payment request/invoice by the Contractor.

1.6.1 Obligation of Government Payments

The obligation of the Government to make payments required under the provisions of this contract will, at the discretion of the Contracting Officer, be subject to the following:

- a. Reasonable retention and/or deductions due to defects in material or workmanship; potential liquidated damages; and/or failure to comply with any other requirements of the contract.
- b. Claims which the Government may have against the Contractor under or in connection with this contract; and
- c. Unless otherwise adjusted, repayment to the Government upon demand for overpayments made to the Contractor.
- d. Failure to provide up to date record drawings not current as stated in Contract Clause "FAC 5252.236-9310, Record Drawings"; NC State tax certified statement and report in accordance with FAR 52.229-2; labor payrolls in accordance with FAR 52.222-6; as-built drawings in accordance with Section 01 45 10, "Quality Control"; warranties and O&M manuals; and any other requirements in the contract.

1.6.2 Payment for Onsite and Offsite Materials

Progress payments may be made to the contractor for materials delivered on the site, for materials stored off construction sites, or materials that are in transit to the construction sites under the following conditions:

- a. FAR 52.232-5(b) Payments Under Fixed Price Construction Contracts.
- b. Materials delivered on the site but not installed, including completed preparatory work, and off-site materials to be considered for progress payment shall be major high cost, long lead, special order, or specialty items, not susceptible to deterioration or physical damage in storage or in transit to the construction site. Examples of materials acceptable for payment

considerations include, but are not limited to, structural steel, non-magnetic steel, non-magnetic aggregate, equipment, machinery, large pipe and fittings, precast/ prestressed concrete products, plastic lumber (e.g. fender piles/ curbs), and high-voltage electrical cable. Materials no acceptable for payment include consumable materials such as nails, fasteners, conduits, gypsum board, glass, insulation, and wall coverings.

- c. Materials to be considered for progress payment prior to installation shall be specifically and separately identified in the Contractor's estimates of work submitted for the Contracting Officer's approval in accordance with Earned Value Report requirement of this contract. Requests for progress payment considerations for such items shall be supported by documents establishing their value and that the title requirements of the clause at FAR 52.232-5 have been met.
- d. Materials are adequately insured and protected from theft and exposure.
- e. Provide a written consent from the surety company with each payment request for offsite materials.
- f. Materials to be considered for progress payments prior to installation shall be stored in the Continental United States.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

03/12

PART 1 GENERAL

1.1 SUBMITTALS

Submit the following in accordance with the Section 01 33 00, "Submittal Procedures."

SD-01 Preconstruction Submittals

List of contact personnel

1.2 MINIMUM INSURANCE REQUIREMENTS

Procure and maintain during the entire period of performance under this contract the following minimum insurance coverage:

- a. Comprehensive general liability: \$500,000 per occurrence
- b. Automobile liability: \$200,000 per person, \$500,000 per occurrence, \$20,000 per occurrence for property damage
- c. Workmen's compensation as required by Federal and State workers' compensation and occupational disease laws,
- d. Employer's liability coverage of \$100,000, except in States where workers compensation may not be written by private carriers,
- e. Others as required by State law.

1.3 ELECTRONIC MAIL (EMAIL)

- a. The Contractor is required to establish and maintain electronic mail (email) capability along with the capability to open various electronic attachments in Microsoft, Adobe Acrobat, and other similar formats.
- b. Within 10 days after contract award; the Contractor shall provide the Contracting Officer a single (only one) email address for the ROICC office to send communications related to this contract correspondence. The ROICC office may also use email to notify the Contractor of base access conditions when emergency conditions warrant, such as hurricanes, terrorist threats, etc.
- c. Multiple email addresses are not authorized.
- d. It is the Contractor's responsibility to make timely distribution of all ROICC email within its own organization, including field office(s).
- e. The Contractor shall promptly notify the Contracting Officer, in writing, of any changes to their email address.

1.4 CONTRACTOR PERSONNEL REQUIREMENTS

1.4.1 Subcontractors and Personnel

Furnish a [list of contact personnel](#) of the Contractor and subcontractors including addresses and telephone numbers for use in the event of an emergency. As changes occur and additional information becomes available, correct and change the information contained in previous lists.

1.4.2 Identification Badges

Identification badges will be furnished without charge. Application for and use of badges will be as directed below. Immediately report instances of lost or stolen badges to the Contracting Officer. Employees are required to resubmit a complete 50 state criminal records check in order to renew their contractor badge.

1.4.3 Business Access Security Requirements

1.4.3.1 Business Access Definition

Contractor/subcontractor employees requiring installation access to MCB, Camp Lejeune or MCAS New River, N.C. must obtain a Business Access Identification Badge for that particular installation. Regularly scheduled delivery personnel, to include FEDEX, UPS, Pick-up and deliveries, should, also, follow the Business Access guidelines described below. Personnel requiring Business Access Identification Badges shall submit all documentation listed below. Badges are not required if the contracted position requires the employee to obtain a Common Access Card (CAC) which will be identified separately within the Government contract.

1.4.3.2 Installation Security Access Requirements

Contractor shall accomplish the security requirements below within 10 days after award or prior to performance under the contract.

1.4.3.3 Business Access Identification Badge Requirement

In order to obtain a Business Access Identification Badge for access to MCB, Camp Lejeune, and satellite activities, or MCAS New River, NC, all personnel providing services under this contract shall be required to present the documentation below to the following offices, as applicable:

MCB, Camp Lejeune, NC and its satellite activities. Report as follows:

1. Identification Card Center, 60 Molly Pitcher Road for badge (910-450-8444).

MCAS New River, NC. Report as follows:

1. Pass and Identification Office, Bldg AS-187 for badge (910-449-7695) and vehicle pass (910-449-5513).

1.4.3.4 Proof of Employee Citizenship or Legal Alien Status

Employers may participate in the E-verify program (1-888-464-4218, www.DHS.gov/e-verify) allowing U.S. employers to verify name, DOB, and SSN along with immigration information for non-citizens, against federal

databases in order to verify the employment eligibility of both citizens and non-citizen new hires.

1.4.3.5 Proof of Criminal Records Check

Commercial and contract employees must provide proof a complete 50 state criminal records check on an annual basis. The record check may be obtained from any of the following Internet investigative services: Kröll (former Infolink Screening Services) at www.kroll.com, Castle Branch at www.castlebranch.com, or any other investigative services company that provides records checks for all 50 states. These services also validate social security card numbers. All criminal history checks must be completed no more than 30 days prior to start date of contract. (Note: These Internet screening services are listed as possible sources for obtaining a criminal background check. The United States government and the United States Marine Corps do not endorse nor are they affiliated with any of these services).

1.4.3.6 Letter Provided By Contracting Officer Indicating Contract

Letter provided by Contracting Officer indicating contract, contract period and prime contractor. Proof of employment on a valid Government contract (e.g., a letter on company letterhead from the prime contractor including contract number and term).

1.4.3.7 Photo ID

Valid state or federal issued picture identification card. Acceptable documents include state drivers license, DMV issued photo identification, or alien registration card.

1.4.3.8 National Crime Investigation Center (NCIC) Check

Provost Marshals are authorized to conduct a national crime information center (NCIC) check of all persons entering the installation, if/where applicable, the NCIC check may include drivers's license query, wants and warrants, and criminal history.

1.4.4 Denial of Access

Installation access shall be denied if it is determined that an employee:

- a. Is on the National Terrorist Watch List
- b. Is illegally present in the United States.
- c. Is subject to an outstanding warrant.
- d. Has knowingly submitted an employment questionnaire with false or fraudulent information.
- e. Has been issued a debarment order and is currently banned from military installations.
- f. Is a Registered Sexual Offender.
- g. Has been convicted of a felony or a drug crime within the past five years.

- h. Individuals who have received a DUI/DWI in the last year may be allowed access to the installation, but will not be permitted to drive on the installation.
- i. Any reason the Installation Commander deems reasonable for the good order and discipline.

1.4.5 Appeal Process

All appeals should be directed to the Base Inspector's Office for any individual that has been denied access to the Base.

1.4.6 Display of Badges

Contractors/subcontractors shall prominently display their badges on their person at all times. Upon completion/termination of this contract or an individual's employment, the Contractor shall collect and turn in to the Pass & ID Office all badges. If the Contractor fails to obtain the employee's badge, the Pass & ID Office will be notified within 24 hours. Immediately report instances of lost or stolen badges to the Contracting Officer.

1.4.7 Contractor and Subcontractor Vehicle Requirements

Each vehicle to be used in contract performance shall show the Contractor's or subcontractor's name so that it is clearly visible and shall always display a valid state license plate and safety inspection sticker. To obtain a vehicle decal, which will be valid for one year or contract period, whichever is shorter, Contractor or subcontractor vehicle operators shall provide to the Vehicle Registration Office, 60 Molly Pitcher Road (910-451-1158) or to MCAS, Building AS-187 (910-449-5513) for vehicle decal:

- a. An installation sponsor request forwarded to provost Marshall office
- b. A valid form of Federal or state government I.D.
- c. If driving a motor vehicle, a valid driver's license, vehicle registration and proof of insurance

Upon completion/termination of this contract or an individual's employment, the Contractor shall collect and turn in to Vehicle Registration all Government vehicle decals. If any are not collected, the Contractor shall notify the Vehicle Registration Office within 24 hours.

1.4.8 Security Checks

Contractor personnel and vehicles shall only be present in locations relevant to contract performance. All Contractor personnel entering the base shall conform to all Government regulations and are subject to such checks as may be deemed necessary to ensure that violations do not occur. Employees shall not be permitted on base when such a check reveals that their presence would be detrimental to the security of the base. Subject to security regulations, the Government will allow access to an area for servicing equipment and/or performing required services. Upon request, the Contractor shall submit to the Contracting Officer questionnaires and other forms as may be required for security purposes.

1.4.9 Subcontractor Special Requirements

1.4.9.1 Space Temperature Control, HVAC TAB, and Apparatus Inspection

All contract requirements of Section 23 09 23.13 20, "BACnet DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC," AND Section 23 05 92, "TESTING/ADJUSTING/BALANCING: SMALL HEATING/VENTILATING/COOLING SYSTEMS" shall be accomplished directly by a first tier subcontractor. No work required by Section 23 09 23.13 20 or 23 05 92 shall be accomplished by a second tier subcontractor.

1.4.9.2 Telecommunication and High Voltage Work

When telecommunications and high voltage work is required, all work associated with telecommunications and high voltage shall be accomplished by a first tier subcontractor. The contractor must possess a valid North Carolina Public Utility - Electrical, contractor's license and be insured to do such work in the State of North Carolina.

1.5 DISCLOSURE OF INFORMATION

Contractor shall comply as follows:

- (a) The Contractor shall not release to anyone outside the Contractor's organization any unclassified information, regardless of medium (e.g., film, tape, document), pertaining to any part of this contract or any program related to this contract, unless -
 - (1) The Contracting Officer has given prior written approval; or
 - (2) The information is otherwise in the public domain before the date of release.
- (b) Requests for approval shall identify the specific information to be released, the medium to be used, and the purpose for the release. The Contractor shall submit its request to the Contracting Officer at least 45 days before the proposed date for release.
- (c) The Contractor agrees to include a similar requirement in each subcontract under this contract. Subcontractors shall submit requests for authorization to release through the prime contractor to the Contracting Officer.

1.6 SUPERVISION

Have at least one qualified supervisor capable of reading, writing, and conversing fluently in the English language on the job site during working hours. In addition, if a Quality Control (CQ) representative is required on the contract, then that individual shall also have fluent English communication skills.

NOTE: If training and experience requirements of Section 01 45 10, "Quality Control" and 01 35 29, "Safety and Occupational Health Requirements" have been met the supervisor may also serve as QC Manager and Site Safety and Health Officer (SSHO).

1.7 PRECONSTRUCTION CONFERENCE

After award of the contract but prior to commencement of any work at the

site, meet with the Contracting Officer to discuss and develop a mutual understanding relative to the administration of the value engineering and safety program, preparation of the schedule of prices, shop drawings, and other submittals, scheduling programming, and prosecution of the work. Major subcontractors who will engage in the work shall also attend.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 32 16

CONSTRUCTION PROGRESS DOCUMENTATION

04/12

PART 1 GENERAL

1.1 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-01 Preconstruction Submittals

Construction schedule

Equipment delivery schedule

1.2 CONSTRUCTION SCHEDULE

Within 21 days after receipt of the Notice of Award, prepare and submit to the Contracting Officer for approval a Critical Path Method (CPM), Network Schedule in accordance with the terms in Contract Clause "FAR 52.236-15, Schedules for Construction Contracts," except as modified in this contract. Primavera P6 will be utilized to produce and update all progress schedules.

1.2.1 HVAC TAB Milestones

Requirements for the milestones related to HVAC TAB work, Section 23 05 92, "TESTING/ADJUSTING/BALANCING: SMALL HEATING/VENTILATING/COOLING SYSTEMS," are specified in Section 01 20 00, "Price and Payment Procedures."

1.3 EQUIPMENT DELIVERY SCHEDULE

1.3.1 Initial Schedule

Within 30 calendar days after approval of the proposed construction schedule, submit for Contracting Officer approval a schedule showing procurement plans for materials, plant, and equipment. Submit in the format and content as prescribed by the Contracting Officer, and include as a minimum the following information:

- a. Description.
- b. Date of the purchase order.
- c. Promised shipping date.
- d. Name of the manufacturer or supplier.
- e. Date delivery is expected.
- f. Date the material or equipment is required, according to the current construction schedule.

1.4 NETWORK ANALYSIS SYSTEM (NAS)

The Contractor shall use the critical path method (CPM) to schedule and control construction activities. The Network shall have a minimum of 25 activities and a maximum of 50 activities. The schedule shall identify as a minimum:

- a. Construction time for all major systems and components;
- b. Major submittals and submittal processing time; and
- c. Major equipment lead time.

1.4.1 CPM Submittals and Procedures

The Contractor shall use the critical path method (CPM) to schedule and control project activities. Project schedules shall be prepared and maintained using Primavera P6, Primavera SureTrak or current mandated scheduling program. Save files in Concentric P6 or current mandated scheduling program file format, compatible with the Governments version of the scheduling program. The network analysis system shall be kept current, with changes made to reflect the actual progress and status of the construction.

1.5 UPDATED SCHEDULES

Update the construction schedule and equipment delivery schedule at monthly intervals or when schedule has been revised. Reflect any changes occurring since the last update. Submit copies of the purchase orders and confirmation of the delivery dates as directed.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 33 00

SUBMITTAL PROCEDURES

12/10

PART 1 GENERAL

1.1 SUMMARY

1.1.1 Government-Furnished Information

Submittal register will be delivered to the contractor in hard copy format. Register will have the following fields completed, to the extent that will be required by the Government during subsequent usage.

Column (c): Lists specification section in which submittal is required.

Column (d): Lists each submittal description (SD No. and type, e.g. SD-04 Drawings) required in each specification section.

Column (e): Lists one principal paragraph in specification section where a material or product is specified. This listing is only to facilitate locating submitted requirements. Do not consider entries in column (e) as limiting project requirements.

Column (f): Indicate approving authority for each submittal. The Contracting Officer is approving authority for all submittals.

1.2 DEFINITIONS

1.2.1 Submittal

Shop drawings, product data, samples, and administrative submittals presented for review and approval. Contract Clauses "FAR 52.236-5, Material and Workmanship," paragraph (b) and "FAR 52.236-21, Specifications and Drawings for Construction," paragraphs (d), (e), and (f) apply to all "submittals."

1.2.2 Types of Submittals

All submittals are classified as indicated in paragraph "Submittal Descriptions (SD)". Submittals also are grouped as follows:

- a. Shop drawings: As used in this section, drawings, schedules, diagrams, and other data prepared specifically for this contract, by contractor or through contractor by way of subcontractor, manufacturer, supplier, distributor, or other lower tier contractor, to illustrate portion of work.
- b. Product data: Preprinted material such as illustrations, standard schedules, performance charts, instructions, brochures, diagrams, manufacturer's descriptive literature, catalog data, and other data to illustrate portion of work, but not prepared exclusively for this contract.
- c. Samples: Physical examples of products, materials, equipment,

assemblies, or workmanship that are physically identical to portion of work, illustrating portion of work or establishing standards for evaluating appearance of finished work or both.

- d. Administrative submittals: Data presented for reviews and approval to ensure that administrative requirements of project are adequately met but not to ensure directly that work is in accordance with design concept and in compliance with contract documents.

1.2.3 Submittal Descriptions (SD)

SD-01 Preconstruction Submittals

Certificates of insurance
Surety bonds
List of proposed subcontractors
List of proposed products
Construction Progress Schedule
Submittal schedule
Schedule of values
Health and safety plan
Work plan
Quality control plan
Environmental protection plan

SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.

Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the contractor for integrating the product or system into the project.

Drawings prepared by or for the contractor to show how multiple systems and interdisciplinary work will be coordinated.

SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials or equipment for some portion of the work.

Samples of warranty language when the contract requires extended product warranties.

SD-04 Samples

Physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.

Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.

Field samples and mock-ups constructed on the project site establish standards by which the ensuring work can be judged. Includes assemblies or

portions of assemblies which are to be incorporated into the project and those which will be removed at conclusion of the work.

SD-05 Design Data

Calculations, mix designs, analyses or other data pertaining to a part of work.

SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. (Testing must have been within three years of date of contract award for the project.)

Report which includes findings of a test required to be performed by the contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.

Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Investigation reports

Daily checklists

Final acceptance test and operational test procedure

SD-07 Certificates

Statements signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements. Must be dated after award of project contract and clearly name the project.

Document required of Contractor, or of a supplier, installer or subcontractor through Contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.

Confined space entry permits.

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and Material Safety Data sheets concerning impedances, hazards and safety precautions.

SD-09 Manufacturer's Field Reports

Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

Factory test reports.

SD-10 Operation and Maintenance Data

Data intended to be incorporated in operations and maintenance manuals.

SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

As-built drawings

Special warranties

Posted operating instructions

Training plan

1.2.4 Approving Authority

Person authorized to approve submittal.

1.2.5 Work

As used in this section, on- and off-site construction required by contract documents, including labor necessary to produce construction and materials, products, equipment, and systems incorporated or to be incorporated in such construction.

1.3 SUBMITTALS

Submit the following in accordance with the requirements of this section.

SD-11 Closeout Submittals

Submittal register

Complete Submittal Package 1 CD

1.4 USE OF SUBMITTAL REGISTER

Prepare and maintain submittal register, as the work progresses. Use the hard copy submittal register furnished by the Government or other approved format. Do not change data which is output in columns (c), (d), (e), and (f) as delivered by government; retain data which is output in columns (a), (g), (h), and (i) as approved.

1.4.1 Submittal Register

Submit submittal register as a hard copy. Submit with quality control plan and project schedule required by Section 01 45 10, "Quality Control" and Section 01 32 16, "Construction Progress Documentation." Do not change data in columns (c), (d), (e), and (f) as delivered by the government. Verify that all submittals required for project are listed and add missing submittals. Complete the following on the register:

Column (a) Activity Number: Activity number from the project schedule.

Column (g) Contractor Submit Date: Scheduled date for approving authority to receive submittals.

Column (h) Contractor Approval Date: Date contractor needs approval of

submittal.

Column (i) Contractor Material: Date that contractor needs material delivered to contractor control.

1.4.2 Contractor Use of Submittal Register

Update the following fields in the government-furnished submittal register.

Column (b) Transmittal Number: Contractor assigned list of consecutive numbers.

Column (j) Action Code (k): Date of action used to record contractor's review when forwarding submittals to QC.

Column (l) List date of submittal transmission.

Column (q) List date approval received.

1.4.3 Approving Authority Use of Submittal Register

Update the following fields in the government-furnished submittal register.

Column (b).

Column (l) List date of submittal receipt.

Column (m) through (p).

Column (q) List date returned to contractor.

1.4.4 Contractor Action Code and Action Code

Entries used will be as follows (others may be prescribed by Transmittal Form):

NR - Not Received

AN - Approved as noted

A - Approved

RR - Disapproved, Revise, and Resubmit

1.4.5 Copies Delivered to the Government

Deliver one copy of submitted register updated by contractor to government with each invoice request.

1.5 PROCEDURES FOR SUBMITTALS

1.5.1 Reviewing, Certifying, Approving Authority

QC organization shall be responsible for reviewing and certifying that submittals are in compliance with contract requirements. The Contracting Officer is the approving authority for all submittals.

1.5.2 Constraints

- a. Submittals listed or specified in this contract shall conform to provisions of this section, unless explicitly stated otherwise.
- b. Submittals shall be complete for each definable feature of work; components of definable feature interrelated as a system shall be submitted at same time.
- c. When acceptability of a submittal is dependent on conditions, items, or materials included in separate subsequent submittals, submittal will be returned without review.
- d. Approval of a separate material, product, or component does not imply approval of assembly in which item functions.

1.5.3 Scheduling

- a. Coordinate scheduling, sequencing, preparing and processing of submittals with performance of work so that work will not be delayed by submittal processing. Allow for potential requirements to resubmit.
- b. Except as specified otherwise, allow review period, beginning with receipt by approving authority, that includes at least 15 working days for submittals for QC manager approval and 20 working days for submittals for contracting officer approval. Period of review for submittals with contracting officer approval begins when Government receives submittal from QC organization. Period of review for each resubmittal is the same as for initial submittal.
- c. For submittals requiring review by fire protection engineer, allow review period, beginning when government receives submittal from QC organization, of 45 working days for return of submittal to the contractor. Period of review for each resubmittal is the same as for initial submittal.

1.5.4 Variations

Variations from contract requirements require Government approval pursuant to contract Clause entitled "FAR 52.236-21, Specifications and Drawings for Construction" and will be considered where advantageous to government.

1.5.4.1 Considering Variations

Discussion with contracting officer prior to submission, will help ensure functional and quality requirements are met and minimize rejections and resubmittals. When contemplating a variation which results in lower cost, consider submission of the variation as a Value Engineering Change Proposal (VECP).

1.5.4.2 Proposing Variations

When proposing variation, deliver written request to the contracting officer, with documentation of the nature and features of the variation and why the variation is desirable and beneficial to government. If lower cost is a benefit, also include an estimate of the cost saving. In addition to documentation required for variation, include the submittals required for the item. Clearly mark the proposed variation in all documentation.

1.5.4.3 Warranting That Variation Are Compatible

When delivering a variation for approval, contractor warrants that this contract has been reviewed to establish that the variation, if incorporated, will be compatible with other elements of work.

1.5.4.4 Review Schedule Is Modified

In addition to normal submittal review period, a period of 10 working days will be allowed for consideration by the Government of submittals with variations.

1.5.5 Contractor's Responsibilities

- a. Determine and verify field measurements, materials, field construction criteria; review each submittal; and check and coordinate each submittal with requirements of the work and contract documents.
- b. Transmit submittals to QC organization in accordance with schedule on approved Submittal Register, and to prevent delays in the work, delays to government, or delays to separate contractors.
- c. Advise contracting officer of variation, as required by paragraph entitled "Variations."
- d. Correct and resubmit submittal as directed by approving authority. When resubmitting disapproved transmittals or transmittals noted for resubmittal, the contractor shall provide copy of that previously submitted transmittal including all reviewer comments for use by approving authority. Direct specific attention in writing or on resubmitted submittal, to revisions not requested by approving authority on previous submissions.
- e. Furnish additional copies of submittal when requested by contracting officer, to a limit of 20 copies per submittal.
- f. Complete work which must be accomplished as basis of a submittal in time to allow submittal to occur as scheduled.
- g. Ensure no work has begun until submittals for that work have been returned as "approved," or "approved as noted", except to the extent that a portion of work must be accomplished as basis of submittal.

1.5.6 QC Organization Responsibilities

- a. Note date on which submittal was received from contractor on each submittal.
- b. Review each submittal; and check and coordinate each submittal with requirements of work and contract documents.
- c. Review submittals for conformance with project design concepts and compliance with contract documents.
- d. Act on submittals, determining appropriate action based on QC organization's review of submittal.

(1) When QC manager is approving authority, take appropriate action on submittal from the possible actions defined in paragraph entitled, "Actions Possible."

(2) When contracting officer is approving authority or when variation has been proposed, forward submittal to Government with certifying statement or return submittal marked "not reviewed" or "revise and resubmit" as appropriate. The QC organization's review of submittal determines appropriate action.

- e. Ensure that material is clearly legible.
- f. Stamp each sheet of each submittal with QC certifying statement or approving statement, except that data submitted in bound volume or on one sheet printed on two sides may be stamped on the front of the first sheet only.

(1) When approving authority is contracting officer, QC organization will certify submittals forwarded to contracting officer with the following certifying statement:

"I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated with contract Number N40085-12-B-0066, is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is submitted for Government approval.

Certified by Submittal Reviewer _____, Date _____
(Signature when applicable)

Certified by QC manager _____, Date _____"
(Signature)

- g. Sign certifying statement or approval statement. The person signing certifying statements shall be QC organization member designated in the approved QC plan. The signatures shall be in original ink. Stamped signatures are not acceptable.
- h. Update submittal register as submittal actions occur and maintain the submittal register at project site until final acceptance of all work by contracting officer.
- i. Retain a copy of approved submittals at project site, including contractor's copy of approved samples.

1.5.7 Government's Responsibilities

When approving authority is contracting Officer, the Government will:

- a. Note date on which submittal was received from QC manager, on each submittal for which the contracting officer is approving authority.
- b. Review submittals for approval within scheduling period specified and only for conformance with project design concepts and compliance with contract documents.
- c. Identify returned submittals with one of the actions defined in paragraph entitled "Actions Possible" and with markings

appropriate for action indicated.

1.5.8 Actions Possible

Submittals will be returned with one of the following notations:

- a. Submittals marked "not reviewed" will indicate submittal has been previously reviewed and approved, is not required, does not have evidence of being reviewed and approved by contractor, or is not complete. A submittal marked "not reviewed" will be returned with an explanation of the reason it is not reviewed. Resubmit submittals returned for lack of review by contractor or for being incomplete, with appropriate action, coordination, or change.
- b. Submittals marked "approved" "approved as submitted" authorize contractor to proceed with work covered.
- c. Submittals marked "approved as noted" authorize contractor to proceed with work as noted provided contractor takes no exception to the notations.
- d. Submittals marked "revise and resubmit" or "disapproved" indicate submittal is incomplete or does not comply with design concept or requirements of the contract documents and shall be resubmitted with appropriate changes. No work shall proceed for this item until resubmittal is approved.

1.6 FORMAT OF SUBMITTALS

1.6.1 Complete Submittal Package

Contractor shall make electronic copies of all submittals, including the transmittal sheet, and provide a CD/DVD containing all submittals for project close out.

The CD/DVD shall be marked "Complete Submittal Package - Contract #N40085-12-B-0066."

1.6.2 Transmittal Form

Transmit each submittal, except sample installations and sample panels, to office of approving authority. Transmit submittals with transmittal form prescribed by contracting officer and standard for project. The transmittal form shall identify contractor, indicate date of submittal, and include information prescribed by transmittal form and required in paragraph entitled "Identifying Submittals." Process transmittal forms to record actions regarding sample panels and sample installations.

1.6.3 Identifying Submittals

Identify submittals, except sample panel and sample installation, with the following information permanently adhered to or noted on each separate component of each submittal and noted on transmittal form. Mark each copy of each submittal identically, with the following:

- a. Project title and location.
- b. Construction contract number.

- c. Section number of the specification section by which submittal is required.
- d. Submittal description (SD) number of each component of submittal.
- e. When a resubmission, alphabetic suffix on submittal description, for example, SD-10A, to indicate resubmission.
- f. Name, address, and telephone number of subcontractor, supplier, manufacturer and any other second tier contractor associated with submittal.
- g. Product identification and location in project.

1.6.4 Format for Product Data

- a. Present product data submittals for each section as a complete, bound volume. Include table of contents, listing page and catalog item numbers for product data.
- b. Indicate, by prominent notation, each product which is being submitted; indicate specification section number and paragraph number to which it pertains.
- c. Supplement product data with material prepared for project to satisfy submittal requirements for which product data does not exist. Identify this material as developed specifically for project.

1.6.5 Format for Shop Drawings

- a. Shop drawings shall not be less than 8 1/2 by 11 inches nor more than 30 by 42 inches.
- b. Present 8 1/2 by 11 inches sized shop drawings as part of the bound volume for submittals required by section. Present larger drawings in sets.
- c. Include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to information required in paragraph entitled "Identifying Submittals."
- d. Dimension drawings, except diagrams and schematic drawings; prepare drawings demonstrating interface with other trades to scale. Shop drawing dimensions shall be the same unit of measure as indicated on the contract drawings. Identify materials and products for work shown.

1.6.6 Format of Samples

- a. Furnish samples in sizes below, unless otherwise specified or unless the manufacturer has prepackaged samples of approximately same size as specified:
 - (1) Sample of Equipment or Device: Full size.
 - (2) Sample of Materials Less Than 2 by 3 inches: Built up to 8 1/2 by 11 inches.

- (3) Sample of Materials Exceeding 8 1/2 by 11 inches: Cut down to 8 1/2 by 11 inches and adequate to indicate color, texture, and material variations.
 - (4) Sample of Linear Devices or Materials: 10 inch length or length to be supplied, if less than 10 inches. Examples of linear devices or materials are conduit and handrails.
 - (5) Sample of Non-Solid Materials: Pint. Examples of non-solid materials are sand and paint.
 - (6) Color Selection Samples: 2 by 4 inches.
 - (7) Sample Panel: 4 by 4 feet.
 - (8) Sample Installation: 100 square feet.
- b. Samples Showing Range of Variation: Where variations are unavoidable due to nature of the materials, submit sets of samples of not less than three units showing extremes and middle of range.
 - c. Reusable Samples: Incorporate returned samples into work only if so specified or indicated. Incorporated samples shall be in undamaged condition at time of use.
 - d. Recording of Sample Installation: Note and preserve the notation of area constituting sample installation but remove notation at final clean up of project.
 - e. When color, texture or pattern is specified by naming a particular manufacturer and style, include one sample of that manufacturer and style, for comparison.

1.6.7 Format of Administrative Submittals

- a. When submittal includes a document which is to be used in project or become part of project record, other than as a submittal, do not apply contractor's approval stamp to document, but to a separate sheet accompanying document.
- b. Operation and Maintenance Manual Data: Submit in accordance with Section 01 78 23, "Operation and Maintenance Data." Include components required in that section and the various technical sections.

1.7 QUANTITY OF SUBMITTALS

1.7.1 Number of Copies of Product Data

- a. Submit five copies of submittals of product data requiring review and approval only by the Contracting Officer. Submit three copies of submittals of product data for operation and maintenance manuals.

1.7.2 Number of Copies of Shop Drawings

Submit shop drawings in compliance with quantity requirements specified for product data.

1.7.3 Number of Samples

- a. Submit two samples, or two sets of samples showing range of variation, of each required item. One approved sample or set of samples will be retained by approving authority and one will be returned to contractor.
- b. Submit one sample panel. Include components listed in technical section or as directed.
- c. Submit one sample installation, where directed.
- d. Submit one sample of non-solid materials.

1.7.4 Number of Copies of Administrative Submittals

- a. Unless otherwise specified, submit administrative submittals compliance with quantity requirements specified for product data.
- b. Submit administrative submittals required under "SD-19 Operation and Maintenance Manuals" to conform to Section 01 78 23, "Operation and Maintenance Data."

1.8 FORWARDING SUBMITTALS

1.8.1 Samples and Submittals

Except as otherwise noted, submit **Architectural** samples and submittals to:

Maune Belangia Faulkenberry Architects, PA
317-C Pollock Street
New Bern, North Carolina 28560

Except as otherwise noted, submit **Plumbing, Mechanical, and Electrical** samples and submittals to:

Crenshaw Consulting Engineers
3516 Bush St, Suite 200
Raleigh, NC 27609

1.8.1.1 Administrative Submittals

Submit administrative submittals for asbestos/lead removal and environmental protection plan to the Resident Officer in Charge of Construction (ROICC/OICC).

1.8.1.2 Fire Protection and Fire Alarm System Submittals

Submit fire protection and fire alarm system submittals to ROICC/OICC.

1.8.1.3 TAB Submittals

Submit to ROICC/OICC for all projects.

1.8.2 Shop Drawings, Product Data, and O&M Data

As soon as practicable after award of the contract, and before procurement or fabrication, submit shop drawings, product data and O&M Data required in the technical sections of this specification.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION

Repair the MCAS Police Station, Building AS-302

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT OR CLASSIFICATION REVIEW	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY					REMARKS	
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		MAILED TO CONTR/ DATE RCD FRM APPR AUTH
		01 20 00	SD-01 Preconstruction Submittals														
			Schedule of prices	1.3													
		01 30 00	SD-01 Preconstruction Submittals														
			List of contact personnel	1.4.1													
		01 32 16	SD-01 Preconstruction Submittals														
			Construction schedule	1.2													
			Equipment delivery schedule	1.3													
		01 33 00	SD-11 Closeout Submittals														
			Submittal register	1.4.1													
			Complete Submittal Package	1.6.1													
		01 35 29	SD-01 Preconstruction Submittals														
			Accident Prevention Plan (APP)	1.9													
			Activity Hazard Analysis (AHA)	1.10													
			Crane Critical Lift Plan	1.9.1													
			Crane Work Plan	1.9.1													
			Crane Operators	1.7.1.6													
			SD-06 Test Reports														
			Reports	1.14													
			Accident Reports	1.14.1													
			Monthly Exposure Reports	1.14.3													
			Regulatory Citations and Violations	1.14.4													
			Crane Reports	1.14.5													
			SD-07 Certificates														
			Confined Space Entry Permit	1.11													
			Certificate of Compliance	1.14.6													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION

Repair the MCAS Police Station, Building AS-302

CONTRACTOR

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																		(g)
		01 35 29	Third Party Certification of Barge-Mounted Mobile Cranes	1.14.7														
		01 45 10	SD-11 Closeout Submittals QC PLAN	1.6														
		01 50 00	SD-03 Product Data Backflow preventers	2.1														
			SD-06 Test Reports Backflow Preventer Tests	3.1														
			SD-07 Certificates Backflow Tester Certifications	1.3														
			Backflow Preventers Certificate	1.3.1														
		01 57 19	SD-11 Closeout Submittals Solid waste disposal permit	1.4.1														
			Disposal permit for hazardous waste	1.4.2														
			Environmental training documentation	1.2														
			Permit to transport hazardous waste	1.4.3														
			Hazardous waste certification	1.4.4														
			Annual Report of Products	2.1														
			Containing Recovered Materials															
		01 59 00	SD-03 Product Data Trailer	2.1														
		01 78 00	SD-10 Operation and Maintenance Data															

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		01 78 00	Equipment/product warranty list	1.4.1													
			SD-11 Closeout Submittals														
			As-built drawings	1.2.1													
			GIS Deliverables	1.3													
			Record of materials	1.3.3													
			Maximo requirements	1.3.4													
			Complete Submittal Package	1.5													
			Equipment/product warranty tag	1.4.2													
		02 41 00	SD-01 Preconstruction Submittals														
			Existing Conditions	1.9													
			SD-07 Certificates														
			Demolition Plan	1.2.1													
			Notification	1.6													
			SD-11 Closeout Submittals														
			Receipts	3.2.3													
		02 82 16	SD-06 Test Reports														
			Air sampling results	1.5.2													
			Pressure differential recordings for local exhaust system	1.5.3													
			Clearance sampling	3.3.3.2													
			SD-07 Certificates														
			Asbestos hazard abatement plan	1.5.1													
			SD-11 Closeout Submittals														
			Asbestos Waste Shipment	1.5.4													
			Record N.C. (DHHS-HHCU) Form 3787														

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		02 82 16	Daily log	1.5.5														
			North Carolina permit	1.5.6														
			Modifications to the North Carolina permit	1.5.7														
			Asbestos Inspection Reporting Form	1.5.8														
		02 82 33.12	SD-03 Product Data															
			Vacuum filters	1.5.4														
			Respirators	1.5.1														
			SD-06 Test Reports															
			Monitoring Results	1.4.4														
			SD-07 Certificates															
			Qualifications of CIH	1.4.1														
			Testing laboratory	1.4.2														
			Rental equipment notification	1.5.3														
			Preparation of Surfaces Coated with Lead-Contaminated Paint	1.4.3														
			Work Plan															
			Respiratory protection program	1.3.4														
			Hazard communication program	1.3.5														
			disposal facility	3.4														
			Hazardous waste management plan	1.3.6														
			Vacuum filters	1.5.4														
			SD-11 Closeout Submittals															
			manifest	3.4														

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		02 82 33.12	medical examinations	1.3.1													
			training certification	1.3.3.1													
		02 82 33.13	SD-03 Product Data														
			Vacuum filters	1.6.4													
			Respirators	1.6.1													
			SD-06 Test Reports														
			Monitoring Results	1.4.4													
			SD-07 Certificates														
			Qualifications of CIH	1.4.1													
			Testing laboratory	1.4.2													
			Materials coated with	1.4.3													
			lead-containing paint removal work plan														
			Rental equipment notification work plan	1.6.3 1.3.8													
			Respiratory protection program	1.3.4													
			Hazard communication program	1.3.5													
			disposal	3.4.4													
			Hazardous waste management plan	1.3.6													
			Vacuum filters	1.6.4													
			SD-11 Closeout Submittals														
			disposal	3.4.4													
			medical examinations	1.3.1													
			training certification	1.3.3.1													
		05 30 00	SD-02 Shop Drawings														

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		05 30 00	Fabrication Drawings	1.3.2													
			Deck Units	2.3.1													
			Cant Strips	2.3.2.1													
			Ridge and Valley Plates	2.3.2.2													
			Metal Closure Strips	2.3.2.3													
		05 40 00	SD-02 Shop Drawings														
			Framing Components	1.6.1													
			SD-03 Product Data														
			studs,joists	2.1													
			SD-05 Design Data														
			Metal framing calculations	1.6.2													
			SD-07 Certificates														
			Load-bearing cold-formed metal framing	1.4													
			Welds	3.1.1													
		05 50 13	SD-02 Shop Drawings														
			Access doors and panels	2.3													
			SD-03 Product Data														
			Access doors and panels	2.3													
		06 20 00	SD-02 Shop Drawings														
			Detail Drawings - Cabinets	1.3													
		06 61 16	SD-02 Shop Drawings														
			Detail Drawings	1.4.2													
			Installation	3.1													
			SD-03 Product Data														
			Solid polymer material	2.1													

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																		(a)
		06 61 16	Qualifications	1.4.1														
			Fabrications	2.3														
			SD-04 Samples															
			Material	2.1														
			Counter and Vanity Tops	2.3.4														
			SD-06 Test Reports															
			Solid polymer material	2.1														
			SD-07 Certificates															
			Fabrications	2.3														
			Qualifications	1.4.1														
			SD-10 Operation and Maintenance															
			Data															
			Clean-up	3.2														
		07 22 00	SD-02 Shop Drawings															
			Wood nailers	2.3														
			SD-03 Product Data															
			Fasteners	2.2														
			Insulation	2.1														
			SD-06 Test Reports															
			Flame spread and smoke developed ratings	1.4.1														
			SD-07 Certificates															
			qualifications	1.3														
			SD-08 Manufacturer's Instructions															
			fasteners	2.2														
			insulation	2.1														

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		07 41 13	SD-02 Shop Drawings														
			Roofing Panels	1.4.5													
			Flashing and Accessories	1.4.5													
			Gutter/Downspout Assembly	1.4.5													
			SD-03 Product Data														
			Roof panels	2.1													
			FACTORY-APPLIED COLOR FINISH	1.4.5													
			Accessories	2.4													
			Fasteners	1.4.5													
			Pressure Sensitive Tape	1.4.5													
			UNDERLAYMENTS	2.7													
			Gaskets and Sealing/Insulating Compounds	2.8													
			Coil Stock	1.4.5													
			Self-Adhering Modified Bitumen Underlayment	2.7.1													
			SD-04 Samples														
			Roof Panels	2.1													
			Factory-applied Color Finish	1.4.5													
			Accessories	2.4													
			Fasteners	1.4.5													
			Gaskets and Sealant/Insulating Compounds	1.4.5													
			SD-05 Design Data														
			Wind Uplift Resistance	1.2.1.2													

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		07 41 13	SD-06 Test Reports														
			Leakage Test Report	1.2.1.1													
			Wind Uplift Test Report	1.2.1.2													
			Factory Finish and Color Performance Requirements	2.2													
			SD-07 Certificates														
			Roof Panels	2.1													
			Coil stock compatibility	1.4.5													
			Self-Adhering Modified Bitumen Underlayment	2.7.1													
			Qualification of Manufacturer	1.4.1													
			Qualification of Applicator	1.4.2													
			SD-08 Manufacturer's Instructions														
			INSTALLATION MANUAL	1.4.5													
			SD-09 Manufacturer's Field Reports														
			Manufacturer's Field Inspection Reports	3.10.1													
			SD-11 Closeout Submittals														
			Warranties	1.8													
			Information Card	3.11													
			Date Of Installation Wall-Mounted Placard	3.12													
		07 60 00	SD-02 Shop Drawings														
			Gutters	3.1.12													
			Downspouts;	3.1.13													

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		07 60 00	Fascias	3.1.11													
			Counterflashing	3.1.10													
			Flashing at roof penetrations	3.1.14													
			SD-11 Closeout Submittals														
			Quality Control Plan	3.5													
		07 84 00	SD-02 Shop Drawings														
			Firestopping Materials	2.1													
			SD-07 Certificates														
			Manufacturer's Technical Representative	1.4.2													
			Firestopping Materials	2.1													
			Installer Qualifications	1.4.1													
			Inspection	3.3													
		07 92 00	SD-03 Product Data														
			Sealants	2.1													
			Primers	2.2													
			Bond breakers	2.3													
			Backstops	2.4													
			SD-07 Certificates														
			Sealant	3.3.6													
		08 11 13	SD-02 Shop Drawings														
			Doors	2.1													
			Doors	2.1													
			Frames	2.4													
			Frames	2.4													
			Accessories	2.2													

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		08 11 13	SD-03 Product Data														
			Doors	2.1													
			Frames	2.4													
			Accessories	2.2													
		08 14 00	SD-02 Shop Drawings														
			Doors	2.1													
			SD-03 Product Data														
			Doors	2.1													
			Accessories	2.2													
			Water-resistant sealer	2.3.4													
			warranty	1.4													
			Fire resistance rating	2.1.2													
			SD-04 Samples														
			Door finish colors	2.3.3.2													
		08 71 00	SD-02 Shop Drawings														
			Hardware schedule	1.3													
			Keying system	2.3.4													
			SD-03 Product Data														
			Hardware items	2.3													
			SD-08 Manufacturer's Instructions														
			Installation	3.1													
			SD-10 Operation and Maintenance														
			Data														
			Hardware Schedule	1.3													
			SD-11 Closeout Submittals														
			Key Bitting	1.4													

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		08 81 00	SD-02 Shop Drawings														
			Installation	3.2.1													
			SD-03 Product Data														
			Insulating Glass	1.6.1													
			Glazing Accessories	1.3													
			SD-07 Certificates														
			Insulating Glass	1.6.1													
			SD-08 Manufacturer's Instructions														
			Setting and sealing materials	2.3													
			Glass setting	3.2													
		09 29 00	SD-03 Product Data														
			Cementitious backer units	2.1.3													
			Moisture and Mold Resistant Gypsum Board	2.1.2													
			Accessories	2.1.6													
			Gypsum Board	2.1.1													
			Joint Treatment Materials	2.1.4													
			SD-07 Certificates														
			Asbestos Free Materials	2.1													
			SD-08 Manufacturer's Instructions														
			Material Safety Data Sheets	2.1													
			SD-10 Operation and Maintenance Data														
			Manufacturer maintenance instructions	2.1													
			Waste Management	3.8													

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		09 30 00	SD-03 Product Data														
			Tile	2.1													
			Setting-Bed	2.2													
			Mortar, Grout, and Adhesive	2.4													
			Reinforcing Wire Fabric	2.2.6													
			SD-04 Samples														
			Tile	2.1													
			Marble Thresholds	2.5													
			Grout	2.4.3													
			SD-06 Test Reports														
			TEST OF MEMBRANE WATERPROOFING	3.6													
		09 51 00	SD-03 Product Data														
			Acoustical Units	2.1													
			SD-04 Samples														
			Acoustical Units	2.1													
			Acoustic Ceiling Tiles	2.1.1													
			SD-06 Test Reports														
			Ceiling Attenuation Class and Test	1.2.1													
			SD-07 Certificates														
			Acoustical Units	2.1													
			Acoustic Ceiling Tiles	2.1.1													
		09 65 00	SD-03 Product Data														
			Resilient Flooring and Accessories	2.8													

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		09 65 00	Adhesives	2.4													
			Vinyl Composition Tile	2.1													
			Wall Base	2.2													
			SD-04 Samples														
			Resilient Flooring and Accessories	2.8													
			SD-06 Test Reports														
			Moisture, Alkalinity and Bond Tests	3.3													
			SD-08 Manufacturer's Instructions														
			Surface Preparation	3.2													
			Installation	3.1													
			SD-10 Operation and Maintenance Data														
			Resilient Flooring and Accessories	2.8													
			SD-11 Closeout Submittals														
			Resilient Flooring and Accessories	2.8													
			Adhesives	2.4													
		09 68 00	SD-02 Shop Drawings														
			Installation	3.4													
			Moldings	2.4													
			SD-03 Product Data														
			Carpet	2.1													
			Moldings	2.4													

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																		(a)
		09 68 00	Surface Preparation	3.1														
			Installation	3.4														
			Regulatory Requirements	1.4														
			Physical Characteristics	2.1.1														
			SD-04 Samples															
			Carpet	2.1														
			Moldings	2.4														
			SD-06 Test Reports															
			Moisture and Alkalinity Tests	3.2														
			SD-07 Certificates															
			Carpet	2.1														
			Regulatory Requirements	1.4														
			SD-10 Operation and Maintenance															
			Data															
			Carpet	2.1														
			Cleaning and Protection	3.5														
			Maintenance Service	3.7.1														
			SD-11 Closeout Submittals															
			Carpet	2.1														
			Adhesives and Concrete Primer	2.3														
		09 90 00	SD-03 Product Data															
			Coating	2.1														
			Manufacturer's Technical Data	2.1														
			Sheets															
			SD-04 Samples															
			Color	2.1														

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		09 90 00	SD-07 Certificates														
			Applicator's qualifications	1.3													
			SD-08 Manufacturer's Instructions														
			Application instructions	3.2.1													
			Mixing	3.5.2													
			Manufacturer's Material Safety Data Sheets	1.7.2													
			SD-10 Operation and Maintenance Data														
			Coatings:	2.1													
			SD-11 Closeout Submittals														
			Materials	2.1													
		10 14 02	SD-02 Shop Drawings														
			Detail Drawings	1.2													
			Sign Schedule	1.2													
			SD-03 Product Data														
			Installation	3.1													
			SD-04 Samples														
			Interior and Exterior Signage	1.2													
			SD-10 Operation and Maintenance Data														
			Approved Manufacturer's Instructions	3.1													
			Protection and Cleaning	3.1.2													
		10 21 13	SD-02 Shop Drawings														
			Fabrication Drawings	1.2													

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		10 21 13	Installation Drawings	3.2													
			SD-03 Product Data														
			Toilet Partition System	1.2													
			Cleaning and Maintenance Instructions	1.2													
			Colors And Finishes	2.7													
			Galvanized Steel Sheet	2.1.1													
			Sound Deadening Cores	2.1.2													
			Partition Panels and Doors	2.2													
			Anchoring Devices and Fasteners	2.1.3													
			Hardware and Fittings	2.1.5													
			Brackets	2.1.4													
			Door Hardware	2.1.6													
			Floor-Anchored Partitions	2.3													
			Overhead-Braced Partitions	2.4													
			Toilet Enclosures	2.2.1													
			Urinal Screens	2.2.2													
			SD-04 Samples														
			Colors and Finishes	2.7													
			Partition Panels	2.2													
			Hardware and Fittings	2.1.5													
			Anchoring Devices and Fasteners	2.1.3													
			SD-07 Certificates														
			Certification	1.6													

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		10 21 13	SD-10 Operation and Maintenance Data														
			Waste Management	3.7													
			Plastic Identification	1.2.1													
		10 28 13	SD-03 Product Data														
			Finishes	2.1.2													
			Accessory Items	2.2													
			SD-07 Certificates														
			Accessory Items	2.2													
		21 13 13.00 20	SD-02 Shop Drawings														
			Shop Drawings	1.5.1													
			SD-03 Product Data														
			Pipe	2.2.1													
			Fittings	2.2.1													
			Valves	2.2.4													
			Sprinklers	2.2.3													
			Pipe hangers and supports	2.2.5													
			Sprinkler Alarm Switches	2.3.1													
			Fire department connections	2.2.6													
			Mechanical couplings	2.2.1													
			Backflow Prevention Assembly	2.2.7													
			SD-05 Design Data														
			Hydraulic Calculations	1.3													
			SD-06 Test Reports														
			request to schedule Preliminary Tests	3.5													

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		21 13 13.00 20	Preliminary Test Report	3.5													
			request to schedule Final	3.6													
			Acceptance Test														
			Final Acceptance Test Report	3.6													
			SD-07 Certificates														
			Sprinkler System Installer	1.5.1													
			SD-10 Operation and Maintenance														
			Data														
			Operating and Maintenance	3.7													
			Instructions														
			SD-11 Closeout Submittals														
			As-built drawings	3.6													
			On-site training	3.7													
		22 00 00	SD-02 Shop Drawings														
			Plumbing System	3.7.1													
			SD-03 Product Data														
			Fixtures	2.4													
			Flush valve water closets	2.4.2													
			Flush valve urinals	2.4.3													
			Wall hung lavatories	2.4.4													
			Countertop lavatories	2.4.5													
			Kitchen sinks	2.4.6													
			Service sinks	2.4.7													
			Drinking-water coolers	2.4.8													
			Backflow prevention assemblies	3.7.1.1													
			Shower Faucets	2.5.2													

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		22 00 00	Vibration-Absorbing Features	3.3													
			SD-06 Test Reports														
			Tests, Flushing and Disinfection	3.7													
			Test of Backflow Prevention Assemblies	3.7.1.1													
			SD-07 Certificates														
			Materials and Equipment	1.3													
			Bolts	2.1.1													
			SD-10 Operation and Maintenance														
			Data														
			Plumbing System	3.7.1													
		22 07 19.00 40	SD-02 Shop Drawings														
			Installation Drawings	1.5													
			Installation Drawings	3.1													
			SD-03 Product Data														
			Adhesives	Part 2													
			Coatings	Part 2													
			Insulating Cement	Part 2													
			Insulation Materials	Part 2													
			Jacketing	Part 2													
			Tape	Part 2													
			SD-07 Certificates														
			Recycled Materials	1.4													
			Recycled Materials	1.4													
			SD-08 Manufacturer's Instructions														
			Installation Manual	1.5													

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		22 07 19.00 40	Installation Manual	3.1													
		23 05 92	SD-06 Test Reports														
			Certified TAB Report	1.4.1													
		23 07 00	SD-03 Product Data														
			Piping insulation	2.1													
			Piping insulation finishes	2.1.7													
			Heating, ventilating, and air conditioning systems insulation	2.2													
			Duct insulation finishes	2.2.4													
			Accessory materials	2.5													
			Adhesives, sealants, and coating compounds	2.4													
		23 09 13.34 40	SD-03 Product Data														
			Self-Contained Temperature Control Valves	2.1													
			Rate-of-Flow Controller	2.2													
			Water Pressure Regulating Valve	2.3													
			Water Pressure Relief Valve	2.4													
			Pilot-Operated Pressure-Relief Valve	2.5													
			Sample Warranty	1.4													
			SD-07 Certificates														
			Listing of Product Installation	1.3													
			Certificates of Conformance	1.4													
			Manufacturer's Warranty	3.1													
		23 09 23.13	SD-02 Shop Drawings														

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		23 09 23.13	Control system drawings title sheet	1.3.1.1													
			List of I/O Points	1.3.1.2													
			Control System Components List	1.3.1.3													
			Control system schematics	1.3.1.4													
			HVAC Equipment Electrical Ladder diagrams	1.3.1.5													
			Component wiring diagrams	1.3.1.6													
			Terminal strip diagrams	1.3.1.7													
			BACnet communication architecture schematic	1.3.1.8													
			SD-03 Product Data														
			Direct Digital Controllers	2.1.3													
			BACnet Gateways	2.1.3.13													
			Sensors and Input Hardware	2.2													
			Output Hardware	2.3													
			Surge and transient protection	2.4.2													
			Duct smoke detectors	2.5.1													
			SD-05 Design Data														
			Performance Verification Testing Plan	3.5.2													
			Pre-Performance Verification Testing Checklist	3.5.4													
			SD-06 Test Reports														
			Performance Verification Testing Report	3.5.11													

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		23 09 23.13	SD-07 Certificates														
			Contractor's Qualifications	1.5.6													
			SD-09 Manufacturer's Field Reports														
			Pre-PVT Checklist	3.5.1													
			SD-10 Operation and Maintenance Data														
			BACnet Direct Digital Control Systems	1.3													
			Controls System Operators Manuals	3.4													
			VFD Service Manuals	2.6.2													
			SD-11 Closeout Submittals														
			Training documentation	3.6.1													
		23 11 25	SD-03 Product Data														
			Pipe and Fittings	1.5													
			Pipe Coating Materials	2.1													
			Pressure regulators	2.5													
			Valves	2.3													
			SD-06 Test Reports														
			Testing	3.12													
			Pressure Tests	3.12.1													
			Test With Gas	3.12.2													
			SD-07 Certificates														
			Welders procedures and qualifications	1.4.1													

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		23 25 00	SD-03 Product Data														
			Field Instructions	3.4													
			Tests	3.5													
			Training Course	3.4													
		23 52 00	SD-03 Product Data														
			Materials and Equipment	2.1.1													
		23 73 33	SD-03 Product Data														
			air-handling units	2.1													
			Exhaust fans	2.2													
			Exhaust fans	2.3													
			Fire dampers	2.5.7													
			Pipe hangers and supports	2.7.1													
			Dampers	2.5.3													
			Diffusers, registers, and grilles	2.5.4													
			Outside air intake louvers	2.5.5													
			Flexible round ducts	2.5.8													
			Valves	2.6.6													
			Pipe and fittings	2.6													
			SD-06 Test Reports														
			air-handling units	2.1													
			SD-07 Certificates														
			Certification of welders' qualifications	1.3.1													
			SD-10 Operation and Maintenance Data														
			air-handling units	2.1													

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		23 73 33	Exhaust fans	2.2													
			Exhaust fans	2.3													
			Fire dampers	2.5.7													
		23 84 16.00 20	SD-03 Product Data														
			Desiccant Dehumidification Unit	2.1													
			SD-07 Certificates														
			Desiccant dehumidification unit	2.1													
			SD-10 Operation and Maintenance Data														
			Desiccant dehumidification unit	2.1													
		26 05 00.00 40	SD-01 Preconstruction Submittals														
			Material, Equipment, and Fixture Lists	1.5													
			Circuit Breakers	2.8													
			Panelboards	2.7													
			Lamps and Lighting Fixtures	2.9													
			Dry-Type Distribution Transformers	2.10													
			SD-03 Product Data														
			Circuit Breakers	2.8													
			Panelboards	2.7													
			Lamps and Lighting Fixtures	2.9													
			Dry-Type Distribution Transformers	2.10													
			Certification	1.5													
			SD-06 Test Reports														

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		26 05 00.00 40	Continuity Test	3.11													
			SD-08 Manufacturer's Instructions														
			Manufacturer's Instructions	1.5													
		26 05 19.00 10	SD-03 Product Data														
			Installation Instructions	3.1													
			SD-06 Test Reports														
			Tests, Inspections, and Verifications	3.2													
		26 05 71.00 40	SD-01 Preconstruction Submittals														
			Fuses	2.3													
			SD-03 Product Data														
			Enclosures	2.1													
			Circuit Breakers	2.2													
			SD-08 Manufacturer's Instructions														
			Control Devices	3.1													
			Protective Devices	3.1													
			SD-10 Operation and Maintenance Data														
			Circuit Breakers	2.2													
		26 09 23.00 40	SD-03 Product Data														
			Time Switch	2.3													
			Photocell Switch	2.4													
			Occupancy Sensors	2.5													
		26 20 00	SD-02 Shop Drawings														
			Panelboards	2.10													
			Transformers	2.12													

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		26 20 00	SD-03 Product Data														
			Receptacles	2.9													
			Circuit breakers	2.10.2													
			Switches	2.8													
			Transformers	2.12													
			SD-06 Test Reports														
			600-volt wiring test	3.2.2													
			Grounding system test	3.2.5													
			Transformer tests	3.2.3													
			Ground-fault receptacle test	3.2.4													
			SD-07 Certificates														
			Fuses	2.11													
			SD-09 Manufacturer's Field Reports														
			Transformer factory tests	2.17.1													
			SD-10 Operation and Maintenance Data														
			Electrical Systems	1.5.1													
		26 51 00	SD-03 Product Data														
			Fluorescent lighting fixtures	2.1													
			Fluorescent electronic ballasts	1.5.1													
			Fluorescent lamps	2.1.2													
			Exit signs	2.3													
			Emergency lighting equipment	2.4													
			Occupancy sensors	2.6													
			SD-06 Test Reports														

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		26 51 00	Operating test	3.2													
		26 52 00.00 40	SD-01 Preconstruction Submittals														
			Material, Equipment, and Fixture Lists	1.2.1													
			Sample Warranty	1.2.1													
			SD-03 Product Data														
			Emergency Lighting Egress Units	2.2.1													
			Emergency Fluorescent Lighting	2.2.2													
			SD-06 Test Reports														
			System Operational Tests	3.2													
			SD-07 Certificates														
			Certificates of Conformance	1.2.1													
			Warranty	3.3													
		26 53 00.00 40	SD-01 Preconstruction Submittals														
			Material, Equipment, and Fixture Lists	1.2													
			Exit Lighting Units	2.2													
			SD-03 Product Data														
			Exit Lighting Units	2.2													
			SD-06 Test Reports														
			Operational Tests	3.2													
			SD-07 Certificates														
			Efficiencies	2.1.1													
		26 56 00	SD-03 Product Data														
			Luminaires	2.1													
			SD-06 Test Reports														

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(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		26 56 00	Operating test	3.2													
		27 10 00	SD-03 Product Data														
			Telecommunications cabling	2.3.1													
			Telecommunications outlet/connector assemblies	2.6													
			SD-06 Test Reports														
			Telecommunications cabling testing	3.3.1													
			SD-07 Certificates														
			Telecommunications Contractor Manufacturer Qualifications	1.7.1.1													
			Test plan	1.7.1.2													
			Test plan	1.7.2													
		28 31 76	SD-02 Shop Drawings														
			Nameplates	2.1.2													
			Wiring Diagrams	3.2.1													
			System Layout	1.4.1													
			System Operation	2.3													
			Notification Appliances	2.17													
			Amplifiers	2.14													
			SD-03 Product Data														
			Technical Data And Computer Software	1.4.2													
			Fire Alarm Control Unit and Mass Notification Control Unit (FMCP)	2.13													
			Manual stations	2.16													
			Transmitters	2.20													

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						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		MAILED TO CONTR/ DATE RCD FRM APPR AUTH
		28 31 76	Batteries	2.12.1													
			Battery chargers	2.12.2													
			Smoke sensors	2.10													
			Notification appliances	2.17													
			Addressable interface devices	2.7													
			Amplifiers	2.14													
			Tone generators	2.14													
			Digitalized voice generators	2.14													
			Radio transmitter and interface panels	2.20.1													
			Local Operating Console (LOC)	1.3													
			SD-05 Design Data														
			Battery power	2.12.1.2													
			Battery chargers	2.12.2													
			SD-06 Test Reports														
			Field Quality Control	3.7													
			Testing Procedures	3.7.1													
			Smoke sensor testing	2.10.2													
			SD-07 Certificates														
			Installer	1.6.1.4													
			Formal Inspection and Tests	3.7.2.2													
			Final Testing	3.7.2.3													
			SD-09 Manufacturer's Field Reports														
			System Operation	2.3													

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		28 31 76	Fire Alarm/Mass Notification System	1.6.2.2													
			SD-10 Operation and Maintenance Data														
			Operation and Maintenance (O&M) Instructions	1.8													
			Instruction of Government Employees	3.8													
			SD-11 Closeout Submittals														
			As-Built Drawings	3.7.2.4													
		31 11 00	SD-03 Product Data														
			Nonsaleable Materials	3.6.2													
			SD-04 Samples														
			Tree wound paint	2.1													
			Herbicide	2.2													
		31 23 00.00 20	SD-01 Preconstruction Submittals														
			Shoring and Sheeting Plan	1.7.1													
			Dewatering work plan	1.7.2													
			SD-06 Test Reports														
			Borrow Site Testing	1.6													
			Fill and backfill	3.14.2.1													
			Select material	3.14.2.2													
			Density tests	3.14.2.4													
		32 31 13.53	SD-02 Shop Drawings														
			Fence Installation	1.3.2													
			Fence Installation	3.1													

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		32 31 13.53	Installation Drawings	1.3.2													
			Location of gate, corner, end, and pull posts	1.3.2													
			Gate Assembly	1.3.2													
			Gate Assembly	2.6.1													
			Gate Assembly	2.6.1													
			SD-03 Product Data														
			Fence Installation	1.3.2													
			Fence Installation	3.1													
			Gate Assembly	1.3.2													
			Gate Assembly	2.6.1													
			Gate Assembly	2.6.1													
			SD-06 Test Reports														
			zinc coating	1.3.1													
			SD-07 Certificates														
			Chain Link Fence reports	2.2.1													
			reports	1.3.1													
			reports	1.3.1													
			Zinc Coating	1.3.1													
			Fabric	2.1.1													
			Barbed Wire	2.4.2													
			Stretcher Bars	2.1.1													
			Concrete	2.5													
			SD-08 Manufacturer's Instructions														
			Fence Installation	1.3.2													
			Fence Installation	3.1													

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		32 31 13.53	Gate Assembly	1.3.2													
			Gate Assembly	2.6.1													
			Gate Assembly	2.6.1													
			Accessories	1.3.1													
		33 11 00	SD-03 Product Data														
			Water service line	2.1													
			Valve boxes	2.1.2.10													
			SD-07 Certificates														
			Water service line	2.1													
			SD-08 Manufacturer's Instructions														
			Installation	3.1.1													
		33 30 00	SD-03 Product Data														
			Pipeline materials	2.1													
		33 61 14	SD-03 Product Data														
			Pipe, fittings, and end connections	2.1													
			Factory-prefabricated preinsulated water piping system	2.1													
			Plastic reinforced thermosetting resin (RTR) piping	2.2.3													
			SD-07 Certificates														
			Certification of welders' qualifications	1.4.1													
			SD-08 Manufacturer's Instructions														
			factory-prefabricated preinsulated water piping system	2.1													

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		33 82 00	SD-02 Shop Drawings														
			Telecommunications Outside Plant	1.6.1.1													
			Telecommunications Entrance Facility Drawings	1.6.1.2													
			SD-03 Product Data														
			Wire and cable	2.5													
			Building protector assemblies	2.2.1													
			Protector modules	2.2.2													
			Spare Parts	1.8.2													
			SD-06 Test Reports														
			Pre-installation tests	3.5.1													
			Acceptance tests	3.5.2													
			Outside Plant Test Plan	1.6.3													
			SD-07 Certificates														
			Telecommunications Contractor Qualifications	1.6.2.1													
			Key Personnel Qualifications	1.6.2.2													
			SD-08 Manufacturer's Instructions														
			Building protector assembly installation	2.2.1													
			SD-09 Manufacturer's Field Reports														
			Factory Reel Test Data	2.11.1													
			SD-10 Operation and Maintenance Data														

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		33 82 00	Telecommunications outside plant (OSP)	1.6.1.1													
			SD-11 Closeout Submittals														
			Record Documentation	1.8.1													

SECTION 01 35 29

SAFETY AND OCCUPATIONAL HEALTH REQUIREMENTS

06/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z359.1 (1992; R 1999) Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components

ASME INTERNATIONAL (ASME)

ASME B30.3 (1996) Construction Tower Cranes

ASME B30.5 (2000) Mobile and Locomotive Cranes

ASME B30.8 (2000) Floating Cranes and Floating Derricks

ASME B30.22 (2000) Articulating Boom Cranes

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10 (2010) Standard for Portable Fire Extinguishers

NFPA 241 (2000) Safeguarding Construction, Alteration, and Demolition Operations

NFPA 51B (2003) Fire Prevention During Welding, Cutting, and Other Hot Work

NFPA 70 (2011; Errata 2 2012) National Electrical Code

NFPA 70E (2004) Electrical Safety in the Workplace

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2008; Errata 1-2010; Changes 1-3 2010; Changes 4-6 2011) Safety and Health Requirements Manual

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910 Occupational Safety and Health Standards

29 CFR 1910.146	Permit-required Confined Spaces
29 CFR 1910.94	Ventilation
29 CFR 1915	Confined and Enclosed Spaces and Other Dangerous Atmospheres in Shipyard Employment
29 CFR 1919	Gear Certification
29 CFR 1926	Safety and Health Regulations for Construction
29 CFR 1926.500	Fall Protection

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00
SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

- Accident Prevention Plan (APP)
- Activity Hazard Analysis (AHA)
- Crane Critical Lift Plan
- Crane Work Plan
- Proof of qualifications for Crane Operators

SD-06 Test Reports

Reports

Submit reports as their incidence occurs, in accordance with the requirements of the paragraph entitled, "Reports."

- Accident Reports
- Monthly Exposure Reports
- Regulatory Citations and Violations
- Crane Reports

SD-07 Certificates

- Confined Space Entry Permit
- Certificate of Compliance (Crane)
- Third Party Certification of Barge-Mounted Mobile Cranes

Submit one copy of each permit/certificate attached to each Daily Report.

1.3 DEFINITIONS

- a. Associate Safety Professional (ASP). An individual who is currently certified by the Board of Certified Safety Professionals.
- b. Certified Construction Health & Safety Technician (CHST). An individual who is currently certified as a CHST by the Board of Certified Safety Professionals.
- c. Certified Industrial Hygienist (CIH). An individual who is currently certified as a CIH by the American Board of Industrial Hygiene.
- d. Certified Safety Professional (CSP). An individual who is currently certified as a CSP by the Board of Certified Safety Professionals.
- e. Certified Safety Trained Supervisor (STS). An individual who is currently certified as an STS by the Board of Certified Safety Professionals.
- f. Competent Person for Fall Protection. A person who is capable of identifying hazardous or dangerous conditions in the personal fall arrest system or any component thereof, as well as their application and use with related equipment, and has the authority to take prompt corrective measures to eliminate the hazards of falling.
- g. High Visibility Accident. Any mishap which may generate publicity and/or high visibility.
- h. Low-slope roof. A roof having a slope less than or equal to 4 in 12 (vertical to horizontal).
- i. Medical Treatment. Treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even though provided by a physician or registered personnel.
- j. Multi-Employer Work Site (MEWS). A multi-employer work site, as defined by OSHA, is one in which many employers occupy the same site. The Government considers the Prime Contractor to be the "controlling authority" for all work site safety and health of the subcontractors.
- k. Operating Envelope. The area surrounding any crane. Inside this "envelope" is the crane, the operator, riggers, rigging gear between the hook and the load, the load and the crane's supporting structure (ground, rail, etc.).
- l. Qualified Person for Fall Protection. A person with a recognized degree or professional certification, extensive knowledge, training and experience in the field of fall protection who is capable of performing design, analysis, and evaluation of fall protection systems and equipment.
- m. Recordable Injuries or Illnesses. Any work-related injury or illness that results in:
 - (1) Death, regardless of the time between the injury and death, or the length of the illness;
 - (2) Days away from work;

- (3) Restricted work;
- (4) Transfer to another job;
- (5) Medical treatment beyond first aid;
- (6) Loss of consciousness; or
- (7) A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (6) above.

n. Site Safety and Health Officer (SSHO). The superintendent or other qualified or competent person who is responsible for the on-site safety and health required for the project.

o. Steep roof. A roof having a slope greater than 4 in 12 (vertical to horizontal).

p. "USACE" property and equipment specified in USACE EM 385-1-1 should be interpreted as Government property and equipment.

q. Weight Handling Equipment (WHE) Accident. A WHE accident occurs when any one or more of the six elements in the operating envelope fails to perform correctly during operation, including operation during maintenance or testing resulting in personnel injury or death; material or equipment damage; dropped load; derailment; two-blocking; overload; and collision, including unplanned contact between the load, crane, and/or other objects. A dropped load, derailment, two-blocking, overload and collision are considered accidents even though no material damage or injury occurs. A component failure (e.g., motor burnout, gear tooth failure, bearing failure) is not considered an accident solely due to material or equipment damage unless the component failure results in damage to other components (e.g., dropped boom, dropped load, roll over, etc.).

1.4 CONTRACTOR SAFETY SELF-EVALUATION CHECKLIST

Contracting Officer will provide a "Contractor Safety Self-Evaluation checklist" to the Contractor at the pre-construction conference. The checklist will be completed monthly by the Contractor and submitted with each request for payment voucher. An acceptable score of 90 or greater is required. Failure to submit the completed safety self-evaluation checklist or achieve a score of at least 90, will result in a retention of up to 10 percent of the voucher.

1.5 REGULATORY REQUIREMENTS

In addition to the detailed requirements included in the provisions of this contract, work performed shall comply with USACE EM 385-1-1, and the following laws, ordinances, criteria, rules and regulations. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements shall apply.

1.6 DRUG PREVENTION PROGRAM

Conduct a proactive drug and alcohol use prevention program for all workers, prime and subcontractor, on the site. Ensure that no employee uses illegal drugs or consumes alcohol during work hours. Ensure there are no employees under the influence of drugs or alcohol during work hours. After accidents, collect blood, urine, or saliva specimens and test the injured and involved employees for the influence of drugs and alcohol. A copy of the test shall be made available to the Contracting Officer upon request.

1.7 SITE QUALIFICATIONS, DUTIES AND MEETINGS

1.7.1 Personnel Qualifications

Work performed under this contract shall meet Level 2.

1.7.1.1 Site Safety and Health Officer (SSHO)

Site Safety and Health Officer (SSHO) shall be provided at the work site at all times to perform safety and occupational health management, surveillance, inspections, and safety enforcement for the Contractor. The SSHO shall meet the following requirements:

Level 1:

Worked on similar projects.
10-hour OSHA construction safety class or equivalent within last 3 years.
Competent person training as needed.

Level 2:

A minimum of 3 years safety work on similar project.
30-hour OSHA construction safety class or equivalent within last 3 years.
Competent person training as needed.

Level 3:

A minimum of 5 years safety work on similar projects.
30-hour OSHA construction safety class or equivalent within the last 5 years.
An average of at least 24 hours of formal safety training each year for the past 5 years.
Competent person training as needed.

Level 4:

A minimum of 10 years safety work of a progressive nature with at least 5 years of experience on similar projects.
30-hour OSHA construction safety class or equivalent within the last 5 years.
An average of at least 24 hours of formal safety training each year for the past 5 years with training for competent person status for at least the following areas of competency: Excavation; Scaffolding; Fall protection; Hazardous energy; Confined space; Health hazard recognition, evaluation and control of chemical, physical and biological agents; Personal protective equipment and clothing to include selection, use and maintenance.

Level 5:

An Associate Safety Professional (ASP), Certified Safety Trained

Supervisor (STS) and/or Construction Health & Safety Technician (CHST).

A minimum of 10 years safety work of a progressive nature with at least 5 years of experience on similar projects.

30-hour OSHA construction safety class or equivalent within the last 5 years.

An average of at least 24 hours of formal safety training each year for the past 5 years with training for competent person status for at least the following areas of competency: Excavation; Scaffolding; Fall protection; Hazardous energy; Confined space; Health hazard recognition, evaluation and control of chemical, physical and biological agents; Personal protective equipment and clothing to include selection, use and maintenance.

Level 6: A

Certified Safety Professional (CSP) and/or Certified Industrial Hygienist (CIH).

A minimum of 10 years safety work of a progressive nature with at least 5 years of experience on similar projects.

30-hour OSHA construction safety class or equivalent within the last 5 years.

An average of at least 24 hours of formal safety training each year for the past 5 years with training for competent person status for at least the following areas of competency: Excavation; Scaffolding; Fall protection; Hazardous energy; Confined space; Health hazard recognition, evaluation and control of chemical, physical and biological agents; Personal protective equipment and clothing to include selection, use and maintenance.

1.7.1.2 Certified Safety Professional (CSP) and/or Certified Industrial hygienist (CIH)

Provide a Certified Safety Professional (CSP) and/or Certified Industrial Hygienist (CIH) at the work site to perform safety and occupational health management, surveillance, inspections, and safety enforcement for the Contractor. The CSP and/or CIH shall be the safety and occupational health "competent person" as defined by USACE EM 385-1-1. The CSP and/or CIH shall have no other duties than safety and occupational health management, inspections, and/or industrial hygiene.

1.7.1.3 Associate Safety professional (ASP), Certified Safety Trained Supervisor (STS) and/or Construction Health and Safety Technician (CHST).

Provide an Associate Safety Professional (ASP); Certified Safety Trained Supervisor (STS); and/or Construction Health & Safety Technician (CHST) at the work site to perform safety management, surveillance, inspections, and safety enforcement for the Contractor to meet the designated safety level in paragraph 1.6.1. The ASP, STS, and/or CHST shall be the safety and occupational health "competent person" as defined by USACE EM 385-1-1. The ASP, STS, and/or CHST shall be at the work site at all times whenever work or testing is being performed and shall conduct and document daily safety inspections. The ASP, STS, and/or CHST shall have no other duties other than safety and occupational health management, inspections, and enforcement on this contract.

1.7.1.4 Competent Person for Confined Space Entry

Provide a competent person meeting the requirements of EM 385-1-1 who is assigned in writing by the Designated Authority to assess confined spaces

and who possesses demonstrated knowledge, skill and ability to:

- a. Identify the structure, location, and designation of confined and permit-required confined spaces where work is done;
- b. Calibrate and use testing equipment including but not limited to, oxygen indicators, combustible gas indicators, carbon monoxide indicators, and carbon dioxide indicators, and to interpret accurately the test results of that equipment;
- c. Perform all required tests and inspections specified in 29 CFR 1910.146 and 29 CFR 1915 Subpart B;
- d. Assess hazardous conditions including atmospheric hazards in confined space and adjacent spaces and specify the necessary protection and precautions to be taken;
- e. Determine ventilation requirements for confined space entries and operations;
- f. Assess hazards associated with hot work in confined and adjacent space and determine fire watch requirements; and,
- g. Maintain records required.

When the work involves marine operations that handle combustible or hazardous materials, this qualified person shall be a NFPA certified marine chemist.

1.7.1.5 Competent Person for the Health Hazard Control and Respiratory Protection Program

Provide a competent person meeting the requirements of EM 385-1-1 who is:

- a. Capable by education, specialized training and/or experience of anticipating, recognizing, and evaluating employee exposure to hazardous chemical, physical and biological agents in accordance with USACE EM 385-1-1, Section 6.
- b. Capable of specifying necessary controls and protective actions to ensure worker health.

1.7.1.6 Crane Operators

Crane operators shall meet the requirements in USACE EM 385-1-1, Section 16 and Appendix G. In addition, for mobile cranes with Original Equipment Manufacturer (OEM) rated capacities of 50,000 pounds or greater, crane operators shall be designated as qualified by a source that qualifies crane operators (i.e., union, a government agency, or an organization that tests and qualifies crane operators). Proof of current qualifications shall be provided.

1.7.2 Personnel Duties

1.7.2.1 Site Safety and Health Officer (SSHO)/Superintendent

- a. Conduct daily safety and health inspections and maintain a written log which includes area/operation inspected, date of inspection, identified hazards, recommended corrective actions, estimated and

actual dates of corrections. Safety inspection logs shall be attached to the Contractors' daily report.

- b. Conduct mishap investigations and complete required reports. Maintain the OSHA Form 300 and Daily Production reports for prime and sub-contractors.
- c. Maintain applicable safety reference material on the job site.
- d. Attend the pre-construction conference, pre-work meetings including preparatory inspection meeting, and periodic in-progress meetings.
- e. Implement and enforce accepted APPS and AHAs.
- f. Maintain a safety and health deficiency tracking system that monitors outstanding deficiencies until resolution. A list of unresolved safety and health deficiencies shall be posted on the safety bulletin board.
- g. Ensure sub-contractor compliance with safety and health requirements.
- h. Ensure an approved "Special Permission Energized Electrical Work Permit" prior to starting any activity on energized electrical systems.

Failure to perform the above duties will result in dismissal of the superintendent and/or SSO, and a project work stoppage. The project work stoppage will remain in effect pending approval of a suitable replacement.

1.7.2.2 Certified Safety Professional (CSP), Certified Industrial Hygienist (CIH), Associate Safety Professional (ASP), Certified Safety Trained Supervisor (STS), and/or Certified Construction Health & Safety Technician (CHST)

- a. Perform safety and occupational health management, surveillance, inspections, and safety enforcement for the project.
- b. Perform as the safety and occupational health "competent person" as defined by USACE EM 385-1-1.
- c. Be on site whenever work or testing is being performed.
- d. Conduct and document safety inspections.
- e. Shall have no other duties other than safety and occupational health management, inspections, and enforcement on this contract.

If the CSP, CIH, ASP, STS, CHST is appointed as the SSO all duties of that position shall also be performed.

1.7.3 Meetings

1.7.3.1 Preconstruction Conference

- a. The Contractor will be informed, in writing, of the date of the preconstruction conference. The purpose of the preconstruction conference is for the Contractor and the Contracting Officer's representatives to become acquainted and explain the functions and operating procedures of their respective organizations and to reach

mutual understanding relative to the administration of the overall project's Accident Prevention Plan (APP) before the initiation of work.

b. Contractor representatives who have a responsibility or significant role in accident prevention on the project shall attend the preconstruction conference. This includes the project superintendent, site safety and health officer, quality control supervisor, or any other assigned safety and health professionals who participated in the development of the APP (including the Activity Hazard Analyses (AHAs) and special plans, program and procedures associated with it).

c. The Contractor shall discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated AHAs that will be developed and implemented during the performance of the contract. This list of proposed AHAs will be reviewed at the conference and an agreement will be reached between the Contractor and the Contracting Officer's representative as to which phases will require an analysis. In addition, a schedule for the preparation, submittal, review, and acceptance of AHAs shall be established to preclude project delays.

d. Deficiencies in the submitted APP will be brought to the attention of the Contractor at the preconstruction conference, and the Contractor shall revise the plan to correct deficiencies and re-submit it for acceptance. Work shall not begin until there is an accepted APP.

e. The functions of a Preconstruction conference may take place at the Post-Awqrd Kickoff meeting for Design Build Contracts.

1.7.3.2 Weekly Safety Meetings

Conduct weekly safety meetings at the project site for all employees. The Contracting Officer will be informed of the meeting in advance and be allowed attendance. Minutes showing contract title, signatures of attendees and a list of topics discussed shall be attached to the Contractors' daily report.

1.7.3.3 Work Phase Meetings

The appropriate AHA shall be reviewed and attendance documented by the Contractor at the preparatory, initial, and follow-up phases of quality control inspection. The analysis should be used during daily inspections to ensure the implementation and effectiveness of safety and health controls.

1.8 TRAINING

1.8.1 New Employee Indoctrination

New employees (prime and sub-contractor) will be informed of specific site hazards before they begin work. Documentation of this orientation shall be kept on file at the project site.

1.8.2 Periodic Training

Provide Safety and Health Training in accordance with USACE EM 385-1-1 and the accepted APP. Ensure all required training has been accomplished for all onsite employees.

1.8.3 Training on Activity Hazard Analysis (AHA)

Prior to beginning a new phase, training will be provided to all affected employees to include a review of the AHA to be implemented.

1.9 ACCIDENT PREVENTION PLAN (APP)

The Contractor shall use a qualified person to prepare the written site-specific APP. Prepare the APP in accordance with the format and requirements of USACE EM 385-1-1 and as supplemented herein. Cover all paragraph and subparagraph elements in USACE EM 385-1-1, Appendix A, "Minimum Basic Outline for Preparation of Accident Prevention Plan". Where a paragraph or subparagraph element is not applicable to the work to be performed indicate "Not Applicable" next to the heading. Specific requirements for some of the APP elements are described below at paragraph 1.8.1. The APP shall be job-specific and shall address any unusual or unique aspects of the project or activity for which it is written. The APP shall interface with the Contractor's overall safety and health program. Any portions of the Contractor's overall safety and health program referenced in the APP shall be included in the applicable APP element and made site-specific. The Government considers the Prime Contractor to be the "controlling authority" for all work site safety and health of the subcontractors. Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out. The APP shall be signed by the person and firm (senior person) preparing the APP, the Contractor, the on-site superintendent, the designated site safety and health officer and any designated CSP and/or CIH.

Submit the APP to the Contracting Officer 15 calendar days prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP. The Contracting Officer reviews and comments on the Contractor's submitted APP and accepts it when it meets the requirements of the contract provisions.

Once accepted by the Contracting Officer, the APP and attachments will be enforced as part of the contract. Disregarding the provisions of this contract or the accepted APP will be cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified.

Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the Contracting Officer, project superintendent, SSSH and quality control manager. Should any unforeseen hazard become evident during the performance of work, the project superintendent shall inform the Contracting Officer, both verbally and in writing, for resolution as soon as possible. In the interim, all necessary action shall be taken by the Contractor to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public, and the environment.

Copies of the accepted plan will be maintained at the resident engineer's office and at the job site. The APP shall be continuously reviewed and amended, as necessary, throughout the life of the contract. Unusual or high-hazard activities not identified in the original APP shall be incorporated in the plan as they are discovered.

1.9.1 EM 385-1-1 Contents

In addition to the requirements outlines in Appendix A of USACE EM 385-1-1, the following is required:

- a. Names and qualifications (resumes including education, training, experience and certifications) of all site safety and health personnel designated to perform work on this project to include the designated site safety and health officer and other competent and qualified personnel to be used such as CSPs, CIHs, STSs, CHSTs. The duties of each position shall be specified.
- b. Qualifications of competent and of qualified persons. As a minimum, competent persons shall be designated and qualifications submitted for each of the following major areas: excavation; scaffolding; fall protection; hazardous energy; confined space; health hazard recognition, evaluation and control of chemical, physical and biological agents; personal protective equipment and clothing to include selection, use and maintenance.
- c. Confined Space Entry Plan. Develop a confined space entry plan in accordance with USACE EM 385-1-1, applicable OSHA standards 29 CFR 1910, 29 CFR 1915, and 29 CFR 1926, and any other federal, state and local regulatory requirements identified in this contract. Identify the qualified person's name and qualifications, training, and experience. Delineate the qualified person's authority to direct work stoppage in the event of hazardous conditions. Include procedure for rescue by contractor personnel and the coordination with emergency responders. (If there is no confined space work, include a statement that no confined space work exists and none will be created.)
- d. Health Hazard Control Program. The Contractor shall designate a competent and qualified person to establish and oversee a Health Hazard Control Program in accordance with USACE EM 385-1-1, Section 6. The program shall ensure that employees, on-site Government representatives, and others, are not adversely exposed to chemical, physical and biological agents and that necessary controls and protective actions are instituted to ensure health.
- e. Crane Critical Lift Plan. Prepare and sign weight handling critical lift plans for lifts over 75 percent of capacity of the crane or hoist (or lifts over 50 percent of the capacity of a barge mounted mobile crane's hoists) at any radius of lift; lifts involving more than one crane or hoist; lifts of personnel; and lifts involving more than rigging or operation, sensitive equipment, or unusual safety risks. The plan shall be submitted 15 calendar days prior to on-site work and include the requirements of USACE EM 385-1-1, paragraph 16.c.18. and the following:
 - (1) For lifts of personnel, the plan shall demonstrate compliance with the requirements of 29 CFR 1926.500(g).
 - (2) For barge mounted mobile cranes, barge stability calculations identifying barge list and trim based on anticipated loading; and load charts based on calculated list and trim. The amount of list and trim shall be within the crane manufacturer's requirements.
- f. Alcohol and Drug Abuse Plan

(1) Describe plan for random checks and testing with pre-employment screening in accordance with the DFAR Clause subpart 252.223-7004, "Drug Free Work Force."

(2) Description of the on-site prevention program

g. Fall Protection and Prevention (FP&P) Plan. The plan shall be site specific and address all fall hazards in the work place and during different phases of construction. It shall address how to protect and prevent workers from falling to lower levels when they are exposed to fall hazards above 1.8 m (6 feet). A qualified person for fall protection shall prepare and sign the plan. The plan shall include fall protection and prevention systems, equipment and methods employed for every phase of work, responsibilities, assisted rescue self-rescue and evacuation procedures, training requirements, and monitoring methods. Fall Protection and Prevention Plan shall be revised every six months for lengthy projects, reflecting any changes during the course of construction due to changes in personnel, equipment, systems or work habits. The accepted Fall Protection and Prevention Plan shall be kept and maintained at the job site for the duration of the project. The Fall Protection Plan shall be included in the Accident Prevention Plan (APP)

h. Training Records and Requirements. List of mandatory training and certifications which are applicable to this project (e.g. explosive actuated tools, confined space entry, fall protection, crane operation, vehicle operator, forklift operators, personal protective equipment); list of requirements for periodic retraining/certification; outline requirements for supervisory and employee safety meetings.

i. Occupant Protection Plan. The safety and health aspects of lead-based paint removal, prepared in accordance with Section 02 83 19.00 10 Lead Based Paint Hazard Abatement, Target Housing & Child Occupied Facilities, 02 82 33.13 20 Removal/Control and Disposal of Lead Containig Paint.

j. Lead Compliance Plan. The safety and health aspects of lead work, prepared in accordance with Section 02 83 13.00 20 Lead in Construction.

k. Asbestos Hazard Abatement Plan. The safety and health aspects of asbestos work, prepared in accordance with Section 02 2 16.00, "Engineering Control of Asbestos Containing Materials"

l. Site Safety and Health Plan. The safety and health aspects prepared in accordance with this section.

m. PCB Plan. The safety and health aspects of Polychlorinated Biphenyls work, prepared in accordance with Sections 02 84 33, "Removal and Disposal of Polychlorinated Biphenyls (PCBs) and 02 61 23, "Removal and Disposal of PCB Contaminated Soils)".

n. Site Demolition Plan. The safety and health aspects prepared in accordance with Section 02 41 00.00 40, Demolition" and referenced sources. Include engineering survey as applicable.

o. Excavation Plan. The safety and health aspects prepared in accordance with Section 3100, Earthwork.

p. [Crane Work Plan](#). The contractor shall provide a crane work plan

to the Contracting Officer for acceptance. The crane work plan shall include the specific model of each crane and a drawing identifying their locations (exact), the dimensions, wheel sizes, number of wheels, wheel spacing, tire pressure(s), number of axles, axle spacing, minimum wheel load to be exerted during operations and maximum outrigger load to be exerted during operations. The Contractor shall allow at least 10 working days for acceptance/non-acceptance of the crane work plan. No crane operations shall begin prior to written acceptance of the crane plan by the Government. ROICC shall be the government approving authority.

1.10 ACTIVITY HAZARD ANALYSIS (AHA)

The Activity Hazard Analysis (AHA) format shall be in accordance with USACE EM 385-1-1. Submit the AHA for review at least 15 calendar days prior to the start of each phase. Format subsequent AHA as amendments to the APP. An AHA will be developed by the Contractor for every operation involving a type of work presenting hazards not experienced in previous project operations or where a new work crew or subcontractor is to perform work. The analysis must identify and evaluate hazards and outline the proposed methods and techniques for the safe completion of each phase of work. At a minimum, define activity being performed, sequence of work, specific safety and health hazards anticipated, control measures (to include personal protective equipment) to eliminate or reduce each hazard to acceptable levels, equipment to be used, inspection requirements, training requirements for all involved, and the competent person in charge of that phase of work. For work with fall hazards, including fall hazards associated with scaffold erection and removal, identify the appropriate fall protection methods used. For work with materials handling equipment, address safeguarding measures related to materials handling equipment. For work requiring excavations, include requirements for safeguarding excavations. An activity requiring an AHA shall not proceed until the AHA has been accepted by the Contracting Officer's representative and a meeting has been conducted by the Contractor to discuss its contents with everyone engaged in the activity, including on-site Government representatives. The Contractor shall document meeting attendance at the preparatory, initial, and follow-up phases of quality control inspection. The AHA shall be continuously reviewed and, when appropriate, modified to address changing site conditions or operations. The analysis should be used during daily inspections to ensure the implementation and effectiveness of the activity's safety and health controls.

The AHA list will be reviewed periodically (at least monthly) at the Contractor supervisory safety meeting and updated as necessary when procedures, scheduling, or hazards change.

Activity hazard analyses shall be updated as necessary to provide an effective response to changing work conditions and activities. The on-site superintendent, site safety and health officer and competent persons used to develop the AHAs, including updates, shall sign and date the AHAs before they are implemented.

The activity hazard analyses shall be developed using the project schedule as the basis for the activities performed. Any activities listed on the project schedule will require an AHA. The AHAs will be developed by the contractor, supplier or subcontractor and provided to the prime contractor for submittal to the Contracting Officer.

1.11 DISPLAY OF SAFETY INFORMATION

Within 1 calendar days after commencement of work, erect a safety bulletin board at the job site. The following information shall be displayed on the safety bulletin board in clear view of the on-site construction personnel, maintained current, and protected against the elements and unauthorized removal:

- a. Map denoting the route to the nearest emergency care facility.
- b. Emergency phone numbers.
- c. Copy of the most up-to-date APP.
- d. Current AHA(s).
- e. OSHA 300A Form.
- f. OSHA Safety and Health Protection-On-The-Job Poster.
- g. [Confined space entry permit](#).
- h. Hot work permit.
- i. A sign indicating the number of hours worked since last lost workday accident.
- j. Safety and Health Warning Posters.

1.12 SITE SAFETY REFERENCE MATERIALS

Maintain safety-related references applicable to the project, including those listed in the article "References." Maintain applicable equipment manufacturer's manuals.

1.13 EMERGENCY MEDICAL TREATMENT

Contractors will arrange for their own emergency medical treatment. Government has no responsibility to provide emergency medical treatment.

1.14 [REPORTS](#)

1.14.1 [Accident Reports](#)

- a. For recordable injuries and illnesses, and property damage accidents resulting in at least \$2,000 in damages, the Prime Contractor shall conduct an accident investigation to establish the root cause(s) of the accident, complete the Navy Contractor Significant Incident Report (CSIR) form or USACE Accident Report Form 3394 and provide the report to the Contracting Officer within 1 calendar day(s) of the accident. The Contracting Officer will provide copies of any required or special forms.
- b. For a weight handling equipment accident (including rigging gear accidents) the Prime Contractor shall conduct an accident investigation to establish the root cause(s) of the accident, complete the WHE Accident Report (Crane and Rigging Gear) form and provide the report to the Contracting Officer within 30 calendar days of the accident. Crane operations shall not proceed until cause is determined and corrective

actions have been implemented to the satisfaction of the Contracting Officer. The Contracting Officer will provide a blank copy of the accident report form.

1.14.2 Accident Notification

Notify the Contracting Officer as soon as practical, but not later than four hours, after any accident meeting the definition of Recordable Injuries or Illnesses or High Visibility Accidents, property damage equal to or greater than \$2,000, or any weight handling equipment accident. Information shall include contractor name; contract title; type of contract; name of activity, installation or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (to include type of construction equipment used, PPE used, etc.). Preserve the conditions and evidence on the accident site until the Government investigation team arrives on site and Government investigation is conducted.

1.14.3 Monthly Exposure Reports

Monthly exposure reporting to the Contracting Officer is required to be attached to the monthly billing request. This report is a compilation of employee-hours worked each month for all site workers, both prime and subcontractor. The Contracting Officer will provide copies of any special forms.

1.14.4 Regulatory Citations and Violations

Contact the Contracting Officer immediately of any OSHA or other regulatory agency inspection or visit, and provide the Contracting Officer with a copy of each citation, report, and contractor response. Correct violations and citations promptly and provide written corrective actions to the Contracting Officer.

1.14.5 Crane Reports

Submit crane inspection reports required in accordance with USACE EM 385-1-1, Appendix H and as specified herein with Daily Reports of Inspections.

1.14.6 Certificate of Compliance

The Contractor shall provide a Certificate of Compliance for each crane entering an activity under this contract (see Contracting Officer for a blank certificate). Certificate shall state that the crane and rigging gear meet applicable OSHA regulations (with the Contractor citing which OSHA regulations are applicable, e.g., cranes used in construction, demolition, or maintenance shall comply with 29 CFR 1926 and USACE EM 385-1-1 section 16 and Appendix H. Certify on the Certificate of Compliance that the crane operator(s) is qualified and trained in the operation of the crane to be used. For cranes at DOD activities in foreign countries, the Contractor shall certify that the crane and rigging gear conform to the appropriate host country safety standards. The Contractor shall also certify that all of its crane operators working on the DOD activity have been trained in the proper use of all safety devices (e.g., anti-two block devices). These certifications shall be posted on the crane.

1.14.7 Third Party Certification of Barge-Mounted Mobile Cranes

Barge-mounted mobile cranes shall be certified in accordance with 29 CFR 1919 by an OSHA accredited person.

1.15 HOT WORK

Prior to performing "Hot Work" (welding, cutting, etc.) or operating other flame-producing/spark producing devices, a written permit shall be requested from the Fire Division. CONTRACTORS ARE REQUIRED TO MEET ALL CRITERIA BEFORE A PERMIT IS ISSUED. The Contractor will provide at least two (2) twenty (20) pound 4A:20 BC rated extinguishers for normal "Hot Work". All extinguishers shall be current inspection tagged, approved safety pin and tamper resistant seal. It is also mandatory to have a designated FIRE WATCH for any "Hot Work" done at this activity. The Fire Watch shall be trained in accordance with NFPA 51B and remain on-site for a minimum of 30 minutes after completion of the task or as specified on the hot work permit.

a. Oil painting materials (paint, brushes, empty paint cans, etc.), and all flammable liquids shall be removed from the facility at quitting time. All painting materials and flammable liquids shall be stored outside in a suitable metal locker or box and will require re-submittal with non-hazardous materials.

b. Accumulation of trays, paper, shavings, sawdust, boxes and other packing materials shall be removed from the facility at the close of each workday and such material disposed of in the proper containers located away from the facility.

c. The storage of combustible supplies shall be a safe distance from structures.

d. Area outside the facility undergoing work shall be cleaned of trash, paper, or other discarded combustibles at the close of each workday.

e. All portable electric devices (saws, sanders, compressors, extension chord, lights, etc.) shall be disconnected at the close of each workday. When possible, the main electric switch in the facility shall be deactivated.

f. When starting work in the facility, Contractors shall require their personnel to familiarize themselves with the location of the nearest fire alarm boxes and place in memory the emergency phone number 911. ANY FIRE, NO MATTER HOW SMALL, SHALL BE REPORTED IMMEDIATELY.

g. Obtain services from the FIRE DIVISION for "HOT WORK" within or around flammable materials (such as fuel systems, welding/cutting on fuel pipes) or confined spaces (such as sewer wet wells, manholes, vaults, etc.) that have the potential for flammable or explosive atmospheres.

PART 2 PRODUCTS

2.1 CONFINED SPACE SIGNAGE

The Contractor shall provide permanent signs integral to or securely attached to access covers for all required confined spaces. Signs

wording: "DANGER--PERMIT-REQUIRED CONFINED SPACE - DO NOT ENTER -" in bold letters a minimum of 25 mm(one inch) in height and constructed to be clearly legible with all paint removed. The signal word "DANGER" shall be red and readable from 1.52 m(5 feet).

2.2 FALL PROTECTION ANCHORAGE

Fall protection anchorage, conforming to ANSI Z359.1, installed under the supervision of a qualified person in fall protection, shall be left in place for continued customer use and so identified by signage stating the capacity of the anchorage (strength and number of persons who may be tied-off to it at any one time).

PART 3 EXECUTION

3.1 CONSTRUCTION AND/OR OTHER WORK

The Contractor shall comply with USACE EM 385-1-1, NFPA 241, the APP, the AHA, Federal and/or State OSHA regulations, and other related submittals and activity fire and safety regulations. The most stringent standard shall prevail.

3.1.1 Hazardous Material Use

Each hazardous material must receive approval prior to being brought onto the job site or prior to any other use in connection with this contract. Allow a minimum of 10 working days for processing of the request for use of a hazardous material. Any work or storage involving hazardous chemicals or materials must be done in a manner that will not expose Government or Contractor employees to any unsafe or unhealthful conditions. Adequate protective measures must be taken to prevent Government or Contractor employees from being exposed to any hazardous condition that could result from the work or storage. The Prime Contractor shall keep a complete inventory of hazardous materials brought onto the work-site. Approval by the Contracting Officer of protective measures and storage area is required prior to the start of the work.

3.1.2 Hazardous Material Exclusions

Notwithstanding any other hazardous material used in this contract, radioactive materials or instruments capable of producing ionizing/non-ionizing radiation (with the exception of radioactive material and devices used in accordance with USACE EM 385-1-1 such as nuclear density meters for compaction testing and laboratory equipment with radioactive sources) as well as materials which contain asbestos, mercury or polychlorinated biphenyls, di-isocyanates, lead-based paint are prohibited. The Contracting Officer, upon written request by the Contractor, may consider exceptions to the use of any of the above excluded materials.

3.1.3 Unforeseen Hazardous Material

The design should have identified materials such as PCB, lead paint, and friable and non-friable asbestos. If additional material, not indicated, that may be hazardous to human health upon disturbance during construction operations is encountered, stop that portion of work and notify the Contracting Officer immediately. Within 14 calendar days the Government will determine if the material is hazardous. If material is not hazardous or poses no danger, the Government will direct the Contractor to proceed

without change. If material is hazardous and handling of the material is necessary to accomplish the work, the Government will issue a modification pursuant to "FAR 52.243-4, Changes" and "FAR 52.236-2, Differing Site Conditions."

3.2 PRE-OUTAGE COORDINATION MEETING

Contractors are required to apply for utility outages at least 15 days in advance. As a minimum, the request should include the location of the outage, utilities being affected, duration of outage and any necessary sketches. Special requirements for electrical outage requests are contained elsewhere in this specification section. Once approved, and prior to beginning work on the utility system requiring shut down, the Contractor shall attend a pre-outage coordination meeting with the Contracting Officer to review the scope of work and the lock-out/tag-out procedures for worker protection. No work will be performed on energized electrical circuits unless proof is provided that no other means exist.

3.3 FALL HAZARD PROTECTION AND PREVENTION

The Contractor shall establish a fall protection and prevention program, for the protection of all employees exposed to fall hazards. The program shall include company policy, identify responsibilities, education and training requirements, fall hazard identification, prevention and control measures, inspection, storage, care and maintenance of fall protection equipment and rescue and escape procedures.

3.3.1 Training

The Contractor shall institute a fall protection training program. As part of the Fall Hazard Protection and Prevention Program, the Contractor shall provide training for each employee who might be exposed to fall hazards. A competent person for fall protection shall provide the training. Training requirements shall be in accordance with USACE EM 385-1-1, section 21.A.16.

3.3.2 Fall Protection Equipment

The Contractor shall enforce use of the fall protection equipment designated for each specific work activity in the Fall Protection and Prevention Plan and/or AHA at all times when an employee is on a surface 1.8 m (6 feet) or more above lower levels. Fall protection systems such as guardrails, personnel fall arrest system, safety nets, etc., are required when working within 1.8m (6 feet) of any leading edge. In addition to the required fall protection systems, safety skiff, personal floatation devices, life rings etc., are required when working above or next to water in accordance with USACE EM 385-1-1, paragraphs 05.I. and 05.J. Personal fall arrest systems are required when working from an articulating or extendible boom, swing stages, or suspended platform. In addition, personal fall arrest systems may be required when operating other equipment such as scissor lifts if the work platform is capable of being positioned outside the wheelbase. The need for tying-off in such equipment is to prevent ejection of the employee from the equipment during raising, lowering, or travel. Fall protection must comply with 29 CFR 1926.500, Subpart M and USACE EM 385-1-1.

3.3.2.1 Personal Fall Arrest Equipment

Personal fall arrest equipment, systems, subsystems, and components shall meet ANSI Z359.1. Only a full-body harness with a shock-absorbing lanyard

or self-retracting lanyard is an acceptable personal fall arrest device. Body belts may only be used as a positioning device system (for uses such as steel reinforcing assembly and in addition to an approved fall arrest system). Harnesses shall have a fall arrest attachment affixed to the body support (usually a Dorsal D-ring) and specifically designated for attachment to the rest of the system. Only locking snap hooks and carabiners shall be used. Webbing, straps, and ropes shall be made of synthetic fiber. The maximum free fall distance when using fall arrest equipment shall not exceed 1.8 m (6 feet). The total fall distance and any swinging of the worker (pendulum-like motion) that can occur during a fall shall always be taken into consideration when attaching a person to a fall arrest system.

3.3.3 Fall Protection for Roofing Work

Fall protection controls shall be implemented based on the type of roof being constructed and work being performed. The roof area to be accessed shall be evaluated for its structural integrity including weight-bearing capabilities for the projected loading.

a. Low Sloped Roofs:

(1) For work within 1.8 m (6 feet) of an edge, on low-slope roofs, personnel shall be protected from falling by use of personal fall arrest systems, guardrails, or safety nets. A safety monitoring system is not adequate fall protection and is not authorized.

(2) For work greater than 1.8 m (6 feet) from an edge, warning lines shall be erected and installed in accordance with [29 CFR 1926.500](#) and [USACE EM 385-1-1](#).

b. Steep Roofs: Work on steep roofs requires a personal fall arrest system, guardrails with toe-boards, or safety nets. This requirement also includes residential or housing type construction.

3.3.4 Safety Nets

If safety nets are used as the selected fall protection system on the project, they shall be provided at unguarded workplaces, leading edge work or when working over water, machinery, dangerous operations and or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors, fall arrest systems or restraint/positioning systems are impractical. Safety nets shall be tested immediately after installation with a drop test of 181.4 kg (400 pounds) dropped from the same elevation a person might fall, and every six months thereafter.

3.3.5 Existing Anchorage

Existing anchorages, to be used for attachment of personal fall arrest equipment, shall be certified (or re-certified) by a qualified person for fall protection in accordance with [ANSI Z359.1](#). Existing horizontal lifeline anchorages shall be certified (or re-certified) by a registered professional engineer with experience in designing horizontal lifeline systems.

3.3.6 Horizontal Lifelines

Horizontal lifelines shall be designed, installed, certified and used under

the supervision of a qualified person for fall protection as part of a complete fall arrest system which maintains a safety factor of 2 (29 CFR 1926.500).

3.3.7 Guardrail Systems

Guardrails shall consist of top and mid-rails, post and toe boards. The top edge height of standard railing must be 42 inches plus or minus 3 inches above the walking/working level. When mid-rails are used, they must be installed at a height midway between the top edge of the guardrail system and the walking/working level. Posts shall be placed no more than 8 feet apart (29 CFR 1926.500 and USACE EM 385-1-1).

3.3.8 Rescue and Evacuation Procedures

When personal fall arrest systems are used, the contractor must ensure that the mishap victim can self-rescue or can be rescued promptly should a fall occur. A Rescue and Evacuation Plan shall be prepared by the contractor and include a detailed discussion of the following: methods of rescue; methods of self-rescue; equipment used; training requirement; specialized training for the rescuers; procedures for requesting rescue and medical assistance; and transportation routes to a medical facility. The Rescue and Evaluation Plan shall be included in the Activity Hazard Analysis (AHA) for the phase of work, in the Fall Protection and Prevention (FP&P) Plan, and the Accident Prevention Plan (APP).

3.4 PERSONAL PROTECTIVE EQUIPMENT

All personnel who enter a construction site area shall wear Personal Protective Equipment (PPE) at all times as outlined in the EM 385 1-1. In addition to the requirements of the EM 385 1-1, Safety Glasses (ANSI Z87.1) and High-Visibility Apparel (ANSI 107-2004 Performance Class II, Shirt or Vest) will be worn at all times on construction sites. Hearing protection is required in noise hazard areas or when performing noise hazard tasks. Mandatory PPE on all construction sites includes:

- a. Hard Hats
- b. Safety Glasses
- c. High-Visibility Shirt or Vest
- d. Safety-Toed Shoes or Boots

3.5 SCAFFOLDING

Employees shall be provided with a safe means of access to the work area on the scaffold. Climbing of any scaffold braces or supports not specifically designed for access is prohibited. Access to scaffold platforms greater than 6 m (20 feet) in height shall be accessed by use of a scaffold stair system. Vertical ladders commonly provided by scaffold system manufacturers shall not be used for accessing scaffold platforms greater than 6 m (20 feet) in height. The use of an adequate gate is required. Contractor shall ensure that employees are qualified to perform scaffold erection and dismantling. Do not use scaffold without the capability of supporting at least four times the maximum intended load or without appropriate fall protection as delineated in the accepted fall protection and prevention plan. Stationary scaffolds must be attached to structural building components to safeguard against tipping forward or backward.

Special care shall be given to ensure scaffold systems are not overloaded. Side brackets used to extend scaffold platforms on self-supported scaffold systems for the storage of material is prohibited. The first tie-in shall be at the height equal to 4 times the width of the smallest dimension of the scaffold base. Work platforms shall be placed on mud sills. Scaffold or work platform erectors shall have fall protection during the erection and dismantling of scaffolding or work platforms that are more than six feet. Delineate fall protection requirements when working above six feet or above dangerous operations in the Fall Protection and Prevention (FP&P) Plan and Activity Hazard Analysis (AHA) for the phase of work.

3.5.1 Stilts

The use of stilts for gaining additional height in construction, renovation, repair or maintenance work is prohibited.

3.6 EQUIPMENT

3.6.1 Material Handling Equipment

a. Material handling equipment such as forklifts shall not be modified with work platform attachments for supporting employees unless specifically delineated in the manufacturer's printed operating instructions.

b. The use of hooks on equipment for lifting of material must be in accordance with manufacturer's printed instructions.

c. Operators of forklifts or power industrial trucks shall be licensed in accordance with OSHA.

3.6.2 Weight Handling Equipment

a. Cranes must be equipped with:

(1) Load indicating devices (LIDs) and a boom angle or radius indicator,

(2) or load moment indicating devices (LMIs).

(3) Anti-two block prevention devices.

(4) Boom hoist hydraulic relief valve, disconnect, or shutoff (stops hoist when boom reaches a predetermined high angle).

(5) Boom length indicator (for telescoping booms).

(6) Device to prevent uncontrolled lowering of a telescoping hydraulic boom.

(7) Device to prevent uncontrolled retraction of a telescoping hydraulic boom.

b. The Contractor shall notify the Contracting Officer 15 days in advance of any cranes entering the activity so that necessary quality assurance spot checks can be coordinated. Contractor's operator shall remain with the crane during the spot check.

c. The Contractor shall comply with the crane manufacturer's

specifications and limitations for erection and operation of cranes and hoists used in support of the work. Erection shall be performed under the supervision of a designated person (as defined in ASME B30.5). All testing shall be performed in accordance with the manufacturer's recommended procedures.

d. The Contractor shall comply with ASME B30.5 for mobile and locomotive cranes, ASME B30.22 for articulating boom cranes, ASME B30.3 for construction tower cranes, and ASME B30.8 for floating cranes and floating derricks.

e. The presence of Government personnel does not relieve the Contractor of an obligation to comply with all applicable safety regulations. The Government will investigate all complaints of unsafe or unhealthful working conditions received in writing from contractor employees, federal civilian employees, or military personnel.

f. Each load shall be rigged/attached independently to the hook/master-link in such a fashion that the load cannot slide or otherwise become detached. Christmas-tree lifting (multiple rigged materials) is not allowed.

g. Under no circumstance shall a Contractor make a lift at or above 90% of the cranes rated capacity in any configuration.

h. When operating in the vicinity of overhead transmission lines, operators and riggers shall be alert to this special hazard and shall follow the requirements of USACE EM 385-1-1 section 11 and ASME B30.5 or ASME B30.22 as applicable.

i. Crane suspended personnel work platforms (baskets) shall not be used unless the Contractor proves that using any other access to the work location would provide a greater hazard to the workers or is impossible. Personnel shall not be lifted with a line hoist or friction crane.

j. A fire extinguisher having a minimum rating of 10BC and a minimum nominal capacity of 5lb of extinguishing agent shall be available at all operator stations or crane cabs. Portable fire extinguishers shall be inspected, maintained, and recharged as specified in NFPA 10, Standard for Portable Fire Extinguishers.

k. All employees shall be kept clear of loads about to be lifted and of suspended loads.

l. A weight handling equipment operator shall not leave his position at the controls while a load is suspended.

m. The Contractor shall use cribbing when performing lifts on outriggers.

n. The crane hook/block must be positioned directly over the load. Side loading of the crane is prohibited.

o. A physical barricade must be positioned to prevent personnel from entering the counterweight swing (tail swing) area of the crane.

p. A substantial and durable rating chart containing legible letters and figures shall be provided with each crane and securely mounted onto

the crane cab in a location allowing easy reading by the operator while seated in the control station.

q. Certification records which include the date of inspection, signature of the person performing the inspection, and the serial number or other identifier of the crane that was inspected shall always be available for review by Contracting Officer personnel.

r. Written reports listing the load test procedures used along with any repairs or alterations performed on the crane shall be available for review by Contracting Officer personnel.

s. The Contractor shall certify that all crane operators have been trained in proper use of all safety devices (e.g. anti-two block devices).

3.6.3 Equipment and Mechanized Equipment

a. Equipment shall be operated by designated qualified operators. Proof of qualifications shall be kept on the project site for review.

b. Manufacture specifications or owner's manual for the equipment shall be on site and reviewed for additional safety precautions or requirements that are sometimes not identified by OSHA or USACE EM 385-1-1. Such additional safety precautions or requirements shall be incorporated into the AHAs.

c. Equipment and mechanized equipment shall be inspected in accordance with manufacturer's recommendations for safe operation by a competent person prior to being placed into use.

d. Daily checks or tests shall be conducted and documented on equipment and mechanized equipment by designated competent persons.

3.7 EXCAVATIONS

The competent person for excavations performed as a result of contract work shall be on-site when excavation work is being performed, and shall inspect, and document the excavations daily prior to entry by workers. The competent person must evaluate all hazards, including atmospheric, that may be associated with the work, and shall have the resources necessary to correct hazards promptly. The competent person shall perform soil classification in accordance with 29 CFR 1926.

3.7.1 Utility Locations

All underground utilities in the work area must be positively identified by a third party, independent, private utility locating company in addition to any station locating service and coordinated with the station utility department. Any markings made during the utility investigation must be maintained throughout the contract.

3.7.2 Utility Location Verification

The Contractor must physically verify underground utility locations, including utility depth, by hand digging using wood or fiberglass handled tools when any adjacent construction work is expected to come within three feet of the underground system. Digging within 2 feet of a known utility must not be performed by means of mechanical equipment; hand digging shall

be used. If construction is parallel to an existing utility the utility shall be exposed by hand digging every 100 feet if parallel within 5 feet of the excavation.

3.7.3 Utilities Within and Under Concrete, Bituminous Asphalt and Other Impervious Surfaces

Utilities located within concrete slabs or pier decks, bridges, parking areas, and the like, are extremely difficult to identify. Whenever contract work involves chipping, saw cutting, or core drilling through concrete, bituminous asphalt or other impervious surfaces, the existing utility location must be coordinated with station utility departments in addition to location and depth verification by a third party, independent, private locating company. The third party, independent, private locating company shall locate utility depth by use of Ground Penetrating Radar (GPR), X-ray, bore scope, or ultrasound prior to the start of demolition and construction. Outages to isolate utility systems must be used in circumstances where utilities are unable to be positively identified. The use of historical drawings does not alleviate the contractor from meeting this requirement.

3.7.4 Shoring Systems

Trench and shoring systems must be identified in the accepted safety plan and AHA. Manufacture tabulated data and specifications or registered engineer tabulated data for shoring or benching systems shall be readily available on site for review. Job-made shoring or shielding shall have the registered professional engineer stamp, specifications, and tabulated data. Extreme care must be used when excavating near direct burial electric underground cables.

3.7.5 Trenching Machinery

Trenching machines with digging chain drives shall be operated only when the spotters/laborers are in plain view of the operator. Operator and spotters/laborers shall be provided training on the hazards of the digging chain drives with emphasis on the distance that needs to be maintained when the digging chain is operating. Documentation of the training shall be kept on file at the project site.

3.8 ELECTRICAL

3.8.1 Conduct of Electrical Work

Underground electrical spaces must be certified safe for entry before entering to conduct work. Cables that will be cut must be positively identified and de-energized prior to performing each cut. Positive cable identification must be made prior to submitting any outage request for electrical systems. Arrangements are to be coordinated with the Contracting Officer and Station Utilities for identification. The Contracting Officer will not accept an outage request until the Contractor satisfactorily documents that the circuits have been clearly identified. Perform all high voltage cable cutting remotely using hydraulic cutting tool. When racking in or live switching of circuit breakers, no additional person other than the switch operator will be allowed in the space during the actual operation. Plan so that work near energized parts is minimized to the fullest extent possible. Use of electrical outages clear of any energized electrical sources is the preferred method. When working in energized substations, only qualified electrical workers shall be permitted

to enter. When work requires Contractor to work near energized circuits as defined by the **NFPA 70**, high voltage personnel must use personal protective equipment that includes, as a minimum, electrical hard hat, safety shoes, insulating gloves with leather protective sleeves, fire retarding shirts, coveralls, face shields, and safety glasses. In addition, provide electrical arc flash protection for personnel as required by **NFPA 70E**. Insulating blankets, hearing protection, and switching suits may be required, depending on the specific job and as delineated in the Contractor's AHA.

3.8.2 Arc Flash Risk/Hazard Analysis

Contractor shall provide an Arc Flash Risk/Hazard Analysis in accordance with **NFPA 70E** for all locations where workers may be exposed to arc flash hazard (work on energized electrical equipment). The Arc Flash Risk/Hazard Analysis shall be sealed and signed by a qualified professional engineer.

3.8.3 Arc Flash Risk/Hazard Analysis Qualifications

Contractor shall engage the services of a qualified organization to provide Arc Flash Risk/Hazard Analysis of the electrical distribution system. Organization shall be independent of the supplier, manufacturer, and installer of the equipment. The organization shall be a first tier subcontractor. This work shall not be performed by a second tier subcontractor.

- a. Submit name and qualifications of organization. Organization shall have been regularly engaged in providing Arc Flash Risk/Hazard Analysis for a minimum of 5 years.
- b. Submit name and qualifications of the professional engineer performing the analysis. Include a list of three comparable jobs performed by the engineer with specific names and telephone numbers for reference.

3.8.4 Special Permission Energized Electrical Work Permit

All work on energized electrical systems, including high voltage, must have an approved "Special Permission Energized Electrical Work Permit." The results of a Arc Flash Risk/Hazard Analysis, per **NFPA 70E**, shall be included in the "Special Permission Energized Electrical Work Permit" request. Flame-resistant (FR) clothing and personal protective equipment (PPE) shall be rated for a minimum of 8 calories per square centimeter even if the flash hazard analysis indicates a lower value. A blank copy of the permit request is attached. An editable version may be obtained from the Contracting Officer.

3.8.5 Portable Extension Cords

Portable extension cords shall be sized in accordance with manufacturer ratings for the tool to be powered and protected from damage. All damaged extension cords shall be immediately removed from service. Portable extension cords shall meet the requirements of **NFPA 70**.

3.9 WORK IN CONFINED SPACES

The Contractor shall comply with the requirements in Section 06.I of USACE **EM 385-1-1** and **OSHA 29 CFR 1910.146**. Any potential for a hazard in the confined space requires a permit system to be used.

- a. Entry Procedures. Prohibit entry into a confined space by personnel for any purpose, including hot work, until the qualified person has conducted appropriate tests to ensure the confined or enclosed space is safe for the work intended and that all potential hazards are controlled or eliminated and documented. (See Section 06.I.05 of USACE EM 385-1-1 for entry procedures.) All hazards pertaining to the space shall be reviewed with each employee during review of the AHA.
- b. Forced air ventilation is required for all confined space entry operations and the minimum air exchange requirements must be maintained to ensure exposure to any hazardous atmosphere is kept below its' action level.
- c. Ensure the use of rescue and retrieval devices in confined spaces greater than 1.5 m (5 feet) in depth. Conform to Sections 06.I.09, 06.I.10 and 06.I.11 of USACE EM 385-1-1.
- d. Sewer wet wells require continuous atmosphere monitoring with audible alarm for toxic gas detection.
- e. Include training information for employees who will be involved as entrants and attendants for the work. Conform to Section 06.I.06 of USACE EM 385-1-1.
- f. Daily Entry Permit. Post the permit in a conspicuous place close to the confined space entrance.

3.10 CRYSTALLINE SILICA

Grinding, abrasive blasting, and foundry operations of construction materials containing crystalline silica, shall comply with OSHA regulations, such as 29 CFR 1910.94, and USACE EM 385-1-1, Appendix C. The Contractor shall develop and implement effective exposure control and elimination procedures to include dust control systems, engineering controls, and establishment of work area boundaries, as well as medical surveillance, training, air monitoring, and personal protective equipment.

3.11 HOUSEKEEPING

3.11.1 Clean-Up

All debris in work areas shall be cleaned up daily or more frequently if necessary. Construction debris may be temporarily located in an approved location, however garbage accumulation must be removed each day.

3.11.2 Falling Object Protection

All areas must be barricaded to safeguard employees. When working overhead, barricade the area below to prevent entry by unauthorized employees. Construction warning tape and signs shall be posted so they are clearly visible from all possible access points. When employees are working overhead all tools and equipment shall be secured so that they will not fall. When using guardrail as falling object protection, all openings shall be small enough to prevent passage of potential falling objects.

-- End of Section --

Special Permission Energized Electrical Work Permit

Permit Number: _____

Part I: Request for Special Permission

Job Order/Contract Number: _____

(1) Description of circuit/equipment: _____

(2) Job Location: _____

(3) Description of work to be done: _____

(4) Justification of why the circuit/equipment cannot be de-energized: _____

(5) Anticipated Duration of Work Requiring Special Permission: (hours/minutes) _____ On (date) _____

(6) Means Employed to Restrict Access of Unqualified Persons: _____

(7) Shock Hazard Analysis:

Voltage _____ Approach Boundaries: (distance) Limited _____ Restricted _____ Prohibited _____ Flash _____

(8) Flash Hazard Analysis: Calorie PPE required _____ (8 minimum)

Approach Boundaries to be crossed: (Check as applicable) Limited ____ Restricted ____ Prohibited ____ Flash Protection ____

(9) PPE to be used: (in addition to required daily wear)

Leather Gloves:	Yes ____ No ____
Voltage Rated Rubber Gloves with Leather Protectors	Yes ____ No ____
Safety Glasses	Yes ____ No ____
Arc Flash Face Shield rated 10-cal/cm sq or more	Yes ____ No ____
Arc Flash Hood rated 20 cal/cm sq or more	Yes ____ No ____
Safety Helmet	Yes ____ No ____
Balaclava (Head Sock)	Yes ____ No ____
Hearing Protection (single level)	Yes ____ No ____
Voltage Rated Tools	Yes ____ No ____
Hazard Risk Category 3 Clothing	Yes ____ No ____

(10) Source of Lighting: Outside Daylight ____ Inside Existing Artificial ____ Temporary Portable Lighting: (AC) ____ Battery ____

(11) Name of Employee(s) Assigned to Job and will receive job briefing before beginning work (sign in sheet required): _____

Requested By _____

Name Typed

Organization (BL / FEAD / PWO)

Phone #

Signature

Part II: Recommended Approval

Construction Safety Manager Concurrence: _____ Date: _____

Notification:

Operation Officer: _____ Date: _____

Executive Officer: _____ Date: _____

Approved by: _____ Date _____

Commanding Officer / Designee

SECTION 01 42 00

SOURCES FOR REFERENCE PUBLICATIONS

08/10

PART 1 GENERAL

1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the standards producing organization, (e.g. ASTM B 564 Nickel Alloy Forgings). However, when the standards producing organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

1.2 ORDERING INFORMATION

The addresses of the standards publishing organizations whose documents are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the specifications with numbers which were not assigned by the standards producing organization should be ordered from the source by title rather than by number.

AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)
38800 Country Club Drive
Farmington Hills, MI 48331
Ph: 248-848-3700
Fax: 248-848-3701
E-mail: bkstore@concrete.org
Internet: <http://www.concrete.org>

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)
30 West University Drive
Arlington Heights, IL 60004-1893
Ph: 847-394-0150
Fax: 847-253-0088
E-mail: amca@amca.org
Internet: <http://www.amca.org>

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)
2111 Wilson Blvd, Suite 500
Arlington, VA 22201
Ph: 703-600-0355
Fax: 703-562-1942
E-mail: fdietz@ahrinet.org
Internet: <http://www.ahrinet.org>

ALUMINUM ASSOCIATION (AA)
National Headquarters
1525 Wilson Boulevard, Suite 600
Arlington, VA 22209
Ph: 703-358-2960

Fax: 703-358-2961
Internet: <http://www.aluminum.org>

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)
1827 Walden Office Square
Suite 550
Schaumburg, IL 60173-5774
Ph: 847-303-5664
Fax: 847-303-5774
E-mail: webmaster@aamanet.org
Internet: <http://www.aamanet.org>

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)
1 Davis Drive
P.O. Box 12215
Research Triangle Park, NC 27709
Ph: 919-549-8141
Fax: 919-549-8933
E-mail: leonardc@aatcc.org
Internet: <http://www.aatcc.org>

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)
1330 Kemper Meadow Drive
Cincinnati, OH 45240
Ph: 513-742-2020 or 513-742-6163
Fax: 513-742-3355
E-mail: mail@acgih.org
Internet: <http://www.acgih.org>

AMERICAN GAS ASSOCIATION (AGA)
400 North Capitol Street N.W.
Suite 450
Washington, D.C. 20001
Ph: 202-824-7000
Fax: 202-824-7115
E-mail: website@aga.org
Internet: <http://www.aga.org>

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
One East Wacker Drive, Suite 700
Chicago, IL 60601-1802
Ph: 312-670-2400
Fax: 312-670-5403
Publications: 800-644-2400
E-mail: pubs@aisc.org
Internet: <http://www.aisc.org>

AMERICAN IRON AND STEEL INSTITUTE (AISI)
1140 Connecticut Avenue, NW, Suite 705
Washington, DC 20036
Ph: 202-452-7100
Fax: 202-463-6577
E-mail: webmaster@steel.org
Internet: <http://www.steel.org>

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)
P.O. Box 210
Germantown, MD 20875-0210
Ph: 301-972-1700

Fax: 301-540-8004
E-mail: alsc@alsc.org
Internet: <http://www.alsc.org>

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
1819 L Street, NW, 6th Floor
Washington, DC 20036
Ph: 202-293-8020
Fax: 202-293-9287
E-mail: info@ansi.org
Internet: <http://www.ansi.org/>

AMERICAN PETROLEUM INSTITUTE (API)
1220 L Street, NW
Washington, DC 20005-4070
Ph: 303-397-7993
Fax: 303-397-2740
E-mail: greg.kallio@ihs.com
Internet: <http://www.api.org>

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)
1801 Alexander Bell Drive
Reston, VA 20191-4400
Ph: 703-295-6300 - 800-548-2723
Fax: 703-295-6333
E-mail: member@asce.org
Internet: <http://www.asce.org>

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING
ENGINEERS (ASHRAE)
1791 Tullie Circle, NE
Atlanta, GA 30329
Ph: 800-527-4723 or 404-636-8400
Fax: 404-321-5478
E-mail: ashrae@ashrae.org
Internet: <http://www.ashrae.org>

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)
1800 East Oakton Street
Des Plaines, IL 60018-2187
Ph: 847-699-2929
Fax: 847-768-3434
E-mail: customerservice@asse.org
Internet: <http://www.asse.org>

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)
901 Canterbury, Suite A
Westlake, OH 44145
Ph: 440-835-3040
Fax: 440-835-3488
E-mail: info@asse-plumbing.org
Internet: <http://www.asse-plumbing.org>

AMERICAN WATER WORKS ASSOCIATION (AWWA)
6666 West Quincy Avenue
Denver, CO 80235
Ph: 800-926-7337
Fax: 303-347-0804
E-mail: smorrison@awwa.org

Internet: <http://www.awwa.org>

AMERICAN WELDING SOCIETY (AWS)
550 N.W. LeJeune Road
Miami, FL 33126
Ph: 800-443-9353 - 305-443-9353
Fax: 305-443-7559
E-mail: info@aws.org or customerservice@awspubs.com
Internet: <http://www.aws.org>

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)
P.O. Box 361784
Birmingham, AL 35236-1784
Ph: 205-733-4077
Fax: 205-733-4075
E-mail: email@awpa.com
Internet: <http://www.awpa.com>

APA - THE ENGINEERED WOOD ASSOCIATION (APA)
7011 South 19th St.
Tacoma, WA 98466-5333
Ph: 253-565-6600
Fax: 253-565-7265
E-mail: help@apawood.org
Internet: <http://www.apawood.org>

ARCHITECTURAL WOODWORK INSTITUTE (AWI)
46179 Westlake Drive, Suite 120
Potomac Falls, VA 20165
Ph: 571-323-3636
Fax: 571-323-3630
E-mail: info@awinet.org
Internet: <http://www.awinet.org>

ARCNET TRADE ASSOCIATION (ATA)
E-M-mail: info@arnet.com
Internet: <http://www.arcnet.com/index.htm></URL

ASME INTERNATIONAL (ASME)
Three Park Avenue, M/S 10E
New York, NY 10016-5990
Ph: 800-854-7179 or 800-843-2763
Fax: 212-591-7674
E-mail: infocentral@asme.org
Internet: <http://www.asme.org>

ASSOCIATED AIR BALANCE COUNCIL (AABC)
1518 K Street, NW
Washington, DC 20005
Ph: 202-737-0202
Fax: 202-638-4833
E-mail: info@aabc.com
Internet: <http://www.aabchq.com>

ASSOCIATION OF EDISON ILLUMINATING COMPANIES (AEIC)
600 North 18th Street
P.O. Box 2641
Birmingham, AL 35291
Ph: 205-257-2530

Fax: 205-257-2540
E-Mail: aeicdir@bellsouth.net
Internet: <http://www.aeic.org>

ASTM INTERNATIONAL (ASTM)
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959
Ph: 610-832-9500
Fax: 610-832-9555
E-mail: service@astm.org
Internet: <http://www.astm.org>

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)
355 Lexington Avenue
15th Floor
New York, NY 10017
Ph: 212-297-2122
Fax: 212-370-9047
E-mail: assocmgmt@aol.com
Internet: <http://www.buildershardware.com>

CSA STANDARDS (CSA)
8501 East Pleasant Valley Road
Cleveland, OH 44131-5575
Ph: 216-524-4990 or 1-877-235-9791
Fax: 216-520-8979
E-mail: cathy.rake@csa-america.org
Internet: <http://www.csa-america.org>

CARPET AND RUG INSTITUTE (CRI)
P.O. Box 2048
Dalton, GA 30722-2048
Ph: 800-882-8846 or 706-278-3176
Fax: 706-278-8835
Internet: <http://www.carpet-rug.com>

CAST IRON SOIL PIPE INSTITUTE (CISPI)
5959 Shallowford Road, Suite 419
Chattanooga, TN 37421
Ph: 423-892-0137
Fax: 423-892-0817
Internet: <http://www.cispi.org>

CONSUMER ELECTRONICS ASSOCIATION (CEA)
1919 South Eads St.
Arlington, VA 22202
Ph: 866-858-1555 or 703-907-7600
Fax: 703-907-7675
E-mail: cea@CE.org
Internet: <http://www.CE.org>

COPPER DEVELOPMENT ASSOCIATION (CDA)
260 Madison Avenue
New York, NY 10016
Ph: 212-251-7200
Fax: 212-251-7234
E-mail: questions@cda.copper.org
Internet: <http://www.copper.org>

ELECTRONIC COMPONENTS ASSOCIATION (ECA)
2500 Wilson Blvd.
Suite 310
Arlington, VA 22201
Ph: 703-907-8024
E-mail: emikoski@ecaus.org
Internet: <http://www.ecaus.org>

ELECTRONIC INDUSTRIES ALLIANCE (EIA)
2500 Wilson Boulevard
Arlington, VA 22201-3834
Ph: 703-907-7500
Fax: 703-907-7501
E-mail: infor@ecaus.org
Internet: <http://www.eia.org>

U.S. DEPARTMENT OF ENERGY (DOE)
1000 Independence Ave. SW
Washington, DC 20585
Ph: 800-342-5363
Fax: 202-586-4403
E-mail: dmteam@hq.doe.gov
Internet: <http://www.eh.doe.gov/>

EXPANSION JOINT MANUFACTURERS ASSOCIATION (EJMA)
25 North Broadway
Tarrytown, NY 10591
Ph: 914-332-0040
Fax: 914-332-1541
E-mail: inquiries@ejma.org
Internet: <http://www.ejma.org>

FM GLOBAL (FM)
270 Central Avenue
P.O. Box 7500
Johnston, RI 02919
Ph: 401-275-3000 ext. 1945
Fax: 401-275-3029
E-mail: servicedesk.myrisk@fmglobal.com
Internet: <http://www.fmglobal.com>

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH
(FCCCHR)
University of South California
Kaprielian Hall 200
Los Angeles, CA 90089-2531
Ph: 213-740-2032 or 866-545-6340
Fax: 213-740-8399
E-mail: fccchr@usc.edu
Internet: <http://www.usc.edu/dept/fccchr>

GLASS ASSOCIATION OF NORTH AMERICA (GANA)
2945 SW Wanamaker Drive, Suite A
Topeka, KS 66614
Ph: 785-271-0208
Fax: 785-271-0166
E-mail: gana@glasswebsite.com
Internet: <http://www.glasswebsite.com>

GREEN SEAL (GS)
1001 Connecticut Avenue, NW
Suite 827
Washington, DC 20036-5525
Ph: 202-872-6400
Fax: 202-872-4324
E-mail: green seal@green seal.org
Internet: <http://www.green seal.org>

GYP SUM ASSOCIATION (GA)
6525 Belcrest Road, Suite 480
Hyattsville, MD 20782
Ph: 301-277-8686
Fax: 301-277-8747
E-mail: info@gyp sum.org
Internet: <http://www.gyp sum.org>

HARDWOOD PLYWOOD AND VENEER ASSOCIATION (HPVA)
1825 Michael Faraday Dr.
Reston, VA 20190
Ph: 703-435-2900
Fax: 703-435-2537
E-mail: hpva@hpva.org
Internet: <http://www.hpva.org>

HYDRONICS INSTITUTE DIVISION OF GAMA (HYI)
35 Russo Place
P.O. Box 218
Berkeley Heights, NJ 07922-0218
Ph: 908-464-8200
Fax: 908-464-7818
E-mail: information@gamanet.org
Internet: <http://www.gamanet.org>

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA)
120 Wall Street, 17th Floor
New York, NY 10005
Ph: 212-248-5000
Fax: 212-248-5018
E-mail: iesna@iesna.org
Internet: <http://www.iesna.org>

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
445 Hoes Lane or 2001 L Street, NW, Suite 700
Piscataway, NJ 08855-1331 or Washington, DC 20036-4910 USA
Ph: 732-981-0060 or 800-701-4333
Fax: 732-562-6380
E-mail: onlinesupport@ieee.org or ieeeusa@ieee.org
Internet: <http://www.ieee.org>

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)
P.O. Box 1568
Carrollton, GA 30112
Ph: 1 800 447 3352
Fax: 1 303 397 2599
E-mail: global@ihs.com
Internet: <http://www.icea.net>

INSULATING GLASS MANUFACTURERS ALLIANCE (IGMA)
27 N. Wacker Dr. Suite 365
Chicago, IL 60606-2800
Ph: 613-233-1510
Fax: 613-482-9436
E-mail: info@igmaonline.org
Internet: <http://www.igmaonline.org>

INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS
(IAPMO)
5001 E. Philadelphia St.
Ontario, CA 91761
Ph: 909-472-4100
Fax: 909-472-4150
E-mail: iampo@iampo.org
Internet: www.iampo.org

INTERNATIONAL CODE COUNCIL (ICC)
5360 Workman Mill Road
Whittier, CA 90601
Ph: 562-699-0541
Fax: 562-699-8031
E-mail: webmaster@iccsafe.org
Internet: www.iccsafe.org

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

3050 Centre Ave. Suite 102
Portage, MI 49024
Ph: 269-488-6382
Fax: 269-488-6383
E-mail: neta@netaworld.org
Internet: <http://www.netaworld.org>

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)
1, ch. de la Voie-Creuse
Case Postale 56
CH-1211 Geneve 20 Switzerland
Ph: 41-22-749-01-11
Fax: 41-22-733-34-30
E-mail: central@iso.ch
Internet: <http://www.iso.org>

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS
INDUSTRY (MSS)
127 Park Street, NE
Vienna, VA 22180
Ph: 703-281-6613
Fax: 703-281-6671
E-mail: info@mss-hq.com
Internet: <http://www.mss-hq.com>

MARBLE INSTITUTE OF AMERICA (MIA)
28901 Clemens Road, Suite 100
Cleveland, OH 44145
Ph: 440-250-9222
Fax: 440-250-9223
E-mail: info@marble-institute.com
Internet: <http://www.marble-institute.com>

MASTER PAINTERS INSTITUTE (MPI)
2800 Engleton Avenue
Burnaby, BC CANADA V5C 6G7
Ph: 604-298-7578
Fax: 604-298-7571
E-mail: info@paintinfo.com, jody@mpi.net, bgl@mpi.net
Internet: <http://www.paintinfo.com/mpi>

METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)
1300 Sumner Avenue
Cleveland, OH 44115-2851
Ph: 216-241-7333
Fax: 216-241-0105
E-mail: mbma@mbma.com
Internet: <http://www.mbma.com>

NACE INTERNATIONAL (NACE)
1440 South Creek Drive
Houston, TX 77084-4906
Ph: 281-228-6200
Fax: 281-228-6300
E-mail: firstservice@nace.org
Internet: <http://www.nace.org>

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
1300 North 17th Street, Suite 1752
Rosslyn, VA 22209
Ph: 703-841-3200
Fax: 703-841-5900
Internet: <http://www.nema.org/>

NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)
8575 Grovemont Circle
Gaithersburg, MD 20877
Ph: 301-977-3698
Fax: 301-977-9589
E-Mail: elana@nebb.org
Internet: <http://www.nebb.org>

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
1 Batterymarch Park
Quincy, MA 02169-7471
Ph: 617-770-3000 or 800-344-3555
Fax: 617-770-0700
E-mail: webmaster@nfpa.org
Internet: <http://www.nfpa.org>

NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)
10255 West Higgins Road, Suite 600
Rosemont, IL 60018-5607
Ph: 847-299-9070
Fax: 847-299-1183
E-mail: form available online
Internet: <http://www.nrca.net>

NSF INTERNATIONAL (NSF)
789 North Dixboro Road
P.O. Box 130140

Ann Arbor, MI 48113-0140
Ph: 734-769-8010 or 800-NSF-MARK
Fax: 734-769-0109
E-mail: info@nsf.org
Internet: <http://www.nsf.org>

PLASTIC PIPE AND FITTINGS ASSOCIATION (PPFA)
800 Roosevelt Road, Building C, Suite 312
Glen Ellyn, IL 60137
Ph: 630-858-6540
Fax: 630-790-3095
Internet: <http://www.ppfahome.org>

PLUMBING AND DRAINAGE INSTITUTE (PDI)
800 Turnpike Street, Suite 300
North Andover, MA 01845
Ph: 978-557-0720 or 800-589-8956
Fax: 978-557-0721
E-Mail: pdi@PDIonline.org
Internet: <http://www.pdionline.org>

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)
2200 Powell Street, Suite 725
Emeryville, CA 94608
Ph: 510-452-8000
Fax: 510-452-8001
Internet: <http://www.scs1.com>

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION
(SMACNA)
4201 Lafayette Center Drive
Chantilly, VA 20151-1219
Ph: 703-803-2980
Fax: 703-803-3732
E-mail: info@smacna.org
Internet: <http://www.smacna.org>

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)
400 Commonwealth Drive
Warrendale, PA 15096-0001
Ph: 724-776-4970
Fax: 724-776-0790
E-mail: customerservice@sae.org
Internet: <http://www.sae.org>

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)
21865 Copley Drive
Diamond Bar, CA 91765
Ph: 909-396-2000
Internet: <http://www.aqmd.gov>

STEEL DECK INSTITUTE (SDI)
P.O. Box 25
Fox River Grove, IL 60021
Ph: 847-458-4647
Fax: 847-458-4648
E-mail: Steve@sdi.org
Internet: <http://www.sdi.org>

STEEL DOOR INSTITUTE (SDI/DOOR)
c/o Steel Door Institute
30200 Detroit Road
Cleveland, OH 44145-1967
Ph: 440-899-0010
Fax: 440-892-1404
E-mail: info@steeldoor.org
Internet: <http://www.steeldoor.org>

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)
40 24th Street, 6th Floor
Pittsburgh, PA 15222-4656
Ph: 412-281-2331
Fax: 412-281-9992
E-mail: info@sspc.org
Internet: <http://www.sspc.org>

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)
2500 Wilson Blvd, . Suite 300
Arlington, VA 22201
Ph: 703-907-7700
Fax: 703-907-7727
Internet: <http://www.tiaonline.org>

TILE COUNCIL OF NORTH AMERICA (TCNA)
100 Clemson Research Boulevard
Anderson, SC 29625
Ph: 864-646-8453
Fax: 864-646-2821
E-mail: literature@tileusa.com
Internet: <http://www.tileusa.com>

UNDERWRITERS LABORATORIES (UL)
2600 N.W. Lake Road
Camas, WA 98607-8542
Ph: 877-854-3577
Fax: 360-817-6278
E-mail: CEC.us@us.ul.com
Internet: <http://www.ul.com/>

UNI-BELL PVC PIPE ASSOCIATION (UBPPA)
2711 Villa Creek Drive, Suite 1000
Dallas, TX 75234
Ph: 972-243-3902
Fax: 972-243-3907
E-mail: info@uni-bell.org
Internet: <http://www.uni-bell.org>

U.S. ARMY CORPS OF ENGINEERS (USACE)
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Ph: 202-761-0011
E-mail: hq-publicaffairs@usace.army.mil
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Fax: 301-394-0084
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or <http://www.hnd.usace.army.mil/techinfo/engpubs.htm>

U.S. DEFENSE LOGISTICS AGENCY (DLA)
Andrew T. McNamara Building
8725 John J. Kingman Road
Fort Belvoir, VA 22060-6221
Ph: 1-877-352-2255 or 703-767-5525
Fax: DSN 427-3316
Internet: <http://www.dla.mil>

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Gastonia, NC 28054-2193
Ph: 704-810-8871
Fax: 704-852-4189
E-mail: seed.ams@usda.gov
Internet: <http://www.ams.usda.gov/lsg/seed.htm>
Order Other Publications from:
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Washington, DC 20250
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Fax: 202-720-2166
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Ph: 215-697-6396 - for account/password issues
Internet: <http://assist.daps.dla.mil/online/start/>; account
registration required
Obtain Unified Facilities Criteria (UFC) from:
Whole Building Design Guide (WBDG)
National Institute of Building Sciences (NIBS)
1090 Vermont Avenue NW, Suite 700

Washington, CD 20005
Ph: 202-289-7800
Fax: 202-289-1092
Internet: http://www.wbdg.org/references/docs_refs.php

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Washington, DC 20004
Ph: 202-272-0167
for Fax and E-mail see below
Internet: <http://www.epa.gov>
--- Some EPA documents are available only from:
National Technical Information Service (NTIS)
5301 Shawnee Road
Alexandria, VA 22312
Ph: 703-605-6050 or 1-688-584-8332
Fax: 703-605-6900
E-mail: info@ntis.gov
Internet: <http://www.ntis.gov>

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U. S. GREEN BUILDING COUNCIL (USGBC)
2101 L St NW, Suite 500
Washington, D.C. 20037
Fax: 202-828-5110
E-mail: info@usgbc.org
Internet: <http://www.usgbc.org>

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Ph: 215-697-6396 - for account/password issues
Internet: <http://assist.daps.dla.mil/online/start/>; account registration required

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Internet: <http://www.gpoaccess.gov>

U.S. NAVAL FACILITIES ENGINEERING COMMAND (NAVFAC)
1322 Patterson Ave. SE, Suite 1000
Washington Navy Yard, DC 20374
Ph: 757-322-4200
Fax: 757-322-4416
Internet: <http://www.navfac.navy.mil>

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)
Yeon Building
522 SW 5th Avenue
Suite 500
Portland, OR 97204-2122
Ph: 503-224-3930
Fax: 503-224-3934
E-mail: info@wwpa.org
Internet: <http://www.wwpa.org>

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)
401 N. Michigan Ave., Suite 2200
Chicago, IL 60611
Ph: 312-321-6802
Fax: 312-673-6922
E-mail: wdma@wdma.com
Internet: <http://www.wdma.com>

WOOD MOULDING AND MILLWORK PRODUCERS ASSOCIATION (WMMPA)
507 First Street
Woodland, CA 95695
Ph: 530-661-9591 or 800-550-7889
Fax: 530-661-9586
E-mail: info@wmmpa.com
Internet: <http://www.wmmpa.com>

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not used

-- End of Section --

SECTION 01 45 10

QUALITY CONTROL

09/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

- ASTM A 880 (1996) Criteria for Use in Evaluation of Testing Laboratories and Organizations for Examination and Inspection of Steel, Stainless Steel, and Related Alloys
- ASTM C 1077 (1998) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
- ASTM D 3666 (2000) Minimum Requirements for Agencies Testing and Inspecting Bituminous Paving Materials
- ASTM D 3740 (1999c) Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
- ASTM E 329 (2011a) Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
- ASTM E 543 (1999) Evaluating Agencies that Perform Nondestructive Testing

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-11 Closeout Submittals

Quality Control Plan (QC PLAN)

Submit a QC plan within 30 calendar days after receipt of Notice of Award.

1.3 INFORMATION FOR THE CONTRACTING OFFICER

Deliver the following to the Contracting Officer:

- a. Combined Contractor Production Report/Contractor Quality Control Report (1 sheet): Original and 1 copy, by 10:00 AM the next working day after each day that work is performed;
- b. QC Specialist Reports and Test Results: Originals and 1 copy, by 10:00 AM the next working day after each day that work is performed;
- c. Testing Plan and Log, 1 copy, at the end of each month;
- d. QC Meeting Minutes: 1 copy, within 2 calendar days of the meeting;
- e. Rework Items List: 1 copy, by the last working day of the month and;
- f. QC Certifications: As required by the paragraph entitled "QC Certifications".

1.4 QC PROGRAM REQUIREMENTS

Establish and maintain a QC program as described in this section. The QC program consists of a QC Organization, a QC Plan, attending a QC Plan meeting, attending a Coordination and Mutual Understanding Meeting, conducting QC meetings, performing three phases of control, performing submittal review, ensuring testing is performed, and preparing QC certifications and documentation necessary to provide materials, equipment, workmanship, fabrication, construction and operations which comply with the requirements of this Contract. The QC program shall cover construction operations on-site and off-site and shall be keyed to the proposed construction sequence.

1.5 QC ORGANIZATION

1.5.1 QC Manager

1.5.1.1 Duties

Provide a QC Manager at the work site to manage and implement the QC program. The QC Manager is required to attend the QC Plan meeting, attend the Coordination and Mutual Understanding Meeting, conduct the QC meetings, perform the three phases of control, perform submittal review, ensure testing is performed and prepare QC certifications and documentation required in this Contract. The QC Manager is responsible for managing and coordinating the three phases of control and documentation performed by the QC specialists. In addition to managing and implementing the QC program, the QC Manager may perform the duties of project superintendent.

1.5.1.2 Qualifications

An individual with a minimum of five years experience as a foreman, superintendent, inspector, QC Manager, project manager, or construction manager on similar size construction contracts which included the major trades that are part of this Contract.

1.5.1.3 Construction Quality Management Training

In addition to the above experience and education requirements, the QC Manager shall have completed the course entitled "Construction Quality Management for Contractors." This course is periodically offered by the

Navy and the Corps of Engineers. However, it is sponsored by both the AGC and the ABC of Charlotte, North Carolina. Call one of the following to sign up for the next available class:

The Army Corps of Engineers, Baltimore District;
(Offered in Baltimore, MD)
Contact: Corps of Engineers, Baltimore District
10 South Howard Street
Baltimore, MD 21201
Phone: 410-962-2323

The Associated General Contractors (AGC), Virginia Chapter
in Cooperation with the Army Corps of Engineers, Norfolk District, and
the Naval Facilities Engineering Command, Atlantic Division.
(Offered at rotating locations in Norfolk, Williamsburg, and Richmond)
Contact: AGC of Virginia
8631 Maylan Drive, Parham Park
Richmond, VA 23294
Phone: 804-346-3383

Carolinas Associated General Contractors (CACG)
Contact: CACG
1100 Euclid Avenue
Charlotte, NC 28203
Phone: 704-372-1450 (ext. 5248)

Associated Builders and Contractors (ABC), Carolinas Chapter
Contact: ABC, Carolinas Chapter
3705 Latrobe Drive
Charlotte, NC 28211
Phone: 704-367-1331
or: 877-470-4819

1.5.2 Alternate QC Manager Duties and Qualifications

Designate an alternate for the QC Manager at the work site to serve in the event of the designated QC Manager's absence. The period of absence may not exceed two weeks at one time, and not more than 30 workdays during a calendar year. The qualification requirements for the Alternate QC Manager shall be three years of experience in one of the specified positions.

1.6 QC PLAN

1.6.1 Requirements

Provide for approval by the Contracting Officer, a QC plan submitted in a 3-ring binder with pages numbered sequentially that covers, both on-site and off-site work and includes, the following:

- a. A table of contents listing the major sections identified with tabs in the following order:
 - I. QC ORGANIZATION
 - II. NAMES AND QUALIFICATIONS
 - III. DUTIES, RESPONSIBILITY AND AUTHORITY OF QC PERSONNEL
 - IV. OUTSIDE ORGANIZATIONS
 - V. APPOINTMENT LETTERS
 - VI. SUBMITTAL PROCEDURES AND INITIAL SUBMITTAL REGISTER
 - VII. TESTING LABORATORY INFORMATION

- VIII. TESTING PLAN AND LOG
 - IX. PROCEDURES TO COMPLETE REWORK ITEMS
 - X. DOCUMENTATION PROCEDURES
 - XI. LIST OF DEFINABLE FEATURES
 - XII. PROCEDURES FOR PERFORMING THE THREE PHASES OF CONTROL
 - XIII. PERSONNEL MATRIX
 - XIV. PROCEDURES FOR COMPLETION INSPECTION
-
- b. A chart showing the QC organizational structure and its relationship to the production side of the organization.
 - c. Names and qualifications, in resume format, for each person in the QC organization.
 - d. Duties, responsibilities and authorities of each person in the QC organization.
 - e. A listing of outside organizations such as, architectural and consulting engineering firms that will be employed by the Contractor and a description of the services these firms will provide.
 - f. A letter signed by an officer of the firm appointing the QC Manager and stating that he/she is responsible for managing and implementing the QC program as described in this contract. Include in this letter the QC Manager's authority to direct the removal and replacement of non-conforming work.
 - g. Procedures for reviewing, approving and managing submittals. Provide the names of the persons in the QC organization authorized to review and certify submittals prior to approval.
 - h. Testing laboratory information required by the paragraphs entitled "Accredited Laboratories" or "Testing Laboratory Requirements", as applicable.
 - i. A Testing Plan and Log that includes the tests required, referenced by the specification paragraph number requiring the test, the frequency, and the person responsible for each test.
 - j. Procedures to identify, record, track and complete rework items.
 - k. Documentation procedures, including proposed report formats.
 - l. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks and requires separate control requirements. As a minimum, if approved by the Contracting Officer, consider each Section of the Specifications as a definable feature of work. However, at times, there may be more than one definable feature of work in each Section of the Specifications.
 - m. A personnel matrix showing, for each section of the specification, who will perform and document the three phases of control, and who will perform and document the testing.
 - o. Procedures for Identifying and Documenting the Completion Inspection process. Include in these procedures the responsible party for punch out inspection, prefinal inspection, and final

acceptance inspection.

1.6.2 Preliminary Work Authorized Prior to Approval

The only work that is authorized to proceed prior to the approval of the QC plan is mobilization of storage and office trailers and surveying.

1.6.3 Approval

Approval of the QC plan is required prior to the start of construction. The Contracting Officer reserves the right to require changes in the QC plan and operations as necessary to ensure the specified quality of work. The Contracting Officer reserves the right to interview any member of the QC organization at any time in order to verify his/her submitted qualifications.

1.6.4 Notification of Changes

Notify the Contracting Officer, in writing, of any proposed change, including changes in the QC organization personnel, a minimum of seven calendar days prior to a proposed change. Proposed changes must be approved by the Contracting Officer.

1.7 QC PLAN MEETING

Prior to submission of the QC plan, meet with the Contracting Officer to discuss the QC plan requirements of this Contract. The purpose of this meeting is to develop a mutual understanding of the QC plan requirements prior to plan development and submission.

1.8 COORDINATION AND MUTUAL UNDERSTANDING MEETING

After submission of the QC Plan, but prior to the start of construction, meet with the Contracting Officer to discuss the QC program required by this Contract. The purpose of this meeting is to develop a mutual understanding of the QC details, including forms to be used for documentation, administration for on-site and off-site work, and the coordination of the Contractor's management, production and QC personnel with the Contracting Officer. As a minimum, the Contractor's personnel required to attend shall include the project manager, project superintendent, and QC Manager. Minutes of the meeting shall be prepared by the QC Manager and signed by both the Contractor and the Contracting Officer.

1.9 QC MEETINGS

After the start of construction, the QC Manager shall conduct weekly QC meetings at the work site with the project superintendent and QC specialists. The QC Manager shall prepare the minutes of the meeting and provide a copy to the Contracting Officer within 2 working days after the meeting. The Contracting Officer may attend these meetings. The QC Manager shall notify the Contracting Officer at least 48 hours in advance of each meeting. As a minimum, the following shall be accomplished at each meeting:

- a. Review the minutes of the previous meeting;
- b. Review the schedule and the status of work:

- Work or testing accomplished since last meeting
 - Rework items identified since last meeting
 - Rework items completed since last meeting;
- c. Review the status of submittals:
- Submittals reviewed and approved since last meeting
 - Submittals required in the near future;
- d. Review the work to be accomplished in the next 2 weeks and documentation required. Schedule the three phases of control and testing:
- Establish completion dates for rework items
 - Preparatory phases required
 - Initial phases required
 - Follow-up phases required
 - Testing required
 - Status of off-site work or testing
 - Documentation required;
- e. Resolve QC and production problems; and
- f. Address items that may require revising the QC plan:
- Changes in QC organization personnel
 - Changes in procedures.

1.9.1 THREE PHASES OF CONTROL

The QC Manager shall perform the three phases of control to ensure that work complies with Contract requirements. The Three Phases of Control shall adequately cover both on-site and off-site work and shall include the following for each definable features of work: A definable feature of work is a task which is separate and distinct from other tasks and requires separate control requirements.

1.9.2 Preparatory Phase

Notify the Contracting Officer at least 48 hours in advance of each preparatory phase. Conduct the preparatory phase with the superintendent, and the foreman responsible for the definable feature. Document the results of the preparatory phase actions in the daily Contractor Quality Control Report. Perform the following prior to beginning work on each definable feature of work:

- a. Review each paragraph of the applicable specification sections;
- b. Review the Contract drawings;
- c. Verify that appropriate shop drawings and submittals for materials and equipment have been submitted and approved. Verify receipt of approved factory test results, when required;
- d. Review the testing plan and ensure that provisions have been made to provide the required QC testing;
- e. Examine the work area to ensure that the required preliminary work has been completed;

- f. Examine the required materials, equipment and sample work to ensure that they are on hand and conform to the approved shop drawings and submitted data;
- g. Review the safety plan and appropriate activity hazard analysis to ensure that applicable safety requirements are met, and that required Material Safety Data Sheets (MSDS) are submitted; and
- h. Discuss construction methods

1.9.3 Initial Phase

Notify the Contracting Officer at least 48 hours in advance of each initial phase. When construction crews are ready to start work on a definable feature of work, conduct the initial phase with the QC Specialists, the superintendent, and the foreman responsible for that definable feature of work. Observe the initial segment of the definable feature of work to ensure that the work complies with Contract requirements. Document the results of the initial phase in the daily Contractor Quality Control Report. Repeat the initial phase for each new crew to work on-site, or when acceptable levels of specified quality are not being met. Perform the following for each definable feature of work:

- a. Establish the quality of workmanship required;
- b. Resolve conflicts;
- c. Review the Safety Plan and the appropriate activity hazard analysis to ensure that applicable safety requirements are met; and
- d. Ensure that testing is performed by an approved laboratory.

1.9.4 Follow-Up Phase

Perform the following for on-going work daily, or more frequently as necessary until the completion of each definable feature of work and document in the daily Contractor Quality Control Report:

- a. Ensure the work is in compliance with Contract requirements;
- b. Maintain the quality of workmanship required;
- c. Ensure that testing is performed by an approved laboratory; and
- d. Ensure that rework items are being corrected.

1.9.5 Notification of Three Phases of Control for Off-Site Work

Notify the Contracting Officer at least two weeks prior to the start of the preparatory and initial phases.

1.10 SUBMITTAL REVIEW

Procedures for submittals are as described in Section entitled "Submittal Procedures."

1.11 TESTING

Except as stated otherwise in the specification sections, perform sampling and testing required under this Contract.

1.11.1 Testing Laboratory Requirements

Provide an independent testing laboratory or establish a laboratory qualified to perform sampling and tests required by this Contract. When the proposed testing laboratory is not accredited by an acceptable accreditation program as described by the paragraph entitled "Accredited Laboratories", submit to the Contracting Officer for approval, certified statements signed by an official of the testing laboratory attesting that the proposed laboratory meets or conforms to the following requirements:

- a. Sampling and testing shall be under the technical direction of a Registered Professional Engineer (P.E) with at least 5 years of experience in construction material testing.
- b. Laboratories engaged in testing of concrete and concrete aggregates shall meet the requirements of [ASTM C 1077](#).
- c. Laboratories engaged in testing of bituminous paving materials shall meet the requirements of [ASTM D 3666](#).
- d. Laboratories engaged in testing of soil and rock, as used in engineering design and construction, shall meet the requirements of [ASTM D 3740](#).
- e. Laboratories engaged in inspection and testing of steel, stainless steel, and related alloys will be evaluated according to [ASTM A 880](#). Laboratories shall meet the requirements of [ASTM E 329](#).
- f. Laboratories engaged in nondestructive testing (NDT) shall meet the requirements of [ASTM E 543](#).
- g. Laboratories engaged in hazardous materials testing shall meet the requirements of OSHA and EPA.

1.11.2 Accredited Laboratories

Acceptable accreditation programs are the National Institute of Standards and Technology (NIST) National Voluntary Laboratory Accreditation Program (NVLAP), the American Association of State Highway and Transportation Officials (AASHTO) program and the American Association for Laboratory Accreditation (A2LA) program. Furnish to the Contracting Officer, a copy of the Certificate of Accreditation, Scope of Accreditation and latest directory of the accrediting organization for accredited laboratories. The scope of the laboratory's accreditation shall include the test methods required by the Contract.

1.11.3 Inspection of Testing Laboratories

Prior to approval of non-accredited laboratories, the proposed testing laboratory facilities and records shall be subject to inspection by the Contracting Officer. Records subject to inspection include equipment inventory, equipment calibration dates and procedures, library of test procedures, audit and inspection reports by agencies conducting laboratory evaluations and certifications, testing and management personnel

qualifications, test report forms, and the internal QC procedures.

1.11.4 Capability Check

The Contracting Officer retains the right to check laboratory equipment in the proposed laboratory and the laboratory technician's testing procedures, techniques, and other items pertinent to testing, for compliance with the standards set forth in this Contract.

1.11.5 Test Results

Cite applicable Contract requirements, tests or analytical procedures used. Provide actual results and include a statement that the item tested or analyzed conforms or fails to conform to specified requirements. Conspicuously stamp the cover sheet for each report in large red letters "CONFORMS" or "DOES NOT CONFORM" to the specification requirements, whichever is applicable. Test results shall be signed by a testing laboratory representative authorized to sign certified test reports. Furnish the signed reports, certifications, and other documentation to the Contracting Officer via the QC Manager. Furnish a summary report of field tests at the end of each month. Attach a copy of the summary report to the last daily Contractor Quality Control Report of each month.

1.12 QC CERTIFICATIONS

1.12.1 Contractor Quality Control Report Certification

Each Contractor Quality Control Report shall contain the following statement: "On behalf of the Contractor, I certify that this report is complete and correct and equipment and material used and work performed during this reporting period is in compliance with the contract drawings and specifications to the best of my knowledge, except as noted in this report".

1.12.2 Invoice Certification

Furnish a certificate to the Contracting Officer with each payment request, signed by the QC Manager, attesting that as-built drawings are current and attesting that the work for which payment is requested, including stored material, is in compliance with contract requirements.

1.12.3 Completion Certification

Upon completion of work under this Contract, the QC Manager shall furnish a certificate to the Contracting Officer attesting that "the work has been completed, inspected, tested and is in compliance with the Contract".

1.13 DOCUMENTATION

Maintain current and complete records of on-site and off-site QC program operations and activities.

1.13.1 Contractor Production Report

Reports are required for each day that work is performed and shall be attached to the Contractor Quality Control Report prepared for the same day. Account for each calendar day throughout the life of the Contract. The reporting of work shall be identified by terminology consistent with the construction schedule. Contractor Production Reports are to be

prepared, signed and dated by the project superintendent and shall contain the following information:

- a. Date of report, report number, name of contractor, contract number, title and location of Contract and superintendent present.
- b. Weather conditions in the morning and in the afternoon including maximum and minimum temperatures.
- c. A list of Contractor and subcontractor personnel on the work site, their trades, employer, work location, description of work performed and hours worked.
- e. A list of job safety actions taken and safety inspections conducted. Indicate that safety requirements have been met including the results on the following:
 - (1) Was a job safety meeting held this date? (If YES, attach a copy of the meeting minutes.)
 - (2) Were there any lost time accidents this date? (If YES, attach a copy of the completed OSHA report.)
 - (3) Was crane/manlift/trenching/scaffold/hv electrical/high work/hazmat work done? (If YES, attach a statement or checklist showing inspection performed.)
 - (4) Was hazardous material/waste released into the environment? (If YES, attach a description of incident and proposed action.)
- f. A list of safety actions taken today and safety inspections conducted.
- g. A list of equipment/material received each day that is incorporated into the job.
- h. A list of construction and plant equipment on the work site including the number of hours used, idle and down for repair.
- i. Include a "remarks" section in this report which will contain pertinent information including directions received, problems encountered during construction, work progress and delays, conflicts or errors in the drawings or specifications, field changes, safety hazards encountered, instructions given and corrective actions taken, delays encountered and a record of visitors to the work site.

1.13.2 Contractor Quality Control Report

Reports are required for each day that work is performed and for every seven consecutive calendar days of no-work and on the last day of a no-work period. Account for each calendar day throughout the life of the Contract. The reporting of work shall be identified by terminology consistent with the construction schedule. Contractor Quality Control Reports are to be prepared, signed and dated by the QC Manager and shall contain the following information:

- a. Identify the control phase and the definable feature of work.

- b. Results of the Preparatory Phase meetings held including the location of the definable feature of work and a list of personnel present at the meeting. Indicate in the report that for this definable feature of work, the drawings and specifications have been reviewed, submittals have been approved, materials comply with approved submittals, materials are stored properly, preliminary work was done correctly, the testing plan has been reviewed, and work methods and schedule have been discussed.
- c. Results of the Initial Phase meetings held including the location of the definable feature of work and a list of personnel present at the meeting. Indicate in the report that for this definable feature of work the preliminary work was done correctly, samples have been prepared and approved, the workmanship is satisfactory, test results are acceptable, work is in compliance with the Contract, and the required testing has been performed and include a list of who performed the tests.
- d. Results of the Follow-up Phase inspections held including the location of the definable feature of work. Indicate in the report for this definable feature of work that the work complies with the Contract as approved in the Initial Phase, and that required testing has been performed and include a list of who performed the tests.
- e. Results of the three phases of control for off-site work, if applicable, including actions taken.
- f. List the rework items identified, but not corrected by close of business.
- g. List the rework items corrected from the rework items list along with the corrective action taken.
- h. Include a "remarks" section in this report which will contain pertinent information including directions received, quality control problem areas, deviations from the QC plan, construction deficiencies encountered, QC meetings held, acknowledgement that as-built drawings have been updated, corrective direction given by the QC Organization and corrective action taken by the Contractor.
- i. Contractor Quality Control Report certification.

1.13.3 Testing Plan and Log

As tests are performed, the QC Manager shall record on the "Testing Plan and Log" the date the test was conducted, the date the test results were forwarded to the Contracting Officer, remarks and acknowledgement that an accredited or Contracting Officer approved testing laboratory was used. Attach a copy of the updated "Testing Plan and Log" to the last daily Contractor Quality Control Report of each month.

1.13.4 Rework Items List

The QC Manager shall maintain a list of work that does not comply with the Contract, identifying what items need to be reworked, the date the item was originally discovered, and the date the item was corrected. There is no requirement to report a rework item that is corrected the same day it is discovered. Attach a copy of the "Contractor Rework Items List" to the

last daily Contractor Quality Control Report of each month. The Contractor shall be responsible for including on this list items needing rework including those identified by the Contracting Officer.

1.13.5 As-Built Drawings

The QC Manager is required to review the as-built drawings required by Section 01 11 00, "Summary of Work", to ensure that as-built drawings are kept current on a daily basis and marked to show deviations which have been made from the Contract drawings. The QC Manager shall initial each deviation and each revision. Upon completion of work, the QC Manager shall furnish a certificate attesting to the accuracy of the as-built drawings prior to submission to the Contracting Officer.

1.13.6 Report Forms

The following forms, which are attached at the end of this section, are acceptable for providing the information required by the paragraph entitled "Documentation". While use of these specific formats are not required, any other format used shall contain the same information:

- a. Combined Contractor Production Report and Contractor Quality Control Report (1 sheet), with separate continuation sheet
- b. Testing Plan and Log
- c. Rework Items List

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

CONTRACTOR PRODUCTION REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE

CONTRACT NO

TITLE AND LOCATION

REPORT NO

CONTRACTOR

SUPERINTENDENT

AM WEATHER

PM WEATHER

MAX TEMP

F

MIN TEMP

F

WORK PERFORMED TODAY

Schedule Activity No.	WORK LOCATION AND DESCRIPTION	EMPLOYER	NUMBER	TRADE	HRS

JOB SAFETY

WAS A JOB SAFETY MEETING HELD THIS DATE?
if YES attach copy of the meeting minutes
 YES NO

WERE THERE ANY LOST TIME ACCIDENTS THIS DATE?
if YES attach copy of completed OSHA report
 YES NO

WAS CRANE/MANLIFT/TRENCHING/SCAFFOLD/HV ELECTRICAL/HIGH WORK DONE?
if YES attach statement or checklist showing inspection performed
 YES NO

WAS HAZARDOUS MATERIAL/WASTE RELEASED INTO THE ENVIRONMENT?
if YES attach description of incident and proposed action
 YES NO

TOTAL WORK HOURS ON JOB SITE THIS DATE

CUMULATIVE TOTAL OF WORK HOURS FROM PREVIOUS REPORT

TOTAL WORK HOURS FROM START OF CONSTRUCTION

SAFETY REQUIREMENTS HAVE BEEN MET.

LIST SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED

EQUIPMENT/MATERIAL RECEIVED TODAY TO BE INCORPORATED IN JOB

CONSTRUCTION AND PLANT EQUIPMENT ON JOB SITE TODAY. INCLUDE NUMBER OF HOURS USED TODAY

REMARKS

CONTRACTOR/SUPERINTENDENT

DATE

CONTRACTOR QUALITY CONTROL REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE _____

PHASE	@BLANK NOT APPLICABLE	YES	NO	IDENTIFY SPECIFICATION SECTION, DEFINABLE FEATURE OF WORK, LOCATION AND LIST PERSONNEL PRESENT
PREPARATORY	PLANS AND SPECS HAVE BEEN REVIEWED.	<input type="checkbox"/>	<input type="checkbox"/>	
	THE SUBMITTALS HAVE BEEN APPROVED.	<input type="checkbox"/>	<input type="checkbox"/>	
	MATERIALS COMPLY WITH APPROVED SUBMITTALS	<input type="checkbox"/>	<input type="checkbox"/>	
	MATERIALS STORED PROPERLY.	<input type="checkbox"/>	<input type="checkbox"/>	
	PRELIMINARY WORK WAS DONE CORRECTLY.	<input type="checkbox"/>	<input type="checkbox"/>	
	TESTING PLAN HAS BEEN REVIEWED.	<input type="checkbox"/>	<input type="checkbox"/>	
	WORK METHOD AND SCHEDULE DISCUSSED.	<input type="checkbox"/>	<input type="checkbox"/>	
	JOB SAFETY / HAZARD ANALYSIS ADDRESSED	<input type="checkbox"/>	<input type="checkbox"/>	
	INITIAL	PRELIMINARY WORK WAS DONE CORRECTLY	<input type="checkbox"/>	
SAMPLE HAS BEEN PREPARED/APPROVED		<input type="checkbox"/>	<input type="checkbox"/>	
WORKMANSHIP IS SATISFACTORY		<input type="checkbox"/>	<input type="checkbox"/>	
TEST RESULTS ARE ACCEPTABLE.		<input type="checkbox"/>	<input type="checkbox"/>	
WORK IS IN COMPLIANCE WITH THE CONTRACT.		<input type="checkbox"/>	<input type="checkbox"/>	
WORK COMPIES WITH SAFETY REQUIREMENTS		<input type="checkbox"/>	<input type="checkbox"/>	
TESTING PERFORMED & WHO PERFORMED TEST				
FOLLOW-UP	WORK COMPIES WITH CONTRACT AS APPROVED INITIAL PHASE	<input type="checkbox"/>	<input type="checkbox"/>	
	WORK COMPIES WITH SAFETY REQUIREMENTS	<input type="checkbox"/>	<input type="checkbox"/>	
	TESTING PERFORMED & WHO PERFORMED TEST			

REWORK ITEMS IDENTIFIED TODAY (NOT CORRECTED BY CLOSE OF BUSINESS)

REWORK ITEMS CORRECTED TODAY (FROM REWORK ITEMS LIST)

REMARKS

On behalf of the contractor, I certify that this report is completed and correct and equipment and material used and work performed during this reporting period is in compliance with the contract drawings and specifications to the best of my knowledge except as noted in this report.

AUTHORIZED QC MANAGER AT SITE

DATE

GOVERNMENT QUALITY ASSURANCE REPORT

DATE _____

QUALITY ASSURANCE REPRESENTATIVE'S REMARKS AND/OR EXCEPTIONS TO THE REPORT

GOVERNMENT QUALITY ASSURANCE MANAGER

DATE

CONTRACTOR QUALITY CONTROL REPORT CONTINUATION SHEET
 (ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE _____

PHASE	BLANK NOT APPLICABLE	YES	NO
PREPARATORY	PLANS AND SPECS HAVE BEEN REVIEWED	<input type="checkbox"/>	<input type="checkbox"/>
	THE SUBMITTALS HAVE BEEN APPROVED.	<input type="checkbox"/>	<input type="checkbox"/>
	MATERIALS COMPLY WITH APPROVED SUBMITTALS	<input type="checkbox"/>	<input type="checkbox"/>
	MATERIALS STORED PROPERLY.	<input type="checkbox"/>	<input type="checkbox"/>
	PRELIMINARY WORK WAS DONE CORRECTLY.	<input type="checkbox"/>	<input type="checkbox"/>
	TESTING PLAN HAS BEEN REVIEWED.	<input type="checkbox"/>	<input type="checkbox"/>
	WORK METHOD AND SCHEDULE DISCUSSED.	<input type="checkbox"/>	<input type="checkbox"/>
	JOB SAFETY / HAZARD ANALYSIS ADDRESSED	<input type="checkbox"/>	<input type="checkbox"/>

IDENTIFY SPECIFICATION SECTION, DEFINABLE FEATURE OF WORK, LOCATION AND LIST PERSONNEL PRESENT

PREPARATORY

PRELIMINARY WORK WAS DONE CORRECTLY	<input type="checkbox"/>	<input type="checkbox"/>
SAMPLE HAS BEEN PREPARED/APPROVED	<input type="checkbox"/>	<input type="checkbox"/>
WORKMANSHIP IS SATISFACTORY	<input type="checkbox"/>	<input type="checkbox"/>
TEST RESULTS ARE ACCEPTABLE.	<input type="checkbox"/>	<input type="checkbox"/>
WORK IS IN COMPLIANCE WITH THE CONTRACT.	<input type="checkbox"/>	<input type="checkbox"/>
WORK COMPLIES WITH SAFETY REQUIREMENTS	<input type="checkbox"/>	<input type="checkbox"/>

TESTING PERFORMED & WHO PERFORMED TEST

INITIAL

CONTRACTOR QUALITY CONTROL REPORT CONTINUATION SHEET
 (ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE

PHASE

(BLANK NOT APPLICABLE)

YES

NO

IDENTIFY SPECIFICATION SECTION, DEFINABLE FEATURE OF WORK, LOCATION AND LIST PERSONNEL PRESENT

WORK COMPLIES WITH CONTRACT AS APPROVED INITIAL PHASE	<input type="checkbox"/>	<input type="checkbox"/>
WORK COMPLIES WITH SAFETY REQUIREMENTS	<input type="checkbox"/>	<input type="checkbox"/>

FOLLOW-UP

REWORK ITEMS LIST

Contract No. and Title: _____

Contractor: _____

NUMBER	DATE IDENTIFIED	DESCRIPTION	CONTRACT REQUIREMENT (Spec. Section and Par. No., Drawing No. and Detail No., etc.)	ACTION TAKEN BY QC MANAGER	RESOLUTION	DATE COMPLETED

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C511 (1997) Reduced-Pressure Principle Backflow-Prevention Assembly

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (FCCCHR)

FCCCHR-01 (1993) Manual of Cross-Connection Control

FCCCHR-USC (2002) List of Approved Backflow Prevention Assemblies

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-03 Product Data

Backflow preventers

SD-06 Test Reports

Backflow Preventer Tests

SD-07 Certificates

Backflow Tester Certifications

Backflow Preventers Certificate of Full Approval

1.3 BACKFLOW TESTER CERTIFICATIONS

Certificate of Full Approval from FCCCHR-USC, University of Southern California, attesting that the design, size and make of each backflow preventer has satisfactorily passed the complete sequence of performance testing and evaluation for the respective level of approval. Certificate of Provisional Approval will not be acceptable.

1.3.1 Backflow Preventers Certificate

The Contractor shall submit a certificate recognized by the State or local

authority that states the Contractor has completed at least 10 hours or training in backflow preventer installations. The certificate must be current.

1.4 TEMPORARY UTILITIES

1.4.1 Availability of Utility Services

- a. The Contract clause related to utilities applies. Reasonable amounts of water and electricity from the nearest outlet will be provided free of charge for pursuance of work within a facility under this contract. If the nearest available outlet cannot be utilized by the Contractor because of improper voltage, insufficient current, improper pressure, incompatible connectors, etc., it shall be the responsibility of the Contractor to provide temporary utilities as required.
- b. Reasonable amounts of utilities for contractor trailers and storage buildings will be made available to the Contractor, when available. The Contractor shall be responsible for providing transformers, electrical service poles and drops for electrical services, and backflow preventer devices on connections to domestic water lines. Final taps and tie-ins to the Government utility grid will be made by the Contractor after approval by the Contracting Officer. Tap-in cost, if any, shall be the responsibility of the Contractor. Under no circumstances will taps to base fire hydrants be allowed for obtaining domestic water.

1.4.2 Trailers

Electrical service will be supplied by the Government, when available, except at Tarawa Terrace where Carolina Power and Light Company will be the supplier.

1.4.3 Energy and Utilities Conservation

The Contractor shall carefully conserve utilities furnished without charge. The Contractor, at his own expense and in a manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines and remove the same prior to final acceptance of the construction.

1.4.4 Location of Underground Utilities

Location and Protection of underground utilities shall be the responsibility of the Contractor. Where existing-to-remain piping, utilities, and underground obstructions of any type are indicted in locations to be traversed by new piping, ducts, and other excavations the elevations of the existing utilities and obstructions shall be determined before the new work is completed.

- a. In addition, the Contractor will be responsible for obtaining the services of a professional utility locator prior to digging. Contractor will provide documentation that the site has been surveyed and checked for underground utilities. All utilities must be located, including but not limited to power, water, sewer, storm drains, fiber optics, T.V. cable, telephone, and intrusion detection wiring. A set of known utility drawings will be available in the ROICC office for review to assist the locator.

- b. It is mandatory that the Contractor also contact the Base Telephone Office (451-2531) prior to accomplishing any digging at Camp Lejeune. A telephone office representative will assist in locating telephone lines.
- c. It is mandatory that the Contractor also contact Charter Communications, cable TV service prior to accomplishing any digging at Camp Lejeune, to ensure that all buried cable lines are identified. Contact Mr. Olin Criswell at 353-8677 for assistance.

1.4.4.1 The Locations of Underground Utilities shown at only approximate and the information provided may be incomplete. Contractor shall attempt to ascertain locations of existing underground utilities prior to and during digging operations.

1.4.4.2 Damage to Underground Utilities

Immediate notice shall be delivered to the Contracting Officer of any damage. The Contractor shall make temporary repairs immediately, and shall provide permanent repairs as soon as practicable. For any additional work required by reason of conflict between the new and existing work, an adjustment in contract price will be made in accordance with Contract clause entitled "Differing Site Conditions", if appropriate.

1.5 WEATHER PROTECTION

Take necessary precautions to ensure that roof openings and other critical openings in the building are monitored carefully. Take immediate actions required to seal off such openings when rain or other detrimental weather is imminent, and at the end of each workday. Ensure that the openings are completely sealed off to protect materials and equipment in the building from damage.

1.5.1 Building and Site Storm Protection

When a warning of gale force winds is issued, take precautions to minimize danger to persons, and protect the work and nearby Government property. Precautions shall include, but are not limited to, closing openings; removing loose materials, tools and equipment from exposed locations; and removing or securing scaffolding and other temporary work. Close openings in the work when storms of lesser intensity pose a threat to the work or any nearby Government property.

1.5.1.1 Hurricane Conditions of Readiness

Unless directed otherwise, comply with:

- a. Condition FIVE: Normal weather conditions are expected for the foreseeable future. No action is required.
- b. Condition FOUR (Sustained winds of 74 mph or greater expected within 72 hours): Contractors shall continue normal daily clean up and good house keeping practices. Collect and store in piles or containers scrap lumber, waste material, and rubbish for removal and disposal at the close of each work day. Stack lumber in neat piles less than 4 feet high. Prepare to remove or secure all debris, trash, or stored materials that could become missile hazards during high wind conditions. Meetings should be held

on-site with all subcontractors to review the measures that are going to need to be taken should the base go to a higher readiness condition. Contact the ROICC for any additional updates and upon completion of all required actions.

- c. Condition THREE (Sustained winds of 74 mph or greater expected within 48 hours): Once Condition 3 is set, contractors shall shift their focus from their normal activities to taking the actions that are required to prepare the job site for the potential of destructive weather. All debris and rubbish shall be removed from the site at the end of the workday. All stored materials shall either be removed from the job site or secured (metal straps or heavy lines/ropes). All tools, equipment and gear shall be secured at the end of the workday. Begin preparations to adequately secure the facility (windows boarded up, etc.). Meetings should be held on-site with all subcontractors to review the measures that are going to be taken should base go to a higher readiness condition. Contact the ROICC for any additional updates and upon completion of all required actions.
- d. Condition TWO (Sustained winds of 74 mph or greater expected within 24 hours): Cease all normal activities until the job-site is completely prepared for the onslaught of destructive weather. The job site should be completely free of debris, rubbish and scrap materials. The facility being worked on should be made weather-tight. All scaffolding planking shall be removed. All formwork and free standing structural steel shall be braced. All machinery, tools, equipment and materials shall be properly secured or removed from the job-site. Expend every effort to clear all missiles hazards and loose equipment from the job site. When the contractor secures for the day the job site should be left in a condition that is ready for the storm and the contractor should assume that they will not be allowed to return to their job site until after the storm passes and the base is reopened. Contact ROICC for additional updates and upon completion of required actions.
- e. Condition ONE (Sustained winds of 74 mph or greater expected within 12 hours): If still on the job site, the contractor will be required to immediately leave the base until the storm passes and the base is reopened.

1.6 STORAGE AREAS

The Contract Clause entitled "FAR 52.236-10, Operations and Storage Areas" and the following apply:

1.6.1 Storage Size and Location

The open site available for storage shall be confined to the indicated operations area. The storage area shall be coordinated with the government.

1.6.2 Storage in Existing Buildings

The Contractor shall be working in an existing building; the storage of material will not be allowed in the building.

1.7 TEMPORARY SANITARY FACILITIES

Provide adequate sanitary conveniences of a type approved for the use of persons employed on the work, properly secluded from public observation, and maintained in such a manner as required and approved by the Contracting Officer. Maintain these conveniences at all times without nuisance. Upon completion of the work, remove the conveniences from the premises, leaving the premises clean and free from nuisance. Dispose of sewage through connection to a municipal, district, or station sanitary sewage system. Where such systems are not available, use chemical toilets or comparably effective units, and periodically empty wastes into a municipal, district, or station sanitary sewage system, or remove waste to a commercial facility. Include provisions for pest control and elimination of odors.

1.8 TEMPORARY BUILDINGS

Locate these where directed and within the indicated operations area.

1.8.1 Trailers or Storage Buildings

Trailers or storage buildings will be permitted, where space is available, subject to the approval of the Contracting Officer. The trailers or buildings shall be in good condition, free from visible damage rust and deterioration, and meet all applicable safety requirements. Trailers shall be roadworthy and comply with all appropriate state and local vehicle requirements. Failure to maintain storage trailers or buildings to these standards shall result in the removal of non-complying units at the Contractor's expense. A sign not smaller than 24 by 24 inches shall be conspicuously placed on the trailer depicting the company name, business phone number, and emergency phone number. Trailers shall be anchored to resist high winds and must meet applicable state or local standards for anchoring mobile trailers.

PART 2 PRODUCTS

2.1 Backflow Preventers

Reduced pressure principle type conforming to the applicable requirements [AWWA C511](#). Provide backflow preventers complete with 150 pound flanged cast iron, mounted gate valve and strainer, 304 stainless steel or bronze, internal parts. The particular make, model/design, and size of backflow preventers to be installed shall be included in the latest edition of the List of Approved Backflow Prevention Assemblies issued by the [FCCCHR-USC](#) and shall be accompanied by a Certificate of Full Approval from [FCCCHR-USC](#).

PART 3 EXECUTION

3.1 REDUCED PRESSURE BACKFLOW PREVENTERS

Provide an approved reduced pressure backflow prevention assembly at each location where the Contractor taps into the Government potable water supply.

A certified tester(s) shall perform testing of backflow preventer(s) for proper installation and operation and provide subsequent tagging. [Backflow preventer tests](#) shall be performed using test equipment, procedures, and certification forms conforming to those outlined in the latest edition of the Manual of Cross-Connection Control published by the [FCCCHR-01](#). Test and tag each reduced pressure backflow preventer upon initial installation (prior to continued water use) and quarterly thereafter. Tag shall contain

the following information: make, model, serial number, dates of tests, results, maintenance performed, and signature of tester. Record test results on certification forms conforming to requirements cited earlier in this paragraph.

-- End of Section --

SECTION 01 57 19

TEMPORARY ENVIRONMENTAL CONTROLS

05/12

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

- 40 CFR 261 Identification and Listing of Hazardous Waste
- 40 CFR 262 Generators of Hazardous Waste
- 40 CFR 263 Transporters of Hazardous Waste
- 40 CFR 264 Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
- 40 CFR 265 Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
- 40 CFR 300 National Oil and Hazardous Substances Pollution Contingency Plan
- 49 CFR 171 General Information, Regulations, and Definitions
- 49 CFR 172 Hazardous Materials Tables and Hazardous Materials Communications Regulations
- 49 CFR 178 Shipping Container Specification

1.2 Contractor Liabilities for Environmental Protection

Contractors shall complete and provide [environmental training documentation](#) for training required by Federal, State, and local regulations.

1.3 DEFINITIONS

1.3.1 Sediment

Soil and other debris that have eroded and have been transported by runoff water or wind.

1.3.2 Solid Waste

Rubbish, debris, garbage, and other discarded solid materials, except recyclables and hazardous waste as defined in paragraph entitled "Hazardous Waste," resulting from industrial, commercial, and agricultural operations

and from community activities.

1.3.3 Sanitary Wastes

Wastes characterized as domestic sanitary sewage.

1.3.4 Rubbish

Combustible and noncombustible wastes such as non-recyclable paper and cardboard, crockery, and bones.

Recyclables includes: clean paper, cardboard, glass, plastics (No. 1 & 2), metal, and cans.

Non-recyclable paper and cardboard are defined as material that has become wet or contaminated with food or other residue that render it un-acceptable for recycling.

Treated wood/lumber is defined as wood that has been stained or treated to prevent rot, or composite wood products such as OSB, pressboard furniture, etc.

Untreated wood is defined as lumber, trees, stumps, limbs, tops, and shrubs.

1.3.5 Debris

Combustible and noncombustible wastes such as ashes and waste materials resulting from construction or maintenance and repair work, (excluding organic matter) leaves, pine straw, grass and shrub clippings.

1.3.6 Chemical Wastes

This includes salts, acids, alkalies, herbicides, pesticides, and organic chemicals.

1.3.7 Garbage

Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

1.3.8 Hazardous Waste

Hazardous substances as defined in 40 CFR 261 or as defined by applicable State and local regulations.

1.3.9 Hazardous Materials

Hazardous materials as defined in 49 CFR 171 and listed in 49 CFR 172.

1.3.10 Landscape Features

Trees, plants, shrubs, and ground cover.

1.3.11 Lead Acid Battery Electrolyte

The electrolyte substance (liquid medium) within a battery cell.

1.3.12 Oily Waste

Petroleum products and bituminous materials.

1.3.13 Class I Ozone Depleting Substance (ODS)

Class I and Class II ODS are defined in Sections 602 (a and b) of The Clean Air Act.

1.4 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-11 Closeout Submittals

Solid waste disposal permit

Disposal permit for hazardous waste

Environmental training documentation

Permit to transport hazardous waste

Hazardous waste certification

Annual Report of Products Containing Recovered Materials

1.4.1 Solid Waste Disposal Permit

Submit one copy of a State and local permit or license for the solid waste disposal facility. If the contract permits the use of the Base Landfill, request a letter from the Contracting Officer authorizing permission to dump on base; submit the letter to the Base Landfill Office. In lieu of the letter a copy of the contract must be delivered to the Landfill Office for review.

1.4.2 Disposal Permit for Hazardous Waste

Submit a copy of the applicable EPA and State permits, manifests, or licenses for transportation, treatment, storage, and disposal of hazardous waste by permitted facilities.

1.4.3 Permit to Transport Hazardous Waste

Submit one copy of the EPA or State permit license, or regulation for the transporter who will ship the hazardous waste to the permitted Treatment, Storage, and Disposal (TSD) facility.

1.4.4 Hazardous Waste Certification

Submit written certification that hazardous waste turned in for disposal was generated on Government property and is identified, packaged, and labeled in accordance with 40 CFR 261, 40 CFR 262, and 40 CFR 263.

1.5 ADMINISTRATIVE REQUIREMENTS

1.5.1 Licenses and Permits

Obtain licenses and permits pursuant to "FAR 52.236-7, Permits and Responsibilities" except for those permits which will be obtained by the Contractor:

For permits obtained by the Contracting Officer, whether or not required by the permit, perform inspections of the work in progress, and submit certifications to the applicable regulatory agency, via the Contracting Officer, that the work conforms to the contract and permit requirements. The inspections and certifications shall be provided through the services of a Professional Engineer, registered in the State where the work is being performed. As a part of the quality control plan, which is required to be submitted for approval by the quality control section, provide a subitem containing the name, P.E. registration number, address, and telephone number of the professional engineer(s) who will be performing the inspections and certifications for each permit listed above.

1.6 GENERAL ENVIRONMENTAL MANAGEMENT SYSTEM AND ENVIRONMENTAL AWARENESS

The Contractor shall familiarize himself with requirements of the attached "Marine Corps Base (MCB), Camp Lejeune, Contractor Environmental Guide."

1.7 CAMP LEJEUNE SANITARY LANDFILL INFORMATION SHEET

See attached "Camp Lejeune Sanitary Landfill Information Sheet" for hours of operation and other important information pertaining Landfill.

PART 2 PRODUCTS

2.1 ANNUAL REPORT OF PRODUCTS CONTAINING RECOVERED MATERIALS

The Contractor shall submit data annually (by December 1) products used during the previous fiscal year (October 1 - September 30) as required by 6002 of the Solid Waste Disposal Act as amended by Resource Conservation and Recovery Act (RCRA). Report forms is attached to end of this section as "Appendix A."

PART 3 EXECUTION

3.1 PROTECTION OF NATURAL RESOURCES

Preserve the natural resources within the project boundaries and outside the limits of permanent work. Restore to an equivalent or improved condition upon completion of work. Confine construction activities to within the limits of the work indicated or specified.

3.1.1 Land Resources

Except in areas to be cleared, do not remove, cut, deface, injure, or destroy trees or shrubs without Contracting Officer's permission. Do not fasten or attach ropes, cables, or guys to existing nearby trees for anchorages unless authorized by Contracting Officer. Where such use of attach ropes, cables, or guys is authorized, the Contractor shall be responsible for any resultant damage.

3.1.1.1 Protection of Trees

Protect existing trees which are to remain and which may be injured, bruised, defaced, or otherwise damaged by construction operations. Remove displaced rocks from uncleared areas. By approved excavation, remove trees with 30 percent or more of their root systems destroyed. Removal of trees and the procedure for removal requires approval of the Contracting Officer.

3.1.1.2 Landscape Replacement

Remove trees and other landscape features scarred or damaged by equipment operations, and replace with equivalent, undamaged trees and landscape features. Obtain Contracting Officer's approval before removal or replacement.

3.1.1.3 Temporary Construction

Remove traces of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other signs of construction. Grade temporary roads, parking areas, and similar temporarily used areas to conform with surrounding contours.

3.2 HISTORICAL AND ARCHAEOLOGICAL RESOURCES

Carefully protect in-place and report immediately to the Contracting Officer historical and archaeological items or human skeletal remains discovered in the course of work. Stop work in the immediate area of the discovery until directed by the Contracting Officer to resume work. The Government retains ownership and control over historical and archaeological resources.

3.3 CONTROL AND DISPOSAL OF SOLID WASTES

Pick up and separate solid wastes, and place in covered containers which are regularly emptied. Do not prepare or cook food on the project site. Prevent contamination of the site or other areas when handling and disposing of wastes. At project completion, leave the areas clean.

3.3.1 Disposal of Metal Paint Cans

All metal paint cans shall be taken to Building 962 for recycling. The cans shall be empty and completely dry. The cans shall be triple rinsed and stenciled "Triple Rinsed" prior to turn in. The Contractor shall give the Government 72 hours advance notice prior to turn-in. Contractor is responsible for rinsing, stenciling, crushing, and depositing in Government owned receptacle, located at Building 962.

3.3.2 Disposal of Rubbish and Debris

Rubbish and debris shall be taken off-base for disposal, unless specifically directed otherwise below:

Metals shall be taken to the DRMO disposal area at Lot 203, as specified.

<u>CATEGORY</u>	<u>CONSTRUCTION DEBRIS DISPOSAL - BASE SANITARY LANDFILL EXAMPLE/GENERAL INFORMATION FOR DEPOSIT IN THE LANDFILL</u>
Recyclable Cardboard	Breakdown corrugated cardboard boxes and deliver to the Base Recycling Center located at Building 982. If base personnel rejects the cardboard, take cardboard for off-base disposal.
Recyclable Wood Pallets	Deliver usable pallets to the Base Recycling Center located at Building 982. If base personnel rejects the pellets, take pallets for off-base disposal.
Organic Matter	Organic matter will not be accepted at the landfill.
Asphalt Pavement	Remove pavement from Government property and deliver to an asphalt recycling establishment. Provide a record of the total tons of asphalt recycled and the corporate name and location of the recycling establishment receiving the removed asphalt.
*****	Weigh each and every vehicle delivering debris upon entrance and exit. Cover debris.
Asbestos	Refer to Section 02 82 16
Lead Based Paint Materials	Refer to Section 02 82 33.13.
<hr/>	
Metals	Metals will not be accepted at the landfill. Remove metals from each and every category before delivery to landfill. (Example: Remove hardware from doors and windows.) Dispose of metal construction debris at Defense Reutilization Maintenance Office (DRMO). Aluminum, brass, copper, lead, other metal, electrical wiring, cable (cut in 3 foot or less sections)
Treated & Untreated Wood/Lumber	Treated & untreated wood/lumber will not be accepted at the landfill.
Concrete	Concrete will not be accepted at the landfill.
Construction Material	Construction material should be managed and placed in a designated area. Area shall be kept clean of debris and all material removed at the end of the project.

CONSTRUCTION DEBRIS DISPOSAL - BASE
SANITARY LANDFILL EXAMPLE/GENERAL
INFORMATION FOR DEPOSIT IN THE LANDFILL

CATEGORY

Solid Waste	Separate each category of solid waste to enhance recycling.
Hazardous Material	This project involves demolition, renovation/repair and/or construction activities; therefore, hazardous material (such as paints, solvents, thinners, adhesives, etc) may be used during the execution of this project. The contractor will be required to appropriately manage the hazardous material and provide secondary containment.
Solid Waste Report	All solid waste generated and recycled will be weighed. Contractor will report the amount of solid waste disposed and recycled at the end of the project to EMD's Solid Waste Manager or the Pollution Prevention Manager via the OICC. Tonnage information for all materials delivered to the Base Landfill is available at the Landfill Office. Submit a written request to the Landfill Manager, specifying the desired information.
Recycling of Construction Debris	Recyclable material (ex. Scrap metal/aluminum/brass/copper/lead, and other metal) may be recycled through Defense Utilization Maintenance Office) DRMO using a 1348-1a with the following information (Proceeds for the sale of recyclable material are to go to the Qualified Recycling financial account - 17F3875 27RM 00767001 0 000027 3c 000000 06700198004). For additional information contact the Base Recycling Coordinator 910-451-4214.

Electrical Equipment	Before demolition or removal of electrical equipment from the Base - Contractor shall contact Base High Voltage Shop Supervisor at (910) 451-2790, to allow for first right of refusal of electrical equipment such as: ATS, transformers, and generators. Electrical equipment will not be accepted at landfill.
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3.3.3 Disposal Off-Base

- a. Provide 24-hour advance written notice to the Contracting Office of Contractor's intention to dispose of off base.

- b. Disposal at sites or landfills not holding a valid State of North Carolina permit is specifically prohibited. The prohibition also applies to sites where a permit may have been applied for but not yet obtained.
- c. Off-base disposal of construction debris outside the parameters of this paragraph at site without State permits and/or not in accordance with regulatory requirements shall require the Contractor at his own expense to remove, transport and relocate the debris to a State approved site. The Contractor shall also be required to pay any fines, penalties, or fees related to the illegal disposal of construction debris

3.4 CONTROL AND DISPOSAL OF HAZARDOUS WASTE

3.4.1 Hazardous Waste Generation

Handle generated hazardous waste in accordance with 40 CFR 262.

3.4.2 Hazardous Waste Disposal

Dispose of hazardous waste in accordance with Federal, State, and local regulations, especially 40 CFR 263, 40 CFR 264, and 40 CFR 265. Removal of hazardous waste from Government property shall not occur without prior notification and coordination with the Contracting officer. Transport hazardous waste by a permitted, licensed, or registered hazardous waste transported to a TSD facility. Hazardous waste shall be properly identified, packaged, and labeled in accordance with 49 CFR 172. Provide completed manifest for hazardous waste disposed of off-site to the Contracting Officer within 7 days of disposal. Hazardous waste shall not be brought onto the station.

3.4.3 Hazardous Waste Storage

Store hazardous waste in containers in accordance with 49 CFR 178. Identify hazardous waste in accordance with 40 CFR 261 and 40 CFR 262. Identify hazardous waste generated within the confines of the station by the station's EPA generator identification number.

3.4.4 Spills of Oil and Hazardous Materials

Take precautions to prevent spills of oil and hazardous material. In the event of a spill, immediately notify the Contracting Officer. Spill response shall be in accordance with 40 CFR 300 and applicable State regulations.

3.4.5 Lead-Acid Batteries

Dispose of lead-acid batteries that are not damaged or leaking at a State-approved battery recycle or at a permitted or interim status hazardous waste TSD facility. For lead-acid batteries that are leaking or have cracked casings, dispose of the electrolyte solution using one of the following alternatives:

- a. An industrial waste water treatment plant, if available and approved by the Contracting Officer for disposing of lead-acid battery electrolyte.

- b. Dispose of the lead-acid battery electrolyte at a permitted or interim status hazardous waste TSD facility.

The management and disposal of waste lead-acid batteries and electrolyte shall comply with requirements for management and disposal of hazardous wastes.

3.4.6 Mercury Control

Prior to starting work, remove thermostats, switches, and other components that contain mercury. Upon removal, place items containing mercury in doubled polyethylene bags, label, and turn over to the Contracting Officer for disposal.

3.4.7 Petroleum Products

Protect against spills and evaporation during fueling and lubrication of equipment and motor vehicles. Dispose of lubricants to be discarded and excess oil.

3.4.8 Ozone Depleting Substances (ODS)

Remove ODS as specified in Section 02 41 00, "Demolition."

3.5 DUST CONTROL

Keep dust down at all times, including nonworking periods. Sprinkle or treat, with dust suppressants, the soil at the site, haul roads, and other areas disturbed by operations. Dry power brooming will not be permitted. Instead, use vacuuming, wet mopping, wet sweeping, or wet power brooming. Air blowing will be permitted only for cleaning nonparticulate debris such as steel reinforcing bars. Only wet cutting will be permitted for cutting concrete blocks, concrete, and bituminous concrete. Do not shake bags of cement, concrete mortar, or plaster unnecessarily.

3.6 QUARANTINE FOR IMPORTED FIRE ANT (4/82)

Onslow, Jones, and Cartaret Counties and portions of Duplin and Craven Counties have been declared a generally infested area by the United States Department of Agriculture (USDA) for the imported fire ant. Compliance with the quarantine regulations established by this authority as set forth in USDA Publication 301.81 of 31 December 1992, is required for operations hereunder. Pertinent requirements of the quarantine for materials originating on the Camp Lejeune reservation, the Marine Corps Air Station (Helicopter), New River and the Marine Corps Air Station, Cherry Point, which are to be transported outside Onslow County or adjacent suppression areas, include the following:

- a. Certification is required for the following articles and they shall not be moved from the reservation to any point outside Onslow County and adjacent designated areas unless accompanied by a valid inspection certificate issued by an Officer of the Plant Protection and Quarantine Program (PPQ) of the U.S. Department of Agriculture.
 - (1) Bulk soil
 - (2) Used mechanized soil-moving equipment. (Used mechanized soil-moving equipment is exempt if cleaned of loose noncompacted

soil).

(3) Other products, articles, or means of conveyances, if it is determined by an inspector that they present a hazard of transporting spread of the imported fire ant and the person in possession thereof has been so notified.

- b. Authorization for movement of equipment outside the imported fire and regulated area shall be obtained from USDA, Animal and Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ), Box 28, Goldsboro, North Carolina, 27533-0028, Attn: Mr. William Scroggins or Mr. Frank Best, telephone (919) 735-1941. If Mr. Scroggins or Mr. Best are not available, contact Mr. Jim Kelley at (910) 815-4667, the supervisor's office in Wilmington. Requests for inspection shall be made sufficiently in advance of the date of movement to permit arrangements for the services of authorized inspectors. The equipment shall be prepared and assembled so that it may be readily inspected. Soil on or attached to equipment, supplies, and materials shall be removed by washing with water or such other means as necessary to accomplish complete removal. Resulting spoil shall be wasted as necessary and as directed.

ANNUAL REPORT OF PRODUCTS CONTAINING RECOVERED MATERIALS

Contractor shall submit data annually (By 1 December) for the following products used during the previous fiscal year (1 October - 30 September) as required by 6002 of the Solid Waste Disposal Act as ammended by Resource Conservation and Recovery Act (RCRA):

Contract Number: _____ Fiscal Year: _____

<u>MATERIAL</u>	<u>UNIT</u>	<u>QUANTITY (CRM)</u>	<u>TOTAL QUANTITY</u>
<u>A. Insulation</u>			
1. Loose fill	Ft3		
2. Blanket or batt	Ft2		
3. Board	Ft2		
4. Spray-in-place	m3		
5. Other			
<u>B. Cement and Concrete</u>			
	yd3		
<u>C. Paper and Paper Products</u>			
1. Copy Paper	Box		
2. Printing/Writing Paper	Box		
3. Corrugated and fiberboard boxes	Box		
4. Folding boxboard and cartons	Box		
5. Stationary, office papers, envelopes, and computer paper	\$Amt		
6. Toilet tissue, paper towels, fasial tissue, paper napkins, doilies and industrial wipes	\$Amt		
7. Brown papers and coarse papers	Box		
8. Other			

APPENDIX A

<u>MATERIAL</u>	<u>DEFINITION</u>
1. Quantity (CRM)	Quantity used containing recovered materials.
2. Total Quantity	Quantity used containing recovered materials plus quantity used not containing recovered materials.
3. Unit	Ft3 (cubic feet), Ft2 (square feet), m3 (cubic meters), yd3 (cubic yards), box (number of boxes used), \$ Amt (dollar value of material used)
4. Loose-Fill Insulation	Includes, but is not limited to..."cellulose fiber, mineral fibers (fiberglass and rock wool), vermiculite, and perlite.
5. Blanket or Batt Insulation	Includes, but is not limited to... "mineral fibers (fiberglass and rock wool)."
6. Board Insulation	This category refers to sheathing, roof decking, and wood panel insulation. It includes, but is not limited to... "cellulose fiber fiberboard, perlite composite board, polyurethane, polyisocyanurate, polystyrene, phenolics, and composites."
7. Spray-in-place Insulation	Includes, but is not limited to... "foam-in-place polyurethane and polyisocyanurate, and spray-on cellulose."
8. Cement or Concrete Containing Recovered Materials, Cement, or Concrete Containing Fly Ash	
9. Copy Paper	This item refers to... "any grade of paper suitable for copying by the xerographic method."
10. Printing & Writing Paper	This item refers to... "paper designed for printing, other than newsprint, such as offset or book paper," and... "paper suitable for pen and ink, pencil, typewriter or printing."

APPENDIX A

<u>MATERIAL</u>	<u>DEFINITION</u>
11. Corrugated & Fiberboard Boxes	Corrugated boxes refer to... "boxes made of corrugated paperboard, which, in turn, is made from a fluted corrugating medium pasted to two flat sheets of paperboard (linerboard)." Fiber or fiberboard boxes refer to... "boxes made from containerboard, either solid fiber or corrugated paperboard (general term); or boxes made from solid paperboard of the same material throughout."
12. Folding Boxes and Cartons	This item refers to... "a paperboard suitable for the manufacture of folding cartons."
13. Stationery, Office Papers, Envelopes, and Manifold Business Forms	This item is considered self-explanatory, however, if questions arise refer to 40 CFR 250.4 for definitions of any of these items.
14. Toilet Tissue, Paper Towels, Facial Tissue, Paper Napkins, Doilies, and Industrial Wipes	This item is considered self-explanatory, however, if questions arise refer to 40 CFR 250.4 for definitions of any of these items.
15. Brown Papers, and Coarse Papers	Brown papers refer to... "papers usually made from unbleached kraft pulp and used for bags, sacks, wrapping paper, and so forth." Coarse papers refer to... "papers used for industrial purposes, as distinguished from those used for cultural or sanitary purposes."
16. Other	Any other type of paper not included in any of the above categories.

APPENDIX A

-- End of Section --

Marine Corps Base (MCB) Camp Lejeune Contractor Environmental Guide



August 2008

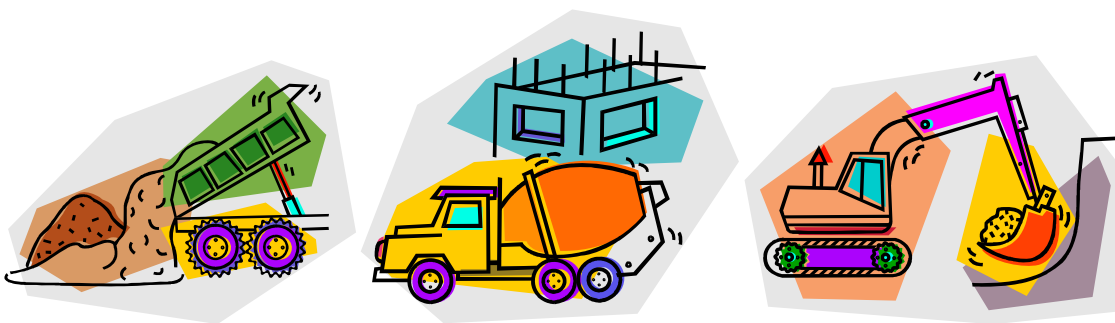


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Attachment 3-1 Spill Reporting Form

Attachment 4-1 Weekly Hazardous Waste (HW) Site Inspection Form, MCB
Camp Lejeune

Attachment 4-2 Weekly Hazardous Waste (HW) Site Inspection Form, MCAS
New River

Attachment A MCB Camp Lejeune, NC/MCAS New River General EMS and
Environmental Awareness Training for Contractors and Vendors

1.0 CONTRACTOR ENVIRONMENTAL GUIDE OVERVIEW

The purpose of this Contractor Environmental Guide is to assist contractors working aboard Marine Corps Base (MCB) Camp Lejeune (MCBCL) and Marine Corps Air Station (MCAS) New River (MCASNR) in complying with Federal and state environmental laws and regulations, as well as Marine Corps and local Installation environmental policies. This guide is designed to answer many of the environmental questions that arise as well as provide pertinent information on environmental topics and training requirements.

NOTE This document should be used only as a *guide* to environmental issues contractors may face while working aboard MCBCL and MCASNR. It is expected that contractors will work closely with their Resident Officer in Charge of Construction (ROICC) or Contract Representatives who will consult with the Environmental Management Division (EMD) at MCBCL and the Environmental Affairs Department (EAD) at MCASNR regarding environmental management issues, concerns, and/or questions.

NOTE This guide is designed to provide the Federal and state requirements and Marine Corps and Installation policies that pertain to MCBCL and MCASNR. It is the contractor's responsibility to know and comply with requirements and policies. Environmental personnel will assist contractors with compliance issues; however, the primary burden of regulatory identification, familiarity, and compliance lies with the contractor. This training *does not* replace any required regulatory environmental training as per contract requirements. Required environmental training should be completed *prior* to working at MCBCL or MCASNR, if required by your contract.

NOTE It is the contractor's responsibility to review the project-specific contract and specifications. Additional environmental requirements, submissions, and/or meetings not documented in this guide may be necessary.

This document should be used only as a *guide* to environmental issues contractors may face while working aboard MCBCL and MCASNR.

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact EMD or EAD if additional clarification is necessary.

1.1 KEY DEFINITIONS AND CONCEPTS

The following are key definitions and concepts used throughout this guide. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

1.1.1 Key Definitions

- **Environment.** Surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation.
- **Environmental Management Division (EMD).** MCBCL's environmental division responsible for environmental issues and compliance at MCBCL and MCASNR (with the exception of hazardous waste and hazardous materials at MCASNR).
- **Environmental Affairs Department (EAD).** MCASNR's environmental department responsible for hazardous waste/hazardous material issues at MCASNR.

1.1.2 Key Concepts

- **Comprehensive Environmental Training and Education Program (CETEP).** The Marine Corps training program designed to ensure that high-quality, efficient, and effective environmental training, education, and information are provided at all levels of the Marine Corps.
- **Environmental Management System (EMS).** The part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes, and resources for developing, implementing, achieving, reviewing, and maintaining the Environmental Policy.
- **EMS Training.** Instruction that is designed to ensure that military and civilian personnel, including contractors and vendors, become familiar with the Installation's EMS and how it functions.
- **General Environmental Awareness Training.** Instruction that is designed to ensure that military and civilian personnel, including contractors and vendors, become familiar with the local environmental policies and programs for regulatory compliance, natural resource conservation, pollution prevention, and environmental protection.
- **Installation.** Throughout this document, Installation refers to all MCBCL property, including MCASNR and all outlying fields associated with MCBCL.

1.2 INSTALLATION BACKGROUND

MCB Camp Lejeune was established in 1941 in Onslow County along the southern coast of North Carolina. MCBCL is located just north of MCAS New River. MCBCL encompasses more than 153,000 acres, consisting of 26,000 acres of water and 127,000 acres of land.

The primary function of MCBCL is national defense, providing a home base for the II Marine Expeditionary Force (MEF), 2d Marine Division, 2d Marine Logistics Group, and other combat units and support commands. MCBCL's mission is to maintain combat ready units for expeditionary deployment. MCBCL maintains and utilizes supply warehouses;

maintenance shops; hazardous material and hazardous waste storage; bulk fuel storage and transfer facilities; fleet parking; housing areas; recreational areas; two golf courses; and a marina. Additionally, MCBCL is a self-sufficient Base, with its own steam-generating station, wastewater treatment plant, drinking water wells, drinking water treatment plants, and landfill.

MCASNR is the principal U.S. Marine Corps (USMC) helicopter operating location on the East Coast. The Air Station supports aircrew training in the H-53 helicopter. It is also the evaluation and prospective beddown site for the V-22 Osprey. The mission of MCASNR is to provide the necessary support for its tenant units, Marine Aircraft Group 26 (MAG-26) and MAG-29.

1.2.1 Environmental Management Division (EMD) and Environmental Affairs Department (EAD)

MCBCL's EMD, located within the Installation and Environment Department, is responsible for all natural resource and environmental matters aboard the Installation (with the exception of hazardous waste/hazardous material issues at MCASNR). EMD works closely with activities at MCBCL, educating and training personnel to comply with environmental laws while accomplishing the military mission.

The Environmental Affairs Department (EAD) is located at MCASNR. EAD and EMD work closely together. MCBCL and MCASNR participate together in one Environmental Management System (EMS).

1.2.2 Expectations

As contractors aboard the Installation, your commitment to strict compliance with environmental laws and regulations will assist the Installation in providing the best possible training facilities for today's Marines and Sailors while honoring our environmental responsibilities and objectives. Violation of environmental laws can result in severe civil or criminal penalties and fines.

1.3 OVERVIEW OF REQUIREMENTS

1.3.1 Contractor Environmental Guide

The following information is contained in the guide:

- MCBCL Contractor Environmental Guide
 - EMS overview and requirements
 - Environmental program specific requirements
- Attachment A: MCB Camp Lejeune/MCAS New River General EMS and Environmental Awareness Training for Contractors and Vendors

This guide and associated EMS and General Environmental Awareness training module is provided for review to contractors and their employees performing work aboard the Installation. Included is a summary of the EMS and environmental programs, as well as a summary of key requirements associated with the various environmental issues contractors may encounter while performing work aboard the Installation. Contractors are expected to work with their ROICC or Contract Representatives and the EMD/EAD when environmental concerns or issues arise.

1.3.2 Environmental and EMS Training

In accordance with Department of Defense (DoD) instructions and Marine Corps Orders (MCO), MCBCL and MCASNR have implemented Comprehensive Environmental Training and Education Programs (CETEP). The goal of CETEP is to ensure that appropriate environmental instruction and related information are provided to all levels of the Marine Corps in the most effective and efficient manner to achieve full compliance with all applicable environmental training requirements. A major component of the CETEP is to provide general environmental awareness training to all individuals associated with the Installation, including contractors.

In addition to CETEP requirements, the Installation has implemented an Installation-wide Environmental Management System. The EMS highlights the fact that the authority and principal responsibility for controlling environmental impacts belong to those commands, units, offices, and personnel (including contractors) whose activities have the potential to impact the environment.

All contractors should provide both EMS and General Environmental Awareness training to their employees. This guide, along with the training materials in Attachment A, satisfy these training requirements. The

This guide and associated EMS and General Environmental Awareness training module is provided for review to contractors and their employees performing work aboard MCB Camp Lejeune.

All contractors are provided both EMS and General Environmental Awareness training materials in this handbook to utilize in training their employees.

training module can also be accessed at the MCBCL EMD website at: <http://www.lejeune.usmc.mil/emd/> under “General EMS and Environmental Awareness Training for Contractors and Vendors.”

As such, contractors working aboard the Installation will do the following:

- Fulfill job responsibilities in compliance with environmental regulations and in conformance with EMS requirements.
- Complete all applicable environmental training and maintain associated records as per contract requirements.
- Review EMS and General Environmental Awareness training, and be aware of and understand the Environmental Policy.
- Contact their ROICC or Contract Representative immediately regarding environmental and/or EMS issues.

1.4 POINTS OF CONTACT

Table 1-1 lists the EMD Branches and their respective phone numbers. Contact your ROICC or Contract Representative, who may refer you to an EMD POC for environmental and EMS-related questions and/or concerns.

Table 1-1. EMD Points of Contact, 0730 to 1630 M–F

Branch/Program Area	Phone Number
MARINE CORPS BASE, CAMP LEJEUNE	
Environmental Management Division (EMD), I&E Dept	(910) 451-5003
Environmental Compliance Branch, EMD	(910) 451-5837
Hazardous Waste/Hazardous Material (HW/HM) Program	(910) 451-1482
Base HazMart	(910) 451-1482
Pollution Abatement System Program	(910) 451-1482
Environmental Quality Branch (Air Quality, Water Quality, Solid Waste, Permitting)	(910) 451-5068
Environmental Conservation Branch (Natural Resources, Cultural Resources)	(910) 451-5063
Conservation Law Enforcement	(910) 451-5226
MARINE CORPS AIR STATION, NEW RIVER	
Environmental Affairs Division (HW/HM issues aboard MCASNR)	(910) 449-5997

In the case of an environmental emergency, contact the appropriate party, as well as your ROICC or Contract Representative, as outlined in Table 1-2. Additional emergency response procedures are provided in Section 3.0 of this guide.

Table 1-2. Environmental Emergency Contacts

If you spill:	Call:
Hazardous waste	911
Unknown materials	911
Hazardous materials	911
Petroleum, oil, and lubricants (POL) and/or nonpetroleum oils (cooking oils and greases)	911

2.0 ENVIRONMENTAL MANAGEMENT SYSTEM

The Installation jointly operates an Environmental Management System (EMS). An EMS is a systematic way of continually implementing environmental requirements and evaluating performance. The EMS is founded on the principles of MCB Camp Lejeune and MCAS New River's Environmental Policy, which is endorsed by their respective Commanding Officers (COs). Three key principles of the Environmental Policy are to comply with relevant environmental laws and regulations, prevent pollution, and continually improve our EMS.

The purpose of the EMS is to sustain and enhance mission readiness and access to training areas through effective and efficient environmental management. The EMS highlights the fact that the authority and principal responsibility for controlling environmental impacts belong to those commands, units, offices, and personnel (including contractors and vendors) whose activities have the potential to impact the environment.

2.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with environmental management systems. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

Three key principles of the Environmental Policy are to comply with relevant environmental laws and regulations, prevent pollution, and continually improve our EMS.

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact EMD if additional clarification is necessary.

2.1.1 Key Definitions

- **Environment.** Surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation.
- **Environmental Aspect.** A characteristic of a practice that can cause, in normal operation or upset mode, an impact to an environmental or other resource. Each practice may have several aspects.
- **Environmental Impact.** An effect of a practice's aspect on an environmental or other resource. Each practice may have several impacts.
- **Environmental Resources.** Sensitive environmental receptors (e.g., air, water, natural resources) or cultural or historic assets at the Installation, in the surrounding community, within the ecosystem or beyond, that can be impacted by the operation of practices.
- **Practice.** A unit process that supports a military mission and can impact environmental resources. (It is the ability to impact an environmental resource that is key to defining a practice. However, practices may also impact other resources.)
- **Practice Owner.** Person(s) responsible for control of practices. EMS procedures use the term *practice owner* when assignment of more specific responsibilities is left to the owning organizations.

2.1.2 Key Concepts

- **Environmental Management System (EMS).** The part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes, and resources for developing, implementing, achieving, reviewing, and maintaining the Environmental Policy.
- **Environmental Policy.** Statement by the organization of its intentions and principles in relation to the overall environmental performance, which provides a framework for action and for the setting of environmental objectives and targets.

2.2 OVERVIEW OF REQUIREMENTS

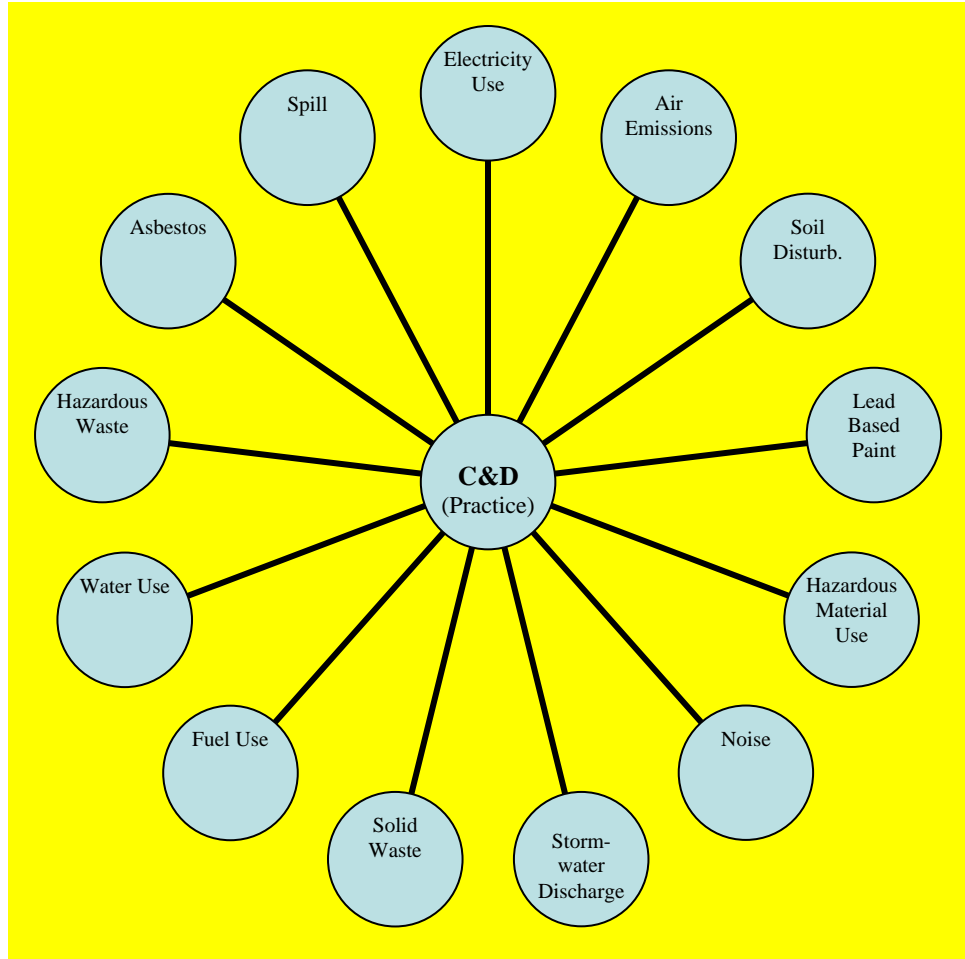
Contractors must be aware of, and adhere to, all regulations and requirements concerning EMS, including the following:

- **Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management.** Requires implementation of an EMS at all appropriate organizational levels.

2.3 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

An EMS is a systematic way of continually implementing environmental requirements and evaluating performance. The foundation of the Installation's EMS is based on the activities, or practices, conducted at the installation. One "systematic" component of the EMS is identifying all practices, or actions, executed aboard the Installation that have potential environmental aspects and impacts. Each practice at the installation, such as construction/demolition, wastewater treatment, or groundskeeping, has one or many environmental aspects. An aspect of a practice is a characteristic that can cause an impact to an environmental or other resource, such as water use. These environmental aspects can then result in an impact (e.g., depletion of natural resources) on an environmental or other resource. This relationship between practices and aspects for the practice of construction and demolition (C&D) activities is illustrated in the following simplified figure:

It is expected that contractors understand that the activities performed on base can interact with the environment and have the potential to impact the environment.



2.4 EMS RESPONSIBILITIES

It is expected that contractors understand that the activities (e.g., practices) performed on Installation can interact with the environment (e.g., environmental aspects) and have the potential to impact the environment. Therefore, it is expected that contractors will do the following:

- Review the Contractor Environmental Guide.
- Be aware of the Environmental Policy.
- Conduct activities in a manner to avoid and/or minimize impacts to the environment by complying with all applicable Federal, state, and local environmental regulations and Base Orders.
- Be familiar with spill procedures.
- Report all environmental emergencies and spills.

- Report any environmental problems or concerns promptly and notify the ROICC or Contract Representative.
- Respond to data collection efforts upon request.

2.5 CONTRACTOR ENVIRONMENTAL GUIDE AND EMS

The Contractor Environmental Guide comprises sections that are categorized based on the type of environmental requirements routinely encountered by contractors at the Installation. The following matrix relates the practices that contractors generally execute aboard the Installation to the contents of this guide. The matrix is provided to assist contractors in narrowing down specific requirements that may apply to on-site activities.

MCB CAMP LEJEUNE PRACTICES	Env. Emergency Response/ Spill Response, Section 3.0	HM/HW, Section 4.0	Unforeseen Site Conditions, Section 5.0	Asbestos, Section 6.0	Lead Based Paint, Section 7.0	Stormwater, Section 8.0	Solid Waste, Recycling, and P2, Section 9.0	Training, Section 10.0	Cultural Resources, Section 11.0	Permitting, Section 12.0	Air Quality, Section 13.0	Natural Resources, Section 14.0
Battery Replacement							●					
Building Maintenance–General		●		●			●					
Building Operation–General		●					●					
Catch Basin Cleaning						●						
Construction/Demolition				●	●	●	●		●	●		●
Controlled Burn Operations												
Degreasing		●										
Engine Operation and Maintenance		●									●	
Equipment Calibration		●										
Equipment Disposal							●					
Equipment Operation and Maintenance		●		●								
Erosion Control						●				●		●
Fuel Storage–Containers		●				●						
Fueling		●										
Grinding												
HM Storage		●			●	●						
HM Transportation		●			●							
HW Generation		●					●			●		
HW Satellite Accumulation Area		●					●			●		
Land Clearing						●	●		●	●		●
Landscaping						●						
Material Storage Handling		●					●					
Mowing						●						
Outfall Cleaning						●						
Packaging/Unpackaging							●					
Paint Removal					●						●	
Painting		●									●	
Painting Preparation		●										
Parts Replacement				●								
PCB Disposal		●										
Pesticide/Herbicide Application		●								●		
Range Residue Clearance						●				●		

MCB Camp Lejeune Practices	Emergency Response/ Spill Response, Chapter 3.0	HM/HW, Chapter 4.0	Unforeseen Site Conditions, Chapter 5.0	Asbestos, Chapter 6.0	Lead Based Paint, Chapter 7.0	Stormwater, Chapter 8.0	Recycling and Pollution Prevention, Chapter 9.0	Training, Chapter 10.0	Cultural Resources, Chapter 11.0	Permitting, Chapter 12.0	Air Quality, Chapter 13.0	Natural Resources, Chapter 14.0		
Refrigerant Replacement	Applicable To All Practices Conducted Aboard MCB Camp Lejeune	●	Applicable To All Practices Conducted Aboard MCB Camp Lejeune								●			
Riparian Buffer Maintenance							●						●	
Rock Crushing Operations							●	●			●			
Runoff Sedimentation Basins							●		●					
Sediment Traps							●							
Soil Excavation/Grading							●			●			●	
Solid Waste Recycling Collection/Transportation									●			●		
Storage Tank Cleaning and Maintenance		●										●		
Stormwater Collection/Conveyance System								●				●		
Stormwater Engineering Controls Operation and Maintenance								●				●		
Stump/Brush Removal								●	●					●
Vehicle Operation									●					
Vehicle Parking								●						
Vehicle/Equipment Fluid Change	●													

3.0 ENVIRONMENTAL EMERGENCY RESPONSE/SPILL RESPONSE

The purpose of emergency planning is to control, contain, and remove releases of materials while minimizing impacts to human health and the environment. Contractors operating aboard the Installation must be aware of, and adhere to, environmental emergency response procedures and notification requirements to minimize detrimental effects from inadvertent releases.

For procedures relating to emergencies caused by unforeseen site conditions, please refer to Section 5.0 in this guide. For other types of non-environmental emergencies, always call 911.

3.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with environmental emergency response and spill response requirements. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

3.1.1 Key Definitions

- **Berm.** A mound used to prevent the spread of a contaminated area.
- **Non-Petroleum Oil.** Oil products that may include, but are not limited to, synthetic oils such as silicone fluids and tung oils, wood-derivative oils such as resin/rosin oils, animal fats and oil, and edible and inedible seed oils from plants.
- **POL.** Petroleum, Oil, and Lubricant products that may include, but are not limited to, any petroleum-based products such as gasoline, diesel fuel, jet fuel, engine oil, gear oil, lube oil, and lubricant products such as hydraulic brake fluid, automatic transmission fluid (ATF), and grease.
- **Release.** The uncontrolled loss of a hazardous material from its storage vessel, to include POLs. All releases are required to be reported to the Fire and Emergency Services Division. Releases of POLs that occur within an enclosed and contained maintenance facility are not subject to this reporting requirement provided they do not have the potential to impact the environment.

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact EMD if additional clarification is necessary.

3.1.2 Key Concepts

- **Environmental Emergency Response Contacts:**

If you spill:	Call:	Follow-up:
Hazardous waste	911	Spill Report
Unknown materials	911	Spill Report
Hazardous materials	911	Spill Report

- **Spill Follow-Up.** Contractors have containment and cleanup responsibilities following a spill.

3.1.3 Environmental Management System

All practices associated with Emergency Response/Spill Response are listed in Section 2 of this Handbook. The following is a list of potential impacts associated with these practices.

- Air Quality Degradation
- Community Relations/Public Perception Impact
- Depletion of Landfill Space
- Depletion of Resources
- Electricity Consumption
- Fuel Consumption
- Groundwater Quality Degradation
- Historic/Cultural Resource Disturbance
- Other Natural Resource Disturbance
- Personnel Exposure
- Potable Water Quality Degradation
- Real Property/Private Property Damage
- Soil Compaction
- Soil Erosion
- Soil Quality Degradation
- Surface Water Quality Degradation
- Water Consumption
- Wetlands Disturbance
- Wildlife Species/Habitat Disturbance

3.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding emergency response and spill procedures, including the following:

- **Clean Air Act (CAA) of 1970, Section 112r.** Specifies emergency planning where potential exists for catastrophic release of hazardous air pollutants.
- **Clean Water Act (CWA) of 1972.** Establishes the basic structure for regulating discharges of pollutants into the Waters of the United States.
- **Comprehensive Environmental Response, Compensation, and Liability (CERCLA) Act of 1980.** Authorizes federal response to any release or threatened release of hazardous substance into the environment. This act defines hazardous substances (HS) by reference to substances that are listed or designated under other environmental statutes.
- **Emergency Planning and Community Right-to-Know Act of 1986, Section 304.** Establishes requirements for the reporting of a release to ensure a quick response by local emergency responders. Notification requirements apply to two chemical lists: the Extremely Hazardous Substances (EHS) list and CERCLA HS list. The “List of Lists” provides comprehensive identification of EHSs and HSs.
- **NC General Statute Chapter 143, Article 21A – Oil Pollution and Hazardous Substances Control.** Prohibits pollution by oil, oil products, oil by-products, and other hazardous substances into the land and the waters over which the State has jurisdiction. The statute establishes specific requirements for reporting a release to the State and supports and complements applicable provisions of the Federal Water Pollution Control Act.
- **Oil Pollution Act (OPA) of 1990.** Addresses oil storage at facilities and emphasizes preparedness and response activities. This act prohibits the harmful discharge of oil and hazardous substances into Waters of the United States.
- **Resource Conservation and Recovery Act of 1976 Subtitle C.** Establishes a system for controlling hazardous waste from the time it is generated, transported, treated, stored, and/or disposed of, or from “cradle to grave.”

3.3 Spill Notification

The Installation Integrated Contingency Plan (ICP) provides general information for any type of response actions needed for spills aboard the Installation. Contractors must develop a Unit Level Contingency Plan that addresses spill response for their specific sites and potential spill types (e.g., chemical; sewer; POL; and non-petroleum oils). This plan must be maintained onsite and be available for review upon request.

In the event of a spill, contact your ROICC or Contract Representative after contacting emergency response. They will contact EMD to obtain a spill report form. Return the completed form to EMD (Fax # (910) 451-3471) and to your ROICC or Contract Representative. A copy of the spill reporting form is included as Attachment 3-1. The following information must be provided when reporting a spill to 911:

- Your name and phone number
- Location of spill (building, number, street)
- Number and type of injuries, if any
- Type and amount of spilled material
- Source of the spill (container, vehicle, etc.)
- Action being taken, if any, to control the spill
- Estimated time of spill

Do not wait to report a spill if all of the required information is not immediately available.

3.4 Follow-Up

Should surface runoff be contaminated, the contractor will, under the advisement of the Fire and Emergency Services Division or EMD, construct a temporary berm or containment area. Contaminated surface water will be removed in accordance with all safety and environmental requirements for the Installation. The Resource Conservation and Recovery Section (RCRS) within EMD ((910) 451-1482) will be notified and will provide concurrence for temporary containment areas and removal of contaminated runoff.

If solid or hazardous waste was generated as the result of a spill, refer to Sections 4.0 and 9.0 of this guide for disposal requirements.

Contractors must develop a Unit Level Contingency Plan that addresses spill response for their specific sites and potential spill types.

Attachment 3-1

Spill Reporting Form

** For EMD Personnel Only.
Fill out all the blanks except for #18.

SPILL REPORTING FORM

CALL RECEIVED BY: _____ RESPONDED BY: _____

SUBJ: _____

1. DATE: _____ TIME: _____

2. SOURCE: _____

(Include Serial Number of equipment if available).

3. LOCATION BUILDING: _____

4. Did Fire Dept. Respond? _____ Name of Responder: _____

5. UNIT/AGENCY: _____ POC: _____

6. ESTIMATED AMOUNT: _____ GALLONS -- QUARTS -- PINTS (Circle One)

7. TYPE OF SUBSTANCE: _____

8. SAMPLES TAKEN: _____

9. SLICK DESCRIPTION: (NONE) OR _____

10. ACTION TAKEN: _____

11. ON SCENE WEATHER: _____

12. OIL SPILL MOVEMENT: (NONE) OR _____

13. DAMAGE: (NONE) OR _____

14. POTENTIAL DANGER: (NONE) OR _____

15. CAUSE OF SPILL: _____

16. PARTIES PERFORMING SPILL REMOVAL: _____

17. ASSISTANCE REQUIRED: NO ADDITIONAL OR _____

** 18. TELEPHONE REPORT WAS MADE TO NRC—TIME _____ DATE _____
CONFIRMATION NUMBER IS _____. TELEPHONE REPORT WAS MADE TO
NC DIVISION OF EMERGENCY—TIME _____ DATE _____, POC IS

POINT OF CONTACT IS MR JOHN HAMILTON, ENVIRONMENTAL COMPLIANCE
BRANCH, ENVIRONMENTAL MANAGEMENT DIVISION, INSTALLATION AND
ENVIRONMENT DEPARTMENT, AT (910) 451-1482.

4.0 HAZARDOUS MATERIALS/HAZARDOUS WASTE MANAGEMENT

All persons on a Marine Corps installation are subject to compliance with Federal and state regulations and permit conditions addressing the proper management of both hazardous materials and hazardous waste.

Mishandling these wastes and materials may result in violation notices, fines, and/or penalties. The U.S. Environmental Protection Agency (USEPA) regulates hazardous wastes through the Resource Conservation and Recovery Act (RCRA), which provides specific regulatory definitions for hazardous waste and its management. RCRA governs all hazardous waste from the point of generation to the point of final disposal. This includes hazardous waste generated by contractors aboard the Installation. Hazardous materials, including those used by contractors aboard the Installation, are regulated by the Emergency Planning and Community Right-to-Know Act (EPCRA). Additionally, the North Carolina Department of Environment and Natural Resources (NCDENR) has issued more stringent rules and regulations governing hazardous materials and hazardous waste management that also apply to contractors.

4.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with hazardous materials, hazardous wastes, and their management. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

4.1.1 Key Definitions

- **Hazardous Material (HM).** A chemical compound, or combination of compounds, posing or capable of posing a significant risk to public health, safety, or the environment as a result of its quantity, concentration, or physical/chemical/infectious properties.
- **Hazardous Waste (HW).** A solid waste, or combination of solid wastes, which because of quantity, concentration, or physical, chemical, or infectious characteristics may:

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative.

-
- Cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness, or
 - Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.
- **Manifest.** A document that allows all parties involved in hazardous waste management (e.g., generators, transporters, disposal facilities, USEPA, state agencies) to track the movement of hazardous waste from the point of generation to the point of ultimate treatment, storage, or disposal.
 - **Material Safety Data Sheet (MSDS).** A document that provides information about (1) the potential health effects of exposure to chemicals or other potentially dangerous substances and (2) safe working procedures for users to adhere to when handling that chemical or substance.
 - **Non-RCRA-Regulated Waste.** A waste that is not regulated or is exempt from regulation under RCRA hazardous waste requirements but has other regulatory requirements for proper management.
 - **Satellite Accumulation Area (SAA).** A HW generation point at which waste may be accumulated until the HW storage container is full. A filled container must be transferred within 72 hours to an approved 90-day site or long-term HW storage facility. An EMD authorization for an SAA must be obtained and posted at the site. EMD authorization will establish individual limits for each SAA. No SAA authorizations will exceed 55 gallons of HW or 1 quart of acutely HW. Per Installation policy, storage of HW in a SAA should not exceed 365 days even if the container is not full.
 - **Universal Waste (UW).** Universal waste regulations streamline hazardous waste management standards for batteries, pesticides, mercury-containing equipment, and fluorescent lamps. The regulations govern the collection and management of these widely generated wastes, thus facilitating environmentally sound collection and proper recycling or treatment. In North Carolina, batteries,

thermostats, obsolete agricultural pesticides, and fluorescent lamps may be managed under the UW Rule. UW must be transferred off-site within one (1) year of the date when the material was first identified as waste.

- **Used Oil.** Any oil that has been refined from crude oil or synthetic oil and, as a result of use, storage, or handling, has become unsuitable for its original purpose due to the presence of impurities or loss of original properties. Used oil may be suitable for further use and is economically recyclable, therefore is managed as a separate category of material.

4.1.2 Key Concepts

None.

4.1.3 Environmental Management System

Practices, or activities, associated with hazardous materials and hazardous waste management includes the following:

- Building maintenance—general
- Building operation—general
- Degreasing
- Engine operation and maintenance
- Equipment calibration
- Equipment operation and maintenance
- Fuel storage—containers
- Fueling
- HM storage
- HM transportation
- HW satellite accumulation area
- Painting
- Painting preparation
- Polychlorinated biphenyl (PCB) disposal
- Pesticide/herbicide application
- Refrigerant replacement
- Storage tank cleaning and maintenance
- Vehicle/equipment fluid change

The potential impacts of these activities on the environment include depletion of the hazardous waste landfill; depletion of non-renewable resources; and degradation of soil quality.

4.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard MCB Lejeune and MCAS New River must be aware of, and adhere to, all applicable regulations and requirements regarding hazardous materials and hazardous waste, including the following:

- **Base Order (BO) 5090.9, Hazardous Material/Waste Management/Air Station Order (ASO) 5090.2, Environmental Compliance and Protection Program for MCAS New River.** Establishes procedures and general responsibilities for the disposal of hazardous material and hazardous waste under environmental permits and authorizations.
- **Emergency Planning and Community Right-to-Know Act (EPCRA).** Establishes requirements regarding emergency planning and the reporting of hazardous chemical storage and usage.
- **Resource Conservation and Recovery Act (RCRA) of 1976.** Establishes standards for generators and transporters of hazardous waste that will ensure the following: proper recordkeeping and reporting; use of manifest system; use of appropriate labels and containers; and proper management of hazardous waste transfer, storage, and disposal facilities.
- **40 CFR Subchapter I (Parts 260–299), Solid Wastes.** Federal regulations promulgated under the 1976 RCRA that regulate hazardous waste management, generators, transporters, and owners or operators of treatment, storage, or disposal facilities. North Carolina has adopted the Federal hazardous waste rules by reference.

The Installation is a large quantity generator of hazardous waste. Therefore, all hazardous waste generated aboard MCB Camp Lejeune must meet the regulatory requirements of this generator designation.

Both MCB Camp Lejeune and MCAS New River maintain Hazardous Waste Management Plans that outline the specific requirements for

managing hazardous materials and hazardous wastes each Base. This section presents key points from these documents.

The contractor is responsible for ensuring that any used hazardous materials generated during work aboard MCB Camp Lejeune are properly managed and turned in weekly on Wednesday from 1300 - 1500 hours to the EMD Consolidation Center, Bldg. S-962 on Michael Road. For work aboard MCAS New River, hazardous materials can be turned at the Environmental Affairs Department (EAD) Hazardous Waste warehouse, Bldg AS-4225, located on Canal Street. This includes universal waste, used oil, petroleum-contaminated materials, regulated hazardous waste, and non-RCRA-regulated waste. Environmental personnel will provide oversight to verify compliance with applicable Federal and state laws governing the generation and handling of these materials.

Depending on the type of project, contractors may be required to submit a Hazardous Waste Management Plan to the ROICC or the Contract Representative prior to beginning work. Additionally, a Contractor Hazardous Material Inventory Log and corresponding MSDSs for all materials to be used aboard either Base during the execution of the contract may be required by the Contracting Officer. EMD/EAD will use the MSDSs to help contractors establish their Hazardous Material Storage and Satellite Accumulation Areas.

Contractors may be required to submit a Hazardous Waste Management Plan to the ROICC or the Contract Representative prior to beginning work.

4.3 HAZARDOUS MATERIALS REQUIREMENTS

If a project uses hazardous materials:

- Reduce/reuse/recycle when possible; meet contract requirements for recycling.
- Segregate incompatible materials. Consult your MSDS or EMD if you are unsure of a material's compatibility. Some **examples of incompatible materials** likely to be used by contractors at the Installation are:
 - **Corrosives** (e.g., batteries, stripping and cleaning compounds containing acids or bases) **and Flammables** (e.g., fuels, oils, paints, and adhesives);

- **Corrosives** (e.g., batteries, stripping and cleaning compounds containing acids or bases) **and Oxidizers** (e.g., bleach); and
- **Oxidizers** (e.g., bleach) **and Flammables** (e.g., fuels, oils).

Do not store large quantities of materials. Keep on hand only what can be used.

Stop work immediately if a project unearths a hazardous material (such as munitions or ordnance) and report the situation to the ROICC or Contract Representative.

- Keep flammable materials in flammable storage lockers.
- Do not store large quantities of materials. Keep on hand only what can be used.
- Do not dump any hazardous material into floor drains, sinks, oil-water separators, or storm drains, or onto the ground
- Store containers that hold 55 gallons or more (including in-use electrical generators and portable equipment) in proper secondary containment. Containment must be inspected on a weekly basis; all inspections and drainage events must be documented.
- Maintain MSDSs and appropriate spill control/cleanup materials on-site at all times.
- Provide HAZMAT storage and usage information for regulatory reporting to the appropriate environmental office upon request.
- Stop work immediately if a project unearths a hazardous material (such as munitions or ordnance) and report the situation to the ROICC or Contract Representative.
- Do not leave hazardous materials on-site once the contract is completed. Remove from Installation property or turn in all full, partially full, and empty hazardous material containers to the Resource Conservation and Recovery Section (RCRS) at Bldg. S-962 on Michael Road (MCBCL) or EAD at Bldg AS-4225 on Canal Street (MCASNR) upon completion of the contract.

4.4 UNIVERSAL WASTE REQUIREMENTS

NCDENR allows thermostats, obsolete agricultural pesticides, lamps, and certain types of batteries to be managed as universal waste (UW). UW has less stringent requirements for storage, transport, and collection, but must

still comply with full hazardous waste requirements for final recycling, treatment, or disposal. UW requirements are outlined in 40 CFR 273.

All UW must be properly containerized, stored, and labeled at the time the waste is first generated. Containers/areas accumulating UW must be labeled as follows:

- Words: *UNIVERSAL WASTE*.
- Content: Noun name found on the specific Hazardous Waste Profile Sheet (DRMS Form 1930) available from EMD (e.g., *batteries, fluorescent lamps, pesticides, mercury-containing equipment*).
- Accumulation Start Date (ASD): The ASD must be marked on the subject container the moment a UW item is placed into the container. Storage of UW cannot exceed 365 days.
- Number of Containers: The number of containers marked reflects the total number of containers disposed of within the current document (i.e., 1 of 1, etc.).

RCRS or EAD personnel will assist contractors in establishing each UW accumulation area. Key points to follow:

- The containers must be under the control of the contractor generating the waste and must be closed at all times except when adding waste.
- Per Installation policy, UW containers/areas must be inspected weekly using the Weekly Hazardous Waste (HW) Site Inspection Form included as Attachment 4-1 or 4-2. Written records noting discrepancies as well as corrective actions must be maintained onsite for a period of three years. Copies of inspection reports should be provided to the ROICC or Contract Representative.
- When the ASD reaches one year or when the container is full, the waste generator has 72 hours (3 days) to move the UW into the permitted storage area at Bldg. S-962 on Michael Road (MCBCL) or to Bldg AS-4225 on Canal Street (MCASNR). Coordinate with the appropriate environmental office for pickup (MCBCL – (910) 451-1482; MCASNR – (910) 449-5997/6143) when the drum is full or the contract is finished.

The appropriate environmental office must be notified before any hazardous waste is generated on projects managed by the ROICC or the FSC.

4.5 HAZARDOUS WASTE REQUIREMENTS

The appropriate environmental office must be notified before any hazardous waste is generated on projects managed by the ROICC or the Facilities Support Contracts (FSC). If you are uncertain about whether a waste meets the definition of a hazardous waste, have your ROICC or Contract Representative contact RCRS or EAD. Installation personnel must approve all regulated waste and hazardous waste storage locations.

If a project generates hazardous waste:

- Minimize generation through waste minimization and pollution prevention techniques.
- Have your ROICC or Contract Representative contact RCRS or EAD if you are unsure about how to manage a waste. Do not mix waste types (e.g., used oil rags and solvent rags).
- Have your ROICC or Contract Representative contact RCRS or EAD for turn-in procedures as wastes are generated.
- Do not dump any hazardous waste into floor drains, sinks, oil-water separators, or storm drains, or onto the ground. Do not place hazardous waste into general trash dumpsters.
- Ensure that hazardous waste drums are properly labeled and lids are secured (wrench tight).
- Ensure that SAAs are managed properly and storage limits are not exceeded; have your ROICC or Contract Representative consult with RCRS or EAD prior to creating a new SAA.

4.5.1 Storage

All hazardous waste must be properly containerized, stored, and labeled at the time the waste is first generated. Hazardous waste must be stored in containers that meet applicable specifications of the U.S. Department of Transportation (DOT). Hazardous waste labels, as required by the USEPA and the NCDENR, must contain the following information:

- Words: *HAZARDOUS WASTE*.

- Content: Noun name found on the specific Hazardous Waste Profile Sheet (DRMS Form 1930) provided by RCRS or EAD.
- Accumulation Start Date (ASD): For HW accumulated in an SAA, the ASD will be affixed once the container is filled or at the one-year anniversary, whichever comes first.
- Number of Containers: Reflects the total number of containers (i.e., 1 of 1, etc.).

Any HW generated by contractors must be stored in a SAA. RCRS or EAD will assist contractors in establishing each SAA. A summary of procedures follows:

- The generator of hazardous waste may accumulate as much as 55 gallons of a hazardous waste stream (or less than one quart of acutely hazardous waste) in a container at or near the point of generation.
- The containers must be under the control of the contractor generating the waste and must be kept closed (wrench tight) at all times except when adding waste.
- Hazardous waste containers must be inspected weekly using the Weekly Hazardous Waste (HW) Site Inspection Form included as Attachment 4-1 or 4-2. Written records noting discrepancies as well as corrective actions must be maintained for a period of three years. Copies of inspection reports should be provided to the ROICC or Contract Representative.
- The generating contractor should monitor the level of waste in the SAA container and shall coordinate turn-in to RCRS or EAD prior to it becoming full. If the SAA container should become full, the generating contractor has 72 hours (3 days) to move the hazardous waste to the permitted storage area at Bldg. S-962 on Michael Road (MCBCL) or Bldg AS-4225 on Canal Street (MCASNR). Storage of HW in a SAA should not exceed 365 days even if the container is not full.

4.5.2 Manifesting and Disposal

Disposal of hazardous waste generated by contractors must be coordinated with the Installation. Hazardous and universal waste generated aboard MCB Camp Lejeune and MCAS New River must be transported off-base by a permitted hazardous waste transporter and must include a hazardous waste manifest. These procedures must be followed:

- The MCB Camp Lejeune or MCAS New River USEPA ID number is used for disposal of all contractor-generated hazardous waste.
- Only personnel from the Installation who have been designated in writing by the Commanding Officer can sign the hazardous waste manifest. Your ROICC or Contract Representative should contact RCRS at (910) 451-1482 (MCBCL) or EAD at (910) 449-5997 (MCASNR) regarding manifesting regulated and non-regulated wastes off-site.
- Under NO circumstances can a contractor or ROICC or Contract Representative sign a hazardous waste manifest or use another USEPA ID number for wastes generated at Installation.

Only personnel from EMD who have been designated in writing by the MCB Camp Lejeune Commanding Officer can sign the hazardous waste manifest.

4.6 NON-RCRA-REGULATED WASTE REQUIREMENTS

Non-RCRA-regulated wastes include used oil and oil filters, used antifreeze, contaminated wipes, discarded electronic equipment, and batteries not managed as universal waste.

4.6.1 Used Oil and Oil Filters

Used motor oil itself is *not* regulated as a hazardous waste in North Carolina if it is recycled or burned for energy recovery. If used oil is not recycled, the generator must determine prior to disposal whether it is a hazardous waste. Used oil must be collected in drums marked “Used Oil.” If the Used Oil storage container has a volume of 55 gallons or more, it must be stored in secondary containment. Coordinate with RCRS at (910) 451-1482 (MCBCL) or EAD at (910) 449-5997 (MCASNR) for pickup when the drum is full or the contract is finished.

-
- Do not dump used oil into drains, sinks, or trash containers, or onto the ground.
 - Do not store used oil in open buckets or drip pans, damaged or rusted containers, or containers that cannot be fully closed.
 - Do not mix used oil with other waste materials.

Used oil filters are not regulated as hazardous waste in North Carolina as long as they are not mixed with listed hazardous wastes. To qualify for this exclusion, the following conditions must be met:

- Used oil filters must be gravity hot-drained by puncturing the filter anti-drain back valve or filter dome and hot draining into a “Used Oil” storage drum. “Hot-drained” means that the oil filter is drained at a temperature that approximates the temperature at which the engine operates. All used oil filters will be hot-drained for a minimum of 24 hours before turn-in to RCRS at Bldg. S-962 on Michael Road (MCBCL) or EAD at Bldg AS-4225 on Canal Street (MCASNR).
- Any incidental spillage that occurs must be cleaned up with Dry Sweep, rags, or “oil socks.”
- Drained used oil filters must be collected in a container that is in good condition and is labeled with the words “Drained Used Oil Filters.”
- No other waste streams should be deposited in containers collecting used oil filters for disposal.
- Drained used oil filters will be turned into RCRS at Bldg. S-962 on Michael Road on a weekly basis on Wednesday from 1300 to 1500 (MCBCL) or to EAD at Bldg AS-4225 on Canal Street (MCASNR).

4.6.2 Used Antifreeze

Used antifreeze is considered a hazardous waste because of its toxicity unless it is recycled or placed in an approved storage area. Used antifreeze will be containerized in spill proof containers and turned in at RCRS on a weekly basis at Bldg. S-962 on Michael Road, for recycling. For used

antifreeze generated aboard MCAS New River, contact EAD at (910) 449-5997 for turn-in instructions.

4.6.3 Petroleum-Contaminated Wipes/Oily Rags

Petroleum-contaminated wipes and oily rags are to be managed as non-regulated waste. Follow these procedures:

- Store oil-contaminated wipes and oily rags in metal containers because of their flammability/combustibility to protect them from the weather.
- Do not throw these non-regulated waste items into solid waste dumpsters or garbage cans.
- Turn petroleum-contaminated wipes and oily rags that are not on a red rag contract into RCRS at Bldg. S-962 on Michael Road on a weekly basis on Wednesday from 1300 to 1500 (MCBCL) hour or to EAD at Bldg AS-4225 on Canal Street (MCASNR).

4.6.4 Used Electronic Equipment

Used electronic equipment usually contains lead solder or polychlorinated biphenyl (PCB) oils (i.e., light ballast). These items will be turned in as they are generated. Have your ROICC or Contract Representative contact RCRS (MCBL) at (910) 451-1482 or EAD (MCASNR) at (910) 449-5997 for proper handling and turn-in procedures.

4.6.5 New and Used Batteries (Not Regulated as Universal Waste)

- Store compatible batteries together (i.e., lithium batteries should be stored with other lithium batteries).
- Store batteries off the ground to prevent them from coming into contact with water.
- Store lead-acid batteries away from an open flame.
- Place rechargeable batteries in plastic bags before storing them with other rechargeable batteries.
- Do not dispose of batteries unless authorized.

- Have your ROICC or Contract Representative contact RCRS at (910) 451-1482 or EAD at (910) 449-5997 for proper handling and turn-in procedures.

Attachment 4-1

**Weekly Hazardous Waste (HW) Site Inspection Form
MCB Camp Lejeune**

MCB Camp Lejeune Weekly Hazardous Waste (HW) Site Inspection
 Universal Waste (UW)/Satellite Accumulation Area (SAA)

Bldg Number/location of HW Site: _____

Unit Evaluated: _____ Evaluation Date: ____/____/____

Evaluation By (Site Manager): _____ Evaluation Time: _____

QUESTION	YES	NO	Location of Discrepancy <i>and</i> Proposed Corrective Action
1. Is housekeeping maintained in acceptable manner?			
2. Is any HW present at site?			
3. Are HW containers properly marked?			
4. Are HW containers in serviceable condition			
5. Are container bungs, caps, openings properly secured?			
6. Is unit spill plan/activation prominently posted?			
7. Is 911 spill response sign posted?			
8. Are " Danger-Unauthorized Personnel Keep Out " signs posted so they may be seen from any approach?			
9. Are " No Smoking " signs posted?			
10. Does the site have emergency communication system or two man rule in effect? If the two man rule is implemented is there a sign with the legend " Two Man Rule in Effect " posted?			
11. Are properly charged fire extinguishers as well as eye wash stations present and are they inspected at least monthly?			
12. Is the post indicator valve in good operating condition and secured in the closed position, are there any structural defects such as cracked concrete?			
13. Is the proper spill response equipment readily available?			
14. Is the site designated, recognizable, and is the EMD Authorization posted within the site as to be visible to personnel placing waste into the container? (SAA site only)			
15. Are all hazardous wastes properly segregated and stored in the designated site?			
16. Are there any hazardous materials being stored in the Satellite Accumulation Area or < 90 day storage site?			

Attachment 4-2

**Weekly Hazardous Waste (HW) Site Inspection Form
MCAS New River**

Weekly Hazardous Waste Storage
Area Inspection Form

Squadron: _____ Inspector: _____

Date: _____ Signature: _____

Question Yes No Corrective Actions or N/A

1. Is the HW container located at or near the point of generation?			
2. Is the HW container DOT approved?			
3. Is the HW container marked correctly with the words Hazardous Waste, correct noun name of contents, NSN'S and unit designator?			
4. Is the HW container closed and wrench tight when not adding to the container?			
5. If a funnel is left in place, does that funnel have a plug or ball valve to be considered closed or secured?			
6. Is the HW container in good condition? (no excessive rust or dents in critical areas, seals are in place, no bulging or collapsing and no signs of spillage or leakage)			
7. Is the Spill Contingency Plan posted and in plain view?			
8. Is the SAA Site approval letter from EAD posted at the SAA site?			
9. Is the SAA Site limited to Authorized Personnel only?			
10. Is the HW container below the proper ullage for a liquid to expand? (4 inches from the top)			
11. Are SAA HW containers moved to the 90-Day Site within 72 hours when filled to the proper ullage or weight capacity of the container?			
12. (90 Day-Site only) Are all palletized waste streams correctly marked with Hazardous Waste or Universal Waste, noun name of the waste, NSN and unit designator on the pallet or wall of the waste structure?			
13. (90 Day-Site only) Are all HW containers turned into DRMO prior to the 90 th day since the ASD?			
14. Are there adequate spill response supplies readily available for use in case of spill or leakage?			
15. Is there a means of emergency communications between storage facilities and working spaces?			
16. Is the SAA site or 90 Day-Site in a good state of police?			

5.0 UNFORESEEN SITE CONDITIONS

Marine Corps Base (MCB) Camp Lejeune was placed on the U.S. Environmental Protection Agency's (USEPA's) National Priorities List (NPL) effective November 4, 1989. To ensure the protection of human health and the environment, a proactive Installation Restoration Program has been established and is in the process of assessing and remediating various sites on the Installation. Numerous investigations have been performed on the Installation to ensure that all contaminated sites have been found, but additional contaminated areas may still exist. As a contractor, it is your responsibility to notify the ROICC or Contract Representative of any unforeseen site conditions you encounter while on the Installation. It is recommended that any contractors performing intrusive activities on the Installation be properly trained in accordance with the Occupational Safety and Health Act (OSHA) standards as written in 29 CFR 1910.120(e). If intrusive activities are planned in known contaminated areas, all required environmental training should be completed *prior* to working at MCB Camp Lejeune. Copies of training records should be available upon request by federal or state regulators.

5.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with unforeseen site conditions. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

5.1.1 Key Definitions

- **National Priorities List (NPL).** Lists the sites of national priority among the known releases or threatened releases of hazardous substances, pollutants, or contaminants.
- **Unforeseen Site Condition.** A potentially hazardous, unanticipated site condition encountered on a job site.

5.1.2 Key Concepts

- **Notification.** Contractors must notify the ROICC or Contract Representative of any unforeseen site conditions.

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative.

- **Response.** Contractors must stop working and evacuate work areas in the event unforeseen site contaminants are suspected.

5.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding unforeseen site conditions.

- **Comprehensive Environmental Response, Compensation, and Liability (CERCLA) Act of 1980 and Superfund Amendments & Reauthorization Act (SARA) of 1986.** Establishes the nation's hazardous waste site cleanup program.

5.3 UNFORESEEN SITE CONDITION PROCEDURES

5.3.1 Petroleum, Oil, and Lubricants (POL)

The most frequent condition encountered that requires EMD assistance is the presence of a petroleum, oil, or lubricant odor while excavating. If you notice an odor, take the following action:

If you notice an odor, stop work and immediately clear the area of all personnel to a safe distance upwind of the suspected area.

- Stop work.
- Immediately clear the area of all personnel to a safe distance upwind of the suspected area.
- Call the Fire and Emergency Services Division (911) immediately if personnel are affected or injured by the suspected contaminant.
- Call the Fire and Emergency Services Division to properly secure the area.
- Notify the ROICC or Contract Representative so that the EMD Spill Response Team will be contacted to determine the appropriate course of action.

Please note that while staged and awaiting sampling results and proper disposal, the contaminated soil is to be placed on and covered with plastic. [Note: Per the Resource Conservation and Recovery Act, the North Carolina Department of Environment and Natural Resources does not allow contaminated soils to be reintroduced into excavations].

5.3.2 Munitions and Ordnance

Stop work immediately if a project unearths a hazardous material (such as munitions or an ordnance item) and report the situation to the ROICC or Contract Representative.

For other emergency response procedures, please refer to Section 3.0 of this guide.

Stop work immediately if a project unearths a hazardous material (such as munitions or an ordnance item) and report the situation to the ROICC or Contract Representative.

6.0 ASBESTOS

Contractors working aboard the Installation must follow Federal and state regulations for the proper notifications and management of asbestos associated with demolition and renovation projects, as well as Installation requirements.

6.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with asbestos and its management. If you have any questions or concerns about the information in this section, please consult with the ROICC or your Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

6.1.1 Key Definitions

- **Asbestos.** A group of natural minerals that separate into strong, very fine fibers that are heat resistant and extremely durable.
- **Asbestos-Containing Material (ACM).** Any material containing more than one (1) percent asbestos, per 29 CFR 1101.
- **Category I Nonfriable ACM.** Asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing products containing more than one percent asbestos, per 40 CFR 61.
- **Category II Nonfriable ACM.** Any material, excluding Category I nonfriable ACM, containing more than one (1) percent asbestos that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure, per 40 CFR 61.
- **Demolition.** The removal of any load-bearing walls or structure.
- **Friable.** Any ACM that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure (may include damaged ACM that was previously identified as nonfriable), per 40 CFR 763.
- **Glove Bag.** A sealed compartment with attached inner gloves that is used for the handling of ACM.

If you have any questions or concerns about the information in this section, please consult with the ROICC or your Contract Representative.

- **Presumed Asbestos-Containing Material (PACM).** Thermal system insulation and surfacing material found in buildings constructed no later than 1980, per 29 CFR 1926.
- **Regulated Asbestos-Containing Material (RACM).** Includes friable ACM, Category I nonfriable ACM that has become friable, Category I nonfriable ACM that has been sanded, ground, cut, etc., and Category II nonfriable ACM that has a high probability of becoming crumbled, pulverized, or reduced to powder during demolition or renovation, per 40 CFR 61.
- **Renovation.** Altering a facility or its components in any way, including the stripping or removal of RACM, per 40 CFR 61.

6.1.2 Key Concepts

- **Demolition Notification.** North Carolina law requires notification for all demolitions, regardless of whether asbestos is present, 10 working days prior to starting demolition.
- **Disposal.** ACM waste can be accepted at the MCB Camp Lejeune Sanitary Landfill. Work with the ROICC or your Contract Representative to coordinate the disposal through the MCBCL Landfill office at (910) 451-2946.
- **Removal Requirements.** Permits for asbestos removal or demolition must be obtained when RACM present exceeds 160 linear feet, 260 square feet, or 35 cubic feet. Additionally, proper work practice procedures must be followed during demolition or renovation operations.
- **Renovation Notification.** If RACM is present within a structure, North Carolina law requires notification of renovation 10 working days prior to starting renovation.

6.1.3 Environmental Management System

Practices, or activities, associated with asbestos management include the following:

- Building maintenance—general
- Construction/demolition

- Equipment operation and maintenance
- Parts replacement

The potential impacts of these activities on the environment include soil contamination and degradation of water quality, air quality, and quality of life.

6.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding ACM, including the following:

- **Asbestos Hazard and Emergency Response Act (AHERA), 1986.** AHERA was written primarily to provide officials in schools, grades K-12, with rules and guidance for the management of asbestos-containing materials.
- **Asbestos School Hazard Abatement Reauthorization Act (ASHERA), 1992.** This act extended AHERA regulations to cover public and commercial buildings
- **National Emission Standards for Hazardous Air Pollutants (NESHAP), Subpart A, General Provisions, and Subpart M, Asbestos, 40 CFR 61.** Includes standards for asbestos demolition and renovation, disposal, and administrative requirements.
- **Naval Facilities Guide Specifications and Engineering Control of Asbestos Materials.** Covers the requirements for safety procedures and requirements for the demolition, removal, encapsulation, and disposal of asbestos-containing materials.
- **North Carolina Asbestos Hazard Management Program, NC General Statutes Chapter 130A, Article 19; 10A NCAC 41C .0601–.0608 and .0611.** Incorporates 40 CFR Part 763 and 29 CFR 1926.1101 by reference and outlines criteria for asbestos exposures in public areas, accreditation of persons conducting asbestos management activities, and asbestos permitting and fee requirements.

- **Safety and Health Regulations for Construction, Asbestos, 29 CFR 1926.1101.** Regulates asbestos exposure in construction activities.

6.3 RESPONSIBILITIES BEFORE A DEMOLITION OR RENOVATION PROJECT

Prior to starting a demolition or renovation project, contractors must:

- Know whether ACM or PACM is present in the buildings involved in the project,
- Complete the necessary notifications,
- Understand what actions to take if ACM or PACM is unexpectedly encountered during project execution, and
- Know how to properly dispose of ACM.

6.3.1 Identification of ACM and PACM

Contract documents will identify the presence of ACM and PACM. Contact your ROICC or Contract Representative with questions regarding the presence of ACM or PACM as identified in these documents.

6.3.2 Notification

To maintain accurate files and records, the ROICC or Contract Representative is required to notify the EMD Asbestos Program Manager, who is part of the Installations and Environment Department, of all work involving asbestos removals, including glove bag projects.

A demolition/renovation notification form DHHS 3768 must be submitted to the NC Health Hazards Control Unit (NCHHCU) 10 working days in advance of demolition activities, regardless of whether asbestos is present. This form must be posted on-site during the entire duration of the project. Have your ROICC or Contract Representative contact the Asbestos Program Manager with questions or concerns about requirements for notification of demolition or renovation.

The ROICC or Contract Representative is required to notify Camp Lejeune’s Asbestos Program Manager of all work involving asbestos removals, including glove bag projects.

A demolition/renovation notification form DHHS 3768 must be submitted to the NCHHCU 10 working days in advance of demolition activities, regardless of whether asbestos is present.

6.3.3 Removal

If ACM is present, it must be removed before the area is disturbed during renovation or demolition activities (except in certain rare instances).

Certification and handling requirements for asbestos removal are provided in 10A NCAC 41C and the Asbestos NESHAP. Refer to these regulations for detailed requirements.

6.3.4 Training

North Carolina regulations require that all persons who perform asbestos management activities in the State of North Carolina must be accredited by the NCHHCU under the appropriate accreditation category (i.e. Building Inspector, Project Supervisor, Abatement Worker). Training documentation should be available upon request.

6.4 RESPONSIBILITIES DURING A DEMOLITION OR RENOVATION PROJECT

North Carolina regulations require that Form DHHS 3768, *Asbestos Permit Application and Notification for Demolition and Renovation*, be posted on-site during all permitted projects. Contractors must post this form when the project will remove the following: 35 cubic feet, 160 square feet, or 260 linear feet of RACM or asbestos that might become regulated as a result of handling. The form must also be posted for nonscheduled asbestos removal that will exceed these numbers in a calendar year.

During a renovation or demolition project, if the contractor suspects the presence of additional ACM other than those materials identified in contract documents, the contractor must immediately report the suspected area to the ROICC or Contract Representative. Before proceeding, the facility must be inspected by a person who has been trained and accredited in North Carolina as an asbestos building inspector by the NCHHCU. The individual performing the asbestos survey will coordinate with the ROICC or Contract Representative throughout the process. A legible copy of the building inspection report must be provided to the NCHHCU prior to each demolition and upon request for renovations; a building inspection report will be acceptable only if the inspection was performed during the three

**Form DHHS 3768
must be posted
on-site during all
permitted
projects.**

**During a renovation
or demolition
project, if the
contractor suspects
additional ACM, the
contractor must
immediately report
the suspected area
to the ROICC or
Contract
Representative.**

years before the demolition. A copy of the report should also be forwarded to the Asbestos Program Manager.

For glove bag project requirements, please refer to 29 CFR 1926.1101 for specific work procedures.

6.5 DISPOSAL OF ACM WASTE

Contractors can dispose of ACM waste at the MCB Camp Lejeune Sanitary Landfill after first coordinating with the MCBCL Landfill office, through their ROICC or Contract Representative. The contractor must provide the MCBCL Landfill with Form DHHS 3787, *North Carolina Health Hazards Control Unit's Asbestos Waste Shipment Record*. The form must be submitted to NCHHCU for all permitted asbestos removal projects by the contractor.

7.0 LEAD-BASED PAINT

The improper removal of lead-based paint (LBP) may result in the production of paint chips and dust, which may contaminate a structure inside and out. The North Carolina Department of Health and Human Services (NCDHHS) regulations require any person who performs an inspection, risk assessment, or abatement to be certified. NCDHHS also requires a person who conducts an abatement of a child-occupied facility or target housing to obtain a permit for the abatement.

7.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with LBP activities. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

7.1.1 Key Definitions

- **Abatement.** The permanent elimination of lead-based paint hazards.
- **Demolition.** The removal of any load-bearing walls or structure.
- **Inspection.** A surface-by-surface investigation to determine the presence of lead-based paint and a report explaining the results of the investigation.
- **Lead-Based Paint (LBP).** Surface coatings that contain lead in amounts equal to or in excess of 1.0 milligram per square centimeter, or more than 0.5 percent by weight, per 40 CFR 745.
- **Lead-Containing Paint.** Surface coatings that contain lead in any amount greater than the laboratory reporting limit but less than 1.0 milligram per square centimeter, or less than 0.5 percent by weight, per 29 CFR 1926.62 and 29 CFR 1910.1025; also contained in 40 CFR Part 745 Subpart L, and have been adopted by the State of North Carolina under NC General Statute Chapter 130A, Article 19A.

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative.

- **Renovation.** Alteration of a facility or its components in any way.

7.1.2 Key Concepts

- **Disposal.** Analysis is required to determine proper disposal of waste (nonhazardous or hazardous). A Toxic Characteristic and Leaching Process analysis must be conducted to determine whether lead levels have exceeded 5 parts per million, which is the RCRA level for hazardous waste determination.
- **Lead-Based Paint Survey.** A lead-based paint survey is required prior to the disturbance of painted surfaces to determine whether the paint meets the criteria of a lead-based paint.
- **Training.** Lead-based paint training requirements set forth by the Occupational Safety and Health Administration (OSHA) are to be followed by personnel involved in all lead-based paint removal activities. MCBCL Base Safety tracks this training for contract staff, as the Safety Office houses the Lead Program Manager.

7.1.3 Environmental Management System

Practices, or activities, associated with LBP include the following:

- Construction/demolition
- Hazardous material storage
- Hazardous material transportation
- Paint removal

The potential impacts of these activities on the environment include the potential degradation of soil, water, and air environments, and the potential exposure of Installation occupants. Camp Lejeune still contains living quarters that have lead-based paint on the inside of the structures.

7.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding LBP activities, including the following:

- **Naval Facilities Engineering Service Center, Facilities Management Guide for Asbestos and Lead.** Ensures the protection of workers, building occupants, and the environment.

- **10A NCAC 41C .0800, Lead-Based Paint Hazard Management Program.** Requires (1) all individuals and firms involved in LBP activities to be certified and (2) all LBP activities to be carried out in accordance with 40 CFR 745.
- **29 CFR 1926, Safety and Health Regulations for Construction.** Contains OSHA requirements for construction activities where workers may have contact with lead.
- **40 CFR Part 745, Lead-Based Paint Poisoning Prevention in Certain Residential Structures.** Ensures that (1) lead-based paint abatement professionals, including workers, supervisors, inspectors, risk assessors, and project designers, are well trained in conducting LBP activities and (2) inspections for the identification of LBP, risk assessments for the evaluation of LBP hazards, and abatements for the permanent elimination of LBP hazards are conducted safely, effectively, and reliably by requiring certification of professionals.

7.3 RESPONSIBILITIES BEFORE RENOVATION OR DEMOLITION

Prior to any renovation or demolition aboard the Installation that involves the disturbance of painted surfaces, a LBP survey must be completed by a certified inspector, retained through the ROICC or Public Works (PW) offices. Certain projects will use PW staff to conduct the sampling and other projects will use contracted personnel. Buildings constructed prior to 1978 are assumed to contain LBP; therefore, no LBP survey is necessary. The LBP survey (through sampling and analysis) will determine whether painted surfaces meet the criteria of LBP (lead content equal to or greater than 1.0 milligram per square centimeter as measured by X-ray fluorescence (XRF) or lab analysis, or 0.5 percent by weight). For contracts where LBP is to be removed prior to demolition or renovation, the associated Naval Facilities Guide Specifications and contract documents must be implemented.

Buildings constructed prior to 1978 are assumed to contain LBP.

7.4 PERMITS

Contractors must obtain Lead Removal permits from NCDHHS when lead paint is removed from targeted housing (child-occupied facilities and housing built prior to 1978).

If the LBP survey determines that LBP will be abated as part of a renovation or demolition project, analytical samples must be taken to determine whether the material is hazardous.

7.5 DISPOSAL

If the LBP survey determines that LBP will be abated as part of a renovation or demolition project, analytical samples must be taken by the contractor to determine whether the material is hazardous. Usually a Toxic Characteristic Leaching Process (TCLP) sample is collected from a “representative” sample of the material removed. The laboratory conducting the sample analysis must be accredited by the Environmental Lead Laboratory Accreditation Program (ELLAP). A list of these accredited labs is available by contacting (703) 849-8888.

If the LBP is removed from the underlying building material, then the paint is the waste stream. If the LBP is removed with the building material, then both materials are considered the waste stream.

If the lead content is below hazardous waste (HW) regulatory disposal levels, consult with your ROICC or Contract Representative to determine whether your contract allows for the disposal material in the MCB Camp Lejeune Sanitary Landfill.

If the abated LBP is above HW regulatory levels, refer to Section 4.0 of this guide for information on HW management and disposal requirements.

7.6 TRAINING

Before the project begins, workers who are subject to exposure of lead during abatement or removal activities must be trained according to the OSHA regulation in 29 CFR 1926.62 concerning lead exposure in construction. The contractor is responsible for providing this training.

8.0 STORMWATER

There are three types of stormwater discharge that contractors for the Installation must address if they plan on disturbing land: industrial, construction, and post-construction stormwater runoff. The general requirements for each area as they apply to contractors are discussed in the following subsections.

8.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with stormwater. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

8.1.1 Key Definitions

- **Best Management Practices (BMPs).** Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of Waters of the United States. BMPs can include treatment requirements, operational procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may also denote structural and nonstructural stormwater treatment devices and measures.
- **Erosion and Sedimentation Control Plan.** Any plan, amended plan, or revision to an approved plan submitted to the North Carolina Division of Land Resources or delegated authority in accordance with North Carolina General Statute 113A-57. Erosion and Sedimentation Control Plans show the devices and practices that will retain sediment generated by the land-disturbing activity within the boundaries of the tract during construction and upon development of the tract.
 - **Land Disturbance.** Areas that are subject to clearing, excavating, grading, stockpiling earth materials, and placement/removal of earth material.
- **Nonpoint Source Discharge.** All discharges from stormwater runoff that cannot be attributed to a discernible, confined, and discrete conveyance.

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative.

- **Point Source Discharge.** Any discernible, confined, and discrete conveyance, including but specifically not limited to, any pipe, ditch, channel, tunnel conduit, well, discrete fissure, container, rolling stock, or concentrated animal feeding operation from which pollutants are or may be discharged to Waters of the State.
- **Stormwater.** Stormwater runoff, snow melt runoff, and surface runoff and drainage, per 40 CFR 122.
- **Stormwater Associated with Construction Activities.** The discharge of stormwater from construction activities including clearing, grading, and excavating that result in a land disturbance of equal to or greater than 1 acre, per 40 CFR 122.
- **Stormwater Associated with Industrial Activities.** The discharge from any conveyance that is used for collecting and conveying stormwater and that is directly related to manufacturing, processing, or raw materials storage areas from an applicable industrial plant or activity, per 40 CFR 122.

8.1.2 Key Concepts

- **Operational Requirements.** Equipment, discharge, and material use requirements that apply to all construction and industrial activities.
- **Permit Requirements.** Land-disturbing projects may be subject to a variety of permit requirements to protect surface water quality from both construction and post-construction stormwater runoff. In the applicable areas of the Installation, a State Stormwater Management Permit and coverage under the Construction General Permit may be required.
- **Post-Construction.** The management of stormwater generated on a stable, established site after the construction process is complete. The State Stormwater Management Program sets forth requirements for post-construction stormwater runoff control.

8.1.3 Environmental Management System

Practices, or activities, associated with stormwater include the following:

- Catch basin cleaning
- Construction/demolition

- Erosion control
- Fuel storage–containers
- Hazardous material storage
- Land clearing
- Landscaping
- Mowing
- Outfall cleaning
- Range residue clearance
- Riparian buffer maintenance
- Runoff sedimentation basins
- Sediment traps
- Soil excavation/grading/grubbing
- Stormwater collection/conveyance system
- Stormwater engineering controls operation and maintenance
- Stump/brush removal
- Vehicle parking

The potential impacts of these activities on the environment include degradation of water quality and damage to public & private property due to flooding.

8.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding potential stormwater contamination, including the following.

- **40 CFR 122, National Pollutant Discharge Elimination System.** Requires permits for the discharge of pollutants from any point source into Waters of the United States.
- **15 NCAC 02H. 0100, Point Source Discharges to the Surface Waters.** Requires permits for control of sources of water pollution by providing the requirements and procedures for application and issuance of state NPDES permits for discharge from an outlet, point source, disposal system discharging to the surface waters of the state, and for the construction and operations of treatment works with such a discharge.
- **15A NCAC Chapter 4.** Requires all persons conducting land-disturbing activity to take all reasonable measures to protect

all public and private property from damage caused by the release of sediments from the activity. The primary tool used to accomplish the objective is the development of an Erosion and Sedimentation Control Plan. The plan must

- Identify critical areas,
 - Limit exposure areas,
 - Limit time of exposure,
 - Control surface water,
 - Control sedimentation, and
 - Manage stormwater runoff.
- **15A NCAC 02H. 1000 Stormwater Management.** The State Stormwater Management Program requires all persons conducting land-disturbing activities that (1) require a Coastal Area Management Act (CAMA) Major Development Permit or an Erosion and Sedimentation Control Plan, and (2) are located within coastal counties or drain to specific classifications of water bodies, to protect surface waters and highly productive aquatic resources from the adverse impacts of uncontrolled high-density development or the potential failure of stormwater control measures. To receive permit approval, projects must limit the density of development, reduce the use of conventional collection systems in favor of vegetative systems, and incorporate post-construction, structural BMPs.

Any project involving land-disturbing activities aboard the Installation has been reviewed by the Installation’s NEPA Review Board prior to the onset of work.

8.3 Prior to Site Work

8.3.1 Notifications

Any project involving land-disturbing activities aboard the Installation has been reviewed by the Installation’s National Environmental Policy Act (NEPA) Review Board prior to the onset of work. Documentation of this review should have been provided to your ROICC or Contract Representative and may include mandatory conditions affecting the construction/implementation of the project. Consult with your ROICC or Contract Representative to obtain or review any NEPA documentation associated with the project in your contract.

8.3.2 Stormwater Phase I Permit

Discharges of industrial stormwater have the potential to contain contaminants from industrial activity. This type of discharge is defined

and regulated in 40 CFR 122, the USEPA final rule regarding National Pollutant Discharge Elimination System (NPDES) stormwater permitting.

Daily industrial operations discharging stormwater aboard MCB Camp Lejeune and MCAS New River are covered under NPDES Permit NCS000290.

8.3.3 Project-Specific Permits

Contractors are responsible for preparing all project-specific stormwater permit applications and related plans and for coordinating the permit review schedule with the ROICC or Contract Representative. For projects located outside of Public-Private Venture (PPV) housing, MCB Camp Lejeune is the responsible party for all project-specific stormwater permits. (All permit-required plans and applications must go through internal approval before being submitted to the appropriate state agency.) The permit review schedule should allow adequate time for internal review prior to state submission deadlines. For housing-related projects located outside of the jurisdiction of MCB Camp Lejeune, stormwater compliance should be coordinated with the appropriate PPV contractor.

For construction activities that disturb one acre or more of land, permit coverage is required under the North Carolina General Permit No. NCG010000 (General Permit). To obtain coverage under the General Permit, three copies of a proposed Erosion and Sedimentation Control Plan must be prepared and submitted to the NCDENR Sedimentation Control Commission (or to an approved local program) at least 30 days prior to beginning construction activity. Another copy of the plan will be kept on file at the job site. **Coverage under the permit becomes effective upon issuance of a plan approval. No land-disturbing activities may take place prior to receiving plan approval.** The approved plan is considered a requirement or condition of the General Permit; deviation from the approved plan will constitute a violation of the terms and conditions of the permit unless prior approval for the deviations has been obtained.

A State Stormwater Management Permit, issued in accordance with 15A NCAC 02H. 1000, is required for all development activities that require a CAMA Major Development Permit or an Erosion and Sedimentation Control Plan and that meet any of the following criteria:

- Development within the 20 coastal counties

Contractors are responsible for preparing all project-specific stormwater permit applications and related plans and for coordinating the permit review schedule with the ROICC or Contract Representative.

All permit-required plans and applications must go through internal approval before being submitted to the appropriate state agency.

A State Stormwater Management Permit is required for all activities that will disturb one acre or more of land.

- Development that drains to an Outstanding Resource Water (ORW)
- Development within one mile of and draining to a High Quality Water (HQW)

Because the Installation is located in a coastal county, any project that disturbs greater than one acre of land (hence requiring coverage under the General Permit for construction activity) will also require a State Stormwater Management Permit. A State Stormwater Management Permit Application must be submitted and filed with the NCDENR, Division of Water Quality, following completion of the construction plans and specifications and prior to commencement of construction activities. Copies of this form are available at the NCDENR website: http://h2o.enr.state.nc.us/su/Forms_Documents.htm#sswmp. The State Stormwater Management Permits typically specify design standards for conveyance systems and structural BMPs, a schedule of compliance, and general conditions to which the permittee must adhere.

8.4 Responsibilities During Site Work

The contractor is responsible for maintaining the quality of the stormwater runoff and preventing pollution of stormwater at the construction/job site. The job site may be inspected by Installation environmental personnel to ensure compliance with the Installation Stormwater Pollution Prevention Plan and applicable permits. The following requirements apply to all projects occurring at the Installation that have the potential to impact water quality:

- Any changes to the project area that do not comply with the approved Erosion and Sedimentation Control Plan, alter the approved post-construction stormwater conveyance system, or could otherwise significantly change the nature or increase the quantity of pollutants discharged should be immediately communicated to the ROICC or Contract Representative.
- Equipment utilized during the project activity must be operated and maintained in such a manner as to prevent the potential or actual pollution of the surface or ground waters of the state.
- All permitted erosion and sedimentation control projects will be inspected by the contractor at least once every seven calendar days

(unless discharges to a 303(d)-Listed water body are occurring) and within 24 hours after any storm event greater than 0.5 inch of rain per 24-hour period, as required by the North Carolina General Permit No. NCG010000 (General Permit). Inspection results shall be maintained by the designated contractor throughout the duration of the active construction project.

- Fuels, lubricants, coolants, hydraulic fluids, or any other petroleum products shall not be discharged onto the ground, into surface waters, or down storm drains (to include leaking vehicles, heavy equipment, pumps and/or structurally deficient containers of hazardous materials).
- Spent fluids shall be disposed of in a manner so as not to enter surface, ground waters of the state, or storm drains. Disposal of spent fluids is outlined in Section 4.0.
- Implement spill prevention measures, clean up all spills immediately, and follow spill reporting requirements presented in Section 3.0. Any spilled fluids shall be cleaned up to the extent practicable and disposed of in a manner so as not to allow their entry into the water, surface or ground, of the state. Please refer to Section 3.0 for emergency and spill response procedures.
- Herbicide, pesticide, and fertilizer usage during construction activity shall be consistent with the Federal Insecticide, Fungicide, and Rodenticide Act and shall be in accordance with label restrictions. Please refer to Section 4.0 for additional information on Hazardous Material/Hazardous Waste Management.
- Particular care must be used when storing materials outside. Materials and equipment stored outside that could potentially affect the quality of stormwater runoff include, but are not limited to, garbage dumpsters, vehicles, miscellaneous metals, wood products, and empty storage drums. If there is any question about whether an outdoor storage practice is acceptable, contact the ROICC or Contract Representative.
- Use good-housekeeping practices to maintain work areas in a clean and orderly manner, paying particular attention to those areas that may contribute pollutants to stormwater.

9.0 SOLID WASTE, RECYCLING, AND POLLUTION PREVENTION

The Installation has a proactive pollution prevention (P2) and recycling program. Contractors should minimize the amount of solid waste requiring disposal in a landfill. This section addresses solid waste, including both municipal solid waste (MSW) and construction and demolition (C&D) waste. Hazardous materials and hazardous waste are discussed in Section 4.0 of this guide. Contractors are required to comply with all Federal, state, and local laws and regulations for proper disposal and recycling of all solid wastes.

9.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with solid waste, recycling, and pollution prevention. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

9.1.1 Key Definitions

- **Construction and Demolition (C&D) Debris.** Materials generated during the construction, renovation, and demolition of buildings, roads, and bridges. C&D debris often contains bulky, heavy materials that include concrete, wood (from buildings), asphalt (from roads and roofing shingles), gypsum (the main component of drywall), etc.
- **Green Procurement (GP).** The purchase of environmentally preferable products and services in accordance with Federally mandated “green” procurement preference programs. GP is intended to protect the environment and reduce energy consumption.
- **Pollution Prevention (P2).** Reducing the amount of a hazardous substance or pollutant entering waste streams or otherwise released to the environment prior to recycling, treatment, or disposal.
- **Recycling.** A series of activities that includes collecting, sorting and processing recyclables into raw materials, and manufacturing raw

Contractors should minimize the amount of solid waste requiring disposal in a landfill.

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative.

materials into new products per the US Environmental Protection Agency (USEPA).

- **Solid Waste.** Any solid, semisolid, liquid, or contained gaseous materials discarded, including garbage, construction debris, commercial refuse, sludge from water supply or waste treatment plants or from air pollution control facilities, and other discarded materials, per the Resource Conservation and Recovery Act (RCRA) of 1976.

9.1.2 Key Concepts

- **Pollution Prevention/Green Procurement.** Pollution prevention and green procurement practices are strongly encouraged for Installation contractors.
- **Recycling.** Recycling is required on the Installation. The MCBCL Recycling Center accepts specified recyclables.
- **Solid Waste.** The location for disposal of solid waste will be in accordance with contract specifications (off-base or MCBCL Landfill). Data related to off-base disposal (to include C&D waste) must be provided to the ROICC or Contract Representative on a monthly basis.

9.1.3 Environmental Management System

Practices, or activities, associated with solid waste, recycling, and pollution prevention, include the following:

- Battery replacement
- Building maintenance—general
- Building operation—general
- Construction/demolition
- Equipment disposal
- Hazardous waste recycling
- Land clearing
- Material storage handling
- Packaging/unpackaging
- Rock crushing operations
- Solid waste recycling collection/transportation
- Stump/brush removal

- Vehicle operation

The potential impacts of these activities on the environment include soil degradation, surface water quality degradation, depletion of landfill space, and depletion of nonrenewable resources.

9.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding solid waste disposal, recycling, and pollution prevention, including the following:

- **Base Order (BO) 5090.4, Solid Waste Reduction – Qualified Recycling Program (QRP).** Provides guidance for solid waste reduction, pollution prevention, and management of recyclable materials.
- **BO 11350.2D, Refuse Disposal Procedures.** Establishes procedures for the separation, collection, and disposal of refuse and the disposal of waste wood products.
- **Pollution Prevention Act (PPA) of 1990 (42 U.S.C. 13101 *et seq.*).** Establishes the national policy that "pollution should be prevented or reduced at the source whenever feasible," and establishes the following hierarchy: source reduction, recycling, treatment, and disposal.
- **Resource Conservation and Recovery Act (RCRA) of 1976.** Governs the disposal of solid waste and establishes Federal waste disposal standards and requirements for state and regional authorities. The objectives of Subtitle D are to assist in developing and encouraging methods for the disposal of solid waste that are environmentally sound and that maximize the utilization of valuable resources recoverable from solid waste.
- **Solid Waste Disposal Act (SWDA) of 1965.** Requires Federal facilities to comply with all Federal, state, interstate, and local requirements concerning the disposal and management of solid wastes.

At a minimum, the following actions are required by all contractors:

1. Prior to performing work that will or may generate solid waste at the Installation, all contractors must provide their ROICC or Contract

Representative with a copy of their Solid Waste Disposal Permit unless MCBCL's landfill is being utilized for disposal. Recycling is encouraged and can be coordinated with the ROICC or Contract Representative and the Landfill Manager.

2. Provide the weights of ALL wastes, both solid and C&D that are either disposed of or recycled to the ROICC or Contract Representative with a copy to the Landfill Manager. This requirement does not apply in instances where the Landfill/Recycling facility picks up or accepts materials directly from the contractor. If contractors are transporting waste off-site for disposal, it is mandatory that they track the material weight and provide that information to their ROICC or Contract Representative.

9.3 SOLID WASTE REQUIREMENTS

Contractors producing solid waste on the Installation are required to take these steps:

- Pick up solid waste and place it in covered containers that are regularly emptied.
- Prevent contamination of the site and the surrounding areas when handling and disposing of waste.
- Leave the project site clean upon completion of a project.

9.3.1 MCBCL Landfill Acceptable Waste Streams

The MCBCL Landfill accepts certain types of solid waste under the conditions specified in Table 9-1. MCBCL Landfill hours of operation are 0800 to 1530, Monday through Friday. Contractors must have a construction pass and a copy of the face of the related contract to enter the MCBCL Landfill and dispose of waste. Contractors must also contact the Landfill Operator prior to unloading refuse. Each material must be separated into different loads.

Table 9-1. MCBCL Landfill Requirements

Waste Category ^a	Example	Requirements
Mixed Debris	Sheetrock, plaster, ceramic tiles	<ul style="list-style-type: none"> • Items may be mixed together
Painted Masonry and Concrete	Concrete, block, brick	<ul style="list-style-type: none"> • Separate from other items • Lead-painted or mastic-contaminated masonry or concrete must be separated from unpainted concrete products • Remove reinforcement wire and rebar flushed with exposed surfaces
Unpainted Masonry and Concrete	Concrete, block, brick	<ul style="list-style-type: none"> • Separate from other items • Remove reinforcement wire and rebar flushed with exposed surfaces
Nonrecyclable Cardboard	N/A	<ul style="list-style-type: none"> • Dispose of cardboard only if the MCBCL Recycling Center has rejected the cardboard
Nonrecyclable Wood Pallets	N/A	<ul style="list-style-type: none"> • Dispose of pallets only if the MCBCL Recycling Center has rejected the pallets
Treated Wood	Piling, power poles	<ul style="list-style-type: none"> • Separate from other items
Untreated/Unpainted Wood	Lumber, stumps, limbs	<ul style="list-style-type: none"> • Separate from other items
Organic Matter	Leaves, grass clippings	<ul style="list-style-type: none"> • Separate from other items • No bags or containers are allowed
Fiberglass Tanks	N/A	<ul style="list-style-type: none"> • Clean tanks before delivering to the landfill

^a Metals are not accepted at the landfill and must be removed from each waste category prior to disposal. Metal construction debris should be disposed of at the DRMO. Disposal requirements set forth in BO 11350.2D should be followed.

9.4 RECYCLING REQUIREMENTS

The Installation Recycling program is managed by the MCBCL Landfill, with assistance from the EMD. The MCBCL Landfill plays a vital role in the Installation's effort to reduce the amount of solid waste requiring disposal. Reducing solid waste saves money and helps to protect the environment by conserving natural resources. Additionally, Marine Corps facilities are mandated to recycle.

9.4.1 MCBCL Recycling Center

The MCBCL Recycling Center, Bldg. 982, is co-located with the landfill on Piney Green Road. Normal working hours are Monday through Friday, 0730–1530. All materials can be brought to the Recycling Center. For details, have your ROICC or Contract Representative contact the Recycling Center for details at (910) 451-2946. The following types and categories of materials are accepted for recycling at the Recycling Center:

- Wood pallets
- White Paper (mixed flat or shredded)
- Newspaper
- Magazines
- Military publications (binders removed)
- Phone books
- Plastic and glass (containers or bottles)
- Toner cartridges

The following types and categories of materials are accepted for recycling but must be delivered to the Defense Reutilization and Marketing Office (DRMO) at Lot 203:

- Scrap metal
- Steel (high temperature, corrosion resistant)
- Brass (includes spent/fired munitions)
- Copper and copper wire
- Aluminum (plate, sheet, scrap) and aluminum cans

Special arrangements can be made for other materials (C&D debris) or larger volumes of commonly recycled materials from events such as

construction and deconstruction. Regulations set forth in BO 11350.2D must be followed.

9.4.2 Other Recyclables

- **Asphalt Pavement.** Asphalt must be removed and delivered to an asphalt recycling facility. Contractors must provide a record of the total tons of asphalt recycled and the corporate name and location of the recycling facility to their ROICC or Contract Representative, with a copy to the Landfill Manager.
- **Empty Metal Paint Cans.** Empty metal paint cans shall be taken to Bldg. S-962 for recycling. All HM cans or HM containers that are generated from MCBCL or Marine Expeditionary Force contracts will be turned into Bldg. S-962 on Michael Rd. on the scheduled contractor turn-in day. Have your ROICC or Contract Representative contact EMD at (910) 451-1482 for more information. Any waste generated from this process must be managed appropriately.
- **Other Metals.** Other metals must be taken to the DRMO disposal area in Lot 201.
- **Red Rags Recycling.** A basewide program is in place to supply and launder shop rags through an off-site contractor, Aramark, in Savannah, Georgia. Almost all work centers on the Installation use this “Red-Rags” service wherein clean rags are supplied by the contractor and picked up after use. The rags are then laundered off-site and returned. This has reduced rag/POL-contaminated non-regulated waste by over 85 percent.
- **Universal Waste.** See Section 4.0 of this guide for management procedures.
- **Unused Hazardous Materials.** These materials can be turned into Bldg. 908 HM Free Issue point on Michael Rd. Have your ROICC or Contract Representative contact the Free Issue Point at (910) 451-1718.
- **White Rags Recycling.** Analogous to the red rags program, white rags have recently been introduced into painting operations at MCB Camp Lejeune. An off-site contractor, Aramark, in Savannah, Georgia, launders used rags. The white rags have no dye in the cloth

that can interfere with painting operations. Laundering the white rags reduces disposal of paint-related waste.

9.5 POLLUTION PREVENTION AND GREEN PROCUREMENT

MCB Camp Lejeune is subject to green procurement (GP) requirements. GP implements environmentally protective principles in the procurement arena and includes preferential use of the following:

- Recovered materials products
- Biobased products
- Water and energy efficient products
- Alternatives to ozone depleting substances
- Electronics meeting Electronic Produce Environmental Assessment Tool standards
- Products that do not contain toxic chemicals, hazardous substances, and other pollutants targeted for reduction and elimination by the Department of Defense
- Alternative fuel use/increased fuel efficiency
- Environmentally preferable purchasing practices

Contractors are encouraged to employ GP practices whenever feasible.

10.0 TRAINING

It is the contractor's responsibility to ensure that every employee has the required training to perform his or her duties in compliance with Federal, state, and local regulatory requirements.

To minimize the environmental impact of operations occurring on the Installation, all civilian and military personnel, including contractors, are required to receive both Environmental Management System (EMS) and general environmental awareness training at the level necessary for their job function. The training presentation provided as Attachment A satisfies these training requirements.

NOTE It is the contractor's responsibility to know and comply with Federal, state, and local regulations. Installation environmental personnel, upon request from the ROICC or Contract Representative, will assist contractors with compliance issues; however, the primary burden of regulatory identification, familiarity, and compliance lies with the contractor. This training *does not* replace any required regulatory environmental training (i.e., asbestos abatement worker training) as per contract requirements. Any required environmental training should be completed *prior* to working at MCB Camp Lejeune. Copies of training records should be available upon request by federal or state regulators.

10.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with contractor training requirements. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

10.1.1 Key Definitions

None.

10.1.2 Key Concepts

- **Comprehensive Environmental Training and Education Program (CETEP).** The Marine Corps training program designed to ensure that high-quality, efficient, and effective environmental

To minimize the environmental impact of operations aboard the Installation, all contractors are required to receive both EMS and general environmental awareness training at the level necessary for their job function.

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative.

training, education, and information are provided at all levels of the Marine Corps.

- **Environmental Management System (EMS).** The part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes, and resources for developing, implementing, achieving, reviewing, and maintaining the Environmental Policy.
- **EMS Training.** Instruction that is designed to ensure that military and civilian personnel, including contractors and vendors, become familiar with the Installation's EMS and how it functions
- **General Environmental Awareness Training.** Instruction that is designed to ensure that Installation personnel, including contractors and vendors, become familiar with the MCB Camp Lejeune and MCAS New River environmental policies and programs for regulatory compliance, natural resource conservation, pollution prevention, and environmental protection. General EMS and Environmental Awareness Training for Contractors and Vendors is required for all contractors working aboard the Installation. The training presentation is included as Attachment A. Documentation of receipt of this training should be maintained by the contractor and be available upon request.

10.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements concerning training, including the following:

- **Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management.** Requires implementation of an EMS at all appropriate organizational levels.

10.3 REQUIRED TRAINING

10.3.1 General Environmental Awareness

In accordance with Department of Defense (DoD) instructions and Marine Corps Orders (MCO), the Installation has implemented a Comprehensive Environmental Training and Education Program (CETEP). A major

component of the CETEP is to provide general environmental awareness training to all individuals associated with the installation, including contractors and vendors. Attachment A is provided to contractors and their employees performing work aboard the Installation to utilize for general environmental awareness training.

10.3.2 Environmental Management System (EMS)

In addition to CETEP requirements, the Installation has implemented a basewide EMS per Executive Order 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, and DoD and Marine Corps EMS policy. The EMS highlights the fact that the authority and principal responsibility for controlling environmental impacts belong to those commands, units, offices, and personnel (including contractors and vendors) whose activities have the potential to impact the environment. Attachment A is provided to contractors and their employees performing work aboard the Installation to utilize for EMS Training.

10.3.3 Recordkeeping

All training records, including other applicable environmental training, should be maintained on-site by the contractor for review upon request.

Attachment A is provided to contractors and their employees performing work aboard the Installation to utilize for EMS and general environmental awareness training.

11.0 CULTURAL RESOURCES

The Installation enjoys a rich history, and remnants of our past can be found throughout the installation. As contractors, it is your responsibility to notify the Resident Officer in Charge of Construction (ROICC) or your Contract Representative immediately if you encounter suspected archaeological sites, artifacts, or human remains during your activities.

11.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with cultural resource management. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

11.1.1 Key Definitions

- **Archaeological Resource.** Any material remains of human life or activities that are at least 100 years old and are capable of providing scientific or human understanding of past human behavior and cultural adaptation, including the site on which the remains are located. Examples include structures, tools, debris, organic waste, human remains, artistic representations, and shipwrecks.
- **Cultural Resource.** A generic term commonly used to include buildings, structures, districts, sites, and objects of significance in history, architecture, archaeology, engineering, or culture per MCO P5090.2A.
- **Historic Resource.** Any prehistoric or historic district, site, building, structure, or object significant in United States history, architecture, archaeology, engineering, or culture and included, or eligible for listing, the National Register of Historic Places (NRHP) per the National Historic Preservation Act (NHPA) of 1966 and MCO P5090.2A.

11.1.2 Key Concepts

- **Notification.** Contractors must notify the ROICC or Contract Representative if any cultural resources are encountered.

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative.

- **Policy.** It is DoD policy to preserve significant historic and archaeological resources.

11.1.3 Environmental Management System

Practices, or activities, associated with cultural resources include the following:

- Construction/demolition
- Land clearing
- Soil excavation/grading
- Stump/brush removal

The potential impacts of these activities on the environment include damage to cultural resources and degradation of soil quality.

11.2 OVERVIEW OF REQUIREMENTS

It is DoD policy to integrate the archeological and historic preservation requirements of applicable laws with the planning and management of activities under DoD control; to minimize expenditures through judicious application of options available in complying with applicable laws; and to encourage practical, economically feasible rehabilitation and adaptive use of significant historical resources.

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding cultural resources, including the following:

- **Archaeological and Historic Preservation Act of 1974 (16 U.S.C. 469 *et seq.*).** Amends the Reservoir Salvage Act to extend its provisions beyond the construction of dams to any terrain alteration resulting from any Federal construction project or Federally licensed project, activity, or program.
- **ARPA of 1979 (16 U.S.C. 470 (aa) *et seq.*** Requires Federal land managers to issue permits for the excavation or removal of artifacts from lands under their jurisdiction. The Act requires that relevant Native American tribes be notified of permit issuance if significant religious or cultural sites will be affected. It prohibits the excavation, damage, alteration, or defacement of an archaeological site unless permitted by the Federal land manager.

- **DoD Directive 4710.1, Archaeological and Historic Resources Management.** Provides policy for the management of archaeological and historic resources on land and in water under DoD control.
- **Executive Order (EO) 11593, May 13, 1971.** Requires all Federal agencies to administer cultural properties under their control. Agencies are required to direct their policies, plans, and programs so that significant sites and structures are preserved.
- **Historic Sites, Buildings, and Antiquities Act of 1935 (Public Law 74-292, 16 U.S.C. 461 *et seq.*).** States that it is Federal policy to preserve historic and prehistoric properties of national significance.
- **National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 *et seq.*).** States that it is Federal policy to preserve important historic, cultural, and natural aspects of our national heritage and that it is a requirement to consider environmental concerns during project planning and execution.
- **National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. 470 *et seq.*).** Establishes historic preservation as a national policy and requires Federal agencies undertaking actions that may affect NRHP-eligible historic properties to consult with state historic preservation offices and the Advisory Council on Historic Preservation. Section 110 of the Act requires Federal agencies to inventory, evaluate, identify, and protect cultural resources that are determined eligible for listing in the NRHP.
- **Public Buildings Cooperative Use Act of 1976 (Public Law 94-541).** Encourages adaptive reuse of historic buildings as administrative facilities for Federal agencies.

11.3 PROCEDURES

All contractors are expected to follow these procedures:

- Notify the ROICC or Contract Representative immediately if suspected archaeological sites, artifacts, or human remains are encountered during your activities.

Notify the ROICC or Contract Representative immediately if suspected archaeological sites, artifacts, or human remains are encountered during your activities.

- Stop work in the immediate area of the discovery until directed by the ROICC or Contract Representative to resume work.
- Be particularly aware of your surroundings when working in a designated historic area. A summary of key cultural, archaeological, and historic areas/sites is available at the following website:
<http://www.lejeune.usmc.mil/EMD/CULTURAL/HOME.htm>

Remember, the Government retains ownership and control over historical and archaeological resources.

12.0 PERMITTING

Contractors operating aboard the Installation must ensure that all relevant environmental permits are obtained before work commences on-site. Contractors must work with their ROICC or Contract Representative to determine permitting responsibilities prior to beginning work. Contractors must adhere to all permit conditions. Examples of environmentally related permits are provided in Section 12.3.

12.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with contractor permitting requirements. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

12.1.1 Key Definitions

- **SA Waters.** Surface water that is suitable for recreation and for commercial shellfish harvesting.

12.1.2 Key Concepts

- **Permits.** Prior to beginning work aboard the Installation, consult applicable permit requirements and ensure that they are met before work begins. Copies of all applicable permits/authorizations should be retained onsite for the life of the project.

12.2 OVERVIEW OF REQUIREMENTS

Please refer to the individual sections of this Guide for applicable permitting regulations and requirements that relate to each environmental medium. Many permits have specific timetables for submittal prior to project initiation. Contractors must consult the permit requirements and ensure that the permits are obtained in the required time frame.

12.3 PROJECT PERMITS AND APPROVALS

Prior to work being awarded, the Installation-associated action proponent should have had an environmental review by the Installation's National

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative.

The NCDENR website (<http://www.enr.state.nc.us>) is a useful reference for determining required permits and obtaining necessary forms.

Environmental Policy Act (NEPA) Section to comply with the NEPA of 1969. The outcome of this review would have been in the form of a Decision Memorandum (DM) or an Environmental Assessment (EA). Contractors must refer to their contract and the requirements outlined in the NEPA documentation for specific permitting requirements. EMD Program Managers are available for guidance; however, if the contractor is tasked with preparing permit applications, the contractor is expected to have the necessary capability and expertise required to complete the submittals in accordance with the guidance provided by the regulatory agency that issues the permit. In addition, EMD must be provided with copies of all permits submitted to the North Carolina Department of Environment and Natural Resources (NCDENR). In some cases, EMD must submit the permit application. Please direct questions to your ROICC or Contract Representative.

Examples of permits that may be required are discussed in applicable sections of this Guide. The following list of permits is not meant to be all inclusive. Please be aware that other permits not listed in this section may be required. The NCDENR website (<http://www.enr.state.nc.us>) is a useful reference for determining required permits and obtaining necessary forms. In addition, any inspection and/or data collection required by the permits must be retained on site for review upon request.

12.3.1 Stormwater (Section 8.0)

- **National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Permit for Construction Activities (also referred to as General Permit No. NCG010000).** Required for all land-disturbing activities (LDA) that exceed one (1) acre; also requires an accompanying Erosion and Sedimentation Control Plan.
- **High-Density Stormwater Permit.** Required when the (1) LDA exceeds one (1) acre and impervious surfaces are greater than or equal to 25 percent of the total project area adjacent to non-SA waters or greater than or equal to 12 percent of the total project area adjacent to SA water; OR (2) total development exceeds 10,000 square feet of impervious surface.

- **Low-Density Stormwater Permit.** Required when the LDA exceeds one (1) acre and impervious surfaces are less than 25 percent when adjacent to non-SA waters or less than 12% when adjacent to SA waters.

12.3.2 Asbestos (Section 6.0)

- **Asbestos Permit Application and Notification for Demolition/Renovation.** DHHS Form 3768, available at the following website:
<http://www.epi.state.nc.us/epi/asbestos/ahmp.html>

12.3.3 Air Quality (Section 13.0)

- **Clean Air Act Title V Construction and Operation Permit.** Required for the construction of the following types of emission sources:
 - Boilers
 - Generators
 - Engine Test Stands
 - Surface Coating/Painting Operations
 - Refrigerant Operations (e.g., Chillers)
 - Chemical or Mechanical Depainting, Abrasive Blasting, Grinding, or Other Surface Preparation Activities
 - Fuel Storage and Fuel Dispensing
 - Woodworking Shops
 - Welding Shops
 - Bulk Chemical or Flammables Storage
 - Open Burning
 - Fire Training
 - Rock Crushing or other dust-causing activities

EMD must submit all permit applications directly to the North Carolina Division of Air Quality.

12.3.4 Wetlands (Section 14.0)

- Contractors working aboard the Installation will not perform any work in Waters of the United States or wetlands without an approved permit (even if the work is temporary). Unavoidable impacts to wetlands or waters of the U.S. will require coordination and written approval from the US Army Corps of Engineers for a Section 404 Clean Water Act Permit (Individual or applicable Nationwide Permit), the NC Division of Water Quality for a Section 401 Clean Water Act, Water Quality certification, and the NC Division of Coastal Management for a Federal Consistency Determination. Failure to acquire written authorization for impacts to wetlands and/or waters of the U.S. may result in significant project delays or design modifications. The action proponent must coordinate with Land and Conservation Resources Section, ECON at (910) 451-5063/7235 during project design to ensure Clean Water Act permitting issues are addressed at the earliest opportunity.

12.3.5 Drinking Water/Wastewater

- **Approval of Engineering Plans and Specifications for Water Supply Systems.** Applicant submits engineering plans and specifications at least 30 days prior to the date upon which the Authorization to Construct is desired. Must have Authorization to Construct prior to onset of work.
- **Wastewater Extension Permit.** NCDENR Form FTA 02/03 – Rev. 3 04/05. Applicant submitting Form FTA 02/03 should plan accordingly and allow the State approximately 90 days to issue the permit. Permit must be in hand prior to onset of work.

13.0 AIR QUALITY

The Air Quality Program is responsible for ensuring that the Installation complies with all applicable Federal and state air quality regulations. Your ROICC or Contract Representative can provide a copy of Base Order 5090.6, Air Quality Management, which has additional information.

13.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with air quality. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative.

13.1.1 Key Definitions

- **Ozone-Depleting Substance (ODS).** Chemicals, such as certain refrigerants, that cause depletion of the stratospheric ozone layer.
- **Title V Permit.** Permit issued under the Clean Air Act Amendments (CAAA) for all major sources of air pollution. All emission sources at the Installation must be listed on the permit.

13.1.2 Key Concepts

- **Emission Sources.** Please have your ROICC or Contract Representative check with the EMD before beginning any emitting activity to determine whether any recordkeeping requirements apply.
- **Permitted Sources.** Ensure that construction permits are in place prior to beginning construction.

13.1.3 Environmental Management System

Practices, or activities, associated with air quality include the following:

- Controlled burn operations
- Degreasing
- Engine operation and maintenance
- Paint removal
- Painting

- Refrigerant replacement

The potential impacts of these activities on the environment include degradation of air quality, degradation of quality of life, and depletion of nonrenewable resources.

13.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding air quality, including the following:

- **Clean Air Act Amendments of 1990.** Protect human health and clean air resources by establishing standards and regulations for the control of air pollutants.
- **Title V Permit.** Outlines the requirements that the Installation must follow to ensure air quality compliance.
- **Base Order (BO) 5090.6, Air Quality Management.** Implements policies and procedures at the Installation level that all personnel must follow in order to demonstrate compliance with the Title V Permit and USMC requirements.
- **Base Bulletin (BBul) 6280, Open Burning of Vegetative Debris.** Outlines procedures for conducting open burning in accordance with state regulations and Installation procedures.

A permit is required prior to the construction of any emission source. Timely submittal of the permit application is required to obtain the permit prior to commencing construction.

13.3 PERMIT REQUIREMENTS

The Installation has a single permit, the Clean Air Act Title V Construction and Operating Permit, that includes all stationary air emission sources located at the facility; therefore, all permit application submittals to the North Carolina Division of Air Quality (NCDAQ) must be coordinated through the EMD. NCDAQ will review and process the application then issue a permit to construct and operate or to modify the emission source(s). A permit is required prior to the construction of any emission source. Timely submittal of the permit application is required to obtain the final permit prior to commencing construction. The most common types of emission sources at the Installation are as follows:

- Boilers
- Generators
- Engine Test Stands
- Surface Coating/Painting Operations
- Depainting (Chemical or Mechanical), Abrasive Blasting, or Other Surface Preparation Activities
- Fuel Storage and Fuel Dispensing
- Grinding
- Woodworking
- Welding
- Refrigerant Recovery and Recycling Operations or other Ozone-Depleting Substances (e.g., Halon fire extinguishing, cleaning agents)
- Bulk Chemical and Flammable Materials Storage

13.4 ADDITIONAL ACTIVITIES OF CONCERN

Other activities that do not necessarily require modification to the Title V Permit, but that must be coordinated with or tracked by EMD or the State Division of Air Quality, include:

- **Use of Refrigerants and other ODS.** Includes installation, removal, replacement, conversion, or service of chillers and other refrigerant-containing equipment.
- **Open Burning (e.g., right-of-way clearing, storm debris burning).** Only vegetative debris may be burned (i.e., NO paper products, trash, treated lumber, shingles, or other synthetic materials). Any plans to conduct open burning activities at the facility must be communicated to EMD and the Fire and Emergency Services Division. Your ROICC or Contract Representative can provide a copy of Base Bulletin 6280, which contains a summary of the Installation's open burning requirements. Any open burning activities that will take place within 1,000 feet of an occupied dwelling require a waiver and approval from occupants and NCDAQ. A waiver form can be downloaded at this site: http://daq.state.nc.us/enf/openburn/openburn_1000ft.pdf
Five designated sites have been permitted for storing and/or burning storm debris. They are located in the following areas: Mainside on

Sawmill Road, Courthouse Bay, Camp Johnson, Camp Geiger, and MCAS New River. Only storm debris can be accumulated at these sites. EMD must notify the Division of Air Quality if the Installation intends to burn the storm debris at one of these sites. Contact your ROICC or Contract Representative for more information.

- **Fire training outside of designated fire training pits.** State approval is required to conduct fire training outside of the designated fire training pits. First, complete the Notification of Open Burning for the Training of Firefighting Personnel form. The form is available at the following site:
http://daq.state.nc.us/enf/openburn/ob_firetrain.pdf

An accredited North Carolina Asbestos Inspector must inspect any structure to be burned to ensure that it is free from asbestos before the training exercise. Turn in the completed form to EMD for submittal to NCDAQ and the Division of Public Health, Health Hazards Control Unit.

- **Dust-causing activities (e.g., rock crushing).** Wet suppression is required during the entire dust-causing operation. Ensure that an adequate water supply is available, and coordinate with the Fire and Emergency Services Division if access to a fire hydrant is necessary.

14.0 NATURAL RESOURCES

The Installation has stewardship and recovery responsibilities over the natural resources located on the installation. These responsibilities are regulated under numerous laws described in this section. The Installation ensures compliance with these laws through an interdisciplinary process of review and coordination of all activities occurring on the installation. Contractors performing work on the Installation are responsible for complying with conditions and measures imposed on their work as a result of this process; these responsibilities include preserving the natural resources within the project boundaries and outside the limits of permanent work, restoring work sites to an equivalent or improved condition on completion of work, and confining construction activities to within the limits of the work indicated or specified. The contractor is advised that the Installation is subject to strict compliance with Federal, State, and Local wildlife laws and regulations. The contractor must not disturb wildlife (birds, nesting birds, mammals, reptiles, amphibians, and fish) or the native habitat adjacent to the project area except when indicated or specified.

14.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with natural resources management. If you have any questions or concerns about the information in this section or require assistance regarding any wildlife matters (snakes, nesting birds, nuisance wildlife) on the site or within the project area, please consult with your ROICC or Contract Representative, who will contact Environmental Conservation Branch (ECON) at 910-451-7235 (during working hours) or 910-451-7235 (after working hours).

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative.

14.1.1 Key Definitions

- **Natural Resource.** Soil, water, air, plants, and animals, according to the Natural Resources Conservation Service.

- **Threatened or Endangered Species.** Federally listed plants and animals that are likely to become either endangered or extinct in the foreseeable future.
- **Wetland.** An area that is regularly saturated by surface water or groundwater and contains vegetation that is adapted for life in saturated soil conditions per the United States Environmental Protection Agency (USEPA).

14.1.2 Key Concepts

- **National Environmental Policy Act (NEPA) of 1969.** Contractors must obtain and review any NEPA documentation associated with their projects.
- **Threatened and Endangered Species.** Specific requirements regarding protected areas on the Installation apply to contractor activities.
- **Timber.** Contractors must ensure that the ROICC or Contract Representative notify the Forest Management Program prior to conducting site work. Timber will not be released to contractors without the approval of the Forest Management Program.
- **Wetlands.** Any work in Installation waters or wetlands requires a permit prior to the start of an activity.

14.1.3 Environmental Management System

Practices, or activities, associated with natural resources include the following:

- Construction/demolition
- Controlled burn operations
- Erosion control
- Land clearing
- Riparian buffer maintenance
- Soil excavation/grading
- Stump/brush removal

The potential impacts of these activities on the environment include air emissions, sedimentation, eutrophication of surface waters, degradation of

habitat, impacts to marine mammals, damage to commercial and noncommercial timber, impacts to endangered species and cultural resources, and degradation of soil quality.

14.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding natural resources, including the following:

- **BO 5090.11, Protected Species Program.** Sets forth regulations and establishes responsibilities to ensure conservation of threatened and endangered species and species at risk aboard MCB Camp Lejeune.
- **Clean Water Act (CWA) of 1972.** Establishes the basic structure for regulating discharges of pollutants into the Waters of the United States.
- **Marine Corps Order (MCO) P5090.2A, Environmental Compliance and Protection Manual.** Provides guidance and instruction to installations to ensure the protection, conservation, and management of watersheds, wetlands, natural landscapes, soils, forests, fish and wildlife, and other natural resources as vital Marine Corps assets.
- **NEPA of 1969 (42 U.S.C. 4321 *et seq.*).** Requires Federal agencies, including the Marine Corps, to consider the environmental impacts of projects before the decision maker proceeds with the implementation. All projects that support military training, major and minor military construction, maintenance, and natural resources management actions are reviewed for potential environmental impacts.
- **BO 11000.1D, Environmental Impact Review Procedures.** Implements the NEPA of 1969 and NEPA policy and guidance in Chapter 12 of MCO P5090.2A.
- **Rivers and Harbors Act of 1899.** Prohibits the excavation, filling, or alteration of the course, condition, or capacity of any port, harbor, or channel without prior approval from the Chief of Engineers.

14.3 National Environmental Policy Act (NEPA)

Staff specialists from various Installation departments participate in the NEPA process, which coordinates the review of projects and documents environmental impacts (or lack thereof) for projects before implementation.

The documentation of this review process occasionally includes mandatory conditions affecting design and construction/implementation of the project. The documentation, when completed, is provided to the action proponent, who is expected to provide it to his or her ROICC or Contract Representative.

Consult with your ROICC or Contract Representative to obtain or review any NEPA documentation associated with the project in your contract.

The documentation marks the end of the NEPA review process; it does not constitute approval for the proponent of the action to implement the action. Some contracts may include stipulations from the NEPA document that must be implemented prior to the onset of work to prevent environmental impacts and violations of Federal or state rules and regulations. Stipulations could include: replacing monitoring wells if damages occur from contractor operations; stopping work if contamination is encountered; notification that a wetlands permit is required; seasonal restrictions, etc.

14.4 Timber

Potential timber resources are identified during the NEPA process. The contractor is responsible for advising the ROICC or Contract Representative to notify the Forest Management Program at (910) 451-7223 prior to beginning site work. Additionally, the ROICC or Contract Representative and/or contractor is required to notify the Forest Management Program in the event the contract has been amended with modifications to the site location.

The Forest Management Program maintains first right of refusal for all timber products on construction projects and will determine whether the government will harvest the timber or release it to the contractor. The government retains exclusive rights for all forest products on construction projects. If the government elects to harvest the timber, only merchantable

Consult with your ROICC or Contract Representative to obtain or review any NEPA documentation associated with the project in your contract.

The contractor is responsible for advising the ROICC or Contract Representative to notify the Forest Management Program at (910) 451-7223 prior to beginning site work.

timber will be removed. Per MCO P5090.2A, Chapter 11, “Forest products will not be given away, abandoned, carelessly destroyed, used to offset costs of contracts, or traded for products, supplies, or services.”

Contractors must adhere to the following requirements when performing site work that may impact timber resources:

- Do not remove, cut, deface, injure, or destroy trees or shrubs, without authorization from the ROICC or Contract Representative.
- Do not fasten or attach ropes, cables, or guys to existing nearby trees for anchorages without authorization from the ROICC or Contract Representative. (In such cases that these actions are authorized, the contractor shall be responsible for any resultant damage.)
- Protect existing trees that are to remain in place and that may be injured, bruised, defaced, or otherwise damaged by construction operations.
- With the ROICC or Contract Representative’s approval, use approved methods of excavation to remove trees with 30 percent or more of their root systems destroyed.
- With the ROICC or Contract Representative’s approval, remove trees and other landscape features scarred or damaged by equipment operations, and replace with equivalent, undamaged trees and landscape features.

Please refer to Section 9.0 for disposal information for land-clearing debris.

14.5 Threatened and Endangered Species

With the exception of improved roadways, entry into a threatened or endangered species site or shorebird nesting area marked with signs and/or white paint is prohibited without written permission from Installation personnel. BO 5090.11 lists threatened and endangered species residing on Installation. The following restrictions apply on the Installation unless written permission is received from Installation personnel:

Protect existing trees that are to remain in place and that may be injured, bruised, defaced, or otherwise damaged by construction operations.

Entry into a threatened or endangered species site or shorebird nesting area marked with signs and/or white paint is prohibited without written permission from Installation personnel.

- Work on Onslow Beach or Brown's Island is not permitted between 1 April and 31 October. Traffic on the beaches should be limited to below the high tide line.
- Vehicles and lighting are prohibited on the beaches overnight between 1 May and 31 October.
- Construction activities are prohibited within 1500 feet of a bald eagle's nest (JD Training area).
- Cutting or damaging of pine trees is not permitted.
- Alteration of hydrology through excavation, ditching, etc., is prohibited.
- Fish and wildlife must not be disturbed.
- Water flows may not be altered; the native habitat adjacent to the project and critical to the survival of fish and wildlife may not be significantly disturbed, except as indicated or specified.

14.6 Wetlands

14.6.1 Avoidance

In accordance with MCO P5090.2A, all facilities and operational actions must avoid, to the maximum degree feasible, wetlands destruction or degradation regardless of wetland size or legal necessity for a permit. Prior to the onset of construction, coordination with the Land and Conservation Resources Section of EMD should have taken place during project design to ensure Clean Water Act permitting issues are addressed by the contractor at the earliest opportunity. Contractors must incorporate avoidance and minimization measures in order to comply with the national policy to permit no overall net loss of wetlands.¹ Any proposed action significantly affecting wetlands must be coordinated with the Commanding Officer of MCB Camp Lejeune.

The contractor must ensure that construction of all buildings, facilities and related amenities, including earthwork, grading, landscaping, drainage,

¹ Contractor must meet concept design criteria while incorporating avoidance and minimization measures to protect wetlands, streams and Waters of the United States.

Contractors must incorporate avoidance and minimization measures in order to comply with the national policy to permit no overall net loss of wetlands.

stormwater management, parking lot and paved roadway, sidewalks, site excavation, sanitary sewer system extensions, and domestic water extensions, avoids, to the maximum degree feasible, wetlands destruction or degradation.

Identified and mapped boundaries of legally defined wetlands on all Marine Corps lands within the project area will be distributed to the ROICC or Contract Representative for use (if available) and shall be included in all design products including drawings, plans, and figures.

14.6.2 Permits

All unavoidable potential impacts to wetlands or Waters of the United States require prior coordination as described in this section. Failure to acquire written authorization for impacts to wetlands and/or Waters of the United States may result in significant project delays or design modifications.

No discharge of fill material, mechanized land clearing, or any other activity is allowed in jurisdictional wetlands or Waters of the United States without the proper approvals. The contractor may be responsible for obtaining the following permits (including pre-permit coordination, preparation, and submission of all permit applications after review and concurrence by the Installation) and complying with all regulations and requirements stipulated by the State of North Carolina as conditions upon issuance of the permits:

- United States Army Corps of Engineers (USACE), Section 404 Permit (Individual or applicable Nationwide Permit); Clean Water Act (CWA) of 1977, as Amended (Public Law 95-217, 33 U. S. C. 1251 et seq.)
- North Carolina Division of Water Quality (NCDWQ), Section 401 Water Quality Certification – (15A NCAC 02H) N.C. Department of Environment and Natural Resources (NCDENR); Clean Water Act (CWA) of 1977, as Amended (Public Law 95-217, 33 U. S. C. 1251 et seq.)

If work in wetlands is required, be sure you know who is responsible for obtaining permits, and what the terms and conditions of the permits require.

- North Carolina Division of Coastal Management (NCDCM), Federal Consistency Determination (15A NCAC 07) NCDENR; Coastal Zone Management Act (CZMA) of 1972 (16 U. S. C. 1451 et seq.)

Two types of activities generally require a permit from the USACE:

- **Activities within navigable waters.** Activities such as dredging, constructing docks and bulkheads, and placing navigation aides require review under Section 10 of the Rivers and Harbors Act of 1899 to ensure that they will not cause an obstruction to navigation.
- **Activities in wetlands and Waters of the United States** (regulated by Section 404 of the CWA of 1972). A major aspect of the regulatory program under Section 404 of the CWA is determining which areas qualify for protection as wetlands. Contractors should contact the USACE, the NCDWQ, or the NCDCM if there is any question about whether performing any activities could impact wetlands.

Contractors working on the Installation will not perform any work in Waters of the United States or wetlands without an approved permit (even if the work is temporary).

Contractors working on the Installation will not perform any work in Waters of the United States or wetlands without an approved permit (even if the work is temporary). Examples of temporary discharges include dewatering of dredged material prior to final disposal and temporary fills for access roadways, cofferdams, storage, and work areas.

14.6.3 Impacts

Any disturbance to the soil or substrate (bottom material) of a wetland or water body, including a stream bed, is an impact and may adversely affect the hydrology of an area. Discharges of fill material generally include the following, without limitation:

- Placement of fill material that is necessary for the construction of any structure or impoundment requiring rock, sand, dirt, or other material for its construction; site-development fills for recreational, industrial, commercial, residential, and other uses; and causeways or road fills
- Dams and dikes
- Artificial islands

- Property protection or reclamation devices such as riprap, groins, seawalls, breakwaters, revetments, and beach nourishment
- Levees
- Fill for intake and outfall pipes and subaqueous utility lines
- Fill associated with the creation of ponds
- Any other work involving the discharge of fill or dredged material

14.6.4 Mitigation

Any facility requirement that cannot be sited to avoid wetlands must be designed to minimize wetlands degradation and must include compensatory mitigation as required by wetland regulatory agencies in all phases of project planning, programming, and budgeting.

The contractor may be required to develop on-site mitigation, consisting of wetland/stream restoration or creation for all unavoidable wetland and stream impacts whenever possible and feasible. Use of Marine Corps lands and lands of other entities may be permissible for mitigation purposes for Marine Corps projects when consistent with USEPA and USACE guidelines or permit provisions. Land within the project area suitable for establishment of wetlands mitigation may be evaluated by the contractor and used for mitigation where compatible with mission requirements and approved by the Commanding Officer. Proposals for permanent resource areas must be approved by the Assistant Secretary of the Navy (Installations and Environment) or his/her designee.

Off-site mitigation should be proposed only if there is no other reasonable compensatory mitigation alternative.

14.7 Temporary Construction

Traces of temporary construction facilities, such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other signs of construction, should be removed.

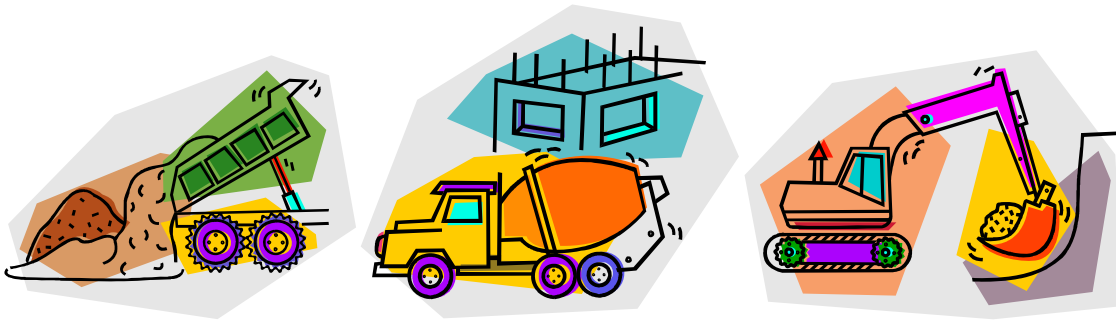
Temporary roads, parking areas, and similar temporarily used areas should be graded to conform to surrounding contours.

The contractor may be required to develop on-site mitigation consisting of wetland/stream restoration or creation for all unavoidable wetland and stream impacts whenever possible and feasible.

General EMS & Environmental Awareness Training for Contractors & Vendors



Attachment (1)



**MCB Camp Lejeune, NC/
MCAS New River**



**General EMS and
Environmental Awareness
Training
for
Contractors and Vendors**



Revised: April 2008



Disclaimer

- This training does not replace any required regulatory environmental training as per your contract
 - Required environmental training should be completed *prior* to working aboard the Installation
 - Training records should be available for review upon request





Training Overview

- EMS and the Environmental Policy
- Environmental Management Division
- General Environmental Awareness
- Spill Response Basics
- Summary





EMS and the Environmental Policy





What is an EMS?

- MCB Camp Lejeune and MCAS New River have implemented an Environmental Management System (EMS) that is founded on the principles of our respective **Environmental Policy**.
- The purpose of the EMS is to sustain and enhance mission readiness and access to training areas through effective and efficient environmental management.
- The EMS emphasizes that the authority and principal responsibility for controlling environmental impacts belong to those commands, units, offices, and personnel, *including contractors and vendors*, whose activities have the potential to impact the environment.





Why have an EMS?

“To sustain our operations and training capabilities, and to safeguard land-use availability, will comply with environmental laws and conserve the natural and cultural resources with which it has been entrusted.”

Excerpt from the Commanding Officer's Environmental Policy Statement





What YOU Need to Know

- The Installation has an EMS
- These three goals are the foundation of our **Environmental Policy**:
 1. **Comply** with relevant environmental laws and regulations
 2. **Prevent pollution**
 3. **Continually improve** our EMS





YOUR EMS Responsibilities

- Be aware of the Environmental Policy
- Be familiar with spill procedures
- Keep your eyes open for potential problems
- Report any environmental problems or concerns promptly and notify your ROICC or Contract Representative
- Utilize this training for your workers





Environmental Management Division (EMD), MCBCL

**Environmental Affairs
Department
(EAD), MCASNR**





EMD/EAD can help!

- The appropriate environmental office works with your ROICC or Contract Representative to ensure:
 - Proper management of waste
 - Compliance with regulations
 - Required environmental plans are developed and followed, if applicable
 - Required environmental training material is provided for contractor use





What Does EMD/EAD Do for You?



- If you have EMS or environmentally related questions, contact your ROICC or Contract Representative who will then work with EMD & EAD to determine how to proceed





Remember...

ALL environmental program requirements are applicable to **ALL** contractors and vendors working aboard the Installation!





General Environmental Awareness





Water Quality

- **Construction/demolition and other projects can result in:**

- Stormwater pollution
- Erosion and sedimentation



- **If a project could impact water quality:**

- Don't dispose of oil, chemicals, or any other material/debris down storm drains
- Keep sediment, leaves, and construction debris away from storm drains (use barriers)
- Sediment Erosion Control Plans are required for sites when more than 1 acre will be disturbed





Used Oil

■ Oil handling/changing operations can result in:

- Spills
- Waste
- Groundwater, stormwater, or soil contamination



■ If a project involves the use of oil:

- Perform maintenance in paved, designated areas
- Recycle used oil, oil filters, and other fluids...don't dump down storm drain or dispose of in the trash
- Clean up spills immediately and properly!





Air Quality

If a project could impact air quality:

- Prior to beginning operations, have your ROICC or Contract Representative contact the Installation Air Quality Program representative for applicable Federal and state permitting requirements
- Follow all permit requirements, including material usage recordkeeping for Title V permit sources
- Notify your ROICC or Contract Representative before bringing new equipment on site
- Notify your ROICC or Contract Representative before modifying an existing permitted source (including physical changes and material changes). Examples of permitted sources include boilers, generators, fuel tanks, and welding/soldering operations





Hazardous Waste Management

■ Hazardous waste generation can result in:

- Consumption of natural resources
- Increased Regulatory Burden

■ If a project generates hazardous waste:

- Reduce/Minimize the generation of hazardous waste
- Contact your ROICC or Contract Representative if unsure how to manage a waste
- Don't put hazardous wastes into general trash dumpsters
- Ensure satellite accumulation areas (SAA) are managed properly
 - Notify your ROICC or Contract Representative prior to creating a new SAA!
- Ensure hazardous waste drums are labeled and lids are secured





Hazardous Materials

- **If a project requires the use hazardous material (HAZMAT):**
 - Keep flammable materials in HAZMAT lockers
 - Don't store large quantities – keep on hand only what you will use
 - Maintain MSDSs for each material on-site
 - Place materials stored outside in secondary containment to prevent spill/reduce releases
 - Stop work if you unearth a hazardous material (i.e., ordnance) and report to your ROICC or Contract Representative





PCB and Asbestos

- **If a project generates or involves the removal of PCB or asbestos:**

- Manage and handle PCB and asbestos only if you are properly trained



- Manage PCB and asbestos in proper containers with appropriate labeling





Solid Waste Management

- **Solid waste generation can result in:**
 - Consumption of natural resources
 - Decreased landfill space
- **If a project generates regulated or solid waste:**
 - Reduce/Reuse/Recycle when possible; meet contract requirements for recycling
 - Contact your ROICC or Contract Representative if unsure how to manage a waste
 - Don't put unauthorized wastes into general trash dumpsters – Recyclable products should be placed in appropriate containers & not co-mingled with solid waste
 - Don't use government-owned dumpsters for your contractor waste and debris





Good Housekeeping

■ Poor housekeeping can result in:

- Fines, termination of contract
- Environmental contamination, spills
- Injuries



■ Maintain good housekeeping:

- **DO** store flammable materials in HAZMAT lockers
- **DO** ensure containers are labeled and lids are secured
- **DO** keep stormwater drains clear of debris
- **DO** clean up work sites at the end of *each* day
- **DO** clean up spills immediately and properly
- **DO** clean up work area after job completion
- **DON'T** pour material down storm or floor drains
- **DON'T** stockpile waste – put it where it belongs!





Spill Response Basics





If You Have or See a Spill...

Call 911





Natural Resources – Threatened & Endangered Species

- The Installation is currently home to nine federally listed endangered species: red-cockaded woodpecker (RCW), green sea turtle, loggerhead sea turtle), rough-leaved loosestrife, seabeach amaranth, piping plover, American alligator, and American bald eagle and Hirst's panic grass.



- The following restrictions apply:
 - Construction activities are restricted within 1500 ft of a bald eagle's nest
 - Vehicles & lighting are prohibited on the beaches overnight = 1 May -31 Oct
 - Cutting or damaging pine trees in not permitted
 - Fish & wildlife must not be disturbed





Natural Resources – Wetlands

- The US Army Corps of Engineers defines a wetland as " areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."
- No discharge of fill material, mechanized land clearing, or any other activity is allowed in jurisdictional wetlands or Waters of the United States without the proper approvals.
- Permits will be required





Natural Resources – Timber

There are over 127,000 acres of forested land aboard the Installation

- The MCBCL Forest Management Program has 1st right of refusal for all timber products on construction projects
 - The following restrictions apply:



- Do not cut or deface trees w/o authorization
- Protect existing trees that are to remain in place
- Do not fasten or attach ropes or cables to existing nearby trees for anchorages w/o authorization





Cultural Resources

The Installation manages a variety of historic and prehistoric archaeological sites, as well as historic structures.

- **IF YOU FIND A BONE, BOTTLE OR PIECE OF POTTERY THAT YOU THINK MIGHT HAVE ARCHAEOLOGICAL OR HISTORIC INTEREST, DON'T PICK IT UP. IF YOU FIND ANY OF THESE THINGS, MARK THE AREA & NOTIFY THE BASE ARCHAEOLOGIST, EMD AT 451-5063.**





Summary





Summary

- MCB Camp Lejeune and MCAS New River protect, preserve, and enhance their natural resources through their EMS and Environmental Policies
 - **We comply** with relevant environmental laws and regulations
 - **We prevent pollution**
 - **We continually improve** the EMS
- **YOU** are responsible for complying with applicable environmental requirements too
- If you aren't sure what to do...**ASK!**
 - Your ROICC or Contract Representative and EMD/EAD are here to help





Remember...

Consult the *Contractor Environmental Guide* for more detailed information pertaining to environmental requirements applicable to the work you do.

If you have any questions or concerns about the information in this training, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.



SECTION 01 59 00

TEMPORARY TRAILERS FOR DISPLACED TENANTS

04/94

PART 1 GENERAL

1.1 SUBMITTALS

Submit the following.

SD-02 Shop Drawings

- a. Foundation/Pier Plan
- b. Underpinning
- c. Floor Plans
- d. Mechanical Systems
- e. Plumbing Schematics
- f. Electrical Distribution
- g. Lighting Plans

SD-03 Product Data

- a. Trailer Manufacturer's Literature

1.2 SCHEDULING THE WORK

The Contractor shall provide and install office trailer(s) and a bathroom trailer as specified on the project plans and as indicated herein complete and ready for occupancy 15 days prior to starting any work within Building AS-302.

1.2.1 Upon Request or After Completion

Upon request by the Contracting Officer or after completion of all work, the Contractor shall have three weeks to remove the trailer(s), including all utility services, steps, foundations, and other associated materials. The grounds shall be restored to the original condition. Repair to original condition any damage to grassed or paved areas caused by mobile building or by anchoring.

PART 2 PRODUCTS

2.1 TRAILER

Trailer shall be provided as presented on the project plans. The trailers shall be provided, set up and made ready for occupancy including all utility connections. Provide domestic water, domestic sewer, electrical systems, and communication system as specified on the project plans complete and ready for use.

2.1.1 Office Trailers

Provide single story office trailers of the minimum sizes indicated on the project plans. Each trailer shall have floor plans consistent with those presented on the project plans.

Exterior of trailers shall be gray, unless otherwise specified by the contracting officer. Offices shall be 8 feet by 10 feet unless otherwise noted or approved.

2.1.2 Bathroom Trailer

Provide a bathroom trailer of the approximate size and floor plan as indicated on the project plans.

2.2 Construction Requirements

Each trailer shall be structurally sound, weathertight enclosure suitable for commercial use, conforming to the following minimum requirements.

2.2.1 Office Trailers

- a. nominal 2 x 4 wall construction
- b. nominal 2 x 6 floor joists with 5/8-inch plywood decking
- c. R-11 insulation in floor and walls
- d. R-14 insulation in ceiling
- e. Two entry doors with locks and three keys per lock.
- f. Windows with operable sash, except where otherwise noted.
- g. Interior materials shall be sheet type materials, pre-finished or painted. Floor coverings shall be vinyl composition tile. Exterior material shall be weather resistant.
- h. Provide consistent color scheme on interior and exterior as approved by the Contracting Officer.
- i. Steps and Landing: Durable nonslip materials such as checkered plate metal, treated wood or concrete stairs and landing. Landing at trailer level of size adequate for person to stand on landing and open the door. Railing on both sides of steps and two sides of landing. Provide handicap accessible pathway to be designed by the Contracting Officer, including sidewalks and ramps
- j. Skirting: Skirting shall be vinyl. Skirting shall be installed after all utility and telecommunications work is complete and once all inspections have been completed and approved.
- k. Foundation and Underpinning: Provide masonry foundation and underpinning to comply with the manufacturer's requirements and to provide vertical and lateral stability for the soil conditions present and for the basic wind velocity applicable to the site as specified in the applicable codes. The foundation and underpinning systems shall be designed by a North Carolina Licensed Professional Engineer. Minimum foundation requirements are shown on the project plans.
- l. All trailers shall conform to all life safety code requirements including travel distances, dead end limits, etc.

- m. Windows shall be operable and with mini-blinds.
- n. All exterior doors shall open outward and all interior doors shall open into the offices.
- o. Trailers and stairs are required to be secured to ensure that they are capable of withstanding three second gust of 130 mph.
- p. All materials, supplies, and labor to accomplish work shall be provided by the contractor.
- q. Fire extinguisher - Provide appropriate type and wall mount on interior adjacent to each exterior door.

2.2.1.1 Mechanical and Electrical Minimum Requirements for Office Trailers

- a. Central HVAC as required to maintain interior conditions between 72 - 78 degrees F DB and 40 - 60% RH. With exterior conditions between 23 degrees F DB (winter) and 90 degrees F DB and 79 degrees F WB (summer). Outside air shall be introduced at the rate of 0.125 CMB/SF of conditioned space.
- b. 200 amp - 20 circuit panel
- c. 120 volt lighting, ceiling mounted
- d. 120 volt duplex wall receptacles spaced 6 feet o.c. on interior walls.
- e. Exterior light at entrance doors

2.2.1.2 Communication System Requirements for Office Trailers

- a. A centrally located office trailer shall be equipped with a telecommunications cabinet to serve as the communications distribution point (submit the telecomm cabinet to base telephone for approval). The telecom cabinet shall be lockable and shall have two (2) dedicated 20 amp power outlets. The central communications distribution point is as indicated on the plans.

Contractor shall install telecommunications cabling in accordance with specification sections 27 10 00 BUILDING COMMUNICATIONS CABLING SYSTEM and 33 82 00 TELECOMMUNICATIONS OUTSIDE PLANT (OSP).

For all trailers provide two telecomm outlets in each of the corner offices, within 6" of the electrical outlets. Also provide a telecomm outlet within 6" of each electrical outlet in the open office areas, classrooms, conference rooms, or training rooms. Ensure that requirements outlined in 27 10 00 BUILDING COMMUNICATIONS CABLING SYSTEM and 33 82 00 TELECOMMUNICATIONS OUTSIDE PLANT (OSP) are met. Telecomm outlets shall be standard double gang box with single gang reducer and 1 inch conduits stubbed down below floor of trailer for each faceplate. Four RJ-45 jacks per faceplate with 4 cat 5e cables going back to a patch panel in lockable Cabinet large enough for all equipment. Provide CAT 32 J hooks under and around the perimeter of trailer fastened to the trailer frame no more than 4 feet apart for cable path. Leave skirting off until after all cables are run.

- b. The contractor shall provide and coordinate with Base Telephone to accomplish the routing of the telecomm cabling to the dedicated telecomm trailer from the existing communication room in AS-302. The contractor shall adhere to 33 82 00 TELECOMMUNICATIONS OUTSIDE PLANT (OSP) specifications for the proper installation of the conduit to the telecomm trailer. Conduit shall terminate underneath the dedicated telecomm trailer (near telecomm cabinet location). Base telephone shall make the final connection of the cabling to the existing communications system in the existing communications room at AS-302. Otherwise, the Contractor is responsible for all other system components. The contractor is responsible for all telecommunication pathway and infrastructure. The contractor shall provide the lockable cabinet. The contractor is to ensure that the temporary trailers have a complete and usable telecomm system upon completion. Once construction has been completed, the contractor shall remove all conduit and cabling.

Provide a separate 4" PVC conduit underground from telecomm trailer to other trailers for telecommunications cabling installation/pathway. Conduits shall be installed after trailers have been placed and set up. Conduits shall use long sweeps at all changes of direction. Inside radius of conduit shall be at least 24". Conduit shall have no more than 180 degrees of directional change in any single sweep unless a waterproof pull box is installed after every 180 degrees of total change in direction. Pull boxes shall a 2'x2'x4' minimum dimension. Conduit runs shall not exceed 75' in length without a waterproof pull box. Conduit shall be installed with pull wire accessible from both ends and both ends shall be capped.

2.2.1.3 Hardened Relocatable Facilities in Office Trailers

Provide hardened trailers for those units designated as hardened on the project plans.

Submit floor and lighting plans for approval. Provided floor plans shall include location of lighting, HVAC systems, doors, walls, data and telephone J-boxes, electrical receptacles and switches.

All openings such as ducts and vents shall be kept less than 96 square inches. Openings greater than 96 square inches shall be hardened per:

Military Handbook 1012/1A
SECNAVINST 5510.36
10A-2 SECNAVINST 5510.36

Provide skirting around all hardened trailers. Skirting shall be constructed of concrete masonry units from ground surface to solid trailer construction built up on continuous concrete footings 12" x 12". Concrete block shall be reinforced with (1) #5 @ 6 foot on center and all cells filled with concrete. Crawl space under trailer shall be no less than 30 inches with a hatch equipped with a GSA approved lock and security hasp - Sergeant's Greenleaf 8077AD.

Provide that all exterior doors shall open outward and all interior doors shall open into the offices or restroom. Exterior doors shall have 3' x 6'-8" x 1-3/4" metal hollow core 90 minute fire rating with deadlocking

panic hardware, door closers, cipher lock, and X09 lock. All exterior doors shall have peened, brazed, or spot welded hinges to prevent removal. All interior doors shall be keyed with privacy locks on the bathroom doors. Interior doors shall be wood, solid core with a 20 minute fire rating.

Hardened trailers shall be windowless.

Hardened trailers and stairs are required to be secured to ensure they will be capable of withstanding three second wind gusts of 130 miles per hour.

2.2.1.4 Water, Sewer, and Electrical Connections

Provide domestic water, domestic sewer, electrical systems, and communication systems as specified on the project plans complete and ready for use.

2.2.2 Bathroom Trailer

- a. nominal 2 x 4 wall construction
- b. nominal 2 x 6 floor joists with 5/8-inch plywood decking
- c. R-11 insulation in floor and walls
- d. R-14 insulation in ceiling
- e. Two entry doors with locks and three keys per lock.
- f. Interior materials shall be sheet type materials, pre-finished or painted. Floor coverings shall be vinyl composition tile. Exterior material shall be weather resistant.
- g. Provide consistent color scheme on interior and exterior as approved by the Contracting Officer.
- h. Steps and Landing: Durable nonslip materials such as checkered plate metal, treated wood or concrete stairs and landing. Landing at trailer level of size adequate for person to stand on landing and open the door. Railing on both sides of steps and two sides of landing. Provide handicap accessible pathway to be designed by the Contracting Officer, including sidewalks and ramps
- i. Skirting: Skirting shall be vinyl. Skirting shall be installed after all utility and telecommunications work is complete and once all inspections have been completed and approved.
- j. Foundation and Underpinning: Provide masonry foundation and underpinning to comply with the manufacturer's requirements and to provide vertical and lateral stability for the soil conditions present and for the basic wind velocity applicable to the site as specified in the applicable codes. The foundation and underpinning systems shall be designed by a North Carolina Licensed Professional Engineer. Minimum foundation requirements are shown on the project plans.
- k. All trailers shall conform to all life safety code requirements including travel distances, dead end limits, etc.

- l. All exterior doors shall open outward.
- m. Trailers and stairs are required to be secured to ensure that they are capable of withstanding three second gust of 130 mph.
- n. All materials, supplies, and labor to accomplish work shall be provided by the contractor.
- o. Fire extinguisher - Provide appropriate type and wall mount on interior adjacent to each exterior door.

2.2.2.1 Mechanical and Electrical Minimum Requirements for Bathroom Trailer

- a. Central HVAC as required to maintain interior conditions between 72 - 78 degrees F DB and 40 - 60% RH. With exterior conditions between 23 degrees F DB (winter) and 90 degrees F DB and 79 degrees F WB (summer). Outside air shall be introduced at the rate of 0.125 CMB/SF of conditioned space.
- b. Toilet Exhaust Air System: Provide 25 CPM exhaust for each toilet room. Switch with the toilet light.
- c. 200 amp - 20 circuit panel
- d. 120 volt lighting, ceiling mounted
- e. Provide one (1) 120 volt duplex wall receptacles adjacent to the lavatory area. Provide electrical and communications outlets in accordance with requirements for office trailers.
- f. Exterior light at entrance doors

2.2.2.2 Water, Sewer and Electrical Connections

Provide domestic water, domestic sewer, and electrical and communications systems as specified on the project plans complete and ready for use.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Foundation

Provide foundation for trailer(s); conform to applicable codes.

3.2 INSTALLATION

Install trailer(s); provide full skirting and anchoring for 130 mph wind zone; conform to applicable codes. Connect indicated utilities.

3.2.1 Steps and Landing

Provide steps and landing for each mobile building as indicated on the project plans. Provide one handicap accessible ramp for one trailer as designated by the Contracting Officer.

3.2.2 Plumbing, Electrical and Communications Hook-Up

Provide complete plumbing, electrical and communications hookup to mobile

buildings. Supply all necessary parts and connections and conform to all applicable codes.

3.2.3 Damages

Government will not be responsible for damage to trailers from installation of phones, moving furniture, minor modification and normal wear and tear.

-- End of Section --

SECTION 01 78 00

CLOSEOUT PROCEDURES

12/10

PART 1 GENERAL

1.1 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-10, Operation and Maintenance Data

Equipment/product warranty list

Submit Data Package 1 in accordance with Section 01 78 23, "Operation and Maintenance Data."

SD-11 Closeout Submittals

As-built drawings

GIS Deliverables

Record of materials

Maximo requirements

Complete Submittal Package - 1 copy

Equipment/product warranty tag

1.2 PROJECT RECORD DOCUMENTS

As-Built Drawings will be submitted as specified in 1.2.1 along with GIS Deliverables which will be created and submitted within specification in section 1.2.2.

1.2.1 As-Built Drawings

"FAC 5252.236-9310, Record Drawings." In addition to the requirements of FAC 5252.236-9310, the Contractor shall survey the horizontal and vertical location of all new utilities and structures to within 0.1 feet relative to the station datum. Drawing files shall be drawn according to, and in scale with NAD-1983-UTM-Zone-18N, GCS-North-America 1983, Datum: D-North-America-1983. All utilities shall be surveyed at each fitting and every 100 LF of run length and at each change of direction. All structures shall be surveyed at corners of buildings. Locations and elevations shall be recorded on the Record Drawings. Submit drawings with QC certification. Submit drawings in AutoCAD format versions 2000 or 2002.

1.3 SPECIFICATION FOR DIGITAL DATA - GIS DELIVERABLES

Objective: The primary objective of this section is to provide detailed specifications for the collection and creation of Geographic Information

System (GIS) data to ensure that all GIS data delivered is compatible and will add value to Camp Lejeune's Installation Geospatial Information and Services (IGI&S) repository.

1.3.1 **Section 1** - Collection and Creation of Geospatial data

Prior to data collection and creation the contractor shall provide the Government Project Manager a Technical Approach Plan for approval which describes the contractor's plan to collect and create GIS Data as specified in this section.

The Technical Approach Plan will contain the following:

- a. How features will be collected utilizing Global Positioning System (GPS) technology
- b. Which features, as specified in Section 2, will be located, GPS and created
- c. Source of attribute data
- d. Steps taken to create file personal Geodatabase
- e. What GIS data will be delivered

All questions regarding the Specification For Digital Data - GIS Deliverables shall be directed to MCB Camp Lejeune I&E, PWD GIS Section, via the Government Project Manager.

Specific Tasks are as follows:

- a. Contractor is responsible for the collection and creation of geospatial data for newly constructed or replaced utilities and infrastructure features that fall within the realm of this specification.
- b. Utilize GPS technology to locate and create GIS data and deliver only features that are relevant to this contract as specified in Section 2.
- c. Follow instructions in Section 2 which defines the following:
 - (1) GIS feature requirements
 - (2) The manner in which the data will be collected in GPS
 - (3) The manner in which GIS data will be created
 - (4) Required Attribute data
 - (5) Other instructions pertaining to GIS data

Survey Grade and Sub-Foot GPS Geospatial Data Collection requirements:

- a. GPS data shall be completed in accordance with the "Statewide Global Positioning System (GPS) Data Collection and Documentation Standards, Version 3" (or higher version if available at the time of this project) as prepared by the Statewide Mapping Advisory Committee and adopted by the North Carolina Geographic Coordinating Council in May 2006. Copies of these standards can be found on the Internet at: www.ncgicc.org.
- b. Only bench marks included in the North Carolina Geodetic Survey

Base Station Network shall be used for mapping grade GPS data collection.

- c. Mission planning is essential and contractor should utilize lowest possible PDOP values.
- d. Geographic data shall be collected and created into the Universal Transverse Mercator (UTM) coordinate system.
 - (1) UTM Zone 18N, the GRS 1980 spheroid and the North American Datum 1983.
- e. Spatial accuracy requirements for Survey and Sub-Foot grade data collection are as follows:

Sub-Foot requirements

- (1) All points shall be within + 12 inches
- (2) 95 % accuracy rate for all points.

Survey Grade requirements

- (1) All points shall be within + 1 centimeter
- (2) 98 % accuracy rate for all points

- f. Every effort shall be made to capture feature locations without using offsets.
 - (1) Offsets will be noted in final report and user_flag field for which each feature it applies, unless otherwise specified

1.3.1.1 Geospatial Data Standards

The IGI&S repository model is based on the Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE) with modifications.

- a. Copies of the SDSFIE may be obtained from the Solutions and Technology for the Advancement and Refinement of SDSFIE (STARS) Team Internet homepage at <http://www.sdsfie.org/>.
- b. Due to on-going government modifications to Camp Lejeune's IGI&S repository the contract shall ensure the schema of the final product is in compliance and all data will be created and delivered utilizing Camp Lejeune's most current IGI&S repository schema.
 - (1) The contractor shall request an additional template prior to delivery to be used for the final delivery of data
 - (2) Final report will include date of last data request for IGI&S schema and geospatial data

Camp Lejeune's IGI&S repository's schema and geospatial data shall be obtained via the Government Project Manager before any data is collected or created. The Project Manager, upon request, shall furnish the contractor with a Geospatial data request package. The contractor shall:

- a. Request only GIS data that is pertinent to the contract

b. Request shall include the following information:

- (1) Contract Number and Title
- (2) Contractor's Name, Address, Phone Number, Email and Point of Contact
- (3) Summary of Project
- (4) Contract Specification
- (5) Expected Delivery date and features

When developing a new feature class, the Contractor shall develop the initial structure consistent with the most current version of SDSFIE.

- a. If further modifications to the database structure are required, the Contractor will consult with the Government Project Manager for direction and final approval.
- b. All new feature data class shall be noted on the final report.

1.3.1.2 Collection of Geospatial data

- a. Utility data, as identified in Section 2 will be collected utilizing Survey Grade GPS data collection methods.
- b. Prior to GPS efforts, buried underground utilities shall be located in order to GPS accurate location.
- c. Other infrastructure data, as identified in Section 2 shall be collected utilizing Sub-Foot GPS data collection methods.
- d. GPS data and collection data files shall be included with every phase of delivery.

1.3.1.3 Creation of Geospatial Data

Data will be created in a File Personal Geodatabase using ArcGIS 9.3 or higher if a higher version is being used by the government at the time of this project.

Contractor shall verify the ArcGIS version, via the Government Project Manager, at the commencement of this contract.

Geodatabase Spatial Reference Properties shall include the following:

- a. Coordinate System of UTM Zone 18N, the GRS 1980 spheroid and the North American Datum 1983
- b. x,y domain precision of 1000

To ensure that all Geospatial data created can be loaded and add value to Camp Lejeune's IGI&S repository; data will be created in such a way that the delivered file personal geodatabase mirrors the IGI&S repository. This includes, but is not limited to the following:

- a. Geospatial database table structure
- b. Domain(s) configuration
 - (1) SDSFIE domains have been modified by Camp Lejeune for operational purposes, it is the contractor's responsibility to

request and utilize associated domain structure to ensure deliverable will load into the geodatabase

- c. Required attribute data as specified in Section 2 shall be obtained via contract specifications, plans and on as-built drawings
 - (1) Actual field data always supersedes drawings
- d. The contractor may have to research and verifying existing as-built data in the Technical Records Section located at the Public Works Building, MCB Camp Lejeune

All data must be created using GIS topology rules for polygons, points and lines, such as, but not limited to the following examples:

- a. Polygons, Polylines and points rules, please reference illustrating topology rules in ArcGIS at www.esri.com
- b. Polygons must not have slivers
- c. All utility or infrastructure system data, which is, but not limited to, transportation system and electrical, water, steam distribution, and wastewater collection etc., will be created using GIS spatially connectivity rules which specifies that vertex, edge and endpoints be snapped to features within the system.
 - (1) Features will be snapped to the appropriate item
 - (2) Data will be created to represent the real world, for example, direction of flow, i.e., water, sewer and transportation systems will be drawn and created in the direction of flow
 - (3) Utility systems will be created from source to sink, etc
 - (4) Abandoned In Place (AIP) utility lines will be located and updated in the current utility line feature data set and identified as AIP in the attribute table
 - (4) Demolished Lines are to be delivered in a feature data set, which appropriately reflects the utility

1.3.1.4 Creation of Geographic Data Documentation (METADATA)

For each digital file delivered containing geographic information the Contractor shall provide documentation consistent with the Federal Geographic Data Committee (FGDC) Content Standards for Digital Geospatial Metadata (CSDGM). Both 'Mandatory' and 'Mandatory-if-Applicable' fields shall be completed for each geographic data set.

Metadata generation tools included in the ArcGIS suite of software shall be used in the production of the required metadata in XML format. If neither of these tools is used, the Contractor must insure that the metadata is delivered in a format that can be easily translated to the XML format. Copies of the FGDC metadata standard can be obtained on the Internet at <http://www.fgdc.gov>.

The documentation shall include, but not be limited to, the following:

- a. The name and description of the data set/data layer
- b. The source of the data and any related data quality information such as positional accuracy and time period of content
- c. Descriptions of the receiver and other equipment used during collection and processing, base stations used for differential corrections, software used for performing differential corrections, estimated horizontal and vertical accuracies obtained, and conversion routines used to translate the data into final geographic data delivery format
- d. Type of data layer (point, line, polygon, etc.)
- e. Field names of all attribute data and a description of each field name
- f. Definition of all codes used in the data fields
- g. Ranges of numeric fields and the meaning of these numeric ranges
- h. The creation date of the data layer and the name of the person or company who created it
- i. A point of contact shall be provided to answer technical questions

Final report will also be required with the following supplement information:

- a. Specific procedures and list of equipment, software and versions that was utilized for the GPS data collection and creation of geospatial data
- b. Any offsets
- c. Modifications to the geodatabase to include any new feature data class
- d. Source that was utilized for all required attributes
- e. Miscellaneous information that the contractor deems significant
- f. A Technical Point of Contact
- g. GPS data controller files

1.3.1.5 GIS Submittals

- a. Reports will be submitted in the following formats and or versions. Contractor shall verify version(s) of software, via the Government Project Manager, at the commencement of this contract
 - (1) Microsoft Office 2003
 - (2) Adobe Portable Document Format (PDF)
 - (3) Spreadsheet files shall be provided in Microsoft Excel format
- b. All GIS data will be provided in a ArcGIS file personal geodatabase as specified

- c. Media for Geospatial Data Deliverables: Geographic data shall be delivered on a compact disk read-only memory (CD-ROM) -or- digital versatile disk read-only memory (DVD-ROM)
- d. Map submittals shall accompany each geospatial deliverable
 - (1) Include ANSI C map for each project / area

Data should be labeled and attributed per specification

1.3.1.6 Ownership

All digital files, final hard-copy products, source data acquired for this project, and related materials, including that furnished by the Government, shall become the property of Marine Corps Base, Camp Lejeune and will not be issued, distributed, or published by the Contractor.

1.3.1.7 Geographic Data Review

- a. The digital geographic maps, GPS collection files and related data, all working text and documents and file personal geodatabase shall be included for review in the draft and final contract submittals
- b. The contract shall submit a preliminary review of data between 15-25 percent to ensure specifications are being met
- c. The data will be analyzed for discrepancies in subject content, correct format in accordance with these specifications, and compatibility with Camp Lejeune's IGI&S repository schema
- d. Failure for non-compliance of the specifications outlined in this document will result in non-acceptance of data deliverables

1.3.2 **Section 2** - Instructions to GPS and Attribute Requirements

Contract shall deliver all GIS data required in this section that applies to this contract

- a. Attribute data requirements for Infrastructure: The following attributes shall be collected for each infrastructure data class: Collect GPS data for all features listed with Sub-Foot accuracy and enter attribute data in compliance with the IGI&S repository
- b. Structures: CLJN.structure_existing_area

GPS Structure and collect the following attributes:

- (1) Subtype ID:
- (2) Building ID:
- (3) Structure Status
- (4) Number of Levels
- (5) Structure Use 2: Populate "Residential" if structure is a residential unit
- (6) Material:
- (7) Drawing Number
- (8) Contract Number
- (9) Date Acquired

(10) Source

- c. Floor Outline: CLJN.building.floor_outline (Polyline) All new and renovated buildings will be required to have a "clean floor plan" for each floor level that will be delivered in GIS format. Each level will represent one feature and provide the following: walls, doors, windows, closet, crawlspace, head facility, stairwells, etc.

Create feature and update the following attributes:

- (1) Building ID: Facility number
- (2) Floor Name
- (3) Subtype ID:
- (4) Drawing Number
- (5) Drawing Type
- (6) Contract Number

- d. Slabs: CLJN.slab_area

GPS and collect the following attributes:

- (1) Structure ID: (Facility Number, if applicable)
- (2) Feature Description:
- (3) Structure Material
- (4) Structure Condition
- (5) Built Date
- (6) Drawing Number
- (7) Drawing Type
- (8) Contract Number
- (9) Data Source:

1.3.2.1 Attribute data requirements for Transportation

The following attributes shall be collected for each infrastructure data class: Collect GPS data for all features listed with Sub-Foot accuracy.

- a. Road Centerline: CLJN.road_centerline

GPS and collect the following attributes:

- (1) Category:
- (2) Road Name
- (3) Paved: PAVED / UNPAVED
- (4) Date Acquired:
- (5) Surface Type:
- (6) Drawing Number
- (7) Contract Number
- (8) Data Source:
- (9) Use:
- (10) Ramp:

- b. Road Area: CLJN.road_area

GPS and collect the following attributes:

- (1) Road Segment
- (2) Paved
- (3) Divided: yes / no

- (4) Number of Lanes
- (5) Installation Date
- (6) Surface Type: Drawing Number
- (7) Contract Number
- (8) Data Source:
- (9) Road_Name
- (10) Ramp:

c. Curb line: CLJN.curb_line

GPS and collect the following attributes:

- (1) Curb Material
- (2) Description
- (3) Drawing Number
- (4) Contract Number
- (5) Data Source:

d. Driveways: CLJN.vehicle_driveway_area

GPS and collect the following attributes:

- (1) Driveway ID: Building that is associated with this feature
- (2) Paved or Unpaved:
- (3) Surface Material
- (4) Installation Date
- (5) Drawing Number
- (6) Contract Number
- (7) Data Source:

e. Parking Lots: CLJN.vehicle_parking_area

GPS and collect the following attributes:

- (1) Parking ID: Building that is associated with this feature
- (2) Paved or Unpaved
- (3) Total Spaces
- (4) Lighting:
- (5) Drawing Number
- (6) Contract Number
- (7) Data Source:
- (8) Surface_Type:
- (9) Vehicle_Day:
- (10) Park_use:
- (11) Feature Name:
- (12) Striping:
- (13) Vehicle_Type:

f. Bridge: CLJN.road_bridge_area

GPS and collect the following attributes:

- (1) Bridge ID: Facility Number
- (2) Number of Lanes
- (3) Bridge Material Type
- (4) Bridge Type
- (5) Capacity:
- (6) Drawing Number
- (7) Drawing Type

- (8) Contract Number
- (9) Data Source:
- (10) Feature Name:

g. Pedestrian Sidewalks: CLJN.pedestrian_sidewalk_area

GPS and collect the following attributes:

- (1) Material
- (2) Use:
- (3) Status
- (4) Drawing Number
- (5) Contract Number
- (6) Data Source:

1.3.2.2 Attribute data requirements for Improvement

The following attributes shall be collected for each infrastructure data class: Collect GPS data for all features listed with Sub-Foot accuracy.

a. Fence: CLJN.fence_line

GPS and collect the following attributes:

- (1) Material: CHAIN LINK, WOOD, etc
- (2) Drawing Number
- (3) Contract Number
- (4) Data Source:
- (5) Length:

b. Gates: CLJN.gate_line

GPS and collect the following attributes:

- (1) Material:
- (2) Feature Height
- (3) Drawing Number
- (4) Contract Number
- (5) Data Source:
- (6) Length:

c. Walls: CLJN.wall_line

GPS and collect the following attributes:

- (1) Material:
- (2) Feature Height
- (3) Drawing Number
- (4) Contract Number
- (5) Data Source:
- (6) Length:

d. Recreation Trails: CLJN.recreation_trail_centerline

GPS and collect the following attributes:

- (1) Subtype:
- (2) Trail Description:
- (3) Paved:

- (4) Date Acquired:
- (5) Drawing Number
- (6) Contract Number
- (7) Data Source:
- (8) trail_id:
- (9) Trail_Name:

e. Playground: CLJN.playground_area

GPS and collect the following attributes:

- (1) Pool ID: Facility Number
- (2) Feature Description:
- (3) Drawing Number
- (4) Contract Number
- (5) Data Source:

f. Swimming Pool: CLJN.swimming_pool_area

GPS and collect the following attributes:

- (1) Swimming Pool ID:
- (2) Feature Description:
- (3) Drawing Number
- (4) Contract Number
- (5) Data Source:

g. Athletic Court: CLJN.athletic_court_area

GPS and collect the following attributes:

- (1) Court ID:
- (2) Court Type:
- (3) Court Name
- (4) Date Acquired
- (5) Drawing Number
- (6) Contract Number
- (7) Court Desc:

h. Athletic Field: CLJN.athletic_field_area

GPS Structures and collect the following attributes:

- (1) Field ID: Facility Number
- (2) Field Description:
- (3) Date Acquired:
- (4) Field Type
- (5) Contract Number
- (6) Drawing Number
- (7) Data Source:
- (8) Field Name

1.3.2.3 Environmental Storage Tanks

The following attributes shall be collected for each infrastructure data class: Collect GPS data for all features listed with survey grade accuracy.

a. Underground Storage Tanks: CLJN.underground_storage_tank_point

GPS and collect the following attributes:

- (1) ENVUST-ID for Under Ground Storage Tank
- (2) Hazsite_ID
- (3) EH_Tank: Fuel Type
- (4) Facility Number
- (5) X Coordinates
- (6) Y Coordinates
- (7) Installation Date:
- (8) Product_D:
- (9) Narrative
- (10) Serial Number
- (11) Tank_Sys_D:
- (12) Status:
- (13) regulated:
- (14) Volume
- (15) Volume_U_D:

- b. Aboveground Storage Tanks: CLJN.aboveground_storage_tank_site

GPS and collect the following attributes:

- (1) ENVAST_ID for Above Ground Storage Tank
- (2) Hazsite_ID
- (3) EH_Tank:
- (4) Facility Number
- (5) X Coordinates
- (6) Y Coordinates
- (7) Product_D:
- (8) Narrative
- (9) Serial Number
- (10) Tank_Sys_D:
- (11) Status:
- (12) Regulated:
- (13) Volume
- (14) Volume_U_D:

1.3.2.4 Other Features

- a. Other Infrastructure Features:

All newly constructed features require GIS deliverables. If a particular utility is being installed and has been omitted from this specification, the feature shall be deliverable under these guidelines. At a minimum the following will be required:

- (1) Subtype Id
- (2) Facility ID
- (3) Installation Date
- (4) Type/Description
- (5) Material
- (6) Drawing Number
- (7) Contract Number
- (8) Data Source:

1.3.2.5 Utilities

Locate as specified in The Collections of Geospatial Data and Collect GPS

data for each feature listed with survey grade accuracy and enter Domain data in compliance with the IGI&S database

Please note: All utility lines that can be currently located in MCB, Camp Lejeune GIS geodatabase that are to be demolished/removed within the specifications of this contract will be used to update the demolished line feature data set for that class. The existing spatial and non-spatial data will be copied into the demolished feature class. This information does not include Abandoned in Place (AIP) lines. Abandoned lines shall remain the in the existing data feature class and be attributed AIP.

1.3.2.6 Electrical Distribution

Please Note: MCB, Camp Lejeune's Complete Circuit ID list is available, please contract Government Project Manager for list which is provided by our Electrical Distribution shop in Public Works, MCB Camp Lejeune.

The following attributes shall be collected for each utility data class:

- a. Collect GPS data for all features listed with survey grade accuracy.
- b. Demolished Electrical Lines: CLJN.demolished_cable_line

Existing attribute information will be copied into the demolished feature class: Please add the following attribute data once updated.

- (1) Date
- (2) Drawing Number
- (3) Drawing Type
- (4) Contract Number
- (5) Data Source:

- c. Electrical Lines: CLJN.electrical_cable_line

Locate all Electrical Line data and collect the following attributes:

- (1) Subtype Identifier:
- (2) Disposition:
- (3) Subtype:
- (4) Date Acquired:
- (5) Conduit Size
- (6) Number of Phases
- (7) Insulation Material
- (8) Voltage
- (9) Size of Units
- (10) Substation ID
- (11) Circuit ID:
- (12) Contract Number
- (13) Drawing Number
- (14) Data Source:

- d. Electrical Meter: CLJN.electrical_meter_point

Locate, GPS and collect the following attributes:

- (1) Meter ID

- (2) Voltage
- (3) KW Rate
- (4) Number of Phases
- (5) Model Number
- (6) Date Acquired
- (7) Facility ID
- (8) Substation ID
- (9) Circuit ID:
- (10) X Coordinates
- (11) Y Coordinates
- (12) Contract Number
- (13) Drawing Number
- (14) Data Source:

e. Electrical Transformer: CLJN.elect_transformr_bank_point

Locate, GPS and collect the following attributes:

- (1) Subtype:
- (2) Date Installed
- (3) Primary Voltage
- (4) Secondary Voltage
- (5) Number of Transformers
- (6) Total KVA
- (7) Substation ID
- (8) Circuit ID:
- (9) KVA Information
- (10) X Coordinates
- (11) Y Coordinates
- (12) Contract Number
- (13) Drawing Number
- (14) Data Source:

f. Electrical Poles: CLJN.utility_pole_tower_point

Locate, GPS and collect the following attributes:

- (1) Pole No
- (2) Date Acquired:
- (3) Condition
- (4) Type:
- (5) Material
- (6) Pole Height
- (7) Units of Measure
- (8) Circuit ID
- (9) X Coordinates
- (10) Y Coordinates
- (11) Contract Number
- (12) Drawing Number
- (13) Data Source:

g. Exterior Lighting: CLJN. exterior_lighting_point

Locate, GPS and collect the following attributes:

- (1) Light Type
- (2) X Coordinates
- (3) Y Coordinates
- (4) Sensor:

- (5) Watts
- (6) Voltage
- (7) Circuit ID
- (8) Contract Number
- (9) Drawing Number
- (10) Date Acquired:
- (11) Data Source:

h. Electrical Switch: CLJN.electrical_switch_point

Locate, GPS and collect the following attributes:

- (1) Subtype ID:
- (2) Switch ID:
- (3) Disposition
- (4) Installation Type:
- (5) Switch Status:
- (6) Voltage
- (7) Circuit ID:
- (8) X Coordinates
- (9) Y Coordinates
- (10) Contract Number
- (11) Drawing Number
- (12) Data Source:

i. Electrical Regulator: CLJN.electrical_regulator_point

Locate, GPS and collect the following attributes:

- (1) Electrical Regulator ID:
- (2) Disposition
- (3) Regulator Type
- (4) Regulator Use
- (5) Primary Volts
- (6) Secondary Volts
- (7) Number of Taps
- (8) KV Rate
- (9) Fuse Type
- (10) Manufacture
- (11) Model Number
- (12) Circuit ID:
- (13) X Coordinates
- (14) Y Coordinates
- (15) Contract Number
- (16) Drawing Number
- (17) Data Source:

j. Electrical Manholes: CLJN.electrical_junction_point

Locate, GPS and collect the following attributes:

- (1) Subtype ID:
- (2) Type:
- (3) Number of Cables
- (4) Rim Elevation
- (5) Units of Elevation
- (6) Diameter
- (7) Diameter Units
- (8) X Coordinates

- (9) Y Coordinates
- (10) Sub Station ID
- (11) Contract Number
- (12) Drawing Number
- (13) Data Source:

k. Electrical Generators: CLJN.electrical_generator_point

Locate, GPS and collect the following attributes:

- (1) Generator ID
- (2) Disposition
- (3) KVA
- (4) KW Rate
- (5) Voltage
- (6) Fuel Type
- (7) Manufacture
- (8) Model
- (9) Serial Number
- (10) Circuit ID:
- (11) X Coordinates
- (12) Y Coordinates
- (13) Facility ID
- (14) Contract Number
- (15) Drawing Number
- (16) Data Source:

1.3.2.7 Substation

a. Substation: CLJN.CLJN.electrical_substation_point

Locate, GPS and collect the following attributes:

- (1) Disposition
- (2) Capacity Rate
- (3) Capacity Measure
- (4) Voltage In
- (5) Voltage Out
- (6) Number of transformer
- (7) Number of Spares
- (8) Number of Circuits
- (9) X Coordinates
- (10) Y Coordinates
- (11) Contract Number
- (12) Drawing Number
- (13) Data Source
- (14) Date Acquired

1.3.2.8 Steam Distribution

The following attributes shall be collected for each utility data class:
Collect GPS data for all features listed with survey grade accuracy.

a. Boiler: CLJN.heat_cool_boiler_site - If Required

Locate, GPS and collect the following attributes:

- (1) Date Acquired:
- (2) Disposition

- (3) Type
- (4) Capacity Heat
- (5) Capacity Units
- (6) Building ID: Facility Number where Boiler Resides
- (7) X Coordinates
- (8) Y Coordinates
- (9) Contract Number
- (10) Drawing Number
- (11) Data Source

b. Fitting: CLJN.heat_cool_fitting_point

Georeference fitting data and collect the following attributes:

- (1) Subtype ID:
- (2) Date Acquired:
- (3) Material
- (4) Size
- (5) Units
- (6) Line Diameter
- (7) Diameter in Units
- (8) X Coordinates
- (9) Y Coordinates
- (10) Contract Number
- (11) Drawing Number
- (12) Data Source:

c. Valves: CLJN.heat_cool_valve_point

Locate, GPS and collect the following attributes:

- (1) Data Acquired
- (2) Size
- (3) Size Units
- (4) Elevation
- (5) Elevation Units
- (6) Project ID
- (7) X Coordinates
- (8) Y Coordinates
- (9) Contract Number
- (10) Drawing Number
- (11) Data Source:

d. Manholes: CLJN.heat_cool_junction_point

Locate, GPS and collect the following attributes:

- (1) Sub Type ID:
- (2) Number of Valves
- (3) Number of Pipes
- (4) Width
- (5) Length
- (6) Diameter
- (7) Units for Measurements
- (8) Rim Elevations
- (9) Ground Elevation
- (10) Contract Number
- (11) Drawing Number
- (12) X Coordinates

- (13) Y Coordinates
- (14) Data Source:

e. Steam Line: CLJN.heat_cool_line

Locate, GPS and collect the following attributes:

- (1) Subtype ID: Condensate, Steam
- (2) Date Acquired:
- (3) Disposition
- (4) Use Underground, Overhead, Abandoned
- (5) Material
- (6) Size
- (7) Length
- (8) Size Units
- (9) Ground Elevation
- (10) Invert Elevation
- (11) Units for Elevation
- (12) Taped: Yes/No
- (13) Building ID - If service line indicate Building
- (14) Insulation Material
- (15) Size of Insulation
- (16) Size Units
- (17) Contract Number
- (18) Drawing Number
- (19) Data Source:

f. Demolished Steam Line: CLJN.demolished_heat_cool_line

Existing attribute information will be copied into the demolished feature class: Please add the following attribute data once updated.

- (1) Date
- (2) Drawing Number
- (3) Drawing Type
- (4) Contract Number
- (5) Data Source:

1.3.2.9 Storm Sewer

a. Storm Sewer Lines: CLJN.storm_sewer_line

Locate, GPS and collect the following attributes:

- (1) Date Acquired:
- (2) Use
- (3) Type
- (4) Material
- (5) Size
- (6) Diameters Units
- (7) Elevation
- (8) Elevation Units
- (9) Contract Number
- (10) Drawing Type
- (11) Drawing Number

b. Storm Sewer Drainage Line: CLJN.storm_sewer_open_drainage_line

Locate, GPS and collect the following attributes:

- (1) Date Acquired:
- (2) Disposition
- (3) Contract Number
- (4) Drawing Type
- (5) Drawing Number

c. Manhole: CLJN.storm_sewer_junction_point

Locate, GPS and collect the following attributes:

- (1) Subtype
- (2) X Coordinate
- (3) Y Coordinates
- (4) Contract Number
- (5) Drawing Type
- (6) Drawing Number

d. Inlet: CLJN.storm_sewer_inlet_point -

Locate, GPS and collect the following attributes: Contract shall verify SWPPP GPS inlet and add to this feature.

- (1) Subtype
- (2) Date Acquired
- (3) X Coordinates
- (4) Y Coordinates
- (5) Contract Number
- (6) Drawing Type
- (7) Drawing Number

e. Outfall: CLJN.storm_sewer_outfall_point

Locate, GPS and collect the following attributes:

- (1) Subtype Domain
- (2) Date Acquired:
- (3) Basin ID - contractor shall utilized existing data and coordinate Basin_ID with data manager
- (4) User_Flag
- (5) X Coordinates
- (6) Y Coordinates
- (7) Contract Number
- (8) Drawing Type
- (9) Drawing Number

f. Ponds, Basins, & Treatment Measures:

CLJN.storm_sewer_reservoir_areas

Locate, GPS and collect the following attributes:

- (1) Date Acquired:
- (2) Project ID:
- (3) Permit ID: SW8 XXXXXX
- (4) Size:
- (5) Facility ID:
- (6) Installation ID:
- (7) Drawing Type:

(8) Drawing Number:

1.3.2.10 Wastewater Collection

The following attributes shall be collected for each utility data class:
Collect GPS data for all features listed with survey grade accuracy.

a. Wastewater Lines: CLJN.wastewater_line

Locate, GPS and collect the following attributes:

- (1) Pipe ID: by Manhole number
- (2) Date Acquired
- (3) Use
- (4) Material
- (5) Size of Diameter
- (6) Units
- (7) Invert Elevation 1
- (8) Invert Elevation 2
- (9) Elevation Units
- (10) Slope
- (11) Slope Units:
- (12) Building ID: If building/facility service line indicate Building number that the line services
- (13) Contract Number
- (14) Drawing Number
- (15) Data Source:
- (16) Subtype:

b. Demolished Lines: CLJN.demolished_wastewater_line

Existing attribute information will be copied into the demolished feature class: Please add the following attribute data once updated.

- (1) Date
- (2) Drawing Number
- (3) Drawing Type
- (4) Contract Number
- (5) Data Source:

c. Fitting: CLJN.wastewater_fitting_point

Georeference Fitting data and collect the following attributes:

- (1) Subtype ID:
- (2) Date Acquired:
- (3) Type
- (4) Material
- (5) Size of Diameter
- (6) Units
- (7) User Flag: Named Area
- (8) Contract Number
- (9) Drawing Number
- (10) X Coordinates
- (11) Y Coordinates
- (12) Data Source:

d. Valves: CLJN.wastewater_valve_point

Locate, GPS and collect the following attributes:

- (1) Valves ID: Manhole Number associate with valve
- (2) Date Acquired:
- (3) Valve Style/Group:
- (4) Valve Use
- (5) Size in Diameter
- (6) Valve Elevation
- (7) Units of Elevation
- (8) X Coordinates
- (9) Y Coordinates
- (10) Manhole ID
- (11) Contract Number
- (12) Drawing Number
- (13) Data Source:

e. Manholes: CLJN.wastewater_junction_point

Locate, GPS and collect the following attributes:

- (1) Subtype ID: Manhole
- (2) Manhole ID: Each section of the base has a unique numbering system for manholes; please see Public Work, GIS office for details.
- (3) Use:
- (4) Type
- (5) Material
- (6) Number of Pipes in manhole
- (7) Rim Elevation
- (8) Invert Elevation
- (9) Elevations Units
- (10) Manhole Diameter
- (11) Diameter Units
- (12) X Coordinates
- (13) Y Coordinates
- (14) Date Acquired:
- (15) Contract Number
- (16) Drawing Number
- (17) Data Source:

f. Vent: CLJN.wastewater_vent_point

Locate, GPS and collect the following attributes:

- (1) Date Acquired:
- (2) Valve Style/Type:
- (3) Use:
- (4) Size in Diameters
- (5) Units in Diameters
- (6) X Coordinates
- (7) Y Coordinates
- (8) Subtype ID: AIR
- (9) Containment Type
- (10) Contract Number
- (11) Drawing Number
- (12) Data Source:

g. Pump Stations: CLJN.wastewater_pump_point

Locate, GPS and collect the following attributes:

- (1) Pump Station ID: Facility Number
 - (2) Date Acquired
- (3) Use
- (4) Type
 - (5) Cooling Method
 - (6) Rated Outflow Volume
 - (7) Flow Unit Measure Code
 - (8) X Coordinates
 - (9) Y Coordinates
 - (10) Number of Pumps
 - (11) Contract Number
 - (12) Drawing Number
 - (13) Data Source

h. Oil Water Separators: CLJN.wstewat_oil_wat_separatr_point

Locate, GPS and collect the following attributes:

- (1) Oil Water Separator ID: Facility Number
- (2) Date Acquired
- (3) Type
- (4) Separator Process
- (5) Separator Volume
- (6) Volume Units of Measure
- (7) Grit Chamber:
- (8) Flow Capacity
- (9) Flow Units
- (10) X Coordinates
- (11) Y Coordinates
- (12) Contract Number
- (13) Drawing Number
- (14) Data Source

i. Grease Trap: CLJN.wastewater_grease_trap_point

Locate, GPS and collect the following attributes:

- (1) Trap Identification: Nearest Facility use Number
- (2) Type of Trap
- (3) Material
- (4) Capacity Units
- (5) Manhole
- (6) Total Number of Laterals
- (7) Flow Rate
- (8) Flow Units
- (9) Building ID: Facility Number on associated Building
- (10) X Coordinates
- (11) Y Coordinates
- (12) Contract Number
- (13) Drawing Number
- (14) Data Source:

j. Septic Tank: CLJN.CLJN.wastewater_septic_tank_point

Locate, GPS and collect the following attributes:

- (1) Date Acquired:
- (2) Disposition
- (3) Tank Capacity
- (4) Contract Number
- (5) Drawing Number
- (6) Data Source:

1.3.2.11 Water Distribution

The following attributes shall be collected for each utility data class:
Collect GPS data for all features listed with survey grade accuracy.

a. Water Lines: CLJN.water_line

Locate, GPS and collect the following attributes:

- (1) Date Acquired
- (2) Use of Line
- (3) Disposition
- (4) Material
- (5) Size
- (6) Size Units
- (7) Pipe Length
- (8) Unit for Length Dimension
- (9) Taped
- (10) Source
- (11) All Invert Elevation information
- (12) Units of Measures
- (13) Contract Number
- (14) Drawing Number
- (15) Data Source
- (16) Subtype

b. Demolished Line: CLJN.demolished_water_line

Existing attribute information will be copied into the demolished feature class: Please add the following attribute data once updated.

- (1) Date
- (2) Drawing Number
- (3) Drawing Type
- (4) Contract Number
- (5) Data Source: Existing GIS Data

c. Water Meter: CLJN.water_meter_point

Locate, GPS and collect the following attributes:

- (1) Meter ID
- (2) Date Acquired:
- (3) Type
- (4) Installation Type
- (5) Building ID: Facility Number - If attached to Building
- (6) X Coordinates
- (7) Y Coordinates
- (8) Contract Number
- (9) Drawing Number
- (10) Data Source

d. Water Tank: CLJN.water_tank_point

Locate, GPS and collect the following attributes:

- (1) Tank ID: Facility Number
- (2) Date Acquired
- (3) Disposition
- (4) Tank Use
- (5) Tank Status
- (6) Tank Width
- (7) Tank Length
- (8) Tank Diameter
- (9) Ground Elevation
- (10) Tank Volume
- (11) Unit of measure in Gallons
- (12) Top Elevation
- (13) Overflow Elevation
- (14) Pressure High
- (15) Pressure Low
- (16) X Coordinates
- (17) Y Coordinates
- (18) Contract Number
- (19) Drawing Number
- (20) Data Source:

e. Water Valve: CLJN.water_valve_point

Locate, GPS and collect the following attributes:

- (1) Date Acquired:
- (2) Disposition
- (3) Use: Valve
- (4) Valve Status
- (5) Size
- (6) Size Units
- (7) Valve Elevation
- (8) Ground Elevation
- (9) Size Unit
- (10) Manhole ID
- (11) X Coordinates
- (12) Y Coordinates
- (13) Contract Number
- (14) Drawing Number
- (15) Data Source
- (16) subtype

f. Water Fitting: CLJN.water_fitting_point

Georeference and collect the following attributes:

- (1) Date Acquired
- (2) Disposition
- (3) Type
- (4) Material
- (5) Size
- (6) Size Units
- (7) Contract Number
- (8) Drawing Number

(9) Data Source

g. Water Well: CLJN.potable_water_well_point

Locate, GPS and collect the following attributes:

- (1) Well ID: Facility Number
- (2) Use: potable
- (3) Well Status
- (4) Station ID: Building Number
- (5) Date Acquired:
- (6) X Coordinates
- (7) Y Coordinates
- (8) Tank ID: Water Tank Facility Number
- (9) Contract Number
- (10) Drawing Number
- (11) Data Source:

h. Water Manhole: CLJN.water_junction_point

Locate, GPS and collect the following attributes:

- (1) Subtype
- (2) Use
- (3) Type
- (4) Material
- (5) Number Valves
- (6) Number Pipes
- (7) Installation Date
- (8) Size Diameter
- (9) Unit Diameter
- (10) X Coordinates
- (11) Y Coordinates
- (12) Contract Number
- (13) Drawing Number
- (14) Data Source:

i. Fire Hydrant: CLJN.water_fire_connection_point

Locate, GPS and collect the following attributes:

- (1) Hydrant ID: TBD by Fire Department
- (2) Date Acquired:
- (3) Disposition
- (4) Valve Connector Type
- (5) Valve Size:
- (6) Inlet Diameter
- (7) Units of measure
- (8) X Coordinates
- (9) Y Coordinates
- (10) Contract Number
- (11) Drawing Number
- (12) Data Source:

j. NON Potable Water Well: CLJN.non-potable_water_well_point

Locate, GPS and collect the following attributes:

- (1) Well ID: Facility Number

- (2) Use:
- (3) Well Status
- (4) Station ID: Building Number
- (5) Date Acquired:
- (6) X Coordinates
- (7) Y Coordinates
- (8) Tank ID: Water Tank Facility Number
- (9) Contract Number
- (10) Drawing Number
- (11) Data Source:

k. Other Utility Features: Failure to follow the specification outlined in this document will result in non-acceptance of data deliverable.

Geospatial data delivery does not replace as-built requirements

All newly constructed features require GIS deliverables.

- (1) Facility ID
- (2) Installation Date
- (3) Type/Description
- (4) Material
- (5) Size
- (6) Drawing Number
- (7) Contract Number
- (8) Data Source

1.3.2.12 Non-Compliance

Failure to follow the specification outlined in this document will result in non-acceptance of data deliverable.

Geospatial data delivery does not replace as-built requirements.

1.3.3 As-Built Record of Materials

Furnish a record of materials.

Where several manufacturers' brands, types, or classes of the item listed have been used in the project, designate specific areas where each item was used. Designations shall be keyed to the areas and spaces depicted on the contract drawing. Furnish the record of materials used in the following format:

MATERIALS DESIGNATION	SPECIFICATION	MANUFACTURER	MATERIALS USED (MANUFACTURER'S DESIGNATION)	WHERE USED
_____	_____	_____	_____	_____

1.3.4 Maximo Requirements

Submit maximo requirements as specified in Section 23 03 00 and 26 00 00.

1.4 EQUIPMENT/PRODUCT WARRANTIES

1.4.1 Equipment/Product Warranty List

Furnish to the Contracting Officer a bound and indexed notebook containing written warranties for equipment/products that have extended warranties (warranty periods exceeding the standard one-year warranty) furnished under the contract, and prepare a complete listing of such equipment/products. The equipment/products list shall state the specification section applicable to the equipment/product, duration of the warranty therefor, start date of the warranty, ending date of the warranty, and the point of contact for fulfillment of the warranty. The warranty period shall begin on the same date as project acceptance and shall continue for the full product warranty period. Execute the full list and deliver to the Contracting Officer prior to final acceptance of the facility.

1.4.2 Equipment Warranty Tags and Guarantor's Local Representative

Furnish with each warranty the name, address, and telephone number of the guarantor's representative nearest to the location where the equipment and appliances are installed. The guarantor's representative, upon request of the station representative, shall honor the warranty during the warranty period, and shall provide the services prescribed by the terms of the warranty. At the time of installation, tag each item of warranted equipment with a durable, oil- and water-resistant tag approved by the Contracting Officer. Attach tag with copper wire and spray with a clear silicone waterproof coating. Leave the date of acceptance and QC's signature blank until project is accepted for beneficial occupancy. Tag shall show the following information:

EQUIPMENT/PRODUCT WARRANTY TAG

Type of Equipment/Product _____
Warranty Period _____ From _____ To _____
Contract No. _____
Inspector's Signature _____ Date Accepted _____

Construction Contractor:
Name: _____
Address: _____
Telephone: _____

Warranty Contact: _____
Name: _____
Address: _____
Telephone: _____

STATION PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE

1.5 COMPLETE SUBMITTAL PACKAGE

Contractor shall make electronic copies of all submittals, including the transmittal sheet, and provide a CD/DVD containing all submittals for project close out.

The CD/DVD shall be marked "Complete Submittal Package - Contract # N40085-12-B-0066."

1.6 MECHANICAL TESTING AND BALANCING

All contract requirements of Section 23 73 33, "HEATING, VENTILATING, AND COOLING SYSTEM," 23 09 23.13 20, "BACnet DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC" shall be fully completed, including all testing, prior to contract completion date. In addition, all contract requirements of Section 23 05 92 "TESTING/ADJUSTING/BALANCING: SMALL HEATING/VENTILATING/COOLING SYSTEMS" shall be fully completed, including testing and inspection, prior to contract completion date, except as noted otherwise in Section 23 05 92. The time required to complete all work and testing as prescribed by Sections 23 73 33, 23 09 23.13 20, and 23 05 92 is included in the allotted calendar days for completion.

1.7 CLEANUP

Leave premises "broom clean." Clean interior and exterior glass surfaces exposed to view; remove temporary labels, stains and foreign substances; polish transparent and glossy surfaces; vacuum carpeted and soft surfaces. Clean equipment and fixtures to a sanitary condition. Clean filters of operating equipment. Clean debris from roofs, gutters, downspouts and drainage systems. Sweep paved areas and rake clean landscaped areas. Remove waste and surplus materials, rubbish and construction facilities from the site.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

07/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E 1971

(2005) Stewardship for the Cleaning of
Commercial and Institutional Buildings

1.2 SUBMISSION OF OPERATION AND MAINTENANCE DATA

Submit Operation and Maintenance (O&M) Data specifically applicable to this contract and a complete and concise depiction of the provided equipment, product, or system, stressing and enhancing the importance of system interactions, troubleshooting, and long-term preventative maintenance and operation. The subcontractors shall compile and prepare data and deliver to the Contractor prior to the training of Government personnel. The Contractor shall compile and prepare aggregate O&M data including clarifying and updating the original sequences of operation to as-built conditions. Organize and present information in sufficient detail to clearly explain O&M requirements at the system, equipment, component, and subassembly level. Include an index preceding each submittal. Submit in accordance with this section and Section 01 33 00 SUBMITTAL PROCEDURES.

1.2.1 Package Quality

Documents must be fully legible. Poor quality copies and material with hole punches obliterating the text or drawings will not be accepted.

1.2.2 Package Content

Data package content shall be as shown in the paragraph titled "Schedule of Operation and Maintenance Data Packages." Comply with the data package requirements specified in the individual technical sections, including the content of the packages and addressing each product, component, and system designated for data package submission, except as follows. Commissioned items without a specified data package requirement in the individual technical sections shall use Data Package 3 4 5. Commissioned items with a Data Package 1 or 2 requirement shall use instead Data Package 3 4 5.

1.2.3 Changes to Submittals

Manufacturer-originated changes or revisions to submitted data shall be furnished by the Contractor if a component of an item is so affected subsequent to acceptance of the O&M Data. Changes, additions, or revisions required by the Contracting Officer for final acceptance of submitted data, shall be submitted by the Contractor within 30 calendar days of the

notification of this change requirement.

1.2.4 O&M Database

Develop a database from the O&M manuals that contains the information required to start a preventative maintenance program.

1.3 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES

1.3.1 Operating Instructions

Include specific instructions, procedures, and illustrations for the following phases of operation for the installed model and features of each system:

1.3.1.1 Safety Precautions

List personnel hazards and equipment or product safety precautions for all operating conditions.

1.3.1.2 Operator Prestart

Include procedures required to install, set up, and prepare each system for use.

1.3.1.3 Startup, Shutdown, and Post-Shutdown Procedures

Provide narrative description for Startup, Shutdown and Post-shutdown operating procedures including the control sequence for each procedure.

1.3.1.4 Normal Operations

Provide narrative description of Normal Operating Procedures. Include Control Diagrams with data to explain operation and control of systems and specific equipment.

1.3.1.5 Emergency Operations

Include Emergency Procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Include Emergency Shutdown Instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance and procedures for emergency operation of all utility systems including required valve positions, valve locations and zones or portions of systems controlled.

1.3.1.6 Operator Service Requirements

Include instructions for services to be performed by the operator such as lubrication, adjustment, inspection, and recording gage readings.

1.3.1.7 Environmental Conditions

Include a list of Environmental Conditions (temperature, humidity, and other relevant data) that are best suited for the operation of each product, component or system. Describe conditions under which the item equipment should not be allowed to run.

1.3.2 Preventive Maintenance

Include the following information for preventive and scheduled maintenance to minimize corrective maintenance and repair for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

1.3.2.1 Lubrication Data

Include preventative maintenance lubrication data, in addition to instructions for lubrication provided under paragraph titled "Operator Service Requirements":

- a. A table showing recommended lubricants for specific temperature ranges and applications.
- b. Charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities.
- c. A Lubrication Schedule showing service interval frequency.

1.3.2.2 Preventive Maintenance Plan and Schedule

Include manufacturer's schedule for routine preventive maintenance, inspections, tests and adjustments required to ensure proper and economical operation and to minimize corrective maintenance. Provide manufacturer's projection of preventive maintenance work-hours on a daily, weekly, monthly, and annual basis including craft requirements by type of craft. For periodic calibrations, provide manufacturer's specified frequency and procedures for each separate operation.

1.3.2.3 Cleaning Recommendations

Provide environmentally preferable cleaning recommendations in accordance with ASTM E 1971.

1.3.3 Corrective Maintenance (Repair)

Include manufacturer's recommended procedures and instructions for correcting problems and making repairs for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

1.3.3.1 Troubleshooting Guides and Diagnostic Techniques

Include step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.

1.3.3.2 Wiring Diagrams and Control Diagrams

Wiring diagrams and control diagrams shall be point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams, number electrical and electronic wiring and pneumatic control tubing and the terminals for each type, identically to

actual installation configuration and numbering.

1.3.3.3 Maintenance and Repair Procedures

Include instructions and a list of tools required to repair or restore the product or equipment to proper condition or operating standards.

1.3.3.4 Removal and Replacement Instructions

Include step-by-step procedures and a list required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Instructions shall include a combination of text and illustrations.

1.3.3.5 Spare Parts and Supply Lists

Include lists of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays. Special consideration is required for facilities at remote locations. List spare parts and supplies that have a long lead-time to obtain.

1.3.4 Corrective Maintenance Work-Hours

Include manufacturer's projection of corrective maintenance work-hours including requirements by type of craft. Corrective maintenance that requires completion or participation of the equipment manufacturer shall be identified and tabulated separately.

1.3.5 Appendices

Provide information required below and information not specified in the preceding paragraphs but pertinent to the maintenance or operation of the product or equipment. Include the following:

1.3.5.1 Product Submittal Data

Provide a copy of all SD-03 Product Data submittals required in the applicable technical sections.

1.3.5.2 Manufacturer's Instructions

Provide a copy of all SD-08 Manufacturer's Instructions submittals required in the applicable technical sections.

1.3.5.3 O&M Submittal Data

Provide a copy of all SD-10 Operation and Maintenance Data submittals required in the applicable technical sections.

1.3.5.4 Parts Identification

Provide identification and coverage for all parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and

exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing shall show the index, reference, or key number that will cross-reference the illustrated part to the listed part. Parts shown in the listings shall be grouped by components, assemblies, and subassemblies in accordance with the manufacturer's standard practice. Parts data may cover more than one model or series of equipment, components, assemblies, subassemblies, attachments, or accessories, such as typically shown in a master parts catalog

1.3.5.5 Warranty Information

List and explain the various warranties and clearly identify the servicing and technical precautions prescribed by the manufacturers or contract documents in order to keep warranties in force. Include warranty information for primary components such as the compressor of air conditioning system.

1.3.5.6 Personnel Training Requirements

Provide information available from the manufacturers that is needed for use in training designated personnel to properly operate and maintain the equipment and systems.

1.3.5.7 Testing Equipment and Special Tool Information

Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components.

1.3.5.8 Testing and Performance Data

Include completed prefunctional checklists, functional performance test forms, and monitoring reports. Include recommended schedule for retesting and blank test forms.

1.3.5.9 Contractor Information

Provide a list that includes the name, address, and telephone number of the General Contractor and each Subcontractor who installed the product or equipment, or system. For each item, also provide the name address and telephone number of the manufacturer's representative and service organization that can provide replacements most convenient to the project site. Provide the name, address, and telephone number of the product, equipment, and system manufacturers.

1.4 TYPES OF INFORMATION REQUIRED IN CONTROLS O&M DATA PACKAGES

Include Data Package 5 and the following for control systems:

- a. Narrative description on how to perform and apply all functions, features, modes, and other operations, including unoccupied operation, seasonal changeover, manual operation, and alarms. Include detailed technical manual for programming and customizing control loops and algorithms.
- b. Full as-built sequence of operations.
- c. Copies of all checkout tests and calibrations performed by the

Contractor (not Cx tests).

d. Full points list. A listing of rooms shall be provided with the following information for each room:

- (1) Floor
- (2) Room number
- (3) Room name
- (4) Air handler unit ID
- (5) Reference drawing number
- (6) Air terminal unit tag ID
- (7) Heating and/or cooling valve tag ID
- (8) Minimum cfm
- (9) Maximum cfm

e. Full print out of all schedules and set points after testing and acceptance of the system.

f. Full as-built print out of software program.

g. Electronic copy on disk or CD of the entire program for this facility.

h. Marking of all system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.

1.5 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

Furnish the O&M data packages specified in individual technical sections. The required information for each O&M data package is as follows:

1.5.1 Data Package 1

- a. Safety precautions
- b. Cleaning recommendations
- c. Maintenance and repair procedures
- d. Warranty information
- e. Contractor information
- f. Spare parts and supply list

1.5.2 Data Package 2

- a. Safety precautions
- b. Normal operations

- c. Environmental conditions
- d. Lubrication data
- e. Preventive maintenance plan and schedule
- f. Cleaning recommendations
- g. Maintenance and repair procedures
- h. Removal and replacement instructions
- i. Spare parts and supply list
- j. Parts identification
- k. Warranty information
- l. Contractor information

1.5.3 Data Package 3

- a. Safety precautions
- b. Operator prestart
- c. Startup, shutdown, and post-shutdown procedures
- d. Normal operations
- e. Emergency operations
- f. Environmental conditions
- g. Lubrication data
- h. Preventive maintenance plan and schedule
- i. Cleaning recommendations
- j. Troubleshooting guides and diagnostic techniques
- k. Wiring diagrams and control diagrams
- l. Maintenance and repair procedures
- m. Removal and replacement instructions
- n. Spare parts and supply list
- o. Product submittal data
- p. O&M submittal data
- q. Parts identification
- r. Warranty information
- s. Testing equipment and special tool information

- t. Testing and performance data
- u. Contractor information

1.5.4 Data Package 4

- a. Safety precautions
- b. Operator prestart
- c. Startup, shutdown, and post-shutdown procedures
- d. Normal operations
- e. Emergency operations
- f. Operator service requirements
- g. Environmental conditions
- h. Lubrication data
- i. Preventive maintenance plan and schedule
- j. Cleaning recommendations
- k. Troubleshooting guides and diagnostic techniques
- l. Wiring diagrams and control diagrams
- m. Maintenance and repair procedures
- n. Removal and replacement instructions
- o. Spare parts and supply list
- p. Corrective maintenance man-hours
- q. Product submittal data
- r. O&M submittal data
- s. Parts identification
- t. Warranty information
- u. Personnel training requirements
- v. Testing equipment and special tool information
- w. Testing and performance data
- x. Contractor information

1.5.5 Data Package 5

- a. Safety precautions

- b. Operator prestart
- c. Start-up, shutdown, and post-shutdown procedures
- d. Normal operations
- e. Environmental conditions
- f. Preventive maintenance plan and schedule
- g. Troubleshooting guides and diagnostic techniques
- h. Wiring and control diagrams
- i. Maintenance and repair procedures
- j. Removal and replacement instructions
- k. Spare parts and supply list
- l. Product submittal data
- m. Manufacturer's instructions
- n. O&M submittal data
- o. Parts identification
- p. Testing equipment and special tool information
- q. Warranty information
- r. Testing and performance data
- s. Contractor information

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 02 41 00

DEMOLITION

05/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI Guideline K (2009) Guideline for Containers for Recovered Non-Flammable Fluorocarbon Refrigerants

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.6 (2006) Safety Requirements for Demolition Operations

ASTM INTERNATIONAL (ASTM)

ASTM F 710 (2008) Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

CARPET AND RUG INSTITUTE (CRI)

CRI 104 (2002) Standard for Installation Specification of Commercial Carpet

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2008; Errata 1-2010; Changes 1-3 2010; Changes 4-6 2011) Safety and Health Requirements Manual

U.S. DEFENSE LOGISTICS AGENCY (DLA)

DLA 4145.25 (June 2000) Storage and Handling of Liquefied and Gaseous Compressed Gases and Their Full and Empty Cylinders

U.S. DEPARTMENT OF DEFENSE (DOD)

DOD 4000.25-1-M (2004) Military Standard Requisitioning and Issue Procedures

MIL-STD-129 (2007; Rev P; Change 4) Military Marking for Shipment and Storage

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 61	National Emission Standards for Hazardous Air Pollutants
40 CFR 82	Protection of Stratospheric Ozone
49 CFR 173.301	Shipment of Compressed Gases in Cylinders and Spherical Pressure Vessels

1.2 PROJECT DESCRIPTION

1.2.1 Demolition/Deconstruction Plan

Prepare a [Demolition Plan](#) and submit proposed demolition, and removal procedures for approval before work is started. Include in the plan procedures for coordination with other work in progress, a detailed description of methods and equipment to be used for each operation and of the sequence of operations. Coordinate with Waste Management Plan. Include statements affirming Contractor inspection of the existing roof deck and its suitability to perform as a safe working platform or if inspection reveals a safety hazard to workers, state provisions for securing the safety of the workers throughout the performance of the work. Provide procedures for safe conduct of the work in accordance with [EM 385-1-1](#). Plan shall be approved by Contracting Officer prior to work beginning.

1.2.2 General Requirements

Do not begin demolition or deconstruction until authorization is received from the Contracting Officer. [The work of this section is to be performed in a manner that maximizes salvage and recycling of materials.](#) Remove rubbish and debris from the station daily; do not allow accumulations inside or outside the building. The work includes demolition, and removal of resulting rubbish and debris. Remove rubbish and debris from Government property daily, unless otherwise directed. Store materials that cannot be removed daily in areas specified by the Contracting Officer. In the interest of occupational safety and health, perform the work in accordance with [EM 385-1-1](#), Section 23, Demolition, and other applicable Sections.

1.3 ITEMS TO REMAIN IN PLACE

Take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government. Repair or replace damaged items as approved by the Contracting Officer. Coordinate the work of this section with all other work indicated. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract. Do not overload structural elements [and](#) pavements to remain. Provide new supports and reinforcement for existing construction weakened by demolition, deconstruction, or removal work. Repairs, reinforcement, or structural replacement require approval by the Contracting Officer prior to performing such work.

1.3.1 Existing Construction Limits and Protection

Do not disturb existing construction beyond the extent indicated or

necessary for installation of new construction. Provide temporary shoring and bracing for support of building components to prevent settlement or other movement. Provide protective measures to control accumulation and migration of dust and dirt in all work areas. Remove dust, dirt, and debris from work areas daily.

1.3.2 Weather Protection

For portions of the building to remain, protect building interior and materials and equipment from the weather at all times. Where removal of existing roofing is necessary to accomplish work, have materials and workmen ready to provide adequate and temporary covering of exposed areas.

1.3.3 Trees

Protect trees within the project site which might be damaged during demolition or deconstruction, and which are indicated to be left in place, by a 6 foot high fence. Erect and secure fence a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Replace any tree designated to remain that is damaged during the work under this contract with like-kind or as approved by the Contracting Officer.

1.3.4 Utility Service

Maintain existing utilities indicated to stay in service and protect against damage during demolition and deconstruction operations. Prior to start of work, utilities serving each area of alteration or removal will be shut off by the Government and disconnected and sealed by the Contractor.

1.3.5 Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities. Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, must remain standing without additional bracing, shoring, or lateral support until demolished or deconstructed, unless directed otherwise by the Contracting Officer. Ensure that no elements determined to be unstable are left unsupported and place and secure bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract.

1.4 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

1.5 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Existing Conditions;

SD-07 Certificates

Demolition Plan;

Notification

SD-11 Closeout Submittals

Receipts

1.6 QUALITY ASSURANCE

Furnish timely notification of demolition and renovation projects to Federal, State, regional, and local authorities in accordance with 40 CFR 61, Subpart M. Notify the State's environmental protection agency and local air pollution control district/agency and the Contracting Officer in writing 10 working days prior to the commencement of work in accordance with 40 CFR 61, Subpart M. Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," conform to the safety requirements contained in ASSE/SAFE A10.6. Comply with the Environmental Protection Agency requirements specified. Use of explosives will not be permitted.

1.6.1 Dust and Debris Control

Prevent the spread of dust and debris and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution. Vacuum and dust the work area daily.

1.7 PROTECTION

1.7.1 Traffic Control Signs

a. Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights. Notify the Contracting Officer prior to beginning such work.

1.7.2 Protection of Personnel

Before, during and after the demolition work continuously evaluate the condition of the structure and the work being demolished and take immediate action to protect all personnel working in and around the project site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

1.8 RELOCATIONS

Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Items to be relocated which are damaged by the Contractor shall be repaired or replaced with new undamaged items as approved by the Contracting Officer.

1.9 EXISTING CONDITIONS

Before beginning any demolition or deconstruction work, survey the site and examine the drawings and specifications to determine the extent of the work. Record existing conditions in the presence of the Contracting Officer showing the condition of structures and other facilities adjacent to areas of alteration or removal. Photographs sized 4 inch will be acceptable as a record of existing conditions. Include in the record the elevation of the top of foundation walls, finish floor elevations, possible conflicting electrical conduits, plumbing lines, alarms systems, the location and extent of existing cracks and other damage and description of surface conditions that exist prior to before starting work. It is the Contractor's responsibility to verify and document all required outages which will be required during the course of work, and to note these outages on the record document.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

Inspect and evaluate existing structures onsite for reuse. Existing construction scheduled to be removed for reuse shall be disassembled. Dismantled and removed materials are to be separated, set aside, and prepared as specified, and stored or delivered to a collection point for reuse, remanufacture, recycling, or other disposal, as specified. Materials shall be designated for reuse onsite whenever possible.

3.1.1 Utilities and Related Equipment

3.1.1.1 General Requirements

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the Contracting Officer. Do not interrupt existing utilities serving facilities occupied and used by the Government except when approved in writing and then only after temporary utility services have been approved and provided. Do not begin demolition or deconstruction work until all utility disconnections have been made. Shut off and cap utilities for future use, as indicated.

3.1.1.2 Disconnecting Existing Utilities

Remove existing utilities, as indicated, and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Contracting Officer. When utility lines are encountered but are not indicated on the drawings, notify the Contracting Officer prior to further work in that area.

3.1.2 Paving and Slabs

Remove concrete and asphaltic concrete paving and slabs including aggregate base as indicated to a depth of 16 inches below new finish grade. Provide neat sawcuts at limits of pavement removal as indicated. Pavement and slabs not to be used in this project shall be removed from the Installation at Contractor's expense.

3.1.3 Roofing

Remove existing roof system and associated components in their entirety down to existing roof deck. Cut existing felts and insulation along straight lines. Remove roofing system and insulation without damaging the roof deck. Sequence work to minimize building exposure between demolition and new roof materials installation.

3.1.3.1 Temporary Roofing

Install temporary roofing and flashing as necessary to maintain a watertight condition throughout the course of the work. Remove temporary work prior to installation of permanent roof system materials unless approved otherwise by the Contracting Officer. Make provisions for worker safety during demolition and installation of new materials as described in paragraphs entitled "Statements" and "Regulatory and Safety Requirements."

3.1.3.2 Reroofing

When removing the existing roofing system from the roof deck, remove only as much roofing as can be recovered by the end of the work day, unless approved otherwise by the Contracting Officer. Do not attempt to open the roof covering system in threatening weather. Reseal all openings prior to suspension of work the same day.

3.1.4 Masonry

Sawcut and remove masonry so as to prevent damage to surfaces to remain, and to facilitate the installation of new work. Where new masonry adjoins existing, the new work shall abut or tie into the existing construction as specified for the new work. Provide square, straight edges and corners where existing masonry adjoins new work and other locations.

3.1.5 Concrete

Saw concrete along straight lines to a depth of a minimum 2 inch. Make each cut in walls perpendicular to the face and in alignment with the cut in the opposite face. Break out the remainder of the concrete provided that the broken area is concealed in the finished work, and the remaining concrete is sound. At locations where the broken face cannot be concealed, grind smooth or saw cut entirely through the concrete.

3.1.6 Miscellaneous Metal

Scrap metal shall become the Contractor's property. Recycle scrap metal as part of demolition and deconstruction operations. Provide separate containers to collect scrap metal and transport to a scrap metal collection or recycling facility, in accordance with the Waste Management Plan.

3.1.7 Flooring Adhesive Removal

Remove existing resilient floor covering, quarry or paver tile, all traces of old adhesives, paint or other contaminants. Do not sand, dry sweep, dry scrape, drill, saw, beadblast, or mechanically chip or pulverize existing resilient flooring, backing lining felt, asphaltic "cutback" adhesive, or other adhesive. Do not use solvents.

Flooring adhesive removal shall adhere to the following guidelines:

- a. The use of Hydrocarbon Petrochemical products or Solvents of any kind are prohibited and banned from use on this project.
- b. MSDS Sheets for products proposed for use must be submitted for approval 15 working days prior to use.
- c. RFCI (The Resilient Floor Covering Institute) methods must be adhered to.
- d. Concrete subfloor must free of any bond breakers or sealers of any kind.
- e. ASTM F 710 Standards apply.

3.1.8 Carpet

Remove existing carpet for reclamation in accordance with manufacturer recommendations and as follows. Remove used carpet in large pieces, roll tightly, and pack neatly in a container. Remove adhesive according to recommendations of the Carpet and Rug Institute (CRI). Adhesive removal solvents shall comply with CRI 104, with the exception that adhesive removal solvents shall not be used. Recycle removed carpet cushion.

3.1.9 Acoustic Ceiling Tile

Remove, neatly stack, and recycle acoustic ceiling tiles. Recycling may be available with manufacturer. Otherwise, priority shall be given to a local recycling organization.

3.1.10 Patching

Where removals leave holes and damaged surfaces exposed in the finished work, patch and repair these holes and damaged surfaces to match adjacent finished surfaces, using on-site materials when available. Where new work is to be applied to existing surfaces, perform removals and patching in a manner to produce surfaces suitable for receiving new work. Finished surfaces of patched area shall be flush with the adjacent existing surface and shall match the existing adjacent surface as closely as possible as to texture and finish. Patching shall be as specified and indicated, and shall include:

- a. Concrete and Masonry: Completely fill holes and depressions, caused by previous physical damage or left as a result of removals in existing masonry walls to remain, with an approved masonry patching material, applied in accordance with the manufacturer's printed instructions.
- b. Where existing partitions have been removed leaving damaged or missing resilient tile flooring, patch to match the existing floor tile.
- c. Patch acoustic lay-in ceiling where partitions have been removed. The transition between the different ceiling heights shall be effected by continuing the higher ceiling level over to the first runner on the lower ceiling and closing the vertical opening with a painted sheet metal strip.

3.1.11 Air Conditioning Equipment

Remove air conditioning, refrigeration, and other equipment containing refrigerants without releasing chlorofluorocarbon refrigerants to the atmosphere in accordance with the Clean Air Act Amendment of 1990. Recover all refrigerants prior to removing air conditioning, refrigeration, and other equipment containing refrigerants and dispose of in accordance with the paragraph entitled "Disposal of Ozone Depleting Substance (ODS)." Turn in salvaged Class I ODS refrigerants as specified in paragraph, "Salvaged Materials and Equipment."

3.1.12 Locksets on Swinging Doors

Remove all locksets from all swinging doors indicated to be removed and disposed of. Deliver the locksets and related items to a designated location for receipt by the Contracting Officer after removal.

3.1.13 Mechanical Equipment and Fixtures

Disconnect mechanical hardware at the nearest connection to existing services to remain, unless otherwise noted. Disconnect mechanical equipment and fixtures at fittings. Remove service valves attached to the unit.

3.1.13.1 Preparation for Storage

Remove water, dirt, dust, and foreign matter from units; tanks, piping and fixtures shall be drained; interiors, if previously used to store flammable, explosive, or other dangerous liquids, shall be steam cleaned. Seal openings with caps, plates, or plugs. Secure motors attached by flexible connections to the unit. Change lubricating systems with the proper oil or grease.

3.1.13.2 Piping

Disconnect piping at unions, flanges and valves, and fittings as required to reduce the pipe into straight lengths for practical storage. Store salvaged piping according to size and type. If the piping that remains can become pressurized due to upstream valve failure, end caps, blind flanges, or other types of plugs or fittings with a pressure gage and bleed valve shall be attached to the open end of the pipe to ensure positive leak control. Carefully dismantle piping that previously contained gas, gasoline, oil, or other dangerous fluids, with precautions taken to prevent injury to persons and property. Store piping outdoors until all fumes and residues are removed. Box prefabricated supports, hangers, plates, valves, and specialty items according to size and type. Wrap sprinkler heads individually in plastic bags before boxing. Classify piping not designated for salvage, or not reusable, as scrap metal.

3.1.13.3 Ducts

Classify removed duct work as scrap metal.

3.1.13.4 Fixtures, Motors and Machines

Remove fixtures, motors and machines associated with plumbing, heating, air conditioning, refrigeration, and other mechanical system installations. Classify non-porcelain broken, damaged, or otherwise unserviceable units and not caused to be broken, damaged, or otherwise

unserviceable as debris to be disposed of by the Contractor. Salvage and crush porcelain plumbing fixtures unsuitable for reuse.

3.1.14 Electrical Equipment and Fixtures

Disconnect primary, secondary, control, communication, and signal circuits at the point of attachment to their distribution system.

3.1.14.1 Fixtures

Remove electrical fixtures.

3.1.14.2 Electrical Devices

Remove switches, switchgear, transformers, conductors including wire and nonmetallic sheathed and flexible armored cable, regulators, meters, instruments, plates, circuit breakers, panelboards, outlet boxes, and similar items.

3.1.14.3 Wiring Ducts or Troughs

Remove wiring ducts or troughs. Dismantle plug-in ducts and wiring troughs into unit lengths. Remove plug-in or disconnecting devices from the busway and store separately.

3.1.14.4 Conduit and Miscellaneous Items

If indicated on the drawings, salvage conduit except where embedded in concrete or masonry. Consider corroded, bent, or damaged conduit as scrap metal. Sort straight and undamaged lengths of conduit according to size and type. Classify supports, knobs, tubes, cleats, and straps as debris to be removed and disposed.

3.1.15 Items With Unique/Regulated Disposal Requirements

Remove and dispose of items with unique or regulated disposal requirements in the manner dictated by law or in the most environmentally responsible manner.

3.2 DISPOSITION OF MATERIAL

3.2.1 Title to Materials

Except for salvaged items specified in related Sections, and for materials or equipment scheduled for salvage, all materials and equipment removed and not reused or salvaged, shall become the property of the Contractor and shall be removed from Government property. Title to materials resulting from demolition and deconstruction, and materials and equipment to be removed, is vested in the Contractor upon approval by the Contracting Officer of the Contractor's demolition, deconstruction, and removal procedures, and authorization by the Contracting Officer to begin demolition and deconstruction. The Government will not be responsible for the condition or loss of, or damage to, such property after contract award. Showing for sale or selling materials and equipment on site is prohibited.

3.2.2 Reuse of Materials and Equipment

Remove and store materials and equipment indicated to be reused or

relocated to prevent damage, and reinstall as the work progresses.

3.2.3 Disposal of Ozone Depleting Substance (ODS)

Class I and Class II ODS are defined in Section, 602(a) and (b), of The Clean Air Act. Prevent discharge of Class I and Class II ODS to the atmosphere. Place recovered ODS in cylinders meeting [AHRI Guideline K](#) suitable for the type ODS (filled to no more than 80 percent capacity) and provide appropriate labeling. Recovered ODS shall be removed from Government property and disposed of in accordance with [40 CFR 82](#). Products, equipment and appliances containing ODS in a sealed, self-contained system (e.g. residential refrigerators and window air conditioners) shall be disposed of in accordance with [40 CFR 82](#). Submit [Receipts](#) or bills of lading, as specified. Submit a shipping receipt or bill of lading for all containers of ozone depleting substance (ODS) shipped to the Defense Depot, Richmond, Virginia.

3.2.3.1 Special Instructions

No more than one type of ODS is permitted in each container. A warning/hazardous label shall be applied to the containers in accordance with Department of Transportation regulations. All cylinders including but not limited to fire extinguishers, spheres, or canisters containing an ODS shall have a tag with the following information:

- a. Activity name and unit identification code
- b. Activity point of contact and phone number
- c. Type of ODS and pounds of ODS contained
- d. Date of shipment
- e. Naval stock number (for information, call (804) 279-4525).

3.2.3.2 Fire Suppression Containers

Deactivate fire suppression system cylinders and canisters with electrical charges or initiators prior to shipment. Also, safety caps must be used to cover exposed actuation mechanisms and discharge ports on these special cylinders.

3.2.4 Transportation Guidance

Ship all ODS containers in accordance with [MIL-STD-129](#), [DLA 4145.25](#) (also referenced one of the following: Army Regulation 700-68, Naval Supply Instruction 4440.128C, Marine Corps Order 10330.2C, and Air Force Regulation 67-12), [49 CFR 173.301](#), and [DOD 4000.25-1-M](#).

3.3 CLEANUP

Remove debris and rubbish from basement and similar excavations. Remove and transport the debris in a manner that prevents spillage on streets or adjacent areas. Apply local regulations regarding hauling and disposal.

3.4 DISPOSAL OF REMOVED MATERIALS

3.4.1 Regulation of Removed Materials

Dispose of debris, rubbish, scrap, and other nonsalvageable materials resulting from removal operations with all applicable federal, state and local regulations as contractually specified by removing from Marine Corps Base, Camp Lejeune.

3.4.2 Burning on Government Property

Burning of materials removed from demolished and deconstructed structures will not be permitted on Government property.

3.4.3 Removal to Spoil Areas on Government Property

Transport noncombustible materials removed from demolition and deconstruction structures to designated spoil areas on Government property.

3.4.4 Removal from Government Property

Transport waste materials removed from demolished and deconstructed structures, except waste soil, from Government property for legal disposal. Dispose of waste soil as directed.

3.5 REUSE OF SALVAGED ITEMS

Recondition salvaged materials and equipment designated for reuse before installation. Replace items damaged during removal and salvage operations or restore them as necessary to usable condition.

-- End of Section --

SECTION 02 82 16

REMOVAL AND DISPOSAL OF ASBESTOS MATERIALS
(CAMP LEJEUNE COMPLEX)

03/10

PART 1 GENERAL

1.1 APPLICABLE NORTH CAROLINA LAW

North Carolina State General Statutes 130A, Article 19-444-452 and 10A North Carolina Administrative Chapter (NCAC) 41C .0600 through .0611.

1.1.1 N.C. (DHHS-HHCU) Asbestos Accreditation

All personnel involved in asbestos removal shall be currently accredited for asbestos removal by N.C. (DHHS-HHCU). An application for accreditation may be requested from the State of North Carolina, Health Hazards Control Unit, Department of Health and Human Services, Division of Public Health, ; 1912 Mail Service Center, Raleigh, NC 27699-1912; (919) 707-5950. Out of State accreditation will not be accepted.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z88.2 (1992) Respiratory Protection

ASTM INTERNATIONAL (ASTM)

ASTM C 732 (1995) Aging Effects of Artificial Weathering on Latex Sealants

ASTM D 1331 (1989; R 1995) Surface and Interfacial Tension of Solutions of Surface-Active Agents

ASTM E 84 (2011b) Standard Test Method for Surface Burning Characteristics of Building Materials

ASTM E 96 (1997; Rev A) Water Vapor Transmission of Materials

ASTM E 119 (2011) Standard Test Methods for Fire Tests of Building Construction and Materials

ASTM E 736 (1992) Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members

ASTM E 1368 (1997) Visual Inspection of Asbestos Abatement Projects

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.103 Respiratory Protection

29 CFR 1926.59 Hazard Communication

29 CFR 1926.1101 Asbestos

40 CFR 61, SUBPART A General Provisions

40 CFR 61, SUBPART M National Emission Standard for Hazardous Air Pollutants

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 560/5-85-024 (1985) Guidance for Controlling Asbestos Containing Materials in Buildings

EPA SW-846 (Rev O; Updates I, II, IIA, IIB, and III) Test Methods for Evaluating Solid Waste (Vol IA, IB, IC, and II)

UNDERWRITERS LABORATORIES (UL)

UL 586 (1996; Rev thru Aug 1999) High-Efficiency, Particulate, Air Filter Units

1.3 DEFINITIONS

1.3.1 Asbestos Containing Material (ACM)

All building materials that have more than 1% of chrysotile, amosite, crocidolite, tremolite, anthophyllite, or any other form of asbestos in the serpentine or anthobole class.

1.3.2 Action Level/Permissive Exposure Limit (PEL)

An airborne concentration of asbestos fibers, in the breathing zone of a worker equaling 0.1 fibers per cubic centimeter of air calculated as an 8-hour time weighted average.

1.3.3 Amended Water

Water containing a wetting agent or surfactant with a surface tension of 29 dynes per square centimeter when tested in accordance with ASTM D 1331 shall be utilized. In the event where wetting operations are suspended due to freezing temperatures, the operator or abatement contractor shall record the temperature on Form DHHS 3787..

1.3.4 Area Sampling

Sampling of asbestos fiber concentrations within the asbestos control area and outside the asbestos control area which approximates the concentrations of asbestos in the theoretical breathing zone but is not actually collected in the breathing zone of an employee.

1.3.5 Asbestos

The term asbestos includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite and any of these minerals that has been chemically treated or altered. Materials are considered to contain asbestos if the asbestos content is more than 1% of the material by area.

1.3.6 Asbestos Control Area

That area where asbestos removal operations are performed which is isolated by physical boundaries which assist in the prevention of the uncontrolled release of asbestos dust, fibers, or debris. Two examples of an asbestos control area are: a full containment and a "glovebag."

1.3.7 Asbestos Fibers

Those fibers having an aspect ratio of at least 3:1 and longer than 5 micrometers as determined by National Institute for Occupational Safety and Health (NIOSH) Method 7400.

1.3.8 Asbestos Permissible Exposure Limit

0.1 fibers per cubic centimeter of air as an 8-hour time weighted average as defined by 29 CFR 1926.1101 or other federal legislation having legal jurisdiction for the protection of workers health.

1.3.9 Background

Normal airborne asbestos concentration in an area similar to the asbestos abatement area but in an uncontaminated (with asbestos) state.

1.3.10 Contractor

The Contractor is that individual, or entity under contract to the Navy to perform the herein listed work.

1.3.11 Encapsulants

Specific materials in various forms used to chemically entrap asbestos fibers in various configurations to prevent these fibers from becoming airborne. There are four types of encapsulants as follows which must comply with performance requirements as specified herein.

- a. Removal Encapsulant (can be used as a wetting agent)
- b. Bridging Encapsulant (used to provide a tough, durable surface coating to asbestos containing material)
- c. Penetrating Encapsulant (used to penetrate the asbestos containing material down to substrate, encapsulating all asbestos fibers)
- d. Lock-Down Encapsulant (used to seal off or "lock-down" minute asbestos fibers left on surfaces from which asbestos containing material has been removed)

1.3.12 Friable Asbestos Material

Material that contains more than 1% asbestos by area and that can be crumbled, pulverized, or reduced to powder by hand pressure when dry.

1.3.13 Full Containment

Those engineering control techniques described in 29 CFR 1926.1101 for major asbestos removal, renovation and demolition operations.

1.3.14 Glovebag Technique

Those asbestos removal and control techniques put forth in 29 CFR 1926.1101.

1.3.15 HEPA Filter Equipment

High efficiency particulate air (HEPA) filtered vacuum and/or exhaust ventilation equipment with a filter system capable of collecting and retaining asbestos fibers. Filters shall retain 99.97 percent of particles 0.3 microns or larger as indicated in UL 586.

1.3.16 Navy Industrial Hygienist (NIH)

That industrial hygienist employed by the Navy to monitor, sample, and/or inspect the work separate from the original construction contract. The NIH can be either a Federal civil servant or a private consultant as determined by the Navy. In some instances the NIH shall perform assigned duties vicariously through a trained subordinate but only with the specific consent of the Contracting Officer.

1.3.17 Nonfriable Asbestos Material

Material that contains asbestos in which the fibers have been temporarily locked in by a bonding agent, coating, binder, or other material so that the asbestos is well bound and will not normally release asbestos fibers during any appropriate use, handling, storage or transportation. It is understood that asbestos fibers will be released under other conditions such as demolition or removal.

1.3.18 PCM - Phased Contrast Microscopy

A method of analyzing air samples for fibers using a light microscope.

1.3.19 PLM - Polarized Light Microscopy

A method of analyzing bulk samples for asbestos in which the sample is illuminated with polarized light (light which vibrates in only one plane) and viewed under a light microscope.

1.3.20 Personal Sampling

Air sampling to determine asbestos fiber concentrations within the breathing zone of a specific employee, performed in accordance with 29 CFR 1926.1101.

1.3.21 Supervising Air Monitor (SAM)

That supervising air monitor hired by the Contractor to perform the herein listed industrial hygiene tasks. In some instances, the SAM can perform this role vicariously through a trained subordinate, but only with the specific consent of the Contracting Officer. Under N.C. Statue, the SAM must make a site visit on any project exceeding 10 days and once every 30 days thereafter.

1.3.22 TEM

Refers to Transmission Electron Microscopy (TEM). Technique whereby a beam of electrons is transmitted through an ultra thin specimen, interacting with the specimen as it passes through. An image is formed from the interaction of the electrons transmitted through the specimen; the image is magnified and focused onto an imaging device, such as a fluorescent screen, on a layer of photographic film, or to be detected by a sensor such as a CCB camera.

1.3.23 Time Weighted Average (TWA)

The TWA is an 8-hour time weighted average airborne concentration of asbestos fibers. At least three full shift samples per person are required to establish that person's TWA exposure.

1.3.24 Wetting Agent

That specific agent used to reduce airborne asbestos levels by physically bonding asbestos fibers to material to be removed. An equivalent wetting agent must have a surface tension of at least 29 dynes per square centimeter as tested in accordance with [ASTM D 1331](#). In the event where wetting operations are suspended due to freezing temperatures, the operator or abatement contractor shall record the temperature on Form DHHS 3787.

1.4 REQUIREMENTS

1.4.1 Description of Work

The work covered by this section includes the handling of asbestos containing materials which are encountered during repair, construction and demolition projects and describes some of the resultant procedures and equipment required to protect workers and occupants of the building or area, or both, from contact with airborne asbestos fibers. The work also includes the disposal of the generated asbestos containing materials. The asbestos work includes the demolition and removal of mastic under floor tile located in the NCID and Hallways. Under normal conditions non-friable or chemically bound materials containing asbestos would not be considered hazardous; however, this material will release airborne asbestos fibers during demolition and removal and therefore must be handled in accordance with North Carolina Regulations.

1.4.2 N. C. (DHHS-HHCU) North Carolina Department of Health and Human Services - Health Hazards Control Unit

Obtain necessary permits in conjunction with asbestos removal, hauling, and disposition, and furnish timely notification of such actions required by federal, state, regional, and local authorities. A permit is only required when you will be abating more than 260 linear feet, 160 square feet, or 35 cubic feet of an asbestos-containing building material. Also, if mechanical means of removing non-friable asbestos is utilized the contractor will need to provide permit. Notify the N.C. (DHHS-HHCU) and the Contracting Officer in writing 10 days prior to the commencement of work. Submit a copy of the permit to the Contracting Officer.

1.4.2.1 N.C. (DHHS-HHCU) mailing address is:

Health Hazards Control Unit

N.C. Department of Health and Human Services
Division of Public Health
1912 Mail Service Center
Raleigh, NC 27699-1912
Phone: (919) 733-0820

1.4.2.2 Changes in Work

Changes in Work which affect items on the attached form shall be covered by an amended form submitted to the same address.

1.4.3 Safety and Health Compliance

In addition to detailed requirements of this specification, comply with those applicable laws, ordinances, criteria, rules, and regulations of federal, state, regional, and local authorities regarding handling, storing, transporting, and disposing of asbestos waste materials. Comply with the applicable requirements of the current issue of 29 CFR 1926.1101, 40 CFR 61, SUBPART A, 40 CFR 61, SUBPART M. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting the work. Where the requirements of this specification, applicable laws, rules, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirement as defined by the Contracting Officer shall apply.

1.4.4 Respiratory Protection Program

Establish and implement a respirator program as required by ANSI Z88.2 and 29 CFR 1910.103.

1.4.5 Supervising Air Monitor (SAM)

Conduct personal area/environmental air sampling and training under the direction of a North Carolina accredited supervising air monitor. For the purpose of this contract, the Contractor shall retain the services of a SAM to perform the Contractor's industrial hygiene tasks.

1.5 SUBMITTALS

Submit 4 copies of the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-06 Test Reports

Air sampling results

Pressure differential recordings for local exhaust system

Clearance sampling

SD-07 Certificates

Asbestos hazard abatement plan (Abatement Design)

SD-11 Closeout Submittals

Asbestos Waste Shipment Record N.C. (DHHS-HHCU) Form 3787

Daily log

North Carolina permit

Modifications to the North Carolina permit

Asbestos Inspection Reporting Form

Closeout submittals shall be submitted within 60 days of asbestos activity completion.

1.5.1 Asbestos Hazard Abatement Plan (NC Abatement Design)

An asbestos abatement design shall be prepared by a N.C. accredited asbestos abatement designer for each individually permitted removal of more than 260 linear feet, 160 square feet, or 35 cubic feet of regulated asbestos containing materials. The plan shall be prepared, signed, and sealed, including accreditation number and date, by an accredited abatement designer. The respirator program and air monitoring strategies portion of this plan shall be prepared by the supervising air monitor. Such plan shall include but not be limited to the precise personal protective equipment to be used, the location of asbestos control areas including clean and dirty areas, buffer zones, showers, storage areas, change rooms, removal method, interface of trades involved in the construction, sequencing of asbestos related work, disposal plan, type of wetting agent and asbestos sealer to be used, locations of local exhaust equipment, planned air monitoring strategies, and a detailed description of the method to be employed in order to control pollution. The plan shall also include (both fire and medical emergency) response plans. The Contractor and designer shall meet with the Contracting Officer prior to beginning work, to discuss in detail the asbestos plan, including work procedures and safety precautions. The plan will be enforced as if an addition to the specification. Any changes required in the specification as a result of the plan shall be identified specifically in the plan. The plan shall comply with all federal and state requirements and this specification, and shall serve as the North Carolina Abatement Design. Submit a copy of plan to the Contracting Officer.

1.5.2 Air Sampling Results

Complete fiber counting and provide results to the SAM for review within 16 hours. Notify the Contracting Officer immediately of any airborne levels of asbestos fibers in excess of the acceptable limits. Submit sampling results to the Contracting Officer and the affected Contractor employees within 3 working days, signed by the employee performing air sampling, the employee that analyzed the sample, and the SAM.

1.5.3 Pressure Differential Recordings for Local Exhaust System

Provide a local exhaust system that creates a negative pressure of at least 0.02 inches of water relative to the pressure external of the enclosure and operate it continuously, 24 hours a day, until the enclosure of the asbestos control area is removed. Provide continuous 24-hour per day monitoring of the pressure differential with a pressure differential automatic recording instrument. Submit pressure differential recordings for each work day to the SAM for review and to the Contracting Officer within 24 hours from the end of each work day. Notify the Contractor and the Contracting Officer immediately of any variance in the pressure differential which could cause adjacent unsealed areas to have asbestos fiber concentrations in excess of 0.01 fibers per cubic centimeter or

background whichever is higher. In no circumstance shall levels exceed 0.1 fibers per cubic centimeter.

1.5.4 Asbestos Waste Shipment Record N.C. (DHHS-HHCU) Form 3787

Record and report, to the Contracting Officer, the amount of asbestos containing material removed and released for disposal. Deliver the report for the previous day at the beginning of each day shift with amounts of material removed during the previous day reported in linear feet or square feet as described initially in this specification and in cubic feet for the amount of asbestos containing material released for disposal. Use "Asbestos Waste Shipment Record N.C. (DHHS-HHCU) Form 3787 for this report. A copy of the (DHHS-HHCU) Form 3787 must accompany any asbestos waste shipment to the Base sanitary landfill.

1.5.5 Daily Log

A daily log documenting work practices, sample locations, and all other asbestos related job conditions shall be maintained, by the testing lab and be available for Government examination throughout the course of work. At the completion of testing, a copy of this log shall be immediately delivered to the Government.

1.5.6 North Carolina Permit

Submit one copy of the North Carolina Permit before beginning abatement activities to the Contracting Officer.

1.5.7 Modifications to the North Carolina Permit

Submit a copy of all permit modifications to the Contracting Officer. These must be received before they become effective. The Contractor is responsible for proper permit modification notification to the State. Modifications may be delivered to the Contracts Office or transmitted by facsimile to (910) 411-5899.

1.5.8 Asbestos Inspection Reporting Form

This Asbestos Inspection Reporting Form is included at the end of this section and shows the homogeneous areas involved with this project. The Contractor shall mark the line "confirmed ACM from this HA:" as either "Abated" or "Managed in Place." Abated shall be defined as removed. If an HA is partially abated, approximate the percentage of asbestos removed and mark in the comments area. Provide any other descriptive data, such as rooms/areas removed or rooms/areas where asbestos not removed. The intent of this requirement is to report "as built" conditions. The Contractor is not required to perform any additional asbestos surveys or inspections as a result of this paragraph. Include this report with drawing of abated areas with other closeout documentation.

1.6 PRE-ABATEMENT MEETING

The Contractor and designer shall meet with the Contracting Officer prior to beginning work, to discuss in detail the asbestos plan, including work procedures and safety precautions.

1.7 ASBESTOS INSPECTION REPORTING FORM AND ASBESTOS SAMPLE REPORTING FORM

These two forms are included at the end of this section for informational

purposes. They do not define or modify the scope of work.

PART 2 PRODUCTS

2.1 ENCAPSULANTS

Shall conform to current USEPA requirements, shall contain no toxic or hazardous substances as defined in 29 CFR 1926.59, and shall conform to the following performance requirements. Use of encapsulants is generally restricted to the surface of the temporary enclosure and to areas that are not to be refinished such as attics and crawlspaces. The proposed use of encapsulants shall be included in the abatement design.

2.1.1 Removal Encapsulants

<u>Requirement</u>	<u>Test Standard</u>
Flame Spread - 25, Smoke Emission - 50	ASTM E 84
Life Expectancy - 20 years	ASTM C 732, Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E 96

2.1.2 Lock-down Encapsulant

<u>Requirement</u>	<u>Test Standard</u>
Flame Spread - 25, Smoke Emission - 50	ASTM E 84
Life Expectancy - 20 years	ASTM C 732 Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E 96
Fire Resistance - Negligible affect on fire resistance rating over 3 hour test (Tested with fireproofing over encapsulant applied directly to steel member)	ASTM E 119
Bond Strength - 100 pounds of force/foot (Tests compatibility with cementitious and fibrous fire-proofing)	ASTM E 736

2.1.3 Plastic Sheet

Plastic sheet, polyethylene, 6 mil minimum thickness, unless otherwise specified, in sizes to minimize the frequency of joints. All asbestos material or debris will be at least double bagged or wrapped in two layers of 6 mil poly sheeting.

2.1.4 Tape

Capable of sealing joints of adjacent sheets or plastic sheets and for attachment of plastic sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under dry and wet conditions,

including use of amended water.

2.1.5 Disposal Bags

Bags shall be a minimum of 6 mil thick polyethylene. Affix a warning and Department of Transportation (DOT) label to each bag or use bags with the approved warnings and DOT labeling preprinted on the bag.

2.1.6 Warning Labels

Provide labels conforming to 29 CFR 1926.1101 of sufficient size to be clearly legible, displaying the following legend:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD
BREATHING ASBESTOS DUST MAY
CAUSE SERIOUS BODILY HARM

PART 3 EXECUTION

3.1 DISPOSAL SITE

CAMP LEJEUNE SANITARY LANDFILL
982 PINEY GREEN ROAD
CAMP LEJEUNE, NC 28542
(910) 451-5011

Base Sanitary Landfill shall be used for disposal of all asbestos waste. The Base Sanitary Landfill is approved and is available for use by the Contractor providing the following requirements are satisfied:

- a. The Contracting Officer must be informed at least five working days in advance of the anticipated delivery date of the asbestos material to the Landfill. On larger projects, the notification should be accompanied by a cubic yard estimate of the anticipated volume, updated weekly if the disposal period extends for more than one week. The Government will be responsible for digging the trenches and covering the debris at the end of the working day. Debris will not be accepted before 8:00 AM or after 10:00 AM, except in an emergency situation.
- b. Asbestos will be accepted only if adequately wet and double bagged in heavy-duty 6 mil plastic bags which are clearly marked "Asbestos." If a Contractor desires to handle the asbestos in a manner other than double-bagged, written application, along with a description of the proposed deviation, must be submitted to the OICC and Landfill Manager for approval.
- c. Asbestos insulated piping with the asbestos insulation intact will be accepted if the following requirements are met:
 - 1. The pipe is cut in eight foot or shorter lengths
 - 2. Each section of pipe is double wrapped, sealed, and labeled as asbestos.
 - 3. All pipe is palletized on a 7/8-inch, 4- by 8-foot sheet of

plywood. The whole pallet is banded with a minimum of three 1-inch wide metal bands with the coupling on top and wrapped with 6-mil plastic. The pallet is not higher than 3-inches.

- d. All asbestos, except palletized pipe will be off loaded and placed in the trench pipe hand.
- e. Asbestos disposal is restricted to one designated location in the Landfill and the landfill operators must be informed of and direct each delivery. Asbestos shall be disposed of from 0800 to 1000 hours daily, except holidays and weekends. Trucks hauling asbestos must be properly covered with tarpaulins or equivalent. Trucks not covered properly must be parked until the Contracting Officer approves corrective actions.
- f. The Contractor will ensure asbestos contaminated material delivered to the Base Sanitary Landfill contain no free liquids. Free liquids are defined as material which fails the EPA SW-846 free liquids test.
- g. The Contractor will include all asbestos waste shipment records (DHHS-HHCU Form 3787) that are filled out completely with the correct information, to the project manager after abatement job is completed.

3.2 EQUIPMENT

Make available to the Contracting Officer or the Contracting Officer's Representative, two complete sets of personal protective equipment as required herein for entry to the asbestos control area at all times for inspection of the asbestos control area. Provide equivalent training to the Contracting Officer or a designated representative as provided to Contractor employees in the use of the required personal protective equipment. Provide manufacturer's certificate of compliance for all equipment required to contain airborne asbestos fibers.

3.2.1 Respirators

Comply with 29 CFR 1926.1101.

3.3 WORK PROCEDURE

Remove all friable and non-friable ACM in accordance with all Federal, State, and local Marine Corps regulations. Ensure that the asbestos abatement plan is followed throughout all aspects of the abatement process.

3.3.1 Furnishings

Furniture and equipment will remain in the building. Cover and seal furnishings with 6-mil plastic sheet or remove from the work area and store in a location on site approved by the Contracting Officer.

Furnishings listed below and located in the work area are considered to be contaminated with asbestos fibers. Transfer these items to an area on site approved by the Contracting Officer, decontaminate (wet methods where possible), and then store until the room from which they came is declared clean and safe for entry. At the conclusion of the asbestos removal work and cleanup operations, transfer all objects so removed and cleaned back to the area from which they came and re-install them. Base bids on

decontaminating:

3.3.2 Pipe Insulation

Pipe may be removed with the asbestos insulation in place by wrapping the entire length of pipe and associated insulation with double thickness 6 mil plastic secured with duct tape. Mechanically cutting of asbestos containing insulation is prohibited. When using the "candy-stripe" method the abatement contractor must use glovebag operations to establish an "asbestos free" area to cut the pipe into appropriate lengths. Cut piping simultaneously into lengths suitable for transportation to disposal area, but no greater than 8 feet in length. Continuously wet the cutting site during the process. As soon as a length of pipe is completely cut loose, cover exposed ends with double thickness 6 mil plastic secured with duct tape. If the pipe is to remain in service, the removed pipe must be replaced in accordance with this Specification, with a pipe of the same size that is removed.

3.3.2.1 Attic Insulation

In those buildings indicated on the drawings, attic insulation consisting of any combination of blown-in or batt fiberglass or rockwool material, has been contaminated with asbestos materials, and is to be removed as contaminated asbestos material. The insulation material shall be wet with a fine mist of amended water. The material shall be placed immediately in double thickness 6 mil plastic bags for disposal as asbestos waste.

3.3.2.2 Contaminated Soil

In those buildings so indicated on the drawings, asbestos materials are located in the building crawl spaces and deterioration of the asbestos material has resulted in contamination of the soil under the building. Under the indicated area of these buildings, asbestos material and 2 inches of soil shall be removed and one sheet of plastic, 6 mils thick, spread over the area with seams lapped a minimum of 4 inches. . Removal shall occur just prior to clean-up operations. All debris in the crawl space shall be disposed of with the soil as asbestos materials. Workers shall be equipped with respirators and protective clothing during the removal of soil and debris.

3.3.2.3 Non-Organic Bound (NOB) Asbestos Materials

These kind of materials include floor tile, mastic, caulking, roofing material, and other non-friable material. Materials are to be adequately wet before removal and double bagged with a 6 mil poly bag. Ensure that bags have been labeled properly before they are taken to the Base Landfill.

3.3.3 Air Sampling

Sampling of airborne concentrations of asbestos fibers shall be performed in accordance with 29 CFR 1926.1101 and as specified herein. Sampling performed in accordance with 29 CFR 1926.1101 shall be performed by the SAM. Sampling performed for environmental and quality control reasons shall be performed by the SAM. Unless otherwise specified, use NIOSH Method 7400 for sampling and analysis. Monitoring may be duplicated by the Government at the discretion of the Contracting Officer. If the air sampling results obtained by the Government differ from those results obtained by the Contractor, the Government results shall prevail.

3.3.3.1 Sampling During Asbestos Work

The SAM shall provide personal and area sampling as indicated in [29 CFR 1926.1101](#) and governing environmental regulations. Thereafter, provided the same type of work is being performed, provide area sampling at least once every work shift close to the work inside the containment, outside the clean room entrance to the containment, and at the exhaust opening of the local exhaust system. Also, where an enclosure is not provided, conduct area monitoring of airborne asbestos fibers during the work shift at the designated limits of the asbestos work area at such frequency as recommended by the SAM and conduct personal samples of each worker engaged in asbestos handling (removal, disposal, transport and other associated work). If the quantity of airborne asbestos fibers monitored at the breathing zone of the workers or designated limits at any time exceeds background or 0.01 fibers per cubic centimeter whichever is lesser outside of the containment area, stop work, evacuate personnel in adjacent areas or provide personnel with approved protective equipment at the discretion of the Contracting Officer. This sampling may be duplicated by the government at the discretion of the Contracting Officer. If the air sampling results obtained by the government differ from those obtained by the Contractor, the government results shall prevail. If adjacent areas are contaminated as determined by the Contracting Officer, clean the contaminated areas, monitor, and visually inspect the area as specified herein. If sampling outside the containment shows airborne levels have exceeded background or 0.01 fibers per cubic centimeter, whichever is greater, stop all work, correct the condition(s) causing the increase, and notify the Contracting Officer immediately.

3.3.3.2 Sampling After Final Clean-Up (Clearance Sampling) For All Areas Unless Noted Otherwise

Provide area sampling of asbestos fibers using aggressive air sampling techniques as defined in the [EPA 560/5-85-024](#) and establish an air borne asbestos concentration of less than 70 structures per square millimeter after final clean-up but before removal of the containment or the asbestos work control area. After final cleanup and the asbestos control area is dry but prior to clearance sampling, the SAM shall perform a visual inspection, in accordance with [ASTM E 1368](#), to insure that the asbestos control and work area is free of any accumulations of dirt, dust, or debris. Use transmission electron microscopy (TEM) to analyze clearance samples and report the results in accordance with current NIOSH criteria. The asbestos fiber counts from these samples shall be less than 70 structures per square millimeter or be not greater than the background, whichever is greater. Should any of the final samples indicate a higher value, the Contractor shall take appropriate actions to re-clean the area and shall repeat the sampling and TEM analysis at the Contractor's expense.

3.3.3.3 Sampling After Final Clean-Up (Clearance Sampling) For the Following Areas NCID and Hallways

Provide area sampling of asbestos fibers and establish an air borne asbestos concentration of less than 0.01 fibers per cubic centimeter after final clean-up but before removal of the containment or the asbestos work control area. After final cleanup and the asbestos control area is dry but prior to clearance sampling, the SAM shall perform a visual inspection, in accordance with [ASTM E 1368](#), to insure that the asbestos control and work area is free of any accumulations of dirt, dust, or debris. Should any of the final samples indicate a higher value, the Contractor shall take appropriate actions to re-clean the area and shall repeat the sampling and

analysis at the Contractor's expense.

3.3.4 Lock Down

Prior to removal of plastic barriers and after pre-clearance clean up of gross contamination, a visual inspection by the SAM, of all areas affected by the removal of the asbestos contaminated materials for any visible fibers, shall be conducted and approved by the SAM. A post removal (lock down) encapsulant shall then be spray applied to ceiling, walls, floors and other areas exposed in the removal area. The exposed area shall include but not be limited to plastic barriers, furnishings and articles to be discarded as well as dirty change room, air locks for bag removal and decon chambers.

3.3.5 Site Inspection

While performing asbestos removal work, the Contractor shall be subject to on-site inspection by the Contracting Officer who may be assisted by or represented by safety or industrial hygiene personnel. If the work is found to be in violation of this specification, the Contracting Officer or his representative will issue a stop work order to be in effect immediately and until the violation is resolved. Standby time required to resolve the violation shall be at the Contractor's expense.

3.4 CLEAN-UP AND DISPOSAL

3.4.1 Housekeeping

Essential parts of asbestos dust control are housekeeping and clean-up procedures. Maintain surfaces of the asbestos control area free of accumulations of asbestos fibers. Give meticulous attention to restricting the spread of dust and debris; keep waste from being distributed over the general area. Use HEPA filtered vacuum cleaners. Do not blow down the space with compressed air. When asbestos removal is complete, all asbestos waste is removed from the work-site, final clean-up is completed, and final air sampling results are reported, the SAM will certify the area as safe and the Contracting Officer will approve the abatement completion, before the signs can be removed. After final clean-up and acceptable airborne concentrations are attained but before the HEPA unit is turned off and the containment removed, remove all pre-filters on the building HVAC system and provide new pre-filters. Dispose of filters as asbestos-contaminated materials. Reestablish HVAC mechanical, and electrical systems in proper work ing order. The Contracting Officer will visually inspect all surfaces within the containment for residual material or accumulated dust or debris. The Contractor shall re-clean all areas showing dust or residual materials. If re-cleaning is required, air sample and establish an acceptable asbestos airborne concentration after re-cleaning. The SAM will provide written certification that the work area is safe within all standards as referenced within this contract before unrestricted entry is permitted. The Government shall have the option to perform monitoring to certify the areas are safe before entry is permitted.

3.4.2 Title to Materials

All materials resulting from demolition work, except as specified otherwise, shall become the property of the Contractor and shall be disposed of as specified in applicable local, state, and Federal regulations and herein. All building materials that are cross contaminated must be disposed of as an ACM at Base Landfill.

3.4.3 Disposal of Asbestos

3.4.3.1 Procedure for Disposal

Collect asbestos waste, asbestos contaminated water, scrap, debris, bags, containers, equipment, and asbestos contaminated clothing which may produce airborne concentrations of asbestos fibers and place in sealed fiberproof, waterproof, non-returnable containers (e.g. double plastic bags 6 mils thick, cartons, drums or cans). Wastes within the containers must be wetted to insure the security of the material in case of container breaching. Affix a warning and Department of Transportation (DOT) label to each bag or use at least 6 mil thick bags with the approved warnings and DOT labeling preprinted on the bag. For temporary storage, store sealed impermeable bags in asbestos waste drums or skids. An area for interim storage of asbestos waste-containing drums or skids will be assigned by the Contracting Officer or his authorized representative. Procedure for hauling and disposal shall comply with 40 CFR 61, SUBPART M, state, regional, and local standards.

3.4.3.2 Disposal Material Shall Contain No Free Liquid

The Contractor will ensure asbestos contaminated material delivered to the Base Sanitary Landfill contain no free liquids. Free liquids are defined as material which fails the EPA SW-846 Free Liquids Test.

-- End of Section --

Asbestos Inspection Reporting Form

Required under contractual agreement with Marine Corps Base, Camp Lejeune

Instructions: Supply the following information by filling in the blanks or selecting (checking) appropriate boxes.

General Information

Building Number _____	Date of Activity _____
Contractor Name _____	Contract Number _____
Inspector Name _____	Inspector Accreditation Number _____
Public Works POC _____	

Inspection Information

Homogeneous Area (HA) ID Number: _____

(for additional HAs, please use Continuation Sheets)

Homogeneous Description:	Homogeneous Location:

ACM Type: Surfacing Material Thermal System Insulation Miscellaneous

Friability: High Moderate Low Non

Estimated Quantity of ACM: _____ Sq Feet Linear Feet Other _____

Damage Designation: Localized Distributed

Potential for Contact: Low Moderate High
(by building occupants)

Influence of Vibration: Low Moderate High

Influence of Air Erosion: Low Moderate High

Overall Potential for Disturbance: Low Moderate High

Percent Damage _____ %

Number of Samples Collected: _____
(NOTE: Sample Results Entered on the Asbestos Sample Reporting Forms)

Laboratory Sampling Analysis Method: Polarized Light Microscopy (AHERA Recommendation)
 Other _____

Confirmed ACM from this HA: Abated or Managed in Place

Inspection Activity Resulting From: Total Renovation Demolition
 Partial Renovation (Please Describe)

Comments:

Asbestos Sample Reporting Form

Instructions: Supply the following information by filling in the blanks or checking the appropriate box. An example entry is provided to illustrate a correct response.

Bldg No.	HA No.	Sample No.	Date	Description of Material Sampled	Location of Material Sampled	CHR ¹ %	AMO ¹ %	CRO ¹ %	Other ² %	Positive ³	Comments
Example	1	1	5/1/1996	Ceiling Tile 1'x1', white	ISMD Storage	ND	ND	ND		<input type="checkbox"/>	
										<input type="checkbox"/>	
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										<input type="checkbox"/>	
										<input type="checkbox"/>	

¹Percent of chrysotile (chr), amosite (amo), and crocidolite (cro). If no amount was detected, then "ND" should be entered under the appropriate column.

²Comments describing other suspect mineral types.

³Indication of positive for asbestos (this box is checked where no quantitative results exist, but records indicate that the sample is positive for asbestos).

Homogeneous Area (HA) Continuation Form

Provide the following information for each additional HA

HA ID Number: _____ Bldg Number: _____	HA ID Number: _____ Bldg Number: _____
HA Description:	HA Location:
ACM Type: <input type="checkbox"/> Surfacing Material <input type="checkbox"/> Thermal System Insulation <input type="checkbox"/> Miscellaneous Friability: <input type="checkbox"/> High <input type="checkbox"/> Moderate <input type="checkbox"/> Low <input type="checkbox"/> Non Est Qty of ACM: _____ <input type="checkbox"/> Sq Ft <input type="checkbox"/> LF <input type="checkbox"/> Other _____ Damage Designation: <input type="checkbox"/> Localized <input type="checkbox"/> Distributed Potential for Contact: <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High Influence of Vibration: <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High Influence of Air Erosion: <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High Overall Potential for Disturbance: <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High Percent Damage: _____ % No. of Samples Collected: _____ Laboratory Sampling analysis Method: <input type="checkbox"/> PLM <input type="checkbox"/> Other _____ Confirmed ACM from this HA: <input type="checkbox"/> Abated or <input type="checkbox"/> Managed in Place Inspection Activity Resulting From: <input type="checkbox"/> Demolition <input type="checkbox"/> Total Renovation <input type="checkbox"/> Partial Renovation (please describe)	ACM Type: <input type="checkbox"/> Surfacing Material <input type="checkbox"/> Thermal System Insulation <input type="checkbox"/> Miscellaneous Friability: <input type="checkbox"/> High <input type="checkbox"/> Moderate <input type="checkbox"/> Low <input type="checkbox"/> Non Est Qty of ACM: _____ <input type="checkbox"/> Sq Ft <input type="checkbox"/> LF <input type="checkbox"/> Other _____ Damage Designation: <input type="checkbox"/> Localized <input type="checkbox"/> Distributed Potential for Contact: <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High Influence of Vibration: <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High Influence of Air Erosion: <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High Overall Potential for Disturbance: <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High Percent Damage: _____ % No. of Samples Collected: _____ Laboratory Sampling analysis Method: <input type="checkbox"/> PLM <input type="checkbox"/> Other _____ Confirmed ACM from this HA: <input type="checkbox"/> Abated or <input type="checkbox"/> Managed in Place Inspection Activity Resulting From: <input type="checkbox"/> Demolition <input type="checkbox"/> Total Renovation <input type="checkbox"/> Partial Renovation (please describe)
Comments:	Comments:

Asbestos Sample Reporting Continuation Form

Provide the following information for each additional asbestos sample.

Bldg No.	HA No.	Sample No.	Date	Description of Material Sampled	Location of Material Sampled	CHR ¹ %	AMO ¹ %	CRO ¹ %	Other ² %	Positive ³	Comments
										<input type="checkbox"/>	
										<input type="checkbox"/>	
										<input type="checkbox"/>	
										<input type="checkbox"/>	
										<input type="checkbox"/>	
										<input type="checkbox"/>	
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										<input type="checkbox"/>	

¹Percent of chrysotile (chr), amosite (amo), and crocidolite (cro). If no amount was detected, then "ND" should be entered under the appropriate column.

²Comments describing other suspect mineral types.

³Indication of positive for asbestos (this box is checked where no quantitative results exist, but records indicate that the sample is positive for asbestos).

SECTION 02 82 30

RE-ESTABLISHING VEGETATION

03/12

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

The work covered by this section consists of preparing seedbeds; furnishing and placing limestone, fertilizer, and seed; compacting seedbeds; furnishing, placing, and securing mulch; mowing; and other operations necessary for the permanent establishment of grasses.

Seeding and mulching shall be performed on all earth areas disturbed by construction. The Contractor shall adapt his operations to variations in weather or soil conditions as necessary for the successful establishment and growth.

The quantity of mowing to be performed will be affected by the actual conditions which occur during the construction of the project. The quantity of mowing may be increased, decreased, or eliminated entirely at the direction of the Contracting Officer. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

PART 2 PRODUCTS

2.1 FERTILIZER

The quality of all fertilizer and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Fertilizer Law and with the rules and regulations, adopted by the North Carolina Board of Agriculture in accordance with the provisions of said law, in effect at the time of sampling. Fertilizer shall be 10-10-10. Dry fertilizer shall have been manufactured from cured stock. Liquid fertilizer shall be stored and cared for after manufacture in a manner that will prevent loss of plant food values.

2.2 LIMESTONE

The quality of all limestone and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Lime Law and with the rules and regulations adopted by the North Carolina Board of. Limestone shall be agricultural grade ground Dolomitic limestone. All limestone shall contain not less than 90 percent calcium carbonate equivalents. Dolomitic limestone shall contain not less than 10 percent of magnesium. Dolomitic limestone shall be so graded that at least 90 percent will pass through a U.S. Standard 20 mesh screen, and at least 35 percent will pass through a U.S. Standard 100 mesh screen.

2.3 SOD

Sod shall consist of a live, dense, well rooted growth of centipede grass free from an excessive amount of restricted noxious weeds as defined by the North Carolina Board of Agriculture. The area from which sod is to be

obtained shall have been mowed to a height of not less than 2 inches. Sod shall be cut into rectangular sections of sizes convenient for handling without breaking or loss of soil. It shall be cut with a sod cutter or other acceptable means to a depth that will retain in the sod practically all of the dense root system of the grass. During wet weather the sod shall be allowed to dry sufficiently before lifting to prevent tearing during handling and placing, and during extremely dry weather it shall be watered before lifting if such watering is necessary to insure its vitality and to prevent loss of soil during handling.

2.4 MULCH FOR EROSION CONTROL

Mulch for erosion control shall consist of grain straw or other acceptable material, and shall have been approved by the Contracting Officer before being used. All mulch shall be reasonably free from mature seed bearing stalks, roots, or bulblets. Material for holding mulch in place shall be asphalt or other approved binding material.

2.5 SEED

The quality of all seed and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Seed Law and with the rules and regulations adopted by the North Carolina Board of Agriculture. Seed shall have been approved by the North Carolina Department of Agriculture before being sown. No seed will be accepted with a date of test more than 8 months prior to the date of sowing, excluding the month in which the test was completed. Seed mix by weight shall be as specified on the plans.

2.6 MATTING FOR EROSION CONTROL

2.6.1 General

Matting for erosion control shall be or excelsior matting. Other acceptable material manufactured especially for erosion control may be used when approved by the Contracting Officer in writing before being used. Matting for erosion control shall not be dyed, bleached, or otherwise treated in a manner that will result in toxicity to vegetation.

2.6.2 Erosion Control Matting

Matting shall consist of a machine produced mat of curled wood excelsior a minimum of 47 inches in width. The mat shall weigh 1.6 pounds per square yard with a tolerance of plus or minus 10 percent. At least 80 percent of the individual fibers shall be 6 inches or more in length. The fibers shall be evenly distributed over the entire area of the blanket. One side of the excelsior matting shall be covered with an extruded plastic mesh. The mesh size for the plastic mesh shall be a maximum of 1 inch x 1 inch.

2.6.3 Wire Staples

Staples shall be machine made of No. 11 gage new steel wire formed into a "U" shape. The size when formed shall be not less than 6 inches in length with a throat of not less than 1 inch in width.

2.7 WATER

Water used in the planting or care of vegetation shall meet the requirements of Class C fresh waters as defined in 15 NAC 2B.0200.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

The work shall be performed immediately upon completion of earthwork areas. No exception will be made to this requirement unless otherwise permitted in writing by the Contracting Officer. Upon failure or neglect on the part of the Contractor to coordinate his grading with seeding and mulching operations and diligently pursue the control of erosion and siltation, the Contracting Officer may suspend the Contractor's operations until such time as the work is coordinated in a manner acceptable to the Contracting Officer.

3.2 SEEDBED PREPARATION

The Contractor shall cut and satisfactorily dispose of weeds or other unacceptable growth on the areas to be seeded. The soil shall then be scarified or otherwise loosened to a depth of not less than 3 inches except as otherwise provided below or otherwise directed by the Contracting Officer. Clods shall be broken and the top 2 to 3 inches of soil shall be worked into an acceptable seedbed by the use of soil pulverizers, drags, or harrows; or by other methods approved by the Contracting Officer. All rock and debris 3 inches or larger shall be removed prior to the application of seed and fertilizer. On cut slopes that are 2:1 and steeper, both the depth of preparation and the degree of smoothness of the seedbed may be reduced as permitted by the Contracting Officer, but in all cases the slope surface shall be scarified, grooved, trenched, or punctured so as to provide pockets, ridges, or trenches in which the seeding materials can lodge. On cut slopes that are either 2:1 or steeper, the Contracting Officer may permit the preparation of a partial or complete seedbed during the initial grading of the slope. If at the time of final sodding and mulching operations such initial preparation is still in a condition acceptable to the Contracting Officer, additional seedbed preparation may be reduced or eliminated. Seedbed preparation within 2 feet of the edge of any pavement shall be limited to a depth of 2 to 3 inches. The preparation of seedbeds shall not be done when the soil is frozen, extremely wet, or when the Contracting Officer determines that it is an otherwise unfavorable working condition.

3.3 LIMESTONE AND FERTILIZER

Limestone may be applied as a part of the seedbed preparation, provided it is immediately worked into the soil. If not so applied, limestone and fertilizer shall be distributed uniformly over the prepared seedbed and then harrowed, raked, or otherwise thoroughly worked into the seedbed. Apply fertilizer at the rate as specified on the plans. Apply lime at the rate as specified on the plans. Application equipment for liquid fertilizer, other than a hydraulic seeder, shall be calibrated to ensure that the required rate of fertilizer is applied uniformly.

3.4 SODDING

Extreme care shall be exercised to prevent breaking the sod sections and to prevent the sod from drying out. Any sod that is torn, broken, or too dry will be rejected. Torn or broken sod, if kept moist, may be used for filling unavoidable small gaps in sod cover as permitted by the Contracting Officer. Sod shall be placed on the designated areas within 24 hours after being cut. The area to be sodded shall be brought to a firm uniform

surface. The limestone and fertilizer shall be distributed uniformly over the area. The area shall be roughened by means of picks, rakes, or other approved means to a depth of not less than 2 inches without distorting the uniformity of the surface. The finished surface shall be moistened with water prior to placing the sod. Within 24 hours after soil preparation has been completed, place the sod. Each piece of sod shall be packed tightly against the edge of adjacent pieces so that the fewest possible gaps will be left between the pieces. Unavoidable gaps shall be closed with small pieces of sod. Sod shall be placed beginning at either the top or the toe of the slope. Sod shall be placed with the long edge horizontal and with staggered vertical joints. The edge of the sod shall be turned slightly into the ground at the top of a slope and a layer of earth placed over it and tamped as to conduct the surface water over and onto the top of the sod. On all slopes 2:1 or steeper, in drainage channels, and on any areas that are in such condition that there is danger of sod slipping, sod shall be stapled in place by driving staples flush with the sod. Stapling shall be done concurrently with sod placement and prior to tamping. Use wire staples, per Section 2.6.3. The number of staples shall be sufficient to prevent slipping or displacement of the sod. Staples shall be driven perpendicular to the slope. Where backfill is necessary on cut slopes to obtain a uniform sodding area, staples shall be of sufficient length to reach a minimum of 3 inches into the solid earth underneath the backfill. Sod shall not be placed when the atmospheric temperature is below 32 degrees F. Frozen sod shall not be used. After sod has been placed and tamped, it shall be carefully and thoroughly watered as required to maintain the sod in a healthy condition. Watering shall be conducted until final acceptance. Application of water may be made by the use of hydraulic seeding equipment, farm type irrigation equipment, or by other acceptable means.

3.5 MULCHING

All seeded areas shall be mulched. Grain straw or excelsior mat may be used as mulch at any time of the year. Mulch shall be applied within 24 hours after completion of seeding unless otherwise permitted by the Contracting Officer. Care shall be exercised to prevent displacement of soil or seed or other damage to the seeded area during the mulching operations. Mulch shall be uniformly spread by hand or by approved mechanical spreaders or blowers which will provide an acceptable application. An acceptable application will be that which will allow some sunlight to penetrate and air to circulate but also partially shade the ground, reduce erosion, and conserve soil moisture. Mulch shall be held in place by applying a sufficient amount of asphalt or other approved binding material to assure that the mulch is properly held in place. The rate and method of application of binding material shall meet the approval of the Contracting Officer. Where the binding material is not applied directly with the mulch it shall be applied immediately following the mulch application. During the application of binding material, adequate precautions shall be taken to prevent damage to vehicles, structures, guardrails, and devices. Areas where seeding and mulching have been performed shall be maintained in a satisfactory condition until final acceptance of the project. Maintenance shall include mowing at the location and times directed by the Contracting Officer. Areas of damage or failure due to any cause shall be corrected by being repaired or by being completely redone as may be directed by the Contracting Officer. Excelsior matting shall be installed on all seeded slopes greater than 3:1 (h:v). Install the matting per the manufacturer's printed instructions.

3.6 SEEDING

Seed shall be distributed uniformly over the seedbed at the rate as specified on the plans. Seed shall be harrowed, dragged, raked, or otherwise worked so as to cover the seed with a layer of soil. The depth of covering shall be 1/4 inch. When a hydraulic seeder is used for application of seed and fertilizer, the seed shall not remain in water containing fertilizer for more than 30 minutes prior to application unless otherwise permitted by the Contracting Officer. Immediately after seed has been properly covered the seedbed shall be compacted in the manner and degree approved by the Contracting Officer.

-- End of Section --

SECTION 02 82 33.12

PREPARATION OF SURFACES COATED WITH CONTAMINATED PAINT

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z9.2 (1979; R 1991) Fundamentals Governing the Design and Operation of Local Exhaust Systems

ANSI Z88.2 (1992) Respiratory Protection

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1926.55 Gases, Vapors, Fumes, Dusts, and Mists

29 CFR 1926.57 Ventilation

29 CFR 1926.59 Hazard Communication

29 CFR 1926.62 Lead

29 CFR 1926.103 Respiratory Protection

40 CFR 258 Disposal of Hazardous Materials

40 CFR 261 Identification and Listing of Hazardous Waste

UNDERWRITERS LABORATORIES (UL)

UL 586 (1996; Rev thru Aug 1999) High-Efficiency, Particulate, Air Filter Units

1.2 DEFINITIONS

1.2.1 Action Level

Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air averaged over an 8-hour period. As used in this section, "30 micrograms per cubic meter of air" refers to the action level.

1.2.2 Area Monitoring

Sampling of lead concentrations within the lead control area and inside the physical boundaries which is representative of the airborne lead

concentrations which may reach the breathing zone of personnel potentially exposed to lead.

1.2.3 Physical Boundary

Area physically roped or partitioned off around an enclosed lead control area to limit unauthorized entry of personnel. As used in this section, "inside boundary" shall mean the same as "outside lead control area."

1.2.4 Certified Industrial Hygienist (CIH)

As used in this section, refers to an Industrial Hygienist employed by the Contractor and is certified by the American Board of Industrial Hygiene in comprehensive practice.

1.2.5 Change Rooms and Shower Facilities

Rooms within the designated physical boundary around the lead control area equipped with separate storage facilities for clean protective work clothing and equipment and for street clothes which prevent cross-contamination.

1.2.6 Decontamination Room

Room for removal of contaminated personal protective equipment (PPE).

1.2.7 Eight-Hour Time Weighted Average (TWA)

Airborne concentration of lead averaged over an 8-hour workday to which an employee is exposed.

1.2.8 High Efficiency Particulate Air (HEPA) Filter Equipment

HEPA filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining lead-contaminated paint dust. A high efficiency particulate filter means 99.97 percent efficient against 0.3 micron size particles.

1.2.9 Lead

Metallic lead, inorganic lead compounds, and organic lead soaps. Excluded from this definition are other organic lead compounds.

1.2.10 Lead Control Area

An enclosed area or structure with full containment to prevent the spread of lead dust, paint chips, or debris of lead-contaminated paint removal operations. The lead control area is isolated by physical boundaries to prevent unauthorized entry of personnel.

1.2.11 Lead Permissible Exposure Limit (PEL)

Fifty micrograms per cubic meter of air as an 8-hour time weighted average as determined by 29 CFR 1926.62. If an employee is exposed for more than 8 hours in a work day, the PEL shall be determined by the following formula:

$$\text{PEL (micrograms/cubic meter of air)} = 400/\text{No. hrs worked per day}$$

1.2.12 Personal Monitoring

Sampling of lead concentrations within the breathing zone of an employee to determine the 8-hour time weighted average concentration in accordance with 29 CFR 1926.62. Samples shall be representative of the employee's work tasks. Breathing zone shall be considered an area within a hemisphere, forward of the shoulders, with a radius of 6 to 9 inches and the center at the nose or mouth of an employee.

1.3 QUALITY ASSURANCE

1.3.1 Medical Examinations

Before exposure to lead-contaminated dust, provide workers with a comprehensive medical examination as required by 29 CFR 1926.59. The examination will not be required if adequate records show that employees have been examined as required by 29 CFR 1926.59 within the last year.

1.3.1.1 Medical Records

Maintain complete and accurate medical records of employees for a period of at least 40 years or for the duration of employment plus 20 years, whichever is longer.

1.3.2 CIH Responsibilities

- a. Certify training.
- b. Review and approve materials coated with lead-contaminated paint Removal Work Plan for conformance to the applicable referenced standards.
- c. Inspect lead-contaminated paint removal work for conformance with the approved plan.
- d. Direct monitoring.
- e. Ensure work is performed in strict accordance with specifications at all times.
- f. Ensure hazardous exposure to personnel and to the environment are adequately controlled at all times.
- g. Review and approve "Hazardous Waste Management Plan."

1.3.3 Training

Train each employee performing paint removal, disposal, and air sampling operations prior to the time of initial job assignment, in accordance with 29 CFR 1926.62.

1.3.3.1 Training Certification

Submit certificates signed and dated by the CIH and by each employee stating that the employee has received training.

1.3.4 Respiratory Protection Program

- a. Furnish each employee required to wear a negative pressure

respirator or other appropriate type with a respirator fit test at the time of initial fitting and at least every 6 months thereafter as required by 29 CFR 1926.62.

- b. Establish and implement a respiratory protection program as required by ANSI Z88.2, 29 CFR 1926.103, 29 CFR 1926.62, and 29 CFR 1926.55.

1.3.5 Hazard Communication Program

Establish and implement a Hazard Communication Program as required by 29 CFR 1926.59.

1.3.6 Hazardous Waste Management

The Hazardous Waste Management plan shall comply with applicable requirements of federal, state, and local hazardous waste regulations and address:

- a. Identification of hazardous wastes associated with the work.
- b. Estimated quantities of wastes to be generated and disposed of.
- c. Names and qualifications of each contractor that will be transporting, storing, treating, and disposing of the wastes consisting of lead chips and/or dust not intact lead-coated materials. Include the facility location and a 24-hour point of contact. Furnish two copies of state hazardous waste permits.
- d. Names and qualifications (experience and training) of personnel who will be working on-site with hazardous wastes.
- e. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.
- f. Spill prevention, containment, and cleanup contingency measures to be implemented.
- g. Work plan and schedule for waste containment, removal and disposal. Wastes shall be cleaned up and containerized daily.
- h. Cost for hazardous waste disposal according to this plan.

1.3.7 Safety and Health Compliance

In addition to the detailed requirements of this specification, comply with laws, ordinances, rules, and regulations of federal, state, and local authorities regarding removing, handling, storing, transporting, and disposing of lead waste materials. Comply with the applicable requirements of the current issue of 29 CFR 1926.62. Submit matters regarding interpretation of standards to the Contracting Officer for resolution before starting work. Where specification requirements and the referenced documents vary, the most stringent requirement shall apply.

1.3.8 Pre-Construction Conference

Along with the CIH, meet with the Contracting Officer to discuss in detail the materials coated with lead-contaminated paint removal work plan,

including work procedures and precautions for the work plan.

1.4 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-03 Product Data

Vacuum filters

Respirators

SD-06 Test Reports

Monitoring Results

SD-07 Certificates

Qualifications of CIH

Testing laboratory qualifications

Rental equipment notification

Preparation of Surfaces Coated with Lead-Contaminated Paint Work Plan with CIH approval (signature, date, and certification number)

Respiratory protection program

Hazard communication program

EPA approved hazardous waste treatment or disposal facility for lead disposal

Hazardous waste management plan

Vacuum filters

SD-11 Closeout Submittals

Completed and signed hazardous waste manifest from treatment or disposal facility

Certification of medical examinations

Employee training certification

1.4.1 Qualifications of CIH

Submit name, address, and telephone number of the CIH selected to perform responsibilities in paragraph entitled "CIH Responsibilities." Provide previous experience of the CIH. Submit proper documentation that the Industrial Hygienist is certified by the American Board of Industrial Hygiene in comprehensive practice, including certification number and date of certification/recertification.

1.4.2 Testing Laboratory

Submit the name, address, and telephone number of the testing laboratory selected to perform the monitoring, testing, and reporting of airborne concentrations of lead. Provide proper documentation that persons performing the analysis have been judged proficient by successful participation within the last year in the National Institute for Occupational Safety and Health (NIOSH) Proficiency Analytical Testing (PAT) Program. The laboratory shall be accredited by the American Industrial Hygiene Association (AIHA). Provide AIHA documentation along with date of accreditation/reaccreditation.

1.4.3 Preparation of Surfaces Coated with Lead-Contaminated Paint Work Plan

Submit a detailed job-specific plan of the work procedures to be used in the preparation of surfaces coated with lead-contaminated paint. The plan shall include a sketch showing the location, size, and details of lead control areas, location and details of decontamination rooms, change rooms, shower facilities, and mechanical ventilation system. Include in the plan, eating, drinking, smoking and restroom procedures, interface of trades, sequencing of lead related work, collected wastewater and paint debris disposal plan, air sampling plan, respirators, protective equipment, and a detailed description of the method of containment of the operation to ensure that airborne lead concentrations of 30 micrograms per cubic meter of air are not exceeded outside of the lead control area. Include air sampling, training and strategy, sampling methodology, frequency, duration of sampling, and qualifications of air monitoring personnel in the air sampling portion of the plan.

1.4.4 Air Monitoring

Submit [monitoring results](#) to the Contracting Officer within 3 working days, signed by the testing laboratory employee performing the air monitoring, the employee that analyzed the sample, and the CIH.

1.5 EQUIPMENT

Furnish the Contracting Officer with two complete sets of personal protective equipment daily, as required herein, for entry into and inspection of the removal work within the lead controlled area. Personal protective equipment shall include fitted respirators and disposable whole body covering, including appropriate foot, head, and hand protection. PPE shall remain the property of the Contractor.

1.5.1 Respirators

Furnish appropriate respirators approved by the NIOSH, Department of Health and Human Services, for use in atmospheres containing lead dust. Respirators shall comply with the requirements of [29 CFR 1926.62](#).

1.5.2 Special Protective Clothing

Furnish personnel who will be exposed to lead-contaminated dust with appropriate disposable protective whole body clothing, head covering, gloves, and foot coverings. Furnish appropriate disposable plastic or rubber gloves to protect hands. Reduce the level of protection only after obtaining approval from the CIH.

1.5.3 Rental Equipment Notification

If rental equipment is to be used during lead-contaminated paint handling and disposal, notify the rental agency in writing concerning the intended use of the equipment. Furnish a copy of the written notification to the Contracting Officer.

1.5.4 Vacuum Filters

UL 586 labeled HEPA filters.

PART 2 PRODUCTS

2.1 PAINT PREPARATION PRODUCTS

Submit applicable Material Safety Data Sheets for Surface Preparation products used. Use the least toxic product.

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Notification

Notify the Contracting Officer 20 days prior to the start of any surface preparation work.

3.1.2 RESERVED

3.1.3 Protection of Existing Work to Remain

Perform surface preparation work without damage or contamination of adjacent areas. Where existing work is damaged or contaminated, restore work to its original condition or better.

3.1.4 Boundary Requirements

Provide physical boundaries around the lead control area by roping off the area or providing curtains, portable partitions or other enclosures to ensure that airborne concentrations of lead will not reach 30 micrograms per cubic meter of air outside of the lead control area.

3.1.5 Furnishings

The Contractor shall cover all Government furniture and equipment located in the work area before lead-contaminated paint surface preparation work begins.

3.1.6 Heating, Ventilating and Air Conditioning (HVAC) Systems

Shut down, lock out, and isolate HVAC systems that supply, exhaust, or pass through the lead control areas. Seal intake and exhaust vents in the lead control area with 6-mil plastic sheet and tape. Seal seams in HVAC components that pass through the lead control area.

3.1.7 Change Room and Shower Facilities

Provide clean change rooms and shower facilities within the physical boundary around the designated lead control area in accordance with

requirements of 29 CFR 1926.62.

3.1.8 Mechanical Ventilation System

- a. Use adequate ventilation to control personnel exposure to lead in accordance with 29 CFR 1926.57.
- b. To the extent feasible, use local exhaust ventilation connected to HEPA filters or other collection systems, approved by the industrial hygienist. Local exhaust ventilation systems shall be designed, constructed, installed, and maintained in accordance with ANSI Z9.2.

3.1.9 Personnel Protection

Personnel shall wear and use protective clothing and equipment as specified herein. Eating, smoking, or drinking is not permitted in the lead control area. No one will be permitted in the lead control area unless they have been given appropriate training and protective equipment.

3.1.10 Warning Signs

Provide warning signs at approaches to lead control areas. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area. Signs shall comply with the requirements of 29 CFR 1926.62.

3.2 WORK PROCEDURES

The work shall include removal of materials coated with lead containing paint. Remove dirt, dust, rust, caulking, splinters, loose particles, grease, oil, disintegrated coatings, mildew, mold, and other substances deleterious to coating performance. Sand, spackle, and treat defects to render them smooth. Defects are defined as scratches, nicks, cracks, gouges, spills, alligating, previous runs, chalking, and irregularities due to partial peeling of previous coatings. Sand edges of adjacent soundly-adhered existing coatings so they are tapered as smooth as practical. On interior surfaces, edges may be filled smooth with joint compound in lieu of sanding. The Contractor is advised of these conditions and shall be responsible for compliance with all EPA, Federal, State and Local Requirements.

3.2.1 Personnel Exiting Procedures

Whenever personnel exit the lead-controlled area, they shall perform the following procedures and shall not leave the work place wearing any clothing or equipment worn during the work day:

- a. Vacuum themselves off.
- b. Remove protective clothing in the decontamination room, and place them in an approved impermeable disposal bag.
- c. Shower.
- d. Change to clean clothes prior to leaving the physical boundary designated around the lead-contaminated job site.

3.2.2 Monitoring

Monitoring of airborne concentrations of lead shall be in accordance with 29 CFR 1926.62 and as specified herein. Air monitoring, testing, and reporting shall be performed by a CIH or an Industrial Hygiene (IH) Technician who is under the direction of the CIH.

- a. The CIH or the IH Technician under the direction of the CIH shall be on the jobsite directing the monitoring, and inspecting the lead-contaminated paint removal work to ensure that the requirements of the Contract have been satisfied during the entire removal of materials coated with lead-contaminated paint operation.
- b. Take personal air monitoring samples on employees who are anticipated to have the greatest risk of exposure as determined by the CIH. In addition, take air monitoring samples on at least 25 percent of the work crew or a minimum of two employees, whichever is greater, during each work shift.
- c. Submit results of air monitoring samples, signed by the CIH, within 72 hours after the air samples are taken. Notify the Contracting Officer immediately of exposure to lead at or in excess of the action level of 30 micrograms per cubic meter of air outside of the lead control area.

3.2.2.1 Monitoring During Surface Preparation Work

Perform personal and area monitoring during the surface preparation operation. Sufficient area monitoring shall be conducted at the physical boundary to ensure unprotected personnel are not exposed above 30 micrograms per cubic meter of air at all times. If the outside boundary lead levels are at or exceed 30 micrograms per cubic meter of air, work shall be stopped and the CIH shall immediately correct the condition(s) causing the increased levels and notify the Contracting Officer immediately. The CIH shall review the sampling data collected on that day to determine if condition(s) requires any further change in work methods. Removal work shall resume when approval is given by the CIH. The Contractor shall control the lead level outside of the work boundary to less than 30 micrograms per cubic meter of air at all times. As a minimum, conduct area monitoring daily on each shift in which lead paint removal operations are performed in areas immediately adjacent to the lead control area. For outdoor operations, at least one sample on each shift shall be taken on the downwind side of the lead control area. If adjacent areas are contaminated, clean and visually inspect contaminated areas. The CIH shall certify that the area has been cleaned of lead contamination.

3.3 CLEANUP AND DISPOSAL

3.3.1 Cleanup

Maintain surfaces of the lead control area free of accumulations of paint chips and dust. Restrict the spread of dust and debris; keep waste from being distributed over the work area. Do not dry sweep or use compressed air to clean up the area. At the end of each shift and when the surface preparation operation has been completed, clean the area of visible lead paint contamination by vacuuming with a HEPA filtered vacuum cleaner and wet mopping the area.

3.3.2 Certification

The CIH shall certify in writing that the inside and outside the lead control area aggressive air monitoring samples are less than 30 micrograms per cubic meter of air, the respiratory protection for the employees was adequate, the work procedures were performed in accordance with 29 CFR 1926.62, and that there were no visible accumulations of lead-contaminated paint and dust on the worksite. Do not remove the lead control area or roped-off boundary and warning signs prior to the Contracting Officer's receipt of the CIH's certification. Reclean areas showing dust or residual paint chips.

3.3.3 Disposal

Dispose of removed materials and associated waste in compliance with Environmental Protection Agency (EPA), Federal, State, and Local requirements and the approved work plans for removal and disposal.

- a. Materials (except metals) coated with lead-contaminated paint which is well adhered shall be disposed of in the Base Sanitary Landfill, provided all Base and Landfill requirements are complied with. Comply with the land disposal restriction notification requirements of 40 CFR 258.
- b. All debris, paint chips, and dust will be considered a hazardous waste. Dispose of this material off Base in an approved hazardous waste facility.

3.3.4 Testing of Lead-Contaminated Paint Residue

Test lead-contaminated paint residue and debris in accordance with 40 CFR 261 for hazardous waste. A composite sample of dust and debris collected after removal is complete must be tested for lead using EPA Protocol Total Characteristic Leachate Procedure (TCLP) Test. If the results are less than five parts per million, the debris shall be disposed in the Base Sanitary Landfill. If the results are equal to or greater than five parts per million, the debris shall be disposed in an approved hazardous waste facility.

3.4 PAYMENT FOR HAZARDOUS WASTE

Payment for disposal of hazardous waste shall not be made until a signed copy of the manifest from the disposal facility certifying the amount of hazardous waste delivered is returned and a copy is furnished to the Government.

-- End of Section --

SECTION 02 82 33.13

REMOVAL AND DISPOSAL OF MATERIALS COATED WITH LEAD-CONTAINING PAINT

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z9.2 (1979; R 1991) Fundamentals Governing the Design and Operation of Local Exhaust Systems

ANSI Z88.2 (1992) Respiratory Protection

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1926.55 Gases, Vapors, Fumes, Dusts, and Mists

29 CFR 1926.57 Ventilation

29 CFR 1926.59 Hazard Communication

29 CFR 1926.62 Lead

29 CFR 1926.103 Respiratory Protection

40 CFR 258 Disposal of Hazardous Materials

40 CFR 261 Identification and Listing of Hazardous Waste

UNDERWRITERS LABORATORIES (UL)

UL 586 (1996; Rev thru Aug 1999) High-Efficiency, Particulate, Air Filter Units

1.2 DEFINITIONS

1.2.1 Action Level

Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air averaged over an 8-hour period. As used in this section, "30 micrograms per cubic meter of air" refers to the action level.

1.2.2 Area Monitoring

Sampling of lead concentrations within the lead control area and inside the physical boundaries which is representative of the airborne lead

concentrations which may reach the breathing zone of personnel potentially exposed to lead.

1.2.3 Physical Boundary

Area physically roped or partitioned off around an enclosed lead control area to limit unauthorized entry of personnel. As used in this section, "inside boundary" shall mean the same as "outside lead control area."

1.2.4 Certified Industrial Hygienist (CIH)

As used in this section, refers to an Industrial Hygienist employed by the Contractor and is certified by the American Board of Industrial Hygiene in comprehensive practice.

1.2.5 Change Rooms and Shower Facilities

Rooms within the designated physical boundary around the lead control area equipped with separate storage facilities for clean protective work clothing and equipment and for street clothes which prevent cross-contamination.

1.2.6 Decontamination Room

Room for removal of contaminated personal protective equipment (PPE).

1.2.7 Eight-Hour Time Weighted Average (TWA)

Airborne concentration of lead averaged over an 8-hour workday to which an employee is exposed.

1.2.8 High Efficiency Particulate Air (HEPA) Filter Equipment

HEPA filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining lead-contaminated paint dust. A high efficiency particulate filter means 99.97 percent efficient against 0.3 micron size particles.

1.2.9 Lead

Metallic lead, inorganic lead compounds, and organic lead soaps. Excluded from this definition are other organic lead compounds.

1.2.10 Lead Control Area

An enclosed area or structure with full containment to prevent the spread of lead dust, paint chips, or debris of lead-containing paint removal operations. The lead control area is isolated by physical boundaries to prevent unauthorized entry of personnel.

1.2.11 Lead Permissible Exposure Limit (PEL)

Fifty micrograms per cubic meter of air as an 8-hour time weighted average as determined by 29 CFR 1926.62. If an employee is exposed for more than 8 hours in a work day, the PEL shall be determined by the following formula:

$$\text{PEL (micrograms/cubic meter of air)} = 400/\text{No. hrs worked per day}$$

1.2.12 Personal Monitoring

Sampling of lead concentrations within the breathing zone of an employee to determine the 8-hour time weighted average concentration in accordance with 29 CFR 1926.62. Samples shall be representative of the employee's work tasks. Breathing zone shall be considered an area within a hemisphere, forward of the shoulders, with a radius of 6 to 9 inches and the center at the nose or mouth of an employee.

1.3 QUALITY ASSURANCE

1.3.1 Medical Examinations

Before exposure to lead-contaminated dust, provide workers with a comprehensive medical examination as required by 29 CFR 1926.59. The examination will not be required if adequate records show that employees have been examined as required by 29 CFR 1926.59 within the last year.

1.3.1.1 Medical Records

Maintain complete and accurate medical records of employees for a period of at least 40 years or for the duration of employment plus 20 years, whichever is longer.

1.3.2 CIH Responsibilities

- a. Certify training.
- b. Review and approve materials coated with lead-containing paint Removal Work Plan for conformance to the applicable referenced standards.
- c. Inspect lead-containing paint removal work for conformance with the approved plan.
- d. Direct monitoring.
- e. Ensure work is performed in strict accordance with specifications at all times.
- f. Ensure hazardous exposure to personnel and to the environment are adequately controlled at all times.

1.3.3 Training

Train each employee performing paint removal, disposal, and air sampling operations prior to the time of initial job assignment, in accordance with 29 CFR 1926.62.

1.3.3.1 Training Certification

Submit certificates signed and dated by the CIH and by each employee stating that the employee has received training.

1.3.4 Respiratory Protection Program

- a. Furnish each employee required to wear a negative pressure respirator or other appropriate type with a respirator fit test at the time of initial fitting and at least every 6 months thereafter

as required by 29 CFR 1926.62.

- b. Establish and implement a respiratory protection program as required by ANSI Z88.2, 29 CFR 1926.103, 29 CFR 1926.62, and 29 CFR 1926.55.

1.3.5 Hazard Communication Program

Establish and implement a Hazard Communication Program as required by 29 CFR 1926.59.

1.3.6 Hazardous Waste Management

The Hazardous Waste Management plan shall comply with applicable requirements of federal, state, and local hazardous waste regulations and address:

- a. Identification of hazardous wastes associated with the work.
- b. Estimated quantities of wastes to be generated and disposed of.
- c. Names and qualifications of each contractor that will be transporting, storing, treating, and disposing of the wastes consisting of lead chips and/or dust not intact lead-coated materials. Include the facility location and a 24-hour point of contact. Furnish two copies of state hazardous waste permits .
- d. Names and qualifications (experience and training) of personnel who will be working on-site with hazardous wastes.
- e. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.
- f. Spill prevention, containment, and cleanup contingency measures to be implemented.
- g. Work plan and schedule for waste containment, removal and disposal. Wastes shall be cleaned up and containerized daily.
- h. Cost for hazardous waste disposal according to this plan.

1.3.7 Safety and Health Compliance

In addition to the detailed requirements of this specification, comply with laws, ordinances, rules, and regulations of federal, state, and local authorities regarding removing, handling, storing, transporting, and disposing of lead waste materials. Comply with the applicable requirements of the current issue of 29 CFR 1926.62. Submit matters regarding interpretation of standards to the Contracting Officer for resolution before starting work. Where specification requirements and the referenced documents vary, the most stringent requirement shall apply.

1.3.8 Pre-Construction Conference

Along with the CIH, meet with the Contracting Officer to discuss in detail the materials coated with lead-containing paint removal work plan, including work procedures and precautions for the work plan.

1.4 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures

SD-03 Product Data

Vacuum filters

Respirators

SD-06 Test Reports

Monitoring Results

SD-07 Certificates

Qualifications of CIH

Testing laboratory qualifications

Materials coated with lead-containing paint removal work plan

Rental equipment notification

CIH approval of work plan (signature, date, and certification number)

Respiratory protection program

Hazard communication program

EPA approved hazardous waste treatment or disposal facility for lead disposal

Hazardous waste management plan

Vacuum filters

SD-11 Closeout Submittals

Completed and signed hazardous waste manifest from treatment or disposal facility

Certification of medical examinations

Employee training certification

1.4.1 Qualifications of CIH

Submit name, address, and telephone number of the CIH selected to perform responsibilities in paragraph entitled "CIH Responsibilities." Provide previous experience of the CIH. Submit proper documentation that the Industrial Hygienist is certified by the American Board of Industrial Hygiene in comprehensive practice, including certification number and date of certification/recertification.

1.4.2 Testing Laboratory

Submit the name, address, and telephone number of the testing laboratory selected to perform the monitoring, testing, and reporting of airborne concentrations of lead. Provide proper documentation that persons performing the analysis have been judged proficient by successful participation within the last year in the National Institute for Occupational Safety and Health (NIOSH) Proficiency Analytical Testing (PAT) Program. The laboratory shall be accredited by the American Industrial Hygiene Association (AIHA). Provide AIHA documentation along with date of accreditation/reaccreditation.

1.4.3 Materials Coated with Lead-Containing Paint Removal Work Plan

Submit a detailed job-specific plan of the work procedures to be used in the removal of materials coated with lead-containing paint. The plan shall include a sketch showing the location, size, and details of lead control areas, location and details of decontamination rooms, change rooms, shower facilities, and mechanical ventilation system. Include in the plan, eating, drinking, smoking and restroom procedures, interface of trades, sequencing of lead related work, collected wastewater and paint debris disposal plan, air sampling plan, respirators, protective equipment, and a detailed description of the method of containment of the operation to ensure that airborne lead concentrations of 30 micrograms per cubic meter of air are not exceeded outside of the lead control area. Include air sampling, training and strategy, sampling methodology, frequency, duration of sampling, and qualifications of air monitoring personnel in the air sampling portion of the plan.

1.4.4 Air Monitoring

Submit [monitoring results](#) to the Contracting Officer within 3 working days, signed by the testing laboratory employee performing the air monitoring, the employee that analyzed the sample, and the CIH.

1.5 REMOVAL

1.5.1 Title to Materials

Materials resulting from demolition work, except as specified otherwise, shall become the property of the Contractor and shall be disposed of in accordance with Section [02 41 00](#), "Demolition," except as specified herein.

1.6 EQUIPMENT

Furnish the Contracting Officer with two complete sets of personal protective equipment daily, as required herein, for entry into and inspection of the removal work within the lead controlled area. Personal protective equipment shall include fitted respirators and disposable whole body covering, including appropriate foot, head, and hand protection. PPE shall remain the property of the Contractor.

1.6.1 Respirators

Furnish appropriate respirators approved by the NIOSH, Department of Health and Human Services, for use in atmospheres containing lead dust. Respirators shall comply with the requirements of [29 CFR 1926.62](#) and [29 CFR 1926.103](#).

1.6.2 Special Protective Clothing

Furnish personnel who will be exposed to lead-contaminated dust with appropriate disposable protective whole body clothing, head covering, gloves, and foot coverings. Furnish appropriate disposable plastic or rubber gloves to protect hands. Reduce the level of protection only after obtaining approval from the CIH.

1.6.3 Rental Equipment Notification

If rental equipment is to be used during lead-containing paint handling and disposal, notify the rental agency in writing concerning the intended use of the equipment. Furnish a copy of the written notification to the Contracting Officer.

1.6.4 Vacuum Filters

UL 586 labeled HEPA filters.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Notification

Notify the Contracting Officer 20 days prior to the start of any removal work.

3.1.2 Lead Control Area Requirements

- a. Establish a lead control area by completely enclosing with containment screens the area or structure where materials coated with lead-containing paint removal operations will be performed.

3.1.3 Protection of Existing Work to Remain

Perform removal work without damage or contamination of adjacent areas. Where existing work is damaged or contaminated, restore work to its original condition or better.

3.1.4 Boundary Requirements

Provide physical boundaries around the lead control area by roping off the area or providing curtains, portable partitions or other enclosures to ensure that airborne concentrations of lead will not reach 30 micrograms per cubic meter of air outside of the lead control area.

3.1.5 Furnishings

The Government will remove furniture and equipment from the work area before lead-containing paint removal work begins.

3.1.6 Heating, Ventilating and Air Conditioning (HVAC) Systems

Shut down, lock out, and isolate HVAC systems that supply, exhaust, or pass

through the lead control areas. Seal intake and exhaust vents in the lead control area with 6-mil plastic sheet and tape. Seal seams in HVAC components that pass through the lead control area.

3.1.7 Change Room and Shower Facilities

Provide clean change rooms and shower facilities within the physical boundary around the designated lead control area in accordance with requirements of 29 CFR 1926.62.

3.1.8 Mechanical Ventilation System

- a. Use adequate ventilation to control personnel exposure to lead in accordance with 29 CFR 1926.57.
- b. To the extent feasible, use fixed local exhaust ventilation connected to HEPA filters or other collection systems, approved by the industrial hygienist. Local exhaust ventilation systems shall be designed, constructed, installed, and maintained in accordance with ANSI Z9.2.

3.1.9 Personnel Protection

Personnel shall wear and use protective clothing and equipment as specified herein. Eating, smoking, or drinking is not permitted in the lead control area. No one will be permitted in the lead control area unless they have been given appropriate training and protective equipment.

3.1.10 Warning Signs

Provide warning signs at approaches to lead control areas. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area. Signs shall comply with the requirements of 29 CFR 1926.62.

3.2 WORK PROCEDURES

The work shall include removal of materials coated with lead containing paint. Materials shall be removed with coating adhered and intact. No sanding, sandblasting or other procedures which may cause lead containing particles to become airborne shall be used for demolition. The Contractor is advised of these conditions and shall be responsible for compliance with all EPA, Federal, State and Local Requirements.

3.2.1 Painted Exterior rails, exterior concrete, Windows, and Doors

Remove all painted exterior rails, concrete, windows, and doors with coating intact. Perform removal of materials coated with lead-containing paint in accordance with approved procedures. Use procedures and equipment required to limit occupational environmental exposure to lead when materials coated with lead-containing paint are removed in accordance with 29 CFR 1926.62, except as specified herein.

3.2.2 Personnel Exiting Procedures

Whenever personnel exit the lead-controlled area, they shall perform the following procedures and shall not leave the work place wearing any clothing or equipment worn during the work day:

- a. Vacuum themselves off.
- b. Remove protective clothing in the decontamination room, and place them in an approved impermeable disposal bag.
- c. Shower.
- d. Change to clean clothes prior to leaving the physical boundary designated around the lead-contaminated job site.

3.2.3 Monitoring

Monitoring of airborne concentrations of lead shall be in accordance with 29 CFR 1926.62 and as specified herein. Air monitoring, testing, and reporting shall be performed by a CIH or an Industrial Hygiene (IH) Technician who is under the direction of the CIH.

- a. The CIH or the IH Technician under the direction of the CIH shall be on the jobsite directing the monitoring, and inspecting the lead-containing paint removal work to ensure that the requirements of the Contract have been satisfied during the entire removal of materials coated with lead-containing paint operation.
- b. Take personal air monitoring samples on employees who are anticipated to have the greatest risk of exposure as determined by the CIH. In addition, take air monitoring samples on at least 25 percent of the work crew or a minimum of two employees, whichever is greater, during each work shift.
- c. Submit results of air monitoring samples, signed by the CIH, within 72 hours after the air samples are taken. Notify the Contracting Officer immediately of exposure to lead at or in excess of the action level of 30 micrograms per cubic meter of air outside of the lead control area.

3.2.3.1 Monitoring During Removal Work

Perform personal and area monitoring during the entire removal operation. Sufficient area monitoring shall be conducted at the physical boundary to ensure unprotected personnel are not exposed above 30 micrograms per cubic meter of air at all times. If the outside boundary lead levels are at or exceed 30 micrograms per cubic meter of air, work shall be stopped and the CIH shall immediately correct the condition(s) causing the increased levels and notify the Contracting Officer immediately. The CIH shall review the sampling data collected on that day to determine if condition(s) requires any further change in work methods. Removal work shall resume when approval is given by the CIH. The Contractor shall control the lead level outside of the work boundary to less than 30 micrograms per cubic meter of air at all times. As a minimum, conduct area monitoring daily on each shift in which lead paint removal operations are performed in areas immediately adjacent to the lead control area. For outdoor operations, at least one sample on each shift shall be taken on the downwind side of the lead control area. If adjacent areas are contaminated, clean and visually inspect contaminated areas. The CIH shall certify that the area has been cleaned of lead contamination.

3.3 MATERIALS COATED WITH LEAD-CONTAINING PAINT REMOVAL

Manual or power sanding of interior and exterior surfaces is not

permitted. Remove materials coated with lead containing paint within the areas designated on the drawings. Take whatever precautions are necessary to minimize damage to the underlying substrate or adjacent surfaces to remain.

3.4 CLEANUP AND DISPOSAL

3.4.1 Cleanup

Maintain surfaces of the lead control area free of accumulations of paint chips and dust. Restrict the spread of dust and debris; keep waste from being distributed over the work area. Do not dry sweep or use compressed air to clean up the area. At the end of each shift and when the paint removal operation has been completed, clean the area of visible lead paint contamination by vacuuming with a HEPA filtered vacuum cleaner and wet mopping the area.

3.4.2 Certification

The CIH shall certify in writing that the inside and outside the lead control area air monitoring samples are less than 30 micrograms per cubic meter of air, the respiratory protection for the employees was adequate, the work procedures were performed in accordance with 29 CFR 1926.62, and that there were no visible accumulations of lead-contaminated paint and dust on the worksite. Do not remove the lead control area or roped-off boundary and warning signs prior to the Contracting Officer's receipt of the CIH's certification. Reclean areas showing dust or residual paint chips.

3.4.3 Testing of Lead-Containing Paint Residue

Test lead containing paint residue in accordance with 40 CFR 261 for hazardous waste. A composite sample of dust and debris collected after removal is complete must be tested for lead using EPA protocol Total Characteristic Leachate Procedure (TCLP) Test. If the results of that test are less than five parts per million (PPM), it may be disposed of at the Base Landfill. If the results are greater than five PPM, it will be considered a hazardous waste and disposed of accordingly.

3.4.4 Disposal

Dispose of removed materials and associated waste in compliance with Environmental Protection Agency (EPA), Federal, State, and Local requirements and the approved work plans for removal and disposal.

- a. Materials (except metals) coated with lead-containing paint which is well adhered shall be disposed of in the Base Sanitary Landfill, provided all Base and Landfill requirements are complied with. Comply with the land disposal restriction notification requirements of 40 CFR 258.
- b. All debris, paint chips, and dust may be considered a hazardous waste. Dispose of this material (if TCLP = 5ppm) off Base in an approved hazardous waste facility.

-- End of Section --

SECTION 03 30 50

CAST-IN-PLACE CONCRETE

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)

- ACI 301 (2010) Specifications for Structural Concrete
- ACI 305R (2010) Specification for Hot Weather Concreting
- ACI 306R (2010) Cold Weather Concreting

ASTM INTERNATIONAL (ASTM)

- ASTM A 185 (2002) Steel Welded Wire Reinforcement, Plain, for Concrete
- ASTM A 615/A 615M (2008b) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- ASTM C 33 (2003) Concrete Aggregates
- ASTM C 94/C94M (2000) Ready-Mixed Concrete
- ASTM C 143/C143M (2000) Slump of Hydraulic Cement Concrete
- ASTM C 156 (1998) Water Retention by Concrete Curing Methods
- ASTM D 1140 (2000) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve

PART 2 PRODUCTS

2.1 CONCRETE

ASTM C 94/C94M, a minimum strength of 3000 psi at 28 days and slump between 2 and 4 inches ASTM C 143/C143M.

2.2 CURING MATERIALS

ACI 301.

2.3 CONCRETE AGGREGATE

ASTM C 33, fine aggregate grading with a maximum of 3 percent by weight passing ASTM D 1140, No. 200 sieve, or coarse aggregate Size 57, 67, or 7.

2.4 REINFORCING STEEL

ASTM A 615/A 615M, Grade 60.

2.5 WELDED-WIRE FABRIC FOR CONCRETE REINFORCEMENT

ASTM A 185.

2.6 VAPOR BARRIER

Shall be polyethylene sheeting of natural color with a nominal thickness of 10 mils. The loss of moisture when determined in accordance with ASTM C 156 shall not exceed 0.055 gram per square centimeter of surface.

PART 3 EXECUTION

3.1 FILL

Under the areas to receive concrete shall be compacted to 95% density.

3.2 WORKMANSHIP

The surface immediately under concrete installed on grade shall be wetted as directed immediately before the concrete is placed.

3.3 CURING

Curing concrete shall conform to ACI 301.

3.4 CONCRETE FINISHES

Concrete shall be given a floated finish.

3.5 HOT WEATHER CONCRETE WORK

ACI 305R.

3.6 COLD WEATHER CONCRETE WORK

ACI 306R.

-- End of Section --

SECTION 05 30 00

STEEL DECKS

07/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG-913 (1991) LRFD Cold-formed Steel Design Manual

AISI SG03-3 (2002; Suppl 2001-2004; R 2008)
Cold-Formed Steel Design Manual Set

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2010; Errata 2010) Structural Welding
Code - Steel

AWS D1.3/D1.3M (2008; Errata 2008) Structural Welding
Code - Sheet Steel

ASTM INTERNATIONAL (ASTM)

ASTM A 1008/A 1008M (2009) Standard Specification for Steel,
Sheet, Cold-Rolled, Carbon, Structural,
High-Strength Low-Alloy and High-Strength
Low-Alloy with Improved Formability,
Solution Hardened, and Bake Hardened

ASTM A 123/A 123M (2009) Standard Specification for Zinc
(Hot-Dip Galvanized) Coatings on Iron and
Steel Products

ASTM A 36/A 36M (2008) Standard Specification for Carbon
Structural Steel

ASTM A 653/A 653M (2009a) Standard Specification for Steel
Sheet, Zinc-Coated (Galvanized) or
Zinc-Iron Alloy-Coated (Galvannealed) by
the Hot-Dip Process

ASTM A 780 (2001; R 2006) Standard Practice for
Repair of Damaged and Uncoated Areas of
Hot-Dip Galvanized Coatings

ASTM A 792/A 792M (2006a) Standard Specification for Steel
Sheet, 55% Aluminum-Zinc Alloy-Coated by
the Hot-Dip Process

- ASTM D 1056 (2007) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
- ASTM D 1149 (2007) Standard Test Method for Rubber Deterioration - Surface Ozone Cracking in a Chamber
- ASTM D 746 (2007) Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
- ASTM E 84 (2011b) Standard Test Method for Surface Burning Characteristics of Building Materials

STEEL DECK INSTITUTE (SDI)

- SDI 30 (2001) Design Manual for Composite Decks, Form Decks, and Roof Decks
- SDI DDMO3 (3rd Edition) Diaphragm Design Manual
- SDI DDP (1987; R 2000) Deck Damage and Penetrations
- SDI MOC2 (2006) Manual of Construction with Steel Deck

UNDERWRITERS LABORATORIES (UL)

- UL 209 (2005; Rev thru May 2007) Cellular Metal Floor Raceways and Fittings

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

- Fabrication Drawings
- Deck Units
- Cant Strips
- Ridge and Valley Plates
- Metal Closure Strips

1.3 QUALITY ASSURANCE

1.3.1 Deck Units

Furnish deck units and accessory products from a manufacturer regularly engaged in manufacture of steel decking. Provide manufacturer's certificates attesting that the decking material meets the specified requirements.

1.3.2 Fabrication Drawings

Show type and location of units, location and sequence of connections, bearing on supports, methods of anchoring, attachment of accessories, adjusting plate details, size and location of holes to be cut and reinforcement to be provided, the manufacturer's erection instructions and other pertinent details.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver deck units to the site in a dry and undamaged condition. Store and handle steel deck in a manner to protect it from corrosion, deformation, and other types of damage. Do not use decking for storage or as working platform until units have been fastened into position. Exercise care not to damage material or overload decking during construction. Must not exceed the design live load. The maximum uniform distributed storage load. Stack decking on platforms or pallets and cover with weathertight ventilated covering. Elevate one end during storage to provide drainage. Maintain deck finish at all times to prevent formation of rust. Repair deck finish using touch-up paint. Replace damaged material.

1.5 DESIGN REQUIREMENTS FOR ROOF DECKS

1.5.1 Properties of Sections

Properties of metal roof deck sections must comply with engineering design width as limited by the provisions of [AISI SG-913](#).

1.5.2 Allowable Loads

Indicate total uniform dead and live load for detailing purposes.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Steel Sheet

Flat rolled carbon steel sheets of structural quality, thickness not less than indicated meeting the requirements of [AISI SG03-3](#), except as modified herein.

2.1.2 Steel Coating

[ASTM A 653/A 653M](#) designation galvanized, or [ASTM A 792/A 792M](#) designation [AZ55](#), aluminum-zinc alloy. Apply coating to both sides of sheet. Conform to [UL 209](#) for coating on decking provided as wire raceways.

2.1.3 Mixes

2.1.4 Galvanized Steel Angles for Roof Decks

Provide hot-rolled carbon steel angles conforming to [ASTM A 36/A 36M](#), merchant quality, Grade Designation SAE/AISI 1023 or SAE/AISI 1025, and hot-dip galvanized in accordance with [ASTM A 123/A 123M](#).

2.1.5 Joint Sealant Material for Roof Decks

Provide a nonskinning, gun-grade, bulk compound material as recommended by

the manufacturer.

2.1.6 Galvanizing Repair Paint for Roof Decks

Provide a high zinc-dust content paint for regalvanizing welds in galvanized steel and shall conform to [ASTM A 780](#).

2.1.7 Flexible Closure Strips for Roof Decks

Provide strips made of elastomeric material specified and premolded to the configuration required to provide tight-fitting closures at open ends and sides of steel roof decking.

Provide a vulcanized, closed-cell, expanded chloroprene elastomer having approximately [3.5 psi](#) compressive-deflection at 25 percent deflection (limits), conforming to [ASTM D 1056](#), Grade No. SCE 41, with the following additional properties:

Brittleness temperature of [minus 40 degrees F](#) when tested in accordance with [ASTM D 746](#).

Flammability resistance with a flame spread rating of less than 25 when tested in accordance with [ASTM E 84](#).

Resistance to ozone must be "no cracks" after exposure of a sample kept under a surface tensile strain of 25 percent to an ozone concentration of 100 parts per million of air by volume in air for 100 hours at [104 degrees F](#) and tested in accordance with [ASTM D 1149](#).

Provide a elastomeric type adhesive with a chloroprene base as recommended by the manufacturer of the flexible closure strips.

2.2 ACCESSORIES

Provide accessories of same material as deck, unless specified otherwise. Provide manufacturer's standard type accessories, as specified.

2.2.1 Adjusting Plates

Provide adjusting plates, or segments of deck units, of same thickness and configuration as deck units in locations too narrow to accommodate full size units. Provide factory cut plates of predetermined size where possible.

2.2.2 End Closures

Fabricated of sheet metal by the deck manufacturer. Provide end closures minimum [0.028 inch](#) thick to close open ends at exposed edges of floors, parapets, end walls, eaves, and openings through deck.

2.2.3 Sheet Metal Collar

Where deck is cut for passage of pipes, ducts, columns, etc., and deck is to remain exposed, provide a neatly cut sheet metal collar to cover edges of deck. Do not cut deck until after installation of supplemental supports.

2.2.4 Cover Plates

Sheet metal to close panel edge and end conditions, and where panels change

direction or butt. Polyethylene-coated, self-adhesive, 2 inch wide joint tape may be provided in lieu of cover plates on flat-surfaced decking butt joints.

Fabricate cover plates for abutting floor deck units from the specified structural-quality steel sheets not less than nominal thick before galvanizing. Provide 6 inch wide cover plates and form to match the contour of the floor deck units.

2.2.5 Roof Sump Pans

Sump pans must be provided for roof drains and must be minimum 0.075 inch thick steel, recessed type. Shape sump pans to meet roof slope by the supplier or by a sheet metal specialist. Provide bearing flanges of sump pans to overlap steel deck a minimum of 3 inch. Shape, size, and reinforce the opening in bottom of the sump pan to receive roof drain.

2.2.6 Column Closures

Sheet metal, minimum 0.0358 inch thick or metal rib lath.

2.2.7 Access Hole Covers

Sheet metal, minimum 0.0474 inch thick.

2.2.8 Hanger

Provide clips or loops for utility systems and suspended ceilings of one or more of the following types:

- a. Lip tabs or integral tabs where noncellular decking or flat plate of cellular section is 0.0474 inch thick or more, and a structural concrete fill is used over deck.
- b. Slots or holes punched in decking for installation of pigtails.
- c. Tabs driven from top side of decking and arranged so as not to pierce electrical cells.
- d. Decking manufacturer's standard as approved by the Contracting Officer.

2.2.9 Mechanical Fasteners

Provide mechanical fasteners, such as powder actuated or pneumatically driven fasteners, for anchoring the deck to structural supports and adjoining units that are designed to meet the loads indicated. Provide positive locking-type fasteners standard with the Steel Deck Institute and the steel deck manufacturer, as approved by the Contracting Officer.

2.2.10 Miscellaneous Accessories

Furnish the manufacturer's standard accessories to complete the deck installation. Furnish metal accessories of the same material as the deck and with the minimum design thickness as follows: saddles, 0.0474 inch; welding washers, 0.0598 inch cant strip, 0.0295 inch other metal accessories, 0.0358 inch unless otherwise indicated. Accessories must include but not be limited to saddles, welding washers, fasteners, cant strips, butt cover plates, underlapping sleeves, and ridge and valley plates.

2.3 FABRICATION

2.3.1 Deck Units

2.3.2 Roof Deck

Conform to **ASTM A 792/A 792M** or **ASTM A 1008/A 1008M** for deck used in conjunction with insulation and built-up roofing. Fabricate roof deck units of the steel design thickness required by the design drawings and galvanized.

2.3.2.1 Cant Strips for Roof Decks

Fabricate cant strips from the specified commercial-quality steel sheets not less than nominal **0.0359 inch** thick before galvanizing. Bend strips to form a 45-degree cant not less than **5 inch** wide, with top and bottom flanges a minimum **3 inch** wide. Length of strips **10 feet**.

2.3.2.2 Ridge and Valley Plates for Roof Decks

Fabricate plates from the specified structural-quality steel sheets, not less than nominal **0.0359 inch** thick before galvanizing. Provide plates of minimum **4-1/2 inch** wide and bent to provide tight fitting closures at ridges and valleys. Provide a minimum length of ridge and valley plates of **10 feet**.

2.3.2.3 Metal Closure Strips for Roof Decks

Fabricate strips from the specified commercial-quality steel sheets not less than nominal **0.0359 inch** thick before galvanizing. Provide strips from the configuration required to provide tight-fitting closures at open ends and sides of steel roof decking.

2.3.3 Venting

To ensure positive venting from the underside, provide slotted or perforated steel deck to receive concrete fill, overlay, or a poured concrete deck.

2.3.4 Shop Priming

Shop prime accessories and underside of deck at the factory after coating. Clean surfaces in accordance with the manufacturer's standard procedure followed by a spray, dip or roller coat of rust-inhibitive primer, oven cured.

PART 3 EXECUTION

3.1 EXAMINATION

Prior to installation of decking units and accessories, examine worksite to verify that as-built structure will permit installation of decking system without modification.

3.2 INSTALLATION

Install steel deck units in accordance with **SDI 30** and approved shop drawings. Place units on structural supports, properly adjusted, leveled,

and aligned at right angles to supports before permanently securing in place. Damaged deck and accessories including material which is permanently stained or contaminated, deformed, or with burned holes shall not be installed. Extend deck units over three or more supports unless absolutely impractical. Report inaccuracies in alignment or leveling to the Contracting Officer and make necessary corrections before permanently anchoring deck units. Locate deck ends over supports only. Ends of floor deck may be lapped or butted. Do not use unanchored deck units as a work or storage platform. Permanently anchor units placed by the end of each working day. Do not support suspended ceilings, light fixtures, ducts, utilities, or other loads by steel deck unless indicated. Distribute loads by appropriate means to prevent damage.

3.2.1 Attachment

Immediately after placement and alignment, and after correcting inaccuracies, permanently fasten steel deck units to structural supports and to adjacent deck units by welding with normal $5/8$ inch diameter puddle welds or fastened with screws, powder-actuated fasteners, or pneumatically driven fasteners as indicated on the design drawings and in accordance with manufacturer's recommended procedure and SDI 30. Clamp or weight deck units to provide firm contact between deck units and structural supports while performing welding or fastening. Anchoring the deck to structural supports with powder-actuated fasteners or pneumatically driven fasteners is prohibited. Attachment of adjacent deck units by button-punching is prohibited.

3.2.1.1 Welding

Perform welding in accordance with AWS D1.3/D1.3M using methods and electrodes recommended by the manufacturers of the base metal alloys being used. Ensure only operators previously qualified by tests prescribed in AWS D1.1/D1.1M and AWS D1.3/D1.3M make welds. Immediately recertify, or replace qualified welders, that are producing unsatisfactory welding. Conform to the recommendations of the Steel Deck Institute and the steel deck manufacturer for location, size, and spacing of fastening. Do use welding washers at the connections of the deck to supports. Do not use welding washers at sidelaps. Holes and similar defects will not be acceptable. Lap 2 inch deck ends. Attach all partial or segments of deck units to structural supports in accordance with Section 2.5 of SDI DDMO3. Attach shear connectors as shown and welded as per AWS D1.1/D1.1M through the steel deck to the steel member. Immediately clean welds by chipping and wire brushing. Heavily coat welds, cut edges and damaged portions of finish with the manufacturer's standard touch-up paint.

3.2.1.2 Fastening

Anchor deck to structural supports and adjoining units with mechanical deck fasteners as recommended by the Steel Deck Institute and the steel deck manufacturer, as approved by the Contracting Officer. Drive the powder-actuated fasteners with a low-velocity piston tool by an operator authorized by the manufacturer of the piston tool. Drive pneumatically fasteners with a low-velocity fastening tool and comply with the manufacturer's recommendations.

3.2.2 Openings

Cut or drill all holes and openings required and be coordinated with the drawings, specifications, and other trades. Frame and reinforce openings

through the deck in conformance with SDI DDP. Reinforce holes and openings larger than 12 inch by steel channels or angles installed perpendicular to the steel joists and supported by the adjacent steel joists. Install steel channels or angles perpendicular to the deck ribs and fasten to the channels or angles perpendicular to the steel joists.

3.2.3 Deck Damage

SDI MOC2, for repair of deck damage.

3.2.4 Accessory Installation

3.2.4.1 Adjusting Plates

Install as shown on shop drawings.

3.2.4.2 End Closures

Provide end closure to close open ends of cells at columns, walls, and openings in deck.

3.2.4.3 Closures Above Partitions

Provide for closing voids between cells over partitions that are perpendicular to direction of cells. Provide a one-piece closure strip for partitions 4 inch nominal or less in thickness and two-piece closure strips for wider partitions.

3.2.4.4 Access Hole Covers

Provide to seal holes cut in decking to facilitate welding of decking to structural supports.

3.2.4.5 Hangers

Provide as indicated to support utility system and suspended ceilings. Space devices as indicated.

3.2.5 Preparation of Fire-Proofed Surfaces

Provide deck surfaces, both composite and noncomposite, which are to receive sprayed-on fireproofing, galvanized and free of all grease, mill oil, paraffin, dirt, salt, and other contaminants which impair adhesion of the fireproofing. Complete any required cleaning prior to steel deck installation using a cleaning method that is compatible with the sprayed-on fireproofing.

3.3 JOINT SEALING FOR ROOF DECKS

Seal sidelaps and endlaps with manufacturer's recommended joint sealing material. Shop or field apply the material. Before applying the sealing material, completely remove dust, dirt, moisture, and other foreign material from the surfaces to which the sealing material is to be applied. Apply sealing material in strict accordance with the sealing material manufacturer's printed instructions.

3.4 ROOF SUMP PANS

Place sump pans over openings in roof decking and fusion welded to top

surface of roof decking. Do not exceed spacing of welds of 12 inch with not less than one weld at each corner. Field cut opening in the bottom of each roof sump pan to receive the roof drain as part of the work of this section.

3.5 CANT STRIPS FOR ROOF DECKS

Provide strips to be fusion welded to surface of roof decking, secured to wood nailers by galvanized screws or to steel framing by galvanized self-tapping screws or welds. Do not exceed spacing of welds and fasteners of 12 inch. Lap end joints a minimum 3 inch and secure with galvanized sheet metal screws spaced a maximum 4 inch on center.

3.6 RIDGE AND VALLEY PLATES FOR ROOF DECKS

Provide plates to be fusion welded to top surface of roof decking. Lap end joints a minimum 3 inch. For valley plates, provide endlaps to be in the direction of water flow.

3.7 CLOSURE STRIPS FOR ROOF DECKS

Provide closure strips at open, uncovered ends and edges of the roof decking and in voids between roof decking and top of walls and partitions where indicated. Install closure strips in position in a manner to provide a weathertight installation.

3.8 ROOF INSULATION SUPPORT FOR ROOF DECKS

Provide metal closure strips for support of roof insulation where rib openings in top surface of metal roof decking occur adjacent to edges and openings. Weld metal closure strips in position.

3.9 CLEANING AND PROTECTION FOR ROOF DECKS

Upon completion of the deck, sweep surfaces clean and prepare for installation of the roofing.

3.10 FIELD QUALITY CONTROL

3.10.1 Decks Not Receiving Concrete

Inspect the decking top surface for distortion after installation. For roof decks not receiving concrete, verify distortion by placing a straight edge across three adjacent top flanges. The maximum allowable gap between the straight edge and the top flanges is 1/16 inch; when gap is more than 1/16 inch, provide corrective measures or replacement. Reinspect decking after performing corrective measures or replacement.

-- End of Section --

SECTION 05 40 00

COLD-FORMED METAL FRAMING

05/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG02-KIT (2001; Supp 1 2004) North American Specification for the Design of Cold-Formed Steel Structural Members

AISI SG03-3 (2002; Suppl 2001-2004; R 2008) Cold-Formed Steel Design Manual Set

AMERICAN WELDING SOCIETY (AWS)

AWS D1.3/D1.3M (2008; Errata 2008) Structural Welding Code - Sheet Steel

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M (2009) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A153/A153M (2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A370 (2011) Standard Test Methods and Definitions for Mechanical Testing of Steel Products

ASTM A653/A653M (2010) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM C1513 (2010) Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections

ASTM C955 (2011a) Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases

- ASTM E 329 (2011a) Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
- ASTM F 1941 (2010) Standard Specification for Electrodeposited Coatings on Threaded Fasteners (Unified Inch Screw Threads (UN/UNR))

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Framing Components;

a. Cross sections, plans, and/or elevations showing component types and locations for each framing application; including shop coatings and material thicknesses for each framing component.

b. Connection details showing fastener type, quantity, location, and other information to assure proper installation.

c. Drawings depicting panel configuration, dimensions, components, locations, and construction sequence if the Contractor elects to install prefabricated/prefinished frames.

SD-03 Product Data

Steel studs, joists, tracks, bracing, bridging and accessories

SD-05 Design Data

Metal framing calculations;

SD-07 Certificates

Load-bearing cold-formed metal framing

Mill certificates or test reports from independent testing agency, qualified in accordance with ASTM E 329, showing that the steel sheet used in the manufacture of each cold-formed component complies with the minimum yield strengths and uncoated steel thickness specified. Test reports shall be based on the results of three coupon tests in accordance with ASTM A370.

Welds

Certified copies of welder qualifications test records showing qualification in accordance with AWS D1.3/D1.3M.

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver materials to job site and store in adequately ventilated, dry locations. Storage area shall permit easy access for inspection and handling. If necessary to store materials outside, stack off the ground,

support on a level platform, and protect from the weather as approved. Handle materials to prevent damage. Finish of the framing members shall be maintained at all times, using an approved high zinc dust content, galvanizing repair paint whenever necessary to prevent the formation of rust. Replace damaged items with new, as directed by the Contracting Officer.

1.4 LOAD-BEARING COLD-FORMED METAL FRAMING

Include top and bottom tracks, bracing, fastenings, and other accessories necessary for complete installation. Framing members shall have the structural properties indicated. Where physical structural properties are not indicated, they shall be as necessary to withstand all imposed loads. Design framing in accordance with [AISI SG03-3](#).

1.5 MAXIMUM DEFLECTION

a. Exterior Studs:

<u>Deflection Criteria</u>	<u>Exterior Finish</u>
L/240 or L/360	Synthetic Plaster, Metal Panels
L/360	Cement Plaster, Wood Veneer
L/600	Brick Veneer, Stone Panels

Wall deflections shall be computed on the basis that studs withstand all lateral forces independent of any composite action from sheathing materials. Studs abutting windows or louvers shall also be designed not to exceed [1/4 inch](#) maximum deflection.

a. Roof Rafters:

L/240 - Live load only

1.6 QUALITY ASSURANCE

1.6.1 Drawing Requirements

Submit [framing components](#) to show sizes, thicknesses, layout, material designations, methods of installation, and accessories.

1.6.2 Design Data Required

Submit [metal framing calculations](#) to verify sizes, gages, and spacing of members and connections. Show methods and practices used in installation.

PART 2 PRODUCTS

2.1 STEEL [STUDS, JOISTS](#), TRACKS, BRACING, BRIDGING AND ACCESSORIES

Framing components shall comply with [ASTM C955](#) and the following.

2.1.1 Studs and Joists of [16 Gage \(0.0598 Inch\)](#) and Heavier

Galvanized steel, [ASTM A653/A653M](#), SS Grade 50, [G60](#) .

2.1.2 Studs and Joists of [18 Gage \(0.0478 Inch\)](#) and Lighter

Studs and Joists of [18 Gage \(0.0478 Inch\)](#) and Lighter, Track, and

Accessories (All Gages): Galvanized steel, ASTM A653/A653M, SS, Grade 50 33,000 psi G60.

2.1.3 Sizes, Gages, Section Modulus, and Other Structural Properties

Size and gage as indicated. Steel stud deflection shall be limited to L/600 for exterior wall brick veneer construction.

2.2 MARKINGS

Studs and track shall have product markings stamped on the web of the section. The markings shall be repeated throughout the length of the member at a maximum spacing of 4 feet on center and shall be legible and easily read. The product marking shall include the following:

- a. An ICC number.
- b. Manufacturer's identification.
- c. Minimum delivered uncoated steel thickness.
- d. Protective coating designator.
- e. Minimum yield strength.

2.3 CONNECTIONS

Screws for steel-to-steel connections shall be self-drilling, tapping screws in compliance with ASTM C1513 of the type, size and location as shown on the drawings. Electroplated screws shall have a minimum 5 micron zinc coating in accordance with ASTM F 1941. Screws, bolts, and anchors shall be hot-dipped galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M as appropriate. Screws bolts, and anchors shall be hot dipped galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M as appropriate.

2.4 PLASTIC GROMMETS

Supply plastic grommets, recommended by stud manufacturer, to protect electrical wires. Prevent metal to metal contact for plumbing pipes.

PART 3 EXECUTION

3.1 FASTENING

Fasten framing members together by welding or by using self-drilling or self-tapping screws. Electrodes and screw connections shall be as required and indicated in the design calculations.

3.1.1 Welds

All welding shall be performed in accordance with AWS D1.3/D1.3M, as modified by AISI SG02-KIT. All welders, welding operations, and welding procedures shall be qualified according to AWS D1.3/D1.3M. All welds shall be cleaned and coated with rust inhibitive galvanizing paint. Do not field weld materials lighter than 18 gage.

3.1.2 Screws

Screws shall be of the type, size, and location shown on the drawings. Screw penetration through joined materials shall not be less than three exposed threads. Minimum spacings and edge distances for screws shall be as specified in [AISI SG02-KIT](#). Screws covered by sheathing materials shall have low profile heads.

3.1.3 Anchors

Anchors shall be of the type, size, and location shown on the drawings.

3.1.4 Powder-Actuated Fasteners

Powder-actuated fasteners shall be of the type, size, and location shown on the drawings.

3.2 INSTALLATION

3.2.1 Tracks

Provide accurately aligned runners at top and bottom of partitions. Anchor tracks as indicated in design calculations. Butt weld joints in tracks or splice with stud inserts. Fasteners shall be at least [3 inches](#) from the edge of concrete slabs.

3.2.2 Studs

Cut studs square and set with firm bearing against webs of top and bottom tracks. Position studs vertically in tracks and space as indicated in design. Do not splice studs. Provide at least two studs at jambs of doors and other openings [2 feet](#) wide or larger. Provide jack studs over openings, as necessary, to maintain indicated stud spacing. Provide tripled studs at corners, positioned to receive interior and exterior finishes. Fasten studs to top and bottom tracks by welding or screwing both flanges to the tracks. Framed wall openings shall include headers and supporting components as shown on the drawings. Headers shall be installed in all openings that are larger than the stud spacing in a wall. In curtain wall construction, provide for vertical movement where studs connect to the structural frame. Provide horizontal bracing in accordance with the design calculations and [AISI SG03-3](#), consisting of, as a minimum, runner channel cut to fit between and welded to the studs or hot- or cold-rolled steel channels inserted through cutouts in web of each stud and secured to studs with welded clip angles. Bracing shall be not less than the following:

<u>LOAD</u>	<u>HEIGHT</u>	<u>BRACING</u>
Wind load only	Up to 10 feet Over 10 feet	One row at mid-height Rows 5'-0" o.c. maximum
Axial load	Up to 10 feet Over 10 feet	Two rows at 1/3 points Rows 3'-4" o.c. maximum

3.2.3 Joists and Trusses

Locate each joist or truss directly above a stud. Provide doubled joists under parallel partitions wherever partition length exceeds 1/2 of joist span. Joists shall have at least [2.50 inches](#) of bearing on steel, [4 inches](#)

on masonry, and shall be reinforced over bearings where required to prevent web crippling. Splice joists over bearings only. Lap and weld splices as indicated. Provide manufacturer's standard bridging which shall not be less than the following:

<u>CLEAR SPAN</u>	<u>BRIDGING</u>
Up to 14 feet	One row near center
14 to 20 feet	Two rows at 1/3 points
20 to 26 feet	Three rows at 1/4 points
26 to 32 feet	Four rows at 1/5 points

Temporary bracing shall be provided and remain in place until work is permanently stabilized.

3.2.4 Erection Tolerances

- a. Framing members which will be covered by finishes such as wallboard, plaster, or ceramic tile set in a mortar setting bed, shall be within the following limits:
 - (1) Layout of walls and partitions: 1/4 inch from intended position;
 - (2) Plates and runners: 1/4 inch in 8 feet from a straight line;
 - (3) Studs: 1/4 inch in 8 feet out of plumb, not cumulative; and
 - (4) Face of framing members: 1/4 inch in 8 feet from a true plane.

- b. Framing members which will be covered by ceramic tile set in dry-set mortar, latex-portland cement mortar, or organic adhesive shall be within the following limits:
 - (1) Layout of walls and partitions: 1/4 inch from intended position;
 - (2) Plates and runners: 1/8 inch in 8 feet from a straight line;
 - (3) Studs: 1/8 inch in 8 feet out of plumb, not cumulative; and
 - (4) Face of framing members: 1/8 inch in 8 feet from a true plane.

-- End of Section --

SECTION 05 50 13

MISCELLANEOUS METAL FABRICATIONS

05/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ALUMINUM ASSOCIATION (AA)

AA 46 (1978) Standards for Anodized Architectural Aluminum

AA DAF-45 (2003; Reaffirmed 2009) Designation System for Aluminum Finishes

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 303 (2005) Code of Standard Practice for Steel Buildings and Bridges

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.3 (2006) Operations - Safety Requirements for Powder Actuated Fastening Systems

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2010; Errata 2010) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME B18.2.1 (2010) Square and Hex Bolts and Screws (Inch Series)

ASME B18.2.2 (2010) Standard for Square and Hex Nuts

ASME B18.21.1 (2009) Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series)

ASME B18.6.2 (1998; R 2005) Slotted Head Cap Screws, Square Head Set Screws, and Slotted Headless Set Screws: Inch Series

ASME B18.6.3 (2003; R 2008) Machine Screws and Machine Screw Nuts

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M (2009) Standard Specification for Zinc

	(Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 307	(2007b) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A 36/A 36M	(2008) Standard Specification for Carbon Structural Steel
ASTM A 47/A 47M	(1999; R 2009) Standard Specification for Ferritic Malleable Iron Castings
ASTM A 500/A 500M	(2009) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 53/A 53M	(2006a) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 653/A 653M	(2009a) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 687	(1993) Standard Specification for High-Strength Nonheaded Steel Bolts and Studs
ASTM A 780/A 780M	(2009) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A 924/A 924M	(2009a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B 108/B 108M	(2008) Standard Specification for Aluminum-Alloy Permanent Mold Castings
ASTM B 209	(2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 221	(2008) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B 26/B 26M	(2009) Standard Specification for Aluminum-Alloy Sand Castings
ASTM C 1513	(2004; E 2009; R 2009) Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections

ASTM D 1187 (1997; R 2002e1) Asphalt-Base Emulsions for Use as Protective Coatings for Metal

MASTER PAINTERS INSTITUTE (MPI)

MPI 79 (Oct 2009) Alkyd Anti-Corrosive Metal Primer

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 3 (1982; E 2004) Power Tool Cleaning

SSPC SP 6/NACE No.3 (2007) Commercial Blast Cleaning

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Access doors and panels, installation drawings

Submit fabrication drawings showing layout(s), connections to structural system, and anchoring details as specified in AISC 303.

Submit templates, erection and installation drawings indicating thickness, type, grade, class of metal, and dimensions. Show construction details, reinforcement, anchorage, and installation with relation to the building construction.

SD-03 Product Data

Access doors and panels

1.3 QUALIFICATION OF WELDERS

Qualify welders in accordance with AWS D1.1/D1.1M. Use procedures, materials, and equipment of the type required for the work.

1.4 DELIVERY, STORAGE, AND PROTECTION

Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove and replace damaged items with new items.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Structural Carbon Steel

ASTM A 36/A 36M.

2.1.2 Structural Tubing

ASTM A 500/A 500M.

2.1.3 Steel Pipe

ASTM A 53/A 53M, Type E or S, Grade B.

2.1.4 Fittings for Steel Pipe

Standard malleable iron fittings ASTM A 47/A 47M.

2.1.5 Anchor Bolts

ASTM A 307. Where exposed, shall be of the same material, color, and finish as the metal to which applied.

2.1.5.1 Expansion Anchors and Adhesive Anchors

Provide sizes as shown on the Drawings.

2.1.5.2 Lag Screws and Bolts

ASME B18.2.1, type and grade best suited for the purpose.

2.1.5.3 Toggle Bolts

ASME B18.2.1.

2.1.5.4 Bolts, Nuts, Studs and Rivets

ASME B18.2.2 and ASTM A 687 or ASTM A 307.

2.1.5.5 Powder Actuated Fasteners

Follow safety provisions of ASSE/SAFE A10.3.

2.1.5.6 Screws

ASME B18.2.1, ASME B18.6.2, ASME B18.6.3 and ASTM C 1513.

2.1.5.7 Washers

Provide plain washers to conform to ASME B18.22.1. Provide beveled washers for American Standard beams and channels, square or rectangular, tapered in thickness, and smooth. Provide lock washers to conform to ASME B18.21.1.

2.1.6 Aluminum Alloy Products

Conform to ASTM B 209 for sheet plate, ASTM B 221 for extrusions and ASTM B 26/B 26M or ASTM B 108/B 108M for castings, as applicable. Provide aluminum extrusions at least 1/8 inch thick and aluminum plate or sheet at least 0.050 inch thick.

2.2 FABRICATION FINISHES

2.2.1 Galvanizing

Hot-dip galvanize items specified to be zinc-coated, after fabrication where practicable. Galvanizing: ASTM A 123/A 123M, ASTM A 153/A 153M, ASTM A 653/A 653M or ASTM A 924/A 924M, G90, as applicable.

2.2.2 Galvanize

Anchor bolts, steel lintels, grating fasteners, washers, and parts or devices necessary for proper installation, unless indicated otherwise.

2.2.3 Repair of Zinc-Coated Surfaces

Repair damaged surfaces with galvanizing repair method and paint conforming to ASTM A 780/A 780M or by application of stick or thick paste material specifically designed for repair of galvanizing, as approved by Contracting Officer. Clean areas to be repaired and remove slag from welds. Heat surfaces to which stick or paste material is applied, with a torch to a temperature sufficient to melt the metallics in stick or paste; spread molten material uniformly over surfaces to be coated and wipe off excess material.

2.2.4 Shop Cleaning and Painting

2.2.4.1 Surface Preparation

Blast clean surfaces in accordance with SSPC SP 6/NACE No.3. Surfaces that will be exposed in spaces above ceiling or in attic spaces, crawl spaces, furred spaces, and chases may be cleaned in accordance with SSPC SP 3 in lieu of being blast cleaned. Wash cleaned surfaces which become contaminated with rust, dirt, oil, grease, or other contaminants with solvents until thoroughly clean. Steel to be embedded in concrete shall be free of dirt and grease. Do not paint or galvanize bearing surfaces, including contact surfaces within slip critical joints, but coat with rust preventative applied in the shop.

2.2.4.2 Pretreatment, Priming and Painting

Apply pretreatment, primer, and paint in accordance with manufacturer's printed instructions. On surfaces concealed in the finished construction or not accessible for finish painting, apply an additional prime coat to a minimum dry film thickness of 1.0 mil. Tint additional prime coat with a small amount of tinting pigment.

2.2.5 Nonferrous Metal Surfaces

Protect by plating, anodic, or organic coatings.

2.2.6 Aluminum Surfaces

2.2.6.1 Surface Condition

Before finishes are applied, remove roll marks, scratches, rolled-in scratches, kinks, stains, pits, orange peel, die marks, structural streaks, and other defects which will affect uniform appearance of finished surfaces.

2.2.6.2 Aluminum Finishes

Unexposed sheet, plate and extrusions may have mill finish as fabricated. Sandblast castings' finish, medium, AA DAF-45, or AA 46. Unless otherwise specified, provide all other aluminum items with a standard mill finish. Provide a coating thickness not less than that specified for protective and decorative type finishes for items used in interior locations or architectural Class I type finish for items used in exterior locations in AA DAF-45. Provide a polished satin finish on items to be anodized.

2.3 ACCESS DOORS AND PANELS

Provide flush type access doors and panels unless otherwise indicated. Fabricate frames for access doors of steel not lighter than 14 gage with welded joints and anchorage for securing into construction. Provide access doors with a minimum of 14 by 20 inches and of not lighter than 14 gage steel, with stiffened edges and welded attachments. Provide access doors hinged to frame and with pin-tumbler cylinder locks with appropriate cams in lieu of screwdriver-operated latches. Provide exposed metal surface with a baked enamel finish.

Provide ceiling access panels for terminal air blenders. Provide pin-tumbler cylinder locks with appropriate cams in lieu of screwdriver-operated latches.

All access doors and panels shall have locks that are keyed the same so that all door and panel locks can be opened by one key.

2.4 MISCELLANEOUS PLATES AND SHAPES

Provide for items that do not form a part of the structural steel framework, such as lintels, sill angles, miscellaneous mountings and frames. Provide lintels fabricated from structural steel shapes over openings in masonry walls and partitions as indicated and as required to support wall loads over openings. Provide with connections and fasteners. Construct to have at least 8 inches bearing on masonry at each end.

Provide angles and plates, ASTM A 36/A 36M, for embedment as indicated. Galvanize embedded items exposed to the elements according to ASTM A 123/A 123M.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Install items at locations indicated, according to manufacturer's instructions. Verify all measurements and take all field measurements necessary before fabrication. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and harmonize with the material to which fastenings are applied. Include materials and parts necessary to complete each item, even though such work is not definitely shown or specified. Poor matching of holes for fasteners shall be cause for rejection. Conceal fastenings where practicable. Thickness of metal and details of assembly and supports shall provide strength and stiffness. Form joints exposed to the weather shall be formed to exclude water. Items listed below require additional procedures.

3.2 WORKMANSHIP

Provide miscellaneous metalwork that is well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Provide continuous welding along the entire area of contact except where tack welding is permitted. Do not tack weld exposed connections of work in place and ground smooth. Provide a smooth finish on exposed surfaces of work in place and unless otherwise approved, flush exposed riveting. Mill joints where tight fits are required. Corner joints shall be coped or mitered, well formed, and in true alignment. Accurately set work to established lines and elevations

and securely fastened in place. Install in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

3.3 ANCHORAGE, FASTENINGS, AND CONNECTIONS

Provide anchorage where necessary for fastening miscellaneous metal items securely in place. Include for anchorage not otherwise specified or indicated slotted inserts, expansion shields, and powder-driven fasteners, when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; through bolts, lag bolts, and screws for wood. Do not use wood plugs in any material. Provide non-ferrous attachments for non-ferrous metal. Make exposed fastenings of compatible materials, generally matching in color and finish, to which fastenings are applied. Conceal fastenings where practicable.

3.4 BUILT-IN WORK

Form for anchorage metal work built-in with concrete or masonry, or provide with suitable anchoring devices as indicated or as required. Furnish metal work in ample time for securing in place as the work progresses.

3.5 WELDING

Perform welding, welding inspection, and corrective welding, in accordance with [AWS D1.1/D1.1M](#). Use continuous welds on all exposed connections. Grind visible welds smooth in the finished installation.

3.6 FINISHES

3.6.1 Dissimilar Materials

Where dissimilar metals are in contact, protect surfaces with a coat conforming to [MPI 79](#) to prevent galvanic or corrosive action. Where aluminum is in contact with concrete, plaster, mortar, masonry, wood, or absorptive materials subject to wetting, protect with [ASTM D 1187](#), asphalt-base emulsion.

3.7 ACCESS PANELS

Provide a removable access panel not less than [12 by 12 inches](#) directly below each valve, flow indicator, damper, or air splitter that is located above the ceiling, other than an acoustical ceiling, and that would otherwise not be accessible.

-- End of Section --

SECTION 06 20 00

FINISH CARPENTRY

08/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)

ALSC PS 20 (1970) American Softwood Lumber Standard

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA M2 (2007) Standard for Inspection of Treated Wood Products

AWPA M4 (2002) Standard for the Care of Preservative-Treated Wood Products

AWPA P5 (2009) Standard for Waterborne Preservatives

APA - THE ENGINEERED WOOD ASSOCIATION (APA)

APA PS 1 (1995) Voluntary Product Standard for Construction and Industrial Plywood

ARCHITECTURAL WOODWORK INSTITUTE (AWI)

AWI Qual Stds (8th Edition) AWI Quality Standards

ASME INTERNATIONAL (ASME)

ASME B18.2.1 (2010) Square and Hex Bolts and Screws (Inch Series)

ASME B18.2.2 (2010) Standard for Square and Hex Nuts

ASME B18.6.1 (1981; R 2008) Wood Screws (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM F 547 (2006) Nails for Use with Wood and Wood-Base Materials

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

BHMA A156.9 (2003) Cabinet Hardware

HARDWOOD PLYWOOD AND VENEER ASSOCIATION (HPVA)

HPVA HP-1 (2004) American National Standard for Hardwood and Decorative Plywood

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

WWPA G-5 (1998) Western Lumber Grading Rules

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

WDMA I.S. 4 (2000) Water-Repellent Preservative Non-Pressure Treatment for Millwork

WOOD MOULDING AND MILLWORK PRODUCERS ASSOCIATION (WMMPA)

WMMPA WM 6 (1987) Industry Standard for Non-Pressure Treating of Wood Millwork

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings - Cabinets

1.3 DETAIL DRAWINGS - Cabinets

The Contractor shall submit detail drawings showing fabricated items and special mill and woodwork items. Drawings shall indicate materials and details of construction, methods of fastening, erection, and installation.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver lumber, plywood, trim, and millwork to job site in an undamaged condition. Stack materials to ensure ventilation and drainage. Protect against dampness before and after delivery. Store materials under cover in a well-ventilated enclosure and protect against extreme changes in temperature and humidity. Do not store products in building until wet trade materials are dry.

1.5 QUALITY ASSURANCE

1.5.1 Lumber

Identify each piece or each bundle of lumber, millwork, and trim by the grade mark of a recognized association or independent inspection agency that is certified by the Board of Review, American Lumber Standards Committee, to grade the species.

1.5.2 Plywood

Each sheet of plywood shall bear the mark of a recognized association or independent inspection agency that maintains continuing control over quality of the plywood. Mark shall identify plywood by species group or span rating, and shall show exposure durability classification, grade, and compliance with APA PS 1.

1.5.3 Pressure-Treated Lumber and Plywood

Each treated piece shall be inspected in accordance with **AWPA M2**.

1.5.4 Nonpressure-Treated Woodwork and Millwork

Mark, stamp, or label, indicating compliance with **WDMA I.S. 4**.

1.5.5 Fire-Retardant Treated Lumber

Each piece to bear Underwriters Laboratories label or the label of another nationally recognized independent testing laboratory.

PART 2 PRODUCTS

2.1 WOOD

2.1.1 Sizes and Patterns of Wood Products

Yard and board lumber sizes shall conform to **ALSC PS 20**. Provide shaped lumber and millwork in the patterns indicated and standard patterns of the association covering the species. Size references, unless otherwise specified, are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the applicable standard.

2.1.2 Trim, Finish, and Frames

Provide species and grades listed for materials to be paint finished. Provide materials that are to be stain, natural, or transparent finished one grade higher than that listed. Provide species indicated for materials to be transparent finished. Run trim, except window stools and aprons with hollow backs.

TABLE OF GRADES FOR WOOD TO RECEIVE PAINT FINISH

<u>Grading Rules</u>	<u>Species</u>	<u>Exterior and Interior Trim, Finish, and Frames</u>
WWPA G-5 grading rules	Engelmann Spruce -Lodgepole Pine Engelmann Spruce Hem-Fir Idaho White Pine Lodgepole Pine	All Species: C & Btr. Select (Choice & Btr Idaho White Pine) or Superior Finish.
	Ponderosa Pine- Sugar Pine (Ponderosa Pine -Lodgepole Pine)	

2.1.3 Hardwood Plywood

HPVA HP-1, Type II (Interior), Good (1), Grade, hardwood veneer core

construction, face veneers of birch, of thickness indicated.

2.1.4 Plywood Wainscot

Stain-grade natural birch with "beadboard" pattern, with nominal thickness of 1/4"

2.1.5 Chair Rail, Corner and Miscellaneous Trim for Wainscot

Provide stain-grade natural birch to match wainscot for all trim associated with wainscot application. Provide profiles as indicated.

2.1.6 Shoe Mold

Clear red or white oak, 1/2 by 5/8 inch unless otherwise indicated.

2.2 COUNTER TOPS

2.2.1 Solid Surface

Manufactured from homogeneous solid sheets for filled plastic resin. See specification section 06 61 16 SOLID POLYMER (SOLID SURFACING) FABRICATIONS.

2.3 MOISTURE CONTENT OF WOOD PRODUCTS

Air-dry or kiln-dry lumber. Kiln-dry treated lumber after treatment. Maximum moisture content of wood products at time of delivery to the job site, and when installed, shall be as follows:

- a. Interior Finish Lumber, Trim, and Millwork 1 1/4 Inches Nominal or Less in Thickness: 6 percent on 85 percent of the pieces and 8 percent on remainder.
- b. Exterior Treated and Untreated Finish Lumber and Trim 4 Inches Nominal or Less in Thickness: 19 percent.
- c. Moisture content of other materials shall be in accordance with the applicable standards.

2.4 PRESERVATIVE TREATMENT OF WOOD PRODUCTS

2.4.1 Nonpressure Treatment

Treat woodwork and millwork, such as exterior trim, door trim, and window trim, in accordance with WDMA I.S. 4, with either 2 percent copper naphthenate, 3 percent zinc naphthenate, or 1.8 percent copper-8-quinolinolate. Provide a liberal brushcoat of preservative treatment to field cuts and holes.

2.4.2 Pressure Treatment

Lumber and plywood used on the exterior of buildings or in contact with masonry or concrete shall be treated with water-borne preservative listed in AWPA P5 as applicable, and inspected in accordance with AWPA M2. Identify treatment on each piece of material by the quality mark of an agency accredited by the Board of Review of the American Lumber Standards Committee. Plywood shall be treated to a reflection level as follows:

Exterior wood molding and millwork within 18 inches of soil, in contact with water or concrete shall be preservative-treated in accordance with WMPA WM 6. Exposed areas of treated wood that are cut or drilled after treatment shall receive a field treatment in accordance with AWP A M4. Items of all-heart material of cedar, cypress, or redwood will not require preservative treatment, except when in direct contact with soil.

2.5 HARDWARE

Provide sizes, types, and spacings of manufactured building materials recommended by the product manufacturer except as otherwise indicated or specified.

2.5.1 Wood Screws

ASME B18.6.1.

2.5.2 Bolts, Nuts, Lag Screws, and Studs

ASME B18.2.1 and ASME B18.2.2.

2.5.3 Nails

Nails shall be the size and type best suited for the purpose and shall conform to ASTM F 547. Nails shall be hot-dip galvanized or aluminum when used on exterior work. For siding, length of nails shall be sufficient to extend 1-1/2 inches into supports, including wood sheathing over framing. Screws for use where nailing is impractical shall be size best suited for purpose.

2.5.4 Adjustable Shelf Standards

BHMA A156.9, Type B04071, with shelf rests Type B04081.

2.5.5 Closet Hanger Rods

Chromium-plated steel rods, not less than one inch diameter by 18 gage. Rods may be adjustable with integral mounting brackets if smaller tube is one inch by 18 gage. Provide intermediate support bracket for rods more than 48 inches long.

2.6 FABRICATION

2.6.1 Quality Standards (QS)

The terms "Premium," "Custom," and "Economy" refer to the quality grades defined in AWI Qual Stds. Items not specified to be of a specific grade shall be Custom grade. The AWI QS is superseded by all contract document requirements indicated or stated herein.

2.6.2 Cabinets

Wall and base cabinets shall be of the same construction and appearances. Fabricate with solid ends and frame fronts, or with frames all around. Frames shall be solid hardwood not less than 3/4 by 1 1/2 inches. Ends, bottom, back, partitions, and doors shall be plywood. Mortise and tenon, dovetail, or dowel and glue joints to produce a rigid unit. Cover exposed edges of plywood with hardwood strips. Doors, frames, and solid exposed ends shall be 3/4 inch thick; bottom, partitions, and framed ends 1/2 inch

minimum; shelves 5/8 inch minimum; back 1/4 inch minimum.

2.6.2.1 Cabinet Hardware

BHMA A156.9. Provide cabinet hardware including two self-closing hinges for each door, two side-mounted metal drawer slides for each drawer and pulls for all doors and drawers as follows. Hardware exposed to view shall be **sat**in. All cabinet hardware shall comply with the following requirements:

- a. Provide concealed Euro-Style, back mounted hinges with opening to 165 degrees with self-closing feature at less than 90 degrees to its closed position..
- b. Drawer slides shall have a static rating capacity of 100 lbs. The slides shall have a self closing/stay-closed action, zinc or epoxy coated steel finish, ball bearing rollers, and positive stop with lift out design.
- c. Drawer pulls shall be wire type pulls with center-to-center dimension not less than 3 1/2 inches and cross sectional diameter of 5/16 inch. The handle projection shall be not less than 1 5/16 inches.
- d. Drawer catch shall be heavy duty magnetic catch.

2.6.3 Casework With Transparent Finish (CTF)

2.6.3.1 AWI Quality Grade (CTF)

Custom grade.

2.6.3.2 Exposed Parts

Birch specie, rotary cut.

2.6.4 Casework With High Pressure Laminate Finish (CHPL)

2.6.4.1 AWI Quality Grade (CHPL)

Custom grade.

2.6.4.2 Construction (CHPL)

Details shall conform to flush overlay.

2.6.4.3 Exposed Surfaces

High pressure laminate as selected from manufacturer's standard finishes. See "Finish Key" on Drawing A-604 for plastic laminate color.

2.6.4.4 Semi-Exposed Surfaces

As specified in the **AWI Qual Stds** for the grade selected. The interior of the cabinet shall be thermoset decorative overlay (melamine). The back side of doors and all edges shall be clad with high pressure laminate finish which shall be the same laminate used on the exposed part of the door.

PART 3 EXECUTION

3.1 FINISH WORK

Provide sizes, materials, and designs as indicated and as specified. Apply primer to finish work before installing. Where practicable, shop assemble and finish items of built-up millwork. Joints shall be tight and constructed in a manner to conceal shrinkage. Miter trim and moldings at exterior angles and cope at interior angles and at returns. Material shall show no warp after installation. Install millwork and trim in maximum practical lengths. Fasten finish work with finish nails. Provide blind nailing where practicable. Set face nails for putty stopping.

3.1.1 Interior Finish Work

After installation, sand exposed surfaces smooth.

3.2 MISCELLANEOUS

3.2.1 Cabinets

Install level, plumb, and tight against adjacent walls. Secure cabinets to walls with concealed toggle bolts, and secure top to cabinet with concealed screws. Make cut-outs for fixtures to templates supplied by fixture manufacturer. Carefully locate cut-outs for pipes so that edges of holes will be covered by escutcheons.

3.3 MOLDING AND INTERIOR TRIM

Molding and interior trim shall be installed straight, plumb, level and with closely fitted joints. Exposed surfaces shall be machine sanded at the mill. Molded work shall be coped at returns and interior angles and mitered at external corners. Intersections of flatwork shall be shouldered to ease any inherent changes in plane. Window and door trim shall be provided in single lengths. Blind nailing shall be used to the extent practicable, and face nailing shall be set and stopped with a nonstaining putty to match the finish applied. Screws shall be used for attachment to metal; setting and stopping of screws shall be of the same quality as required where nails are used.

-- End of Section --

SECTION 06 61 16

SOLID POLYMER (SOLID SURFACING) FABRICATIONS

08/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

- ASTM D 2583 (2007) Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
- ASTM D 570 (1998; R 2010e1) Standard Test Method for Water Absorption of Plastics
- ASTM D 638 (2010) Standard Test Method for Tensile Properties of Plastics
- ASTM D 696 (2008) Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degrees C With a Vitreous Silica Dilatometer
- ASTM E 84 (2011b) Standard Test Method for Surface Burning Characteristics of Building Materials
- ASTM G 21 (2009) Determining Resistance of Synthetic Polymeric Materials to Fungi

INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS (IAPMO)

- IAPMO Z124.3 (2005) Plastic Lavatories
- IAPMO Z124.6 (1997) Plastic Sinks

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- ANSI/NEMA LD 3 (2005) Standard for High-Pressure Decorative Laminates

NSF INTERNATIONAL (NSF)

- NSF/ANSI 51 (2009e) Food Equipment Materials

TILE COUNCIL OF NORTH AMERICA (TCNA)

- TCA Hdbk (2010) Handbook for Ceramic Tile

Installation

1.2 SYSTEM DESCRIPTION

- a. Work under this section includes countertops and other items utilizing solid polymer (solid surfacing) fabrication as shown on the drawings and as described in this specification. Do not change source of supply for materials after work has started, if the appearance of finished work would be affected.
- b. In most instances, installation of solid polymer fabricated components and assemblies will require strong, correctly located structural support provided by other trades. To provide a stable, sound, secure installation, close coordination is required between the solid polymer fabricator/installer and other trades to ensure that necessary structural wall support, cabinet counter top structural support, proper clearances, and other supporting components are provided for the installation of wall panels, countertops, shelving, and all other solid polymer fabrications to the degree and extent recommended by the solid polymer manufacturer.
- c. Appropriate staging areas for solid polymer fabrications. Allow variation in component size and location of openings of plus or minus 1/8 inch.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings
Installation

SD-03 Product Data

Solid polymer material
Qualifications
Fabrications

SD-04 Samples

Material
Counter and Vanity Tops

SD-06 Test Reports

Solid polymer material

SD-07 Certificates

Fabrications
Qualifications

SD-10 Operation and Maintenance Data

Clean-up

1.4 QUALITY ASSURANCE

1.4.1 Qualifications

To ensure warranty coverage, solid polymer fabricators shall be certified to fabricate by the solid polymer material manufacturer being utilized. Mark all fabrications with the fabricator's certification label affixed in an inconspicuous location. Fabricators shall have a minimum of 5 years of experience working with solid polymer materials. Submit solid polymer manufacturer's certification attesting to fabricator qualification approval.

1.4.2 Mock-ups

Submit [Detail Drawings](#) indicating locations, dimensions, component sizes, fabrication and joint details, attachment provisions, installation details, and coordination requirements with adjacent work.

1.5 DELIVERY, STORAGE, AND HANDLING

Do not deliver materials to project site until areas are ready for installation. Deliver components and materials to the site undamaged, in containers clearly marked and labeled with manufacturer's name. Materials shall be stored indoors and adequate precautions taken to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation, for duration of project.

1.6 WARRANTY

Provide manufacturer's warranty of ten years against defects in materials, excluding damages caused by physical or chemical abuse or excessive heat. Warranty shall provide for material and labor for replacement or repair of defective material for a period of ten years after component installation.

PART 2 PRODUCTS

2.1 MATERIAL

Provide [solid polymer material](#) that is a homogeneous filled solid polymer; not coated, laminated or of a composite construction; meeting [IAPMO Z124.3](#) and [IAPMO Z124.6](#) requirements. Material shall have minimum physical and performance properties specified. Superficial damage to a depth of [0.01 inch](#) shall be repairable by sanding or polishing. Material thickness shall be as indicated on the drawings. In no case shall material be less than [1/4 inch](#) in thickness. Submit a minimum [4 by 4 inch](#) sample of each color and pattern for approval. Samples shall indicate full range of color and pattern variation. Approved samples shall be retained as a standard for this work. Submit test report results from an independent testing laboratory attesting that the submitted solid polymer material meets or exceeds each of the specified performance requirements.

2.1.1 Cast, 100 Percent Acrylic Polymer Solid Surfacing Material

Cast, 100 percent acrylic solid polymer material shall be composed of acrylic polymer, mineral fillers, and pigments and shall meet the following minimum performance requirements:

PROPERTY	REQUIREMENT (min. or max.)	TEST PROCEDURE
Tensile Strength	4000 psi (min.)	ASTM D 638
Hardness	55-Barcol Impressor (min.)	ASTM D 2583
Thermal Expansion	.000023 in/in/F (max.)	ASTM D 696
Boiling water Surface Resistance	No Change	ANSI/NEMA LD 3-3.05
High Temperature Resistance	No Change	ANSI/NEMA LD 3-3.06
Impact Resistance (Ball drop)		ANSI/NEMA LD 3-303
1/4" sheet	36", 1/2 lb ball, no failure	
1/2" sheet	140", 1/2 lb ball, no failure	
3/4" sheet	200", 1/2 lb ball, no failure	
Mold & Mildew Growth	No growth	ASTM G 21
Bacteria Growth	No Growth	ASTM G 21
Liquid Absorption (Weight in 24 hrs.)	0.1% max.	ASTM D 570
Flammability		ASTM E 84
Flame Spread	25 max.	
Smoke Developed	30 max	
Sanitation	"Food Contact" approval	NSF/ANSI 51

2.1.2 Material Patterns and Colors

Patterns and colors for all solid polymer components and fabrications shall be those indicated on the project drawings. Pattern and color shall occur, and shall be consistent in appearance, throughout the entire depth (thickness) of the solid polymer material.

2.1.3 Surface Finish

Exposed finished surfaces and edges shall receive a uniform appearance. Exposed surface finish shall be matte; gloss rating of 5-20.

2.2 ACCESSORY PRODUCTS

Accessory products, as specified below, shall be manufactured by the solid

polymer manufacturer or shall be products approved by the solid polymer manufacturer for use with the solid polymer materials being specified.

2.2.1 Seam Adhesive

Seam adhesive shall be a two-part adhesive kit to create permanent, inconspicuous, non-porous, hard seams and joints by chemical bond between solid polymer materials and components to create a monolithic appearance of the fabrication. Adhesive shall be approved by the solid polymer manufacturer. Adhesive shall be color-matched to the surfaces being bonded where solid-colored, solid polymer materials are being bonded together. The seam adhesive shall be clear or color matched where particulate patterned, solid polymer materials are being bonded together.

2.2.2 Panel Adhesive

Panel adhesive shall be neoprene based panel adhesive meeting **TCA Hdbk**, Underwriter's Laboratories (UL) listed. Use this adhesive to bond solid polymer components to adjacent and underlying substrates.

2.2.3 Silicone Sealant

Sealant shall be a mildew-resistant, FDA and OSHA Nationally Recognized Testing Laboratory (NRTL) listed silicone sealant or caulk in a clear formulation. The silicone sealant shall be approved for use by the solid polymer manufacturer. Use sealant to seal all expansion joints between solid polymer components and all joints between solid polymer components and other adjacent surfaces such as walls, floors, ceiling, and plumbing fixtures.

2.2.4 Conductive Tape

Conductive tape shall be manufacturer's standard foil tape, **4 mils** thick, applied around the edges of cut outs containing hot or cold appliances.

2.2.5 Mounting Hardware

Provide mounting hardware, including sink/bowl clips, inserts and fasteners for attachment of undermount sinks and lavatories.

2.3 **FABRICATIONS**

Components shall be factory or shop fabricated to sizes and shapes indicated, to the greatest extent practical, in accordance with approved Shop Drawings and manufacturer's requirements. Provide factory cutouts for sinks, lavatories, and plumbing fixtures where indicated on the drawings. Contours and radii shall be routed to template, with edges smooth. Defective and inaccurate work will be rejected. Submit product data indicating product description, fabrication information, and compliance with specified performance requirements for solid polymer, joint adhesive, sealants, and heat reflective tape. Both the manufacturer of materials and the fabricator shall submit a detailed description of operations and processes in place that support efficient use of natural resources, energy efficiency, emissions of ozone depleting chemicals, management of water and operational waste, indoor environmental quality, and other production techniques supporting sustainable design and products.

2.3.1 Joints and Seams

Form joints and seams between solid polymer components using manufacturer's approved seam adhesive. Joints shall be inconspicuous in appearance and without voids to create a monolithic appearance.

2.3.2 Edge Finishing

Rout and finish component edges to a smooth, uniform appearance and finish. Edge shapes and treatments, including any inserts, shall be as detailed on the drawings. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.

2.3.3 Counter and Vanity Top Splashes

Fabricate backsplashes and end splashes from 1/2 inch thick solid surfacing material 4 inches high unless indicated otherwise on the drawings. Backsplashes and end splashes shall be provided for all counter tops and at locations indicated on the drawings. Backsplashes shall be shop fabricated and be permanently attached.

2.3.3.1 Permanently Attached Backsplash

Permanently attached backsplashes shall be attached straight with seam adhesive to form a 90 degree transition.

2.3.3.2 End Splashes

End splashes shall be provided loose for installation at the jobsite after horizontal surfaces to which they are to be attached have been installed.

2.3.4 Counter and Vanity Tops

Fabricate all solid surfacing, solid polymer counter top and vanity top components from 1/2 inch thick material. Edge details, dimensions, locations, and quantities shall be as indicated on the Drawings. Counter tops shall be complete with 4 inch high permanently attached, 90 degree transition at all locations. Attach 2 inch wide reinforcing strip of polymer material under each horizontal counter top seam. Submit a minimum 1 foot wide by 6 inch deep, full size sample for each type of counter top shown on the project drawings. The sample shall include the edge profile and backsplash as detailed on the project drawings. Solid polymer material shall be of a pattern and color as indicated on the drawings. Sample shall include at least one seam. Approved sample shall be retained as standard for this work.

2.3.4.1 Vanity Tops With Bowls

- a. Countertops with vitreous china bowls shall include cutouts to template as furnished by the sink manufacturer. Manufacturer's standard sink mounting hardware for vitreous china installation shall be provided. Seam between sink and counter top shall be sealed with silicone sealant. Sink, faucet, and plumbing requirements shall be in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Components

Install all components and fabricated units plumb, level, and rigid. Make field joints between solid polymer components using solid polymer manufacturer's approved seam adhesives, to provide a monolithic appearance with joints inconspicuous in the finished work. Attach metal or vitreous china sinks and lavatory bowls to counter tops using solid polymer manufacturer's recommended clear silicone sealant and mounting hardware. Solid polymer sinks and bowls shall be installed using a color-matched seam adhesive. Plumbing connections to sinks and lavatories shall be made in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE.

3.1.2 Silicone Sealant

Use a clear, silicone sealant or caulk to seal all expansion joints between solid polymer components and all joints between solid polymer components and other adjacent surfaces such as walls, floors, ceiling, and plumbing fixtures. Sealant bead shall be smooth and uniform in appearance and shall be the minimum size necessary to bridge any gaps between the solid surfacing material and the adjacent surface. Bead shall be continuous and run the entire length of the joint being sealed.

3.1.3 Plumbing

Make plumbing connections to sinks and lavatories in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE.

3.2 CLEAN-UP

Components shall be cleaned after installation and covered to protect against damage during completion of the remaining project items. Components damaged after installation by other trades will be repaired or replaced at the General Contractor's cost. Component supplier will provide a repair/replace cost estimate to the General Contractor who shall approve estimate before repairs are made. Submit a minimum of six copies of maintenance data indicating manufacturer's care, repair and cleaning instructions. Maintenance video shall be provided, if available. Maintenance kit for matte finishes shall be submitted.

-- End of Section --

SECTION 07 22 00

ROOF AND DECK INSULATION

08/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C1289 (2011a) Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board

ASTM E84 (2012) Standard Test Method for Surface Burning Characteristics of Building Materials

FM GLOBAL (FM)

FM 4470 (2010) Single-Ply, Polymer-Modified Bitumen Sheet, Built-up Roof (BUR), and Liquid Applied Roof Assemblies for Use in Class 1 and Noncombustible Roof Deck Construction

FM APP GUIDE (updated on-line) Approval Guide <http://www.approvalguide.com/>

FM P9513 (2002) Specialist Data Book Set for Roofing Contractors; contains 1-22 (2001), 1-28 (2002), 1-29 (2002), 1-28R/1-29R (1998), 1-30 (2000), 1-31 (2000), 1-32 (2000), 1-33 (2000), 1-34 (2001), 1-49 (2000), 1-52 (2000), 1-54 (2001)

UNDERWRITERS LABORATORIES (UL)

UL Bld Mat Dir (2011) Building Materials Directory

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Wood nailers

Show a complete description of the procedures for the installation of each phase of the system indicating the type of materials,

thicknesses, identity codes, sequence of laying insulation, location of ridges and valleys, special methods for cutting and fitting of insulation, and special precautions. The drawings shall be based on field measurements.

SD-03 Product Data

Fasteners

Insulation

Include minimum thickness of insulation for steel decks and fastener pattern for insulation on steel decks.

SD-06 Test Reports

Flame spread and smoke developed ratings

Submit in accordance with [ASTM E84](#).

SD-07 Certificates

Installer [qualifications](#)

SD-08 Manufacturer's Instructions

Nails and [fasteners](#)

Roof [insulation](#), including field of roof and perimeter attachment requirements.

1.3 MANUFACTURER'S CERTIFICATE

Submit certificate from the insulation manufacturer attesting that the installer has the proper [qualifications](#) for installing tapered roof insulation systems.

Certificate attesting that the expanded perlite or polyisocyanurate insulation contains recovered material and showing estimated percent of recovered material. Certificates of compliance for felt materials.

1.4 QUALITY ASSURANCE

1.4.1 Insulation on Steel Decks

Roof insulation shall have a flame spread rating not greater than 75 and a smoke developed rating not greater than 150, exclusive of covering, when tested in accordance with [ASTM E84](#). Insulation bearing the UL label and listed in the [UL Bld Mat Dir](#) as meeting the flame spread and smoke developed ratings will be accepted in lieu of copies of test reports. Compliance with [flame spread and smoke developed ratings](#) will not be required when insulation has been tested as part of a roof construction assembly of the type used for this project and the construction is listed as fire-classified in the [UL Bld Mat Dir](#) or listed as Class I roof deck construction in the [FM APP GUIDE](#). Insulation tested as part of a roof construction assembly shall bear UL or FM labels attesting to the ratings specified herein.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery

Deliver materials to site in manufacturer's unopened and undamaged standard commercial containers bearing the following legible information:

- a. Name of manufacturer;
- b. Brand designation;
- c. Specification number, type, and class, as applicable, where materials are covered by a referenced specification; and

Deliver materials in sufficient quantity to allow continuity of the work.

1.5.2 Storage and Handling

Store and handle materials in a manner to protect from damage, exposure to open flame or other ignition sources, and from wetting, condensation or moisture absorption. Store in an enclosed building or trailer that provides a dry, adequately ventilated environment.

1.6 ENVIRONMENTAL CONDITIONS

Do not install roof insulation during inclement weather or when air temperature is below 40 degrees F and interior humidity is 45 percent or greater, or when there is visible ice, frost, or moisture on the roof deck.

PART 2 PRODUCTS

2.1 INSULATION

2.1.1 Insulation Types

Roof insulation shall be of the following materials and compatible with attachment methods for the specified insulation and roof membrane:

- a. Polyisocyanurate Board: ASTM C1289 Type II, fibrous felt or glass mat membrane both sides, except minimum compressive strength shall be 20 pounds per square inch (psi).

2.1.2 Recovered Materials

Provide thermal insulation materials containing recycled materials to the extent practical. The required minimum recycled material content for the listed materials are:

Perlite Composition Board:	75 percent postconsumer paper
Polyisocyanurate/polyurethane:	9 percent recovered material
Wood Fiberboard:	25 percent recovered material
Cellular Glass Insulation:	75 percent recovered content
Structural Fiberboard:	100 percent recovered content

Fiberglass Insulation:	20-25 percent recovered content
Fiber (felt) or Fiber composite:	50-100 percent recovered content
Rubber:	12-100 percent recovered content
Plastic or Plastic/Rubber composite:	100 percent recovered content
Wood/Plastic Composite:	100 percent Total Recovered content

2.1.3 Insulation Thickness

Provide 3.5 inch thickness.

2.2 FASTENERS

Flush-driven through flat round or hexagonal steel or plastic plates. Steel plates shall be zinc-coated, flat round not less than 1 3/8 inch diameter or hexagonal not less than 28 gage. Plastic plates shall be high-density, molded thermoplastic with smooth top surface, reinforcing ribs and not less than 3 inches in diameter. Fastener head shall recess fully into the plastic plate after it is driven. Plates shall be formed to prevent dishing. Do not use bell-or cup-shaped plates. Fasteners shall conform to insulation manufacturer's recommendations except that holding power, when driven, shall be not less than 120 pounds each in steel deck. Fasteners for steel or concrete decks shall conform to FM APP GUIDE for Class I roof deck construction, and shall be spaced to withstand an uplift pressure of 90 pounds per square foot.

2.2.1 Fasteners for Steel Decks

Approved hardened penetrating fasteners or screws conforming to FM 4470 and listed in FM APP GUIDE for Class I roof deck construction. Quantity and placement to withstand a minimum uplift pressure of 90 psf conforming to FM APP GUIDE.

2.3 WOOD NAILERS

Provide pressure-preservative-treated.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

3.1.1 Surface Inspection

Surfaces shall be clean, smooth, and dry. Check roof deck surfaces, including surfaces sloped to roof drains and outlets, for defects before starting work.

The Contractor shall inspect and approve the surfaces immediately before starting installation. Prior to installing insulation, perform the following:

- a. Examine steel decks to ensure that panels are properly secured to structural members and to each other and that surfaces of top flanges are flat or slightly convex.

3.1.2 Surface Preparation

Correct defects and inaccuracies in roof deck surface to eliminate poor drainage and hollow or low spots and perform the following:

- a. Install wood nailers the same thickness as insulation at eaves, edges, curbs, walls, and roof openings for securing cant strips, gravel stops, gutters, and flashing flanges.
- b. Cover steel decks with a layer of insulation board of sufficient thickness to span the width of a deck rib opening, and conforming to fire safety requirements. Secure with piercing or self-drilling, self-tapping fasteners of quantity and placement conforming to **FM APP GUIDE**. Insulation joints parallel to ribs of deck shall occur on solid bearing surfaces only, not over open ribs.

3.2 INSULATION INSTALLATION

Apply insulation in two layers with staggered joints when total required thickness of insulation exceeds $1/2$ inch. Lay insulation so that continuous longitudinal joints are perpendicular to direction of felts for the built-up roofing, as specified in Section 07 41 13, METAL ROOF PANELS, and end joints of each course are staggered with those of adjoining courses. When using multiple layers of insulation, joints of each succeeding layer shall be parallel and offset in both directions with respect to layer below. Keep insulation $1/2$ inch clear of vertical surfaces penetrating and projecting from roof surface.

3.2.1 Installation Using Only Mechanical Fasteners

Secure total thickness of insulation with penetrating type fasteners. Provide quantity, size, and spacing of fasteners required to meet design and wind loads.

3.3 PROTECTION

3.3.1 Protection of Applied Insulation

Completely cover each day's installation of insulation with the finished roofing specified in 07 41 13, METAL ROOF PANELS on same day. Do not permit phased construction. Protect open spaces between insulation and parapets or other walls and spaces at curbs, scuttles, and expansion joints, until permanent roofing and flashing are applied. Do not permit storing, walking, wheeling, or trucking directly on insulation or on roofed surfaces. Provide smooth, clean board or plank walkways, runways, and platforms near supports, as necessary, to distribute weight. Exposed edges of the insulation shall be protected by cutoffs at the end of each work day or whenever precipitation is imminent. Cutoffs shall be 2 layers of bituminous-saturated felt set in plastic bituminous cement or EPDM membrane set in roof cement. Fill all profile voids in cut-offs to prevent entrapping of moisture into the area below the membrane. Cutoffs shall be removed when work is resumed.

3.3.2 Damaged Work and Materials

Restore work and materials that become damaged during construction to original condition or replace with new materials.

3.4 INSPECTION

The Contractor shall establish and maintain an inspection procedure to assure compliance of the installed roof insulation with the contract requirements. Any work found not to be in compliance with the contract shall be promptly removed and replaced or corrected in an approved manner. Quality control shall include, but not be limited to, the following:

- a. Observation of environmental conditions; number and skill level of insulation workers; start and end time of work.
- b. Verification of certification, listing or label compliance with FM P9513.
- c. Verification of proper storage and handling of insulation and vapor retarder materials before, during, and after installation.
- d. Inspection of vapor retarder application, including edge envelopes and mechanical fastening.
- e. Inspection of mechanical fasteners; type, number, length, and spacing.
- f. Coordination with other materials, cants, sleepers, and nailing strips.
- g. Inspection of insulation joint orientation and laps between layers, joint width and bearing of edges of insulation on deck.
- h. Installation of cutoffs and proper joining of work on subsequent days.
- i. Continuation of complete roofing system installation to cover insulation installed same day.

-- End of Section --

SECTION 07 41 13

METAL ROOF PANELS

11/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ALUMINUM ASSOCIATION (AA)

AA ADM1 (2005; Errata 2005) Aluminum Design Manual

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 501.1 (2005) Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 341 (2005; Supp 2005) Seismic Provisions for Structural Steel Buildings

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI/COS/NASPEC (2001, Supplement 2004) North American Specification for the Design of Cold-Formed Steel Structural Members

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7-05 (2006; Errata 2007) Minimum Design Loads for Buildings and Other Structures

AMERICAN WELDING SOCIETY (AWS)

AWS A5.1/A5.1M (2004; Errata 2004) Carbon Steel Electrodes for Shielded Metal Arc Welding

AWS D1.1/D1.1M (2010; Errata 2010) Structural Welding Code - Steel

AWS D1.2/D1.2M (2008) Structural Welding Code - Aluminum

ASTM INTERNATIONAL (ASTM)

ASTM A 653/A 653M (2009a) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM B 117	(2009) Standing Practice for Operating Salt Spray (Fog) Apparatus
ASTM B 209	(2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM C 792	(2004; R 2008) Effects of Heat Aging on Weight Loss, Cracking, and Chalking of Elastomeric Sealants
ASTM C 920	(2011) Standard Specification for Elastomeric Joint Sealants
ASTM D 1056	(2007) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D 1308	(2002; R 2007) Effect of Household Chemicals on Clear and Pigmented Organic Finishes
ASTM D 1654	(2008) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D 1667	(2005) Flexible Cellular Materials - Poly (Vinyl Chloride) Foam (Closed-Cell)
ASTM D 1970	(2009) Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
ASTM D 2244	(2009a) Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
ASTM D 2247	(2002) Testing Water Resistance of Coatings in 100% Relative Humidity
ASTM D 2794	(1993; R 2004) Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D 3359	(2009) Measuring Adhesion by Tape Test
ASTM D 3363	(2005) Film Hardness by Pencil Test
ASTM D 4214	(2007) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D 4587	(2005) Standard Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings
ASTM D 522	(1993a; R 2008) Mandrel Bend Test of Attached Organic Coatings
ASTM D 523	(2008) Standard Test Method for Specular

Gloss

- ASTM D 5894 (2005) Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet)
- ASTM D 610 (2008) Evaluating Degree of Rusting on Painted Steel Surfaces
- ASTM D 714 (2002; R 2009) Evaluating Degree of Blistering of Paints
- ASTM D 822 (2001; R 2006) Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings
- ASTM D 968 (2005e1) Abrasion Resistance of Organic Coatings by Falling Abrasive
- ASTM E 1592 (2005) Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
- ASTM E 1680 (2003) Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems
- ASTM E 2140 (2001; R 2009) Standard Test Method for Water Penetration of Metal Roof Panel Systems by Static Water Pressure Head
- ASTM E 84 (2011b) Standard Test Method for Surface Burning Characteristics of Building Materials
- ASTM G 23 (1996) Operating Light-Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials

FM GLOBAL (FM)

- FM 4471 (1995) Class I Panel Roofs

METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)

- MBMA RSDM (2000) Metal Roofing Systems Design Manual

NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)

- NRCA 0405 (2001; R 2003, 5th Ed) Roofing and Waterproofing Manual
- NRCA ASMMRM (2006) Architectural Sheet Metal and Metal Roofing Manual

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION
(SMACNA)

SMACNA 1793 (2003) Architectural Sheet Metal Manual,
6th Edition

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 12 (1982; E 2000) Paint Specification No. 12
Cold-Applied Asphalt Mastic (Extra Thick
Film)

U.S. NAVAL FACILITIES ENGINEERING COMMAND (NAVFAC)

NAVFAC A-A-50570 (1997) Paint, Water-Borne, Acrylic Or
Modified Acrylic, Semigloss, For Metal
Surfaces

UNDERWRITERS LABORATORIES (UL)

UL 580 (2006; Rev thru Jul 2009) Tests for Uplift
Resistance of Roof Assemblies

1.2 DESCRIPTION OF METAL ROOF SYSTEM

1.2.1 Performance Requirements

1.2.1.1 Hydrostatic Head Resistance

No water penetration when tested according to ASTM E 2140. Submit leakage test report upon completion of installation.

1.2.1.2 Wind Uplift Resistance

Provide metal roof panel system that conform to the requirements of ASTM E 1592 and UL 580. Uplift force due to wind action governs the design for panels. The design wind speed for this building is 130 mph. Submit wind uplift test report prior to commencing installation.

Roof system and attachments must resist the wind loads as determined by ASCE 7-05, in pounds per square foot. Metal roof panels and component materials must also comply with the requirements in FM 4471 as part of a panel roofing system as listed in Factory Mutual Guide (FMG) "Approval Guide" for class 1 or noncombustible construction, as applicable. Identify all materials with FMG markings.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Roofing Panels

Flashing and Accessories

Gutter/Downspout Assembly

SD-03 Product Data

Submit manufacturer's catalog data for the following items:

Roof panels

FACTORY-APPLIED COLOR FINISH

Accessories

Fasteners

Pressure Sensitive Tape

UNDERLAYMENTS

Gaskets and Sealing/Insulating Compounds

Coil Stock

Self-Adhering Modified Bitumen Underlayment

SD-04 Samples

Roof Panels

Factory-applied Color Finish, samples, 9 inch lengths, full width

Accessories

Fasteners

Gaskets and Sealant/Insulating Compounds

SD-05 Design Data

Wind Uplift Resistance

SD-06 Test Reports

Leakage Test Report

Wind Uplift Test Report

Factory Finish and Color Performance Requirements

SD-07 Certificates

Roof Panels

Coil stock compatibility

Self-Adhering Modified Bitumen Underlayment

Qualification of Manufacturer

Qualification of Applicator

SD-08 Manufacturer's Instructions

INSTALLATION MANUAL

SD-09 Manufacturer's Field Reports

Manufacturer's Field Inspection Reports

SD-11 Closeout Submittals

Warranties

Information Card

Date Of Installation Wall-Mounted Placard

1.4 QUALITY ASSURANCE

1.4.1 Qualification of Manufacturer

Submit documentation verifying metal roof panel manufacturer has been in the business of manufacturing metal roof panels for a period of not less than 5 years.

Manufacturer must also provide engineering services by an Registered Professional Engineer, currently licensed in the geographic area of the project, with a minimum of five (5) years experience as an engineer knowledgeable in roof wind design analysis, protocols and procedures for MBMA RSDM, ASCE 7-05, UL 580, and FM 4471. Engineer must provide certified engineering calculations for the project conforming to the stated references.

Provide a design analysis signed by a Registered Professional Engineer employed by the SSSMR manufacturer. The design analysis shall include a list of the design loads, and complete calculations for the roofing system and its components; valley designs, gutter/downspout calculations, screw pullout test results, and shall indicate how expected thermal movements are accommodated.

Any material submitted must include a list of (3) projects where the proposed material has been used in a similar roofing system as that which is specified and is located within a one hundred mile radius from the location of the project. In addition, the three projects must be at least three (3) years old and be available for inspection by the Contracting Officer.

1.4.1.1 Manufacturer's Technical Representative

The manufacturer's technical representative must be thoroughly familiar with the products to be installed, installation requirements and practices, and with any special considerations in the geographical area of the project. The representative must perform field inspections and attend meetings as specified.

A. When the project is in progress, the roofing system manufacturer will provide the following:

1. Keep the Contracting Officer informed as to the progress and quality of the work as observed. Photographic Inspection Report to be turned in on a weekly basis to the Contracting Officer.

2. Provide job site inspections a minimum of three days a week.
3. Report to the Contracting Officer in writing any failure or refusal of the Contractor to correct unacceptable practices called to the Contractor's attention.
4. Confirm after completion that manufacturer has observed no application procedures in conflict with the specifications other than those that may have been previously reported and corrected.
5. The roofing manufacturer must inspect the roof on an annual basis and submit an annual inspection report to Public Works at Camp Lejeune.
6. The manufacturer's inspector must be a full time employee of the manufacturer with a minimum 5 years experience inspecting the specified roof system. A signed copy to attest to the full time employ and tenure of the inspector by the president of the manufacturing company will accompany submittals.

1.4.1.2 Single Source

Roofing panels, clips, closures, underlayment and other accessories must be standard products of the same manufacturer, and the most recent design of the manufacturer to operate as a complete system for the intended use.

1.4.2 Qualification of Applicator

Metal roof system applicator must be approved, authorized, or licensed in writing by the roof panel manufacturer and have a minimum of three years experience as an approved, authorized, or licensed applicator with that manufacturer, approved at a level capable of providing the specified warranty. Supply the names, locations and client contact information of 5 projects of similar size and scope constructed by applicator using the manufacturer's roofing products submitted for this project within the previous three years.

1.4.3 Field Verification

Prior to the preparation of drawings and fabrication, verify location of roof framing, roof openings and penetrations, and any other special conditions. Indicate all special conditions and measurements on final shop drawings.

1.4.4 Qualifications for Welding Work

Welding procedures must conform to AWS D1.1/D1.1M AWS D1.2/D1.2M for aluminum.

Operators are permitted to make only those types of weldments for which each is specifically qualified.

1.4.5 Pre-roofing Conference

After approval of submittals and before performing roofing system installation work, hold a pre-roofing conference to review the following:

- a. Drawings, specifications, and submittals related to the roof

work. Submit, as a minimum; sample profiles of roofing panels, with factory-applied color finish samples, flashing and accessories, gutter/downspout assembly samples, typical fasteners and pressure sensitive tape, sample gaskets and sealant/insulating compounds. Also include data and 1/2 pint sample of aluminum repair paint and technical data on coil stock and coil stock compatibility, and manufacturer's installation manual.

- b. Roof system components installation;
- c. Procedure for the roof manufacturer's technical representative's onsite inspection and acceptance of the roofing substrate, the name of the manufacturer's technical representatives, the frequency of the onsite visits, distribution of copies of the inspection reports from the manufacturer's technical representative. The manufacturer's roof inspector must be a full time employee of the manufacturer with no less than 5 years experience in inspecting the specified roof system. A signed letter by the president of the manufacturer must accompany the submittals attesting to the full time employ and tenure of the inspector.
- d. Contractor's plan for coordination of the work of the various trades involved in providing the roofing system and other components secured to the roofing; and
- e. Quality control plan for the roof system installation;
- f. Safety requirements.

Coordinate pre-roofing conference scheduling with the Contracting Officer. Attendance is mandatory for the Contractor, the Contracting Officer's designated personnel, personnel directly responsible for the installation of metal roof system, flashing and sheet metal work, other trades interfacing with the roof work, and representative of the metal roofing manufacturer. Before beginning roofing work, provide a copy of meeting notes and action items to all attending parties. Note action items requiring resolution prior to start of roof work.

1.5 DELIVERY, HANDLING, AND STORAGE

Deliver, store, and handle panel materials, bulk roofing products, accessories, and other manufactured items in a manner to prevent damage and deformation, as recommended by the manufacturer, and as specified.

1.5.1 Delivery

Package and deliver materials to the site in undamaged condition. Provide adequate packaging to protect materials during shipment. Do not uncrate materials until ready for use, except for inspection. Immediately upon arrival of materials at jobsite, inspect materials for damage, deformation, dampness, and staining. Remove affected materials from the site and immediately replace. Remove moisture from wet materials not otherwise affected, restack and protect from further moisture exposure.

1.5.2 Handling

Handle materials in a manner to avoid damage. Select and operate material handling equipment so as not to damage materials or applied roofing.

1.5.3 Storage

Stack materials stored on site on platforms or pallets, and cover with tarpaulins or other weathertight covering which prevents trapping of water or condensation under the covering. Store roof panels so that water which may have accumulated during transit or storage will drain off. Do not store panels in contact with materials that might cause staining. Secure coverings and stored items to protect from wind displacement.

1.6 PROJECT CONDITIONS

Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit metal roof panel work to be performed according to manufacturer's written instructions and warranty requirements, and specified safety requirements.

1.7 FABRICATION

Fabricate and finish metal roof panels and accessories on a factory stationary industrial type rolling mill to the greatest extent possible, per manufacturer's standard procedures and processes, and as necessary to fulfill indicated performance requirements. Comply with indicated profiles, dimensional and structural requirements.

Provide panel profile, including major ribs and intermediate stiffening ribs for full length of panel. Fabricate panel side laps with factory installed captive gaskets providing a weather tight seal and preventing metal-to-metal contact, and minimizing noise from movements within the panel assembly.

1.7.1 Finishes

Finish quality and application processes must conform to the related standards specified within this section. Noticeable variations within the same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved samples and are assembled or installed to minimize any contrasting variations.

1.7.2 Accessories

Fabricate flashing and trim to comply with recommendations in [SMACNA 1793](#) as applicable to the design, dimensions, metal, and other characteristics of the item indicated.

- a. Form exposed sheet metal accessories which are free from excessive oil canning, buckling, and tool marks, and are true to line and levels indicated, with exposed edges folded back to form hems.
- b. End Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.
- c. Sealed Joints: Form non-expansion, but movable joints in metal to accommodate elastomeric sealant to comply with [SMACNA 1793](#).
- d. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
- e. Fabricate cleats and attachments devices of size and metal

thickness recommended by SMACNA or by metal roof panel manufacturer for application, but not less than the thickness of the metal being secured.

1.8 WARRANTIES

Provide metal roof system material and workmanship warranties meeting specified requirements. Provide revision or amendment to manufacturer's standard warranty as required to comply with the specified requirements.

1.8.1 Metal Roof Panel Manufacturer Warranty

Furnish the metal roof panel manufacturer's 30-year no dollar limit roof system materials and installation workmanship warranty, including flashing, components, trim, and accessories necessary for a watertight roof system construction. Make warranty directly to the Government, commencing at time of Government's acceptance of the roof work. The warranty must state that:

a. If within the warranty period, the metal roof system, as installed for its intended use in the normal climatic and environmental conditions of the facility, becomes non-watertight, shows evidence of excessive weathering due to defective materials or installation workmanship, the repair or replacement of the defective and damaged materials of the metal roof system and correction of defective workmanship is the responsibility of the metal roof panel manufacturer. All costs associated with the repair or replacement work are the responsibility of the metal roof panel manufacturer.

b. If the manufacturer or his approved applicator fail to perform the repairs within 72 hours of notification, emergency temporary repairs performed by others does not void the warranty.

c. Both the standing seam roof sections and low slope roof sections and coating will fall under a single manufacturer warranty (If there are multiple systems being installed).

1.8.2 Manufacturer's Finish Warranty

Provide a manufacturer's no-dollar-limit 20 year warranty for the roofing system. Issue the warranty directly to the Government at the date of Government acceptance warranting that the factory color finish, under normal atmospheric conditions at the site, will not crack, peel, or delaminate; chalk in excess of a numerical rating of 8 when measured in accordance with [ASTM D 4214](#); or fade or change colors in excess of 5 NBS units as measured in accordance with [ASTM D 2244](#).

1.8.3 Metal Roof System Installer Warranty

Provide roof system installer warranty for a period of not less than five years that the roof system, as installed, is free from defects in installation workmanship, to include the roof panel installation, flashing, accessories, attachments, and sheet metal installation integral to a complete watertight roof system assembly. Issue warranty directly to the Government. Correction of defective workmanship and replacement of damaged or affected materials is the responsibility of the metal roof system installer. All costs associated with the repair or replacement work are the responsibility of the installer.

1.8.4 Continuance of Warranty

Repair or replacement work that becomes necessary within the warranty period must be approved, as required, and accomplished in a manner so as to restore the integrity of the roof system assembly and validity of the metal roof system manufacturer warranty for the remainder of the manufacturer warranty period.

1.9 CONFORMANCE AND COMPATIBILITY

The entire metal roofing and flashing system must be in accordance with specified and indicated requirements, including wind resistance and seismic per AISC 341 requirements. Work not specifically addressed and any deviation from specified requirements must be in general accordance with recommendations of the MBMA RSDM, NRCA 0405, the metal panel manufacturer's published recommendations and details, and compatible with surrounding components and construction. Submit any deviation from specified or indicated requirements to the Contracting Officer for approval prior to installation.

1.10 SCHEDULE

Some metric measurements in this section are based on mathematical conversion of English unit measurements, and not on metric measurement commonly agreed to by the manufacturer's or other parties. The English and metric units for the measurements shown are as follows:

	Products	English Units	Metric Units
a.	Sheet Aluminum	0.040 inch	1.0 mm
b.	Panels	16 inches	406.4 mm
	vertical legs	2 3/8" inches	50 mm
	stiffening ribs	4 inches	100 mm
c.	Screws	No.12	0.242 mm
		No. 14	0.216 mm
d.	Bolts	1/4 inch	6 mm
e.	Studs	3/16 inch	5 mm
f.	Fasteners	1/2 inch	13 mm
		1 inch	25 mm
g.	Rivets	1/16 inch	5 mm
		1/8 inch	3 mm

PART 2 PRODUCTS

2.1 ROOF PANELS

2.1.1 Aluminum Sheet Panels

Roll-form aluminum roof panels to the specified profile, prefinished with .040 thickness and depth as indicated. ALL PANELS TO BE FACTORY FORMED. NO FIELD ROLL FORMING PERMITTED.

Material must be plumb and true, and within the tolerances listed:

- a. Aluminum sheet conforming to **ASTM B 209**, and **AA ADM1**
- b. Individual panels to have continuous length sufficient to cover the entire length of any unbroken roof slope with no joints or seams and formed without warping, waviness, or ripples that are not a part of the panel profile and free from damage to the finish coating system.
- c. Provide panels which after attachment will provide unlimited thermal expansion and contraction.
 1. Profile to be 2 3/8" high seam at 16" o.c.; Mechanically seamed "T" seam; continuous length, no splicing; Concealed 16 GA stainless steel one piece clip not to come in any contact with seam sealant.
 2. Performance and Testing
- d. **ASTM E 1680**: Static pressure air infiltration (roof panels):

Pressure Leakage Rate:

 - a. 1.57 PSF 0.0012 cfm/sq.ft.
 - b. 6.24 PSF 0.0001 cfm/sq.ft.
 - c. 20.0 PSF 0.0011 cfm/sq.ft.

Pressure Leakage Rate:

 - a. 1.57 PSF 0.0054 cfm/sq.ft.
 - b. 6.24 PSF 0.0054 cfm/sq.ft.
 - c. 20.0 PSF 0.0027 cfm/sq.ft.
- e. **ASTM E1646**: Static pressure water infiltration (roof panels):

Pressure Result:

 - a. 5 Gal. /Hr. per S.F. and Static No Leakage
 - b. Pressure of 20.0 Psf for 15 minutes
- f. Capacities for gauge, span or loading other than those tested may be determined by interpolation of test results within the range of test data. Extrapolations for conditions outside test range are not acceptable.
- g. Water penetration (dynamic pressure): No water penetration, other than condensation, when exposed to dynamic rain and 70 mph wind velocities for not less than five minutes duration, when tested in accord with principles of **AAMA 501.1**.
- h. Wind and wind driven rain resistance: No water penetration or panel movement when exposed to 130 mph wind velocities when tested in accordance with TAS 100.
- i. The installed roof system assembly shall show that it can resist the calculated roof pressure in section 1.11.B in accordance with the test results of TAS 125.
- j. Water penetration in low slope applications: No water penetration or panel movement when subject to 6" head of water for 6 hrs when tested in accordance with the **ASTM E 2140** and when subject to 6" head of water for 7 days when tested in accordance with the TAS 114 appendix G.

k. Panel/Cap configuration must have a total of four (4) layers of aluminum surrounding anchor clip for prevention of water infiltration and increased system strength designed to limit potential for panel blow-off.

l. Profile of panel shall have mesa's every two (2) inches on center continuous throughout panel which are a minimum of one and one-half (1-1/2) inches wide.

m. Seam must be two and three-eighths (2-3/8) inches minimum height for added upward pressures and aesthetic appeal. Seam shall have continuous anchor reveals to allow anchor clips to resist positive and negative loading and allow unlimited expansion and contraction of panels due to thermal changes. Integral (not mechanically sealed) seams are unacceptable.

n. Seam cap: Snap-on cap shall be a minimum of 1" wide "T" shaped of continuous length up to forty-five (45) feet according to job conditions and field seamed by means of manufacturer's standard seaming machine.

1. Cap shall be designed to receive two (2) beads of continuous hot applied gasketing sealant, which will be applied independent of anchor clip, to allow unlimited thermal movement of panel without damage to cap sealant.

2. Sealant shall be a SIS (Styrene-Isoprene-Styrene) block copolymer type thermoplastic rubber adhesive, non-fatigue water barrier.

o. Stiffening ribs: Located in flat of panel to minimize oil canning and telegraphing of structural members.

p. Replace ability: Panels shall be of a symmetrical design with snap on, mechanically seamed cap configuration such that individual panels may be removable for replacement without removing adjacent panels.

q. Panel ends shall be panned at ridge, headwall, and hip conditions, or where applicable.

r. Panel length: Full length without joints, including bends.

2.2 **FACTORY FINISH AND COLOR PERFORMANCE REQUIREMENTS**

All panels are to receive a factory applied Kynar 500/Hylar 5000 finish consisting of a baked topcoat with a manufacturer's recommended prime coat conforming to the following:

a. Metal Preparation: All metal is to have the surfaces carefully prepared for painting on a continuous process coil coating line by alkali cleaning, hot water rinsing, application of chemical conversion coating, cold water rinsing, sealing with an acid rinse, and thorough drying.

b. Prime Coating: A base coat of epoxy paint, specifically formulated to interact with the top-coat, is to be applied to the prepared surfaces by roll coating to a dry film thickness of 0.20 + 0.05 mils. The prime coat must be oven cured prior to application of the finish coat.

- c. Exterior Finish Coating: Apply the exterior finish coating over the primer by roll coating to a dry film thickness of 0.80 + 0.05 mils (3.80 + 0.05 mils for Vinyl Plastisol) for a total dry film thickness of 1.00 + 0.10 mils (4.00 + 0.10 mils for Vinyl Plastisol). This exterior finish coat must be oven-cured.
- d. Interior finish coating: Apply a wash coat on the reverse side over primer by roll coating to a dry film thickness of 0.30 + 0.05 mils for a total dry fill thickness of 0.50 + 0.10 mils. The wash coat must be oven cured.
- e. Color: The exterior finish chosen from the manufacturer's standard color chart.
- f. Physical Properties: Coating must conform to the industry and manufacturer's standard performance criteria as listed by the following certified test reports:

General: SSPC Paint 12, NAVFAC A-A-50570, ASTM D 5894, and ASTM D 4587.

Abrasion: ASTM D 968
Adhesion: ASTM D 3359
Chalking: ASTM D 4214
Chemical Pollution: ASTM D 1308
Color Change and Conformity: ASTM D 2244
Creepage: ASTM D 1654
Cyclic Corrosion Test: ASTM D 5894
Flame Spread: ASTM E 84
Flexibility: ASTM D 522
Formability: ASTM D 522
Gloss at 60 and 85 degrees: ASTM D 523
Humidity: ASTM D 2247 and ASTM D 714
Oxidation: ASTM D 610
Pencil Hardness: ASTM D 3363
Reverse Impact: ASTM D 2794
Salt Spray: ASTM B 117
Weatherometer: ASTM G 23 and ASTM D 822

2.2.1 Specular Gloss

Finished roof surfaces to have a specular gloss value of 30 plus or minus 5 at an angle of 60 degrees when measured in accordance with ASTM D 523.

2.3 MISCELLANEOUS METAL FRAMING

2.3.1 General

Provide cold formed metallic-coated steel sheet conforming to ASTM A 653/A 653M, AISI/COS/NASPEC, and as specified in 05 40 00 COLD-FORMED METAL FRAMING unless otherwise indicated.

2.3.2 Fasteners and Miscellaneous Metal Framing

Provide compatible type, corrosion resistant, of sufficient size and length to penetrate the supporting element a minimum of one inch with other required properties to fasten miscellaneous metal framing members to substrates in accordance with the roof panel manufacturer's and ASCE 7-05

requirements.

2.3.2.1 Screws

Provide corrosion resistant screws, coated steel or stainless steel of the type and size recommended by the manufacturer to meet the performance requirements.

2.3.2.2 Rivets

Provide closed-end type rivets, corrosion resistant stainless steel where watertight connections are required.

2.3.2.3 Attachment Clips

Provide stainless steel, series 300 clips. Size, shape, thickness and capacity must meet the thickness and design load criteria specified. The clips must be one piece clips and allow for unlimited thermal movement.

2.3.2.3.1 Bearing Plates

Bearing Plates shall be a minimum of 6 inches by 6 inches and 22 gauge or thicker. Fasteners shall provide pull-out resistance for wind-uplift resistance, including a minimum factor of safety of 4.0, for the design wind-loads specified. The bearing plate material shall be compatible with the clip, and shall be designed to handle the transfer of all loads.

2.3.3 Electrodes for Manual, Shielded Metal Arc Welding

Electrodes for manual, shielded metal arc welding must meet the requirements of [AWS D1.1/D1.1M](#), and be covered, mild-steel electrodes conforming to [AWS A5.1/A5.1M](#).

2.4 ACCESSORIES

Accessories must be compatible with the metal roof panels. Sheet metal flashing, trim, metal closure strips, caps, and similar metal accessories must be not less than the minimum thicknesses specified for roof panels and shall be of the same material as the roof panels. Provide exposed metal accessories to match the panels furnished. Molded foam rib, ridge and other closure strips must be closed-cell or solid-cell synthetic rubber or neoprene premolded to match configuration of the panels and not absorb or retain water.

2.4.1 Pre-manufactured Accessories

Pre-manufactured accessories must be manufacturer's standard for intended purpose, compatible with the metal roof system and approved for use by the metal roof panel manufacturer. Construct curbs to match roof slope.

2.4.2 Metal Closure Strips

Provide factory fabricated aluminum closure strip of the same gauge, thickness, color, finish and profile as the specified roof panel.

2.4.3 Rubber Closure Strips

Provide closed-cell, expanded cellular rubber closure strips conforming to [ASTM D 1056](#) and [ASTM D 1667](#), extruded or molded to the configuration of the

specified roof panel profile and in lengths supplied by roof panel manufacturer.

2.5 JOINT SEALANTS

2.5.1 Sealants

Sealants are to be an approved gun type for use in hand or air pressure caulking guns at temperatures above 40 degrees F (or frost-free application at temperatures above 10 degrees F) with a minimum solid content of 85 percent of the total volume. Sealant must dry with a tough, durable surface skin which permits it to remain soft and pliable underneath, providing a weather tight joint. No migratory staining, in conformance with to ASTM C 792, is permitted on painted or unpainted metal, stone, glass, vinyl or wood.

Prime all joints to receive sealants with a compatible one-component or two-component primer as recommended by the roof panel manufacturer.

2.5.1.1 Shop Applied Sealants

Sealant for shop-applied caulking must be an approved gun grade, non-sag one-component polysulfide or silicone conforming to ASTM C 792 and ASTM C 920, Type II, with a curing time which ensures the sealants plasticity at the time of field erection. Color to match panel color.

2.5.1.2 Field Applied Sealants

Sealants for field-applied caulking must be an approved gun grade, non-sag on-component polysulfide or two component polyurethane with an initial maximum Shore A durometer hardness of 25, conforming to ASTM C 920, Type II. Color to match panel color.

2.5.1.3 Tape Sealants

Provide pressure sensitive, 100 percent solid tape sealant with a release paper backing; permanently elastic, non-sagging, non-toxic and non-staining as approved by the roof panel manufacturer.

2.5.2 Sheet Metal Flashing and Trim

2.5.2.1 Fabrication, General

Custom fabricate sheet metal flashing and trim to comply with recommendations within the SMACNA 1793 that apply to design, dimensions, metal type, and other characteristics of design indicated. Shop fabricate items to the greatest extent possible. Obtain and verify field measurements for accurate fit prior to shop fabrication. Fabricate flashing and trim without excessive oil canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

2.5.2.2 Roof Drainage Sheet Metal Fabrications

Gutters: Fabricate to cross section indicated, with riveted and soldered joints, complete with end pieces, outlet tubes, and other special accessories as required. Fabricate in minimum 96 inch long sections. Fabricate expansion joints and accessories from the same metal as gutters, unless otherwise indicated.

Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangars of same material as downspouts and anchors.

2.6 INSULATION

Insulation, facer material and attachment must be compatible with metal roof system specified, as approved by the roof panel manufacturer.

2.7 UNDERLAYMENTS

2.7.1 Self-Adhering Modified Bitumen Underlayment

Provide self-adhering modified bitumen membrane underlayment material in compliance with **ASTM D 1970** suitable for use as underlayment for metal roofing. Use membrane resistant to cyclical elevated temperatures for extended period of time in high heat service conditions. Provide membrane with integral non-tacking top surface of polyethylene film or other surface material to serve as separator between bituminous material and metal products to be applied to above.

- a. Product: 60 Mil SBR Modified, self adhering, fiberglass reinforced underlayment. Must be manufactured by the manufacturer of the standing seam metal panel system.

2.7.2 Slip Sheet

Provide 0.24 kg per square meter (5 pounds per 100 sf) rosin sized unsaturated building paper for slip sheet, or products required by the roof panel manufacturer.

2.8 GASKETS AND SEALING/INSULATING COMPOUNDS

Gaskets and sealing/insulating compounds must be nonabsorptive and suitable for insulating contact points of incompatible materials. Sealing/insulating compounds must be non-running after drying.

2.9 FINISH REPAIR MATERIAL

Only use repair and touch-up paint supplied by the roof panel manufacturer and is compatible with the specified system.

PART 3 EXECUTION

3.1 EXAMINATION

Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the work. Ensure surfaces are suitable, dry and free of defects and projections which might affect the installation.

Examine primary and secondary roof framing to verify that rafters, purlins, angels, channels, and other structural support members for panels and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer, UL, ASTM, and ASCE/SEI-7-05 and applicable seismic requirements.

Examine rough-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of panels prior to installation.

Submit a written report to the Contracting Officer, endorsed by the installer, listing conditions detrimental to the performance of the work. Proceed with installation only after defects have been corrected.

3.2 INSTALLATION

Installation must meet specified requirements and be in accordance with the manufacturer's installation instructions and approved shop drawings. Do not install damaged materials. Dissimilar materials which are not compatible when contacting each other must be insulated by means of gaskets or sealing/insulating compounds. Keep all exposed surfaces and edges clean and free from sealant, metal cuttings, hazardous burrs, and other foreign material. Remove stained, discolored, or damaged materials from the site.

3.2.1 Preparation

Clean all substrate substances which may be harmful to insulation, and roof panels including removing projections capable of interfering with with insulation, and roof panel attachment.

Install sub-purlins, eave angles, furring, and other miscellaneous roof panel support members and anchorage according to metal roof panel manufacturer's written instructions.

3.2.2 Underlayment

Install underlayment according to roof panel manufacturer's written recommendations and recommendation in NRCA "The NRCA Roofing and Waterproofing Manual".

3.2.2.1 Self-Adhering Sheet Underlayment

Install self-adhering sheet underlayment; wrinkle free on roof deck. Comply with low-temperature installation restrictions of manufacturer where applicable. Install , lapped in a direction to shed water. Lap sides not less than 3-1/2 inches. Lap ends not less than 6 inches staggered 24 inches between courses. Roll laps with roller. Cover underlayment within seven days.

3.2.2.2 Slip Sheet

Apply specified slip sheet at time of roof panel installation when felt or other underlayment is used that may be in direct contact with and adhere to or adversely impact the underside of roof panels, and as otherwise recommended by the roof panel manufacturer.

3.3 INSULATION INSTALLATION

Install insulation concurrently with metal roof panel installation, in thickness indicated, to cover entire roof, according to manufacturer's written instructions.

3.4 PROTECTION OF APPLIED MATERIALS

Do not permit storing, walking, wheeling, and trucking directly on applied

roofing/insulation materials. Provide temporary walkways, runways, and platforms of smooth clean boards or planks as necessary to avoid damage to applied roofing/insulation materials, and to distribute weight to conform to indicated live load limits of roof construction.

3.5 FASTENER INSTALLATION

Anchor metal roof panels and other components of the Work securely in place, using approved fasteners according to manufacturer's written instructions.

3.5.1 Welding

Procedures for manual, shielded metal-arc welding, the appearance and quality of welds made, and the methods used in correcting welding work must be in accordance with [AWS D1.1/D1.1M](#).

3.6 FLASHING, TRIM, AND CLOSURE INSTALLATION

3.6.1 General Requirements

Comply with performance requirements, manufacturer's written installation instructions, and [SMACNA 1793](#). Provide concealed fasteners where possible. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently water tight and weather resistant. Work is to be accomplished to form weather tight construction without waves, warps, buckles, fastening stresses or distortion, and to allow for expansion and contraction. Cutting, fitting, drilling, and other operations in connection with sheet metal required to accomplish the work must conform to the manufacturers written instructions.

3.6.2 Metal Flashing

Install exposed metal flashing at building corners, rakes, eaves, junctions between metal siding and roofing, valleys and changes off slope or direction in metal roofing, building expansion joints and gutters.

Exposed metal flashing must be the same material, color, and finish as the specified metal roofing panels. Furnish flashing in minimum **8 foot** lengths. Exposed flashing must have 1 inch locked and blind soldered end joints, with expansion joints at intervals of no greater than **16 feet**.

Fasten flashing at not more than 8 inches on center for roofs, except where flashing is held in place by the same screws used to secure panels. Exposed flashing and flashing subject to rain penetration must be bedded in specified joint sealant. Flashing which is contact with dissimilar metals must be isolated by means of the specified asphalt mastic material to prevent electrolytic deterioration.

Form drips to the profile indicated, with the edge folded back **1/2 inch** to form a reinforced drip edge.

3.7 ROOF PANEL INSTALLATION

Provide metal roof panels of full length from eave to ridge or eave to wall as indicated, unless otherwise indicated or restricted by shipping limitations. Anchor metal roof panels or other components of the Work securely in place, with provisions for thermal and structural movement in accordance with [NRCA ASMMRM](#).

Aluminum Roof Panels: Use stainless steel fasteners for surfaces exposed to the exterior and for unexposed surfaces.

Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using approved fasteners according to manufacturer's written instructions. Provide all blocking and nailers as required.

Metal Protection: Where dissimilar metals contact each other or possibly corrosive substrates, protect against galvanic action with permanent separation as recommended by the metal roof panel manufacturer.

Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and required for weatherproof performance of metal roof panel system. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal roof panel manufacturer.

3.7.1 Handling and Erection

Erect roofing system in accordance with the approved erection drawings, printed instructions and safety precautions of the manufacturer.

Do not subject panels to overloading, abuse, or undue impact. Do not apply bent, chipped, or defective panels. Damaged panels must be replaced and removed from the site at the contractors expense. Erect panels true, plumb, and in exact alignment with the horizontal and vertical edges of the building, securely anchored, and with indicated rake, eave, and curb overhang. Allow for thermal movement of the roofing, movement of the building structure, and provide permanent freedom from noise due to wind pressure.

Do not permit storage, walking, wheeling or trucking directly on applied roofing materials. Provide temporary walkways, runways, and platforms of smooth clean boards or planks as necessary to avoid damage to the installed roofing materials, and to distribute weight to conform to the indicated live load limits of the roof construction.

Roof panels must be laid with corrugations in the direction of the roof slope. End laps of exterior roofing must not be less than 8 inches; side laps of standard exterior corrugated panels must not be less than 2-1/2 corrugations.

Field cutting of metal roof panels by torch is not permitted. Field cut only as recommended by manufacturer's written instructions.

3.7.2 Closure Strips

Install metal closure strips at open ends of metal ridge rolls; open ends of corrugated or ribbed pattern roofs, and at intersection of wall and roof, unless open ends are concealed with formed eave flashing; rake of metal roof unless open end has a formed flashing member; and in other required areas.

Install closure strips at intersection of the wall with metal roofing; top and bottom of metal siding; heads of wall openings; and in other required locations.

3.7.3 Workmanship

Make lines, arises, and angles sharp and true. Free exposed surfaces from any visible wave, warp, buckle and tool marks. Fold back exposed edges neatly to form a 1/2 inch hem on the concealed side. Make sheet metal exposed to the weather watertight with provisions for expansion and contraction.

Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry, and free of defects and projections which might affect the application. For installation of items not shown in detail or not covered by specifications conform to the applicable requirements of SMACNA 1793. Provide sheet metal flashing in the angles formed where roof decks abut walls, curbs, ventilators, pipes, or other vertical surfaces and wherever indicated and as necessary to make the work watertight.

3.8 ACCEPTANCE PROVISIONS

3.8.1 Erection Tolerances

Erect metal roofing straight and true with plumb vertical lines correctly lapped and secured in accordance with the manufacturer's written instructions. Horizontal lines must not vary more than 1/8 inch in 40 feet.

3.8.2 Leakage Tests

Finished application of metal roofing is to be subject to inspection and test for leakage by the Contracting Officer or his designated representative, and Architect/Engineer. Inspection and tests will be conducted without cost to the Government.

Inspection and testing is to be made promptly after erection to permit correction of defects and removal/replacement of defective materials.

3.8.3 Repairs to Finish

Scratches, abrasions, and minor surface defects of finish may be repaired with the specified repair materials and as recommended by the metal roof panel manufacturer. Finished repaired surfaces must be uniform and free from variations of color and surface texture. Repaired metal surfaces that are not acceptable to the project requirements are to be immediately removed and replaced with new material.

3.8.4 Paint Finished Metal Roofing

Paint finished metal roofing will be tested for color stability by the Contracting Officer during the manufacturer's specified guarantee period. Panels that indicate color changes, fading, or surface degradation, determined by visual examination, must be removed and replaced with new panels at no expense to the Government. New panels will be subject to the specified tests for an additional year from the date of their installation.

3.9 CLEAN UP AND DISPOSAL

Clean exposed sheet metal work at completion of installation. Remove metal shavings, filings, nails, bolts, and wires from roofs. Remove grease and oil films, excess sealants, handling marks, contamination from steel wool, fittings and drilling debris and scrub the work clean. Exposed metal surfaces must be free of dents, creases, waves, scratch marks, solder or

weld marks, and damage to the finish coating. Touch up scratches in panel finish with manufacturer supplied touch-up paint system to match panel finish. Treat exposed cut edges with manufacturer supplied clear coat.

Collect all scrap/waste materials and place in containers. Promptly dispose of demolished and scrap materials. Do not allow scrap/waste materials to accumulate on-site; transport immediately from the government property and legally dispose of them.

3.10 FIELD QUALITY CONTROL

3.10.1 Manufacturer's Inspection

Manufacturer's technical representative must visit the site a minimum of three times per week during the installation for purposes of reviewing materials installation practices and adequacy of work in place.

When the project is in progress, the roofing system manufacturer will provide the following:

1. Keep the Contracting Officer informed as to the progress and quality of the work as observed. Photographic Inspection Report to be turned in on a weekly basis to the Contracting Officer.
2. Provide job site inspections a minimum of three days a week.
3. Submit three signed copies of the [manufacturer's field inspection reports](#) to the Contracting Officer within one week of substantial completion.
4. Report to the Contracting Officer in writing any failure or refusal of the Contractor to correct unacceptable practices called to the Contractor's attention.
5. Confirm after completion that manufacturer has observed no application procedures in conflict with the specifications other than those that may have been previously reported and corrected.
6. The roofing manufacturer must inspect the roof on an annual basis and submit an annual inspection report to Public Works at Camp Lejeune.
7. The manufacturer's inspector must be a full time employee of the manufacturer with a minimum 5 years experience inspecting the specified roof system. A signed copy to attest to the full time employ and tenure of the inspector by the president of the manufacturing company will accompany submittals.

3.11 [INFORMATION CARD](#)

For each roof, furnish a typewritten information card for facility records and a card laminated in plastic and framed for interior display at roof access point, or a photoengraved 1 mm (0.032) inch thick aluminum card for exterior display. [Format as directed in paragraph titled "Form One"](#).

Make card 8 1/2 by 11 inches minimum. Information card must identify facility name and number; location; contract number; approximate roof area; detailed roof system description, including deck type, roof panel manufacturer and product name, type underlayment(s), date of completion; installing contractor identification and contact information; manufacturer

warranty expiration, warranty reference number, and contact information.
Install card at location as directed by the Contracting Officer and provide
a paper copy to the Contracting Officer.

3.11.1 Form One

FORM 1 - PREFORMED ALUMINUM PANEL ROOFING SYSTEM AND COMPONENTS

- 1. Contract Number:
- 2. Building Number & Location:
- 3. NAVFAC Specification Number:
- 4. Deck/Substrate Type:
- 5. Slopes of Deck/Roof Structure:
- 6. Insulation Type & Thickness:
- 7. Insulation Manufacturer:
- 8. Vapor Retarder: ()Yes ()No
- 9. Vapor Retarder Type:
- 10. Preformed Standing Seam Roofing Description:
 - a. Manufacturer (Name, Address, & Phone No.):
 - b. Product Name: c. Width: d. Gage:
 - e. Base Metal: f. Method of Attachment:
- 11. Repair of Color Coating:
 - a. Coating Manufacturer (Name, Address & Phone No.):
 - b. Product Name:
 - c. Surface Preparation:
 - d. Recoating Formula:
 - e. Application Method:
- 12. Statement of Compliance or Exception: _____

- 13. Date Roof Completed:
- 14. Warranty Period: From _____ To _____
- 15. Roofing Contractor (Name & Address):
- 16. Prime Contractor (Name & Address):

Contractor's Signature _____ Date:

Inspector's Signature _____ Date:Text

3.12 DATE OF INSTALLATION WALL-MOUNTED PLACARD

For each metal roof panel installation, furnish an exterior "Date of Installation Placard", 0.032 inch thick aluminum, 8-1/2 inches high by 11 inches wide, with mounting accessories, photoengraved to include the following information:

Facility Name and Number
Approximate Roof Area Newly Installed and Date of Completion
Manufacturer, Type of Roof Panel and Name
Underlayment and Insulation System, R value
Installing Contractor and Contact Information
Warranty Expiration Date
Warranty Reference Number and Contact Information

Install placard as directed by the Contracting Officer.

-- End of Section --

SECTION 07 60 00

FLASHING AND SHEET METAL

08/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WELDING SOCIETY (AWS)

AWS D1.2/D1.2M (2008) Structural Welding Code - Aluminum

ASTM INTERNATIONAL (ASTM)

ASTM A 167 (2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

ASTM B 209 (2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

ASTM B 32 (2004) Standard Specification for Solder Metal

ASTM B 370 (2003) Standard Specification for Copper Sheet and Strip for Building Construction

ASTM D 226 (2006) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing

ASTM D 41 (2005) Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing

ASTM D 4586 (2007) Asphalt Roof Cement, Asbestos-Free
SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION
(SMACNA)

SMACNA Arch. Manual (2006) Architectural Sheet Metal Manual

1.2 General Requirements

Finished sheet metalwork will form a weathertight construction without waves, warps, buckles, fastening stresses or distortion, which allows for expansion and contraction. Sheet metal mechanic is responsible for cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades. Coordinate installation of sheet metal items used in conjunction with roofing with roofing work to permit continuous roofing operations.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Gutters;

Downspouts;

Fascias;

Counterflashing;

Flashing at roof penetrations;

SD-11 Closeout Submittals

Quality Control Plan

Submit for sheet metal work in accordance with paragraph entitled "Field Quality Control."

1.4 DELIVERY, HANDLING, AND STORAGE

Package and protect materials during shipment. Uncrate and inspect materials for damage, dampness, and wet-storage stains upon delivery to the job site. Remove from the site and replace damaged materials that cannot be restored to like-new condition. Handle sheet metal items to avoid damage to surfaces, edges, and ends. Store materials in dry, weather-tight, ventilated areas until immediately before installation.

PART 2 PRODUCTS

2.1 MATERIALS

Do not use lead, lead-coated metal, or galvanized steel. Conform to the requirements specified and to the thicknesses and configurations established in SMACNA Arch. Manual for the materials.

Furnish sheet metal items in 8 to 10 foot lengths. Single pieces less than 8 feet long may be used to connect to factory-fabricated inside and outside corners, and at ends of runs. Factory fabricate corner pieces with minimum 12 inch legs. Provide accessories and other items essential to complete the sheet metal installation. Provide accessories made of the same or compatible materials as the items to which they are applied. Fabricate sheet metal items of the materials specified below and to the gage, thickness, or weight shown in Table I at the end of this section. Provide sheet metal items with mill finish unless specified otherwise. Where more than one material is listed for a particular item in Table I, each is acceptable and may be used except as follows:

2.1.1 Exposed Sheet Metal Items

Must be of the same material. Consider the following as exposed sheet metal: gutters, including hangers; downspouts; and fascias; cap, base, and eave flashings and related accessories.

2.1.2 Drainage

Do not use copper for an exposed item if drainage from that item will pass over exposed masonry, stonework or other metal surfaces. In addition to the metals listed in Table I, lead-coated copper may be used for such items.

2.1.3 Copper, Sheet and Strip

ASTM B 370, cold-rolled temper, H 00 (standard).

2.1.4 Stainless Steel

ASTM A 167, Type 302 or 304, 2D Finish, fully annealed, dead-soft temper.

2.1.5 Aluminum Alloy Sheet and Plate

ASTM B 209, form alloy, and temper appropriate for use.

2.1.5.1 Alclad

When fabricated of aluminum, fabricate the items Alclad 3003, Alclad 3004, Alclad 3005, clad on both sides unless otherwise indicated.

- a. Gutters, downspouts, and hangers
- b. Gravel stops and fascias
- c. Flashing

2.1.5.2 Finish

Exposed exterior sheet metal items of aluminum must have a baked-on, factory-applied color coating of polyvinylidene fluoride (PVF2) or other equivalent fluorocarbon coating applied after metal substrates have been cleaned and pretreated. Provide finish coating dry-film thickness of 0.8 to 1.3 mils, and color which matches the roof panels.

2.1.6 Solder

ASTM B 32, 95-5 tin-antimony.

2.1.7 Bituminous Plastic Cement

ASTM D 4586, Type I.

2.1.8 Roofing Felt

ASTM D 226 Type I.

2.1.9 Asphalt Primer

ASTM D 41.

2.1.10 Fasteners

Use the same metal or a metal compatible with the item fastened. Use stainless steel fasteners to fasten dissimilar materials.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Workmanship

Make lines and angles sharp and true. Free exposed surfaces from visible wave, warp, buckle, and tool marks. Fold back exposed edges neatly to form a 1/2 inch hem on the concealed side. Make sheet metal exposed to the weather watertight with provisions for expansion and contraction.

Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry, and free of defects and projections. For installation of items not shown in detail or not covered by specifications conform to the applicable requirements of *SMACNA Arch. Manual*, Architectural Sheet Metal Manual. Provide sheet metal flashing in the angles formed where roof decks abut walls, curbs, ventilators, pipes, or other vertical surfaces and wherever indicated and necessary to make the work watertight. Join sheet metal items together as shown in Table II.

3.1.2 Nailing

Confine nailing of sheet metal generally to sheet metal having a maximum width of 18 inch. Confine nailing of flashing to one edge only. Space nails evenly not over 3 inch on center and approximately 1/2 inch from edge unless otherwise specified or indicated. Face nailing will not be permitted. Where sheet metal is applied to other than wood surfaces, include in shop drawings, the locations for sleepers and nailing strips required to secure the work.

3.1.3 Cleats

Provide cleats for sheet metal as indicated on the Drawings. Cleats are to be of the same material and thickness as the sheet metal being installed. Secure one end of the cleat with two nails and the cleat folded back over the nailheads. Lock the other end into the seam. Where the fastening is to be made to concrete or masonry, use screws and drive in expansion shields set in concrete or masonry. Prein cleats for soldered seams.

3.1.4 Bolts, Rivets, and Screws

Install bolts, rivets, and screws where indicated or required. Provide compatible washers where required to protect surface of sheet metal and to provide a watertight connection. Provide mechanically formed joints in aluminum sheets 0.040 inch or less in thickness.

3.1.5 Seams

Straight and uniform in width and height with no solder showing on the face.

3.1.5.1 Flat-lock Seams

Finish not less than 3/4 inch wide.

3.1.5.2 Lap Seams

Finish soldered seams not less than one inch wide. Overlap seams not soldered, not less than 3 inch.

3.1.5.3 Loose-Lock Expansion Seams

Not less than 3 inch wide; provide minimum one inch movement within the joint. Completely fill the joints with the specified sealant, applied at not less than 1/8 inch thick bed.

3.1.5.4 Flat Seams

Make seams in the direction of the flow.

3.1.6 Soldering

Where soldering is specified, apply to copper, terne-coated stainless steel, zinc-coated steel, and stainless steel items. Pretin edges of sheet metal before soldering is begun. Seal the joints in aluminum sheets of 0.040 inch or less in thickness with specified sealants. Do not solder aluminum.

3.1.6.1 Edges

Scrape or wire-brush the edges of lead-coated material to be soldered to produce a bright surface. Flux brush the seams in before soldering. Treat with soldering acid flux the edges of stainless steel to be pretinned. Seal the joints in aluminum sheets of 0.040 inch or less in thickness with specified sealants. Do not solder aluminum.

3.1.7 Welding and Mechanical Fastening

Use welding for aluminum of thickness greater than 0.040 inch. Aluminum 0.040 inch or less in thickness must be butted and the space backed with formed flashing plate; or lock joined, mechanically fastened, and filled with sealant as recommended by the aluminum manufacturer.

3.1.7.1 Welding of Aluminum

Use welding of the inert gas, shield-arc type. For procedures, appearance and quality of welds, and the methods used in correcting welding work, conform to AWS D1.2/D1.2M.

3.1.7.2 Mechanical Fastening of Aluminum

Use No. 12, aluminum alloy, sheet metal screws or other suitable aluminum alloy or stainless steel fasteners. Drive fasteners in holes made with a No. 26 drill in securing side laps, end laps, and flashings. Space fasteners 12 inch maximum on center. Where end lap fasteners are required to improve closure, locate the end lap fasteners not more than 2 inch from the end of the overlapping sheet.

3.1.8 Protection from Contact with Dissimilar Materials

3.1.8.1 Copper or Copper-bearing Alloys

Paint with heavy-bodied bituminous paint surfaces in contact with dissimilar metal, or separate the surfaces by means of moistureproof building felts.

3.1.8.2 Aluminum

Do not allow aluminum surfaces in direct contact with other metals except

stainless steel, zinc, or zinc coating. Where aluminum contacts another metal, paint the dissimilar metal with a primer followed by two coats of aluminum paint. Where drainage from a dissimilar metal passes over aluminum, paint the dissimilar metal with a non-lead pigmented paint.

3.1.8.3 Metal Surfaces

Paint surfaces in contact with mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.

3.1.8.4 Wood or Other Absorptive Materials

Paint surfaces that may become repeatedly wet and in contact with metal with two coats of aluminum paint or a coat of heavy-bodied bituminous paint.

3.1.9 Expansion and Contraction

Provide expansion and contraction joints at not more than 32 foot intervals for aluminum and at not more than 40 foot intervals for other metals. Provide an additional joint where the distance between the last expansion joint and the end of the continuous run is more than half the required interval. Space joints evenly. Join extruded aluminum gravel stops and fascias by expansion and contraction joints spaced not more than 12 feet apart.

3.1.10 Counterflashing

Extend down vertical surfaces over upturned vertical leg of base flashings not less than 3 inch. Fold the exposed edges of counterflashings 1/2 inch. Where stepped counterflashings are required, they may be installed in short lengths a minimum 8 inch by 8 inch or may be of the preformed one-piece type. Provide end laps in counterflashings not less than 3 inch and make it weathertight with plastic cement. Do not make lengths of metal counterflashings exceed 10 feet. Form the flashings to the required shapes before installation. Factory-form the corners not less than 12 inch from the angle. Turn up the concealed edge of counterflashings built into walls not less than 4 inches. Install counterflashing to provide a spring action against base flashing.

3.1.11 Fascias

Prefabricate in the shapes and sizes indicated and in lengths not less than 8 feet. Extend flange at least 4 inch onto roofing. Provide prefabricated, mitered corners internal and external corners.

3.1.11.1 Edge Strip

Hook the lower edge of fascias at least 3/4 inch over a continuous strip of the same material bent outward at an angle not more than 45 degrees to form a drip. Nail hook strip to a wood nailer at 6 inch maximum on center. Where fastening is made to concrete or masonry, use screws spaced 12 inch on center driven in expansion shields set in the concrete or masonry. Where horizontal wood nailers are slotted to provide for insulation venting, install strips to prevent obstruction of vent slots. Where necessary, install strips over 1/16 inch thick compatible spacer or washers.

3.1.11.2 Joints

Leave open the section ends of fascias 1/4 inch and backed with a formed

flashing plate, mechanically fastened in place and lapping each section end a minimum of 4 inch set laps in plastic cement. Face nailing will not be permitted.

3.1.12 Gutters

The hung type of shape indicated and supported on underside by brackets that permit free thermal movement of the gutter. Provide gutters in sizes indicated complete with mitered corners, end caps, outlets, brackets, and other accessories necessary for installation. Bead with hemmed edge and reinforce the outer edge of gutter with a stiffening bar at 30 inches on center, not less than 3/4 by 3/16 inch of material compatible with gutter. Fabricate gutters in sections not less than 8 feet. Lap the sections a minimum of one inch in the direction of flow or provide with concealed splice plate 6 inch minimum. Join the gutters, other than aluminum, by riveted and soldered joints. Join aluminum gutters with riveted sealed joints. Provide expansion-type slip joints midway between outlets. Install gutters below slope line of the roof so that snow and ice can slide clear. Support gutters on adjustable hangers spaced not more than 30 inches on center. Adjust gutters to slope uniformly to outlets, with high points occurring midway between outlets. Fabricate hangers and fastenings from metals. Gutters shall match the metal roofing.

3.1.13 Downspouts

Space supports for downspouts according to the manufacturer's recommendation for the masonry substrate. Types, shapes and sizes are indicated. Provide complete including elbows and offsets. Provide downspouts in approximately 10 foot lengths. Provide end joints to telescope not less than 1/2 inch and lock longitudinal joints. Provide gutter outlets with wire ball strainers for each outlet. Provide strainers to fit tightly into outlets and be of the same material used for gutters. Keep downspouts not less than one inch away from walls. Fasten to the walls at top, bottom, and at an intermediate point not to exceed 5 feet on center with leader straps or concealed rack-and-pin type fasteners. Form straps and fasteners of metal compatible with the downspouts. Downspouts shall match the metal roofing.

3.1.13.1 Terminations

Provide downspouts terminating in splash blocks with elbow-type fittings.

3.1.14 Flashing at Roof Penetrations and Equipment Supports

Provide metal flashing for all pipes, ducts, and conduits projecting through the roof surface and for equipment supports, guy wire anchors, and similar items supported by or attached to the roof deck.

3.1.15 Single Pipe Vents

Flashing devices around pipe penetrations shall be flexible, one-piece devices molded from weather-resistant EPDM rubber. Rubber boot material shall be as recommended by the manufacturer. The boots shall have base rings made of aluminum or corrosion resisting steel that conform to the contours of the roof panel to form a weather-tight seal.

3.2 PAINTING

Field-paint sheet metal for separation of dissimilar materials.

3.2.1 Aluminum Surfaces

Shall be solvent cleaned and given one coat of zinc-molybdate primer and one coat of aluminum paint.

3.3 CLEANING

Clean exposed sheet metal work at completion of installation. Remove grease and oil films, handling marks, contamination from steel wool, fittings and drilling debris, and scrub-clean. Free the exposed metal surfaces of dents, creases, waves, scratch marks, and solder or weld marks.

3.4 REPAIRS TO FINISH

Scratches, abrasions, and minor surface defects of finish may be repaired in accordance with the manufacturer's printed instructions and as approved. Repair damaged surfaces caused by scratches, blemishes, and variations of color and surface texture. Replace items which cannot be repaired.

3.5 FIELD QUALITY CONTROL

Establish and maintain a [Quality Control Plan](#) for sheet metal used in conjunction with roofing to assure compliance of the installed sheet metalwork with the contract requirements. Remove work that is not in compliance with the contract and replace or correct. Include quality control, but not be limited to, the following:

- a. Observation of environmental conditions; number and skill level of sheet metal workers; condition of substrate.
- b. Verification that specified material is provided and installed.
- c. Inspection of sheet metalwork, for proper size(s) and thickness(es), fastening and joining, and proper installation.

3.5.1 Procedure

Submit for approval prior to start of roofing work. Include a checklist of points to be observed. Document the actual quality control observations and inspections. Furnish a copy of the documentation to the Contracting Officer at the end of each day.

TABLE I. SHEET METAL WEIGHTS, THICKNESSES, AND GAGES

Sheet Metal Items	Aluminum U.S. Std. Gage
Downspouts and leaders.....	.032
Downspout straps, 2-inch.....	.060
Strainers, wire diameter or gage.....	.144 diameter
Flashings:	
Cap (Counter-flashing)	.032
Fascias:	
Extrusions.....	.075
Sheets, smooth.....	.050
Edge strip.....	.050
Gutters:	
Gutter section.....	.032
Continuous cleat.....	.032
Hangers, dimensions.....	1 inch x .080 inch
Joint Cover plates.... (See Table II)	.032

TABLE II. SHEET METAL JOINTS
TYPE OF JOINT

Item Designa-	Aluminum tion	Remarks
Flashings		
Base	One inch flat locked, soldered; sealed; 3 inch lap for expansion joint	Aluminum producer's recommended hard setting sealant for locked aluminum joints. Fill each metal expansion joint with a joint sealing compound compound.
Edge strip	Butt	
Gravel stops:		
Extrusions	Butt with 1/2 inch space	Use sheet flashing beneath and a cover plate.
Sheet, smooth	Butt with 1/4 inch space	Use sheet flashing backup plate.
Gutters	One inch flat locked riveted and sealed	
-- End of Section --		

SECTION 07 84 00

FIRESTOPPING

05/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

- ASTM E119 (2012) Standard Test Methods for Fire Tests of Building Construction and Materials
- ASTM E1399 (1997; R 2009) Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems
- ASTM E1966 (2007; R 2011) Fire-Resistive Joint Systems
- ASTM E2174 (2010ae1) Standard Practice for On-Site Inspection of Installed Fire Stops
- ASTM E2307 (2010) Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus
- ASTM E2393 (2010a) Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers
- ASTM E814 (2011a) Standard Test Method for Fire Tests of Through-Penetration Fire Stops
- ASTM E84 (2012) Standard Test Method for Surface Burning Characteristics of Building Materials

FM GLOBAL (FM)

- FM APP GUIDE (updated on-line) Approval Guide <http://www.approvalguide.com/>
- FM AS 4991 (2001) Approval of Firestop Contractors

UNDERWRITERS LABORATORIES (UL)

- UL 1479 (2003; Reprint Mar 2010) Fire Tests of Through-Penetration Firestops

UL 2079	(2004; Reprint Jun 2008) Tests for Fire Resistance of Building Joint Systems
UL 723	(2008; Reprint Sep 2010) Test for Surface Burning Characteristics of Building Materials
UL Fire Resistance	(2012) Fire Resistance Directory

1.2 SYSTEM DESCRIPTION

1.2.1 General

Furnish and install tested and listed firestopping systems, combination of materials, or devices to form an effective barrier against the spread of flame, smoke and gases, and maintain the integrity of fire resistance rated walls, partitions, floors, and ceiling-floor assemblies, including through-penetrations and construction joints and gaps.

- a. Through-penetrations include the annular space around pipes, tubes, conduit, wires, cables and vents.
- b. Construction joints include those used to accommodate expansion, contraction, wind, or seismic movement; firestopping material shall not interfere with the required movement of the joint.

Gaps requiring firestopping include gaps between the curtain wall and the floor slab and between the top of the fire-rated walls and the roof or floor deck above and at the intersection of shaft assemblies and adjoining fire resistance rated assemblies.

1.2.2 Sequencing

Coordinate the specified work with other trades. Apply firestopping materials, at penetrations of pipes and ducts, prior to insulating, unless insulation meets requirements specified for firestopping. Apply firestopping materials at building joints and construction gaps, prior to completion of enclosing walls or assemblies. Cast-in-place firestop devices shall be located and installed in place before concrete placement. Pipe, conduit or cable bundles shall be installed through cast-in-place device after concrete placement but before area is concealed or made inaccessible. Firestop material shall be inspected and approved prior to final completion and enclosing of any assemblies that may conceal installed firestop.

1.2.3 Submittals Requirements

- a. Submit detail drawings including manufacturer's descriptive data, typical details conforming to **UL Fire Resistance** or other details certified by another nationally recognized testing laboratory, installation instructions or UL listing details for a firestopping assembly in lieu of fire-test data or report. For those firestop applications for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgment, derived from similar UL system designs or other tests, shall be submitted for review and approval prior to installation. Submittal shall indicate the firestopping material to be provided for each type of application. When more than a total of 5 penetrations and/or construction joints are

to receive firestopping, provide drawings that indicate location, "F" "T" and "L" ratings, and type of application.

b. Submit certificates attesting that firestopping material complies with the specified requirements. For all intumescent firestop materials used in through penetration systems, manufacturer shall provide certification from UL of passing the "Aging and Environmental Exposure Testing " portion of [UL 1479](#).

c. Submit documentation of training and experience for Installer.

d. Submit manufacturer's representative certification stating that firestopping work has been inspected and found to be applied according to the manufacturer's recommendations and the specified requirements.

1.3 SUBMITTALS

Submit the following in accordance with Section [01 33 00 SUBMITTAL PROCEDURES](#):

[SD-02 Shop Drawings](#)

[Firestopping Materials.](#)

[SD-07 Certificates](#)

[Manufacturer's Technical Representative
Firestopping Materials.
Installer Qualifications.
Inspection.](#)

1.4 QUALITY ASSURANCE

1.4.1 Installer

Engage an experienced Installer who is:

- a. FM Research approved in accordance with [FM AS 4991](#), operating as a UL Certified Firestop Contractor, or
- b. Certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary staff, training, and a minimum of 3 years experience in the installation of manufacturer's products in accordance with specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an installer engaged by the Contractor does not in itself confer [installer qualifications](#) on the buyer. The Installer shall have been trained by a direct representative of the manufacturer (not distributor or agent) in the proper selection and installation procedures. The installer shall obtain from the manufacturer written certification of training, and retain proof of certification for duration of firestop installation.

1.4.2 [Manufacturer's Technical Representative](#)

The manufacturer's technical representative shall be a direct representative of the manufacturer (not a distributor or an agent). Provide current documentation from the manufacturer that he or she is a direct representative of the manufacturer and is qualified to perform the specified inspections and certify the firestopping installation.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver materials in the original unopened packages or containers showing name of the manufacturer and the brand name. Store materials off the ground, protected from damage and exposure to elements. Remove damaged or deteriorated materials from the site.

PART 2 PRODUCTS

2.1 FIRESTOPPING MATERIALS

Provide firestopping materials, supplied from a single domestic manufacturer, consisting of commercially manufactured, asbestos-free, nontoxic, water-based, noncombustible products **FM APP GUIDE** approved, or UL listed, for use with applicable construction and penetrating items, complying with the following minimum requirements:

2.1.1 Fire Hazard Classification

Material shall have a flame spread of 25 or less, and a smoke developed rating of 50 or less, when tested in accordance with **ASTM E84** or **UL 723**. Material shall be an approved firestopping material as listed in **UL Fire Resistance** or by a nationally recognized testing laboratory.

2.1.2 Toxicity

Material shall be nontoxic and carcinogen free to humans at all stages of application or during fire conditions and shall not contain hazardous chemicals or require harmful chemicals to clean material or equipment. Firestop material must be free from Ethylene Glycol, PCB, MEK, or other types of hazardous chemicals.

2.1.3 Fire Resistance Rating

Firestop systems shall be **UL Fire Resistance** listed or **FM APP GUIDE** approved with "F" rating at least equal to fire-rating of fire wall or floor in which penetrated openings are to be protected. Where required, firestop systems shall also have "T" rating at least equal to the fire-rated floor in which the openings are to be protected.

2.1.3.1 Through-Penetrations

Firestopping materials for through-penetrations, as described in paragraph SYSTEM DESCRIPTION, shall provide "F", "T" and "L" fire resistance ratings in accordance with **ASTM E814** or **UL 1479**. Fire resistance ratings shall be as follows:

- a. Penetrations of Fire Resistance Rated Walls and Partitions: F Rating = Rating of wall or partition being penetrated.

2.1.3.2 Construction Joints and Gaps

Fire resistance ratings of construction joints, as described in paragraph SYSTEM DESCRIPTION, and gaps such as those between floor slabs or roof decks and curtain walls shall be the same as the construction in which they occur. Construction joints and gaps shall be provided with firestopping materials and systems that have been tested in accordance with **ASTM E119**, **ASTM E1966** or **UL 2079** to meet the required fire resistance rating. Curtain

wall joints shall be provided with firestopping materials and systems that have been tested in accordance with [ASTM E2307](#) to meet the required fire resistance rating. Systems installed at construction joints shall meet the cycling requirements of [ASTM E1399](#) or [UL 2079](#). All joints at the intersection of the top of a fire resistance rated wall and the underside of a fire-rated floor, floor ceiling, or roof ceiling assembly shall provide a minimum class II movement capability.

2.1.4 Material Performance

All firestop materials are subject to these minimum standards of performance.

- a. Firestop material shall be capable of installation at temperatures of [35 to 120 degrees F](#).
- b. Material must be able to be frozen, thawed and still maintain manufacturer approval for installation.
- c. Firestop material must convey a manufacturer's written warranty guaranteeing the performance of the material for the sustainable lifetime of the structure.
- d. Material must maintain a shelf life of no less than two years from date of manufacturing.
- e. Acceptable firestop cast-in-place devices are factory assembled intumescent lined round or oval plastic cylinders capable of protecting plastic, metallic, cable, and blank openings through the cast-in-place device equal to the fire-resistance rating of the floor.

PART 3 EXECUTION

3.1 PREPARATION

Areas to receive firestopping shall be free of dirt, grease, oil, or loose materials which may affect the fitting or fire resistance of the firestopping system. For cast-in-place firestop devices, formwork or metal deck to receive device prior to concrete placement shall be sound and capable of supporting device. Prepare surfaces as recommended by the manufacturer.

3.2 INSTALLATION

Completely fill void spaces with firestopping material regardless of geometric configuration, subject to tolerance established by the manufacturer. Firestopping systems for filling floor voids [4 inches](#) or more in any direction shall be capable of supporting the same load as the floor is designed to support or shall be protected by a permanent barrier to prevent loading or traffic in the firestopped area. Install firestopping in accordance with manufacturer's written instructions. Provide tested and listed firestop systems in the following locations, except in floor slabs on grade:

- a. Penetrations of duct, conduit, tubing, cable and pipe through floors and through fire-resistance rated walls, partitions, and ceiling-floor assemblies.
- b. Penetrations of vertical shafts such as pipe chases, elevator shafts,

and utility chutes.

- c. Gaps at the intersection of floor slabs and curtain walls, including inside of hollow curtain walls at the floor slab.
- d. Gaps at perimeter of fire-resistance rated walls and partitions, such as between the top of the walls and the bottom of roof decks.
- e. Construction joints in floors and fire rated walls and partitions.
- f. Other locations where required to maintain fire resistance rating of the construction.

3.2.1 Insulated Pipes and Ducts

Thermal insulation shall be cut and removed where pipes or ducts pass through firestopping, unless insulation meets requirements specified for firestopping. Replace thermal insulation with a material having equal thermal insulating and firestopping characteristics.

3.2.2 Fire Dampers

Install and firestop fire dampers in accordance with Section 23 73 33 HEATING, VENTILATING, AND COOLING SYSTEM. Firestop installed with fire damper must be tested and approved for use in fire damper system. Firestop installed with fire damper must be tested and approved for use in fire damper system.

3.2.3 Data and Communication Cabling

Cabling for data and communication applications shall be sealed with re-enterable firestopping products. Firestopping devices shall be pre-manufactured modular devices, containing built-in self-sealing intumescent inserts. Firestopping devices shall allow for cable moves, additions or changes without the need to remove or replace any firestop materials. Devices must be capable of maintaining the fire resistance rating of the penetrated membrane at 0% to 100% visual fill of penetrants; while maintaining "L" rating of <5 cfm/sf measured at ambient temperature and 400* F at 0% to 100% visual fill. Each device must be capable of retrofit applications and be available in square and round configurations, with single, double, triple and six-plex bracket systems provided. Firestop devices must also allow for plastic pipe, metallic pipe, and mixed multiple penetrations plastic, metallic, insulated metallic, and cable through a single device.

3.3 INSPECTION

3.3.1 General Requirements

For Navy projects, install one of each type of penetration and have it inspected and accepted by the Mid-lant Division, Naval Facilities Engineering Command, Fire Protection Engineer prior to the installation of the remainder of the penetrations. At this inspection, the manufacturer's technical representative of the firestopping material shall be present. For all projects, the remainder of the firestopped areas shall not be covered or enclosed until inspection is complete and approved by the manufacturer's technical representative. The manufacturer's representative shall inspect the applications initially to ensure adequate preparations (clean surfaces suitable for application, etc.) and periodically during the work to assure

that the completed work has been accomplished according to the manufacturer's written instructions and the specified requirements. Submit written reports indicating locations of and types of penetrations and types of firestopping used at each location; type shall be recorded by UL listed printed numbers.

3.3.2 Inspection Standards

Inspect all firestopping in accordance to ASTM standards for firestop inspection, and document inspection results to be submitted to GC, Architect and Owner.

- a. ASTM E2393
- b. ASTM E2174

-- End of Section --

SECTION 07 92 00

JOINT SEALANTS

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C 920

(2011) Standard Specification for Elastomeric Joint Sealants

ASTM D 1056

(2007) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Sealants

Primers

Bond breakers

Backstops

Manufacturer's descriptive data including storage requirements, shelf life, curing time, instructions for mixing and application, and primer data (if required). Provide a copy of the Material Safety Data Sheet for each solvent, primer or sealant material.

SD-07 Certificates

Sealant

Certificates of compliance stating that the materials conform to the specified requirements.

1.3 ENVIRONMENTAL CONDITIONS

Apply sealant when the ambient temperature is between 40 and 90 degrees F.

1.4 DELIVERY AND STORAGE

Deliver materials to the job site in unopened manufacturers' external

shipping containers, with brand names, date of manufacture, color, and material designation clearly marked thereon. Label elastomeric sealant containers to identify type, class, grade, and use. Carefully handle and store materials to prevent inclusion of foreign materials or subjection to sustained temperatures exceeding 90 degrees F or less than 0 degrees F.

1.5 QUALITY ASSURANCE

1.5.1 Compatibility with Substrate

Verify that each of the sealants are compatible for use with joint substrates.

1.5.2 Joint Tolerance

Provide joint tolerances in accordance with manufacturer's printed instructions.

1.5.3 Mock-Up

Project personnel is responsible for installing sealants in mock-up, using materials and techniques approved for use on the project.

1.6 SPECIAL WARRANTY

Guarantee sealant joint against failure of sealant and against water penetration through each sealed joint for five years.

PART 2 PRODUCTS

2.1 SEALANTS

Provide sealant that has been tested and found suitable for the substrates to which it will be applied.

2.1.1 Interior Sealant

Provide ASTM C 920, Type S or M, Grade NS, Class 12.5, Use NT. Location(s) and color(s) of sealant for the following:

LOCATION	COLOR
a. Small voids between walls or partitions and adjacent lockers, casework, shelving, door frames, built-in or surface-mounted equipment and fixtures, and similar items.	As selected
b. Perimeter of frames at doors, windows, and access panels which adjoin exposed interior concrete and masonry surfaces.	As selected
c. Joints of interior masonry walls and partitions which adjoin columns, pilasters, concrete walls, and exterior walls unless otherwise detailed.	As selected
d. Interior locations, not otherwise indicated or specified, where small voids exist between materials specified to be painted.	As selected

LOCATION	COLOR
e. Joints formed between tile floors and tile base cove; joints between tile and dissimilar materials; joints occurring where substrates change.	As selected
f. Behind escutcheon plates at valve pipe penetrations and showerheads in showers.	As selected

2.1.2 Exterior Sealant

For joints in vertical surfaces, provide **ASTM C 920**, Type S or M, Grade NS, Class 25, Use NT. For joints in horizontal surfaces, provide **ASTM C 920**, Type S or M, Grade P, Class 25, Use T. Provide location(s) and color(s) of sealant as follows:

LOCATION	COLOR
a. Joints and recesses formed where frames and subsills of windows, doors, louvers, and vents adjoin masonry, concrete, or metal frames. Use sealant at both exterior and interior surfaces of exterior wall penetrations.	As selected
b. Joints between new and existing exterior masonry walls.	As selected
c. Expansion and control joints.	As selected
d. Voids where items pass through exterior walls.	As selected
e. Metal-to-metal joints where sealant is indicated or specified.	As selected

2.1.3 Floor Joint Sealant

ASTM C 920, Type S or M, Grade P, Class 25, Use T. Provide location(s) and color(s) of sealant as follows:

LOCATION	COLOR
a. Seats of metal thresholds for exterior doors.	Gray
b. Control and expansion joints in floors, slabs, ceramic tile, and walkways.	Gray

2.2 **PRIMERS**

Provide a nonstaining, quick-drying type and consistency recommended by the sealant manufacturer for the particular application.

2.3 **BOND BREAKERS**

Provide the type and consistency recommended by the sealant manufacturer to

prevent adhesion of the sealant to backing or to bottom of the joint.

2.4 BACKSTOPS

Provide glass fiber roving or neoprene, butyl, polyurethane, or polyethylene foams free from oil or other staining elements as recommended by sealant manufacturer. Provide 25 to 33 percent oversized backing for closed cell and 40 to 50 percent oversized backing for open cell material, unless otherwise indicated. Make backstop material compatible with sealant. Do not use oakum and other types of absorptive materials as backstops.

2.4.1 Rubber

Conform to [ASTM D 1056](#), Type 2, closed cell, Class A round cross section for cellular rubber sponge backing.

2.4.2 Neoprene

Conform to [ASTM D 1056](#), closed cell expanded neoprene cord Type 2, Class C, Grade 2C2.

2.5 CLEANING SOLVENTS

Provide type(s) recommended by the sealant manufacturer except for aluminum and bronze surfaces that will be in contact with sealant.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Clean surfaces from dirt frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter that would tend to destroy or impair adhesion. Remove oil and grease with solvent. Surfaces must be wiped dry with clean cloths. When resealing an existing joint, remove existing calk or sealant prior to applying new sealant. For surface types not listed below, contact sealant manufacturer for specific recommendations.

3.1.1 Steel Surfaces

Remove loose mill scale by sandblasting or, if sandblasting is impractical or would damage finish work, scraping and wire brushing. Remove protective coatings by sandblasting or using a residue-free solvent.

3.1.2 Aluminum or Bronze Surfaces

Remove temporary protective coatings from surfaces that will be in contact with sealant. When masking tape is used as a protective coating, remove tape and any residual adhesive just prior to sealant application. For removing protective coatings and final cleaning, use nonstaining solvents recommended by the manufacturer of the item(s) containing aluminum or bronze surfaces.

3.1.3 Concrete and Masonry Surfaces

Where surfaces have been treated with curing compounds, oil, or other such materials, remove materials by sandblasting or wire brushing. Remove laitance, efflorescence and loose mortar from the joint cavity.

3.1.4 Wood Surfaces

Keep wood surfaces to be in contact with sealants free of splinters and sawdust or other loose particles.

3.2 SEALANT PREPARATION

Do not add liquids, solvents, or powders to the sealant. Mix multicomponent elastomeric sealants in accordance with manufacturer's instructions.

3.3 APPLICATION

3.3.1 Joint Width-To-Depth Ratios

a. Acceptable Ratios:

<u>JOINT WIDTH</u>	<u>JOINT DEPTH</u>	
	Minimum	Maximum
For metal, glass, or other nonporous surfaces:		
1/4 inch (minimum)	1/4 inch	1/4 inch
over 1/4 inch	1/2 of width	Equal to width
For wood, concrete or masonry,		
1/4 inch (minimum)	1/4 inch	1/4 inch
Over 1/4 inch to 1/2 inch	1/4 inch	Equal to width
Over 1/2 inch to 2 inch	1/2 inch	5/8 inch
Over 2 inch.	(As recommended by sealant manufacturer)	

b. Unacceptable Ratios: Where joints of acceptable width-to-depth ratios have not been provided, clean out joints to acceptable depths and grind or cut to acceptable widths without damage to the adjoining work. Grinding is not required on metal surfaces.

3.3.2 Masking Tape

Place masking tape on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or sealant smears. Remove masking tape within 10 minutes after joint has been filled and tooled.

3.3.3 Backstops

Install backstops dry and free of tears or holes. Tightly pack the back or bottom of joint cavities with backstop material to provide a joint of the depth specified. Install backstops in the following locations:

- a. Where indicated.
- b. Where backstop is not indicated but joint cavities exceed the acceptable maximum depths specified in paragraph entitled, "Joint

Width-to-Depth Ratios".

3.3.4 Primer

Immediately prior to application of the sealant, clean out loose particles from joints. Where recommended by sealant manufacturer, apply primer to joints in concrete masonry units, wood, and other porous surfaces in accordance with sealant manufacturer's instructions. Do not apply primer to exposed finish surfaces.

3.3.5 Bond Breaker

Provide bond breakers to the back or bottom of joint cavities, as recommended by the sealant manufacturer for each type of joint and sealant used, to prevent sealant from adhering to these surfaces. Carefully apply the bond breaker to avoid contamination of adjoining surfaces or breaking bond with surfaces other than those covered by the bond breaker.

3.3.6 Sealants

Provide a sealant compatible with the material(s) to which it is applied. Do not use a sealant that has exceeded shelf life or has jelled and can not be discharged in a continuous flow from the gun. Apply the sealant in accordance with the manufacturer's printed instructions with a gun having a nozzle that fits the joint width. Force sealant into joints to fill the joints solidly without air pockets. Tool sealant after application to ensure adhesion. Make sealant uniformly smooth and free of wrinkles. Upon completion of sealant application, roughen partially filled or unfilled joints, apply sealant, and tool smooth as specified. Apply sealer over the sealant when and as specified by the sealant manufacturer.

3.4 PROTECTION AND CLEANING

3.4.1 Protection

Protect areas adjacent to joints from sealant smears. Masking tape may be used for this purpose if removed 5 to 10 minutes after the joint is filled.

3.4.2 Final Cleaning

Upon completion of sealant application, remove remaining smears and stains and leave the work in a clean and neat condition.

- a. Masonry and Other Porous Surfaces: Immediately scrape off fresh sealant that has been smeared on masonry and rub clean with a solvent as recommended by the sealant manufacturer. Allow excess sealant to cure for 24 hour then remove by wire brushing or sanding.
- b. Metal and Other Non-Porous Surfaces: Remove excess sealant with a solvent-moistened cloth.

-- End of Section --

SECTION 08 11 13

STEEL DOORS AND FRAMES

02/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2010; Errata 2010) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A 653/A 653M (2009a) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A 879/A 879M (2006) Standard Specification for Steel Sheet, zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface

ASTM A 924/A 924M (2009a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

ASTM C 578 (2010a) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation

ASTM C 591 (2008a) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation

ASTM D 2863 (2009) Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)

ASTM E 1300 (2009a) Determining Load Resistance of Glass in Buildings

ASTM F2247 Standard Test Method for Metal Doors Used in Blast Resistant Applications (Equivalent Static Load Method)

ASTM F 2248 (2009) Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing

Fabricated with Laminated Glass

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.115 (2006) Hardware Preparation in Steel Doors and Steel Frames

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 105 (2010) Standard for Installation of Smoke Door Assemblies and Other Opening Protectives

NFPA 252 (2008) Standard Methods of Fire Tests of Door Assemblies

NFPA 80 (2010; TIA 10-2) Standard for Fire Doors and Other Opening Protectives

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR 111 (2009) Recommended Selection and Usage Guide for Standard Steel Doors, Frames and Accessories

SDI/DOOR 113 (2001; R 2006) Determining the Steady State Thermal Transmittance of Steel Door and Frame Assemblies

SDI/DOOR A250.11 (2001) Recommended Erection Instructions for Steel Frames

SDI/DOOR A250.6 (2003) Hardware on Steel Doors (Reinforcement - Application)

SDI/DOOR A250.8 (2003; R2008) Recommended Specifications for Standard Steel Doors and Frames

UNDERWRITERS LABORATORIES (UL)

UL 10C (2009) UL Standard for Safety Positive Pressure Fire Tests of Door Assemblies

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Doors

Frames

Accessories

Show elevations, construction details, metal gages, hardware provisions, method of glazing, and installation details.

Schedule of [doors](#)

Schedule of [frames](#)

Submit door and frame locations.

[SD-03 Product Data](#)

[Doors](#)

[Frames](#)

[Accessories](#)

Submit manufacturer's descriptive literature for doors, frames, and accessories. Include data and details on door construction, panel (internal) reinforcement, insulation, and door edge construction.

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors, frames, and accessories undamaged and with protective wrappings or packaging. Strap knock-down frames in bundles. Provide temporary steel spreaders securely fastened to the bottom of each welded frame. Store doors and frames on platforms under cover in clean, dry, ventilated, and accessible locations, with [1/4 inch](#) airspace between doors. Remove damp or wet packaging immediately and wipe affected surfaces dry. Replace damaged materials with new.

PART 2 PRODUCTS

2.1 STANDARD STEEL [DOORS](#)

[SDI/DOOR A250.8](#), except as specified otherwise. Doors, and their installation shall meet the requirements of UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings, dated 9 February 2012. Exterior doors shall meet the requirements of [ASTM F2247](#), category III, for a unseated installation and a seated installation. Prepare doors to receive door hardware as specified in Section [08 71 00](#). Undercut where indicated. Exterior doors shall have top edge closed flush and sealed to prevent water intrusion. Doors shall be [1-3/4 inch](#) thick, unless otherwise indicated. Provide exterior glazing in accordance with [ASTM F 2248](#) and [ASTM E 1300](#).

2.1.1 Classification - Level, Performance, Model

2.1.1.1 Extra Heavy Duty Doors

[SDI/DOOR A250.8](#), Level 3, physical performance Level A, Model 2 [Seamless](#) with core construction as required by the manufacturer, of size(s) and design(s) indicated. Where vertical stiffener cores are required, the space between the stiffeners shall be filled with mineral board insulation. Exterior doors are to be insulated.

2.2 ACCESSORIES

2.2.1 Louvers

2.2.1.1 Interior Louvers

SDI/DOOR 111, Louvers shall be stationary sightproof type. Detachable moldings on room or non security side of door; on security side of door, moldings to be integral part of louver. Form louver frames of 20 gage steel and louver blades of a minimum 24 gage. Sightproof louvers to be inverted "V" blade design with minimum 55 percent net-free opening.

2.2.1.2 Exterior Louvers

Louvers shall be inverted "V" type with minimum of 55 percent net-free opening. Weld or tenon louver blades to continuous channel frame and weld assembly to door to form watertight assembly. Form louvers of hot-dip galvanized steel of same gage as door facings. Louvers shall have steel-framed insect screens secured to room side and readily removable. Provide aluminum wire cloth, 18 by 18 or 18 by 16 inch mesh, for insect screens. Net-free louver area to be before screening.

2.2.2 Astragals

For pairs of exterior steel doors which will not have aluminum astragals or removable mullions, as specified in Section 08 71 00 DOOR HARDWARE provide overlapping steel astragals with the doors. For interior pairs of fire rated and smoke control doors, provide stainless steel astragals complying with NFPA 80 for fire rated assemblies and NFPA 105 for smoke control assemblies.

2.2.3 Moldings

Provide moldings around glass of interior and exterior doors and louvers of interior doors. Provide nonremovable moldings on outside of exterior doors and on corridor side of interior doors. Other moldings may be stationary or removable. Secure inside moldings to stationary moldings, or provide snap-on moldings. Muntins shall interlock at intersections and shall be fitted and welded to stationary moldings.

2.3 INSULATION CORES

Insulated cores shall be of type specified, and provide an apparent U-factor of .48 in accordance with SDI/DOOR 113 and shall conform to:

- a. Rigid Cellular Polyisocyanurate Foam: ASTM C 591, Type I or II, foamed-in-place or in board form, with oxygen index of not less than 22 percent when tested in accordance with ASTM D 2863; or
- b. Rigid Polystyrene Foam Board: ASTM C 578, Type I or II

2.4 STANDARD STEEL FRAMES

SDI/DOOR A250.8, Level 3, except as otherwise specified. Form frames to sizes and shapes indicated, with welded corners and knock-down field-assembled corners. Provide steel frames for doors, sidelights, and interior glazed panels, unless otherwise indicated.

2.4.1 Welded Frames

Continuously weld frame faces at corner joints. Mechanically interlock or continuously weld stops and rabbets. Grind welds smooth.

Weld frames in accordance with the recommended practice of the Structural Welding Code Sections 1 through 6, AWS D1.1/D1.1M and in accordance with the practice specified by the producer of the metal being welded.

2.4.2 Knock-Down Frames

Design corners for simple field assembly by concealed tenons, splice plates, or interlocking joints that produce square, rigid corners and a tight fit and maintain the alignment of adjoining members. Provide locknuts for bolted connections.

2.4.3 Mullions and Transom Bars

Mullions and transom bars shall be closed or tubular construction and be a member with heads and jambs butt-welded thereto or knock-down for field assembly. Bottom of door mullions shall have adjustable floor anchors and spreader connections.

2.4.4 Stops and Beads

Form stops and beads from 20 gage steel. Provide for glazed and other openings in standard steel frames. Secure beads to frames with oval-head, countersunk Phillips self-tapping sheet metal screws or concealed clips and fasteners. Space fasteners approximately 12 to 16 inch on center. Miter molded shapes at corners. Butt or miter square or rectangular beads at corners.

2.4.5 Cased Openings

Fabricate frames for cased openings of same material, gage, and assembly as specified for metal door frames, except omit door stops and preparation for hardware.

2.4.6 Anchors

Provide anchors to secure the frame to adjoining construction. Provide steel anchors, zinc-coated or painted with rust-inhibitive paint, not lighter than 18 gage.

2.4.6.1 Wall Anchors

Provide at least three anchors for each jamb. For frames which are more than 7.5 feet in height, provide one additional anchor for each jamb for each additional 2.5 feet or fraction thereof.

- a. Masonry: Provide anchors of corrugated or perforated steel straps or 3/16 inch diameter steel wire, adjustable or T-shaped;
- b. Stud partitions: Weld or otherwise securely fasten anchors to backs of frames. Design anchors to be fastened to closed steel studs with sheet metal screws, and to open steel studs by wiring or welding;
- c. Completed openings: Secure frames to previously placed concrete

or masonry with expansion bolts in accordance with [SDI/DOOR 111](#).

2.4.6.2 Floor Anchors

Provide floor anchors drilled for [3/8 inch](#) anchor bolts at bottom of each jamb member. Where floor fill occurs, terminate bottom of frames at the indicated finished floor levels and support by adjustable extension clips resting on and anchored to the structural slabs.

2.5 FIRE AND SMOKE DOORS AND FRAMES

[NFPA 80](#) and [NFPA 105](#) and this specification. The requirements of [NFPA 80](#) and [NFPA 105](#) shall take precedence over details indicated or specified.

2.5.1 Labels

Fire doors and frames shall bear the label of Underwriters Laboratories (UL), Factory Mutual Engineering and Research (FM), or Warnock Hersey International (WHI) attesting to the rating required. Testing shall be in accordance with [NFPA 252](#) or [UL 10C](#). Labels shall be metal with raised letters, and shall bear the name or file number of the door and frame manufacturer. Labels shall be permanently affixed at the factory to frames and to the hinge edge of the door. Door labels shall not be painted.

2.5.2 Oversized Doors

For fire doors and frames which exceed the size for which testing and labeling are available, furnish certificates stating that the doors and frames are identical in design, materials, and construction to a door which has been tested and meets the requirements for the class indicated.

2.5.3 Astragal on Fire and Smoke Doors

On pairs of labeled fire doors, conform to [NFPA 80](#) and UL requirements. On smoke control doors, conform to [NFPA 105](#).

2.6 WEATHERSTRIPPING

As specified in Section [08 71 00 DOOR HARDWARE](#).

2.7 HARDWARE PREPARATION

Provide minimum hardware reinforcing gages as specified in [SDI/DOOR A250.6](#). Drill and tap doors and frames to receive finish hardware. Prepare doors and frames for hardware in accordance with the applicable requirements of [SDI/DOOR A250.8](#) and [SDI/DOOR A250.6](#). For additional requirements refer to [ANSI/BHMA A156.115](#). Drill and tap for surface-applied hardware at the project site. Build additional reinforcing for surface-applied hardware into the door at the factory. Locate hardware in accordance with the requirements of [SDI/DOOR A250.8](#), as applicable. Punch door frames, with the exception of frames that will have weatherstripping to receive a minimum of two rubber or vinyl door silencers on lock side of single doors and one silencer for each leaf at heads of double doors. Set lock strikes out to provide clearance for silencers.

2.8 FINISHES

2.8.1 Factory-Primed Finish

All surfaces of doors and frames shall be thoroughly cleaned, chemically treated and factory primed with a rust inhibiting coating as specified in [SDI/DOOR A250.8](#). Where coating is removed by welding, apply touchup of factory primer.

2.8.2 Hot-Dip Zinc-Coated and Factory-Primed Finish

Fabricate exterior doors and frames and indicated interior doors and frames from hot dipped zinc coated steel, alloyed type, that complies with [ASTM A 924/A 924M](#) and [ASTM A 653/A 653M](#). The coating weight shall meet or exceed the minimum requirements for coatings having 0.4 ounces per square foot, total both sides, i.e., [A40](#). Repair damaged zinc-coated surfaces by the application of zinc dust paint. Thoroughly clean and chemically treat to insure maximum paint adhesion. Factory prime as specified in [SDI/DOOR A250.8](#).

2.8.3 Electrolytic Zinc-Coated Anchors and Accessories

Provide electrolytically deposited zinc-coated steel in accordance with [ASTM A 879/A 879M](#), Commercial Quality, Coating Class A. Phosphate treat and factory prime zinc-coated surfaces as specified in [SDI/DOOR A250.8](#).

2.9 FABRICATION AND WORKMANSHIP

Finished doors and frames shall be strong and rigid, neat in appearance, and free from defects, waves, scratches, cuts, dents, ridges, holes, warp, and buckle. Molded members shall be clean cut, straight, and true, with joints coped or mitered, well formed, and in true alignment. Dress exposed welded and soldered joints smooth. Design door frame sections for use with the wall construction indicated. Corner joints shall be well formed and in true alignment. Conceal fastenings where practicable. Design frames in exposed masonry walls or partitions to allow sufficient space between the inside back of trim and masonry to receive calking compound.

2.9.1 Grouted Frames

For frames to be installed in exterior walls and to be filled with mortar or grout, fill the stops with strips of rigid insulation to keep the grout out of the stops and to facilitate installation of stop-applied head and jamb seals.

2.10 PROVISIONS FOR GLAZING

Materials are specified in Section [08 81 00](#), GLAZING.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Frames

Set frames in accordance with [SDI/DOOR A250.11](#). Plumb, align, and brace securely until permanent anchors are set. Anchor bottoms of frames with expansion bolts or powder-actuated fasteners. Build in or secure wall anchors to adjoining construction. Backfill frames with mortar. Coat

inside of frames with corrosion-inhibiting bituminous material. For frames in exterior walls, ensure that stops are filled with rigid insulation before grout is placed.

3.1.2 Doors

Hang doors in accordance with clearances specified in [SDI/DOOR A250.8](#). After erection and glazing, clean and adjust hardware.

3.1.3 Fire and Smoke Doors and Frames

Install fire doors and frames, including hardware, in accordance with [NFPA 80](#). Install fire rated smoke doors and frames in accordance with [NFPA 80](#) and [NFPA 105](#).

3.2 PROTECTION

Protect doors and frames from damage. Repair damaged doors and frames prior to completion and acceptance of the project or replace with new, as directed. Wire brush rusted frames until rust is removed. Clean thoroughly. Apply an all-over coat of rust-inhibitive paint of the same type used for shop coat.

3.3 CLEANING

Upon completion, clean exposed surfaces of doors and frames thoroughly. Remove mastic smears and other unsightly marks.

-- End of Section --

SECTION 08 14 00

WOOD DOORS

08/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ARCHITECTURAL WOODWORK INSTITUTE (AWI)

AWI Qual Stds (8th Edition) AWI Quality Standards

ASTM INTERNATIONAL (ASTM)

ASTM E2226 (2010; E 2011) Standard Practice for Application of Hose Stream

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 105 (2010) Standard for Installation of Smoke Door Assemblies and Other Opening Protectives

NFPA 252 (2008) Standard Methods of Fire Tests of Door Assemblies

NFPA 80 (2010; TIA 10-2) Standard for Fire Doors and Other Opening Protectives

UNDERWRITERS LABORATORIES (UL)

UL 10B (2008; Reprint Apr 2009) Fire Tests of Door Assemblies

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

WDMA I.S. 1-A (2007) Architectural Wood Flush Doors

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

SD-02 Shop Drawings

Doors

Submit drawings or catalog data showing each type of door unit. Drawings and data shall indicate door type and construction, sizes, thickness, methods of assembly, door louvers, and glazing.

SD-03 Product Data

Doors

Accessories

Water-resistant sealer

Sample warranty

Fire resistance rating

SD-04 Samples

Door finish colors

Submit a minimum of three color selection samples, minimum 3 by 5 inches in size representing wood stain for selection by the Contracting Officer.

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors to the site in an undamaged condition and protect against damage and dampness. Stack doors flat under cover. Support on blocking, a minimum of 4 inch thick, located at each end and at the midpoint of the door. Store doors in a well-ventilated building so that they will not be exposed to excessive moisture, heat, dryness, direct sunlight, or extreme changes of temperature and humidity. Do not store in a building under construction until concrete, masonry work, and plaster are dry. Replace defective or damaged doors with new ones.

1.4 WARRANTY

Warrant doors free of defects as set forth in the door manufacturer's standard door warranty.

PART 2 PRODUCTS

2.1 DOORS

Provide doors of the types, sizes, and designs indicated and specified free of urea-formaldehyde resins.

2.1.1 Flush Doors

Conform to WDMA I.S. 1-A for flush doors. Hardwood stile edge bands of doors shall have a matching face veneer. No visible finger joints will be accepted in stile edge bands.

2.1.1.1 Interior Flush Doors

Provide particleboard core, Type II flush doors conforming to WDMA I.S. 1-A with faces of goodgradewhite oak. Hardwood veneers shall be quarter sliced book matched.

2.1.2 Composite-Type Fire Doors

Provide doors specified or indicated to have a fire resistance rating conforming to the requirements of UL 10B, ASTM E2226, or NFPA 252 for the

class of door indicated. Affix a permanent metal label with raised or incised markings indicating testing agency's name and approved hourly fire rating to hinge edge of each door.

2.2 ACCESSORIES

2.2.1 Door Louvers

Fabricate from wood and of sizes indicated. Provide louvers with a minimum of 35 percent free air. Equip louvers with sightproof inverted vee slat type. Mount louvers in the door with flush wood moldings.

2.2.2 Door Light Openings

Provide glazed openings with the manufacturer's standard wood moldings. Provide moldings for doors to receive natural finish of the same wood species and color as the wood face veneers.

2.2.3 Additional Hardware Reinforcement

Provide the minimum lock blocks to secure the specified hardware. The measurement of top, bottom, and intermediate rail blocks are a minimum 125 mm 5 inch by full core width. Comply with the manufacturer's labeling requirements for reinforcement blocking, but not mineral material similar to the core.

2.3 FABRICATION

2.3.1 Quality and Construction

Identify the standard on which the construction of the door was based and identify doors having a Type I glue bond.

2.3.2 Adhesives and Bonds

WDMA I.S. 1-A. Use Type I bond for interior doors. Provide a nonstaining adhesive on doors with a natural finish.

2.3.3 Finishes

2.3.3.1 Factory Finish

Provide doors finished at the factory by the door manufacturer as follows: **AWI Qual Stds** Section 1500, specification for System No. 4 Conversion varnish alkyd urea or System No. 5 Vinyl catalyzed. The coating is **AWI Qual Stds** premium, medium rubbed sheen, open grain effect. Use stain when required to produce the finish specified for color. Seal edges, cutouts, trim, and wood accessories, and apply two coats of finish compatible with the door face finish. Touch-up finishes that are scratched or marred, or where exposed fastener holes are filled, in accordance with the door manufacturer's instructions. Match color and sheen of factory finish using materials compatible for field application.

2.3.3.2 Color

Provide **door finish colors** as selected by the Contracting Officer from the color selection samples.

2.3.4 Water-Resistant Sealer

Provide manufacturer's standard water-resistant sealer compatible with the specified finish.

PART 3 EXECUTION

3.1 INSTALLATION

Before installation, seal top and bottom edges of doors with the approved water-resistant sealer. Seal cuts made on the job immediately after cutting using approved water-resistant sealer. Fit, trim, and hang doors with a $1/16$ inch minimum, $1/8$ inch maximum clearance at sides and top, and a $3/16$ inch minimum, $1/4$ inch maximum clearance over thresholds. Provide $3/8$ inch minimum, $7/16$ inch maximum clearance at bottom where no threshold occurs. Bevel edges of doors at the rate of $1/8$ inch in 2 inch. Door warp shall not exceed $1/4$ inch when measured in accordance with [WDMA I.S. 1-A](#).

3.1.1 Fire and Smoke Doors

Install fire doors in accordance with [NFPA 80](#). Install smoke doors in accordance with [NFPA 105](#). Do not paint over labels.

-- End of Section --

SECTION 08 71 00

DOOR HARDWARE

08/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E 283 (2004) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

- ANSI/BHMA A156.1 (2006) Butts and Hinges
- ANSI/BHMA A156.13 (2005) Mortise Locks & Latches Series 1000
- ANSI/BHMA A156.15 (2006) Release Devices Closer Holder, Electromagnetic and Electromechanical
- ANSI/BHMA A156.16 (2008) Auxiliary Hardware
- ANSI/BHMA A156.18 (2006) Materials and Finishes
- ANSI/BHMA A156.2 (2003) Bored and Preassembled Locks and Latches
- ANSI/BHMA A156.21 (2009) Thresholds
- ANSI/BHMA A156.22 (2005) Door Gasketing and Edge Seal Systems
- ANSI/BHMA A156.3 (2008) Exit Devices
- ANSI/BHMA A156.4 (2008) Door Controls - Closers
- ANSI/BHMA A156.6 (2010) Architectural Door Trim
- ANSI/BHMA A156.7 (2009) Template Hinge Dimensions
- ANSI/BHMA A156.8 (2005) Door Controls - Overhead Stops and Holders

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 101 (2012) Life Safety Code
- NFPA 80 (2010; TIA 10-2) Standard for Fire Doors

and Other Opening Protectives

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR A250.8

(2003; R2008) Recommended Specifications for Standard Steel Doors and Frames

UNDERWRITERS LABORATORIES (UL)

UL Bld Mat Dir

(2011) Building Materials Directory

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

SD-02 Shop Drawings

Hardware schedule

Keying system

SD-03 Product Data

Hardware items

SD-08 Manufacturer's Instructions

Installation

SD-10 Operation and Maintenance Data

Hardware Schedule items, Data Package 1

Submit data package in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

SD-11 Closeout Submittals

Key Bitting

1.3 HARDWARE SCHEDULE

Prepare and submit hardware schedule in the following form:

Hard- ware Item	Quan- tity	Size	Reference Publi- cation Type No.	Finish	Mfr. Name and Catalog No.	Key Con- trol Symbols	UL Mark (If fire rated and listed)	BHMA Finish Designa- tion
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1.4 KEY BITTING CHART REQUIREMENTS

Submit key bitting charts to the Contracting Officer prior to completion of the work. Include:

- a. Complete listing of all keys (AA1, AA2, etc.).

- b. Complete listing of all key cuts (AA1-123456, AA2-123458).
- c. Tabulation showing which key fits which door.
- d. Copy of floor plan showing doors and door numbers.
- e. Listing of 20 percent more key cuts than are presently required in each master system.

1.5 QUALITY ASSURANCE

1.5.1 Hardware Manufacturers and Modifications

Provide, as far as feasible, locks, hinges, and closers of one lock, hinge, or closer manufacturer's make. Modify hardware as necessary to provide features indicated or specified.

1.5.1 Key Shop Drawings Coordination Meeting

Prior to the submission of the key shop drawing, the Contracting Officer, Contractor, Door Hardware subcontractor, using Activity and Base Locksmith shall meet to discuss key requirements for the facility.

1.6 DELIVERY, STORAGE, AND HANDLING

Deliver hardware in original individual containers, complete with necessary appurtenances including fasteners and instructions. Mark each individual container with item number as shown in hardware schedule. Deliver permanent keys and removable cores to the Contracting Officer, either directly or by certified mail. Deliver construction master keys with the locks.

PART 2 PRODUCTS

2.1 TEMPLATE HARDWARE

Provide hardware to be applied to metal or to prefinished doors manufactured to template. Promptly furnish template information or templates to door and frame manufacturers. Conform to [ANSI/BHMA A156.7](#) for template hinges. Coordinate hardware items to prevent interference with other hardware.

2.2 HARDWARE FOR FIRE DOORS AND EXIT DOORS

Provide all hardware necessary to meet the requirements of [NFPA 80](#) for fire doors and [NFPA 101](#) for exit doors, as well as to other requirements indicated, even if such hardware is not specifically mentioned under paragraph entitled "Hardware Schedule." Provide the label of Underwriters Laboratories, Inc. for such hardware listed in [UL Bld Mat Dir](#) or labeled and listed by another testing laboratory acceptable to the Contracting Officer.

2.3 HARDWARE ITEMS

Clearly and permanently mark with the manufacturer's name or trademark, hinges, pivots, locks, latches, exit devices, bolts and closers where the identifying mark will be visible after the item is installed. For closers with covers, the name or trademark may be beneath the cover.

2.3.1 Hinges

[ANSI/BHMA A156.1](#), 4-1/2 by 4-1/2 inch unless otherwise indicated. Construct loose pin hinges for exterior doors and reverse-bevel interior doors so that pins will be nonremovable when door is closed. Other antifriction bearing hinges may be provided in lieu of ball-bearing hinges.

2.3.2 Locks and Latches

2.3.2.1 Mortise Locks and Latches

[ANSI/BHMA A156.13](#), Series 1000, Operational Grade 1, Security Grade 2. Provide mortise locks with escutcheons not less than 7 by 2-1/4 inch with a bushing at least 1/4 inch long. Cut escutcheons to suit cylinders and provide trim items with straight, beveled, or smoothly rounded sides, corners, and edges. Install levers and roses of mortise locks with screwless shanks and no exposed screws.

2.3.3 Cylinders and Cores

Provide cylinders and cores for new locks, including locks provided under other sections of this specification. Provide cylinders and cores with seven pin tumblers. Provide cylinders from products of one manufacturer, and provide cores from the products of one manufacturer. Provide interchangeable cores from Best Lock Corporation, Arrow Lock Corporation, Falcon Lock or Eagle. Rim cylinders, mortise cylinders, and levers of bored locksets have interchangeable cores which are removable by special control keys. Stamp each interchangeable core with a key control symbol in a concealed place on the core.

2.3.4 Keying System

Provide an extension of the existing keying system. Provide construction interchangeable cores.

2.3.5 Lock Trim

Cast, forged, or heavy wrought construction and commercial plain design.

2.3.5.1 Levers and Roses

Conform to the minimum test requirements of [ANSI/BHMA A156.2](#) and [ANSI/BHMA A156.13](#) for levers, roses, and escutcheons. For unreinforced levers, roses, and escutcheons, provide 0.050 inch thickness. For reinforced levers, roses, and escutcheons, provide outer shell of 0.035 inch thickness, and combined thickness of 0.070 inch, except for lever shanks, which are 0.060 inch thick.

2.3.5.2 Lever Handles

Provide lever handles in lieu of knobs. Conform to the minimum requirements of [ANSI/BHMA A156.13](#) for mortise locks of lever handles for exit devices. Provide lever handle locks with a breakaway feature (such as a weakened spindle or a shear key) to prevent irreparable damage to the lock when force in excess of that specified in [ANSI/BHMA A156.13](#) is applied to the lever handle. Lever trim is to be similar to Best Lever 16K, Escutchen J.

2.3.6 Keys

Furnish one file key, one duplicate key, and one working key for each key change and for each master keying system. Furnish one additional working key for each lock of each keyed-alike group. Stamp each key with appropriate key control symbol and "U.S. property - Do not duplicate." Do not place room number on keys.

2.3.7 Door Bolts

ANSI/BHMA A156.16. Provide dustproof strikes for bottom bolts, except for doors having metal thresholds. Automatic latching flush bolts:
ANSI/BHMA A156.3, Type 25.

2.3.8 Closers

ANSI/BHMA A156.4, Series C02000, Grade 1, with PT 4G. Provide with brackets, arms, mounting devices, fasteners, full size covers, except at storefront mounting, and other features necessary for the particular application. Size closers in accordance with manufacturer's recommendations, or provide multi-size closers, Sizes 1 through 6, and list sizes in the Hardware Schedule. Provide manufacturer's 10 year warranty.

2.3.8.1 Identification Marking

Engrave each closer with manufacturer's name or trademark, date of manufacture, and manufacturer's size designation located to be visible after installation.

2.3.9 Overhead Holders

ANSI/BHMA A156.8.

2.3.10 Architectural Door Trim

ANSI/BHMA A156.6. Door pulls shall be 1 inch diameter, 12 inches center to center with 1-3/4 inch clearance, stainless steel finish.

2.3.11 Closer Holder-Release Devices

ANSI/BHMA A156.15.

2.3.12 Door Protection Plates

ANSI/BHMA A156.6.

2.3.12.1 Sizes of Armor, Mop and Kick Plates

Plates shall be 2 inches less than door width for single doors; one inch less than door width for pairs of doors. Provide 10 inch kick plates for flush doors. Provide a minimum 36 inch armor plates for flush doors, except 16 inch high armor plates on fire doors. Provide 6 inch mop plates.

2.3.13 Door Stops and Silencers

ANSI/BHMA A156.16. Silencers Type L03011. Provide three silencers for each single door, two for each pair.

2.3.14 Thresholds

ANSI/BHMA A156.21. Use J32130. Threshold shall meet the requirements for handicapped accessibility.

2.3.15 Weather Stripping Gasketing

ANSI/BHMA A156.22. Provide the type and function designation where specified in paragraph entitled "Hardware Schedule". Provide a set to include head and jamb seals, sweep strips, and, for pairs of doors, astragals. Air leakage of weather stripped doors not to exceed 1.25 cubic feet per minute of air per square foot of door area when tested in accordance with **ASTM E 283**. Provide weather stripping with one of the following:

2.3.15.1 Extruded Aluminum Retainers

Extruded aluminum retainers not less than 0.050 inch wall thickness with vinyl, neoprene, silicone rubber, or polyurethane inserts. Provide clear (natural) anodized aluminum.

2.3.16 Rain Drips

Extruded aluminum, not less than 0.08 inch thick, clear anodized. Set drips in sealant and fasten with stainless steel screws.

2.3.16.1 Door Rain Drips

Approximately 1-1/2 inch high by 5/8 inch projection. Align bottom with bottom edge of door.

2.3.17 Special Tools

Provide special tools, such as spanner and socket wrenches and dogging keys, required to service and adjust hardware items.

2.4 FASTENERS

Provide fasteners of proper type, quality, size, quantity, and finish with hardware. Provide stainless steel or nonferrous metal fasteners that are exposed to weather. Provide fasteners of type necessary to accomplish a permanent installation.

2.5 FINISHES

ANSI/BHMA A156.18. Provide hardware in BHMA 630 finish (satin stainless steel), unless specified otherwise. Provide items not manufactured in stainless steel in BHMA 626 finish (satin chromium plated) over brass or bronze, except aluminum paint finish for surface door closers, and except BHMA 652 finish (satin chromium plated) for steel hinges. Provide hinges for exterior doors in stainless steel with BHMA 630 finish or chromium plated brass or bronze with BHMA 626 finish. Furnish exit devices in BHMA 626 finish in lieu of BHMA 630 finish except where BHMA 630 is specified under paragraph entitled "Hardware Sets". Match exposed parts of concealed closers to lock and door trim. Match hardware finish for aluminum doors to the doors.

PART 3 EXECUTION

3.1 INSTALLATION

Install hardware in accordance with manufacturers' printed installation instructions. Fasten hardware to wood surfaces with full-threaded wood screws or sheet metal screws. Provide machine screws set in expansion shields for fastening hardware to solid concrete and masonry surfaces. Provide toggle bolts where required for fastening to hollow core construction. Provide through bolts where necessary for satisfactory installation.

3.1.1 Weather Stripping Installation

Handle and install weather stripping to prevent damage. Provide full contact, weather-tight seals. Operate doors without binding.

3.1.1.1 Stop-Applied Weather Stripping

Fasten in place with color-matched sheet metal screws not more than 9 inch on center after doors and frames have been finish painted.

3.1.2 Threshold Installation

Extend thresholds the full width of the opening and notch end for jamb stops. Set thresholds in a full bed of sealant and anchor to floor with cadmium-plated, countersunk, steel screws in expansion sleeves.

3.2 FIRE DOORS AND EXIT DOORS

Install hardware in accordance with NFPA 80 for fire doors, NFPA 101 for exit doors.

3.3 HARDWARE LOCATIONS

SDI/DOOR A250.8, unless indicated or specified otherwise.

- a. Kick and Armor Plates: Push side of single-acting doors. Both sides of double-acting doors.
- b. Mop Plates: Bottom flush with bottom of door.

3.4 KEY CABINET AND CONTROL SYSTEM

Locate where directed. Tag one set of file keys and one set of duplicate keys. Place other keys in appropriately marked envelopes, or tag each key. Furnish complete instructions for setup and use of key control system. On tags and envelopes, indicate door and room numbers or master or grand master key.

3.5 FIELD QUALITY CONTROL

After installation, protect hardware from paint, stains, blemishes, and other damage until acceptance of work. Submit notice of testing 15 days before scheduled, so that testing can be witnessed by the Contracting Officer. Adjust hinges, locks, latches, bolts, holders, closers, and other items to operate properly. Demonstrate that permanent keys operate respective locks, and give keys to the Contracting Officer. Correct, repair, and finish, as directed, errors in cutting and fitting and damage

to adjoining work.

3.6 HARDWARE SETS

Quantity	Item	Description
<u>HW-1 Doors 119A</u>		
3 Pair	Hinges	A5111
1	Lockset	F04
2	Double Dummy Trim	
2	Closers	C42021
2	Flush Bolts	L04081
2	Kickplates	J102
1 Set	Weatherstripping	As Specified
1	Threshold	As Specified
<u>HW-2 Door 123B</u>		
1 1/2 Pairs	Hinges-NRP	A5111
1	Lockset	FF-L-2890 LockMaster LKM 7000X09
1	Closer/Stop	C42021
1	Wallstop	L02251
3	Silencers	L03011
1	Kickplate	J102
<u>HW-3 Door 123A</u>		
1 1/2 Pairs	Hinges-NRP	A5111
1	Lockset	F20
1	Closer/Stop	C42021
3	Silencers	L03011
1	Kickplate	J102

-- End of Section --

SECTION 08 81 00

GLAZING

08/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1 (2009; Errata 2010) Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

ASTM INTERNATIONAL (ASTM)

ASTM C1036 (2011) Standard Specification for Flat Glass

ASTM C1048 (2004) Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass

ASTM C1172 (2009e1) Standard Specification for Laminated Architectural Flat Glass

ASTM C1184 (2005) Standard Specification for Structural Silicone Sealants

ASTM C509 (2006; R 2011) Elastomeric Cellular Preformed Gasket and Sealing Material

ASTM C920 (2011) Standard Specification for Elastomeric Joint Sealants

ASTM D 2287 (1996; R 2010) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds

ASTM D 395 (2003; R 2008) Standard Test Methods for Rubber Property - Compression Set

ASTM E 119 (2011) Standard Test Methods for Fire Tests of Building Construction and Materials

ASTM E 1300 (2009a) Determining Load Resistance of Glass in Buildings

GLASS ASSOCIATION OF NORTH AMERICA (GANA)

GANAs Glazing Manual	(2004) Glazing Manual
GANAs Sealant Manual	(2008) Sealant Manual
GANAs Standards Manual	(2001) Tempering Division's Engineering Standards Manual

INSULATING GLASS MANUFACTURERS ALLIANCE (IGMA)

IGMA TB-3001	(1990) Guidelines for Sloped Glazing
IGMA TM-3000	(1997) Glazing Guidelines for Sealed Insulating Glass Units
IGMA TR-1200	(1983) Commercial Insulating Glass Dimensional Tolerances

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

16 CFR 1201	Safety Standard for Architectural Glazing Materials
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1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation

Drawings showing complete details of the proposed setting methods, edge blocking, size of openings, frame details, materials, and types and thickness of glass.

SD-03 Product Data

Insulating Glass

Glazing Accessories

Manufacturer's descriptive product data, handling and storage recommendations, installation instructions, and cleaning instructions.

SD-07 Certificates

Insulating Glass

Certificates stating that the glass meets the specified requirements. Labels or manufacturers marking affixed to the glass will be accepted in lieu of certificates.

SD-08 Manufacturer's Instructions

Setting and sealing materials

Glass setting

Submit glass manufacturer's recommendations for setting and sealing materials and for installation of each type of glazing material specified.

1.3 SYSTEM DESCRIPTION

Glazing systems shall be fabricated and installed watertight and airtight to withstand thermal movement and wind loading without glass breakage, gasket failure, deterioration of [glazing accessories](#), and defects in the work. Glazed panels shall comply with the safety standards, as indicated in accordance with [ANSI Z97.1](#). Glazed panels shall comply with indicated wind/snow loading in accordance with [ASTM E 1300](#).

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver products to the site in unopened containers, labeled plainly with manufacturers' names and brands. Store glass and setting materials in safe, enclosed dry locations and do not unpack until needed for installation. Handle and install materials in a manner that will protect them from damage.

1.5 ENVIRONMENTAL REQUIREMENTS

Do not start glazing work until the outdoor temperature is above [40 degrees F](#) and rising, unless procedures recommended by the glass manufacturer and approved by the Contracting Officer are made to warm the glass and rabbet surfaces. Provide ventilation to prevent condensation of moisture on glazing work during installation. Do not perform glazing work during damp or rainy weather.

1.6 WARRANTY

1.6.1 Warranty for [Insulating Glass](#) Units

Warranty insulating glass units against development of material obstruction to vision (such as dust, fogging, or film formation on the inner glass surfaces) caused by failure of the hermetic seal, other than through glass breakage, for a 10-year period following acceptance of the work. Provide new units for any units failing to comply with terms of this warranty within 45 working days after receipt of notice from the Government.

PART 2 PRODUCTS

2.1 GLASS

[ASTM C1036](#), unless specified otherwise. In doors and sidelights, provide safety glazing material conforming to [16 CFR 1201](#).

2.1.1 Annealed Glass

Annealed glass shall be Type I transparent flat type, Class 1 - clear, Quality q3 - glazing select, [47](#) percent light transmittance, 0.27 percent shading coefficient, conforming to [ASTM C1036](#). Color shall be clear.

2.1.2 Laminated Glass

[ASTM C1172](#), Kind LA fabricated from two nominal [1/8 inch](#) pieces of Type I,

Class 1, Quality q3, flat annealed transparent glass conforming to [ASTM C1036](#). Flat glass shall be laminated together with a minimum of 0.060 inch thick, clear polyvinyl butyral interlayer. The total thickness shall be nominally 1/4 inch. Provide as a interior lite at all glazing locations.

2.1.3 Tempered Glass

[ASTM C1048](#), Kind FT (fully tempered), Condition A (uncoated), Type I, Class 1 (transparent), Quality q3, 1/4 inch thick, 47 percent light transmittance, 0.27 percent shading coefficient conforming to [ASTM C1048](#) and [GANA Standards Manual](#). Color shall be clear. Provide wherever safety glazing material is indicated or specified.

2.1.4 Fire/Safety Rated Glass

Fire/safety rated glass shall be laminated Type I transparent flat type, Class 1-clear. Glass shall have a 20, 45, or 60 minute rating when tested in accordance with [ASTM E 119](#). Glass shall be permanently labeled with appropriate markings. Glass shall meet [ANSI Z97.1](#) and CPSC 16 CFR 1201 (Cat: I and II) for Impact Safety Resistance.

2.2 INSULATING GLASS UNITS

Two panes of glass separated by a dehydrated airspace and hermetically sealed. Dimensional tolerances shall be as specified in [IGMA TR-1200](#). Spacer shall be roll-formed, with bent or tightly welded or keyed and sealed joints to completely seal the spacer periphery and eliminate moisture and hydrocarbon vapor transmission into airspace through the corners. Primary seal shall be compressed polyisobutylene and the secondary seal shall be a specially formulated silicone.

2.2.1 Buildings

Two panes of glass separated by a dehydrated airspace and hermetically sealed.

Insulated glass units shall have a Solar Heat Gain Coefficient (SHGC) maximum of 0.24 and a U-factor maximum of 0.28 Btu per square foot by hr by degree F.

Dimensional tolerances shall be as specified in [IGMA TR-1200](#). Spacer shall be black, roll-formed, steel-reinforced butyl rubber, with bent or tightly welded or keyed and sealed joints to completely seal the spacer periphery and eliminate moisture and hydrocarbon vapor transmission into airspace through the corners. Primary seal shall be compressed polyisobutylene and the secondary seal shall be a specially formulated silicone.

The inner light shall be [ASTM C1172](#), laminated glass, clear annealed flat glass Type I, Class I, Quality q3, 1/4 inch thick. The outer light shall be [ASTM C1036](#), Type I, Class 1 (transparent), Quality q4, 1/4 inch thick and where indicated, [ASTM C1048](#), Grade B (fully tempered), Style I (uncoated), Type I, Class 1 (clear), Quality q4, 1/4 inch thick

2.3 SETTING AND SEALING MATERIALS

Provide as specified in the [GANA Glazing Manual](#), [IGMA TM-3000](#), [IGMA TB-3001](#), and manufacturer's recommendations, unless specified otherwise herein. Do not use metal sash putty, nonskinning compounds, nonresilient preformed sealers, or impregnated preformed gaskets. Materials exposed to view and

unpainted shall be gray or neutral color.

2.3.1 Sealants

Provide elastomeric and structural sealants.

2.3.1.1 Elastomeric Sealant

ASTM C920, Type S, Grade NS, Class 12.5, Use G. Use for channel or stop glazing metal sash. Sealant shall be chemically compatible with setting blocks, edge blocks, and sealing tapes, with sealants used in manufacture of insulating glass units. Color of sealant shall be white.

2.3.1.2 Structural Sealant

ASTM C1184, Type S.

2.3.2 Joint Backer

Joint backer shall have a diameter size at least 25 percent larger than joint width; type and material as recommended in writing by glass and sealant manufacturer.

2.3.3 Preformed Channels

Neoprene, vinyl, or rubber, as recommended by the glass manufacturer for the particular condition.

2.3.4 Sealing Tapes

Preformed, semisolid, PVC-based material of proper size and compressibility for the particular condition, complying with **ASTM D 2287**. Use only where glazing rabbet is designed for tape and tape is recommended by the glass or sealant manufacturer. Provide spacer shims for use with compressible tapes. Tapes shall be chemically compatible with the product being set.

2.3.5 Setting Blocks and Edge Blocks

Closed-cell neoprene setting blocks shall be dense extruded type conforming to **ASTM C509** and **ASTM D 395**, Method B, Shore A durometer between 70 and 90. Edge blocking shall be Shore A durometer of 50 (plus or minus 5). Silicone setting blocks shall be required when blocks are in contact with silicone sealant. Profiles, lengths and locations shall be as required and recommended in writing by glass manufacturer. Block color shall be black.

2.3.6 Accessories

Provide as required for a complete installation, including glazing points, clips, shims, angles, beads, and spacer strips. Provide noncorroding metal accessories. Provide primer-sealers and cleaners as recommended by the glass and sealant manufacturers.

PART 3 EXECUTION

3.1 PREPARATION

Preparation, unless otherwise specified or approved, shall conform to applicable recommendations in the **GANA Glazing Manual**, **GANA Sealant Manual**, **IGMA TB-3001**, **IGMA TM-3000**, and manufacturer's recommendations. Determine

the sizes to provide the required edge clearances by measuring the actual opening to receive the glass. Grind smooth in the shop glass edges that will be exposed in finish work. Leave labels in place until the installation is approved, except remove applied labels on heat-absorbing glass and on insulating glass units as soon as glass is installed. Securely fix movable items or keep in a closed and locked position until glazing compound has thoroughly set.

3.2 GLASS SETTING

Shop glaze or field glaze items to be glazed using glass of the quality and thickness specified or indicated. Glazing, unless otherwise specified or approved, shall conform to applicable recommendations in the [GANA Glazing Manual](#), [GANA Sealant Manual](#), [IGMA TB-3001](#), [IGMA TM-3000](#), and manufacturer's recommendations. Handle and install glazing materials in accordance with manufacturer's instructions. Use beads or stops which are furnished with items to be glazed to secure the glass in place. Verify products are properly installed, connected, and adjusted.

3.2.1 Insulating Glass Units

Do not grind, nip, or cut edges or corners of units after the units have left the factory. Springing, forcing, or twisting of units during setting will not be permitted. Handle units so as not to strike frames or other objects. [Installation](#) shall conform to applicable recommendations of [IGMA TB-3001](#) and [IGMA TM-3000](#).

3.3 CLEANING

Clean glass surfaces and remove labels, paint spots, putty, and other defacement as required to prevent staining. Glass shall be clean at the time the work is accepted.

3.4 PROTECTION

Glass work shall be protected immediately after installation. Glazed openings shall be identified with suitable warning tapes, cloth or paper flags, attached with non-staining adhesives. Reflective glass shall be protected with a protective material to eliminate any contamination of the reflective coating. Protective material shall be placed far enough away from the coated glass to allow air to circulate to reduce heat buildup and moisture accumulation on the glass. [Upon removal, separate protective materials for reuse or recycling](#). Glass units which are broken, chipped, cracked, abraded, or otherwise damaged during construction activities shall be removed and replaced with new units.

-- End of Section --

SECTION 09 29 00

GYPSUM BOARD

05/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A108.11 (1992; Reaffirmed 2005) Specifications for Interior Installation of Cementitious Backer Units

ASTM INTERNATIONAL (ASTM)

ASTM C 1002 (2007) Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs

ASTM C 1047 (2010a) Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base

ASTM C 1396/C 1396M (2009a) Standard Specification for Gypsum Board

ASTM C 475/C 475M (2002; R 2007) Joint Compound and Joint Tape for Finishing Gypsum Board

ASTM C 840 (2008) Application and Finishing of Gypsum Board

ASTM C 954 (2010) Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness

ASTM D 226/D 226M (2009) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing

GYPSUM ASSOCIATION (GA)

GA 214 (2007) Recommended Levels of Gypsum Board Finish

GA 216 (2010) Application and Finishing of Gypsum

Panel Products

UNDERWRITERS LABORATORIES (UL)

UL Fire Resistance

(2012) Fire Resistance Directory

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Cementitious backer units

Moisture and Mold Resistant Gypsum Board

Accessories

Submit for each type of gypsum board and for cementitious backer units.

Gypsum Board;

Joint Treatment Materials

Submit manufacturer's product data, indicating VOC content.

SD-07 Certificates

Asbestos Free Materials

Certify that gypsum board types, gypsum backing board types, cementitious backer units, and joint treating materials do not contain asbestos.

SD-08 Manufacturer's Instructions

Material Safety Data Sheets

SD-10 Operation and Maintenance Data

Manufacturer maintenance instructions

Waste Management

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery

Deliver materials in the original packages, containers, or bundles with each bearing the brand name, applicable standard designation, and name of manufacturer, or supplier.

1.3.2 Storage

Keep materials dry by storing inside a sheltered building. Where necessary

to store gypsum board and cementitious backer units outside, store off the ground, properly supported on a level platform, and protected from direct exposure to rain, snow, sunlight, and other extreme weather conditions. Provide adequate ventilation to prevent condensation. Store per manufacturer's recommendations for allowable temperature and humidity range. Gypsum wallboard shall not be stored with materials which have high emissions of volatile organic compounds (VOCs) or other contaminants. Do not store panels near materials that may offgas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives.

1.3.3 Handling

Neatly stack gypsum board and cementitious backer units flat to prevent sagging or damage to the edges, ends, and surfaces.

1.4 ENVIRONMENTAL CONDITIONS

1.4.1 Temperature

Maintain a uniform temperature of not less than 50 degrees F in the structure for at least 48 hours prior to, during, and following the application of gypsum board, cementitious backer units, and joint treatment materials, or the bonding of adhesives.

1.4.2 Exposure to Weather

Protect gypsum board and cementitious backer unit products from direct exposure to rain, snow, sunlight, and other extreme weather conditions.

1.4.3 Temporary Ventilation

Provide temporary ventilation for work of this section.

1.5 QUALIFICATIONS

Furnish type of gypsum board work specialized by the installer with a minimum of 3 years of documented successful experience.

1.6 SCHEDULING

The gypsum wallboard shall be taped, spackled and primed before the installation of the highly-emitting materials.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to specifications, standards and requirements specified. Provide gypsum board types, gypsum backing board types, cementitious backing units, and joint treating materials manufactured from asbestos free materials only.

Submit Material Safety Data Sheets and manufacturer maintenance instructions for gypsum materials including adhesives.

2.1.1 Gypsum Board

ASTM C 1396/C 1396M.

2.1.2 Moisture and Mold Resistant Gypsum Board

48 inch wide, 5/8 inch thick, Type X, tapered edges, moisture and mold resistant Type X gypsum core encased in a heavy, abrasion and mold/mildew/moisture resistant paper. Provide fasteners that meet manufacturer requirements and specifications stated within this section.

2.1.3 Cementitious Backer Units

In accordance with the Tile Council of America (TCA) Handbook.

2.1.4 Joint Treatment Materials

ASTM C 475/C 475M. Use all purpose joint and texturing compound containing inert fillers and natural binders, including lime compound. Pre-mixed compounds shall be free of antifreeze, vinyl adhesives, preservatives, biocides and other slow releasing compounds.

2.1.4.1 Embedding Compound

Specifically formulated and manufactured for use in embedding tape at gypsum board joints and compatible with tape, substrate and fasteners.

2.1.4.2 Finishing or Topping Compound

Specifically formulated and manufactured for use as a finishing compound.

2.1.4.3 All-Purpose Compound

Specifically formulated and manufactured to serve as both a taping and a finishing compound and compatible with tape, substrate and fasteners.

2.1.4.4 Setting or Hardening Type Compound

Specifically formulated and manufactured for use with fiber glass mesh tape.

2.1.4.5 Joint Tape

Use cross-laminated, tapered edge, reinforced paper, or fiber glass mesh tape recommended by the manufacturer.

2.1.5 Fasteners

2.1.5.1 Screws

ASTM C 1002, Type "G", Type "S" or Type "W" steel drill screws for fastening gypsum board to gypsum board, wood framing members and steel framing members less than 0.033 inch thick. ASTM C 954 steel drill screws for fastening gypsum board to steel framing members 0.033 to 0.112 inch thick. Provide cementitious backer unit screws with a polymer coating.

2.1.6 Accessories

ASTM C 1047. Fabricate from corrosion protected steel or plastic designed for intended use. Accessories manufactured with paper flanges are not acceptable. Flanges shall be free of dirt, grease, and other materials that may adversely affect bond of joint treatment. Provide prefinished or job decorated materials.

2.1.7 Asphalt Impregnated Building Felt

Provide a 15 lb asphalt moisture barrier over gypsum sheathing. Conforming to ASTM D 226/D 226M Type 1 (No. 15) for asphalt impregnated building felt.

2.1.8 Water

Provide clean, fresh, and potable water.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Framing and Furring

Verify that framing and furring are securely attached and of sizes and spacing to provide a suitable substrate to receive gypsum board and cementitious backer units. Verify that all blocking, headers and supports are in place to support plumbing fixtures and to receive soap dishes, grab bars, towel racks, and similar items. Do not proceed with work until framing and furring are acceptable for application of gypsum board and cementitious backer units.

3.2 APPLICATION OF GYPSUM BOARD

Apply gypsum board to framing and furring members in accordance with ASTM C 840 or GA 216 and the requirements specified. Apply gypsum board with separate panels in moderate contact; do not force in place. Stagger end joints of adjoining panels. Neatly fit abutting end and edge joints. Use gypsum board of maximum practical length; select panel sizes to minimize waste. Cut out gypsum board to make neat, close, and tight joints around openings. In vertical application of gypsum board, provide panels in lengths required to reach full height of vertical surfaces in one continuous piece. Lay out panels to minimize waste; reuse cutoffs whenever feasible. Surfaces of gypsum board and substrate members may not be bonded together with an adhesive, except where prohibited by fire rating(s). Treat edges of cutouts for plumbing pipes, screwheads, and joints with water-resistant compound as recommended by the gypsum board manufacturer.

3.2.1 Application of Gypsum Board to Steel Framing and Furring

Apply in accordance with ASTM C 840, System VIII or GA 216.

3.2.2 Control Joints

Install expansion and contraction joints in ceilings and walls in accordance with ASTM C 840, System XIII or GA 216. Fill control joints between studs in fire-rated construction with firesafing insulation to match the fire-rating of construction.

3.3 APPLICATION OF CEMENTITIOUS BACKER UNITS

3.3.1 Application

In wet areas (tubs, shower enclosures, saunas, steam rooms, gang shower rooms), apply cementitious backer units in accordance with ANSI A108.11. Place a 15 lb asphalt impregnated, continuous felt paper membrane behind cementitious backer units, between backer units and studs or base layer of gypsum board. Place membrane with a minimum 6 inch overlap of sheets laid

shingle style.

3.3.2 Joint Treatment

ANSI A108.11.

3.4 FINISHING OF GYPSUM BOARD

Tape and finish gypsum board in accordance with ASTM C 840, GA 214 and GA 216. Finish plenum areas above ceilings to Level 1 in accordance with GA 214. Finish water resistant gypsum backing board, ASTM C 1396/C 1396M, to receive ceramic tile to Level 2 in accordance with GA 214. Unless otherwise specified, finish all gypsum board walls, partitions and ceilings to Level 5 in accordance with GA 214. Provide joint, fastener depression, and corner treatment. Tool joints as smoothly as possible to minimize sanding and dust. Do not use fiber glass mesh tape with conventional drying type joint compounds; use setting or hardening type compounds only. Provide treatment for water-resistant gypsum board as recommended by the gypsum board manufacturer. Protect workers, building occupants, and HVAC systems from gypsum dust.

3.4.1 Uniform Surface

In accordance with GA 214 Level 5, apply a thin skim coat of joint compound to the entire gypsum board surface, after the two-coat joint and fastener treatment is complete and dry.

3.5 SEALING

Seal openings around pipes, fixtures, and other items projecting through gypsum board and cementitious backer units as specified in Section 07 92 00 JOINT SEALANTS. Apply material with exposed surface flush with gypsum board or cementitious backer units.

3.6 FIRE-RESISTANT ASSEMBLIES

Wherever fire-rated construction is indicated, provide materials and application methods, including types and spacing of fasteners, wall and ceiling framing in accordance with the specifications contained in UL Fire Resistance for the Design Number(s) indicated. Joints of fire-rated gypsum board enclosures shall be closed and sealed in accordance with UL test requirements or GA requirements. Seal penetrations through rated partitions and ceilings tight in accordance with tested systems.

3.7 PATCHING

Patch surface defects in gypsum board to a smooth, uniform appearance, ready to receive finishes.

3.8 WASTE MANAGEMENT

As specified in Waste Management Plan and as follows. Separate clean waste gypsum products from contaminants. Do not include wood, plastic, metal, asphalt-impregnated gypsum board, or any gypsum board coated with glass fiber, vinyl, decorative paper, or other finish. Place in designated area and protect from moisture and contamination.

-- End of Section --

SECTION 09 30 00

CERAMIC TILE, QUARRY TILE, AND PAVER TILE

08/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A118.10 (2003) Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installations

ASTM INTERNATIONAL (ASTM)

ASTM A 185/A 185M (2007) Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete

ASTM C 1026 (1987; R 2002) Standard Test Method for Measuring the Resistance of Ceramic Tile to Freeze-Thaw Cycling

ASTM C 1027 (2009) Standard Test Method for Determining Visible Abrasion Resistance of Glazed Ceramic Tile

ASTM C 1028 (2007e1) Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method

ASTM C 144 (2004) Standard Specification for Aggregate for Masonry Mortar

ASTM C 150/C 150M (2009) Standard Specification for Portland Cement

ASTM C 206 (2003) Standard Specification for Finishing Hydrated Lime

ASTM C 207 (2006) Standard Specification for Hydrated Lime for Masonry Purposes

ASTM C 241/C 241M (2009) Standard Specification for Abrasion Resistance of Stone Subjected to Foot Traffic

ASTM C 33/C 33M (2008) Standard Specification for Concrete

Aggregates

- ASTM C 373 (1988; R 2006) Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products
- ASTM C 482 (2002; R 2009) Bond Strength of Ceramic Tile to Portland Cement
- ASTM C 501 (1984; R 2009) Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser
- ASTM C 648 (2004; R 2009) Breaking Strength of Ceramic Tile
- ASTM C 847 (2009) Standard Specification for Metal Lath
- ASTM D 226/D 226M (2009) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
- ASTM D 4068 (2009) Chlorinated Polyethylene Sheeting for Concealed Water-Containment Membrane
- ASTM D 968 (2005e1) Abrasion Resistance of Organic Coatings by Falling Abrasive
- ASTM F 1679 (2004e1) Standard Test Method for Using a Variable Incidence Tribometer

MARBLE INSTITUTE OF AMERICA (MIA)

- MIA Design Manual (2003) Dimension Stone Design Manual

TILE COUNCIL OF NORTH AMERICA (TCNA)

- TCA Hdbk (2010) Handbook for Ceramic Tile Installation

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

- 36 CFR 1191 Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities

1.2 SYSTEM DESCRIPTION

1.2.1 General Requirements

Close space, in which tile is being set, to traffic and other work. Keep closed until tile is firmly set. Do not walk or work on newly tiled floors without using kneeling boards or equivalent protection of the tiled surface. Keep traffic off horizontal portland cement mortar installations for at least 72 hours. Keep all traffic off epoxy installed floors for at least 40 hours after grouting, and heavy traffic off for at least 7 days, unless otherwise specifically authorized by manufacturer. For materials

like Tile, Accessories, and marble Thresholds submit Samples of sufficient size to show color range, pattern, type and joints.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Tile
Setting-Bed
Mortar, Grout, and Adhesive
Reinforcing Wire Fabric

SD-04 Samples

Tile
Marble Thresholds
Grout

SD-06 Test Reports

TEST OF MEMBRANE WATERPROOFING

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the project site in manufacturer's original unopened containers with seals unbroken and labels and hallmarks intact. Protect materials from weather, and store them under cover in accordance with manufacturer's printed instructions.

1.5 ENVIRONMENTAL REQUIREMENTS

Do not perform ceramic tile work unless the substrate and ambient temperature is at least 50 degrees F and rising. Maintain temperature above 50 degrees F while the work is being performed and for at least 7 days after completion of the work. When temporary heaters are used, ventilate the area to the outside to avoid carbon dioxide damage to new tilework.

1.6 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a 1-year period.

1.7 EXTRA MATERIALS

Supply an extra two percent of each type tile used in clean and marked cartons.

PART 2 PRODUCTS

2.1 TILE

Conform to TCA Hdbk for standard grade tile. Provide grade sealed containers. Mark seals with the marks on the signed master grade certificate. Provide an impact resistant tile with a minimum floor breaking strength for wall tile of 90 pound and for floor tile of 250 pound in accordance with ASTM C 648. The manufacturer will provide a frost

resistant rating for tile used in cold climate projects as determined by [ASTM C 1026](#). Provide a 0.50 maximum percent water absorption in accordance with [ASTM C 373](#). Provide a minimum coefficient of friction of 0.60 wet and dry in accordance with [ASTM C 1028](#). Identify floor tile as Class IV Plus-Extra Heavy Traffic, durability classification as rated by the manufacturer when tested in accordance with [ASTM C 1027](#) for abrasion resistance as related to foot traffic.

2.1.1 Mosaic Tile

Furnish ceramic mosaic tile and trim shall be unglazed natural clay with cushion edges. Provide tile size 3 by 3 inch.

2.1.2 Porcelain Tile

Furnish an unglazed porcelain tile and trim with the color extending uniformly through the body of the tile. Provide a nominal size of 6 by 6 by 5/16 inch thick. Criteria for tile to meet or exceed is as follows: Abrasive wear in accordance with [ASTM C 501](#) and bonding strength in accordance with [ASTM C 482](#). Comply with [36 CFR 1191](#) for coefficient of friction for interior tiled floors.

2.2 SETTING-BED

Compose the setting-bed of the following materials:

2.2.1 Aggregate for Concrete Fill

Conform to [ASTM C 33/C 33M](#) for aggregate fill. Do not exceed one-half the thickness of concrete fill for maximum size of coarse aggregate.

2.2.2 Portland Cement

Conform to [ASTM C 150/C 150M](#) for cement, Type I, white for wall mortar and gray for other uses.

2.2.3 Sand

Conform to [ASTM C 144](#) for sand.

2.2.4 Hydrated Lime

Conform to [ASTM C 206](#) for hydrated lime, Type S or [ASTM C 207](#), Type S.

2.2.5 Metal Lath

Conform to [ASTM C 847](#) for flat expanded type metal lath, and weighing a minimum 2.5 pound/square yard.

2.2.6 Reinforcing Wire Fabric

Conform to [ASTM A 185/A 185M](#) for wire fabric. Provide 2 by 2 inch mesh, 16/16 wire or 1-1/2 by 2 inch mesh, 16/13 wire.

2.3 WATER

Provide potable water.

2.4 MORTAR, GROUT, AND ADHESIVE

2.4.1 Dry-Set Portland Cement Mortar

TCA Hdbk. Zero-volatile organic compound (VOC) content.

2.4.2 Latex-Portland Cement Mortar

TCA Hdbk. Zero-VOC content.

2.4.3 Ceramic Tile Grout

TCA Hdbk; petroleum-free and plastic-free sand portland cement grout dry-set grout, latex-portland cement grout or commercial portland cement grout. Maximum VOC content of 150 grams/liter.

2.4.4 Sealants

Comply with applicable regulations regarding toxic and hazardous materials and as specified.

2.4.5 Cementitious Backer Board

Provide cementitious backer units, for use as tile substrate, in accordance with TCA Hdbk. Furnish 1/2 inch thick cementitious backer units.

2.5 MARBLE THRESHOLDS

Provide marble thresholds of size required by drawings or conditions. Categorize marble Group A as classified by MIA Design Manual. Provide a fine sand-rubbed finish marble with gray in color as approved by the Contracting Officer. Provide minimum 12.0 marble abrasion when tested in accordance with ASTM C 241/C 241M.

2.6 PERMANENT PROTECTIVE BARRIER COATING

Provide a permanent protective barrier on the floor tile made from silica (glass) with the following characteristics:

- a. Applied in liquid form at room temperature
- b. Forms a permanent film.
- c. Inorganic and not hurt by UV, Weather, most acids and other cleaning chemicals.
- d. Used on concrete and painted concrete for additional wear, water proofing and anti-graffiti properties
- e. A process designed to re-color grout and includes permanent protection.

Coating shall meet or exceed the following mechanical characteristics:

Test Results

Coefficient of Friction Tile and Grout

Test Method	Sample Type	Result	Test Facility
ASTM C 1028	Ceramic Tile- 4" Glazed (uncoated-dry)	0.84	Tile Council of America
ASTM C 1028	Ceramic Tile- 4" Glazed (coated-dry)	0.99	Tile Council of America
ASTM C 1028	Ceramic Tile- 4" Glazed (uncoated-wet)	0.42	Tile Council of America
ASTM C 1028	Ceramic Tile- 4" Glazed (coated-wet)	1.31	Tile Council of America

Result 15% higher coefficient of Friction dry and 68% higher wet

Visible Abrasion Resistance Tile and Grout

Test Method	Sample Type	Result	Test Facility
ASTM C 1027	Ceramic Tile- 4" Glazed	2100	Tile Council of America
ASTM C 1027	Ceramic Tile- 4" Glazed	6000	Tile Council of America

Result 65% increase in Visible Abrasion resistance

Moh's Scratch Hardness Tile and Grout

Test Method	Sample Type	Result	Test Facility
ASTM C 1027	Ceramic Tile- 4" Glazed (uncoated)	6	Tile Council of America
ASTM C 1027	Ceramic Tile- 4" Glazed (coated)	6	Tile Council of America

Result 0% diminished surface hardness

Coefficient of Friction Concrete

Test Method	Sample Type	Result	Test Facility
ASTM F 1679	Concrete Brushed Finish (uncoated-dry)	0.91	High Safety Consulting Services, Ltd.
ASTM F 1679	Concrete Brushed Finish	0.99	High Safety Consulting Services, Ltd.
ASTM F 1679	Concrete Brushed Finish	0.95	High Safety Consulting Services, Ltd.
ASTM F 1679	Concrete Brushed	0.96	High Safety Consulting

Result 0% diminished coefficient of Friction dry and wet

Visible Abrasion Resistance Concrete

Test Method	Sample Type	Result	Test Facility
ASTM D 968	Coated Panel	22.5 1/mil	Applied Technical Services
ASTM C 1027	Acrylic Paint	1 1/mil	Industry Standard
ASTM C 1027	Industrial Flooring Epoxy	12 1/mil	Industry Standard
ASTM C 1027	Aliphatic Urethane	18 1/mil	Industry Standard

Result 22.5 times more resistant to sand abrasion than conventional paint

2.6.1 Warranty

A. Manufacturer's Warranty: Manufacturer shall provide standard product warranty executed by authorized company official. Term of warranty shall be 3 years from Date of Substantial Completion.

B. Applicator's Warranty: Applicator shall warrant the coating installation against defects caused by faulty workmanship or materials for a period of 3 years from Date of Substantial Completion. The warranty will cover the surfaces treated and will bind the applicator to repair, at his expense, any and all failures of the treated surfaces which are not due to structural weaknesses or other causes beyond applicator's control such as fire, earthquake, tornado and hurricane. The warranty shall read as follows:

1. Warranty: The applicator warrants that, upon completion of the work, surfaces treated with a permanent protective barrier coating will be and will remain free from failure resulting from defective workmanship or materials for a period of 3 years from Date of Substantial Completion. In the event that failure occurs within the warranty period from such causes, the applicator shall, at his sole expense, repair, replace or otherwise correct such defective workmanship or materials. Applicator shall not be liable for consequential damages and applicator's liability shall be limited to repair, replacement or correcting of defective workmanship or materials. Applicator shall have no responsibility with respect to failure or other defects caused by structural failure or movement of the structure, or any other causes beyond Applicator's control.

2.7 MEMBRANE MATERIALS

Conform to ASTM D 226/D 226M, Type 1 for 15 pound waterproofing membrane, asphalt-saturated building felt. Conform to ASTM D 4068 4 mil for polyethylene film.

PART 3 EXECUTION

3.1 PREPARATORY WORK AND WORKMANSHIP

Inspect surface to receive tile in conformance to the requirements of TCA Hdbk for surface conditions for the type setting bed specified and for workmanship. Provide variations of tiled surfaces that fall within maximum values shown below:

TYPE	WALLS	FLOORS
Dry-Set Mortar	1/8 inch in 8 ft.	1/8 inch in 10 ft.
Organic Adhesives	1/8 inch in 8 ft.	1/16 inch in 3 ft.
Latex Portland Cement Mortar	1/8 inch in 8 ft.	1/8 inch in 10 ft.
Epoxy	1/8 inch in 8 ft.	1/8 inch in 10 ft.

3.2 GENERAL INSTALLATION REQUIREMENTS

Do not start tile work until roughing in for mechanical and electrical work has been completed and tested, and built-in items requiring membrane waterproofing have been installed and tested. Do not start floor tile installation in spaces requiring wall tile until after wall tile has been installed. Apply tile in colors and patterns indicated in the area shown on the drawings. Install tile with the respective surfaces in true even planes to the elevations and grades shown. Provide special shapes as required for sills, jambs, recesses, offsets, external corners, and other conditions to provide a complete and neatly finished installation. Solidly back tile bases and coves with mortar.

3.3 INSTALLATION OF WALL TILE

Install wall tile in accordance with the TCA Hdbk, method W244C at Stud Walls, W222 at Masonry Walls. At shower walls, use TCA Hdbk, method B415. Provide a waterproof membrane ANSI A118.10 in showers.

3.3.1 Workable or Cured Mortar Bed

Install tile over workable mortar bed or a cured mortar bed at the option of the Contractor. Install a 4 mil polyethylene membrane, metal lath, and scratch coat. Conform to TCA Hdbk for workable mortar bed, materials, and installation of tile. Conform to TCA Hdbk for cured mortar bed and materials.

3.3.2 Latex-Portland Cement Mortar

Use Latex-Portland Cement to install tile in accordance with TCA Hdbk. Use Latex Portland Cement when installing porcelain ceramic tile.

3.4 INSTALLATION OF FLOOR TILE

Install floor tile in toilets in accordance with TCA Hdbk method F122 on the first floor and F122A on the second and third floor. Install floor tile in the showers in accordance with TCA Hdbk method F121. Install shower receptors in accordance with TCA Hdbk method B415.

3.4.1 Workable or Cured Mortar Bed

Install floor tile over a workable mortar bed or a cured mortar bed at the option of the Contractor. Conform to TCA Hdbk for workable mortar bed materials and installation. Conform to TCA Hdbk for cured mortar bed materials and installation. Provide minimum 1/4 inch to maximum 3/8 inch joints in uniformed width.

3.4.2 Latex-Portland Cement

Use Latex-Portland cement mortar to install tile directly over properly cured, plane, clean concrete slabs in accordance with TCA Hdbk. Use Latex

Portland cement when installing porcelain ceramic tile.

3.4.3 Ceramic Tile Grout

Prepare and install ceramic tile grout in accordance with TCA Hdbk.

3.4.4 Waterproofing

Provide waterproof membrane as required by the Handbook for Ceramic Tile Installation and ANSI A118.10

3.4.5 Concrete Fill

Provide a 3500 psi concrete fill mix to dry as consistency as practicable. Compose concrete fill by volume of 1 part Portland cement to 3 parts fine aggregate to 4 parts coarse aggregate, and mix with water to as dry a consistency as practicable. Spread, tamp, and screed concrete fill to a true plane, and pitch to drains or levels as shown. Thoroughly damp concrete fill before applying setting-bed material. Reinforce concrete fill with one layer of reinforcement, with the uncut edges lapped the width of one mesh and the cut ends and edges lapped a minimum 2 inch. Tie laps together with 18 gauge wire every 10 inch along the finished edges and every 6 inch along the cut ends and edges. Provide reinforcement with support and secure in the centers of concrete fills. Provide a continuous mesh; except where expansion joints occur, cut mesh and discontinue across such joints. Provide reinforced concrete fill under the setting-bed where the distance between the under-floor surface and the finished tiles floor surface is a minimum 2 inch, and of the same thickness that the mortar setting-bed over the concrete fill with the thickness required in the specified TCA Hdbk method.

3.5 INSTALLATION OF MARBLE THRESHOLDS

Install thresholds where indicated, in a manner similar to that of the ceramic tile floor. Provide thresholds full width of the opening. Install head joints at ends not exceeding 1/4 inch in width and grouted full.

3.6 TEST OF MEMBRANE WATERPROOFING

Prior to concealment, plug the drain and cover membrane waterproofing on horizontal surfaces over finished spaces with 4 inches of ponded water for 24 hours to test watertightness. Make careful measurement of the water level at the beginning and end of the 24-hour period. If water level falls, drain the water, and thoroughly dry and inspect the waterproofing membrane. Make repairs or replacement, as directed, and repeat test. The test results shall be presented to the Contracting Officer before work is performed which conceals membrane waterproofing for each shower on the second and third floors of the building

3.7 EXPANSION JOINTS

Form and seal joints as specified in Section 07 92 00 JOINT SEALANTS.

3.7.1 Walls

Provide expansion joints at control joints in backing material. Wherever backing material changes, install an expansion joint to separate the different materials.

3.7.2 Floors

Provide expansion joints over construction joints, control joints, and expansion joints in concrete slabs. Provide expansion joints where tile abuts restraining surfaces such as perimeter walls, curbs and columns and at intervals of 24 to 36 feet each way in large interior floor areas and 12 to 16 feet each way in large exterior areas or areas exposed to direct sunlight or moisture. Extend expansion joints through setting-beds and fill.

3.8 PERMANENT PROTECTIVE BARRIER COATING

A. Apply coatings by brush, roller, spray or other applicators according to coating manufacturer's written instructions. Use brushes or rollers only for exterior coating and where the use of other applicators is not practical.

B. Maintain uniformity of floor coating, and install continuously until reaching a point where the wet edge is at the edge of the application area

C. Transparent (Clear) Finish: Use single coat to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, or other surface imperfections.

3.8.1 Curing

Drying and Cure Time at 80° F	
Dry to Touch	4-6 hours
Hard Dry (foot use)	8-10 hours
Full Cure	24 hours

3.8.2 Protection

- A. Do not allow foot traffic for 12 hours.
- B. Do not clean for 24 hours.

3.8.3 Cleaning

Tile and Grout- Neutral, rinse-less cleaning solution, agitate with soft bristle brush, extract, rinse extract, dry with floor fans.

3.9 CLEANING AND PROTECTING

Upon completion, thoroughly clean tile surfaces in accordance with manufacturer's approved cleaning instructions. Do not use acid for cleaning glazed tile. Clean floor tile with resinous grout or with factory mixed grout in accordance with printed instructions of the grout manufacturer. After the grout has set, provide a protective coat of a noncorrosive soap or other approved method of protection for tile wall surfaces. Cover tiled floor areas with building paper before foot traffic is permitted over the finished tile floors. Provide board walkways on tiled floors that are to be continuously used as passageways by workmen. Replace damaged or defective tiles.

3.10 WASTE MANAGEMENT

Separate waste, including metal and cardboard, in accordance with the Waste

Management Plan and recycle. Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in designated containers and areas. Close and seal tightly partly used sealant and adhesive containers and store in protected, well-ventilated, fire-safe area at moderate temperature. Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in designated containers and areas and dispose of properly.

-- End of Section --

SECTION 09 51 00

ACOUSTICAL CEILINGS

08/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A 641/A 641M	(2009a) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM C 423	(2009a) Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
ASTM C 635/C 635M	(2007) Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings
ASTM C 636/C 636M	(2008) Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
ASTM E 1264	(2008) Acoustical Ceiling Products
ASTM E 1414	(2006) Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
ASTM E 1477	(1998a; R 2008) Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers
ASTM E 580/E 580M	(2009a) Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Moderate Seismic Restraint
ASTM E 795	(2005) Mounting Test Specimens During Sound Absorption Tests

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-310-04	(2007; Change 1) Seismic Design for Buildings
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UNDERWRITERS LABORATORIES (UL)

UL Fire Resistance	(2012) Fire Resistance Directory
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1.2 SYSTEM DESCRIPTION

Provide sound controlling units mechanically mounted on a ceiling suspension system for acoustical treatment. The unit size, texture, finish, and color must be as specified. The location and extent of acoustical treatment shall be as shown on the drawings. Submit drawings showing suspension system, method of anchoring and fastening, details, and reflected ceiling plan. Coordinate with paragraph RECLAMATION PROCEDURES for reclamation of mineral fiber acoustical ceiling panels to be removed from the job site.

1.2.1 Ceiling Attenuation Class and Test

Provide a ceiling system with an attenuation class (CAC) of 35 for when determined in accordance with [ASTM E 1414](#). Provide fixture attenuators over light fixtures and other ceiling penetrations, and provide acoustical blanket insulation adjacent to partitions, as required to achieve the specified CAC. Provide test ceiling continuous at the partition and assembled in the suspension system in the same manner that the ceiling will be installed on the project.

1.2.2 Ceiling Sound Absorption

Determine the Noise Reduction Coefficient (NRC) in accordance with [ASTM C 423](#) Test Method.

1.2.3 Light Reflectance

Determine light reflectance factor in accordance with [ASTM E 1477](#) Test Method.

1.2.4 Other Submittals Requirements

The following shall be submitted:

- a. Manufacturer's data indicating percentage of recycle material in acoustic ceiling tiles to verify affirmative procurement compliance.
- b. Total weight and volume quantities of acoustic ceiling tiles with recycle material.
- c. Manufacturer's catalog showing UL classification of fire-rated ceilings giving materials, construction details, types of floor and roof constructions to be protected, and UL design number and fire protection time rating for each required floor or roof construction and acoustic ceiling assembly.

Reports by an independent testing laboratory attesting that acoustical ceiling systems meet specified sound transmission requirements. Data attesting to conformance of the proposed system to Underwriters Laboratories requirements for the fire endurance rating listed in [UL Fire Resistance](#) may be submitted in lieu of test reports.

Certificate attesting that the mineral based acoustical units furnished for the project contain recycled material and showing an estimated percent of such material.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Acoustical Units

SD-04 Samples

Acoustical Units
Acoustic Ceiling Tiles

SD-06 Test Reports

Ceiling Attenuation Class and Test

SD-07 Certificates

Acoustical Units
Acoustic Ceiling Tiles

1.4 DELIVERY, STORAGE. AND HANDLING

Deliver materials to the site in the manufacturer's original unopened containers with brand name and type clearly marked. Carefully handle and store materials in dry, watertight enclosures. Immediately before installation, store acoustical units for not less than 24 hours at the same temperature and relative humidity as the space where they will be installed in order to assure proper temperature and moisture acclimation.

1.5 ENVIRONMENTAL REQUIREMENTS

Maintain a uniform temperature of not less than 60 degrees F nor more than 85 degrees F and a relative humidity of not more than 70 percent for 24 hours before, during, and 24 hours after installation of acoustical units.

1.6 SCHEDULING

Complete and dry interior finish work such as plastering, concrete and terrazzo work before ceiling installation. Complete mechanical, electrical, and other work above the ceiling line; install and start operating heating, ventilating, and air conditioning systems in order to maintain temperature and humidity requirements.

1.7 WARRANTY

Provide manufacturer's 30 year limited system warranty. Include an agreement to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to, sagging and warping of panels; rusting and manufacturers defects of grid system.

PART 2 PRODUCTS

2.1 ACOUSTICAL UNITS

Submit two samples of each type of acoustical unit and each type of suspension grid tee section showing texture, finish, and color. Conform

acoustical units to **ASTM E 1264**, Class A, and the following requirements:

2.1.1 Affirmative Procurement

Mineral Wool, Cellulose, and Laminated Paperboard used in **acoustic ceiling tiles** are materials listed in the EPA's Comprehensive Procurement Guidelines (CPG) (<http://www.epa.gov/cpg/>). EPA's recommended Recovered Materials Content Levels for Mineral Wool, Cellulose, Structural Fiberboard and Laminated Paperboard are:

Product	Material	Percent of Post Consumer Materials	Percent of Total Recovered Materials
Laminate Paperboard	Post Consumer Paper	100	100
Rock Wool	Slag	75	
Cellulose	Post Consumer Paper	75	75

- a. The recommended recovered materials content levels are based on the weight (not volume) of materials in the insulating core only.
- b. For informational purposes, a list of known sources for acoustical ceiling tiles using recycled material is provided in the EPA/CPG Supplier database at http://www.ergweb2.com/cpg4review/user/cpg_search.cfm.
- c. Note that the Contractor is not limited to these sources. A product meeting CPG recycle requirements from other sources may be submitted for the Government's approval.
- d. Submit recycled material content data for acoustic ceiling tiles indicating compliance with affirmative procurement.
- e. Submit total weight and volume quantities of acoustic ceiling tiles with recycle material.

2.1.2 Humidity Resistant Composition Units

- a. Type: Type III, Form: 1, Non-asbestos mineral or glass fibers bonded with ceramic, moisture resistant thermo-setting resin, or other moisture resistant material and having a factory applied white paint finish. Provide panels that do not sag or warp under conditions of heat, high humidity or chemical fumes.
- b. Flame Spread: Class: A, 25 or less. Smoke Developed Index 50 or less.
- c. Pattern: CE, fine fissured.
- d. Texture: Medium
- e. Minimum NRC: Minimum 0.75 when tested on Mounting Type E-400 of **ASTM E 795**.
- f. Minimum Light Reflectance Coefficient: LR-1, 0.86 or greater.
- g. Nominal Size: **24 by 24 by 7/8 inch**.

- h. Acoustics AC: 170
- i. Edge Detail: Square.

2.2 SUSPENSION SYSTEM

Provide standard **exposed-grid** standard width flange suspension system conforming to **ASTM C 635/C 635M** for intermediate-duty systems. Provide surfaces exposed to view of aluminum or steel with a factory-applied white baked-enamel finish. Provide wall molding having a flange of not less than **15/16 inch**. Provide inside and outside corner caps. Suspended ceiling framing system must have the capability to support the finished ceiling, light fixtures, air diffusers, and accessories, as shown. Provide a suspension system with a maximum deflection of 1/360 of the span length. Conform seismic details to the guidance in **UFC 3-310-04** and **ASTM E 580/E 580M**.

2.3 HANGERS

Provide hangers and attachment capable of supporting a minimum **300 pound** ultimate vertical load without failure of supporting material or attachment.

2.3.1 Wires

Conform wires to **ASTM A 641/A 641M**, Class 1, **0.11 inch** in diameter.

2.4 ACCESS PANELS

Provide access panels that match adjacent acoustical units, designed and equipped with suitable framing and fastenings for removal and replacement without damage. Size panel to be not less than **12 by 12 inch** or more than **12 by 24 inch**.

- a. Attach an identification plate of **0.032 inch** thick aluminum, **3/4 inch** in diameter, stamped with the letters "AP" and finished the same as the unit, near one corner on the face of each access panel.
- b. Identify ceiling access panel by a number utilizing white identification plates or plastic buttons with contrasting numerals. Provide plates or buttons of minimum **1 inch** diameter and securely attached to one corner of each access unit. Provide a typewritten card framed under glass listing the code identification numbers and corresponding system descriptions listed above. Mount the framed card where directed and furnish a duplicate card to the Contracting Officer. Code identification system is as follows:

- 1 Fire detection/alarm system
- 2 Air conditioning controls
- 3 Plumbing system
- 4 Heating and steam systems
- 5 Air conditioning duct system
- 6 Sprinkler system

7 Telephone junction boxes

2.5 FINISHES

Use manufacturer's standard textures, patterns and finishes as specified for acoustical units and suspension system members. Treat ceiling suspension system components to inhibit corrosion.

PART 3 EXECUTION

3.1 INSTALLATION

Examine surfaces to receive directly attached acoustical units for unevenness, irregularities, and dampness that would affect quality and execution of the work. Rid areas, where acoustical units will be cemented, of oils, form residue, or other materials that reduce bonding capabilities of the adhesive. Complete and dry interior finish work such as plastering, concrete, and terrazzo work before installation. Complete and approve mechanical, electrical, and other work above the ceiling line prior to the start of acoustical ceiling installation. Provide acoustical work complete with necessary fastenings, clips, and other accessories required for a complete installation. Do not expose mechanical fastenings in the finished work. Lay out hangers for each individual room or space. Provide hangers to support framing around beams, ducts, columns, grilles, and other penetrations through ceilings. Keep main runners and carrying channels clear of abutting walls and partitions. Provide at least two main runners for each ceiling span. Wherever required to bypass an object with the hanger wires, install a subsuspension system so that all hanger wires will be plumb.

3.1.1 Suspension System

Install suspension system in accordance with [ASTM C 636/C 636M](#) and as specified herein. Do not suspend hanger wires or other loads from underside of steel decking.

3.1.1.1 Plumb Hangers

Install hangers plumb and not pressing against insulation covering ducts and pipes. Where lighting fixtures are supported from the suspended ceiling system, provide hangers at a minimum of four hangers per fixture and located not more than [6 inch](#) from each corner of each fixture.

3.1.1.2 Splayed Hangers

Where hangers must be splayed (sloped or slanted) around obstructions, offset the resulting horizontal force by bracing, countersplaying, or other acceptable means.

3.1.2 Wall Molding

Provide wall molding where ceilings abut vertical surfaces. Miter corners where wall moldings intersect or install corner caps. Secure wall molding not more than [3 inch](#) from ends of each length and not more than [16 inch](#) on centers between end fastenings. Provide wall molding springs at each acoustical unit in semi-exposed or concealed systems.

3.1.3 Acoustical Units

Install acoustical units in accordance with the approved installation instructions of the manufacturer. Ensure that edges of acoustical units are in close contact with metal supports, with each other, and in true alignment. Arrange acoustical units so that units less than one-half width are minimized. Hold units in exposed-grid system in place with manufacturer's standard hold-down clips, if units weigh less than 1 psf or if required for fire resistance rating.

3.1.4 Caulking

Seal all joints around pipes, ducts or electrical outlets penetrating the ceiling. Apply a continuous ribbon of acoustical sealant on vertical web of wall or edge moldings.

3.2 CEILING ACCESS PANELS

Locate ceiling access panels directly under the items which require access.

3.3 CLEANING

Following installation, clean dirty or discolored surfaces of acoustical units and leave them free from defects. Remove units that are damaged or improperly installed and provide new units as directed.

3.4 RECLAMATION PROCEDURES

Neatly stack ceiling tile, designated for recycling by the Contracting Officer, on 4 by 4 foot pallets not higher than 4 foot. Panels must be completely dry. Shrink wrap and symmetrically stack pallets on top of each other without falling over.

-- End of Section --

SECTION 09 65 00

RESILIENT FLOORING

08/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

- ASTM D 4078 (2002; R 2008) Water Emulsion Floor Polish
- ASTM E 648 (2009a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
- ASTM F 1066 (2004) Standard Specification for Vinyl Composition Floor Tile
- ASTM F 1482 (2004; R 2009e1) Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring
- ASTM F 1861 (2008) Resilient Wall Base
- ASTM F 1869 (2010) Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
- ASTM F 2170 (2009) Determining Relative Humidity in Concrete Floor Slabs in situ Probes
- ASTM F 710 (2008) Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

GREEN SEAL (GS)

- GS-36 (2000) Commercial Adhesives

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

- SCAQMD Rule 1168 (1989; R 2005) Adhesive and Sealant Applications

1.2 SYSTEM DESCRIPTION

1.2.1 Fire Resistance Requirements

Provide a minimum average critical radiant flux of 0.45 watts per square centimeter for flooring in corridors and exits when tested in accordance

with ASTM E 648.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

- Resilient Flooring and Accessories
- Adhesives
- Vinyl Composition Tile
- Wall Base

SD-04 Samples

- Resilient Flooring and Accessories

SD-06 Test Reports

- Moisture, Alkalinity and Bond Tests

SD-08 Manufacturer's Instructions

- Surface Preparation
- Installation

SD-10 Operation and Maintenance Data

- Resilient Flooring and Accessories

SD-11 Closeout Submittals

- Resilient Flooring and Accessories
- Adhesives

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the building site in original unopened containers bearing the manufacturer's name, style name, pattern color name and number, production run, project identification, and handling instructions. Store materials in a clean, dry, secure, and well-ventilated area free from strong contaminant sources and residues with ambient air temperature maintained above 68 degrees F and below 85 degrees F, stacked according to manufacturer's recommendations. Remove resilient flooring products from packaging to allow ventilation prior to installation. Protect materials from the direct flow of heat from hot-air registers, radiators and other heating fixtures and appliances. Observe ventilation and safety procedures specified in the MSDS. Do not store rubber surface products with materials that have a high capacity to adsorb volatile organic compound (VOC) emissions. Do not store exposed rubber surface materials in occupied spaces.

1.5 ENVIRONMENTAL REQUIREMENTS

Maintain areas to receive resilient flooring at a temperature above 68 degrees F and below 85 degrees F for 3 days before application, during application and 2 days after application, unless otherwise directed by the flooring manufacturer for the flooring being installed. Maintain a minimum

temperature of 55 degrees F thereafter. Provide adequate ventilation to remove moisture from area and to comply with regulations limiting concentrations of hazardous vapors.

1.6 SCHEDULING

Schedule resilient flooring application after the completion of other work which would damage the finished surface of the flooring.

1.7 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a one year period.

PART 2 PRODUCTS

2.1 VINYL COMPOSITION TILE

Conform to ASTM F 1066 Class 2, (through pattern tile), Composition 1, asbestos-free, 12 inch square and 1/8 inch thick. Provide color and pattern uniformly distributed throughout the thickness of the tile.

2.2 WALL BASE

Conform to ASTM F 1861, Type TS (vulcanized thermoset rubber) Style A (straight - installed with carpet) and Style B (coved - installed with resilient flooring). Provide 4 inch high and a minimum 1/8 inch thick wall base. Provide job formed corners in matching height, shape, and color. Rubber shall contain a minimum of 90 percent post-consumer recycled material.

2.3 MOULDING

Provide tapered mouldings of rubber and types as recommended by flooring manufacturer for both edges and transitions of flooring materials specified. Provide vertical lip on moulding of maximum 1/4 inch. Provide bevel change in level between 1/4 and 1/2 inch with a slope no greater than 1:2.

2.4 ADHESIVES

Provide adhesives for flooring, base and accessories as recommended by the manufacturer and comply with local indoor air quality standards. Interior adhesives shall meet the requirements of LEED low emitting materials credit.

VOC content shall be less than the current VOC content limits of GS-36 and SCAQMD Rule 1168. Submit manufacturer's descriptive data, documentation stating physical characteristics, and mildew and germicidal characteristics. Provide Material Safety Data Sheets (MSDS) for all primers and adhesives to the Contracting Officer. Highlight VOC emissions.

2.5 SURFACE PREPARATION MATERIALS

Provide surface preparation materials, such as floor crack fillers as recommended by the flooring manufacturer for the subfloor conditions.

2.6 POLISH/FINISH

Provide polish finish as recommended by the manufacturer and conform to ASTM D 4078 for polish.

2.7 CAULKING AND SEALANTS

Provide caulking and sealants in accordance with Section 07 92 00 JOINT SEALANTS.

2.8 MANUFACTURER'S COLOR, PATTERN AND TEXTURE

Provide color, pattern and texture for resilient flooring and accessories selected from manufacturer's standard colors. Color listed is not intended to limit the selection of equal colors from other manufacturers. Provide flooring in any one continuous area or replacement of damaged flooring in continuous area from same production run with same shade and pattern. Submit manufacturer's descriptive data and three samples of each indicated color and type of flooring, base, mouldings, and accessories sized a minimum 2-1/2 by 4 inch. Submit Data Package 1 in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

PART 3 EXECUTION

3.1 EXAMINATION

Examine and verify that site conditions are in agreement with the design package. Report all conditions that will prevent a proper installation. Do not take any corrective action without written permission from the Government. Work will proceed only when conditions have been corrected and accepted by the installer. Submit manufacturer's printed installation instructions for all flooring materials and accessories, including preparation of substrate, seaming techniques, and recommended adhesives.

3.2 SURFACE PREPARATION

Provide a smooth, true, level plane for surface preparation of the flooring, except where indicated as sloped. Floor to be flat to within 3/16 inch in 10 feet. Prepare subfloor in accordance with flooring manufacturer's recommended instructions. Prepare the surfaces of lightweight concrete slabs (as defined by the flooring manufacturer) as recommended by the flooring manufacturer. Comply with ASTM F 710 for concrete subfloor preparation. Floor fills or toppings may be required as recommended by the flooring manufacturer. Install underlayments, when required by the flooring manufacturer, in accordance with manufacturer's recommended printed installation instructions. Comply with ASTM F 1482 for panel type underlayments. Before any work under this section is begun, correct all defects such as rough or scaling concrete, chalk and dust, cracks, low spots, high spots, and uneven surfaces. Repair all damaged portions of concrete slabs as recommended by the flooring manufacturer. Remove concrete curing and sealer compounds from the slabs, other than the type that does not adversely affect adhesion. Remove paint, varnish, oils, release agents, sealers, waxes, and adhesives, as required by the flooring product in accordance with manufacturer's printed installation instructions.

3.3 MOISTURE, ALKALINITY AND BOND TESTS

Determine the suitability of the concrete subfloor for receiving the resilient flooring with regard to moisture content and pH level by moisture and alkalinity tests. Conduct moisture testing in accordance with ASTM F 1869 or ASTM F 2170, unless otherwise recommended by the flooring manufacturer. Conduct alkalinity testing as recommended by the flooring manufacturer. Determine the compatibility of the resilient flooring

adhesives to the concrete floors by a bond test in accordance with the flooring manufacturer's recommendations. Submit copy of test reports for moisture and alkalinity content of concrete slab, and bond test stating date of test, person conducting the test, and the area tested.

3.4 PLACING VINYL COMPOSITION TILES

Install tile flooring and accessories in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's directions. Keep tile lines and joints square, symmetrical, tight, and even. Keep each floor in true, level plane, except where slope is indicated. Vary edge width as necessary to maintain full-size tiles in the field, no edge tile to be less than one-half the field tile size, except where irregular shaped rooms make it impossible. Cut flooring to fit around all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Cut, fit, and scribe edge tile to walls and partitions after field flooring has been applied.

3.5 PLACING MOULDING

Provide moulding where flooring termination is higher than the adjacent finished flooring and at transitions between different flooring materials. When required, locate moulding under door centerline. Moulding is not required at doorways where thresholds are provided. Secure moulding with adhesive as recommended by the manufacturer. Prepare and apply adhesives in accordance with manufacturer's printed directions.

3.6 PLACING WALL BASE

Install wall base in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's printed directions. Tighten base joints and make even with adjacent resilient flooring. Fill voids along the top edge of base at masonry walls with caulk. Roll entire vertical surface of base with hand roller, and press toe of base with a straight piece of wood to ensure proper alignment. Avoid excess adhesive in corners.

3.7 CLEANING

Immediately upon completion of installation of flooring in a room or an area, dry/clean the flooring and adjacent surfaces to remove all surplus adhesive. Clean flooring as recommended in accordance with manufacturer's printed maintenance instructions. No sooner than 5 days after installation, wash flooring with a nonalkaline cleaning solution, rinse thoroughly with clear cold water, and, except for rubber flooring and stair treads, risers and stringers, vinyl and other flooring not requiring polish finish by manufacturer, apply the number of coats of polish in accordance with manufacturer's written instructions. Clean and maintain all other flooring as recommended by the manufacturer.

3.8 WASTE MANAGEMENT

Separate offcuts and waste materials and reuse or recycle in accordance with the Waste Management Plan, keeping sheet materials larger than 2 square feet and tiles larger than 1/2 tiles separate for reuse. Identify manufacturer's policy for collection or return of construction scrap, unused material, demolition scrap, and/or packaging material. Place materials defined as hazardous or toxic waste in designated containers and dispose of properly. Close and seal tightly partly used sealant and

adhesive containers and store protected in a well ventilated fire-safe area at moderate temperature.

3.9 PROTECTION

From the time of installation until acceptance, protect flooring from damage as recommended by the flooring manufacturer. Remove and replace flooring which becomes damaged, loose, broken, or curled and wall base which is not tight to wall or securely adhered.

-- End of Section --

SECTION 09 68 00

CARPET

05/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC TM 107 (1962; R 2009) Colorfastness to Water

AATCC TM 134 (1969; R 2006) Electrostatic Propensity of Carpets

AATCC TM 16 (1964; R 2004) Colorfastness to Light

AATCC TM 165 (1986; R 2008) Colorfastness to Crocking: Textile Floor Coverings - Crockmeter Method

AATCC TM 174 (1991; R 2007) Antimicrobial Activity Assessment of Carpets

ASTM INTERNATIONAL (ASTM)

ASTM D 3278 (1996; R 2004e1) Flash Point of Liquids by Small Scale Closed-Cup Apparatus

ASTM D 5793 (2005) Binding Sites Per Unit Length or Width of Pile Yarn Floor Coverings

ASTM D 5848 (2007) Mass Per Unit Area of Pile Yarn Floor Coverings

ASTM D 6859 (2005) Standard Test Method for Pile Thickness of Finished Level Pile Yarn Floor Coverings

ASTM E 648 (2009a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source

CARPET AND RUG INSTITUTE (CRI)

CRI 104 (2002) Standard for Installation Specification of Commercial Carpet

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED (2002; R 2005) Leadership in Energy and Environmental Design(tm) Green Building

Rating System for New Construction
(LEED-NC)

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

16 CFR 1630

Standard for the Surface Flammability of
Carpets and Rugs (FF 1-70)

40 CFR 247

Comprehensive Procurement Guideline for
Products Containing Recovered Materials

1.2 SYSTEM DESCRIPTION

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL
PROCEDURES:

SD-02 Shop Drawings

Installation
Moldings

SD-03 Product Data

Carpet
Moldings
Surface Preparation
Installation
Regulatory Requirements
Physical Characteristics

SD-04 Samples

Carpet
Moldings

SD-06 Test Reports

Moisture and Alkalinity Tests

SD-07 Certificates

Carpet
Regulatory Requirements

SD-10 Operation and Maintenance Data

Carpet
Cleaning and Protection
Maintenance Service

SD-11 Closeout Submittals

Carpet;
Adhesives and Concrete Primer

1.4 QUALITY ASSURANCE

Provide the Carpet and Rug Institute (CRI) Indoor Air Quality (IAQ) label for carpet, carpet cushion, and adhesives or demonstrate compliance with testing criteria and frequencies through independent laboratory test results. Carpet, carpet cushion, and adhesives bearing the label will indicate that the carpet has been tested and meets the [Regulatory Requirements](#) and criteria of the CRI IAQ Carpet Testing Program, and minimizes the impact on indoor air quality. [Procure carpet in accordance with 40 CFR 247, and where possible, purchased locally to reduce emissions of fossil fuels from transporting. Conform to EPA requirements for carpet.](#)

Submit certificates, showing conformance with the referenced standards contained in this section, for the following: Carpet Cushion and Molding. Submit three copies of report stating that carpet and carpet components contain recycled materials and/or involvement in a recycling or reuse program. Include in the report percentage of post-industrial and post-consumer recycled material. Include manufacturer's certification of compliance with Carpet and Rug Institute's Green Label Indoor Air Quality program

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the site in the manufacturer's original wrappings and packages clearly labeled with the manufacturer's name, brand name, size, dye lot number, and related information. Remove materials from packaging and store them in a clean, dry, well ventilated area ([100 percent outside air supply, minimum of 1.5 air changes per hour, and no recirculation](#)), protected from damage, soiling, and moisture, and [strong contaminant sources and residues](#), and maintain at a temperature above [60 degrees F](#) for 2 days prior to installation. [Carpet or carpet tiles shall not be stored with materials which have high emissions of volatile organic compounds \(VOCs\) or other contaminants.](#) Do not store carpet near materials that may offgas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives.

1.6 AMBIENT CONDITIONS

Maintain areas in which carpeting is to be installed at a temperature above [60 degrees F](#) and below [90 degrees F](#) for 2 days before installation, during installation, and for 2 days after installation. Provide temporary ventilation during work of this section. Maintain a minimum temperature of [55 degrees F](#) thereafter for the duration of the contract. Do not permit traffic or movement of furniture or equipment in carpeted area for 24 hours after installation. Complete other work which would damage the carpet prior to installation of carpet.

1.7 WARRANTY

Provide manufacturer's standard performance guarantees or warranties including minimum ten (10) year wear warranty, two (2) year material and workmanship and ten (10) year tuft bind and delamination.

PART 2 PRODUCTS

2.1 CARPET

Furnish first quality carpet; free of visual blemishes, streaks, poorly dyed areas, fuzzing of pile yarn, spots or stains, and other physical and manufacturing defects. Provide carpet materials and treatments as

reasonably nonallergenic and free of other recognized health hazards. Provide a static control construction on all grade carpets which gives adequate durability and performance. Provide the Carpet and Rug Institute (CRI) Indoor Air Quality (IAQ) Label. Carpet type bearing the label will indicate that carpet has been tested and meets the criteria of the CRI Green Label Requirements for Indoor Air Quality Test Criteria. Provide carpet tiles with Carpet Component Identification Codes as established by the CRI for future recycling. The labels shall be permanently printed or attached to the carpet backing. The codes shall identify, at minimum, the carpet's face fiber, primary backing, and secondary backing. Submit certificates of compliance from a laboratory accredited by the National Laboratory Accreditation Program of the National Institute of Standards and Technology attesting that each type of carpet and carpet with cushion material conforms to the standards specified. Submit Manufacturer's catalog data and printed documentation stating physical characteristics, durability, resistance to fading, and flame resistance characteristics for each type of carpet material and installation accessory. Submit manufacturer's catalog data for the following items: 1) Carpet Cushion and 2) Carpet Moldings. Submit samples of the following:

- a. Carpet: Two "Production Quality" samples 18 by 18 inches of each carpet proposed for use, showing quality, pattern, and color specified.
- b. Vinyl Moldings: Two pieces of each type at least 12 inches long.
- c. Special Treatment Materials: Two samples showing system and installation method.

2.1.1 Physical Characteristics

Submit documentation indicating type of biobased material in product and biobased content. Indicate relative dollar value of biobased content products to total dollar value of products included in project. Submit documentation indicating relative dollar value of rapidly renewable materials to total dollar value of products included in project.

2.1.2 Broadloom

Carpet shall comply with the following:

- a. Carpet Construction: Pattern Loop.
- b. Type: Broadloom 12 feet minimum usable carpet width with exception of corridors.
- c. Pile Fiber: Commercial 100 percent branded (federally registered trademark) nylon continuous filament.
- d. Pattern Repeat: 0.40" w x 0.70".
- e. Gauge or Pitch: Minimum 1/10 inch in accordance with ASTM D 5793.
- f. Stitches or Rows/Wires: Minimum 12 per square inch.
- g. Surface Pile Weight: Minimum 28 ounces per square yard. This does not include weight of backings. Determine weight in accordance with ASTM D 5848.
- h. Pile Thickness: Minimum 0.139 inch in accordance with ASTM D 6859.

- i. Pile Density: Minimum 7,252 oz/yd³.
- j. Dye Method: Solution dyed and Yarn (or Skein) dyed.
- k. Backing Materials: Provide primary backing materials of synthetic material. Provide secondary backing to suit project requirements of those customarily used and accepted by the trade for each type of carpet, except when a special unitary back designed for gluedown is needed.

2.2 PERFORMANCE REQUIREMENTS

- a. Static Control: Provide static control to permanently regulate static buildup to less than 3.5 kV when tested at 20 percent relative humidity and 70 degrees F in accordance with AATCC TM 134.
- b. Flammability and Critical Radiant Flux Requirements: Comply carpet with 16 CFR 1630. Provide carpet in corridors and exits with a minimum average critical radiant flux of 0.22 watts per square centimeter when tested in accordance with ASTM E 648.
- c. Tuft Bind: Provide tuft bind force required to pull a tuft or loop free from carpet backing with a minimum 10 pound average force for loop pile.
- d. Colorfastness to Crocking: Comply dry and wet crocking with AATCC TM 165 and with a Class 4 minimum rating on the AATCC Color Transference Chart for all colors.
- e. Colorfastness to Light: Comply colorfastness to light with AATCC TM 16, Test Option E "Water-Cooled Xenon-Arc Lamp, Continuous Light" and with a minimum 4 gray scale rating after 40 hours.
- f. Colorfastness to Water: Comply colorfastness to water with AATCC TM 107 and with a minimum 4.0 gray scale rating and a minimum 4.0 transfer scale rating.
- g. Delamination Strength: Provide delamination strength for tufted carpet with a secondary back of minimum 2.5 lbs/inch.
- h. Antimicrobial: Nontoxic antimicrobial treatment in accordance with AATCC TM 174 Part I (qualitative), guaranteed by the carpet manufacturer to last the life of the carpet.

2.3 ADHESIVES AND CONCRETE PRIMER

Adhesives and concrete primers shall comply with applicable regulations regarding toxic and hazardous materials. Provide water resistant, mildew resistant, nonflammable, and nonstaining adhesives and concrete primers for carpet installation to meet local air-quality standards, and as required by the carpet manufacturer. Provide release adhesive for modular tile carpet as recommended by the carpet manufacturer. Provide adhesives flashpoint of minimum 140 degrees F in accordance with ASTM D 3278. Under closeout submittals, furnish documentation relative to low-emitting materials credit in accordance with LEED Reference Guide. Include in LEED Documentation Notebook.

2.4 MOLDINGS

Provide a heavy-duty vinyl molding, where floor covering material changes or carpet edge does not abut a vertical surface. Provide floor flange of a minimum 1 1/2 inches wide. Provide color to match resilient base.

2.5 TAPE

Provide tape for seams as recommended by the carpet manufacturer for the type of seam used in installation. Any seam sealant shall have a maximum VOC content of 50 grams/liter. Do not use sealants that contain 1,1,1-trichloroethane or toluene.

2.6 COLOR, TEXTURE, AND PATTERN

Provide color, texture, and pattern as indicated on the Drawings.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Do not install carpet on surfaces that are unsuitable and will prevent a proper installation. Prepare subfloor in accordance with flooring manufacturer's recommended instructions. Repair holes, cracks, depressions, or rough areas using material recommended by the carpet or adhesive manufacturer. Free floor of any foreign materials and sweep clean. Before beginning work, test subfloor with glue and carpet to determine "open time" and bond. Submit three copies of the manufacturer's printed installation instructions for the carpet, including preparation of substrate, seaming techniques, and recommended adhesives and tapes.

3.2 MOISTURE AND ALKALINITY TESTS

Test concrete slab for moisture content and excessive alkalinity in accordance with CRI 104. Submit three copies of test reports of moisture and alkalinity content of concrete slab stating date of test, person conducting the test, and the area tested.

3.3 PREPARATION OF CONCRETE SUBFLOOR

Do not commence installation of the carpeting until concrete substrate is at least 90 days old. Prepare the concrete surfaces in accordance with instructions of the carpet manufacturer. Match carpet, when required, and adhesives to prevent off-gassing to a type of curing compounds, leveling agents, and concrete sealer.

3.4 INSTALLATION

Isolate area of installation from rest of building. Perform all work by installers who are CFI certified (International Certified Floorcovering Installer Association), or manufacturer's approved installers. Conduct installation in accordance with the manufacturer's printed instructions and CRI 104. Protect edges of carpet meeting hard surface flooring with molding and install in accordance with the molding manufacturer's printed instructions. Use autofoam mothproofing system for wool carpets. Follow ventilation, personal protection, and other safety precautions recommended by the adhesive manufacturer. Continue ventilation during installation and for at least 72 hours following installation. Submit three copies of drawings indicating areas receiving carpet, carpet types, textures and

patterns, direction of pile, location of seams, and locations of edge molding. Submit installation drawings for: 1) Carpet Moldings diagramming the location of seams, edge moldings, and carpet direction for approval prior to installation.

3.4.1 Broadloom Installation

Install broadloom carpet direct glue down and secure, with a minimum of seams. Installation shall be smooth and uniform. Apply regular, unnoticeable, and treated seams with a seam adhesive. Run side seams toward the light, where practical, and where such layout does not increase the number of seams. Install breadths parallel, with carpet pile in the same direction. Match patterns accurately. Neatly cut and fit cutouts, at door jambs, columns and ducts securely. Locate seams at doorways parallel to and centered directly under doors. Do not make seams perpendicular to doors or at pivot points. Provide seams at changes in directions of corridors to follow the wall line parallel to the carpet direction. Lay the carpet lengthwise down the corridors with widths less than 6 feet.

3.5 CLEANING AND PROTECTION

Submit three copies of carpet manufacturer's maintenance instructions describing recommended type of cleaning equipment and material, spotting and cleaning methods, and cleaning cycles.

3.5.1 Cleaning

As specified in Section 01 78 00 CLOSEOUT SUBMITTALS. After installation of the carpet, remove debris, scraps, and other foreign matter. Remove soiled spots and adhesive from the face of the carpet with appropriate spot remover. Cut off and remove protruding face yarn. Vacuum carpet clean with a high-efficiency particulate air (HEPA) filtration vacuum.

3.5.2 Protection

Protect the installed carpet from soiling and damage with heavy, reinforced, nonstaining kraft paper, plywood, or hardboard sheets. Lap and secure edges of kraft paper protection to provide a continuous cover. Restrict traffic for at least 48 hours. Remove protective covering when directed by the Contracting Officer.

3.6 REMNANTS

Collect information from manufacturer about maintenance agreement options, and provide to Contracting Officer. Manage waste as specified in the Waste Management Plan. Provide remnants remaining from the installation, consisting of scrap pieces more than 2 feet in dimension with more than 6 square feet total to the Government. Non-retained scraps shall be set aside and returned to manufacturer for recycling into new product.

3.7 MAINTENANCE

3.7.1 Maintenance Service

Collect information from the manufacturer about maintenance agreement options, and submit to Contracting Officer. Service shall reclaim materials for recycling and/or reuse. Service shall not landfill or burn reclaimed materials. When such a service is not available, seek local recyclers to reclaim the materials. Submit documentation of manufacturer's

maintenance agreement for carpet. Include contact information, summary of procedures, and the limitations and conditions applicable to the project. Indicate manufacturer's commitment to reclaim materials for recycling and/or reuse.

-- End of Section --

SECTION 09 90 00

PAINTS AND COATINGS

05/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH 0100Doc (2005) Documentation of the Threshold Limit Values and Biological Exposure Indices

ASTM INTERNATIONAL (ASTM)

ASTM D 235 (2002; R 2007) Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)

ASTM D 4214 (2007) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films

ASTM D 4263 (1983; R 2005) Indicating Moisture in Concrete by the Plastic Sheet Method

ASTM D 4444 (2008) Use and Calibration of Hand-Held Moisture Meters

ASTM D 523 (2008) Standard Test Method for Specular Gloss

ASTM D 6386 (2010) Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting

ASTM F 1869 (2010) Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

MASTER PAINTERS INSTITUTE (MPI)

MPI 1 (Oct 2009) Aluminum Paint

MPI 107 (Oct 2009) Rust Inhibitive Primer (Water-Based)

MPI 11 (Oct 2009) Exterior Latex, Semi-Gloss, MPI Gloss Level 5

- MPI 139 (Oct 2009) Interior High Performance Latex, MPI Gloss Level 3
- MPI 145 (Oct 2009) Institutional Low Odor / VOC Interior Latex, MPI Gloss Level 3
- MPI 147 (Oct 2009) Institutional Low Odor / VOC Interior Latex, Semi-Gloss, MPI Gloss Level 5
- MPI 151 (Oct 2009) Interior W.B. Light Industrial Coating, MPI Gloss Level 3
- MPI 163 (Oct 2009) Exterior W.B. Light Industrial Coating, Semi-Gloss, MPI Gloss Level 5
- MPI 39 (Oct 2009) Interior Latex-Based Wood Primer
- MPI 4 (Oct 2009) Interior/Exterior Latex Block Filler
- MPI 47 (Oct 2009) Interior Alkyd, Semi-Gloss, MPI Gloss Level 5
- MPI 50 (Oct 2009) Interior Latex Primer Sealer
- MPI 57 (Oct 2009) Interior Oil Modified Urethane Clear Satin
- MPI 77 (Oct 2009) Epoxy Gloss
- MPI 79 (Oct 2009) Alkyd Anti-Corrosive Metal Primer
- MPI 90 (Oct 2009) Interior Wood Stain, Semi-Transparent
- MPI 95 (Oct 2009) Quick Drying Primer for Aluminum

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

- SCS SP-01 (2000) Environmentally Preferable Product Specification for Architectural and Anti-Corrosive Paints

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

- SSPC Guide 6 (2004) Guide for Containing Surface Preparation Debris Generated During Paint Removal Operations
- SSPC Guide 7 (2004; E 2004) Guide to the Disposal of Lead-Contaminated Surface Preparation Debris
- SSPC PA 1 (2000; E 2004) Shop, Field, and Maintenance Painting of Steel
- SSPC PA Guide 3 (1982; E 1995) A Guide to Safety in Paint

Application

- SSPC SP 1 (1982; E 2004) Solvent Cleaning
- SSPC SP 10/NACE No. 2 (2007) Near-White Blast Cleaning
- SSPC SP 12/NACE No.5 (2002) Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating
- SSPC SP 2 (1982; E 2004) Hand Tool Cleaning
- SSPC SP 3 (1982; E 2004) Power Tool Cleaning
- SSPC SP 6/NACE No.3 (2007) Commercial Blast Cleaning
- SSPC SP 7/NACE No.4 (2007) Brush-Off Blast Cleaning
- SSPC VIS 1 (2002; e 2004) Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
- SSPC VIS 3 (2004) Guide and Reference Photographs for Steel Surfaces Prepared by Hand and Power Tool Cleaning

U.S. ARMY CORPS OF ENGINEERS (USACE)

- EM 385-1-1 (2008; Errata 1-2010; Changes 1-3 2010; Changes 4-6 2011) Safety and Health Requirements Manual

U.S. DEPARTMENT OF DEFENSE (DOD)

- MIL-STD-101 (1970; Rev B) Color Code for Pipelines & for Compressed Gas Cylinders

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

- EPA Method 24 (2000) Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

- FED-STD-313 (Rev D; Am 1) Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

- 29 CFR 1910.1000 Air Contaminants
- 29 CFR 1910.1001 Asbestos
- 29 CFR 1910.1025 Lead
- 29 CFR 1926.62 Lead

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

The current MPI, "Approved Product List" which lists paint by brand, label, product name and product code as of the date of contract award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use a subsequent MPI "Approved Product List", however, only one list may be used for the entire contract and each coating system is to be from a single manufacturer. All coats on a particular substrate must be from a single manufacturer. No variation from the MPI Approved Products List is acceptable.

Samples of specified materials may be taken and tested for compliance with specification requirements.

In keeping with the intent of Executive Order 13101, "Greening the Government through Waste Prevention, Recycling, and Federal Acquisition", products certified by SCS as meeting SCS SP-01 shall be given preferential consideration over registered products. Products that are registered shall be given preferential consideration over products not carrying any EPP designation.

SD-03 Product Data

Coating

Manufacturer's Technical Data Sheets

SD-04 Samples

Color

Submit manufacturer's samples of paint colors. Cross reference color samples to color scheme as indicated.

SD-07 Certificates

Applicator's qualifications

SD-08 Manufacturer's Instructions

Application instructions

Mixing

Detailed mixing instructions, minimum and maximum application temperature and humidity, potlife, and curing and drying times between coats.

Manufacturer's Material Safety Data Sheets

Submit manufacturer's Material Safety Data Sheets for coatings, solvents, and other potentially hazardous materials, as defined in FED-STD-313.

SD-10 Operation and Maintenance Data

Coatings:

Preprinted cleaning and maintenance instructions for all coating systems shall be provided.

SD-11 Closeout Submittals

Materials;

1.3 APPLICATOR'S QUALIFICATIONS

1.3.1 Contractor Qualification

Submit the name, address, telephone number, FAX number, and e-mail address of the contractor that will be performing all surface preparation and coating application. Submit evidence that key personnel have successfully performed surface preparation and application of coatings on a minimum of three similar projects within the past three years. List information by individual and include the following:

- a. Name of individual and proposed position for this work.
- b. Information about each previous assignment including:

Position or responsibility

Employer (if other than the Contractor)

Name of facility owner

Mailing address, telephone number, and telex number (if non-US) of facility owner

Name of individual in facility owner's organization who can be contacted as a reference

Location, size and description of structure

Dates work was carried out

Description of work carried out on structure

1.4 QUALITY ASSURANCE

1.4.1 Field Samples and Tests

The Contracting Officer may choose up to two coatings that have been delivered to the site to be tested at no cost to the Government. Take samples of each chosen product as specified in the paragraph "Sampling Procedures." Test each chosen product as specified in the paragraph "Testing Procedure." Products which do not conform, shall be removed from the job site and replaced with new products that conform to the referenced specification. Testing of replacement products that failed initial testing shall be at no cost to the Government.

1.4.1.1 Sampling Procedure

The Contracting Officer will select paint at random from the products that

have been delivered to the job site for sample testing. The Contractor shall provide **one quart** samples of the selected paint materials. The samples shall be taken in the presence of the Contracting Officer, and labeled, identifying each sample. Provide labels in accordance with the paragraph "Packaging, Labeling, and Storage" of this specification.

1.5 REGULATORY REQUIREMENTS

1.5.1 Environmental Protection

In addition to requirements specified elsewhere for environmental protection, provide coating materials that conform to the restrictions of the local Air Pollution Control District and regional jurisdiction. Notify Contracting Officer of any paint specified herein which fails to conform.

1.5.2 Lead Content

Do not use coatings having a lead content over 0.06 percent by weight of nonvolatile content.

1.5.3 Chromate Content

Do not use coatings containing zinc-chromate or strontium-chromate.

1.5.4 Asbestos Content

Materials shall not contain asbestos.

1.5.5 Mercury Content

Materials shall not contain mercury or mercury compounds.

1.5.6 Silica

Abrasive blast media shall not contain free crystalline silica.

1.5.7 Human Carcinogens

Materials shall not contain **ACGIH 0100Doc** and **ACGIH 0100Doc** confirmed human carcinogens (A1) or suspected human carcinogens (A2).

1.6 PACKAGING, LABELING, AND STORAGE

Paints shall be in sealed containers that legibly show the contract specification number, designation name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name and address of manufacturer. Pigmented paints shall be furnished in containers not larger than **5 gallons**. Paints and thinners shall be stored in accordance with the manufacturer's written directions, and as a minimum, stored off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors, and at temperatures between **40 to 95 degrees F**. **Do not store paint, polyurethane, varnish, or wood stain products with materials that have a high capacity to adsorb VOC emissions. Do not store paint, polyurethane, varnish, or wood stain products in occupied spaces.**

1.7 SAFETY AND HEALTH

Apply coating materials using safety methods and equipment in accordance with the following:

Work shall comply with applicable Federal, State, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis as specified in Section 01 35 29 SAFETY AND OCCUPATIONAL HEALTH REQUIREMENTS and in Appendix A of EM 385-1-1. The Activity Hazard Analysis shall include analyses of the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.

1.7.1 Safety Methods Used During Coating Application

Comply with the requirements of SSPC PA Guide 3.

1.7.2 Toxic Materials

To protect personnel from overexposure to toxic materials, conform to the most stringent guidance of:

- a. The applicable manufacturer's Material Safety Data Sheets (MSDS) or local regulation.
- b. 29 CFR 1910.1000.
- c. ACGIH 0100Doc, threshold limit values.
- d. The appropriate OSHA standard in 29 CFR 1910.1025 and 29 CFR 1926.62 for surface preparation on painted surfaces containing lead. Additional guidance is given in SSPC Guide 6 and SSPC Guide 7. Refer to drawings for list of hazardous materials located on this project. Contractor to coordinate paint preparation activities with this specification section.
- e. The appropriate OSHA standards in 29 CFR 1910.1001 for surface preparation of painted surfaces containing asbestos. Refer to drawings for list of hazardous materials located on this project. Contractor to coordinate paint preparation activities with this specification section.

1.8 ENVIRONMENTAL CONDITIONS

Comply, at minimum, with manufacturer recommendations for space ventilation during and after installation. Isolate area of application from rest of building when applying high-emission paints or coatings.

1.8.1 Coatings

Do not apply coating when air or substrate conditions are:

- a. Less than 5 degrees F above dew point;
- b. Below 50 degrees F or over 95 degrees F, unless specifically pre-approved by the Contracting Officer and the product manufacturer. Under no circumstances shall application conditions exceed manufacturer recommendations.

1.8.2 Post-Application

Vacate space for as long as possible after application. Wait a minimum of 48 hours before occupying freshly painted rooms. Maintain one of the following ventilation conditions during the curing period, or for 72 hours after application:

- a. Supply 100 percent outside air 24 hours a day.
- b. Supply airflow at a rate of 6 air changes per hour, when outside temperatures are between 55 degrees F and 85 degrees F and humidity is between 30 percent and 60 percent.
- c. Supply airflow at a rate of 1.5 air changes per hour, when outside air conditions are not within the range stipulated above.

1.9 SCHEDULING

Allow paint, polyurethane, varnish, and wood stain installations to cure prior to the installation of materials that adsorb VOCs.

1.10 LOCATION AND SURFACE TYPE TO BE PAINTED

1.10.1 Painting Included

Where a space or surface is indicated to be painted, include the following unless indicated otherwise.

- a. Surfaces behind portable objects and surface mounted articles readily detachable by removal of fasteners, such as screws and bolts.
- b. New factory finished surfaces that require identification or color coding and factory finished surfaces that are damaged during performance of the work.
- c. Existing coated surfaces that are damaged during performance of the work.

1.10.1.1 Exterior Painting

Includes new surfaces, existing coated surfaces, of the building and appurtenances. Also included are existing coated surfaces made bare by cleaning operations.

1.10.1.2 Interior Painting

Includes new surfaces of the building and appurtenances as indicated and existing coated surfaces made bare by cleaning operations. Where a space or surface is indicated to be painted, include the following items, unless indicated otherwise.

- a. Exposed columns, girders, beams, joists, and metal deck; and
- b. Other contiguous surfaces.

1.10.2 Painting Excluded

Do not paint the following unless indicated otherwise.

- a. Surfaces concealed and made inaccessible by panelboards, fixed ductwork, machinery, and equipment fixed in place.
- b. Surfaces in concealed spaces. Concealed spaces are defined as enclosed spaces above suspended ceilings, furred spaces, attic spaces, crawl spaces, elevator shafts and chases.
- c. Steel to be embedded in concrete.
- d. Copper, stainless steel, aluminum, brass, and lead except existing coated surfaces.
- e. Hardware, fittings, and other factory finished items.

1.10.3 Mechanical and Electrical Painting

Includes field coating of interior and exterior new surfaces.

- a. Where a space or surface is indicated to be painted, include the following items unless indicated otherwise.
 - (1) Exposed piping, conduit, and ductwork;
 - (2) Supports, hangers, air grilles, and registers;
 - (3) Miscellaneous metalwork and insulation coverings.
- b. Do not paint the following, unless indicated otherwise:
 - (1) New zinc-coated, aluminum, and copper surfaces under insulation
 - (2) New aluminum jacket on piping
 - (3) New interior ferrous piping under insulation.

1.10.3.1 Fire Extinguishing Sprinkler Systems

Clean, pretreat, prime, and paint new fire extinguishing sprinkler systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories. Apply coatings to clean, dry surfaces, using clean brushes. Clean the surfaces to remove dust, dirt, rust, and loose mill scale. Immediately after cleaning, provide the metal surfaces with one coat primer per schedules. Shield sprinkler heads with protective covering while painting is in progress. Upon completion of painting, remove protective covering from sprinkler heads. Remove sprinkler heads which have been painted and replace with new sprinkler heads. Provide primed surfaces with the following:

- a. Piping in Unfinished Areas: Provide primed surfaces with one coat of red alkyd gloss enamel applied to a minimum dry film thickness of 1.0 mil in attic spaces, spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and spaces where walls or ceiling are not painted or not constructed of a prefinished material.
- b. Piping in Finished Areas: Provide primed surfaces with two coats of paint to match adjacent surfaces, except provide valves and operating accessories with one coat of red alkyd gloss enamel applied to a minimum dry film thickness of 1.0 mil.

1.10.4 Definitions and Abbreviations

1.10.4.1 Qualification Testing

Qualification testing is the performance of all test requirements listed in the product specification. This testing is accomplished by MPI to qualify each product for the MPI Approved Product List, and may also be accomplished by Contractor's third party testing lab if an alternative to Batch Quality Conformance Testing by MPI is desired.

1.10.4.2 Batch Quality Conformance Testing

Batch quality conformance testing determines that the product provided is the same as the product qualified to the appropriate product specification. This testing shall only be accomplished by MPI testing lab.

1.10.4.3 Coating

A film or thin layer applied to a base material called a substrate. A coating may be a metal, alloy, paint, or solid/liquid suspensions on various substrates (metals, plastics, wood, paper, leather, cloth, etc.). They may be applied by electrolysis, vapor deposition, vacuum, or mechanical means such as brushing, spraying, calendaring, and roller coating. A coating may be applied for aesthetic or protective purposes or both. The term "coating" as used herein includes emulsions, enamels, stains, varnishes, sealers, epoxies, and other coatings, whether used as primer, intermediate, or finish coat. The terms paint and coating are used interchangeably.

1.10.4.4 DFT or dft

Dry film thickness, the film thickness of the fully cured, dry paint or coating.

1.10.4.5 DSD

Degree of Surface Degradation, the MPI system of defining degree of surface degradation. Five (5) levels are generically defined under the Assessment sections in the MPI Maintenance Repainting Manual.

1.10.4.6 EPP

Environmentally Preferred Products, a standard for determining environmental preferability in support of Executive Order 13101.

1.10.4.7 EXT

MPI short term designation for an exterior coating system.

1.10.4.8 INT

MPI short term designation for an interior coating system.

1.10.4.9 micron / microns

The metric measurement for 0.001 mm or one/one-thousandth of a millimeter.

1.10.4.10 mil / mils

The English measurement for 0.001 in or one/one-thousandth of an inch, equal to 25.4 microns or 0.0254 mm.

1.10.4.11 mm

The metric measurement for millimeter, 0.001 meter or one/one-thousandth of a meter.

1.10.4.12 MPI Gloss Levels

MPI system of defining gloss. Seven (7) gloss levels (G1 to G7) are generically defined under the Evaluation sections of the MPI Manuals. Traditionally, Flat refers to G1/G2, Eggshell refers to G3, Semigloss refers to G5, and Gloss refers to G6.

Gloss levels are defined by MPI as follows:

Gloss Level	Description	Units at 60 degrees	Units at 85 degrees
G1	Matte or Flat	0 to 5	10 max
G2	Velvet	0 to 10	10 to 35
G3	Eggshell	10 to 25	10 to 35
G4	Satin	20 to 35	35 min
G5	Semi-Gloss	35 to 70	
G6	Gloss	70 to 85	
G7	High Gloss		

Gloss is tested in accordance with [ASTM D 523](#). Historically, the Government has used Flat (G1 / G2), Eggshell (G3), Semi-Gloss (G5), and Gloss (G6).

1.10.4.13 MPI System Number

The MPI coating system number in each Division found in either the MPI Architectural Painting Specification Manual or the Maintenance Repainting Manual and defined as an exterior (EXT/REX) or interior system (INT/RIN). The Division number follows the CSI Master Format.

1.10.4.14 Paint

See Coating definition.

1.10.4.15 REX

MPI short term designation for an exterior coating system used in repainting projects or over existing coating systems.

1.10.4.16 RIN

MPI short term designation for an interior coating system used in repainting projects or over existing coating systems.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to the [coating](#) specifications and standards referenced in PART 3. Submit [manufacturer's technical data sheets](#) for specified [coatings](#) and solvents. Submit [color](#) samples for approval. Comply with applicable regulations regarding toxic and hazardous materials.

PART 3 EXECUTION

3.1 PROTECTION OF AREAS AND SPACES NOT TO BE PAINTED

Prior to surface preparation and coating applications, remove, mask, or otherwise protect, hardware, hardware accessories, machined surfaces, radiator covers, plates, lighting fixtures, public and private property, and other such items not to be coated that are in contact with surfaces to be coated. Following completion of painting, workmen skilled in the trades involved shall reinstall removed items. Restore surfaces contaminated by coating materials, to original condition and repair damaged items.

3.2 SURFACE PREPARATION

Remove dirt, splinters, loose particles, grease, oil, disintegrated coatings, and other foreign matter and substances deleterious to coating performance as specified for each substrate before application of paint or surface treatments. Oil and grease shall be removed prior to mechanical cleaning. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces. Exposed ferrous metals such as nail heads on or in contact with surfaces to be painted with water-thinned paints, shall be spot-primed with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas.

3.2.1 Additional Requirements for Preparation of Surfaces With Existing Coatings

Before application of coatings, perform the following on surfaces covered by soundly-adhered coatings, defined as those which cannot be removed with a putty knife:

- a. Test existing finishes for lead before sanding, scraping, or removing. If lead is present, refer to paragraph Toxic Materials.
- b. Wipe previously painted surfaces to receive solvent-based coatings, except stucco and similarly rough surfaces clean with a clean, dry cloth saturated with mineral spirits, [ASTM D 235](#). Allow surface to dry. Wiping shall immediately precede the application of the first coat of any coating, unless specified otherwise.
- c. Sand existing glossy surfaces to be painted to reduce gloss. Brush, and wipe clean with a damp cloth to remove dust.
- d. The requirements specified are minimum. Comply also with the [application instructions](#) of the paint manufacturer.
- e. Previously painted surfaces specified to be repainted shall be thoroughly cleaned of all grease, dirt, dust or other foreign matter.

- f. Blistering, cracking, flaking and peeling or other deteriorated coatings shall be removed.
- g. Chalk shall be removed so that when tested in accordance with [ASTM D 4214](#), the chalk resistance rating is no less than 8.
- h. Slick surfaces shall be roughened. Damaged areas such as, but not limited to, nail holes, cracks, chips, and spalls shall be repaired with suitable material to match adjacent undamaged areas.
- i. Edges of chipped paint shall be feather edged and sanded smooth.
- j. Rusty metal surfaces shall be cleaned as per SSPC requirements. Solvent, mechanical, or chemical cleaning methods shall be used to provide surfaces suitable for painting.
- k. New, proposed coatings shall be compatible with existing coatings.

3.2.2 Existing Coated Surfaces with Minor Defects

Sand, spackle, and treat minor defects to render them smooth. Minor defects are defined as scratches, nicks, cracks, gouges, spalls, alligatoring, chalking, and irregularities due to partial peeling of previous coatings. Remove chalking by sanding so that when tested in accordance with [ASTM D 4214](#), the chalk rating is not less than 8.

3.2.3 Removal of Existing Coatings

Remove existing coatings from the following surfaces:

- a. Surfaces containing large areas of minor defects;
- b. Surfaces containing more than 20 percent peeling area; and
- c. Surfaces designated by the Contracting Officer, such as surfaces where rust shows through existing coatings.

3.2.4 Substrate Repair

- a. Repair substrate surface damaged during coating removal;
- b. Sand edges of adjacent soundly-adhered existing coatings so they are tapered as smooth as practical to areas involved with coating removal; and
- c. Clean and prime the substrate as specified.

3.3 PREPARATION OF METAL SURFACES

3.3.1 Existing and New Ferrous Surfaces

- a. Ferrous Surfaces including Shop-coated Surfaces and Small Areas That Contain Rust, Mill Scale and Other Foreign Substances: Solvent cleaner or detergent wash in accordance with [SSPC SP 1](#) to remove oil and grease. Where shop coat is missing or damaged, clean according to [SSPC SP 2](#), [SSPC SP 3](#), [SSPC SP 6/NACE No.3](#), or [SSPC SP 10/NACE No. 2](#). Brush-off blast remaining surface in accordance with [SSPC SP 7/NACE No.4](#). Shop-coated ferrous surfaces shall be protected from corrosion by treating and touching up corroded areas immediately upon detection.

- b. Surfaces With More Than 20 Percent Rust, Mill Scale, and Other Foreign Substances: Clean entire surface in accordance with [SSPC SP 6/NACE No.3](#) /[SSPC SP 12/NACE No.5](#) WJ-3 [SSPC SP 10/NACE No. 2](#)/[SSPC SP 12/NACE No.5](#) WJ-2.

3.3.2 Final Ferrous Surface Condition:

For tool cleaned surfaces, the requirements are stated in [SSPC SP 2](#) and [SSPC SP 3](#). As a visual reference, cleaned surfaces shall be similar to photographs in [SSPC VIS 3](#).

For abrasive blast cleaned surfaces, the requirements are stated in [SSPC SP 7/NACE No.4](#), [SSPC SP 6/NACE No.3](#), and [SSPC SP 10/NACE No. 2](#). As a visual reference, cleaned surfaces shall be similar to photographs in [SSPC VIS 1](#).

3.3.3 Galvanized Surfaces

- a. New or Existing Galvanized Surfaces With Only Dirt and Zinc Oxidation Products: Clean with solvent, steam, or non-alkaline detergent solution in accordance with [SSPC SP 1](#). If the galvanized metal has been passivated or stabilized, the coating shall be completely removed by brush-off abrasive blast. New galvanized steel to be coated shall not be "passivated" or "stabilized" If the absence of hexavalent stain inhibitors is not documented, test as described in [ASTM D 6386](#), Appendix X2, and remove by one of the methods described therein.
- b. Galvanized with Slight Coating Deterioration or with Little or No Rusting: Water jetting to [SSPC SP 12/NACE No.5](#) WJ3 to remove loose coating from surfaces with less than 20 percent coating deterioration and no blistering, peeling, or cracking. Use inhibitor as recommended by the coating manufacturer to prevent rusting.
- c. Galvanized With Severe Deteriorated Coating or Severe Rusting: Spot abrasive blast rusted areas as described for steel in [SSPC SP 6/NACE No.3](#), and waterjet to [SSPC SP 12/NACE No.5](#), WJ3 to remove existing coating.

3.3.4 Non-Ferrous Metallic Surfaces

Aluminum and aluminum-alloy, lead, copper, and other nonferrous metal surfaces.

Surface Cleaning: Solvent clean in accordance with [SSPC SP 1](#) and wash with mild non-alkaline detergent to remove dirt and water soluble contaminants.

3.3.5 Terne-Coated Metal Surfaces

Solvent clean surfaces with mineral spirits, [ASTM D 235](#). Wipe dry with clean, dry cloths.

3.3.6 Existing Surfaces with a Bituminous or Mastic-Type Coating

Remove chalk, mildew, and other loose material by washing with a solution of $\frac{1}{2}$ cup trisodium phosphate, $\frac{1}{4}$ cup household detergent, one quart 5 percent sodium hypochlorite solution and 3 quarts of warm water.

3.4 PREPARATION OF CONCRETE AND CEMENTITIOUS SURFACE

3.4.1 Concrete and Masonry

- a. Curing: Concrete, stucco and masonry surfaces shall be allowed to cure at least 30 days before painting, except concrete slab on grade, which shall be allowed to cure 90 days before painting.
- b. Surface Cleaning: Remove the following deleterious substances.
 - (1) Dirt, Chalking, Grease, and Oil: Wash new surfaces with a solution composed of 1/2 cup trisodium phosphate, 1/4 cup household detergent, and 4 quarts of warm water. Then rinse thoroughly with fresh water. For large areas, water blasting may be used.
 - (2) Fungus and Mold: Wash new, existing coated, and existing uncoated surfaces with a solution composed of 1/2 cup trisodium phosphate, 1/4 cup household detergent, 1 quart 5 percent sodium hypochlorite solution and 3 quarts of warm water. Rinse thoroughly with fresh water.
 - (3) Paint and Loose Particles: Remove by wire brushing.
 - (4) Efflorescence: Remove by scraping or wire brushing followed by washing with a 5 to 10 percent by weight aqueous solution of hydrochloric (muriatic) acid. Do not allow acid to remain on the surface for more than five minutes before rinsing with fresh water. Do not acid clean more than 4 square feet of surface, per workman, at one time.
- c. Cosmetic Repair of Minor Defects: Repair or fill mortar joints and minor defects, including but not limited to spalls, in accordance with manufacturer's recommendations and prior to coating application.
- d. Allowable Moisture Content: Latex coatings may be applied to damp surfaces, but not to surfaces with droplets of water. Do not apply epoxies to damp vertical surfaces as determined by ASTM D 4263 or horizontal surfaces that exceed 3 lbs of moisture per 1000 square feet in 24 hours as determined by ASTM F 1869. In all cases follow manufacturers recommendations. Allow surfaces to cure a minimum of 30 days before painting.

3.4.2 Gypsum Board, Plaster, and Stucco

- a. Surface Cleaning: Plaster and stucco shall be clean and free from loose matter; gypsum board shall be dry. Remove loose dirt and dust by brushing with a soft brush, rubbing with a dry cloth, or vacuum-cleaning prior to application of the first coat material. A damp cloth or sponge may be used if paint will be water-based.
- b. Repair of Minor Defects: Prior to painting, repair joints, cracks, holes, surface irregularities, and other minor defects with patching plaster or spackling compound and sand smooth.
- c. Allowable Moisture Content: Latex coatings may be applied to damp surfaces, but not surfaces with droplets of water. Do not apply epoxies to damp surfaces as determined by ASTM D 4263. New plaster to be coated shall have a maximum moisture content of 8 percent, when measured in accordance with ASTM D 4444, Method A, unless otherwise

authorized. In addition to moisture content requirements, allow new plaster to age a minimum of 30 days before preparation for painting.

3.5 APPLICATION

3.5.1 Coating Application

Painting practices shall comply with applicable federal, state and local laws enacted to insure compliance with Federal Clean Air Standards. Apply coating materials in accordance with **SSPC PA 1**. **SSPC PA 1** methods are applicable to all substrates, except as modified herein.

At the time of application, paint shall show no signs of deterioration. Uniform suspension of pigments shall be maintained during application.

Unless otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. Use trigger operated spray nozzles for water hoses. Rollers for applying paints and enamels shall be of a type designed for the coating to be applied and the surface to be coated. Wear protective clothing and respirators when applying oil-based paints or using spray equipment with any paints.

Paints, except water-thinned types, shall be applied only to surfaces that are completely free of moisture as determined by sight or touch.

Thoroughly work coating materials into joints, crevices, and open spaces. Special attention shall be given to insure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces.

Each coat of paint shall be applied so dry film shall be of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Hiding shall be complete.

Touch up damaged coatings before applying subsequent coats. Interior areas shall be broom clean and dust free before and during the application of coating material.

Apply paint to new fire extinguishing sprinkler systems including valves, piping, conduit, hangers, supports, miscellaneous metal work, and accessories. Shield sprinkler heads with protective coverings while painting is in progress. Remove sprinkler heads which have been painted and replace with new sprinkler heads. For piping in unfinished spaces, provide primed surfaces with one coat of red alkyd gloss enamel to a minimum dry film thickness of 1.0 mil. Unfinished spaces include attic spaces, spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and space where walls or ceiling are not painted or not constructed of a prefinished material. For piping in finished areas, provide prime surfaces with two coats of paint to match adjacent surfaces, except provide valves and operating accessories with one coat of red alkyd gloss enamel. Upon completion of painting, remove protective covering from sprinkler heads.

- a. Drying Time: Allow time between coats, as recommended by the coating manufacturer, to permit thorough drying, but not to present topcoat adhesion problems. Provide each coat in specified condition to receive next coat.

- b. Primers, and Intermediate Coats: Do not allow primers or intermediate coats to dry more than 30 days, or longer than recommended by manufacturer, before applying subsequent coats. Follow manufacturer's recommendations for surface preparation if primers or intermediate coats are allowed to dry longer than recommended by manufacturers of subsequent coatings. Each coat shall cover surface of preceding coat or surface completely, and there shall be a visually perceptible difference in shades of successive coats.
- c. Finished Surfaces: Provide finished surfaces free from runs, drops, ridges, waves, laps, brush marks, and variations in colors.
- d. Thermosetting Paints: Topcoats over thermosetting paints (epoxies and urethanes) should be applied within the overcoating window recommended by the manufacturer.

3.5.2 Mixing and Thinning of Paints

Reduce paints to proper consistency by adding fresh paint, except when thinning is mandatory to suit surface, temperature, weather conditions, application methods, or for the type of paint being used. Obtain written permission from the Contracting Officer to use thinners. The written permission shall include quantities and types of thinners to use.

When thinning is allowed, paints shall be thinned immediately prior to application with not more than 1 pint of suitable thinner per gallon. The use of thinner shall not relieve the Contractor from obtaining complete hiding, full film thickness, or required gloss. Thinning shall not cause the paint to exceed limits on volatile organic compounds. Paints of different manufacturers shall not be mixed.

3.5.3 Two-Component Systems

Two-component systems shall be mixed in accordance with manufacturer's instructions. Any thinning of the first coat to ensure proper penetration and sealing shall be as recommended by the manufacturer for each type of substrate.

3.5.4 Coating Systems

- a. Systems by Substrates: Apply coatings that conform to the respective specifications listed in the following Tables:

Table

Division 3.	Exterior Concrete Paint Table
Division 4.	Exterior Concrete Masonry Units Paint Table
Division 5.	Exterior Metal, Ferrous and Non-Ferrous Paint Table
Division 6.	Exterior Wood; Dressed Lumber, Paneling, Decking, Shingles Paint Table
Division 9:	Exterior Stucco Paint Table
Division 10.	Exterior Cloth Coverings and Bituminous Coated Surfaces Paint Table
Division 3.	Interior Concrete Paint Table
Division 4.	Interior Concrete Masonry Units Paint Table
Division 5.	Interior Metal, Ferrous and Non-Ferrous Paint Table
Division 6.	Interior Wood Paint Table
Division 9:	Interior Plaster, Gypsum Board, Textured Surfaces

Paint Table

- b. Minimum Dry Film Thickness (DFT): Apply paints, primers, varnishes, enamels, undercoats, and other coatings to a minimum dry film thickness of 1.5 mil each coat unless specified otherwise in the Tables. Coating thickness where specified, refers to the minimum dry film thickness.
- c. Coatings for Surfaces Not Specified Otherwise: Coat surfaces which have not been specified, the same as surfaces having similar conditions of exposure.
- d. Existing Surfaces Damaged During Performance of the Work, Including New Patches In Existing Surfaces: Coat surfaces with the following:
 - (1) One coat of primer.
 - (2) One coat of undercoat or intermediate coat.
 - (3) One topcoat to match adjacent surfaces.
- e. Existing Coated Surfaces To Be Painted: Apply coatings conforming to the respective specifications listed in the Tables herein, except that pretreatments, sealers and fillers need not be provided on surfaces where existing coatings are soundly adhered and in good condition. Do not omit undercoats or primers.

3.6 COATING SYSTEMS FOR METAL

Apply coatings of Tables in Division 5 for Exterior and Interior.

- a. Apply specified ferrous metal primer on the same day that surface is cleaned, to surfaces that meet all specified surface preparation requirements at time of application.
- b. Inaccessible Surfaces: Prior to erection, use one coat of specified primer on metal surfaces that will be inaccessible after erection.
- c. Shop-primed Surfaces: Touch up exposed substrates and damaged coatings to protect from rusting prior to applying field primer.
- d. Surface Previously Coated with Epoxy or Urethane: Apply MPI 101, 1.5 mils DFT immediately prior to application of epoxy or urethane coatings.
- e. Pipes and Tubing: The semitransparent film applied to some pipes and tubing at the mill is not to be considered a shop coat, but shall be overcoated with the specified ferrous-metal primer prior to application of finish coats.
- f. Exposed Nails, Screws, Fasteners, and Miscellaneous Ferrous Surfaces. On surfaces to be coated with water thinned coatings, spot prime exposed nails and other ferrous metal with latex primer MPI 107.

3.7 COATING SYSTEMS FOR CONCRETE AND CEMENTITIOUS SUBSTRATES

Apply coatings of Tables in Division 3, 4 and 9 for Exterior and Interior.

3.8 PIPING IDENTIFICATION

Piping Identification, Including Surfaces In Concealed Spaces: Provide in

accordance with MIL-STD-101. Place stenciling in clearly visible locations. On piping not covered by MIL-STD-101, stencil approved names or code letters, in letters a minimum of 1/2 inch high for piping and a minimum of 2 inches high elsewhere. Stencil arrow-shaped markings on piping to indicate direction of flow using black stencil paint.

3.9 INSPECTION AND ACCEPTANCE

In addition to meeting previously specified requirements, demonstrate mobility of moving components, including swinging and sliding doors, cabinets, and windows with operable sash, for inspection by the Contracting Officer. Perform this demonstration after appropriate curing and drying times of coatings have elapsed and prior to invoicing for final payment.

3.10 WASTE MANAGEMENT

As specified in the Waste Management Plan and as follows. Do not use kerosene or any such organic solvents to clean up water based paints. Properly dispose of paints or solvents in designated containers. Close and seal partially used containers of paint to maintain quality as necessary for reuse. Store in protected, well-ventilated, fire-safe area at moderate temperature. Place materials defined as hazardous or toxic waste in designated containers. Coordinate with manufacturer for take-back program. Set aside scrap to be returned to manufacturer for recycling into new product. When such a service is not available, local recyclers shall be sought after to reclaim the materials. Set aside extra paint for future color matches or reuse by the Government. Where local options exist for leftover paint recycling, collect all waste paint by type and provide for delivery to recycling or collection facility for reuse by local organizations.

3.11 PAINT TABLES

All DFT's are minimum values. Use only materials with a GPS green check mark having a minimum MPI "Environmentally Friendly" E1, E2 or E3 rating based on VOC (EPA Method 24) content levels. Use only interior paints and coatings that meet VOC requirements of LEED low emitting materials credit. Acceptable products are listed in the MPI Green Approved Products List, available at <http://www.specifygreen.com/APL/ProductIdxByMPInum.asp>.

3.11.1 EXTERIOR PAINT TABLES

DIVISION 3: EXTERIOR CONCRETE PAINT TABLE

- A. New and uncoated existing and Existing, previously painted concrete; vertical surfaces, including undersides of balconies and soffits but excluding tops of slabs:

1. Latex

New; MPI EXT 3.1A-G5 (Semigloss) /	Existing; MPI EXT 3.1A-G5 (Semigloss)
Primer:	Intermediate: Topcoat:
MPI 11	MPI 11 MPI 11
System DFT:	3.5 mils

Primer as recommended by manufacturer. Topcoat: Coating to match adjacent surfaces.

DIVISION 4: EXTERIOR CONCRETE MASONRY UNITS PAINT TABLE

A. New and Existing concrete masonry on uncoated surface:

1. Latex

New; MPI EXT 4.2A-G5 (Semigloss) / Existing; MPI REX 4.2A-G5 (Semigloss)
 Block Filler: Primer: Intermediate: Topcoat:
 MPI 4 N/A MPI 11 MPI 11
 System DFT: 11 mils

DIVISION 5: EXTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE

STEEL / FERROUS SURFACES

A. Existing steel that has been spot-blasted to SSPC SP 6/NACE No.3:

1. Surface previously coated with alkyd or latex:

Waterborne Light Industrial Coating
 MPI REX 5.1C-G5 (Semigloss)
 Spot Primer: Intermediate: Topcoat:
 MPI 79 MPI 163 MPI 163
 System DFT: 5 mils

3.11.2 INTERIOR PAINT TABLESDIVISION 3: INTERIOR CONCRETE PAINT TABLE

A. Existing, previously painted Concrete, vertical surfaces, not specified otherwise:

1. High Performance Architectural Latex

New; MPI INT 3.1C-G3 (Eggshell) / Existing; MPI RIN 3.1J-G3 (Eggshell)
 Primer: Intermediate: Topcoat:
 MPI 50 MPI 139 MPI 139
 System DFT: 4 mils

B. Existing, previously painted Concrete in Mechanical Rooms and other high-humidity areas not otherwise specified except floors:

1. Waterborne Light Industrial Coating

New; MPI INT 3.1L-G3(Eggshell) / Existing; MPI RIN 3.1C-G3(Eggshell)
 Primer: Intermediate: Topcoat:
 MPI 151 MPI 151 MPI 151
 System DFT: 4.8 mils

C. New and uncoated existing and Existing, previously painted concrete floors in following areas mechanical rooms, utility closets:

1. Epoxy

New; MPI INT 3.2C-G6 (Gloss) / Existing; MPI RIN 3.2C-G6 (Gloss)
 Primer: Intermediate: Topcoat:
 MPI 77 MPI 77 MPI 77
 System DFT: 5 mils

Note: Primer may be reduced for penetration per manufacturer's instructions.

DIVISION 3: INTERIOR CONCRETE PAINT TABLE

DIVISION 4: INTERIOR CONCRETE MASONRY UNITS PAINT TABLE

A. Existing, previously painted Concrete masonry:

- 1. MPI RIN 4.2K-G3 (Eggshell)

Spot Primer:	Intermediate:	Topcoat:
MPI 50	MPI 139	MPI 139
System DFT: 4.5 mils		

B. Existing, previously painted, concrete masonry units in utility closets and other high humidity areas unless otherwise specified:

- 1. Epoxy

MPI RIN 4.2D-G6 (Gloss)		
Spot Primer:	Intermediate:	Topcoat:
MPI 77	MPI 77	MPI 77
System DFT: 5 mils		

DIVISION 5: INTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE

INTERIOR STEEL / FERROUS SURFACES

A. Metal, Mechanical, Electrical, Fire extinguishing sprinkler systems including valves, conduit, hangers, supports, Surfaces adjacent to painted surfaces (Match surrounding finish), and miscellaneous metal items not otherwise specified except floors, hot metal surfaces, and new prefinished equipment:

- 1. Alkyd

MPI INT 5.1E-G5 (Semigloss)		
Primer:	Intermediate:	Topcoat:
MPI 79	MPI 47	MPI 47
System DFT: 5.25 mils		

B. Metal in toilets, restrooms, and other high-humidity areas not otherwise specified except floors, hot metal surfaces, and new prefinished equipment:

- 1. Alkyd

MPI INT 5.1E-G5 (Semigloss)		
Primer:	Intermediate:	Topcoat:
MPI 79	MPI 47	MPI 47
System DFT: 5.25 mils		

C. Ferrous metal in concealed damp spaces or in exposed areas having unpainted adjacent surfaces.

- 1. Aluminum Paint

MPI INT 5.1M		
Primer:	Intermediate:	Topcoat:
MPI 79	MPI 1	MPI 1
System DFT: 4.25 mils		

D. Miscellaneous non-ferrous metal items not otherwise specified except floors, hot metal surfaces, and new prefinished equipment. Match surrounding finish:

INTERIOR STEEL / FERROUS SURFACES

- 1. Alkyd
 - MPI INT 5.4J-G5 (Semigloss)
 - Primer: Intermediate: Topcoat:
 - MPI 95 MPI 47 MPI 47
 - System DFT: 5 mils

DIVISION 6: INTERIOR WOOD PAINT TABLE

A. Existing, previously painted Wood and plywood not otherwise specified:

- 1. Institutional Low Odor / Low VOC Latex
 - Existing; MPI RIN 6.4D-G5 (Semigloss)
 - Primer: Intermediate: Topcoat:
 - MPI 39 MPI 147 MPI 147
 - System DFT: 4 mils

B. New Wood and Plywood, except floors; natural finish or stained:

- 1. Stained, oil-modified polyurethane
 - New; MPI INT 6.4E-G4 / Existing; MPI RIN 6.4G-G4
 - Stain: Primer: Intermediate: Topcoat:
 - MPI 90 MPI 57 MPI 57 MPI 57
 - System DFT: 4 mils

C. New and Existing, previously finished or stained Wood Doors; Natural Finish or Stained:

- 1. Stained, oil-modified polyurethane
 - New; MPI INT 6.3E-G4 / Existing; MPI RIN 6.3E-G4
 - Stain: Primer: Intermediate: Topcoat:
 - MPI 90 MPI 57 MPI 57 MPI 57
 - System DFT: 4 mils

Note: Sand between all coats per manufacturers recommendations.

DIVISION 9: INTERIOR PLASTER, GYPSUM BOARD, TEXTURED SURFACES PAINT TABLE

A. New and Existing, previously painted Plaster and Wallboard not otherwise specified:

- 1. New; MPI INT 9.2M-G3 (Eggshell) / Existing; MPI RIN 9.2M-G3 (Eggshell)
 - Primer: Intermediate: Topcoat:
 - MPI 50 MPI 145 MPI 145
 - System DFT: 4 mils

B. New and Existing, previously painted Plaster and Wallboard in toilets, restrooms, shower areas, and other high humidity areas not otherwise specified:

- 1. Epoxy
 - New; MPI INT 9.2E-G6 (Gloss) / Existing; MPI RIN 9.2D-G6 (Gloss)
 - Primer: Intermediate: Topcoat:
 - MPI 50 MPI 77 MPI 77
 - System DFT: 4 mils

-- End of Section --

SECTION 10 14 02

INTERIOR SIGNAGE

02/09

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

36 CFR 1191

Americans with Disabilities Act (ADA)
Accessibility Guidelines for Buildings and
Facilities

1.2 SYSTEM DESCRIPTION

Submit samples of each of the following sign types showing typical quality, workmanship and color: Standard Room sign, Sign with integral window; submit interior and exterior signage samples of the design, detail, sizes, types, and message content shown on the detail drawings, attachments, signage placement schedule (as applicable), conforming to the requirements specified, and placed at the locations indicated. The samples may be installed in the work, provided each sample is identified and location recorded. Submit drawings showing elevations of each type of sign, dimensions, details and methods of mounting or anchoring, mounting height, shape and thickness of materials, and details of construction. A sign schedule showing the location, each sign type, and message shall be included. Signs shall be complete with lettering, framing as detailed, and related components for a complete installation. Signage shall be obtained from a single manufacturer with edges and corners of finished letterforms and graphics true and clean.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings
Sign Schedule

SD-03 Product Data

Installation

SD-04 Samples

Interior and Exterior Signage

SD-10 Operation and Maintenance Data

Approved Manufacturer's Instructions
Protection and Cleaning

1.4 DELIVERY, STORAGE, AND HANDLING

Materials shall be packaged to prevent damage and deterioration during shipment, handling, storage and installation. Product shall be delivered to the jobsite in manufacturer's original packaging and stored in a clean, dry area in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Signs, plaques, and dimensional letters shall be the standard product of a manufacturer regularly engaged in the manufacture of such products that essentially duplicate signs that have been in satisfactory use at least 2 years prior to bid opening.

2.2 ROOM IDENTIFICATION SIGNAGE SYSTEM

2.2.1 Standard Room Signs

Signs shall consist of extruded engineered PVC/Acrylic alloy with integral background colors and high impact resistance and shall conform to the following:

- a. Panel depth: 0.25 inch thickness
- b. Construction: One-piece; added on or engraved characters not acceptable.
- c. Panel appearance: high contrast semi-matte colors for graphics, copy, and background. All integral colors shall be UV stabilized resins utilizing industrial grade pigments.
- d. Surface texture: Matte non-glare
- e. Sign size, shape, font, and layout conform to that which is indicated in the drawings.
- f. Integral Windows: Where indicated provide the following:
 1. Subsurface, lateral slot, separate changeable graphic insert plaque construction in compliance with indicated materials, thickness, finish, colors, designs, shapes, sizes, and details.
 2. Graphic Insert: Die-cut paper as supplied by manufacturer and laser printed in accordance with manufacturer's proprietary insert template software.
 3. Visible window opening size and location as indicated on drawings
 4. Insert Format:
1 1/4 inch x sign width
Lens: Clear, 0.080 inch thick, matte first surface.

g. Signs located on the exterior of the building shall be rated for exterior use and shall not warp, fade, or degrade in any way due to exposure to sunlight, heat, cold and/or moisture.

2.2.2 Type of Mounting For Signs

a. All mounting materials shall be materials that are approved by the sign manufacturer for the mounting surface.

b. Surface mounted on painted concrete masonry: Sign shall be mounted with 1/16 inch thick vinyl foam tape and silicone adhesive.

c. Surface mounted on unpainted brick masonry: Sign shall be mounted with 1/16 inch thick vinyl foam tape rated for exterior installation and silicone adhesive.

2.2.3 Character Proportions and Heights

Letters and numbers on signs conform to 36 CFR 1191.

2.2.4 Raised and Braille Characters and Pictorial Symbol Signs (Pictograms)

Raised letters and numbers on signs shall conform to 36 CFR 1191.

2.3 FABRICATION

a. Comply with requirements indicated for materials, thickness, finishes, colors, designs, shapes, sizes, and details of construction.

b. Preassemble signs in the shop to the greatest extent possible to minimize field assembly. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation in a location not exposed to view after final assembly.

c. Conceal fasteners.

PART 3 EXECUTION

3.1 INSTALLATION

Signs shall be installed plumb and true and in accordance with approved manufacturer's instructions at locations shown on the drawings. Mounting height and mounting location shall conform to 36 CFR 1191. Signs on doors or other surfaces shall not be installed until finishes on such surfaces have been installed. Signs installed on glass surfaces shall be installed with matching blank back-up plates in accordance with manufacturer's instructions and requirements of Section 01 78 23 OPERATION AND MAINTENANCE DATA, package 1.

3.1.1 Anchorage

Anchorage shall be in accordance with approved manufacturer's instructions. Where recommended by signage manufacturer, foam tape pads may be used for anchorage. Foam tape pads shall be minimum 1/16 inch thick closed cell vinyl foam with adhesive backing. Adhesive shall be transparent, long aging, high tech formulation on two sides of the vinyl foam. Adhesive surfaces shall be protected with a 5 mil green flatstock treated with silicone. Foam pads shall be sized for the signage in accordance with signage manufacturer's recommendations.

3.1.2 Protection and Cleaning

Protect the work against damage during construction.

-- End of Section --

SECTION 10 21 13

TOILET COMPARTMENTS

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF-45 (2003; Reaffirmed 2009) Designation System for Aluminum Finishes

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M (2009) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 167 (2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

ASTM A 385/A 385M (2009) Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)

ASTM A 653/A 653M (2009a) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM D 1972 (1997; R 2005) Standard Practice for Generic Marking of Plastic Products

ASTM D 6386 (2010) Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting

INTERNATIONAL CODE COUNCIL (ICC)

ICC/ANSI A117.1 (2009) Accessible and Usable Buildings and Facilities

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-60003 (Basic) Partitions, Toilet, Complete

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

36 CFR 1191

Americans with Disabilities Act (ADA)
Accessibility Guidelines for Buildings and
Facilities

1.2 SYSTEM DESCRIPTION

Provide a complete and usable **toilet partition system**, including toilet enclosures, system of panels, hardware, and support components. Furnish the partition system from a single manufacturer, with a standard product as shown in the most recent catalog data. Submit **Fabrication Drawings** for metal toilet partitions consisting of fabrication and assembly details to be performed in the factory. Submit manufacturer's **Cleaning and Maintenance Instructions** with Fabrication Drawings for review.

1.2.1 Plastic Identification

Verify that plastic products to be incorporated into the project are labeled in accordance with **ASTM D 1972**. Where products are not labeled, provide product data indicating polymeric information in the Operation and Maintenance Manual.

- a. Type 1: Polyethylene Terephthalate (PET, PETE).
- b. Type 2: High Density Polyethylene (HDPE).
- c. Type 3: Vinyl (Polyvinyl Chloride or PVC).
- d. Type 4: Low Density Polyethylene (LDPE).
- e. Type 5: Polypropylene (PP).
- f. Type 6: Polystyrene (PS).
- g. Type 7: Other. Use of this code indicates that the package in question is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination.

1.3 SUBMITTALS

Submit the following in accordance with Section **01 33 00 SUBMITTAL PROCEDURES**:

SD-02 Shop Drawings**Fabrication Drawings**
Installation Drawings

Drawings showing plans, elevations, details of construction, hardware, reinforcing, fittings, mountings, and anchorings for metal partitions and urinal screens. Installation drawings as specified.

SD-03 Product Data**Toilet Partition System**
Cleaning and Maintenance Instructions

Colors And Finishes
Galvanized Steel Sheet
Sound Deadening Cores
Partition Panels and Doors
Anchoring Devices and Fasteners
Hardware and Fittings
Brackets
Door Hardware
Floor-Anchored Partitions
Overhead-Braced Partitions

Manufacturer's technical data and catalog cuts including installation and cleaning instructions.

Toilet Enclosures
Urinal Screens;

SD-04 Samples

Colors and Finishes

Manufacturer's standard color charts and color samples.

Partition Panels

Three samples showing a finished edge on two adjacent sides and core construction, each not less than 12-inch square

Hardware and Fittings Anchoring Devices and Fasteners

Three samples of each item. Approved hardware samples may be installed in the work if properly identified.

SD-07 Certificates

Certification

Documentation of product quality, as specified.

SD-10 Operation and Maintenance Data

Waste Management Plastic Identification

When not labeled, identify types in Operation and Maintenance Manual.

1.4 REGULATORY REQUIREMENTS

Conform to ICC/ANSI A117.1 code for access for the handicapped operation of toilet compartment door and hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver materials in the manufacturer's original unopened packages with the brand, item identification, and project reference clearly marked. Store components in a dry location that is adequately ventilated; free from dust, water, other contaminants, and damage during delivery, storage, and construction.

1.6 WARRANTY

Provide [Certification](#) or warranties that metal toilet partitions will be free of defects in materials, fabrication, finish, and installation and will remain so for a period of not less than 15 years after completion.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 [Galvanized Steel Sheet](#)

Provide galvanized steel sheet cold-rolled, stretcher-level, commercial quality material, conforming to [ASTM A 653/A 653M](#). Conform surface preparation of material for painting to [ASTM D 6386](#), Method A.

2.1.2 [Sound-Deadening Cores](#)

Provide sound deadening consisting of treated kraft paper honeycomb cores with a cell size of not more than [1 inch](#). Resin-material content shall weigh not less than 11 percent of the finished core weight. Expanded cores shall be faced on both sides with kraft paper.

2.1.3 [Anchoring Devices and Fasteners](#)

Provide steel anchoring devices and fasteners hot-dipped galvanized after fabrication, in conformance with [ASTM A 385/A 385M](#) and [ASTM A 123/A 123M](#). Conceal all galvanized anchoring devices.

2.1.4 [Brackets](#)

Wall brackets shall be two-ear panel brackets, T-style, [1-inch](#) stock. Provide stirrup style panel-to-pilaster brackets.

2.1.5 [Hardware and Fittings](#)

2.1.5.1 General Requirements

Conform hardware for the toilet partition system to [CID A-A-60003](#) for the specified type and style of partitions. Provide hardware finish highly resistant to alkalis, urine, and other common toilet room acids. Comply latching devices and hinges for handicap compartments with [36 CFR 1191](#); provide stainless steel devices and hinges with door latches that operate without either tight grasping or twisting of the wrist of the operator.

- a. Corrosion-resistant steel shall conform to [ASTM A 167](#), Type 304.

2.1.5.2 Finishes

- a. Corrosion-resistant steel shall have a No. 4 finish.
- b. Exposed fasteners shall match the hardware and fittings.

2.1.6 [Door Hardware](#)

2.1.6.1 Hinges

Hinges shall be adjustable to hold in-swinging doors open at any angle up to 90 degrees and outswinging doors to 10 degrees. Provide

self-lubricating hinges with the indicated swing. Hinges shall be the cutout-insert type and have the following type of return movement:

- a. Gravity return movement

2.1.6.2 Latch and Pull

Latch and pull shall be a combination rubber-faced door strike and keeper equipped with emergency access.

2.1.6.3 Coat Hooks

Coat hooks shall be combination units with hooks and rubber tipped pins.

2.2 PARTITION PANELS AND DOORS

Provide [partition panels](#) and doors not less than [1 inch](#) thick with face sheets not less than [0.0396 inch](#) thick.

2.2.1 Toilet Enclosures

Conform toilet enclosures to [CID A-A-60003](#), Type I, Style C, overhead braced. Furnish width, length, and height of toilet enclosures as shown. Provide a width of [1 inch](#). Finish surface of panels shall be solid polyethylene, Finish 5; water resistant; graffiti resistant; non-absorbent; [1/4 inch](#) radius beveled edges. This item may contain post-consumer or post-industrial recycled content. Reinforce panels indicated to receive toilet paper holders or grab bars for mounting of the items required. Provide grab bars to withstand a bending stress, shear stress, shear force, and a tensile force induced by [250 lbf](#). Grab bars shall not rotate within their fittings.

2.2.2 Urinal Screens

Conform urinal screens to [CID A-A-60003](#), Type III, wall hung. Provide finish for surface of screens as solid polyethylene, Finish 5; water resistant; graffiti resistant; non-absorbent; with plastic face sheets permanently fused to plastic core; [1/4 inch](#) radius beveled edges. Furnish width and height of urinal screens as shown. Provide thickness of [1 inch](#). Secure wall hung urinal screens with [42 inch](#) long, continuous flanges. Fabricate screens from the same types of panels and pilasters as the toilet partitions. Use corrosion-resistant steel fittings and fasteners.

2.3 FLOOR-ANCHORED PARTITIONS

Pilasters shall be not less than [1-1/4 inch](#) thick with face sheets not less than [0.0635 inch](#) thick. Provide anchoring device at the bottom of the pilaster consisting of a steel bar not less than [1/2 by 7/8 inch](#) welded to the reinforced face sheets and having not less than two [3/8 inch](#) round anchorage devices for securing to the floor slab. Provide anchorage devices complete with threaded rods, expansion shields, lock washers, and leveling-adjustment nuts. Trim piece at the floor shall be [3 inch](#) high and fabricated from not less than [0.030 inch](#) thick corrosion-resistant steel.

2.4 OVERHEAD-BRACED PARTITIONS

Pilasters shall be not less than [1-1/4 inch](#) thick with face sheets not less than [0.0393 inch](#) thick. Provide anchoring device at the bottom of the

pilaster consisting of a channel-shaped floor stirrup fabricated from not less than 0.0635 inch thick material and a leveling bolt. Secure the stirrup to the pilaster with not less than a 3/16 inch bolt and nut after the pilaster is leveled. Secure the stirrup to the floor with not less than two lead expansion shields and sheetmetal screws. Fabricate overhead brace from a continuous extruded aluminum tube not less than 1 inch wide by 1-1/2 inch high, 0.125-inch wall thickness. Finish shall be AA-C22A31 in accordance with AA DAF-45. Set and secure brace into the top of each pilaster. Fabricate 3 inch high trim piece at the floor from not less than 0.030 inch thick corrosion-resistant steel.

2.5 PILASTER SHOES

Provide shoes at pilasters to conceal floor-mounted anchorage. Pilaster shoes shall be stainless steel. Height shall be 3 inches.

2.6 HARDWARE

Hardware for the toilet partition system shall conform to CID A-A-60003 for the specified type and style of partitions. Hardware shall be pre-drilled by manufacturer. Hardware finish shall be highly resistant to alkalis, urine, and other common toilet room acids. Hardware shall include: chrome plated non ferrous cast pivot hinges, gravity type, adjustable for door close positioning; nylon bearings; black anodized aluminum door latch; door strike and keeper with rubber bumper; and cast alloy chrome plated coat hook and bumper. Latching devices and hinges for handicap compartments shall comply with 36 CFR 1191 and shall be stainless steel door latches that operate without either tight grasping or twisting of the wrist of the operator. Screws and bolts shall be stainless steel, tamper proof type. Wall mounting brackets shall be continuous, full height, stainless steel, in accordance with toilet compartment manufacturer's instructions. Floor-mounted anchorage shall consist of corrosion-resistant anchoring assemblies with threaded rods, lock washers, and leveling adjustment nuts at pilasters for structural connection to floor.

2.7 COLORS AND FINISHES

2.7.1 Colors

Provide manufacturer's standard color charts for color of finishes for toilet partition system components.

2.7.2 Finishes No. 5

Provide solid plastic fabricated of polymer resins (polyethylene) formed under high pressure rendering a single component section not less than one inch thick. Colors shall extend throughout the panel thickness. Provide exposed finish surfaces: smooth, waterproof, non-absorbent, and resistant to staining and marking with pens, pencils, or other writing devices. Solid plastic partitions shall not show any sign of deterioration when immersed in the following chemicals and maintained at a temperature of 80 degrees F for a minimum of 30 days:

- | | |
|-----------------------------|--------------------------------|
| a. Acetic Acid (80 percent) | Hydrochloric Acid (40 percent) |
| b. Acetone | Hydrogen Peroxide (30 percent) |
| c. Ammonia (liquid) | Isopropyl Alcohol |
| d. Ammonia Phosphate | Lactic Acid (25 percent) |
| e. Bleach (12 percent) | Lime Sulfur |
| f. Borax | Nicotine |

g. Brine	Potassium Bromide
h. Caustic Soda	Soaps
i. Chlorine Water	Sodium Bicarbonate
j. Citric Acid	Trisodium Phosphate
k. Copper Chloride	Urea; Urine
l. Core Oils	Vinegar

PART 3 EXECUTION

3.1 PREPARATION

Take field measurements prior to the preparation of drawing and fabrication to ensure proper fits. Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive work. Verify correct spacing of plumbing fixtures. Verify correct location of built in framing, anchorage, and bracing. Report in writing to Contracting Officer prevailing conditions that will adversely affect satisfactory execution of the work of this section. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

Install partitions rigid, straight, plumb, and level, with the panels centered between the fixtures. Provide a panel clearance of not more than $1/2$ inch and secure the panels to walls and pilasters with not less than two wall brackets attached near the top and bottom of the panel. Locate wall brackets so that holes for wall bolts occur in masonry or tile joints. Secure Panels to pilasters with brackets matching the wall brackets. Provide for adjustment due to minor floor variations. Locate head rail joints at pilaster center lines. Install adjacent components for consistency of line and plane. Equip each door with hinges, one door latch, and one coat hook and bumper. Align hardware to uniform clearance at vertical edges of doors.

a. Secure panels to hollow plastered walls with toggle bolts using not less than $1/4$ -20 screws of the length required for the wall thickness. Toggle bolts shall have a load-carrying strength of not less than 600 pounds per anchor.

b. Secure panels to ceramic tile on hollow plastered walls or hollow concrete-masonry walls with toggle bolts using not less than $1/4$ -20 screws of the length required for the wall thickness. Toggle bolts shall have a load-carrying strength of not less than 600 pounds per anchor.

c. Secure panels to solid masonry or concrete with lead or brass expansion shields designed for use with not less than $1/4$ -20 screws, with a shield length of not less than $1-1/2$ inch. Expansion shields shall have a load-carrying strength of not less than 600 pounds per anchor.

d. Submit Installation Drawings for metal toilet partitions showing plans, elevations, details of construction, hardware, reinforcing and blocking, fittings, mountings and escutcheons. Indicate on drawings the type of partition, location, mounting height, cutouts, and reinforcement required for toilet-room accessories.

3.3 FLOOR-ANCHORED PARTITIONS

Secure pilasters to the floor with the anchorage device specified. Make all leveling devices readily accessible for leveling, plumbing, and tightening the installation. Level tops of doors with tops of pilasters when doors are in a closed position. Expansion shields shall have a minimum 2-inch penetration into the concrete slab.

3.4 OVERHEAD-BRACED PARTITIONS

Secure pilasters to the floor with the anchorage device specified. Make all leveling devices readily accessible for leveling, plumbing, and tightening the installation. Secure overhead brace to the pilaster face with not less than two fasteners per face. Expansion shields shall have a minimum 2-inch penetration into the concrete slab. Make tops of doors parallel with the overhead brace when doors are in a closed position.

3.5 FINAL ADJUSTMENT

After completion of the installation, make final adjustments to the pilaster-leveling devices, door hardware, and other working parts of the partition assembly. Doors shall have a uniform vertical edge clearance of approximately 3/16 inch and shall rest open at approximately 30 degrees when unlatched.

3.6 CLEANING

Clean all surfaces of the work, and adjacent surfaces soiled as a result of the work, in an approved manner compliant with the manufacturer's recommended cleaning and protection from damage procedures until accepted. Remove all equipment, tools, surplus materials, and work debris from the site.

3.7 WASTE MANAGEMENT

Identify manufacturer's policy for collection or return of construction scrap, demolition scrap, unused material and packaging material. Institute demolition and construction waste separation and recycling to take advantage of manufacturer's programs. When such a service is not available, seek local recyclers to reclaim the materials.

-- End of Section --

SECTION 10 28 13

TOILET ACCESSORIES

07/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C 1036 (2006) Standard Specification for Flat Glass

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

- Finishes
Accessory Items

Manufacturer's descriptive data and catalog cuts indicating materials of construction, fasteners proposed for use for each type of wall construction, mounting instructions, operation instructions, and cleaning instructions.

SD-07 Certificates

- Accessory Items

Certificate for each type of accessory specified, attesting that the items meet the specified requirements.

1.3 DELIVERY, STORAGE, AND HANDLING

Wrap toilet accessories for shipment and storage, then deliver to the jobsite in manufacturer's original packaging, and store in a clean, dry area protected from construction damage and vandalism.

1.4 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

Provide toilet accessories where indicated on the Drawings. Provide each

accessory item shall be complete with the necessary mounting plates of sturdy construction with corrosion resistant surface.

2.1.1 Anchors and Fasteners

Provide anchors and fasteners capable of developing a restraining force commensurate with the strength of the accessory to be mounted and suited for use with the supporting construction. Provide oval heads exposed fasteners with finish to match the accessory.

2.1.2 Finishes

Except where noted otherwise, provide the following finishes on metal:

Metal	Finish
_____	_____
Stainless steel	No. 4 satin finish
Carbon steel, copper alloy, and brass	Chromium plated, bright

2.2 ACCESSORY ITEMS

Conform to the requirements for accessory items specified below.

2.2.1 Grab Bar (GB)

Provide an 18 gauge, 1-1/4 inch grab bar OD Type 304 stainless steel. Provide form and length for grab bar as indicated. Provide concealed exposed mounting flange. Provide grab with satin finish peened non-slip surface. Furnish installed bars capable of withstanding a 500 pound vertical load without coming loose from the fastenings and without obvious permanent deformation. Allow 1-1/2 inch space between wall and grab bar.

2.2.2 Mirrors, Glass (MG)

Provide Type I transparent flat type, Class 1-clear glass for mirrors. Glazing Quality q1 1/4 inch thick conforming to ASTM C 1036. Coat glass on one surface with silver coating, copper protective coating, and mirror backing paint. Provide highly adhesive pure silver coating of a thickness which provides reflectivity of 83 percent or more of incident light when viewed through 1/4 inch thick glass, free of pinholes or other defects. Provide copper protective coating with pure bright reflective copper, homogeneous without sludge, pinholes or other defects, of proper thickness to prevent "adhesion pull" by mirror backing paint. Provide mirror backing paint with two coats of special scratch and abrasion-resistant paint and baked in uniform thickness to provide a protection for silver and copper coatings which will permit normal cutting and edge fabrication. All mirrors are to have frames. Frames shall be as follows: Alloy 18-8, type 304, 18 gauge stainless steel. Unitized all welded construction. Corners mitered, welded and polished. Exposed surfaces shall have No. 4 satin finish. Edges and corners to be burrfree."

2.2.3 Paper Towel Dispenser (PTD)

Provide paper towel dispenser constructed of a minimum 0.03 inch Type 304 stainless steel, surface mounted. Provide a towel compartment for each dispenser. Furnish tumbler key lock locking mechanism.

2.2.4 Combination Paper Towel Dispenser/Waste Receptacle (PTDWR)

Provide semi-recessed dispenser/receptacle with a capacity of 400 sheets of C-fold, single-fold, or quarter-fold towel. Design waste receptacle to be locked in unit and removable for service. Provide tumbler key locking mechanism. Provide waste receptacle capacity of 12 gallons. Fabricate a minimum 0.03 inch stainless steel welded construction unit with all exposed surfaces having a satin finish. Provide waste receptacle that accepts reusable liner standard for unit manufacturer.

2.2.5 Sanitary Napkin Disposer (SND)

Construct a Type 304 stainless steel sanitary napkin disposal with removable leak-proof receptacle for disposable liners. Provide fifty disposable liners of the type standard with the manufacturer. Retain receptacle in cabinet by tumbler lock. Provide disposer with a door for inserting disposed napkins, partition mounted surface mounted.

2.2.6 Shower Curtain (SC)

Provide shower curtain and hooks, size to suit conditions. Provide anti-bacterial nylon/vinyl fabric curtain. Color is to be white.

2.2.7 Shower Curtain Rods (SCR)

Provide Type 304 stainless steel shower curtain rods 1-1/4 inch OD by 0.049 inch minimum straight to meet installation conditions.

2.2.8 Towel Bar (TB)

Provide stainless steel towel bar with a minimum thickness of 0.015 inch. Provide minimum 3/4 inch diameter bar, or 5/8 inch square. Provide satin finish.

2.2.9 Soap Dispenser (SD)

Provide soap dispenser surface mounted, liquid type consisting of a vertical Type 304 stainless steel tank with holding capacity of 40 fluid ounces with a corrosion-resistant all-purpose valve that dispenses liquid soaps, lotions, detergents and antiseptic soaps.

2.2.10 Shelf, Metal, Heavy Duty (SMHD) with Utility Hooks and Mop Strip

Furnish a minimum 18 gauge stainless steel heavy duty metal shelf 8 inches deep with return edges. Mop holders are to be riveted to the strip and rubber cams are to be ribbed.

2.2.11 Toilet Tissue Dispenser (TTD)

Furnish Type II - surface mounted toilet tissue holder with two rolls of standard tissue mounted horizontally. Provide stainless steel, satin finish cabinet.

2.2.12 Folding Shower Seat (FSS)

Fabricated or 16 gauge stainless steel polished to a #4 satin finish. Bracket for wall mounting 1/8 inch thick stainless steel piano hinge. Sitting area edges beveled, welded, ground and polished smooth. Overall

size: 15 1/2 inch x 15 1/2 inch x 3/4 inch.

2.2.13 Robe Hook (RH)

Provide double robe hook, satin finish contoured 4 inch wide bar with hook at each end, projects 1-7/8 inch from wall.

2.2.14 Corner Shelf (CS)

Solid Polymer, 5 inches x 5 inches x one-half inch in depth. Provide waterproof adhesive recommended by the solid polymer manufacturer. Provide cut-out at ceramic tile for shelf to be inserted into and provide sealant around the entire perimeter.

PART 3 EXECUTION

3.1 INSTALLATION

Provide the same finish for the surfaces of fastening devices exposed after installation as the attached accessory. Provide oval exposed screw heads. Install accessories at the location and height indicated. Protect exposed surfaces of accessories with strippable plastic or by other means until the installation is accepted. After acceptance of accessories, remove and dispose of strippable plastic protection. Coordinate accessory manufacturer's mounting details with other trades as their work progresses. Use sealants for brackets, plates, anchoring devices and similar items in showers (a silicone or polysulphide sealant) as they are set to provide a watertight installation. After installation, thoroughly clean exposed surfaces and restore damaged work to its original condition or replace with new work.

3.1.1 Surface Mounted Accessories

Mount on concealed backplates, unless specified otherwise. Conceal fasteners on accessories without backplates. Install accessories with sheet metal screws or wood screws in lead-lined braided jute, teflon or neoprene sleeves, or lead expansion shields, or with toggle bolts or other approved fasteners as required by the construction. Install backplates in the same manner, or provide with lugs or anchors set in mortar, as required by the construction. Fasten accessories mounted on gypsum board and plaster walls without solid backing into the metal or wood studs or to solid wood blocking secured between wood studs, or to metal backplates secured to metal studs.

3.2 CLEANING

Clean material in accordance with manufacturer's recommendations. Do not use alkaline or abrasive agents. Take precautions to avoid scratching or marring exposed surfaces.

-- End of Section --

SECTION 21 13 13.00 20

WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION

04/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D709 (2001; R 2007) Laminated Thermosetting Materials

FM GLOBAL (FM)

FM APP GUIDE (updated on-line) Approval Guide <http://www.approvalguide.com/>

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 13 (2010; Errata 10-1; TIA 10-1; TIA 11-2) Standard for the Installation of Sprinkler Systems

NFPA 1963 (2009; Errata 09-1) Standard for Fire Hose Connections

NFPA 24 (2010) Standard for the Installation of Private Fire Service Mains and Their Appurtenances

UNDERWRITERS LABORATORIES (UL)

UL 262 (2004; Reprint Oct 2011) Gate Valves for Fire-Protection Service

UL 668 (2004; Reprint Aug 2008) Hose Valves for Fire-Protection Service

UL 789 (2004; Reprint Aug 2008) Standard for Indicator Posts for Fire-Protection Service

UL Fire Prot Dir (2011) Fire Protection Equipment Directory

1.2 SYSTEM DESCRIPTION

Design and provide new and modify existing automatic wet pipe fire extinguishing sprinkler systems for complete fire protection coverage throughout the entire building.

1.3 SPRINKLER SYSTEM DESIGN

Except as modified herein, design automatic wet pipe fire extinguishing sprinkler systems in accordance with the required and advisory provisions of **NFPA 13**, including all recommendations and advisory portions, which shall be considered mandatory; this includes advisory provisions listed in the appendices of such standard(s), as though the word "shall" had been substituted for the word "should" wherever it appears. Design system by **hydraulic calculations** for uniform distribution of water over the design area. Hydraulic calculations shall assume a **12 psi** pressure loss for the backflow preventer assembly. Locate sprinklers in a consistent pattern with ceiling grid, lights, and air supply diffusers. Provide sprinklers and piping system layout. All Devices and equipment for fire protection service shall be **UL Fire Prot Dir** listed or **FM APP GUIDE** approved for use in wet pipe sprinkler systems.

1.3.1 Location of Sprinklers

Sprinklers in relation to the ceiling and the spacing of sprinklers shall not exceed the hazards indicated on the contract drawings. Uniformly space sprinklers on the branch piping. Sprinklers shall provide coverage throughout 100 percent of the building. This includes, but is not limited to, telephone rooms, electrical equipment rooms, boiler rooms, switchgear rooms, transformer rooms, and other electrical and mechanical spaces.

1.3.2 Water Distribution

Distribution shall be uniform throughout the area in which the sprinklers will open. Discharge from individual sprinklers in hydraulically most remote area shall be between 100 percent and 120 percent of the specified density.

1.3.3 Density of Application of Water

Size pipe to provide the specified density when the system is discharging the specified total maximum required flow. Application to horizontal surfaces below the sprinklers shall be as indicated on the contract drawings.

1.3.4 Sprinkler Discharge Area

Permissible decreases and required increases from **NFPA 13** shall be applied to an initial hydraulically most remote area of **3,000 sq ft**.

1.3.5 Outside Hose Allowances

Hydraulic calculations shall include a hose allowance of **250 gpm** for outside hose streams

1.3.6 Water Supply

Base hydraulic calculations on the water supply data shown on the fire protection contract drawings.

1.4 SUBMITTALS

Partial submittals and submittals not fully complying with the requirements and recommended practices of **NFPA 13** and this specification section shall be returned disapproved without review. This contract stipulation is

non-negotiable.

The following shall be submitted in accordance with Section 01 33 00
SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings

Prepare 24 by 36 inch detail working drawings of sprinklers and piping. Floor plans shall be drawn to a scale not less than $1/8" = 1'-0"$. Show data essential for proper installation of each system. Show details, plan view, elevations and sections of the systems supply and piping. Show piping schematic of systems supply, devices, valves, pipe and fittings. Show point to point electrical wiring diagrams. Submit drawings signed by a registered fire protection engineer. Provide three copies of the Sprinkler System Shop Drawings, no later than 21 days prior to the start of sprinkler system installation.

SD-03 Product Data

Pipe
Fittings
Valves, including gate, check, and globe
Sprinklers
Pipe hangers and supports
Sprinkler Alarm Switches
Fire department connections
Mechanical couplings
Backflow Prevention Assembly

Annotate descriptive data to show the specific model, type, and size of each item. Catalog cuts shall also indicate UL Listing/FM Approval and country of manufacture.

SD-05 Design Data

Hydraulic Calculations

Submit computer program generated hydraulic calculations to substantiate compliance with hydraulic design requirements. Calculations shall be performed by computer using software intended specifically for fire protection system design. Submit name of software program used.

SD-06 Test Reports

request to schedule Preliminary Tests

Preliminary Test Report

Three copies of the completed Preliminary Test Report, no later than 7 days after the completion of the Preliminary Tests. The Preliminary Tests Report shall include both the Contractor's Material and Test Certificate for Underground Piping and the Contractor's Material and Test Certificate for Aboveground Piping. All items in the Preliminary Tests Report shall be signed

by the Fire Protection Engineer.

request to schedule Final Acceptance Test;

Final Acceptance Test Report;

Three copies of the completed Final Acceptance Tests Reports, no later than 7 days after the completion of the Final Acceptance Tests. All items in the Final Acceptance Report shall be signed by the Fire Protection Engineer.

SD-07 Certificates

Sprinkler System Installer

Submit data showing the Sprinkler System Installer has successfully installed systems of the same type and design as specified herein, Data shall include names and locations of at least two installations where the Contractor, or the subcontractor referred to above, has installed such systems. Indicate type and design of each system and certify that each system has performed satisfactorily in the manner intended for not less than 18 months. Provide NICET certification of the system technician. Contractor shall submit data along with submittal of the Fire Protection Engineer Qualifications.

SD-10 Operation and Maintenance Data

Operating and Maintenance Instructions

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA as supplemented and modifies by this specification section.

Provide six manuals in accordance with NFPA 13. The manuals shall include the manufacturer's name, model number, parts list, list of parts and tools that should be kept in stock by the owner for routine maintenance including the name of a local supplier, simplified wiring and controls diagrams, troubleshooting guide, and recommended service organization (including address and telephone number) for each item of equipment.

SD-11 Closeout Submittals

As-built drawings

As-built shop drawings, at no later than 14 days after completion of the Final Tests. The Sprinkler System Drawings shall be updated to reflect as-built conditions after all related work is completed. Provide electronic drawings in dwg or pdf format.

On-site training

1.5 QUALIFICATIONS

1.5.1 Sprinkler System Installer

The Sprinkler System Installer shall be regularly engaged in the installation of the type and complexity of system specified in the Contract

documents, and shall have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months. Installation drawings, [shop drawings](#) and as-built drawings shall be prepared, by or under the supervision of, an system technician who is experienced with the types of works specified herein, and is currently certified by the National Institute for Certification in Engineering Technologies (NICET) as an engineering technician with minimum Level III certification in Automatic Sprinkler System program or by a fire protection engineer.

1.6 QUALITY ASSURANCE

1.6.1 Material and Equipment Qualifications

Provide materials and equipment that are standard products of manufacturers regularly engaged in the manufacture of such products, which are of a similar material, design and workmanship. Standard products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2 year period.

1.6.2 Alternative Qualifications

Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.

1.6.3 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.6.4 Field Fabricated Nameplates

[ASTM D709](#). Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified in the technical sections or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, [0.125 inch](#) thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be [one by 2.5 inches](#). Lettering shall be a minimum of [0.25 inch](#) high normal block style.

1.7 ACCESSIBILITY

Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install concealed valves, expansion joints, controls, dampers, and equipment requiring access, in locations freely accessible through access doors.

1.8 DELIVERY, STORAGE AND HANDLING

All equipment delivered and placed in storage shall be housed in a manner

to preclude any damage from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Additionally, all pipes shall either be capped or plugged until installed.

PART 2 PRODUCTS

2.1 UNDERGROUND PIPING COMPONENTS

2.1.1 Pipe

Pipe shall comply with **NFPA 24**. Minimum pipe size shall be **6 inches**.

2.1.2 Gate Valve and Indicator Posts

Installation shall comply with **NFPA 24**. Gate valves for use with indicator post shall conform to **UL 262**. Indicator posts shall conform to **UL 789**. Provide each indicator post with one coat of primer and two coats of red enamel paint.

2.1.3 Valve Boxes

Except where indicator posts are provided, for each buried valve, provide cast-iron, ductile-iron, or plastic valve box of a suitable size. Plastic boxes shall be constructed of acrylonitrile-butadiene-styrene (ABS) or inorganic fiber-reinforced black polyolefin. Provide cast-iron, ductile-iron, or plastic cover for valve box with the word "WATER" cast on the cover. The minimum box shaft diameter shall be **5.25 inches**. Coat cast-iron and ductile-iron boxes with bituminous paint applied to a minimum dry-film thickness of **10 mils**.

2.1.4 Buried Utility Warning and Identification Tape

Provide detectable aluminum foil plastic backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried piping. Tape shall be detectable by an electronic detection instrument. Provide tape in rolls, **3 inches** minimum width, color coded for the utility involved with warning and identification imprinted in bold block letters continuously and repeatedly over the entire tape length. Warning and identification shall read "CAUTION BURIED WATER PIPING BELOW" or similar wording. Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material.

2.2 ABOVEGROUND PIPING COMPONENTS

All components of the aboveground piping shall fully comply with the requirements and recommended practices of **NFPA 13** and this specification section. Aboveground piping shall be steel.

2.2.1 Steel Pipe

Pipe shall be rigid black steel. Steel piping shall be Schedule 40. **Fittings** into which sprinklers, sprinkler riser nipples, or drop nipples are threaded shall be welded, threaded, or grooved-end type. Plain-end fittings with mechanical couplings, fittings that use steel gripping devices to bite into the pipe and segmented welded fittings shall not be permitted. Rubber gasketed grooved-end pipe and fittings with **mechanical couplings** shall be permitted in pipe sizes **1.5 inches** and larger. Fittings, mechanical couplings, and rubber gaskets shall be supplied by the same manufacturer. Steel piping with wall thickness less than Schedule 30

shall not be threaded. Side outlet tees using rubber gasketed fittings shall not be permitted. Sprinkler pipe and fittings shall be metal.

2.2.2 Grooved Mechanical Joints and Fittings

Grooved couplings, fittings and grooving tools shall be products of the same manufacturer.

2.2.3 Sprinklers

Provide nominal 0.50 inch or 0.53 inch orifice sprinklers. Sprinklers with internal O-rings shall not be used. Sprinklers shall be used in accordance with their listed coverage limitations. Provide Recessed Pendent or Upright sprinklers. Provide institutional sprinklers in the two detention cells. Sprinklers shall have a polished chrome finish. Temperature classification shall be ordinary. Sprinklers in high heat areas including attic spaces or in close proximity to unit heaters shall have temperature classification in accordance with NFPA 13. Extended coverage sprinklers shall not be used. Deflector shall not be more than 3 inches below suspended ceilings. Ceiling plates shall not be more than 0.5 inch deep. Ceiling cups shall not be permitted.

2.2.4 Valves

Provide valves of types approved for fire service. Valves shall open by counterclockwise rotation. Check valves shall be clear opening swing-check type with inspection and access cover plate for sizes 8 inches and larger. Each control valve shall be electrically supervised; minimum contact ratings shall be 2.5 amps at 24 volts DC. Provide supervision against valve closure or tampering of valve.

2.2.5 Pipe Supports

Provide Pipe hangers and supports in accordance with NFPA 13.

2.2.6 Fire Department Connections

Fire department connection shall be projecting type with cast brass body, matching wall escutcheon lettered "Auto Spkr" with a polished brass finish. The connection shall have two inlets with individual self-closing clappers, caps with drip drains and chains. Female inlets shall have 2-1/2 inch diameter American National Fire Hose Connection Screw Threads (NH) per NFPA 1963.

2.2.7 Backflow Prevention Assembly

Provide listed reduced pressure principle valve assembly backflow preventer. Each check valve shall have a drain. Backflow prevention assemblies shall have current "Certificate of Approval from the Foundation for Cross-Connection Control and Hydraulic Research, FCCCHR List. Listing of the specific make, model, design, and size in the FCCCHR List shall be acceptable as the required documentation."

2.3 ALARM INITIATING AND SUPERVISORY DEVICES

2.3.1 Sprinkler Alarm Switches

Provide vane type flow switch(es) with circuit opener or closer for the automatic transmittal of an alarm over the facility fire alarm system.

Connection of switch shall be under Section 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM. Vane type Alarm actuating devices shall have mechanical diaphragm controlled retard device adjustable from 10 to 60 seconds and shall instantly recycle.

2.3.2 Valve Supervisory (Tamper) Switch

Switch shall be suitable for mounting to the type of control valve to be supervised open. The switch shall be tamper resistant and contain one set of SPDT (Form C) contacts arranged to transfer upon removal of the housing cover or closure of the valve of more than two rotations of the valve stem.

2.4 ACCESSORIES

2.4.1 Sprinkler Cabinet

Provide metal cabinet with extra sprinklers and sprinkler wrench adjacent to each alarm valve. The number and types of extra sprinklers shall be as specified in NFPA 13.

2.4.2 Pipe Escutcheon

Provide split hinge metal plates for piping entering walls, floors, and ceilings in exposed spaces. Provide polished stainless steel plates or chromium-plated finish on copper alloy plates in finished spaces. Provide paint finish on metal plates in unfinished spaces.

PART 3 EXECUTION

3.1 UNDERGROUND PIPING INSTALLATION

The methods of fabrication and installation of the underground piping shall fully comply with the requirements and recommended practices of NFPA 13, NFPA 24 and the contract drawings.

3.2 ABOVEGROUND PIPING INSTALLATION

The methods of fabrication and installation of the aboveground piping shall fully comply with the requirements and recommended practices of NFPA 13 and this specification section.

3.2.1 Piping in Finished Areas

In areas with suspended or dropped ceilings and in areas with concealed spaces above the ceiling, piping shall be concealed above ceilings. Piping shall be inspected, tested and approved before being concealed. Risers and similar vertical runs of piping in finished areas shall be concealed.

3.2.2 Pendent Sprinklers

Where sprinklers are installed below suspended or dropped ceilings, drop nipples shall be cut such that sprinkler ceiling plates or escutcheons are of a uniform depth throughout the finished space. The outlet of the reducing coupling shall not extend more than 1 inch below the underside of the ceiling. Pendent sprinklers in suspended ceilings shall be a minimum of 6 inches from ceiling grids.

3.2.3 Reducers

Reductions in pipe sizes shall be made with one-piece tapered reducing fittings. Bushings are prohibited.

3.2.4 Pipe Penetrations

Cutting structural members for passage of pipes or for pipe-hanger fastenings will not be permitted. Pipes that must penetrate concrete or masonry walls or concrete floors shall be core-drilled and provided with pipe sleeves. Each sleeve shall be Schedule 40 galvanized steel, ductile iron or cast iron pipe and shall extend through its respective wall or floor and be cut flush with each wall surface. Sleeves shall provide required clearance between the pipe and the sleeve per NFPA 13. The space between the sleeve and the pipe shall be firmly packed with mineral wool insulation. Where pipes penetrate fire walls, fire partitions, or floors, pipes shall be fire stopped in accordance with Section 07 84 00 FIRESTOPPING. In penetrations that are not fire-rated or not a floor penetration, the space between the sleeve and the pipe shall be sealed at both ends with plastic waterproof cement that will dry to a firm but pliable mass or with a mechanically adjustable segmented elastomer seal.

3.2.5 Backflow Preventer Test Connection

Provide downstream of the backflow prevention assembly UL 668 hose valves with 2.5 inch National Standard male hose threads with cap and chain. Provide one valve for each 250 gpm of system demand or fraction thereof. Provide a permanent sign in accordance with paragraph entitled "Identification Signs" which reads, "Test Valve."

3.2.6 Drains

Main drain piping shall be provided to discharge at a safe point outside the building. Auxiliary drains shall be provided as required by NFPA 13.

3.2.7 Installation of Fire Department Connection

Connection shall be mounted on the exterior wall approximately 3 feet above finished grade. The piping between the connection and the check valve shall be provided with an automatic drip in accordance with NFPA 13 and arranged to drain to the outside.

3.2.8 Identification Signs

Signs shall be affixed to each control valve, inspector test valve, main drain, auxiliary drain, test valve, and similar valves as appropriate or as required by NFPA 13. Valve identification signs shall be minimum 6 inches wide by 2 inches high with enamel baked finish on minimum 18 gauge steel or 0.024 inch aluminum with red letters on a white background or white letters on red background. Hydraulic design data nameplates shall be permanently affixed to each sprinkler riser as specified in NFPA 13.

3.3 ELECTRICAL WORK

Except as supplemented and modified herein, electric equipment and wiring shall be in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Alarm signal wiring connected to the building fire alarm control system shall be in accordance with 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM.

3.4 PIPE PAINTING AND COLOR CODE MARKING

Paint and color code mark sprinkler piping system as specified in Section 09 90 00 PAINTS AND COATINGS.

3.5 PRELIMINARY TESTS

The system, including the underground water mains, and the aboveground piping and system components, shall be tested to assure that equipment and components function as intended. The underground and aboveground interior piping systems and attached appurtenances subjected to system working pressure shall be tested in accordance with NFPA 13 and NFPA 24.

Submit [request to schedule Preliminary Tests](#), no later than 14 days prior to the proposed start of the tests. Upon completion of specified tests, the Contractor shall submit for approval a [Preliminary Test Report](#).

3.5.1 Underground Piping

3.5.1.1 Flushing

Underground piping shall be flushed in accordance with NFPA 24.

3.5.1.2 Hydrostatic Testing

New underground piping shall be hydrostatically tested in accordance with NFPA 24.

3.5.2 Aboveground Piping

3.5.2.1 Hydrostatic Testing

Aboveground piping shall be hydrostatically tested in accordance with NFPA 13.

3.5.2.2 Backflow Prevention Assembly Forward Flow Test

Each backflow prevention assembly shall be tested at system flow demand, including all applicable hose streams, as specified in NFPA 13. The Contractor shall provide all equipment and instruments necessary to conduct a complete forward flow test, including 2.5 inch diameter hoses, playpipe nozzles, calibrated pressure gauges, and pitot tube gauge. The Contractor shall provide all necessary supports to safely secure hoses and nozzles during the test. At the system demand flow, the pressure readings and pressure drop (friction) across the assembly shall be recorded. A metal placard shall be provided on the backflow prevention assembly that lists the pressure readings both upstream and downstream of the assembly, total pressure drop, and the system test flow rate determined during the preliminary testing. The pressure drop shall be compared to the manufacturer's data and the readings observed during the final inspections and tests.

3.6 FINAL ACCEPTANCE TEST

Final Acceptance Test shall begin only when the Preliminary Test Report has been approved. Submit [request to schedule Final Acceptance Test](#), no later than 14 days prior to the proposed start of the tests. Notification shall include a copy of the Contractor's Material & Test Certificates.

This shall include operation of control valves and flowing of inspector's test connections to verify operation of associated waterflow alarm switches. After operation of control valves has been completed, the main drain test shall be repeated to assure that control valves are in the open position. In addition, the representative shall have available copies of [as-built drawings](#) and certificates of tests previously conducted. The installation shall not be considered accepted until identified discrepancies have been corrected and test documentation is properly completed and received. The Contractor shall submit the [Final Acceptance Test Report](#) as specified in the Submittals paragraph.

An experienced technician regularly employed by the system installer shall be present during the inspection. The Fire Protection Engineer shall attend the final inspections and tests. At this inspection, repeat any or all of the required tests as directed. Correct defects in work provided by the Contractor, and make additional tests until the systems comply with contract requirements. Furnish appliances, equipment, electricity, instruments, connecting devices, and personnel for the tests. The Government will furnish water for the tests. The Mid-lant Division, Naval Facilities Engineering Command, Fire Protection Engineer, will witness formal tests and approve systems before they are accepted.

3.7 [ON-SITE TRAINING](#)

Submit request to schedule the On-site Training, at least 14 days prior to the start of related training but prior to the final inspections and tests. The sprinkler contractor shall conduct a training course for operating and maintenance personnel as designated by the Contracting Officer. Training shall be provided for a period of 8 hours of normal working time and shall start after the system is functionally complete and after the Final Acceptance Test. The On-Site Training shall cover all of the items contained in the approved [Operating and Maintenance Instructions](#).

-- End of Section --

SECTION 22 00 00

PLUMBING, GENERAL PURPOSE

11/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI 1010 (2002) Self-Contained, Mechanically Refrigerated Drinking-Water Coolers

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z21.22/CSA 4.4 (1999; Addenda A 2000, Addenda B 2001; R 2004) Relief Valves for Hot Water Supply Systems

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 90.1 - IP (2010) Energy Standard for Buildings Except Low-Rise Residential Buildings

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1010 (2004) Performance Requirements for Water Hammer Arresters (ANSI approved 2004)

ASSE 1018 (2001) Performance Requirements for Trap Seal Primer Valves - Potable Water Supplied (ANSI Approved 2002)

ASSE 1019 (2004; Errata 2005) Performance Requirements for Vacuum Breaker Wall Hydrants, Freeze Resistant, Automatic Draining Type (ANSI Approved 2004)

ASSE 1037 (1990) Performance Requirements for Pressurized Flushing Devices (Flushometers) for Plumbing Fixtures

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA B300 (2010; Addenda 2011) Hypochlorites

AWWA B301 (2010) Liquid Chlorine

AWWA C203 (2008) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel

and Tape - Hot-Applied

- AWWA C606 (2011) Grooved and Shouldered Joints
- AWWA C651 (2005; Errata 2005) Standard for Disinfecting Water Mains
- AWWA C652 (2002) Disinfection of Water-Storage Facilities

AMERICAN WELDING SOCIETY (AWS)

- AWS A5.8/A5.8M (2011) Specification for Filler Metals for Brazing and Braze Welding
- AWS B2.2/B2.2M (2010) Specification for Brazing Procedure and Performance Qualification

ASME INTERNATIONAL (ASME)

- ASME A112.14.1 (2003; R 2008) Backwater Valves
- ASME A112.19.2/CSA B45.1 (2008; Update 2009) Standard for Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals
- ASME A112.19.3/CSA B45.4 (2008) Stainless Steel Plumbing Fixtures
- ASME A112.36.2M (1991; R 2008) Cleanouts
- ASME A112.6.1M (1997; R 2008) Floor Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use
- ASME A112.6.3 (2001; R 2007) Standard for Floor and Trench Drains
- ASME B1.20.1 (1983; R 2006) Pipe Threads, General Purpose (Inch)
- ASME B16.12 (2009) Cast Iron Threaded Drainage Fittings
- ASME B16.15 (2011) Cast Bronze Alloy Threaded Fittings Classes 125 and 250
- ASME B16.18 (2012) Cast Copper Alloy Solder Joint Pressure Fittings
- ASME B16.21 (2011) Nonmetallic Flat Gaskets for Pipe Flanges
- ASME B16.22 (2001; R 2010) Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
- ASME B16.23 (2002; R 2006) Cast Copper Alloy Solder Joint Drainage Fittings - DWV
- ASME B16.24 (2011) Cast Copper Alloy Pipe Flanges and

Flanged Fittings: Classes 150, 300, 600, 900, 1500, and 2500

- ASME B16.29 (2007) Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV
- ASME B16.3 (2011) Malleable Iron Threaded Fittings, Classes 150 and 300
- ASME B16.34 (2009; Supp 2010) Valves - Flanged, Threaded and Welding End
- ASME B16.4 (2011) Standard for Gray Iron Threaded Fittings; Classes 125 and 250
- ASME B16.5 (2009) Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard
- ASME B16.50 (2001; R 2008) Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings
- ASME B31.1 (2010) Power Piping
- ASME B31.5 (2010) Refrigeration Piping and Heat Transfer Components
- ASME B40.100 (2005; R 2010) Pressure Gauges and Gauge Attachments

ASTM INTERNATIONAL (ASTM)

- ASTM A105/A105M (2011a) Standard Specification for Carbon Steel Forgings for Piping Applications
- ASTM A183 (2003; R 2009) Standard Specification for Carbon Steel Track Bolts and Nuts
- ASTM A193/A193M (2011a) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications
- ASTM A47/A47M (1999; R 2009) Standard Specification for Ferritic Malleable Iron Castings
- ASTM A515/A515M (2010) Standard Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service
- ASTM A516/A516M (2010) Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service
- ASTM A518/A518M (1999; R 2008) Standard Specification for Corrosion-Resistant High-Silicon Iron Castings
- ASTM A53/A53M (2010) Standard Specification for Pipe,

	Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A536	(1984; R 2009) Standard Specification for Ductile Iron Castings
ASTM A74	(2009) Standard Specification for Cast Iron Soil Pipe and Fittings
ASTM A888	(2011) Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
ASTM B117	(2011) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B152/B152M	(2009) Standard Specification for Copper Sheet, Strip, Plate, and Rolled Bar
ASTM B306	(2009) Standard Specification for Copper Drainage Tube (DWV)
ASTM B32	(2008) Standard Specification for Solder Metal
ASTM B370	(2011) Standard Specification for Copper Sheet and Strip for Building Construction
ASTM B42	(2010) Standard Specification for Seamless Copper Pipe, Standard Sizes
ASTM B43	(2009) Standard Specification for Seamless Red Brass Pipe, Standard Sizes
ASTM B584	(2011) Standard Specification for Copper Alloy Sand Castings for General Applications
ASTM B75	(2002; R 2010) Standard Specification for Seamless Copper Tube
ASTM B813	(2010) Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube
ASTM B88	(2009) Standard Specification for Seamless Copper Water Tube
ASTM C1053	(2000; R 2010) Standard Specification for Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications
ASTM C564	(2011) Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM C920	(2011) Standard Specification for Elastomeric Joint Sealants

ASTM D 2000	(2008) Standard Classification System for Rubber Products in Automotive Applications
ASTM D 2235	(2004; R 2011) Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings
ASTM D 2564	(2004; R 2009e1) Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D 2661	(2011) Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40, Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D 2665	(2011) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D 2855	(1996; R 2010) Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
ASTM D 2996	(2001; R 2007e1) Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe
ASTM D 3122	(1995; R 2009) Solvent Cements for Styrene-Rubber (SR) Plastic Pipe and Fittings
ASTM D 3138	(2004; R 2011) Solvent Cements for Transition Joints Between Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Non-Pressure Piping Components
ASTM D 3139	(1998; R 2005) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D 3212	(2007) Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D 3311	(2011) Drain, Waste, and Vent (DWV) Plastic Fittings Patterns
ASTM D 4101	(2011) Standard Specification for Polypropylene Injection and Extrusion Materials
ASTM D2822/D2822M	(2005e1; R 2011) Asphalt Roof Cement
ASTM E 1	(2007) Standard Specification for ASTM Liquid-in-Glass Thermometers

- ASTM F 1760 (2001; R 2011) Coextruded Poly(Vinyl Chloride) (PVC) Non-Pressure Plastic Pipe Having Reprocessed-Recycled Content
- ASTM F 2389 (2010) Standard Specification for Pressure-rated Polypropylene (PP) Piping Systems
- ASTM F 477 (2010) Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- ASTM F 493 (2010) Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings
- ASTM F 628 (2008) Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core
- ASTM F 891 (2010) Coextruded Poly (Vinyl Chloride) (PVC) Plastic Pipe with a Cellular Core

CAST IRON SOIL PIPE INSTITUTE (CISPI)

- CISPI 301 (2009) Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
- CISPI 310 (2011) Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications

COPPER DEVELOPMENT ASSOCIATION (CDA)

- CDA A4015 (1994; R 1995) Copper Tube Handbook

INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS (IAPMO)

- IAPMO PS 117 (2005b) Press Type Or Plain End Rub Gasketed W/ Nail CU & CU Alloy Fittings 4 Install On CU Tubing

INTERNATIONAL CODE COUNCIL (ICC)

- ICC IPC (2009) International Plumbing Code
- ICC/ANSI A117.1 (2009) Accessible and Usable Buildings and Facilities

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

- MSS SP-110 (2010) Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends

- MSS SP-25 (2008) Standard Marking System for Valves, Fittings, Flanges and Unions
- MSS SP-58 (2009) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation
- MSS SP-67 (2002a) Butterfly Valves
- MSS SP-69 (2003) Pipe Hangers and Supports - Selection and Application (ANSI Approved American National Standard)
- MSS SP-70 (2011) Gray Iron Gate Valves, Flanged and Threaded Ends
- MSS SP-71 (2011) Gray Iron Swing Check Valves, Flanged and Threaded Ends
- MSS SP-72 (2010) Ball Valves with Flanged or Butt-Welding Ends for General Service
- MSS SP-78 (2011) Cast Iron Plug Valves, Flanged and Threaded Ends
- MSS SP-80 (2008) Bronze Gate, Globe, Angle and Check Valves
- MSS SP-85 (2011) Gray Iron Globe & Angle Valves Flanged and Threaded Ends

NACE INTERNATIONAL (NACE)

- NACE SP0169 (1992; R 2007) Control of External Corrosion on Underground or Submerged Metallic Piping Systems

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- NEMA MG 1 (2011) Motors and Generators
- NEMA MG 11 (1977; R 2007) Energy Management Guide for Selection and Use of Single Phase Motors

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 90A (2012) Standard for the Installation of Air Conditioning and Ventilating Systems

NSF INTERNATIONAL (NSF)

- NSF/ANSI 14 (2011a) Plastics Piping System Components and Related Materials
- NSF/ANSI 61 (2010a) Drinking Water System Components - Health Effects

PLASTIC PIPE AND FITTINGS ASSOCIATION (PPFA)

PPFA Fire Man (2010) Firestopping: Plastic Pipe in Fire Resistive Construction

PLUMBING AND DRAINAGE INSTITUTE (PDI)

PDI WH 201 (2010) Water Hammer Arresters Standard

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE J1508 (2009) Hose Clamp Specifications

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA SM 9223 (2004) Enzyme Substrate Coliform Test

Energy Star (1992; R 2006) Energy Star Energy Efficiency Labeling System

PL 93-523 (1974; A 1999) Safe Drinking Water Act

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 141.80 National Primary Drinking Water Regulations; Control of Lead and Copper; General Requirements

PL 109-58 Energy Policy Act of 2005 (EPAAct05)

UNDERWRITERS LABORATORIES (UL)

UL 1951 (2011) Electric Plumbing Accessories

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Plumbing System

Detail drawings consisting of schedules, performance charts, instructions, diagrams, and other information to illustrate the requirements and operations of systems that are not covered by the Plumbing Code. Detail drawings for the complete plumbing system including piping layouts and locations of connections. Detail drawings shall indicate clearances required for maintenance and operation. Where piping and equipment are to be supported other than as indicated, details shall include loadings and proposed support methods. Mechanical drawing plans, elevations, views, and details, shall be drawn to scale.

SD-03 Product Data

Fixtures;

List of installed fixtures with manufacturer, model, and flow

rate.

Flush valve water closets

Flush valve urinals

Wall hung lavatories

Countertop lavatories

Kitchen sinks

Service sinks

Drinking-water coolers

Backflow prevention assemblies

Shower Faucets

A copy of qualified procedures and a list of names and identification symbols of qualified welders and welding operators.

Vibration-Absorbing Features

Details of vibration-absorbing features, including arrangement, foundation plan, dimensions and specifications.

SD-06 Test Reports

Tests, Flushing and Disinfection

Test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, completion and testing of the installed system. Each test report shall indicate the final position of controls.

Test of Backflow Prevention Assemblies.

Certification of proper operation shall be as accomplished in accordance with state regulations by an individual certified by the state to perform such tests. If no state requirement exists, the Contractor shall have the manufacturer's representative test the device, to ensure the unit is properly installed and performing as intended. The Contractor shall provide written documentation of the tests performed and signed by the individual performing the tests.

SD-07 Certificates

Materials and Equipment

Where equipment is specified to conform to requirements of the ASME Boiler and Pressure Vessel Code, the design, fabrication, and installation shall conform to the code.

Bolts

Written certification by the bolt manufacturer that the bolts furnished comply with the specified requirements.

SD-10 Operation and Maintenance Data

Plumbing System

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.3 STANDARD PRODUCTS

Specified materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacture of such products. Specified equipment shall essentially duplicate equipment that has performed satisfactorily at least two years prior to bid opening. Standard products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2 year period.

1.3.1 Alternative Qualifications

Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.

1.3.2 Service Support

The equipment items shall be supported by service organizations. Submit a certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. These service organizations shall be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.3.3 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.3.4 Modification of References

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction", or words of similar meaning, to mean the Contracting Officer.

1.3.4.1 Definitions

For the International Code Council (ICC) Codes referenced in the contract documents, advisory provisions shall be considered mandatory, the word "should" shall be interpreted as "shall." Reference to the "code official"

shall be interpreted to mean the "Contracting Officer." For Navy owned property, references to the "owner" shall be interpreted to mean the "Contracting Officer." For leased facilities, references to the "owner" shall be interpreted to mean the "lessor." References to the "permit holder" shall be interpreted to mean the "Contractor."

1.3.4.2 Administrative Interpretations

For ICC Codes referenced in the contract documents, the provisions of Chapter 1, "Administrator," do not apply. These administrative requirements are covered by the applicable Federal Acquisition Regulations (FAR) included in this contract and by the authority granted to the Officer in Charge of Construction to administer the construction of this project. References in the ICC Codes to sections of Chapter 1, shall be applied appropriately by the Contracting Officer as authorized by his administrative cognizance and the FAR.

1.4 DELIVERY, STORAGE, AND HANDLING

Handle, store, and protect equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.

1.5 REGULATORY REQUIREMENTS

Unless otherwise required herein, plumbing work shall be in accordance with [ICC IPC](#). Energy consuming products and systems shall be in accordance with [PL 109-58](#) and [ASHRAE 90.1 - IP](#)

1.6 PROJECT/SITE CONDITIONS

The Contractor shall become familiar with details of the work, verify dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

1.7 INSTRUCTION TO GOVERNMENT PERSONNEL

When specified in other sections, furnish the services of competent instructors to give full instruction to the designated Government personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the specified equipment or system. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work.

Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section. When more than 4 man-days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for instruction with the equipment or system.

When significant changes or modifications in the equipment or system are made under the terms of the contract, provide additional instruction to acquaint the operating personnel with the changes or modifications.

1.8 ACCESSIBILITY OF EQUIPMENT

Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install concealed valves, expansion joints, controls, dampers, and equipment requiring access, in locations freely accessible through access doors.

PART 2 PRODUCTS

2.1 Materials

Materials for various services shall be in accordance with TABLES I and II. PVC pipe shall contain a minimum of 25 percent recycled content in accordance with ASTM F 1760. HDPE pipe shall contain a minimum of 100 percent post-consumer recycled content. Steel pipe shall contain a minimum of 30 percent recycled content, with a minimum of 16 percent post-consumer recycled content. Pipe schedules shall be selected based on service requirements. Pipe fittings shall be compatible with the applicable pipe materials. Plastic pipe, fittings, and solvent cement shall meet NSF/ANSI 14 and shall be NSF listed for the service intended. Plastic pipe, fittings, and solvent cement used for potable hot and cold water service shall bear the NSF seal "NSF-PW." Polypropylene pipe and fittings shall conform to dimensional requirements of Schedule 40, Iron Pipe size and shall comply with NSF/ANSI 14, NSF/ANSI 61 and ASTM F 2389. Polypropylene piping that will be exposed to UV light shall be provided with a Factory applied UV resistant coating. Pipe threads (except dry seal) shall conform to ASME B1.20.1. Grooved pipe couplings and fittings shall be from the same manufacturer. Material or equipment containing lead shall not be used in any potable water system. In line devices such as water meters, building valves, check valves, meter stops, valves, fittings and back flow preventers shall comply with PL 93-523 and NSF/ANSI 61, Section 8. End point devices such as drinking water fountains, lavatory faucets, kitchen and bar faucets, residential ice makers, supply stops and end point control valves used to dispense water for drinking must meet the requirements of NSF/ANSI 61, Section 9. Hubless cast-iron soil pipe shall not be installed underground, under concrete floor slabs, or in crawl spaces below kitchen floors. Cast-iron pipe shall contain a minimum of 100 percent recycled content. Plastic pipe shall not be installed in air plenums. Plastic pipe shall not be installed in a pressure piping system in buildings greater than three stories including any basement levels.

2.1.1 Pipe Joint Materials

Grooved pipe and hubless cast-iron soil pipe shall not be used under ground. Solder containing lead shall not be used with copper pipe. Cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Institute. Joints and gasket materials shall conform to the following:

- a. Coupling for Cast-Iron Pipe: for hub and spigot type ASTM A74, AWWA C606. For hubless type: CISPI 310
- b. Coupling for Steel Pipe: AWWA C606.
- c. Couplings for Grooved Pipe: Ductile Iron ASTM A536 (Grade 65-45-12).
- d. Flange Gaskets: Gaskets shall be made of non-asbestos material in accordance with ASME B16.21. Gaskets shall be flat, 1/16 inch thick, and contain Aramid fibers bonded with Styrene Butadiene Rubber (SBR) or

Nitro Butadiene Rubber (NBR). Gaskets shall be the full face or self centering flat ring type. Gaskets used for hydrocarbon service shall be bonded with NBR.

- e. Brazing Material: Brazing material shall conform to AWS A5.8/A5.8M, BCuP-5.
- f. Brazing Flux: Flux shall be in paste or liquid form appropriate for use with brazing material. Flux shall be as follows: lead-free; have a 100 percent flushable residue; contain slightly acidic reagents; contain potassium borides; and contain fluorides.
- g. Solder Material: Solder metal shall conform to ASTM B32.
- h. Solder Flux: Flux shall be liquid form, non-corrosive, and conform to ASTM B813, Standard Test 1.
- i. PTFE Tape: PTFE Tape, for use with Threaded Metal or Plastic Pipe.
- j. Rubber Gaskets for Cast-Iron Soil-Pipe and Fittings (hub and spigot type and hubless type): ASTM C564.
- k. Rubber Gaskets for Grooved Pipe: ASTM D 2000, maximum temperature 230 degrees F.
- l. Flexible Elastomeric Seals: ASTM D 3139, ASTM D 3212 or ASTM F 477.
- m. Bolts and Nuts for Grooved Pipe Couplings: Heat-treated carbon steel, ASTM A183.
- n. Solvent Cement for Transition Joints between ABS and PVC Nonpressure Piping Components: ASTM D 3138.
- o. Plastic Solvent Cement for ABS Plastic Pipe: ASTM D 2235.
- p. Plastic Solvent Cement for PVC Plastic Pipe: ASTM D 2564 and ASTM D 2855.
- q. Plastic Solvent Cement for CPVC Plastic Pipe: ASTM F 493.
- r. Flanged fittings including flanges, bolts, nuts, bolt patterns, etc., shall be in accordance with ASME B16.5 class 150 and shall have the manufacturer's trademark affixed in accordance with MSS SP-25. Flange material shall conform to ASTM A105/A105M. Blind flange material shall conform to ASTM A516/A516M cold service and ASTM A515/A515M for hot service. Bolts shall be high strength or intermediate strength with material conforming to ASTM A193/A193M.
- s. Plastic Solvent Cement for Styrene Rubber Plastic Pipe: ASTM D 3122.
- t. Press fittings for Copper Pipe and Tube: Copper press fittings shall conform to the material and sizing requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117. Sealing elements for copper press fittings shall be EPDM, FKM or HNBR. Sealing elements shall be factory installed or an alternative supplied fitting manufacturer. Sealing element shall be selected based on manufacturer's approved application guidelines.
- u. Copper tubing shall conform to ASTM B88, Type K, L or M.

- v. Heat-fusion joints for polypropylene piping: ASTM F 2389.

2.1.2 Miscellaneous Materials

Miscellaneous materials shall conform to the following:

- a. Water Hammer Arrester: PDI WH 201. Water hammer arrester shall be piston type.
- b. Copper, Sheet and Strip for Building Construction: ASTM B370.
- c. Asphalt Roof Cement: ASTM D2822/D2822M.
- d. Hose Clamps: SAE J1508.
- e. Supports for Off-The-Floor Plumbing Fixtures: ASME A112.6.1M.
- f. Metallic Cleanouts: ASME A112.36.2M.
- g. Plumbing Fixture Setting Compound: A preformed flexible ring seal molded from hydrocarbon wax material. The seal material shall be nonvolatile nonasphaltic and contain germicide and provide watertight, gastight, odorproof and verminproof properties.
- h. Coal-Tar Protective Coatings and Linings for Steel Water Pipelines: AWWA C203.
- i. Hypochlorites: AWWA B300.
- j. Liquid Chlorine: AWWA B301.
- k. Gauges - Pressure and Vacuum Indicating Dial Type - Elastic Element: ASME B40.100.
- l. Thermometers: ASTM E 1. Mercury shall not be used in thermometers.

2.1.3 Pipe Insulation Material

Insulation shall be as specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

2.2 PIPE HANGERS, INSERTS, AND SUPPORTS

Pipe hangers, inserts, and supports shall conform to MSS SP-58 and MSS SP-69.

2.3 VALVES

Valves shall be provided on supplies to equipment and fixtures. Valves 2-1/2 inches and smaller shall be bronze with threaded bodies for pipe and solder-type connections for tubing. Valves 3 inches and larger shall have flanged iron bodies and bronze trim. Pressure ratings shall be based upon the application. Grooved end valves may be provided if the manufacturer certifies that the valves meet the performance requirements of applicable MSS standard. Valves shall conform to the following standards:

Description	Standard
Butterfly Valves	MSS SP-67
Cast-Iron Gate Valves, Flanged and Threaded Ends	MSS SP-70
Cast-Iron Swing Check Valves, Flanged and Threaded Ends	MSS SP-71
Ball Valves with Flanged Butt-Welding Ends for General Service	MSS SP-72
Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends	MSS SP-110
Cast-Iron Plug Valves, Flanged and Threaded Ends	MSS SP-78
Bronze Gate, Globe, Angle, and Check Valves	MSS SP-80
Steel Valves, Socket Welding and Threaded Ends	ASME B16.34
Cast-Iron Globe and Angle Valves, Flanged and Threaded Ends	MSS SP-85
Backwater Valves	ASME A112.14.1
Vacuum Relief Valves	ANSI Z21.22/CSA 4.4
Trap Seal Primer Valves	ASSE 1018

2.3.1 Backwater Valves

Backwater valves shall be either separate from the floor drain or a combination floor drain, P-trap, and backwater valve, as shown. Valves shall have cast-iron bodies with cleanouts large enough to permit removal of interior parts. Valves shall be of the flap type, hinged or pivoted, with revolving disks. Hinge pivots, disks, and seats shall be nonferrous metal. Disks shall be slightly open in a no-flow no-backwater condition. Cleanouts shall extend to finished floor and be fitted with threaded countersunk plugs.

2.3.2 Wall Faucets

Wall faucets with vacuum-breaker backflow preventer shall be brass with 3/4 inch male inlet threads, hexagon shoulder, and 3/4 inch hose connection. Faucet handle shall be securely attached to stem.

2.3.3 Wall Hydrants (Frostproof)

ASSE 1019 with vacuum-breaker backflow preventer shall have a nickel-brass or nickel-bronze wall plate or flange with nozzle and detachable key handle. A brass or bronze operating rod shall be provided within a galvanized iron casing of sufficient length to extend through the wall so that the valve is inside the building, and the portion of the hydrant between the outlet and valve is self-draining. A brass or bronze valve with coupling and union elbow having metal-to-metal seat shall be provided. Valve rod and seat washer shall be removable through the face of the hydrant. The hydrant shall have 3/4 inch exposed hose thread on spout and 3/4 inch male pipe thread on inlet.

2.4 FIXTURES

Fixtures shall be water conservation type, in accordance with ICC IPC. Fixtures for use by the physically handicapped shall be in accordance with ICC/ANSI A117.1. Vitreous China, nonabsorbent, hard-burned, and vitrified throughout the body shall be provided. Porcelain enameled ware shall have specially selected, clear white, acid-resisting enamel coating evenly applied on surfaces. No fixture will be accepted that shows cracks, crazes, blisters, thin spots, or other flaws. Fixtures shall be equipped with appurtenances such as traps, faucets, stop valves, and drain fittings. Each fixture and piece of equipment requiring connections to the drainage system, except grease interceptors, shall be equipped with a trap. Brass expansion or toggle bolts capped with acorn nuts shall be provided for supports, and polished chromium-plated pipe, valves, and fittings shall be provided where exposed to view. Fixtures with the supply discharge below the rim shall be equipped with backflow preventers. Internal parts of flush and/or flushometer valves, shower mixing valves, shower head face plates, pop-up stoppers of lavatory waste drains, and pop-up stoppers and overflow tees and shoes of bathtub waste drains shall be copper alloy with all visible surfaces chrome plated. Plastic in contact with hot water shall be suitable for 180 degrees F water temperature.

2.4.1 Automatic Controls

Provide automatic, sensor operated faucets and flush valves to comply with ASSE 1037 and UL 1951 for lavatory faucets, urinals, and water closets. Flushing and faucet systems shall consist of solenoid-activated valves with light beam sensors. Flush valve for water closet shall include an override

pushbutton. Flushing devices shall be provided as described in paragraph FIXTURES AND FIXTURE TRIMMINGS.

2.4.2 Flush Valve Water Closets

ASME A112.19.2/CSA B45.1, white vitreous china, siphon jet, elongated bowl, floor-mounted, floor outlet. Top of toilet seat height above floor shall be 14 to 15 inches, except 17 to 19 inches for wheelchair water closets. Provide wax bowl ring including plastic sleeve. Provide white solid plastic elongated open-front seat.

Water flushing volume of the water closet and flush valve combination shall not exceed 1.6 gallons per flush.

Provide large diameter flush valve including angle control-stop valve, vacuum breaker, tail pieces, slip nuts, and wall plates; exposed to view components shall be chromium-plated or polished stainless steel. Flush valves shall be nonhold-open type. Mount flush valves not less than 11 inches above the fixture. Mounted height of flush valve shall not interfere with the hand rail in ADA stalls.

2.4.3 Flush Valve Urinals

ASME A112.19.2/CSA B45.1, white vitreous china, ,wall-mounted, wall outlet, siphon jet, integral trap, and extended side shields. Provide urinal with the rim 17 inches above the floor. Water flushing volume of the urinal and flush valve combination shall not exceed 0.50 gallons per flush. Provide ASME A112.6.1M concealed chair carriers with vertical steel pipe supports. Provide large diameter flush valve including angle control-stop valve, vacuum breaker, tail pieces, slip nuts, and wall plates; exposed to view components shall be chromium-plated or polished stainless steel. Flush valves shall be nonhold-open type. Mount flush valves not less than 11 inches above the fixture.

2.4.4 Wall Hung Lavatories

ASME A112.19.2/CSA B45.1, white vitreous china, ,straight back type, minimum dimensions of 19 inches, wide by 17 inches front to rear, with supply openings for use with top mounted centerset faucets, and openings for concealed arm carrier installation. Provide aerator with faucet. Water flow rate shall not exceed 0.5 gpm when measured at a flowing water pressure of 60 psi. Provide ASME A112.6.1M concealed chair carriers with vertical steel pipe supports and concealed arms for the lavatory. Mount lavatory with the front rim 34 inches above floor and with 29 inches minimum clearance from bottom of the front rim to floor. Provide top mounted washerless centerset lavatory faucets.

2.4.5 Countertop Lavatories

ASME A112.19.2/CSA B45.1, white vitreous china, ,self-rimming, minimum dimensions of 19 inches wide by 17 inches front to rear, with supply openings for use with top mounted centerset faucets. Furnish template and mounting kit by lavatory manufacturer. Provide aerator with faucet. Water flow rate shall not exceed 0.5 gpm when measured at a flowing water pressure of 60 psi. Mount counter with the top surface 34 inches above floor and with 27 inches minimum clearance from bottom of the counter face to floor. Provide top mounted washerless centerset lavatory faucets.

2.4.6 Kitchen Sinks

ASME A112.19.3/CSA B45.4, 20 gage stainless steel with integral mounting rim for flush installation, minimum dimensions of 33 inches wide by 21 inches front to rear, two compartments, with undersides fully sound deadened, with supply openings for use with top mounted washerless sink faucets with hose spray, and with 3.5 inch drain outlet. Water flow rate shall not exceed 2.2 gpm when measured at a flowing water pressure of 60 psi. Provide stainless steel drain outlets and stainless steel cup strainers. Provide separate 1.5 inch P-trap and drain piping to vertical vent piping from each compartment. Provide top mounted washerless sink faucets with hose spray.

2.4.7 Service Sinks

ASME A112.19.2/CSA B45.1, white vitreous china with integral back and wall hanger supports, minimum dimensions of 22 inches wide by 20 inches front to rear, with two supply openings in 10 inch high back. Provide floor supported wall outlet cast iron P-trap and stainless steel rim guards as recommended by service sink manufacturer. Provide back mounted washerless service sink faucets with vacuum breaker and 0.75 inch external hose threads.

2.4.8 Drinking-Water Coolers

AHRI 1010 with more than a single thickness of metal between the potable water and the refrigerant in the heat exchanger, wall-hung, bubbler style, air-cooled condensing unit, 4.75 gph minimum capacity, stainless steel splash receptor and basin, and stainless steel cabinet. Bubblers shall be controlled by push levers or push bars, front mounted or side mounted near the front edge of the cabinet. Bubbler spouts shall be mounted at maximum of 36 inches above floor and at front of unit basin. Spouts shall direct water flow at least 4 inches above unit basin and trajectory parallel or nearly parallel to the front of unit. Provide ASME A112.6.1M concealed steel pipe chair carriers.

2.4.9 Wheelchair Drinking Water cooler

AHRI 1010, wall-mounted bubbler style with ASME A112.6.1M concealed chair carrier, air-cooled condensing unit, 4.75 gph minimum capacity, stainless steel splash receptor, and all stainless steel cabinet, with 27 inch minimum knee clearance from front bottom of unit to floor and 36 inch maximum spout height above floor. Bubblers shall also be controlled by push levers, by push bars, or touch pads one on each side or one on front and both sides of the cabinet.

2.5 DRAINS

2.5.1 Floor and Shower Drains

Floor and shower drains shall consist of a galvanized body, integral seepage pan, and adjustable perforated or slotted chromium-plated bronze, nickel-bronze, or nickel-brass strainer, consisting of grate and threaded collar. Floor drains shall be cast iron except where metallic waterproofing membrane is installed. Drains shall be of double drainage pattern for embedding in the floor construction. The seepage pan shall have weep holes or channels for drainage to the drainpipe. The strainer shall be adjustable to floor thickness. A clamping device for attaching flashing or waterproofing membrane to the seepage pan without damaging the

flashing or waterproofing membrane shall be provided when required. Drains shall be provided with threaded connection. Between the drain outlet and waste pipe, a neoprene rubber gasket conforming to ASTM C564 may be installed, provided that the drain is specifically designed for the rubber gasket compression type joint. Floor and shower drains shall conform to ASME A112.6.3. Provide drain with trap primer connection, trap primer, and connection piping. Primer shall meet ASSE 1018.

2.5.2 Bathtub and Shower Faucets and Drain Fittings

Provide single control pressure equalizing bathtub and shower faucets with body mounted from behind the wall with threaded connections. Provide ball joint self-cleaning shower heads. Provide shower heads which deliver a maximum of 2.2 GPM at 80 PSI per Energy Star requirements. Provide tubing mounted from behind the wall between bathtub faucets and shower heads and bathtub diverter spouts. Provide separate globe valves or angle valves with union connections in each supply to faucet. Provide trip-lever pop-up drain fittings for above-the-floor drain installations. The top of drain pop-ups, drain outlets, tub overflow outlet, and; control handle for pop-up drain shall be chromium-plated or polished stainless steel. Linkage between drain pop-up and pop-up control handle at bathtub overflow outlet shall be copper alloy or stainless steel. Provide 1.5 inch copper alloy adjustable tubing with slip nuts and gaskets between bathtub overflow and drain outlet; chromium-plated finish is not required.

2.5.3 Area Drains

Area drains shall be plain pattern with polished stainless steel perforated or slotted grate and bottom outlet. The drain shall be circular or square with a 12 inch nominal overall width or diameter and 10 inch nominal overall depth. Drains shall be cast iron with manufacturer's standard coating. Grate shall be easily lifted out for cleaning. Outlet shall be suitable for inside caulked connection to drain pipe. Drains shall conform to ASME A112.6.3.

2.5.4 Boiler Room Drains

Boiler room drains shall have combined drain and trap, hinged grate, removable bucket, and threaded brass cleanout with brass backwater valve. The removable galvanized cast-iron sediment bucket shall have rounded corners to eliminate fouling and shall be equipped with hand grips. Drain shall have a minimum water seal of 4 inches. The grate area shall be not less than 100 square inches.

2.6 TRAPS

Unless otherwise specified, traps shall be copper-alloy adjustable tube type with slip joint inlet and swivel. Traps shall be without a cleanout. Tubes shall be copper alloy with walls not less than 0.032 inch thick within commercial tolerances, except on the outside of bends where the thickness may be reduced slightly in manufacture by usual commercial methods. Inlets shall have rubber washer and copper alloy nuts for slip joints above the discharge level. Swivel joints shall be below the discharge level and shall be of metal-to-metal or metal-to-plastic type as required for the application. Nuts shall have flats for wrench grip. Outlets shall have internal pipe thread, except that when required for the application, the outlets shall have sockets for solder-joint connections. The depth of the water seal shall be not less than 2 inches. The interior diameter shall be not more than 1/8 inch over or under the nominal size,

and interior surfaces shall be reasonably smooth throughout. A copper alloy "P" trap assembly consisting of an adjustable "P" trap and threaded trap wall nipple with cast brass wall flange shall be provided for lavatories. The assembly shall be a standard manufactured unit and may have a rubber-gasketed swivel joint.

2.7 ELECTRICAL WORK

Provide electrical motor driven equipment specified complete with motors, motor starters, and controls as specified herein and in Section 26 00 00 BASIC ELECTRICAL MATERIALS AND METHODS. Provide internal wiring for components of packaged equipment as an integral part of the equipment. Provide single-phase, fractional-horsepower alternating-current motors, including motors that are part of a system, corresponding to the applications in accordance with NEMA MG 11. Provide motors in accordance with NEMA MG 1 and of sufficient size to drive the load at the specified capacity without exceeding the nameplate rating of the motor.

Motors shall be rated for continuous duty with the enclosure specified. Motor duty requirements shall allow for maximum frequency start-stop operation and minimum encountered interval between start and stop. Motor torque shall be capable of accelerating the connected load within 20 seconds with 80 percent of the rated voltage maintained at motor terminals during one starting period. Motor bearings shall be fitted with grease supply fittings and grease relief to outside of the enclosure.

Controllers and contactors shall have auxiliary contacts for use with the controls provided. Manual or automatic control and protective or signal devices required for the operation specified and any control wiring required for controls and devices specified, but not shown, shall be provided. For packaged equipment, the manufacturer shall provide controllers, including the required monitors and timed restart.

2.8 MISCELLANEOUS PIPING ITEMS

2.8.1 Escutcheon Plates

Provide one piece or split hinge metal plates for piping entering floors, walls, and ceilings in exposed spaces. Provide chromium-plated on copper alloy plates or polished stainless steel finish in finished spaces. Provide paint finish on plates in unfinished spaces.

2.8.2 Pipe Sleeves

Provide where piping passes entirely through walls, ceilings, roofs, and floors. Sleeves are not required where supply drain, waste, and vent (DWV) piping passes through concrete floor slabs located on grade, except where penetrating a membrane waterproof floor.

2.8.2.1 Sleeves in Masonry and Concrete

Provide steel pipe sleeves or schedule 40 PVC plastic pipe sleeves. Sleeves are not required where drain, waste, and vent (DWV) piping passes through concrete floor slabs located on grade. Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in the core-drilled hole are completely grouted smooth.

2.8.2.2 Sleeves Not in Masonry and Concrete

Provide 26 gage galvanized steel sheet or PVC plastic pipe sleeves.

2.8.3 Pipe Hangers (Supports)

Provide MSS SP-58 and MSS SP-69, Type 1 with adjustable type steel support rods, except as specified or indicated otherwise. Attach to steel joists with Type 19 or 23 clamps and retaining straps. Attach to Steel W or S beams with Type 21, 28, 29, or 30 clamps. Attach to steel angles and vertical web steel channels with Type 20 clamp with beam clamp channel adapter. Attach to horizontal web steel channel and wood with drilled hole on centerline and double nut and washer. Attach to concrete with Type 18 insert or drilled expansion anchor. Provide Type 40 insulation protection shield for insulated piping.

2.8.4 Nameplates

Provide 0.125 inch thick melamine laminated plastic nameplates, black matte finish with white center core, for equipment, gages, thermometers, and valves; valves in supplies to faucets will not require nameplates. Accurately align lettering and engrave minimum of 0.25 inch high normal block lettering into the white core. Minimum size of nameplates shall be 1.0 by 2.5 inches. Key nameplates to a chart and schedule for each system. Frame charts and schedules under glass and place where directed near each system. Furnish two copies of each chart and schedule.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Piping located in air plenums shall conform to NFPA 90A requirements. Piping located in shafts that constitute air ducts or that enclose air ducts shall be noncombustible in accordance with NFPA 90A. Installation of plastic pipe where in compliance with NFPA may be installed in accordance with PFFA Fire Man. The plumbing system shall be installed complete with necessary fixtures, fittings, traps, valves, and accessories. Water and drainage piping shall be extended 5 feet outside the building, unless otherwise indicated. A full port ball valve and drain shall be installed on the water service line inside the building approximately 6 inches above the floor from point of entry. Piping shall be connected to the exterior service lines or capped or plugged if the exterior service is not in place. Sewer and water pipes shall be laid in separate trenches, except when otherwise shown. Exterior underground utilities shall be at least 12 inches below the average local frost depth or as indicated on the drawings. If trenches are closed or the pipes are otherwise covered before being connected to the service lines, the location of the end of each plumbing utility shall be marked with a stake or other acceptable means. Valves shall be installed with control no lower than the valve body.

3.1.1 Water Pipe, Fittings, and Connections

3.1.1.1 Utilities

The piping shall be extended to fixtures, outlets, and equipment. The hot-water and cold-water piping system shall be arranged and installed to permit draining. The supply line to each item of equipment or fixture, except faucets, flush valves, or other control valves which are supplied with integral stops, shall be equipped with a shutoff valve to enable

isolation of the item for repair and maintenance without interfering with operation of other equipment or fixtures. Supply piping to fixtures, faucets, hydrants, shower heads, and flushing devices shall be anchored to prevent movement.

3.1.1.2 Cutting and Repairing

The work shall be carefully laid out in advance, and unnecessary cutting of construction shall be avoided. Damage to building, piping, wiring, or equipment as a result of cutting shall be repaired by mechanics skilled in the trade involved.

3.1.1.3 Protection of Fixtures, Materials, and Equipment

Pipe openings shall be closed with caps or plugs during installation. Fixtures and equipment shall be tightly covered and protected against dirt, water, chemicals, and mechanical injury. Upon completion of the work, the fixtures, materials, and equipment shall be thoroughly cleaned, adjusted, and operated. Safety guards shall be provided for exposed rotating equipment.

3.1.1.4 Mains, Branches, and Runouts

Piping shall be installed as indicated. Pipe shall be accurately cut and worked into place without springing or forcing. Structural portions of the building shall not be weakened. Aboveground piping shall run parallel with the lines of the building, unless otherwise indicated. Branch pipes from service lines may be taken from top, bottom, or side of main, using crossover fittings required by structural or installation conditions. Supply pipes, valves, and fittings shall be kept a sufficient distance from other work and other services to permit not less than 1/2 inch between finished covering on the different services. Bare and insulated water lines shall not bear directly against building structural elements so as to transmit sound to the structure or to prevent flexible movement of the lines. Water pipe shall not be buried in or under floors unless specifically indicated or approved. Changes in pipe sizes shall be made with reducing fittings. Use of bushings will not be permitted except for use in situations in which standard factory fabricated components are furnished to accommodate specific accepted installation practice. Change in direction shall be made with fittings, except that bending of pipe 4 inches and smaller will be permitted, provided a pipe bender is used and wide sweep bends are formed. The center-line radius of bends shall be not less than six diameters of the pipe. Bent pipe showing kinks, wrinkles, flattening, or other malformations will not be acceptable.

3.1.1.5 Pipe Drains

Pipe drains indicated shall consist of 3/4 inch hose bibb with renewable seat and full port ball valve ahead of hose bibb. At other low points, 3/4 inch brass plugs or caps shall be provided. Disconnection of the supply piping at the fixture is an acceptable drain.

3.1.1.6 Expansion and Contraction of Piping

Allowance shall be made throughout for expansion and contraction of water pipe. Each hot-water and hot-water circulation riser shall have expansion loops or other provisions such as offsets, changes in direction, etc., where indicated and/or required. Risers shall be securely anchored as required or where indicated to force expansion to loops. Branch

connections from risers shall be made with ample swing or offset to avoid undue strain on fittings or short pipe lengths. Horizontal runs of pipe over 50 feet in length shall be anchored to the wall or the supporting construction about midway on the run to force expansion, evenly divided, toward the ends. Sufficient flexibility shall be provided on branch runouts from mains and risers to provide for expansion and contraction of piping. Flexibility shall be provided by installing one or more turns in the line so that piping will spring enough to allow for expansion without straining. If mechanical grooved pipe coupling systems are provided, the deviation from design requirements for expansion and contraction may be allowed pending approval of Contracting Officer.

3.1.1.7 Thrust Restraint

Plugs, caps, tees, valves and bends deflecting 11.25 degrees or more, either vertically or horizontally, in waterlines 4 inches in diameter or larger shall be provided with thrust blocks, where indicated, to prevent movement. Thrust blocking shall be concrete of a mix not leaner than: 1 cement, 2-1/2 sand, 5 gravel; and having a compressive strength of not less than 2000 psi after 28 days. Blocking shall be placed between solid ground and the fitting to be anchored. Unless otherwise indicated or directed, the base and thrust bearing sides of the thrust block shall be poured against undisturbed earth. The side of the thrust block not subject to thrust shall be poured against forms. The area of bearing will be as shown. Blocking shall be placed so that the joints of the fitting are accessible for repair. Steel rods and clamps, protected by galvanizing or by coating with bituminous paint, shall be used to anchor vertical down bends into gravity thrust blocks.

3.1.1.8 Commercial-Type Water Hammer Arresters

Commercial-type water hammer arresters shall be provided on hot- and cold-water supplies and shall be located as generally indicated, with precise location and sizing to be in accordance with PDI WH 201. Water hammer arresters, where concealed, shall be accessible by means of access doors or removable panels. Commercial-type water hammer arresters shall conform to ASSE 1010. Vertical capped pipe columns will not be permitted.

3.1.2 Joints

Installation of pipe and fittings shall be made in accordance with the manufacturer's recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Joints shall be made up with fittings of compatible material and made for the specific purpose intended.

3.1.2.1 Threaded

Threaded joints shall have American Standard taper pipe threads conforming to ASME B1.20.1. Only male pipe threads shall be coated with graphite or with an approved graphite compound, or with an inert filler and oil, or shall have a polytetrafluoroethylene tape applied.

3.1.2.2 Mechanical Couplings

Mechanical couplings may be used in conjunction with grooved pipe for aboveground, ferrous or non-ferrous, domestic hot and cold water systems, in lieu of unions, brazed, soldered, welded, flanged, or threaded joints.

Mechanical couplings are permitted in accessible locations including behind access plates. Flexible grooved joints will not be permitted, except as vibration isolators adjacent to mechanical equipment. Rigid grooved joints shall incorporate an angle bolt pad design which maintains metal-to-metal contact with equal amount of pad offset of housings upon installation to ensure positive rigid clamping of the pipe.

Designs which can only clamp on the bottom of the groove or which utilize gripping teeth or jaws, or which use misaligned housing bolt holes, or which require a torque wrench or torque specifications will not be permitted.

Rigid grooved pipe couplings shall be for use with grooved end pipes, fittings, valves and strainers. Rigid couplings shall be designed for not less than 125 psi service and appropriate for static head plus the pumping head, and shall provide a watertight joint.

Grooved fittings and couplings, and grooving tools shall be provided from the same manufacturer. Segmentally welded elbows shall not be used. Grooves shall be prepared in accordance with the coupling manufacturer's latest published standards. Grooving shall be performed by qualified grooving operators having demonstrated proper grooving procedures in accordance with the tool manufacturer's recommendations.

The Contracting Officer shall be notified 24 hours in advance of test to demonstrate operator's capability, and the test shall be performed at the work site, if practical, or at a site agreed upon. The operator shall demonstrate the ability to properly adjust the grooving tool, groove the pipe, and to verify the groove dimensions in accordance with the coupling manufacturer's specifications.

3.1.2.3 Unions and Flanges

Unions, flanges and mechanical couplings shall not be concealed in walls, ceilings, or partitions. Unions shall be used on pipe sizes 2-1/2 inches and smaller; flanges shall be used on pipe sizes 3 inches and larger.

3.1.2.4 Grooved Mechanical Joints

Grooves shall be prepared according to the coupling manufacturer's instructions. Grooved fittings, couplings, and grooving tools shall be products of the same manufacturer. Pipe and groove dimensions shall comply with the tolerances specified by the coupling manufacturer. The diameter of grooves made in the field shall be measured using a "go/no-go" gauge, vernier or dial caliper, narrow-land micrometer, or other method specifically approved by the coupling manufacturer for the intended application. Groove width and dimension of groove from end of pipe shall be measured and recorded for each change in grooving tool setup to verify compliance with coupling manufacturer's tolerances. Grooved joints shall not be used in concealed locations.

3.1.2.5 Cast Iron Soil, Waste and Vent Pipe

Bell and spigot compression and hubless gasketed clamp joints for soil, waste and vent piping shall be installed per the manufacturer's recommendations.

3.1.2.6 Copper Tube and Pipe

- a. Brazed. Brazed joints shall be made in conformance with AWS B2.2/B2.2M, ASME B16.50, and CDA A4015 with flux and are acceptable for all pipe sizes. Copper to copper joints shall include the use of copper-phosphorus or copper-phosphorus-silver brazing metal without flux. Brazing of dissimilar metals (copper to bronze or brass) shall include the use of flux with either a copper-phosphorus, copper-phosphorus-silver or a silver brazing filler metal.
- b. Soldered. Soldered joints shall be made with flux and are only acceptable for piping 2 inches and smaller. Soldered joints shall conform to ASME B31.5 and CDA A4015. Soldered joints shall not be used in compressed air piping between the air compressor and the receiver.
- c. Copper Tube Extracted Joint. Mechanically extracted joints shall be made in accordance with ICC IPC.
- d. Press connection. Copper press connections shall be made in strict accordance with the manufacturer's installation instructions for manufactured rated size. The joints shall be pressed using the tool(s) approved by the manufacturer of that joint. Minimum distance between fittings shall be in accordance with the manufacturer's requirements.

3.1.2.7 Plastic Pipe

Acrylonitrile-Butadiene-Styrene (ABS) pipe shall have joints made with solvent cement. PVC and CPVC pipe shall have joints made with solvent cement elastomeric, threading, (threading of Schedule 80 Pipe is allowed only where required for disconnection and inspection; threading of Schedule 40 Pipe is not allowed), or mated flanged.

3.1.2.8 Other Joint Methods

3.1.3 Dissimilar Pipe Materials

Connections between ferrous and non-ferrous copper water pipe shall be made with dielectric unions or flange waterways. Dielectric waterways shall have temperature and pressure rating equal to or greater than that specified for the connecting piping. Waterways shall have metal connections on both ends suited to match connecting piping. Dielectric waterways shall be internally lined with an insulator specifically designed to prevent current flow between dissimilar metals. Dielectric flanges shall meet the performance requirements described herein for dielectric waterways. Connecting joints between plastic and metallic pipe shall be made with transition fitting for the specific purpose.

3.1.4 Corrosion Protection for Buried Pipe and Fittings

Ductile iron, cast iron, and steel pipe, fittings, and joints shall have a protective coating. Additionally, ductile iron, cast iron, and steel pressure pipe shall have a cathodic protection system and joint bonding. The cathodic protection system, protective coating system, and joint bonding for cathodically protected. Coatings shall be selected, applied, and inspected in accordance with NACE SP0169 and as otherwise specified. The pipe shall be cleaned and the coating system applied prior to pipe tightness testing. Joints and fittings shall be cleaned and the coating system applied after pipe tightness testing. For tape coating systems, the tape shall conform to AWWA C203 and shall be applied with a 50 percent

overlap. Primer utilized with tape type coating systems shall be as recommended by the tape manufacturer.

3.1.5 Pipe Sleeves and Flashing

Pipe sleeves shall be furnished and set in their proper and permanent location.

3.1.5.1 Sleeve Requirements

Unless indicated otherwise, provide pipe sleeves meeting the following requirements:

Secure sleeves in position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, ceilings, roofs, and floors.

A modular mechanical type sealing assembly may be installed in lieu of a waterproofing clamping flange and caulking and sealing of annular space between pipe and sleeve. The seals shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve using galvanized steel bolts, nuts, and pressure plates. The links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and each nut. After the seal assembly is properly positioned in the sleeve, tightening of the bolt shall cause the rubber sealing elements to expand and provide a watertight seal between the pipe and the sleeve. Each seal assembly shall be sized as recommended by the manufacturer to fit the pipe and sleeve involved.

Sleeves shall not be installed in structural members, except where indicated or approved. Rectangular and square openings shall be as detailed. Each sleeve shall extend through its respective floor, or roof, and shall be cut flush with each surface, except for special circumstances. Pipe sleeves passing through floors in wet areas such as mechanical equipment rooms, lavatories, kitchens, and other plumbing fixture areas shall extend a minimum of 4 inches above the finished floor.

Unless otherwise indicated, sleeves shall be of a size to provide a minimum of 1/4 inch clearance between bare pipe or insulation and inside of sleeve or between insulation and inside of sleeve. Sleeves in bearing walls and concrete slab on grade floors shall be steel pipe or cast-iron pipe. Sleeves in nonbearing walls or ceilings may be steel pipe, cast-iron pipe, galvanized sheet metal with lock-type longitudinal seam, or plastic.

Except as otherwise specified, the annular space between pipe and sleeve, or between jacket over insulation and sleeve, shall be sealed as indicated with sealants conforming to ASTM C920 and with a primer, backstop material and surface preparation as specified in Section 07 92 00 JOINT SEALANTS. The annular space between pipe and sleeve, between bare insulation and sleeve or between jacket over insulation and sleeve shall not be sealed for interior walls which are not designated as fire rated.

Sleeves through below-grade walls in contact with earth shall be recessed 1/2 inch from wall surfaces on both sides. Annular space between pipe and sleeve shall be filled with backing material and sealants in the joint between the pipe and concrete wall as specified above. Sealant selected for the earth side of the wall shall be compatible with dampproofing/waterproofing materials that are to be applied over the joint

sealant.

3.1.5.2 Flashing Requirements

Pipes passing through roof shall be installed through a 16 ounce copper flashing, each within an integral skirt or flange. Flashing shall be suitably formed, and the skirt or flange shall extend not less than 8 inches from the pipe and shall be set over the roof or floor membrane in a solid coating of bituminous cement. The flashing shall extend up the pipe a minimum of 10 inches. For cleanouts, the flashing shall be turned down into the hub and caulked after placing the ferrule. Pipes passing through pitched roofs shall be flashed, using lead or copper flashing, with an adjustable integral flange of adequate size to extend not less than 8 inches from the pipe in all directions and lapped into the roofing to provide a watertight seal. The annular space between the flashing and the bare pipe or between the flashing and the metal-jacket-covered insulation shall be sealed as indicated. Flashing for dry vents shall be turned down into the pipe to form a waterproof joint. Pipes, up to and including 10 inches in diameter, passing through roof or floor waterproofing membrane may be installed through a cast-iron sleeve with caulking recess, anchor lugs, flashing-clamp device, and pressure ring with brass bolts. Flashing shield shall be fitted into the sleeve clamping device. Pipes passing through wall waterproofing membrane shall be sleeved as described above. A waterproofing clamping flange shall be installed.

3.1.5.3 Waterproofing

Waterproofing at floor-mounted water closets shall be accomplished by forming a flashing guard from soft-tempered sheet copper. The center of the sheet shall be perforated and turned down approximately 1-1/2 inches to fit between the outside diameter of the drainpipe and the inside diameter of the cast-iron or steel pipe sleeve. The turned-down portion of the flashing guard shall be embedded in sealant to a depth of approximately 1-1/2 inches; then the sealant shall be finished off flush to floor level between the flashing guard and drainpipe. The flashing guard of sheet copper shall extend not less than 8 inches from the drainpipe and shall be lapped between the floor membrane in a solid coating of bituminous cement. If cast-iron water closet floor flanges are used, the space between the pipe sleeve and drainpipe shall be sealed with sealant and the flashing guard shall be upturned approximately 1-1/2 inches to fit the outside diameter of the drainpipe and the inside diameter of the water closet floor flange. The upturned portion of the sheet fitted into the floor flange shall be sealed.

3.1.5.4 Optional Counterflashing

Instead of turning the flashing down into a dry vent pipe, or caulking and sealing the annular space between the pipe and flashing or metal-jacket-covered insulation and flashing, counterflashing may be accomplished by utilizing the following:

- a. A standard roof coupling for threaded pipe up to 6 inches in diameter.
- b. A tack-welded or banded-metal rain shield around the pipe.

3.1.5.5 Pipe Penetrations of Slab on Grade Floors

Where pipes, fixture drains, floor drains, cleanouts or similar items penetrate slab on grade floors, except at penetrations of floors with

waterproofing membrane as specified in paragraphs Flashing Requirements and Waterproofing, a groove 1/4 to 1/2 inch wide by 1/4 to 3/8 inch deep shall be formed around the pipe, fitting or drain. The groove shall be filled with a sealant as specified in Section 07 92 00 JOINT SEALANTS.

3.1.5.6 Pipe Penetrations

Provide sealants for all pipe penetrations. All pipe penetrations shall be sealed to prevent infiltration of air, insects, and vermin.

3.1.6 Supports

3.1.6.1 General

Hangers used to support piping 2 inches and larger shall be fabricated to permit adequate adjustment after erection while still supporting the load. Pipe guides and anchors shall be installed to keep pipes in accurate alignment, to direct the expansion movement, and to prevent buckling, swaying, and undue strain. Piping subjected to vertical movement when operating temperatures exceed ambient temperatures shall be supported by variable spring hangers and supports or by constant support hangers. In the support of multiple pipe runs on a common base member, a clip or clamp shall be used where each pipe crosses the base support member. Spacing of the base support members shall not exceed the hanger and support spacing required for an individual pipe in the multiple pipe run. Threaded sections of rods shall not be formed or bent.

3.1.6.2 Pipe Supports and Structural Bracing, Seismic Requirements

as shown. Structural steel required for reinforcement to properly support piping, headers, and equipment, but not shown, shall be provided. Material used for supports shall be as specified in Section 05 50 13 MISCELLANEOUS METAL FABRICATIONS.

3.1.6.3 Pipe Hangers, Inserts, and Supports

Installation of pipe hangers, inserts and supports shall conform to MSS SP-58 and MSS SP-69, except as modified herein.

- a. Types 5, 12, and 26 shall not be used.
- b. Type 3 shall not be used on insulated pipe.
- c. Type 18 inserts shall be secured to concrete forms before concrete is placed. Continuous inserts which allow more adjustment may be used if they otherwise meet the requirements for type 18 inserts.
- d. Type 19 and 23 C-clamps shall be torqued per MSS SP-69 and shall have both locknuts and retaining devices furnished by the manufacturer. Field-fabricated C-clamp bodies or retaining devices are not acceptable.
- e. Type 20 attachments used on angles and channels shall be furnished with an added malleable-iron heel plate or adapter.
- f. Type 24 may be used only on trapeze hanger systems or on fabricated frames.
- g. Type 39 saddles shall be used on insulated pipe 4 inches and larger when the temperature of the medium is 60 degrees F or higher. Type 39

saddles shall be welded to the pipe.

- h. Type 40 shields shall:
 - (1) Be used on insulated pipe less than 4 inches.
 - (2) Be used on insulated pipe 4 inches and larger when the temperature of the medium is 60 degrees F or less.
 - (3) Have a high density insert for all pipe sizes. High density inserts shall have a density of 8 pcf or greater.
- i. Horizontal pipe supports shall be spaced as specified in MSS SP-69 and a support shall be installed not over 1 foot from the pipe fitting joint at each change in direction of the piping. Pipe supports shall be spaced not over 5 feet apart at valves. Operating temperatures in determining hanger spacing for PVC or CPVC pipe shall be 120 degrees F for PVC and 180 degrees F for CPVC. Horizontal pipe runs shall include allowances for expansion and contraction.
- j. Vertical pipe shall be supported at each floor, except at slab-on-grade, at intervals of not more than 15 feet nor more than 8 feet from end of risers, and at vent terminations. Vertical pipe risers shall include allowances for expansion and contraction.
- k. Type 35 guides using steel, reinforced polytetrafluoroethylene (PTFE) or graphite slides shall be provided to allow longitudinal pipe movement. Slide materials shall be suitable for the system operating temperatures, atmospheric conditions, and bearing loads encountered. Lateral restraints shall be provided as needed. Where steel slides do not require provisions for lateral restraint the following may be used:
 - (1) On pipe 4 inches and larger when the temperature of the medium is 60 degrees F or higher, a Type 39 saddle, welded to the pipe, may freely rest on a steel plate.
 - (2) On pipe less than 4 inches a Type 40 shield, attached to the pipe or insulation, may freely rest on a steel plate.
 - (3) On pipe 4 inches and larger carrying medium less than 60 degrees F a Type 40 shield, attached to the pipe or insulation, may freely rest on a steel plate.
- l. Pipe hangers on horizontal insulated pipe shall be the size of the outside diameter of the insulation. The insulation shall be continuous through the hanger on all pipe sizes and applications.
- m. Where there are high system temperatures and welding to piping is not desirable, the type 35 guide shall include a pipe cradle, welded to the guide structure and strapped securely to the pipe. The pipe shall be separated from the slide material by at least 4 inches or by an amount adequate for the insulation, whichever is greater.
- n. Hangers and supports for plastic pipe shall not compress, distort, cut or abrade the piping, and shall allow free movement of pipe except where otherwise required in the control of expansion/contraction.

3.1.6.4 Structural Attachments

Attachment to building structure concrete and masonry shall be by cast-in concrete inserts, built-in anchors, or masonry anchor devices. Inserts and anchors shall be applied with a safety factor not less than 5. Supports shall not be attached to metal decking. Supports shall not be attached to the underside of concrete filled floor or concrete roof decks unless approved by the Contracting Officer. Masonry anchors for overhead applications shall be constructed of ferrous materials only.

3.1.7 Welded Installation

Plumbing pipe weldments shall be as indicated. Changes in direction of piping shall be made with welding fittings only; mitering or notching pipe to form elbows and tees or other similar type construction will not be permitted. Branch connection may be made with either welding tees or forged branch outlet fittings. Branch outlet fittings shall be forged, flared for improvement of flow where attached to the run, and reinforced against external strains. Beveling, alignment, heat treatment, and inspection of weld shall conform to [ASME B31.1](#). Weld defects shall be removed and repairs made to the weld, or the weld joints shall be entirely removed and rewelded. After filler metal has been removed from its original package, it shall be protected or stored so that its characteristics or welding properties are not affected. Electrodes that have been wetted or that have lost any of their coating shall not be used.

3.1.8 Pipe Cleanouts

Pipe cleanouts shall be the same size as the pipe except that cleanout plugs larger than [4 inches](#) will not be required. A cleanout installed in connection with cast-iron soil pipe shall consist of a long-sweep 1/4 bend or one or two 1/8 bends extended to the place shown. An extra-heavy cast-brass or cast-iron ferrule with countersunk cast-brass head screw plug shall be caulked into the hub of the fitting and shall be flush with the floor. Cleanouts in connection with other pipe, where indicated, shall be T-pattern, 90-degree branch drainage fittings with cast-brass screw plugs, except plastic plugs shall be installed in plastic pipe. Plugs shall be the same size as the pipe up to and including [4 inches](#). Cleanout tee branches with screw plug shall be installed at the foot of soil and waste stacks, at the foot of interior downspouts, on each connection to building storm drain where interior downspouts are indicated, and on each building drain outside the building. Cleanout tee branches may be omitted on stacks in single story buildings with slab-on-grade construction or where less than [18 inches](#) of crawl space is provided under the floor. Cleanouts on pipe concealed in partitions shall be provided with chromium plated bronze, nickel bronze, nickel brass or stainless steel flush type access cover plates. Round access covers shall be provided and secured to plugs with securing screw. Square access covers may be provided with matching frames, anchoring lugs and cover screws. Cleanouts in finished walls shall have access covers and frames installed flush with the finished wall. Cleanouts installed in finished floors subject to foot traffic shall be provided with a chrome-plated cast brass, nickel brass, or nickel bronze cover secured to the plug or cover frame and set flush with the finished floor. Heads of fastening screws shall not project above the cover surface. Where cleanouts are provided with adjustable heads, the heads shall be cast iron or plastic.

3.2 FIXTURES AND FIXTURE TRIMMINGS

Polished chromium-plated pipe, valves, and fittings shall be provided where exposed to view. Angle stops, straight stops, stops integral with the faucets, or concealed type of lock-shield, and loose-key pattern stops for supplies with threaded, sweat or solvent weld inlets shall be furnished and installed with fixtures. Where connections between copper tubing and faucets are made by rubber compression fittings, a beading tool shall be used to mechanically deform the tubing above the compression fitting. Exposed traps and supply pipes for fixtures and equipment shall be connected to the rough piping systems at the wall, unless otherwise specified under the item. Floor and wall escutcheons shall be as specified. Drain lines and hot water lines of fixtures for handicapped personnel shall be insulated and do not require polished chrome finish. Plumbing fixtures and accessories shall be installed within the space shown.

3.2.1 Fixture Connections

Where space limitations prohibit standard fittings in conjunction with the cast-iron floor flange, special short-radius fittings shall be provided. Connections between earthenware fixtures and flanges on soil pipe shall be made gastight and watertight with a closet-setting compound or neoprene gasket and seal. Use of natural rubber gaskets or putty will not be permitted. Fixtures with outlet flanges shall be set the proper distance from floor or wall to make a first-class joint with the closet-setting compound or gasket and fixture used.

3.2.2 Flushometer Valves

Flushometer valves shall be secured to prevent movement by anchoring the long finished top spud connecting tube to wall adjacent to valve with approved metal bracket. Flushometer valves for water closets shall be installed 39 inches above the floor, except at water closets intended for use by the physically handicapped where flushometer valves shall be mounted at approximately 30 inches above the floor and arranged to avoid interference with grab bars. In addition, for water closets intended for handicap use, the flush valve handle shall be installed on the wide side of the enclosure.

3.2.3 Height of Fixture Rims Above Floor

Lavatories shall be mounted with rim 31 inches above finished floor. Wall-hung drinking fountains and water coolers shall be installed with rim 42 inches above floor. Wall-hung service sinks shall be mounted with rim 28 inches above the floor. Installation of fixtures for use by the physically handicapped shall be in accordance with ICC/ANSI A117.1.

3.2.4 Shower Bath Outfits

The area around the water supply piping to the mixing valves and behind the escutcheon plate shall be made watertight by caulking or gasketing.

3.2.5 Fixture Supports

Fixture supports for off-the-floor lavatories, urinals, water closets, and other fixtures of similar size, design, and use, shall be of the chair-carrier type. The carrier shall provide the necessary means of mounting the fixture, with a foot or feet to anchor the assembly to the floor slab. Adjustability shall be provided to locate the fixture at the

desired height and in proper relation to the wall. Support plates, in lieu of chair carrier, shall be fastened to the wall structure only where it is not possible to anchor a floor-mounted chair carrier to the floor slab.

3.2.5.1 Support for Solid Masonry Construction

Chair carrier shall be anchored to the floor slab. Where a floor-anchored chair carrier cannot be used, a suitable wall plate shall be imbedded in the masonry wall.

3.2.5.2 Support for Concrete-Masonry Wall Construction

Chair carrier shall be anchored to floor slab. Where a floor-anchored chair carrier cannot be used, a suitable wall plate shall be fastened to the concrete wall using through bolts and a back-up plate.

3.2.5.3 Support for Steel Stud Frame Partitions

Chair carrier shall be used. The anchor feet and tubular uprights shall be of the heavy duty design; and feet (bases) shall be steel and welded to a square or rectangular steel tube upright. Wall plates, in lieu of floor-anchored chair carriers, shall be used only if adjoining steel partition studs are suitably reinforced to support a wall plate bolted to these studs.

3.2.5.4 Support for Wood Stud Construction

Where floor is a concrete slab, a floor-anchored chair carrier shall be used. Where entire construction is wood, wood crosspieces shall be installed. Fixture hanger plates, supports, brackets, or mounting lugs shall be fastened with not less than No. 10 wood screws, 1/4 inch thick minimum steel hanger, or toggle bolts with nut. The wood crosspieces shall extend the full width of the fixture and shall be securely supported.

3.2.5.5 Wall-Mounted Water Closet Gaskets

Where wall-mounted water closets are provided, reinforced wax, treated felt, or neoprene gaskets shall be provided. The type of gasket furnished shall be as recommended by the chair-carrier manufacturer.

3.2.6 Backflow Prevention Devices

Plumbing fixtures, equipment, and pipe connections shall not cross connect or interconnect between a potable water supply and any source of nonpotable water. Backflow preventers shall be installed where indicated and in accordance with IPC at all other locations necessary to preclude a cross-connect or interconnect between a potable water supply and any nonpotable substance. In addition backflow preventers shall be installed at all locations where the potable water outlet is below the flood level of the equipment, or where the potable water outlet will be located below the level of the nonpotable substance. Backflow preventers shall be located so that no part of the device will be submerged. Backflow preventers shall be of sufficient size to allow unrestricted flow of water to the equipment, and preclude the backflow of any nonpotable substance into the potable water system. Bypass piping shall not be provided around backflow preventers. Access shall be provided for maintenance and testing. Each device shall be a standard commercial unit.

3.2.7 Access Panels

Access panels shall be provided for concealed valves and controls, or any item requiring inspection or maintenance. Access panels shall be of sufficient size and located so that the concealed items may be serviced, maintained, or replaced.

3.2.8 Sight Drains

Sight drains shall be installed so that the indirect waste will terminate 2 inches above the flood rim of the funnel to provide an acceptable air gap.

3.2.9 Traps

Each trap shall be placed as near the fixture as possible, and no fixture shall be double-trapped. Traps installed on cast-iron soil pipe shall be cast iron. Traps installed on steel pipe or copper tubing shall be recess-drainage pattern, or brass-tube type. Traps installed on plastic pipe may be plastic conforming to ASTM D 3311. Traps for acid-resisting waste shall be of the same material as the pipe.

3.2.10 Shower Pans

Before installing shower pan, subfloor shall be free of projections such as nail heads or rough edges of aggregate. Drain shall be a bolt-down, clamping-ring type with weepholes, installed so the lip of the subdrain is flush with subfloor.

3.2.10.1 General

The floor of each individual shower, the shower-area portion of combination shower and drying room, and the entire shower and drying room where the two are not separated by curb or partition, shall be made watertight with a shower pan fabricated in place. The shower pan material shall be cut to size and shape of the area indicated, in one piece to the maximum extent practicable, allowing a minimum of 6 inches for turnup on walls or partitions, and shall be folded over the curb with an approximate return of 1/4 of curb height. The upstands shall be placed behind any wall or partition finish. Subflooring shall be smooth and clean, with nailheads driven flush with surface, and shall be sloped to drain. Shower pans shall be clamped to drains with the drain clamping ring.

3.2.10.2 Metal Shower Pans

When a shower pan of required size cannot be furnished in one piece, metal pieces shall be joined with a flintlock seam and soldered or burned. The corners shall be folded, not cut, and the corner seam shall be soldered or burned. Pans, including upstands, shall be coated on all surfaces with one brush coat of asphalt. Asphalt shall be applied evenly at not less than 1 gallon per 50 square feet. A layer of felt covered with building paper shall be placed between shower pans and wood floors. The joining surfaces of metal pan and drain shall be given a brush coat of asphalt after the pan is connected to the drain.

3.2.10.3 Nonplasticized Chlorinated Polyethylene Shower Pans

Corners of nonplasticized chlorinated polyethylene shower pans shall be folded against the upstand by making a pig-ear fold. Hot-air gun or heat lamp shall be used in making corner folds. Each pig-ear corner fold shall

be nailed or stapled 1/2 inch from the upper edge to hold it in place. Nails shall be galvanized large-head roofing nails. On metal framing or studs, approved duct tape shall be used to secure pig-ear fold and membrane. Where no backing is provided between the studs, the membrane slack shall be taken up by pleating and stapling or nailing to studding 1/2 inch from upper edge. To adhere the membrane to vertical surfaces, the back of the membrane and the surface to which it will be applied shall be coated with adhesive that becomes dry to the touch in 5 to 10 minutes, after which the membrane shall be pressed into place. Surfaces to be solvent-welded shall be clean. Surfaces to be joined with xylene shall be initially sprayed and vigorously cleaned with a cotton cloth, followed by final coating of xylene and the joining of the surfaces by roller or equivalent means. If ambient or membrane temperatures are below 40 degrees F the membrane and the joint shall be heated prior to application of xylene. Heat may be applied with hot-air gun or heat lamp, taking precautions not to scorch the membrane. Adequate ventilation and wearing of gloves are required when working with xylene. Membrane shall be pressed into position on the drain body, and shall be cut and fit to match so that membrane can be properly clamped and an effective gasket-type seal provided. On wood subflooring, two layers of 15 pound dry felt shall be installed prior to installation of shower pan to ensure a smooth surface for installation.

3.2.10.4 Nonplasticized Polyvinyl Chloride (PVC) Shower Pans

Nonplasticized PVC shall be turned up behind walls or wall surfaces a distance of not less than 6 inches in room areas and 3 inches above curb level in curbed spaces with sufficient material to fold over and fasten to outside face of curb. Corners shall be pig-ear type and folded between pan and studs. Only top 1 inch of upstand shall be nailed to hold in place. Nails shall be galvanized large-head roofing type. Approved duct tape shall be used on metal framing or studs to secure pig-ear fold and membrane. Where no backing is provided between studs, the membrane slack shall be taken up by pleating and stapling or nailing to studding at top inch of upstand. To adhere the membrane to vertical surfaces, the back of the membrane and the surface to which it is to be applied shall be coated with adhesive that becomes dry to the touch in 5 to 10 minutes, after which the membrane shall be pressed into place. Trim for drain shall be exactly the size of drain opening. Bolt holes shall be pierced to accommodate bolts with a tight fit. Adhesive shall be used between pan and subdrain. Clamping ring shall be bolted firmly. A small amount of gravel or porous materials shall be placed at weepholes so that holes remain clear when setting bed is poured. Membrane shall be solvent welded with PVC solvent cement. Surfaces to be solvent welded shall be clean (free of grease and grime). Sheets shall be laid on a flat surface with an overlap of about 2 inches. Top edge shall be folded back and surface primed with a PVC primer. PVC cement shall be applied and surfaces immediately placed together, while still wet. Joint shall be lightly rolled with a paint roller, then as the joint sets shall be rolled firmly but not so hard as to distort the material. In long lengths, about 2 or 3 feet at a time shall be welded. On wood subflooring, two layers of 15 pound felt shall be installed prior to installation of shower pan to ensure a smooth surface installation.

3.3 VIBRATION-ABSORBING FEATURES

Mechanical equipment, , shall be isolated from the building structure by approved vibration-absorbing features, unless otherwise shown. Each foundation shall include an adequate number of standard isolation units.

Each unit shall consist of machine and floor or foundation fastening, together with intermediate isolation material, and shall be a standard product with printed load rating. Piping connected to mechanical equipment shall be provided with flexible connectors.

3.4 IDENTIFICATION SYSTEMS

3.4.1 Identification Tags

Identification tags made of brass, engraved laminated plastic, or engraved anodized aluminum, indicating service and valve number shall be installed on valves, except those valves installed on supplies at plumbing fixtures. Tags shall be 1-3/8 inch minimum diameter, and marking shall be stamped or engraved. Indentations shall be black, for reading clarity. Tags shall be attached to valves with No. 12 AWG, copper wire, chrome-plated beaded chain, or plastic straps designed for that purpose.

3.4.2 Pipe Color Code Marking

Color code marking of piping shall be as specified in Section 09 90 00 PAINTS AND COATINGS.

3.4.3 Color Coding Scheme for Locating Hidden Utility Components

Scheme shall be provided in buildings having suspended grid ceilings. The color coding scheme shall identify points of access for maintenance and operation of operable components which are not visible from the finished space and installed in the space directly above the suspended grid ceiling. The operable components shall include valves, dampers, switches, linkages and thermostats. The color coding scheme shall consist of a color code board and colored metal disks. Each colored metal disk shall be approximately 3/8 inch in diameter and secured to removable ceiling panels with fasteners. The fasteners shall be inserted into the ceiling panels so that the fasteners will be concealed from view. The fasteners shall be manually removable without tools and shall not separate from the ceiling panels when panels are dropped from ceiling height. Installation of colored metal disks shall follow completion of the finished surface on which the disks are to be fastened. The color code board shall have the approximate dimensions of 3 foot width, 30 inches height, and 1/2 inch thickness. The board shall be made of wood fiberboard and framed under glass or 1/16 inch transparent plastic cover. Unless otherwise directed, the color code symbols shall be approximately 3/4 inch in diameter and the related lettering in 1/2 inch high capital letters.

3.5 ESCUTCHEONS

Escutcheons shall be provided at finished surfaces where bare or insulated piping, exposed to view, passes through floors, walls, or ceilings, except in boiler, utility, or equipment rooms. Escutcheons shall be fastened securely to pipe or pipe covering and shall be satin-finish, corrosion-resisting steel, polished chromium-plated zinc alloy, or polished chromium-plated copper alloy. Escutcheons shall be either one-piece or split-pattern, held in place by internal spring tension or setscrew.

3.6 PAINTING

Painting of pipes, hangers, supports, and other iron work, either in concealed spaces or exposed spaces, is specified in Section 09 90 00 PAINTS AND COATINGS.

3.6.1 Painting of New Equipment

New equipment painting shall be factory applied or shop applied, and shall be as specified herein, and provided under each individual section.

3.6.1.1 Factory Painting Systems

Manufacturer's standard factory painting systems may be provided subject to certification that the factory painting system applied will withstand 125 hours in a salt-spray fog test, except that equipment located outdoors shall withstand 500 hours in a salt-spray fog test. Salt-spray fog test shall be in accordance with [ASTM B117](#), and for that test the acceptance criteria shall be as follows: immediately after completion of the test, the paint shall show no signs of blistering, wrinkling, or cracking, and no loss of adhesion; and the specimen shall show no signs of rust creepage beyond [0.125 inch](#) on either side of the scratch mark.

The film thickness of the factory painting system applied on the equipment shall not be less than the film thickness used on the test specimen. If manufacturer's standard factory painting system is being proposed for use on surfaces subject to temperatures above [120 degrees F](#), the factory painting system shall be designed for the temperature service.

3.6.1.2 Shop Painting Systems for Metal Surfaces

Clean, pretreat, prime and paint metal surfaces; except aluminum surfaces need not be painted. Apply coatings to clean dry surfaces. Clean the surfaces to remove dust, dirt, rust, oil and grease by wire brushing and solvent degreasing prior to application of paint, except metal surfaces subject to temperatures in excess of [120 degrees F](#) shall be cleaned to bare metal.

Where more than one coat of paint is specified, apply the second coat after the preceding coat is thoroughly dry. Lightly sand damaged painting and retouch before applying the succeeding coat. Color of finish coat shall be aluminum or light gray.

- a. Temperatures Less Than [120 Degrees F](#): Immediately after cleaning, the metal surfaces subject to temperatures less than [120 degrees F](#) shall receive one coat of pretreatment primer applied to a minimum dry film thickness of [0.3 mil](#), one coat of primer applied to a minimum dry film thickness of [one mil](#); and two coats of enamel applied to a minimum dry film thickness of [one mil](#) per coat.
- b. Temperatures Between [120 and 400 Degrees F](#): Metal surfaces subject to temperatures between [120 and 400 degrees F](#) shall receive two coats of [400 degrees F](#) heat-resisting enamel applied to a total minimum thickness of [2 mils](#).
- c. Temperatures Greater Than [400 Degrees F](#): Metal surfaces subject to temperatures greater than [400 degrees F](#) shall receive two coats of [600 degrees F](#) heat-resisting paint applied to a total minimum dry film thickness of [2 mils](#).

3.7 TESTS, FLUSHING AND DISINFECTION

3.7.1 Plumbing System

The following tests shall be performed on the plumbing system in accordance with ICC, except that the drainage and vent system final test shall include the smoke test. The Contractor has the option to perform a peppermint test in lieu of the smoke test. If a peppermint test is chosen, the Contractor must submit a testing procedure to the Contracting Officer for approval.

- a. Drainage and Vent Systems Test. The final test shall include a smoke test.
- b. Building Sewers Tests.
- c. Water Supply Systems Tests.

3.7.1.1 Test of Backflow Prevention Assemblies

Backflow prevention assembly shall be tested using gauges specifically designed for the testing of backflow prevention assemblies.

Backflow prevention assembly test gauges shall be tested annually for accuracy in accordance with the requirements of State or local regulatory agencies. If there is no State or local regulatory agency requirements, gauges shall be tested annually for accuracy in accordance with the requirements of University of Southern California's Foundation of Cross Connection Control and Hydraulic Research or the American Water Works Association Manual of Cross Connection (Manual M-14), or any other approved testing laboratory having equivalent capabilities for both laboratory and field evaluation of backflow prevention assembly test gauges. Report form for each assembly shall include, as a minimum, the following:

Data on Device	Data on Testing Firm
Type of Assembly	Name
Manufacturer	Address
Model Number	Certified Tester
Serial Number	Certified Tester No.
Size	Date of Test
Location	
Test Pressure Readings	Serial Number and Test Data of Gauges

If the unit fails to meet specified requirements, the unit shall be repaired and retested.

3.7.1.2 Shower Pans

After installation of the pan and finished floor, the drain shall be temporarily plugged below the weep holes. The floor area shall be flooded with water to a minimum depth of 1 inch for a period of 24 hours. Any drop

in the water level during test, except for evaporation, will be reason for rejection, repair, and retest.

3.7.2 Defective Work

If inspection or test shows defects, such defective work or material shall be replaced or repaired as necessary and inspection and tests shall be repeated. Repairs to piping shall be made with new materials. Caulking of screwed joints or holes will not be acceptable.

3.7.3 System Flushing

3.7.3.1 During Flushing

Before operational tests or disinfection, potable water piping system shall be flushed with potable water. Sufficient water shall be used to produce a water velocity that is capable of entraining and removing debris in all portions of the piping system. This requires simultaneous operation of all fixtures on a common branch or main in order to produce a flushing velocity of approximately 4 fps through all portions of the piping system. In the event that this is impossible due to size of system, the Contracting Officer (or the designated representative) shall specify the number of fixtures to be operated during flushing. Contractor shall provide adequate personnel to monitor the flushing operation and to ensure that drain lines are unobstructed in order to prevent flooding of the facility. Contractor shall be responsible for any flood damage resulting from flushing of the system. Flushing shall be continued until entrained dirt and other foreign materials have been removed and until discharge water shows no discoloration. All faucets and drinking water fountains, to include any device considered as an end point device by NSF/ANSI 61, Section 9, shall be flushed a minimum of 0.25 gallons per 24 hour period, ten times over a 14 day period.

3.7.3.2 After Flushing

System shall be drained at low points. Strainer screens shall be removed, cleaned, and replaced. After flushing and cleaning, systems shall be prepared for testing by immediately filling water piping with clean, fresh potable water. Any stoppage, discoloration, or other damage to the finish, furnishings, or parts of the building due to the Contractor's failure to properly clean the piping system shall be repaired by the Contractor. When the system flushing is complete, the hot-water system shall be adjusted for uniform circulation. Flushing devices and automatic control systems shall be adjusted for proper operation according to manufacturer's instructions. Comply with ASHRAE 90.1 - IP for minimum efficiency requirements. Unless more stringent local requirements exist, lead levels shall not exceed limits established by 40 CFR 141.80 (c)(1). The water supply to the building shall be tested separately to ensure that any lead contamination found during potable water system testing is due to work being performed inside the building.

3.7.4 Operational Test

Upon completion of flushing and prior to disinfection procedures, the Contractor shall subject the plumbing system to operating tests to demonstrate satisfactory installation, connections, adjustments, and functional and operational efficiency. Such operating tests shall cover a period of not less than 8 hours for each system and shall include the following information in a report with conclusion as to the adequacy of the

system:

- a. Time, date, and duration of test.
- b. Water pressures at the most remote and the highest fixtures.
- c. Operation of each fixture and fixture trim.
- d. Operation of each valve, hydrant, and faucet.
- e. Operation of each floor and roof drain by flooding with water.
- f. Operation of each vacuum breaker and backflow preventer.

3.7.5 Disinfection

After all system components are provided and operational tests are complete, the entire domestic hot- and cold-water distribution system shall be disinfected. Before introducing disinfecting chlorination material, entire system shall be flushed with potable water until any entrained dirt and other foreign materials have been removed.

Water chlorination procedure shall be in accordance with AWWA C651 and AWWA C652 as modified and supplemented by this specification. The chlorinating material shall be hypochlorites or liquid chlorine. The chlorinating material shall be fed into the water piping system at a constant rate at a concentration of at least 50 parts per million (ppm). Feed a properly adjusted hypochlorite solution injected into the system with a hypochlorinator, or inject liquid chlorine into the system through a solution-feed chlorinator .

Test the chlorine residual level in the water at 6 hour intervals for a continuous period of 24 hours. If at the end of a 6 hour interval, the chlorine residual has dropped to less than 25 ppm, flush the piping including tanks with potable water, and repeat the above chlorination procedures. During the chlorination period, each valve and faucet shall be opened and closed several times.

After the second 24 hour period, verify that no less than 25 ppm chlorine residual remains in the treated system. The 24 hour chlorination procedure must be repeated until no less than 25 ppm chlorine residual remains in the treated system.

Upon the specified verification, the system including tanks shall then be flushed with potable water until the residual chlorine level is reduced to less than one part per million. During the flushing period, each valve and faucet shall be opened and closed several times.

Take addition samples of water in disinfected containers, for bacterial examination, at locations specified by the Contracting Officer. Test these samples for total coliform organisms (coliform bacteria, fecal coliform, streptococcal, and other bacteria) in accordance with EPA SM 9223. The testing method used shall be EPA approved for drinking water systems and shall comply with applicable local and state requirements.

Disinfection shall be repeated until bacterial tests indicate the absence of coliform organisms (zero mean coliform density per 100 milliliters) in the samples for at least 2 full days. The system will not be

accepted until satisfactory bacteriological results have been obtained.

3.8 WASTE MANAGEMENT

Place materials defined as hazardous or toxic waste in designated containers. Return solvent and oil soaked rags for contaminant recovery and laundering or for proper disposal. Close and seal tightly partly used sealant and adhesive containers and store in protected, well-ventilated, fire-safe area at moderate temperature. Place used sealant and adhesive tubes and containers in areas designated for hazardous waste. Separate copper and ferrous pipe waste in accordance with the Waste Management Plan and place in designated areas for reuse.

3.9 POSTED INSTRUCTIONS

Framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, shall be posted where directed. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system shall be prepared in typed form, framed as specified above for the wiring and control diagrams and posted beside the diagrams. The framed instructions shall be posted before acceptance testing of the systems.

3.10 TABLES

TABLE I							
PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, AND VENT PIPING SYSTEMS							
Item #	Pipe and Fitting Materials	SERVICE A	SERVICE B	SERVICE C	SERVICE D	SERVICE E	SERVICE F
1	Cast iron soil pipe and fittings, hub and spigot, ASTM A74 with compression gaskets. Pipe and fittings shall be marked with the CISPI trademark.	X	X	X	X	X	
2	Cast iron soil pipe and fittings hubless, CISPI 301 and ASTM A888. Pipe and fittings shall be marked with the CISPI trademark.		X	X	X	X	
3	Cast iron drainage fittings, threaded, ASME B16.12 for use with Item 10	X		X	X		

TABLE I							
PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, AND VENT PIPING SYSTEMS							
Item #	Pipe and Fitting Materials	SERVICE A	SERVICE B	SERVICE C	SERVICE D	SERVICE E	SERVICE F
4	Cast iron screwed fittings (threaded) ASME B16.4 for use with Item 10				X	X	
5	Grooved pipe couplings, ferrous and non-ferrous pipe ASTM A536 And ASTM A47/A47M	X	X		X	X	
6	Ductile iron grooved joint fittings for ferrous pipe ASTM A536 and ASTM A47/A47M for use with Item 5	X	X		X	X	
7	Bronze sand casting grooved joint pressure fittings for non-ferrous pipe ASTM B584, for use with Item 5	X	X		X	X	
8	Wrought copper grooved joint pressure pressure fittings for non-ferrous pipe ASTM B75 C12200, ASTM B152/B152M, C11000, ASME B16.22 ASME B16.22 for use with Item 5	X	X				
9	Malleable-iron threaded fittings, galvanized ASME B16.3 for use with Item 10				X	X	
10	Steel pipe, seamless galvanized, ASTM A53/A53M, Type S, Grade B	X			X	X	
11	Seamless red brass pipe, ASTM B43				X	X	

TABLE I							
PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, AND VENT PIPING SYSTEMS							
Item #	Pipe and Fitting Materials	SERVICE A	SERVICE B	SERVICE C	SERVICE D	SERVICE E	SERVICE F
12	Bronzed flanged fittings, ASME B16.24 for use with Items 11 and 14				X	X	
13	Cast copper alloy solder joint pressure fittings, ASME B16.18 for use with Item 14				X	X	
14	Seamless copper pipe, ASTM B42						X
15	Cast bronze threaded fittings, ASME B16.15				X	X	
16	Copper drainage tube, (DWV), ASTM B306	X*	X	X*	X	X	
17	Wrought copper and wrought alloy solder-joint drainage fittings. ASME B16.29	X	X	X	X	X	
18	Cast copper alloy solder joint drainage fittings, DWV, ASME B16.23	X	X	X	X	X	
19	Acrylonitrile-Butadiene-S (ABS) plastic drain, waste, and vent pipe and fittings ASTM D 2661, ASTM F 628	X	X	X	X	X	X
20	Polyvinyl Chloride plastic drain, waste and vent pipe and fittings, ASTM D 2665, ASTM F 891, (Sch 40) ASTM F 1760	X	X	X	X	X	X

TABLE I							
PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, AND VENT PIPING SYSTEMS							
Item #	Pipe and Fitting Materials	SERVICE A	SERVICE B	SERVICE C	SERVICE D	SERVICE E	SERVICE F
21	Process glass pipe and fittings, ASTM C1053						X
22	High-silicon content cast iron pipe and fittings (hub and spigot, and mechanical joint), ASTM A518/A518M		X			X	X
23	Polypropylene (PP) waste pipe and fittings, ASTM D 4101						X
24	Filament-wound reinforced thermosetting resin (RTRP) pipe, ASTM D 2996						X
<p>SERVICE:</p> <ul style="list-style-type: none"> A - Underground Building Soil, Waste and Storm Drain B - Aboveground Soil, Waste, Drain In Buildings C - Underground Vent D - Aboveground Vent E - Interior Rainwater Conductors Aboveground F - Corrosive Waste And Vent Above And Belowground * - Hard Temper 							

-- End of Section --

SECTION 22 07 19.00 40

PLUMBING PIPING INSULATION

02/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM B209	(2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM C1136	(2010) Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
ASTM C195	(2007) Standard Specification for Mineral Fiber Thermal Insulating Cement
ASTM C449	(2007) Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement
ASTM C534/C534M	(2008) Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
ASTM C552	(2007) Standard Specification for Cellular Glass Thermal Insulation
ASTM C592	(2010) Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type)
ASTM C795	(2008) Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel
ASTM C916	(1985; R 2007) Standard Specification for Adhesives for Duct Thermal Insulation
ASTM C920	(2011) Standard Specification for Elastomeric Joint Sealants
ASTM C921	(2010) Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation

ASTM D 579 (2010) Standard Specification for Greige Woven Glass Fabrics

ASTM E 84 (2011b) Standard Test Method for Surface Burning Characteristics of Building Materials

ASTM E 96/E 96M (2010) Standard Test Methods for Water Vapor Transmission of Materials

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 220 (2009) Standard on Types of Building Construction

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE AMS 3779 (1990; Rev A; R 1994) Tape Adhesive, Pressure Sensitive Thermal Radiation Resistant, Aluminum Foil/Glass Cloth

1.2 PERFORMANCE REQUIREMENTS

Provide noncombustible thermal-insulation system materials, as defined by NFPA 220. Provide adhesives, coatings, sealants, facings, jackets, and thermal-insulation materials, except cellular elastomers, with a flame-spread classification (FSC) of 25 or less , and a smoke-developed classification (SDC) of 50 or less . Determine these maximum values in accordance with ASTM E 84 . Provide coatings and sealants that are nonflammable in their wet state.

Provide adhesives, coatings, and sealants with published or certified temperature ratings suitable for the entire range of working temperatures normal for the surfaces to which they are to be applied.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation Drawings

SD-03 Product Data

Adhesives;

Coatings;

Insulating Cement

Insulation Materials;

Jacketing

Tape

SD-07 Certificates

Recycled Materials

SD-08 Manufacturer's Instructions

Installation Manual

1.4 RECYCLED MATERIALS

Provide thermal insulation containing [recycled materials](#) to the extent practicable, provided that the material meets all other requirements of this section. The minimum recycled material content of the following insulation types are:

- a. Rock Wool - 75 percent slag by weight
- b. Fiberglass - 20-25 percent glass cullet by weight
- c. Plastic Rigid Foam - 9 percent recovered material
- d. Polyisocyanurate/Polyurethane - 9 percent recovered material
- e. Rigid Foam - 9 percent recovered material

Submit [recycled materials](#) documentation indicating percentage of post-industrial and post-consumer recycled content per unit of product. Indicate relative dollar value of recycled content products to total dollar value of products included in project.

1.5 PRE-INSTALLATION REQUIREMENTS

Within 30 days of Contract Award, submit [installation drawings](#) for pipe insulation, conforming with the adhesive manufacturer's written instructions for installation. Submit [installation manual](#) clearly stating the manufacturer's instructions for insulation materials

PART 2 PRODUCTS

Submit manufacturer's catalog data for the following items:

- a. [Adhesives](#)
- b. [Coatings](#)
- c. [Insulating Cement](#)
- d. [Insulation Materials](#)
- e. [Jacketing](#)
- f. [Tape](#)

Provide compatible materials which do not contribute to corrosion, soften, or otherwise attack surfaces to which applied, in either the wet or dry state. Meet [ASTM C795](#) requirements for materials to be used on stainless steel surfaces. Provide materials that are asbestos free and conform to the following.

2.1 INSULATION MATERIALS

Provide materials with maximum value conductances as tested at any point, not an average. Replace or augment insulation conductance found by test to exceed the specified maximum by an additional thickness to bring it to the required maximum conductance and a complete finishing system.

2.1.1 Mineral Fiber Insulation

Provide mineral fiber insulation conforming to [ASTM C592](#) and be suitable for surface temperatures up to 370 degrees F, and not less than 4-pound per cubic foot density with thermal conductivity not greater than 0.26 Btu per hour per square foot square per degree F at 150 degrees F mean.

Mineral fiber pipe wrap insulation having an insulating efficiency not less than that of the specified thickness of fibrous glass pipe insulation may be provided in lieu of fibrous glass pipe insulation for pipe sizes 10 inches and larger.

2.1.2 Cellular Elastomer Insulation

Provide cellular elastomer insulation conforming to [ASTM C534/C534M](#), ensuring the water vapor permeability does not exceed 0.30 perms per foot per inch per hour per square foot mercury pressure difference for 1 inch thickness of cellular elastomer.

2.1.3 Cellular Glass Insulation

Conform to [ASTM C552](#), Type II, Grade 2, pipe covering for Cellular Glass. Substitutions for this material are not permitted. Ensure minimum thickness is not less than 1-1/2 inches.

2.1.4 Pipe Fittings

Provide molding pipe fitting insulation covering for use at temperatures up to and including 1200 degrees F.

2.1.5 Flexible Blankets

Provide flexible blankets and felts for use at temperatures up to and including 350 degrees F minimum 1 pound per cubic foot density. Ensure thermal conductivity is no greater than 0.26 Btu per hour per square foot per degree F at 75 degrees F mean.

2.2 ADHESIVES

2.2.1 Cloth Adhesives

Provide adhesives for adhering, sizing, and finishing lagging cloth, canvas, and open-weave glass cloth with a pigmented polyvinyl acetate emulsion conforming to the requirements of [ASTM C916](#), Type I.

2.2.2 Vapor-Barrier Material Adhesives

Provide adhesives for attaching laps of vapor-barrier materials and presized glass cloth for attaching insulation to itself, to metal, and to various other substrates, of nonflammable solvent-base, synthetic-rubber type conforming to the requirements of [ASTM C916](#), Type I, for attaching fibrous-glass insulation to metal surfaces.

2.2.3 Cellular Elastomer Insulation Adhesive

For cellular elastomer insulation adhesive, provide a solvent cutback chloroprene elastomer conforming to [ASTM C916](#), Type I, and be of a type approved by the manufacturer of the cellular elastomer for the intended use.

2.3 INSULATING CEMENT

2.3.1 General Purpose Insulating Cement

Provide general purpose insulating cement, mineral fiber, conforming to [ASTM C195](#). Ensure composite is rated for 1800 degrees F service, with a thermal-conductivity maximum of 0.85 Btu by inch per hour per square foot for each degree F temperature differential at 200 degrees F mean temperature for 1 inch thickness.

2.3.2 Finishing Insulating Cement

Provide finishing insulating cement of a mineral-fiber, hydraulic-setting type conforming to [ASTM C449](#).

2.4 CALKING

Provide elastomeric joint sealant for calking specified insulation materials in accordance with [ASTM C920](#), Type S, Grade NS, Class 25, Use A.

2.5 CORNER ANGLES

Provide nominal 0.016 inch aluminum 1 by 1 inch corner angle piping insulation with factory applied kraft backing. Ensure aluminum conforms to [ASTM B209](#), Alloy 3105 .

2.6 JACKETING

2.6.1 PVC Jacket

Provide 0.010 inch thick, factory-premolded, one-piece fitting polyvinylchloride that is self-extinguishing, high-impact strength, moderate chemical resistance with a permeability rating of 0.01 grain per hour per square foot per inch of mercury pressure difference, determined in accordance with [ASTM E 96/E 96M](#). Provide manufacturer's standard solvent-weld type vapor-barrier joint adhesive.

Conform to [ASTM C1136](#) for, Type I, low-vapor transmission, high-puncture resistance vapor barrier for use on insulation for piping, ducts, and equipment.

2.7 COATINGS

2.7.1 Indoor Vapor-Barrier Finishing

Provide pigmented resin and solvent compound coatings for indoor vapor-barrier finishing of insulation surfaces conforming to [ASTM C1136](#), Type II.

2.7.2 Cellular-Elastomer Insulation Coating

Provide a polyvinylchloride lacquer approved by the manufacturer of the

cellular elastomer finish coating.

2.7.3 Coating Color

Provide white for the coating color.

2.8 TAPE

Provide a knitted elastic cloth glass lagging specifically suitable for continuous spiral wrapping of insulated pipe bends and fittings and produce a smooth, tight, wrinkle-free surface. Conform to requirements of [SAE AMS 3779](#), [SAE AMS 3779](#), [ASTM D 579](#), and [ASTM C921](#) for tape, weighing not less than [10 ounces per square yard](#).

2.9 DUAL-TEMPERATURE (HOT- AND CHILLED-) WATER PIPING

Provide mineral fiber with vapor barrier jacket, Type T-1 insulation, with a thickness of not less than [2"](#). Insulate aboveground pipes, valve bodies, fittings, unions, and flanges.

2.10 HOT-WATER, STEAM, AND CONDENSATE-RETURN PIPING

Provide mineral fiber insulation with glass cloth jacket, Type T-2, with a thickness of not less than [2 in](#). Insulate aboveground pipes, valve bodies, fittings, unions, flanges, and miscellaneous surfaces.

2.11 REFRIGERANT SUCTION PIPING

Provide cellular-elastomer insulation, Type T-3, with a nominal thickness of [3/4 inch](#). Insulate surfaces, including valve, fittings, unions, and flanges.

2.12 COOLING-TOWER CIRCULATING WATER PIPING

Provide cellular-elastomer insulation, Type T-3, with a thickness of not less than [1-1/2"](#). Insulate aboveground pipes, valve bodies, fittings, unions, flanges, and miscellaneous surfaces.

Provide mineral fiber insulation with aluminum jacket, Type T-6, with a thickness of not less than [1-1/2"](#). Insulate aboveground pipes, valve bodies, fittings, unions, flanges, and miscellaneous surfaces.

2.13 HOT WATER HEATING CONVERTER

Provide calcium silicate insulation with glass cloth jacket, Type T-7, with a thickness of [1-1/2 inches](#).

2.14 CHILLED-WATER AND DUAL-TEMPERATURE PUMPS

Provide cellular elastomer insulation, Type T-9, with a thickness of [1 inch](#). Cover surfaces subject to condensation, and provide a vapor-barrier coating.

PART 3 EXECUTION

3.1 INSTALLATION OF INSULATION SYSTEMS

Install smooth and continuous contours on exposed work. Smoothly and securely paste down cemented laps, flaps, bands, and tapes. Apply adhesives on a full-coverage basis.

Apply insulation only to system or component surfaces that have been tested and approved.

Install insulation lengths tightly butted against each other at joints. Where lengths are cut, provide smooth and square and without breakage of end surfaces. Where insulation terminates, neatly taper and effectively seal ends, or finish as specified. Direct longitudinal seams of exposed insulation away from normal view.

Apply materials in conformance with the recommendations of the manufacturer.

Clean surfaces free of oil and grease before insulation adhesives or mastics are applied. Provide solvent cleaning required to bring metal surfaces to such condition.

Submit [installation drawings](#) for pipe insulation, conforming with the adhesive manufacturer's written instructions for installation. Submit [installation manual](#) clearly stating the manufacturer's instructions for insulation materials.

3.2 SYSTEM TYPES

3.2.1 Type T-1, Mineral Fiber with Vapor-Barrier Jacket

Cover piping with mineral-fiber pipe insulation with factory-and field-attached vapor-barrier jacket. Maintain vapor seal. Securely cement jackets, jacket laps, flaps, and bands in place with vapor-barrier adhesive. Provide jacket overlaps not less than [1-1/2 inches](#) and jacketing bands for butt joints [3 inches](#) wide.

Cover exposed-to-view fittings and valve bodies with preformed mineral-fiber pipe-fitting insulation of the same thickness as the pipe-barrel insulation. Temporarily secure fitting insulation in place with light cord ties. Apply a [60-mil](#) coating of white indoor vapor-barrier coating and, while still wet, wrap with glass lagging tape with 50 percent overlap, and smoothly blend into the adjacent jacketing. Apply additional coating as needed and rubber-gloved to smooth fillet or contour coating, then allowed to fully cure before the finish coating is applied. On-the-job fabricated insulation for concealed fittings and special configurations, build up from mineral fiber and a special mastic consisting of a mixture of insulating cement and lagging adhesive diluted with 3 parts water. Where standard vapor-barrier jacketing cannot be used, make the surfaces vapor tight by using coating and glass lagging cloth or tape as previously specified.

In lieu of materials and methods previously specified, fittings may be wrapped with a twine-secured, mineral-wool blanket to the required thickness and covered with premolded polyvinylchloride jackets. Make seams vapor tight with a double bead of manufacturer's standard vapor-barrier adhesive applied in accordance with the manufacturer's instructions. Hold all jacket ends in place with AISI 300 series corrosion-resistant steel straps, [15 mils](#) thick by [1/2 inch](#) wide.

Set pipe insulation into an outdoor vapor-barrier coating for a minimum of [6 inches](#) at maximum [12-foot](#) spacing and the ends of the insulation sealed to the jacketing with the same material to provide an effective vapor-barrier stop.

Do not use staples in applying insulation. Install continuous vapor-barrier materials over all surfaces, including areas inside pipe sleeves, hangers, and other concealments.

Provide piping insulation at hangers consisting of 13-pounds per cubic foot density, fibrous-glass inserts or expanded, rigid, closed-cell, polyvinylchloride. Seal junctions with vapor-barrier jacket where required, glass-cloth mesh tape, and vapor-barrier coating.

Expose white-bleached kraft paper side of the jacketing to view.

Finish exposed-to-view insulation with not less than a 6-mil dry-film thickness of nonvapor-barrier coating suitable for painting.

3.2.2 Type T-3, Cellular Elastomer

Cover piping-system surfaces with flexible cellular-elastomer sheet or preformed insulation. Maintain vapor seal. Cement insulation into continuous material with a solvent cutback chloroprene adhesive recommended by the manufacturer for the specific purpose. Apply adhesive to both of the surfaces on a 100-percent coverage basis to a minimum thickness of 10 mils wet or approximately 150 square feet per gallon of undiluted adhesive.

Seal insulation on cold water piping to the pipe for a minimum of 6 inches at maximum intervals of 12 feet to form an effective vapor barrier. At piping supports, ensure insulation is continuous through using outside-carrying type clevis hangers with insulation shield. Install Cork load-bearing inserts between the pipe and insulation shields to prevent insulation compression.

Insulate hot-water, cold-water, and condensate drain pipes to the extent shown with nominal 1/2 inch thick, fire retardant (FR), cellular elastomer, preformed pipe insulation. Seal joints with adhesive.

At pipe hangers or supports where the insulation rests on the pipe hanger strap, cut the insulation with a brass cork borer and a No. 3 superior grade cork inserted. Seal seams with approved adhesive. Insulate sweat fitting with miter-cut pieces of cellular elastomer insulation of the same nominal pipe size and thickness as the insulation on the adjacent piping or tubing. Joint miter-cut pieces with approved adhesive. Slit and snap covers over the fitting, and seal joints with approved adhesive.

Insulate screwed fittings with sleeve-type covers formed from miter-cut pieces of cellular elastomer thermal insulation having an inside diameter large enough to overlap adjacent pipe insulation. Butt pipe insulation against fittings, and overlap not less than 1 inch. Use adhesive to join cover pieces and cement the cover to the pipe insulation.

Finish surfaces exposed to view or ultraviolet light with a 2-mil minimum dry-film thickness application of a polyvinylchloride lacquer recommended by the manufacturer, and applied in not less than two coats.

3.2.3 Type T-4, Cellular Glass with Vapor-Barrier Jacket

Cover piping with cellular glass insulation and factory- and field-attached vapor-barrier jacket. Maintain vapor seal. Securely cement jackets, jacket laps, flaps, and bands in place with vapor-barrier adhesive, and overlap jacket not less than 1-1/2 inches. Provide jacket bands for butt joints of not less than 3 inches width. Provide insulation continuous

through hangers. Bed insulation in an outdoor vapor-barrier coating applied to all piping surfaces.

Insulate flanges, unions, valves, anchors, and fittings with factory premolded or prefabricated or field fabricated segments of insulation of the same material and thickness as the adjoining pipe insulation. When segments of insulation are used, provide elbows with not less than three segments. For other fittings and valves, cut segments to the required curvature or nesting size.

Secure segments of the insulation in place with twine or copper wire. After the insulation segments are firmly in place, apply a vapor-barrier coating over the insulation in two coats with glass tape imbedded between coats. First coat, tinted, the second, white to ensure application of two coats. Apply coating to a total dry-film thickness of $1/16$ inch minimum. Overlap glass tape seams not less than 1 inch and the tape end not less than 4 inches.

In lieu of materials and methods specified above, fittings may be wrapped with $3/8$ inch thick, vapor-barrier, adhesive-coated strips of cellular elastomer insulation. Insulation shall be under tension, compressed to 25 percent of original thickness, and wrapped until overall thickness is equal to adjacent insulation. Secure cellular elastomer in place with twine and sealed with vapor-barrier coating applied to produce not less than $1/16$ inch dry-film thickness. Cover fittings with premolded polyvinylchloride jackets. Make seams vapor-tight with a double bead of manufacturer's standard vapor-barrier adhesive applied in accordance with the manufacturer's instructions. Hold jacket ends in place with AISI 300 series corrosion-resistant steel straps, 15 mils thick by $1/2$ inch wide.

Insulate anchors secured directly to piping, to prevent condensation, for not less than 6 inches from the surface of the pipe insulation.

Install white-bleached kraft paper side of jacket exposed to view. Finish exposed-to-view insulation with not less than a 6 -mil dry-film thickness of nonvapor-barrier coating suitable for painting.

3.3 ACCEPTANCE

Final acceptance is dependent upon providing construction (Record Drawings) details to the Contracting Officer. Include construction details, by building area, the insulation material type, amount, and installation method. An illustration or map of the duct routing locations may serve this purpose. With data, provide a cover letter/sheet clearly marked with the system name, date, and the words "Record Drawings insulation/material." Forward to the Systems Engineer/Condition Monitoring Office/Predictive Testing Group for inclusion in the Maintenance Database."

-- End of Section --

SECTION 23 03 00

BASIC MECHANICAL MATERIALS AND METHODS

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)
ASTM B 117 (2009) Standing Practice for Operating Salt Spray (Fog) Apparatus

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
IEEE C2 (2012) National Electrical Safety Code

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
NEMA MG 1 (2011) Motors and Generators
NEMA MG 10 (1994) Energy Management Guide for Selection and Use of Fixed Frequency Medium AC Squirrel-Cage Polyphase Induction Motors
NEMA MG 11 (1977; R 2007) Energy Management Guide for Selection and Use of Single Phase Motors

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
NFPA 70 (2011; Errata 2 2012) National Electrical Code

1.2 RELATED REQUIREMENTS

This section applies to all sections of Division 15, "Mechanical" of this project specification, unless specified otherwise in the individual section.

1.3 QUALITY ASSURANCE

1.3.1 Material and Equipment Qualifications

Provide materials and equipment that are standard products of manufacturers regularly engaged in the manufacture of such products, which are of a similar material, design and workmanship. Standard products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2 year period.

1.3.2 Alternative Qualifications

Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.

1.3.3 Service Support

The equipment items shall be supported by service organizations. Submit a certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. These service organizations shall be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.3.4 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.3.5 Modification of References

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction", or words of similar meaning, to mean the Contracting Officer.

1.3.5.1 Definitions

For the International Code Council (ICC) Codes referenced in the contract documents, advisory provisions shall be considered mandatory, the word "should" shall be interpreted as "shall." Reference to the "code official" shall be interpreted to mean the "Contracting Officer." For Navy owned property, references to the "owner" shall be interpreted to mean the "Contracting Officer." For leased facilities, references to the "owner" shall be interpreted to mean the "lessor." References to the "permit holder" shall be interpreted to mean the "Contractor."

1.3.5.2 Administrative Interpretations

For ICC Codes referenced in the contract documents, the provisions of Chapter 1, "Administrator," do not apply. These administrative requirements are covered by the applicable Federal Acquisition Regulations (FAR) included in this contract and by the authority granted to the Officer in Charge of Construction to administer the construction of this project. References in the ICC Codes to sections of Chapter 1, shall be applied appropriately by the Contracting Officer as authorized by his administrative cognizance and the FAR.

1.4 DELIVERY, STORAGE, AND HANDLING

Handle, store, and protect equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.

1.5 ELECTRICAL REQUIREMENTS

Furnish motors, controllers, disconnects and contactors with their respective pieces of equipment. Motors, controllers, disconnects and contactors shall conform to and have electrical connections provided under Section 26 05 00.00 40, "Common Work Results For Electrical." Furnish internal wiring for components of packaged equipment as an integral part of the equipment. Extended voltage range motors will not be permitted. Controllers and contactors shall have a maximum of 120 volt control circuits, and shall have auxiliary contacts for use with the controls furnished. When motors and equipment furnished are larger than sizes indicated, the cost of additional electrical service and related work shall be included under the section that specified that motor or equipment. Power wiring and conduit for field installed equipment shall be provided under and conform to the requirements of Section 26 05 00.00 40, "Common Work Results For Electrical."

1.6 ELECTRICAL INSTALLATION REQUIREMENTS

Electrical installations shall conform to IEEE C2, NFPA 70, and requirements specified herein.

1.6.1 New Work

Provide electrical components of mechanical equipment, such as motors, motor starters (except starters/controllers which are indicated as part of a motor control center), control or push-button stations, float or pressure switches, solenoid valves, integral disconnects, and other devices functioning to control mechanical equipment, as well as control wiring and conduit for circuits rated 100 volts or less, to conform with the requirements of the section covering the mechanical equipment. Extended voltage range motors shall not be permitted. The interconnecting power wiring and conduit, control wiring rated 120 volts (nominal) and conduit, the motor control equipment forming a part of motor control centers, and the electrical power circuits shall be provided under Division 16, except internal wiring for components of package equipment shall be provided as an integral part of the equipment. When motors and equipment furnished are larger than sizes indicated, provide any required changes to the electrical service as may be necessary and related work as a part of the work for the section specifying that motor or equipment.

1.6.2 Modifications to Existing Systems

Where existing mechanical systems and motor-operated equipment require modifications, provide electrical components under Division 16.

1.6.3 High Efficiency Motors

1.6.3.1 High Efficiency Single-Phase Motors

Unless otherwise specified, single-phase fractional-horsepower alternating-current motors shall be high efficiency types corresponding to the applications listed in NEMA MG 11.

1.6.3.2 High Efficiency Polyphase Motors

Unless otherwise specified, polyphase motors, except motors integral to equipment with a total efficiency rating, shall be selected based on

premium efficiency characteristics relative to the applications as listed in NEMA MG 10. Additionally, polyphase squirrel-cage medium induction motors with continuous ratings shall meet or exceed energy efficient ratings in accordance with Table 12-6C of NEMA MG 1.

1.6.4 Three-Phase Motor Protection

Provide controllers for 3 phase motors rated one horsepower (.75 kilowatts) and larger with electronic phase-voltage monitors designed to protect motors from phase-loss, undervoltage, and overvoltage. Provide protection for motors from immediate restart by a time adjustable restart relay.

1.7 INSTRUCTION TO GOVERNMENT PERSONNEL

When specified in other sections, furnish the services of competent instructors to give full instruction to the designated Government personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the specified equipment or system. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work.

Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section. When more than 4 man-days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for instruction with the equipment or system.

When significant changes or modifications in the equipment or system are made under the terms of the contract, provide additional instruction to acquaint the operating personnel with the changes or modifications.

1.8 ACCESSIBILITY

Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install concealed valves, expansion joints, controls, dampers, and equipment requiring access, in locations freely accessible through access doors.

1.9 EQUIPMENT INVENTORY UPDATE

Submit information for each piece of equipment removed and supplied for use of Camp Lejeune to update the Maximo equipment inventory. For the purposes of this paragraph, inventoried equipment is defined as equipment listed on the Maximo Equipment Inventory Update form.

1.9.1 Requirements

The contractor shall prepare and submit one Maximo Equipment Inventory Update form for each individual item of inventoried equipment that is demolished, removed, replaced, or installed. (ex: three new condensing units would require the submission of three Equipment Inventory Update forms. The replacement of two existing air handling units with two new air handling units would require the submission of two Equipment Inventory Update forms). The contractor shall prepare and submit a VAV/TAB Room Number List for each VAV/Tab model installed in a single building. Only one Maximo Equipment Inventory Update form is required for each model of VAV or TAB in a single building.

1.9.1.1 Demolition of all equipment in a structure or facility

When all the inventoried equipment in a building or structure is demolished or removed, and not replaced, an Equipment Inventory Update form is not required.

1.9.1.2 Standards

The contractor shall provide accurate, complete, and legible information on all required forms. All required forms shall be completed and delivered to the Contracting Officer on or before the Beneficial Occupancy Date. All information on Equipment Inventory Update forms shall be obtained by visual inspection of equipment data plate(s).

1.9.1.3 Form Preparation

Each required Maximo Equipment Inventory Update form shall contain the following information:

- (1) The name and telephone number of an individual who can be contacted for clarification or additional information pertaining to the data on the form.
- (2) The date of data collection
- (3) The building or structure identification number and the specific location of the equipment within the structure (ex: 3d deck mech room)
- (4) A check adjacent to the description of the new or replacement item, and a check adjacent to the supplemental description if applicable (ex: circulating pump and HVAC or steam)
- (5) The Maximo number or serial number of the demolished or removed item, if applicable
- (6) All applicable data from the equipment data plate

Each Room Number List form shall contain the following information:

- (1) The name and telephone number of the individual providing the information
- (2) The date the form was completed
- (3) The building or structure identification number
- (4) A check in the box adjacent to each applicable room number

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 PAINTING OF NEW EQUIPMENT

New equipment painting shall be factory applied or shop applied, and shall be as specified herein, and provided under each individual section.

3.1.1 Factory Painting Systems

Manufacturer's standard factory painting systems may be provided subject to certification that the factory painting system applied will withstand 125 hours in a salt-spray fog test, except that equipment located outdoors shall withstand 500 hours in a salt-spray fog test. Salt-spray fog test shall be in accordance with ASTM B 117, and for that test the acceptance criteria shall be as follows: immediately after completion of the test, the paint shall show no signs of blistering, wrinkling, or cracking, and no loss of adhesion; and the specimen shall show no signs of rust creepage beyond 0.125 inch on either side of the scratch mark.

The film thickness of the factory painting system applied on the equipment shall not be less than the film thickness used on the test specimen. If manufacturer's standard factory painting system is being proposed for use on surfaces subject to temperatures above 120 degrees F, the factory painting system shall be designed for the temperature service.

3.1.2 Shop Painting Systems for Metal Surfaces

Clean, pretreat, prime and paint metal surfaces; except aluminum surfaces need not be painted. Apply coatings to clean dry surfaces. Clean the surfaces to remove dust, dirt, rust, oil and grease by wire brushing and solvent degreasing prior to application of paint, except metal surfaces subject to temperatures in excess of 120 degrees F shall be cleaned to bare metal.

Where more than one coat of paint is specified, apply the second coat after the preceding coat is thoroughly dry. Lightly sand damaged painting and retouch before applying the succeeding coat. Color of finish coat shall be aluminum or light gray.

- a. Temperatures Less Than 120 Degrees F: Immediately after cleaning, the metal surfaces subject to temperatures less than 120 degrees F shall receive one coat of pretreatment primer applied to a minimum dry film thickness of 0.3 mil, one coat of primer applied to a minimum dry film thickness of one mil; and two coats of enamel applied to a minimum dry film thickness of one mil per coat.
- b. Temperatures Between 120 and 400 Degrees F: Metal surfaces subject to temperatures between 120 and 400 degrees F shall receive two coats of 400 degrees F heat-resisting enamel applied to a total minimum thickness of 2 mils.
- c. Temperatures Greater Than 400 Degrees F: Metal surfaces subject to temperatures greater than 400 degrees F shall receive two coats of 600 degrees F heat-resisting paint applied to a total minimum dry film thickness of 2 mils.

MAXIMO EQUIPMENT INVENTORY UPDATE

Employee: _____ Phone: _____ Date: ____/____/____

Bldg: _____ Specific Location: _____

- AC, Computer Room
- AC, Package
- AC, Package Terminal
- Assembly, Trap line
- Backflow Preventer
- Boiler
- Chiller, Air Cooled Recip
- Chiller, Air Cooled Screw
- Chiller, Air Cooled Scroll
- Chiller, Water Cooled Recip
- Chiller, Water Cooled Screw
- Compressor, Control Air
- Compressor, Industrial Air
- Dryer, Refrigerated Air
- Exchanger, Heat
- Evaporator, Freezer
- Evaporator, Refrigerator
- Fan, Exhaust
- Generator
- Heater, Space
- Heater, Unit
- Heat Pump, Geo-Thermal
- Heat Pump, Indoor Unit
- Heat Pump, Outdoor Unit
- Heat Pump, Package
- Heat Pump, Package Terminal
- Pump, Circulating, Chilled Water
- Pump, Circulating, Domestic Water
- Pump, Circulating, Dual Temp Water
- Pump, Circulating, Heating Water
- Pump, Condensate
- Pump, Sump
- Regulator, Temperature
- Tank, Hot Water Storage
- Tower, Cooling
- Unit, Air Handling
- Unit, AC Condensing
- Unit, Freezer Condensing
- Unit, Refrigerator Condensing
- Unit, Fan Coil
- Unit, TAB (Attach Room No. List)
- Unit, VAV (Attach Room No. List)
- Valve, Pressure Reducing
- Valve, Steam Pilot
- Water Heater

Demolished/Removed Equipment

Maximo no: _____ or Ser no: _____

New Equipment

Manufacturer: _____

Model no: _____

Ser no: _____

Type: __Elec __Oil __LP Gas __Nat Gas __Steam __Water __Air

Motor Data: HP____ Volts____ Phase____ RLA____ RPM____ Frame____

Tons____ No. of Motors____ no. of Belts____ Belt size(s)____ CFM____

KW____ Refrig type____ Refrig Qty____ Filter Size(s)____

VAV/TAB Room Number List

Employee: _____

Phone: _____

Bldg: _____

Date: _____

VAV/TAB Model Number: _____

100 <input type="checkbox"/>	130 <input type="checkbox"/>	160 <input type="checkbox"/>	200 <input type="checkbox"/>	230 <input type="checkbox"/>	260 <input type="checkbox"/>	300 <input type="checkbox"/>	330 <input type="checkbox"/>	360 <input type="checkbox"/>
101 <input type="checkbox"/>	131 <input type="checkbox"/>	161 <input type="checkbox"/>	201 <input type="checkbox"/>	231 <input type="checkbox"/>	261 <input type="checkbox"/>	301 <input type="checkbox"/>	331 <input type="checkbox"/>	361 <input type="checkbox"/>
102 <input type="checkbox"/>	132 <input type="checkbox"/>	162 <input type="checkbox"/>	202 <input type="checkbox"/>	232 <input type="checkbox"/>	262 <input type="checkbox"/>	302 <input type="checkbox"/>	332 <input type="checkbox"/>	362 <input type="checkbox"/>
103 <input type="checkbox"/>	133 <input type="checkbox"/>	163 <input type="checkbox"/>	203 <input type="checkbox"/>	233 <input type="checkbox"/>	263 <input type="checkbox"/>	303 <input type="checkbox"/>	333 <input type="checkbox"/>	363 <input type="checkbox"/>
104 <input type="checkbox"/>	134 <input type="checkbox"/>	164 <input type="checkbox"/>	204 <input type="checkbox"/>	234 <input type="checkbox"/>	264 <input type="checkbox"/>	304 <input type="checkbox"/>	334 <input type="checkbox"/>	364 <input type="checkbox"/>
105 <input type="checkbox"/>	135 <input type="checkbox"/>	165 <input type="checkbox"/>	205 <input type="checkbox"/>	235 <input type="checkbox"/>	265 <input type="checkbox"/>	305 <input type="checkbox"/>	335 <input type="checkbox"/>	365 <input type="checkbox"/>
106 <input type="checkbox"/>	136 <input type="checkbox"/>	166 <input type="checkbox"/>	206 <input type="checkbox"/>	236 <input type="checkbox"/>	266 <input type="checkbox"/>	306 <input type="checkbox"/>	336 <input type="checkbox"/>	366 <input type="checkbox"/>
107 <input type="checkbox"/>	137 <input type="checkbox"/>	167 <input type="checkbox"/>	207 <input type="checkbox"/>	237 <input type="checkbox"/>	267 <input type="checkbox"/>	307 <input type="checkbox"/>	337 <input type="checkbox"/>	367 <input type="checkbox"/>
108 <input type="checkbox"/>	138 <input type="checkbox"/>	168 <input type="checkbox"/>	208 <input type="checkbox"/>	238 <input type="checkbox"/>	268 <input type="checkbox"/>	308 <input type="checkbox"/>	338 <input type="checkbox"/>	368 <input type="checkbox"/>
109 <input type="checkbox"/>	139 <input type="checkbox"/>	169 <input type="checkbox"/>	209 <input type="checkbox"/>	239 <input type="checkbox"/>	269 <input type="checkbox"/>	309 <input type="checkbox"/>	339 <input type="checkbox"/>	369 <input type="checkbox"/>
110 <input type="checkbox"/>	140 <input type="checkbox"/>	170 <input type="checkbox"/>	210 <input type="checkbox"/>	240 <input type="checkbox"/>	270 <input type="checkbox"/>	310 <input type="checkbox"/>	340 <input type="checkbox"/>	370 <input type="checkbox"/>
111 <input type="checkbox"/>	141 <input type="checkbox"/>	171 <input type="checkbox"/>	211 <input type="checkbox"/>	241 <input type="checkbox"/>	271 <input type="checkbox"/>	311 <input type="checkbox"/>	341 <input type="checkbox"/>	371 <input type="checkbox"/>
112 <input type="checkbox"/>	142 <input type="checkbox"/>	172 <input type="checkbox"/>	212 <input type="checkbox"/>	242 <input type="checkbox"/>	272 <input type="checkbox"/>	312 <input type="checkbox"/>	342 <input type="checkbox"/>	372 <input type="checkbox"/>
113 <input type="checkbox"/>	143 <input type="checkbox"/>	173 <input type="checkbox"/>	213 <input type="checkbox"/>	243 <input type="checkbox"/>	273 <input type="checkbox"/>	313 <input type="checkbox"/>	343 <input type="checkbox"/>	373 <input type="checkbox"/>
114 <input type="checkbox"/>	144 <input type="checkbox"/>	174 <input type="checkbox"/>	214 <input type="checkbox"/>	244 <input type="checkbox"/>	274 <input type="checkbox"/>	314 <input type="checkbox"/>	344 <input type="checkbox"/>	374 <input type="checkbox"/>
115 <input type="checkbox"/>	145 <input type="checkbox"/>	175 <input type="checkbox"/>	215 <input type="checkbox"/>	245 <input type="checkbox"/>	275 <input type="checkbox"/>	315 <input type="checkbox"/>	345 <input type="checkbox"/>	375 <input type="checkbox"/>
116 <input type="checkbox"/>	146 <input type="checkbox"/>		216 <input type="checkbox"/>	246 <input type="checkbox"/>		316 <input type="checkbox"/>	346 <input type="checkbox"/>	
117 <input type="checkbox"/>	147 <input type="checkbox"/>		217 <input type="checkbox"/>	247 <input type="checkbox"/>		317 <input type="checkbox"/>	347 <input type="checkbox"/>	
118 <input type="checkbox"/>	148 <input type="checkbox"/>		218 <input type="checkbox"/>	248 <input type="checkbox"/>		318 <input type="checkbox"/>	348 <input type="checkbox"/>	
119 <input type="checkbox"/>	149 <input type="checkbox"/>		219 <input type="checkbox"/>	249 <input type="checkbox"/>		319 <input type="checkbox"/>	349 <input type="checkbox"/>	
120 <input type="checkbox"/>	150 <input type="checkbox"/>		220 <input type="checkbox"/>	250 <input type="checkbox"/>		320 <input type="checkbox"/>	350 <input type="checkbox"/>	
121 <input type="checkbox"/>	151 <input type="checkbox"/>		221 <input type="checkbox"/>	251 <input type="checkbox"/>		321 <input type="checkbox"/>	351 <input type="checkbox"/>	
122 <input type="checkbox"/>	152 <input type="checkbox"/>		222 <input type="checkbox"/>	252 <input type="checkbox"/>		322 <input type="checkbox"/>	352 <input type="checkbox"/>	
123 <input type="checkbox"/>	153 <input type="checkbox"/>		223 <input type="checkbox"/>	253 <input type="checkbox"/>		323 <input type="checkbox"/>	353 <input type="checkbox"/>	
124 <input type="checkbox"/>	154 <input type="checkbox"/>		224 <input type="checkbox"/>	254 <input type="checkbox"/>		324 <input type="checkbox"/>	354 <input type="checkbox"/>	
125 <input type="checkbox"/>	155 <input type="checkbox"/>		225 <input type="checkbox"/>	255 <input type="checkbox"/>		325 <input type="checkbox"/>	355 <input type="checkbox"/>	
126 <input type="checkbox"/>	156 <input type="checkbox"/>		226 <input type="checkbox"/>	256 <input type="checkbox"/>		326 <input type="checkbox"/>	356 <input type="checkbox"/>	
127 <input type="checkbox"/>	157 <input type="checkbox"/>		227 <input type="checkbox"/>	257 <input type="checkbox"/>		327 <input type="checkbox"/>	357 <input type="checkbox"/>	
128 <input type="checkbox"/>	158 <input type="checkbox"/>		228 <input type="checkbox"/>	258 <input type="checkbox"/>		328 <input type="checkbox"/>	358 <input type="checkbox"/>	
129 <input type="checkbox"/>	159 <input type="checkbox"/>		229 <input type="checkbox"/>	259 <input type="checkbox"/>		329 <input type="checkbox"/>	359 <input type="checkbox"/>	

Instructions

- (1) Confirm room numbers by visual inspection
- (2) Check the box next to each applicable room number

End of Section

SECTION 23 05 92

TESTING/ADJUSTING/BALANCING: SMALL HEATING/VENTILATING/COOLING SYSTEMS

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASSOCIATED AIR BALANCE COUNCIL (AABC)

AABC MN-1 1989 National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems

NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)

NEBB Procedural Stds 1991 Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA TAB HVAC Sys 1993 HVAC Systems - Testing, Adjusting and Balancing

1.2 DESCRIPTION OF WORK

The work includes testing, adjusting, and balancing (TAB) of new and existing heating, ventilating, and cooling (HVAC) air and water distribution systems including equipment, ducts, and piping which are located within, on, under, between, and adjacent to buildings.

1.2.1 Air Distribution Systems

Systems shall be tested, adjusted, and balanced (TAB'd) in compliance with this section. Obtain Contracting Officer's written approval before applying insulation to exterior of air distribution systems under Section 23 07 00, "Insulation for Mechanical Systems."

1.2.2 Water Distribution Systems

Systems shall be TAB'd in compliance with this section. Obtain Contracting Officer's written approval before applying insulation to water distribution systems under Section 23 07 00, "Insulation for Mechanical Systems." At Contractor's option and with Contracting Officer's written approval, the piping systems may be insulated before systems are TAB'd. Piping insulation shall terminate immediately adjacent to each flow control valve, automatic control valve, or device. For chilled water and chilled-hot water piping, the ends of pipe insulation and the space between ends of pipe insulation and piping shall be sealed with waterproof vapor barrier

coating. After completion of work under this section, the flow control valves and devices shall be insulated under Section 23 07 00, "Insulation for Mechanical Systems."

1.3 DEFINITIONS

- a. TAB team supervisor: TAB team engineer.
- b. TAB team technician: TAB team assistant.
- c. Field check group: One or more systems of the same basic type; the subgroup of a "field check group" is a "system."
- d. Out-of-tolerance data: Pertains only to field checking of certified DALT or TAB report. The term is defined as a measurement taken during field checking which does not fall within the range of plus 10 to minus 10 percent of the design for a specific parameter.

1.4 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-06 Test Reports

Certified TAB Report

1.4.1 Certified TAB Report

Submit certified TAB report with a certification statement which attests that the procedures executed have been in full compliance with the requirements of NEBB Procedural Stds, AABC MN-1, or SMACNA TAB HVAC Sys. Certifications shall further attest that any/all known deficiencies in operation, performance, or water/air flows are clearly identified herein. The report shall be reported in the specified format including the following data:

- a. Report Format: Submit completed report forms for each of the following; as a minimum, report all data as contained on standard NEBB Procedural Stds, AABC MN-1, OR SMACNA TAB HVAC Sys report forms as contained within the referenced standards:
 - (1) Air Systems
 - (a) Fan report for rooftop units, central air handlers, exhaust fans, fan coil units, heat pumps, packaged terminal units.
 - (b) Duct traverse supply/return/exhaust/relief ducts.
 - (c) Terminal supply, return, and exhaust outlets.
 - (d) Hot/chilled water coils - report entering/leaving, wet/dry bulb temperatures.
 - (2) Water Systems
 - (b) All flow control balancing valves, circuit setters, flow orifices, venturis - report size, flow, measured pressure

drop, setting, manufacturer, model.

(c) Hot water, chilled water coils.

The report shall be neatly bound with a waterproof cover. It shall contain a table of contents, with each page numbered. All report data shall be typed - handwritten data will not be acceptable.

b. Temperatures: On each TAB report form reporting TAB work accomplished on HVAC thermal energy transfer equipment, include the indoor and outdoor dry bulb temperature range and indoor and outdoor wet bulb temperature range within the TAB data was recorded.

c. Instruments: List the types of instruments actually used to measure the TAB data. Include in the listing each instrument's unique identification number, calibration date, and calibration expiration date.

1.5 QUALITY ASSURANCE

1.5.1 Modifications of References

Accomplish work in accordance with referenced publications of AABC or NEBB except as modified by this section. In the references referred to herein, consider the advisory or recommended provisions to be mandatory, as though the word "shall" had been substituted for the words "should" or "could" or "may" wherever they appear. Interpret reference to the "authority having jurisdiction," the "Administrative Authority," the "Owner," or the "Design Engineer" to mean the "Contracting Officer."

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 TAB PROCEDURES

3.1.1 TAB Field Work

Test, adjust, and balance the listed HVAC systems to the state of operation indicated on and specified in the contract design documents. Air systems and water systems shall be proportionately balanced and reported in the certified TAB report. Provide instruments and consumables required to accomplish the TAB work. Conduct TAB work, including sound measurement work, on the listed HVAC systems in conformance with the [AABC MN-1](#), or [NEBB Procedural Stds](#), except as modified by this section:

a. Workmanship: Conduct TAB work on specified HVAC systems until measured parameters are within plus or minus 10 percent of the design values, that is, the values specified or indicated on the contract documents.

3.1.2 Data From TAB Field Work

After all TAB work has been completed, prepare a handwritten certified, pre-final TAB report using all report forms complete as specified for the final certified TAB report. Except as approved otherwise by the

Contracting Officer, in writing, the TAB work and the TAB report shall be considered incomplete until the TAB work is accomplished to within the accuracy range specified in the paragraph titled "Workmanship."

3.1.3 Quality Assurance For TAB Field Work

3.1.3.1 Field Check

Verbally notify the Contracting Officer that the field check of the pre-final, handwritten report can commence; give this verbal notice 48 hours in advance of when the field check of the pre-final report can commence. Do not schedule the field check of the pre-final report until the TAB work is accomplished to within the accuracy range specified in the paragraph titled "Workmanship" or written approval of the deviations from the requirements has been received from the Contracting Officer.

- a. Recheck: During field check the Contractor shall recheck, in the presence of the Contracting Officer, random selections of all reported data recorded in the pre-final report.
- b. Areas of Recheck: Points and areas of recheck shall be selected by the Contracting Officer.
- c. Procedures: Measurements and test procedures shall be the same as was used for forming basis of the pre-final report.
- d. Recheck Selections: Selections for recheck will not exceed 25 percent of the total number of reported data entries tabulated in the pre-final report.

3.1.3.2 Retests

If random tests reveal a measured value which is an out-of-tolerance quantity, the report is subject to disapproval at the Contracting Officers' discretion. In the event the report is disapproved, all systems shall be readjusted and tested; new data recorded; a new pre-final report submitted; and a new field check conducted at no additional cost to the Government.

3.1.3.3 Out-of-Tolerance Quantity

Out-of-tolerance quantity pertains to field checking of the pre-final report. The term is defined as measurement taken during field checking which does not fall within the range of plus 10 to minus 10 percent of the design for the specific parameter.

3.1.3.4 Report Acceptance

On completion, and approval, of the pre-final report field check, the Contractor shall prepare, assemble, and submit the final certified TAB report in the required format for final review/approval.

3.2 MARKING OF SETTINGS

Permanently mark the settings of HVAC adjustment devices including valves, splitters, and dampers so that adjustment can be restored if disturbed at any time. The permanent markings shall indicate the settings on the adjustment devices which result in the data reported on the submitted certified TAB report.

3.3 MARKING OF TEST PORTS

The TAB team shall permanently and legibly mark and identify the location points of the duct test ports. If the ducts have exterior insulation, these markings shall be made on the exterior side of the duct insulation. The location of test ports shall be shown on the as-built mechanical drawings with dimensions given where the test port is covered by exterior insulation.

-- End of Section --

SECTION 23 07 00

INSULATION OF MECHANICAL SYSTEMS

03/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A 167	(2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A 240/A 240M	(1996) Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels
ASTM B 209	(2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM C 177	(1985; R 1997) Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
ASTM C 195	(1995) Mineral Fiber Thermal Insulating Cement
ASTM C 533	(1995) Calcium Silicate Block and Pipe Thermal Insulation
ASTM C 547	(1995) Mineral Fiber Preformed Pipe Insulation
ASTM C 552	(1991) Cellular Glass Thermal Insulation
ASTM C 553	(1992) Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
ASTM C 578	(2010a) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C 591	(2008a) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C 592	(1980) Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation

(Metal-Mesh Covered) (Industrial Type)

- ASTM C 612 (1993) Mineral Fiber Block and Board Thermal Insulation
- ASTM C 916 (1985; R 1990) Adhesives for Duct Thermal Insulation
- ASTM C 1136 (1995) Flexible, Low permeance Vapor Retarders for Thermal Insulation
- ASTM D 828 (1993) Tensile Breaking Strength of Paper and Paperboard
- ASTM E 84 (2011b) Standard Test Method for Surface Burning Characteristics of Building Materials
- ASTM E 96 (1997; Rev A) Water Vapor Transmission of Materials

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

- FS L-P-535 (Rev. E; Notice 2) Plastic Sheet (Sheeting): Plastic Strip: Poly (Vinyl Chloride) and Poly(Vinyl Chloride-Vinyl Acetate), Rigid

U.S. DEPARTMENT OF DEFENSE (DOD)

- MIL-A-3316 (Rev. C; Am. 2) Adhesives, Fire-Resistant, Thermal Insulation
- MIL-C-19565 (Rev. C; Am. 1) Coating Compounds, Thermal Insulation, Fire- and Water-Resistant, Vapor Barrier
- MIL-C-20079 (Rev. H) Cloth, Glass: Tape, Textile Glass; and Thread, Glass and Wire-Reinforced Glass
- MIL-A-24179 (Rev. A) (Valid Notice 1) Adhesive, Flexible Unicellular-Plastic Thermal Insulation

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 255 (1996) Surface Burning Characteristics of Building Materials

UNDERWRITERS LABORATORIES (UL)

- UL 723 (1996) Surface Burning Characteristics of Building Materials

1.2 SYSTEM DESCRIPTION

Provide new and modify existing field-applied insulation for heating, ventilating, and cooling (HVAC) air distribution systems and piping systems

which are located within, on, under, and adjacent to buildings; and for plumbing piping systems.

1.2.1 Air Distribution System

Obtain Contracting Officer's written approval of systems under Section 23 05 92, "Testing/Adjusting/Balancing: Small Heating/Ventilating/Cooling Systems" before applying field-applied insulation to air distribution systems.

1.2.2 Piping Systems

Obtain Contracting Officer's written approval of HVAC water distribution systems under Section 23 05 92, "Testing/Adjusting/Balancing: Small Heating/Ventilating/Cooling Systems" before applying field-applied insulation to HVAC water distribution systems. At the Contractor's option and with Contracting Officer's written approval, the piping systems may be insulated before systems are tested, adjusted, and balanced (TAB'd). Piping insulation shall terminate immediately adjacent to each flow control valve, automatic control valve, or device. For chilled water and chilled-hot water piping, the ends of pipe insulation and the space between ends of pipe insulation and piping shall be sealed with waterproof vapor barrier coating. After systems are TAB'd, the control valves and devices shall be insulated.

1.3 DEFINITIONS

1.3.1 Finished Spaces

Spaces used for habitation or occupancy where rough surfaces are plastered, panelled, or otherwise treated to provide a pleasing appearance.

1.3.2 Unfinished Spaces

Spaces used for storage or work areas where appearance is not a factor, such as unexcavated spaces and crawl space.

1.3.3 Concealed Spaces

Spaces out of sight. For example, above ceilings; below floors; between double walls; furred-in areas; pipe and duct shafts; and similar spaces.

1.3.4 Exposed

Open to view. For example, pipe running through a room and not covered by other construction.

1.3.5 Fugitive Treatments

Treatment subject to deterioration due to aging, moisture, high humidity, oxygen, ozone, and heat. Fugitive materials are entrapped materials that can cause deterioration, such as solvents and water vapor.

1.3.6 Outside

Open to view up to 5 feet beyond the exterior side of walls, above the roof, and unexcavated or crawl spaces.

1.3.7 Conditioned Space

An area, room or space normally occupied and being heated or cooled for human habitation by any equipment.

1.4 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-03 Product Data

Piping insulation

Piping insulation finishes

Heating, ventilating, and air conditioning systems insulation

Duct insulation finishes

Accessory materials

Adhesives, sealants, and coating compounds

1.5 QUALITY ASSURANCE

Every package or standard container of insulation, jackets, cements, adhesives, and coatings delivered to the project site shall have the manufacturer's stamp or label attached giving name of manufacturer, brand and description of material. Insulation packages and containers shall be asbestos-free.

1.6 FLAME-SPREAD AND SMOKE-DEVELOPED RATINGS

In accordance with NFPA 255, ASTM E 84 or UL 723, the materials on interior of the building shall have a flame-spread rating of not more than 25 and a smoke-developed rating of not more than 150 interior to the building.

1.6.1 Materials Tests

Test factory-applied materials as assembled. Field-applied materials may be tested individually. Use no fugitive or corrosive treatments to impart flame resistance. UL label or satisfactory certified test report from a testing laboratory will be required to indicate that fire hazard ratings for materials proposed for use do not exceed those specified. Flame-proofing treatments subject to deterioration due to effects of moisture or high humidity are not acceptable.

1.6.2 Materials Exempt From Fire-Resistant Rating

Nylon anchors.

PART 2 PRODUCTS

2.1 PIPING INSULATION

Piping systems, except buried pipe requiring insulation, types of insulation required, and insulation thickness shall be as listed in Tables I herein. Unless otherwise specified, insulate all fittings, flanges, and

valves, except valve stems, hand wheels, and operators. Provide factory premolded, precut, or field-fabricated insulation of the same thickness and conductivity as insulation on adjacent piping. Insulation exterior shall be factory cleanable, grease resistant, non-flaking and non-peeling. Pipe insulation shall conform to the referenced publications.

2.1.1 Buried Water Pipe Insulation

Section 33 61 14, "Exterior Buried Preinsulated Water Piping."

2.1.2 Cellular Glass Insulation

ASTM C 552, Type II.

2.1.3 Cellular Phenolic Insulation

ASTM C 1136.

2.1.4 Mineral Fiber

ASTM C 547, Class I.

2.1.5 Calcium Silicate

ASTM C 533, Class I.

2.1.6 Cellular Polystyrene

ASTM C 578, Expanded Polystyrene (EPS).

2.1.7 Piping Insulation Finishes

2.1.7.1 All-Purpose Jacket

Provide a factory applied all-purpose jacket when field applied jacketing is not specified. All purpose jackets shall include integral vapor barrier as required by service. Provide jackets in exposed locations with a white surface suitable for field painting. Allow a maximum water vapor permeance of 0.05 perm in accordance with ASTM E 96, a puncture resistance of not less than 50 Beach units, and a minimum tensile strength of 35 pounds-force per inch of width in accordance with ASTM D 828.

2.1.7.2 Vapor-Barrier Material

ASTM C 1136. Resistant to flame, moisture penetration, and mold growth. Provide vapor-barrier material on pipe insulation as required in Table I.

2.1.7.3 Metal Jackets

- a. Aluminum Jackets: ASTM B 209, Temper H14, minimum thickness of 27 gage (0.016 inch), with factory-applied polyethylene and kraft paper moisture barrier on inside surface. Provide smooth surface jackets for jacket outside diameters less than 8 inches. Provide corrugated surface jackets for jacket outside diameters 8 inches and larger. Provide stainless steel bands, minimum width of 0.5 inch. Provide factory prefabricated aluminum covers for insulation on fittings, valves and flanges.
- b. Stainless Steel Jackets: ASTM A 167 or ASTM A 240/A 240M; Type

304, minimum thickness of 33 gage (0.010 inch), smooth surface with factory-applied polyethylene and kraft paper moisture barrier on inside surface. Provide stainless steel bands, minimum width of 0.5 inch. Provide factory prefabricated stainless steel covers for insulation on fittings, valves, and flanges.

- c. Piping, Fittings, Flanges, and Valves in Outside Locations: Finish elbows and curved piping with factory-fabricated metal covers. Finish tees, flanges, and valves with metal covers. Covers shall be same thickness and material as jackets on adjacent piping.

2.2 HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS INSULATION

Provide insulation on ducts ,plenums ,mixing boxes ,casings and diffusers of Heating, Ventilating and Air Conditioning Systems (HVAC).)

2.2.1 Duct Insulation in Concealed Spaces

Blanket flexible mineral fiber insulation conforming to [ASTM C 553](#), Type 1, Class B-3, .75 pound per cubic foot nominal, 3.0 inches thick, minimum installed R8. Provide flexible insulation in concealed spaces only.

2.2.2 Duct Insulation Not in Concealed Spaces

Mineral fiber in accordance with [ASTM C 612](#), Class 2 (maximum surface temperature 400 degrees F), 6 pcf (pounds per cubic foot) average, 1.5 inch thick.

2.2.3 All Types of Ductwork Located Outside

Provide [ASTM C 591](#), polyisocyanurate or polyurethane board insulation, minimum density of 1.7 pcf, 1.5 inch thick, and weatherproof finish.

2.2.4 Duct Insulation Finishes

2.2.4.1 All-Purpose Jacket

Provide a factory applied all-purpose jacket with or without integral vapor barrier as required by the service. In exposed locations, provide jackets with a white surface suitable for field painting. All-purpose jacket shall have a maximum water vapor permeance of 0.05 perm per [ASTM E 96](#); a puncture resistance of not less than 50 Beach units; and a tensile strength of not less than 35 pounds-force per inch of width in accordance with [ASTM D 828](#).

2.2.4.2 Vapor-Barrier Material

[ASTM C 1136](#), for duct in equipment room and exposed areas and Type I or II in remaining areas. Material shall be resistant to flame, moisture penetration, and shall not support mold growth. Provide vapor barrier on HVAC duct insulation, except insulation for heating only.

2.2.4.3 Metal Jackets

Provide metal jackets with moisture barrier lining for externally insulated ductwork located outside.

- a. Aluminum Jackets: [ASTM B 209](#), Alloy 3003 or 3004, Temper H14, 0.016- inch thick, smooth.

- b. Stainless Steel Jackets: [ASTM A 167](#), Type 304 , 0.010- inch thick, smooth.

2.3 EQUIPMENT

Insulate all equipment and accessories as specified in Table II. In outside locations, provide insulation one inch thicker than specified. Increase the specified insulation thickness for equipment only where necessary to equal the thickness of angles or other structural members to make a smooth, exterior surface. Factory applied insulation shall meet the flame spread and smoke-developed rating of 25/50.

2.4 ADHESIVES, SEALANTS, AND COATING COMPOUNDS

2.4.1 Insulation and Vapor Barrier Adhesive

Provide [ASTM C 916](#), Type I or Type II adhesive for securing insulation to metal surfaces and for vapor barrier lap only in building interior. Provide Type I when an adhesive in which the vehicle is nonflammable in the liquid (wet) state and which will pass the edge-burning test is required. Provide Type II when an adhesive in which the vehicle is nonflammable in the liquid (wet) state and which will not pass the edge-burning test is required.

2.4.2 Lagging Adhesive

[MIL-A-3316](#), Class 1, for bonding fibrous glass cloth to unfaced fibrous glass insulation; for bonding cotton brattice cloth to faced and unfaced fibrous glass insulation board; for sealing edges of and bounding fibrous glass tape to joints of fibrous glass board; or for bonding lagging cloth to thermal insulation, or Class 2, for attaching fibrous glass insulation to metal surfaces.

2.4.3 Mineral Fiber Insulation Cement

[ASTM C 195](#), thermal conductivity 0.85 maximum at 200 degrees F mean when tested in accordance with [ASTM C 177](#).

2.4.4 Vapor Barrier Coating

[MIL-C-19565](#), Type II, indoor only above surface temperature 60 degrees F, color white.

2.4.5 Weatherproof Coating

For outside applications provide a weatherproof coating recommended by the manufacturer of the insulation and jackets.

2.4.6 Flexible Unicellular Insulation Adhesive

[MIL-A-24179](#), Type II, Class 1 or Type III.

2.5 ACCESSORY MATERIALS

2.5.1 Staples

[ASTM A 167](#), Type 304 or 316 stainless steel outside-clinch type.

2.5.2 Insulation Bands

1/2 inch wide; 0.24 gage galvanized steel or 0.26 gage stainless steel or 0.24 gage aluminum.

2.5.3 Bands for Metal Jackets

3/8-inch minimum width; 0.26 gage stainless steel or 0.24 gage aluminum.

2.5.4 Anchor Pins

Provide anchor pins and speed washers recommended by insulation manufacturer.

2.5.5 Glass Cloth and Tape

MIL-C-20079, Type I, Class 1 or Class 3 cloth, and Type II, Class 1 or tape; 20 by 20 maximum size mesh. Tape shall be 4-inch wide rolls. Class 3 tape shall be 4.5 ounces per square yard. In lieu of glass cloth and tape, open weave glass membrane may be provided.

2.5.6 Wire

Soft annealed stainless steel, 0.047-inch nominal diameter.

2.5.7 PVC Pipe Fitting Cover

FS L-P-535, Composition A, Type II, Grade GU, factory premolded, one-piece.

PART 3 EXECUTION

3.1 PREPARATION

Do not insulate materials until system tests have been completed and surfaces to be insulated have been cleaned of dirt, rust, and scale and dried. Insulate return ducts, outside air intakes and supply ducts to the room outlets, flexible runouts, plenums, casings, mixing boxes, filter boxes, coils, fans, and the portion of air terminals not in the conditioned spaces. Ensure full range of motion of equipment actuators. Modify insulation to avoid obstruction with valve handles, safety reliefs, and other such items. Allow adequate space for pipe expansion. Install insulation with jackets drawn tight and cement down on longitudinal and end laps. Do not use scrap pieces where a full length section will fit. Insulation shall be continuous through sleeves, wall and ceiling openings, except at fire dampers in duct systems. Extend surface finishes to protect surfaces, ends, and raw edges of insulation. Apply coatings and adhesives at the manufacturer's recommended coverage per gallon. Individually insulate piping and ductwork. Provide a moisture and vapor seal where insulation terminates against metal hangers, anchors and other projections through the insulation on surfaces for which a vapor seal is specified. Keep insulation dry during application of finish. Bevel and seal the edges of exposed insulation. Unless otherwise indicated, do not insulate the following:

- a. Factory preinsulated flexible ductwork;
- b. Vertical portion of interior roof drain pipelines, chrome plated pipes, and fire protection pipes;

- c. Vibration isolating connections;
- d. Adjacent insulation;
- e. ASME stamps;
- f. Fan name plates; and
- g. Access plates in fan housings.

3.2 PIPING INSULATION

3.2.1 Mineral Fiber Pipe Insulation

Place sections of insulation around the pipe and joints tightly butted into place. The jacket laps shall be drawn tight and smooth. Secure jacket with fire resistant adhesive factory applied self sealing lap, or stainless steel outward clinching staples spaced not over 4 inches on centers and 1/2 inch minimum from edge of lap. Cover circumferential joints with butt strips, not less than 3 inches wide, of material identical to the jacket material. Overlap longitudinal laps of jacket material not less than 1 1/2 inches. Adhesive used to secure the butt strip shall be the same as used to secure the jacket laps. Apply staples to both edges of the butt strips. Patch damaged jacket material by wrapping a strip of jacket material around the pipe and cementing, stapling, and coating as specified for butt strips. Extend the patch not less than 1 1/2 inches past the break in both directions. At penetrations by pressure gages and thermometers, fill the voids with the vapor barrier coating for outside service. Seal with a brush coat of the same coating. Where penetrating roofs, insulate piping to a point flush with the top of the flashing and seal with the vapor barrier coating. Butt tightly the exterior insulation to the top of the flashing and interior insulation. Extend the exterior metal jacket 2 inches down beyond the end of the insulation. Seal the flashing and counterflashing underneath with the vapor barrier coating.

3.2.2 Flexible Unicellular Insulation

Bond cuts, butt joints, ends, and longitudinal joints with adhesive. Miter 90-degree turns and elbows, tees, and valve insulation. Where pipes penetrate fire walls, provide mineral-fiber insulation inserts and sheet-metal sleeves. Insulate flanges, unions, valves, and fittings in accordance with manufacturer's published instructions. Finish all unicellular insulation as follows:

- (1) Coat entire surface of insulation with MIL-A-3316
- (2) While the adhesive is tacky, apply a layer of MIL-C-20079 glass cloth. Stretch tightly and overlap all joints by a minimum of 2-inches. Glass cloth at elbows and fittings shall be mitered.
- (3) Apply a final coat of MIL-A-3316 adhesive.

3.2.3 Calcium Silicate Pipe Insulation

Secure insulation with stainless steel metal bands on 12-inch maximum centers. Apply a skim coat of hydraulic setting cement directly to the insulation. When dry, apply a flooding coat of adhesive over the hydraulic setting cement. Press a layer of MIL-C-20079 glass cloth or tape into

adhesive and seal laps and edges with adhesive. Coat cloth with adhesive cut at a ratio of one part water to five parts adhesive in color other than white for the purpose of visual inspection to ensure sizing of entire surface.

3.2.4 Cellular Glass, Cellular Phenolic, and Polyisocyanurate

Secure outer most layer of insulation with metal bands 12-inch on center. If a factory installed all service jacket is used, the metal bands shall be applied to the outside of the all service jacket. If two or more layers are applied, the inner layers may be secured with fiber reinforced tape. For cold or chilled piping all joints both longitudinal and circumferential shall be sealed. Use the manufacturer's recommended cement or sealant. Apply all-purpose jacket, vapor barrier if required by Table I, and metal jacket if outside. Elbows shall be four piece miter if field fabricated. Pre-manufactured elbows can be held in place with metal bands. All elbows shall be finished as follows: Apply a skim coat of hydraulic setting cement directly to the insulation. When dry, apply a flooding coat of adhesive over the hydraulic setting cement. Press a layer of MIL-C-20079 glass cloth or tape into adhesive and seal laps and edges with adhesive. Coat cloth with adhesive cut at a ratio of one part water to five parts adhesive in color other than white for the purpose of visual inspection to ensure sizing of entire surface. Insulate flexible connection at pumps and other equipment with unicellular plastic insulation, unless otherwise indicated. Factory-fabricated removable and reusable insulated covers shall be provided for all valves, circuit setters, unions and flow control devices. The insulation cover shall be reusable without the need for special material or tools. Insulation shall be two piece molded cellular to fit the valve or device. Flexible unicellular insulation may be used in lieu of molded cellular insulation.

3.2.5 Expanded Cellular Polystyrene

Secure outer most layer of insulation with metal bands 9 inch on center. If a factory installed all service jacket is used, the metal bands shall be applied to the outside of the all service jacket. If two or more layers are applied, the inner layers may be secured with fiber reinforced tape. For cold or chilled piping all joints both longitudinal and circumferential shall be sealed. use the manufacturer's recommended cement or sealant. Apply all-purpose jacket, vapor barrier if required by Table 1, and metal jacket if outside. Elbows shall be four piece miter if field fabricated. Pre-manufactured elbows can be held in place with metal bands. All elbows shall be finished according to manufacturer's recommended method. Insulate flexible connection at pumps and other equipment with unicellular plastic insulation, unless otherwise indicated. Factory-fabricated removable and reusable insulated covers shall be provided for all valves, circuit setters, unions and flow control devices. The insulation cover shall be reusable without the need for special material or tools. Insulation shall be two piece molded cellular to fit the valve or device. Flexible unicellular insulation may be used in lieu of molded cellular insulation.

3.2.6 Hangers and Anchors

Pipe insulation shall be continuous through pipe hangers. Where pipe is supported by the insulation, provide galvanized steel shields protection saddles. Band and secure insulation protection shields without damaging pipe insulation. Where shields are used on pipes 2 inches and larger, provide insulation inserts at points of hangers and supports. Insulation inserts shall be of calcium silicate, cellular glass (minimum 8 pcf),

molded glass fiber (minimum 8 pcf), or other approved material of the same thickness as adjacent insulation. Inserts shall have sufficient compressive strength to adequately support the pipe without compressing the inserts to a thickness less than the adjacent insulation. Insulation inserts shall cover the bottom half of the pipe circumference 180 degrees and be not less in length than the protection shield. Vapor-barrier facing of the insert shall be of the same material as the facing on the adjacent insulation. Seal inserts into the insulation with vapor barrier coating, Type II or for exterior work, manufacturer's recommended weatherproof coating, as applicable. Where protection saddles are used, fill all voids with the same insulation material as used on the adjacent pipe. Where anchors are secured to chilled piping that is to be insulated, insulate the anchors the same as the piping for a distance not less than four times the insulation thickness to prevent condensation. Vapor seal insulation around anchors.

3.2.7 Sleeves and Wall Chases

Where penetrating interior walls, extend a metal jacket 2 inches out on either side of the wall and secure on each end with a band. Where penetrating floors, extend a metal jacket from a point below the back-up material to a point 10 inches above the floor with one band at the floor and one not more than one inch from end of metal jacket. Where penetrating exterior walls, extend the metal jackets through the sleeve to a point 2 inches beyond the interior surface of the wall.

3.2.8 Flanges, Unions, Valves and Fittings for Hot Piping

Flanges, Unions, Valves, and Fittings Insulation (Except Flexible Unicellular) for Hot Piping: Factory fabricated removable and reusable insulation covers may be used. For inside domestic hot water, heating hot water, A/C condensate drains, high temperature hot water, steam and condensate return systems; exposed hot water piping and drains in handicap areas, place factory premolded, precut or field-fabricated segmented insulation of the same thickness and conductivity as the adjoining pipe insulation around the flange, union, valve, and fitting abutting the adjoining pipe insulation. If nesting size insulation is used, overlap 2 inches or one pipe diameter, whichever is larger. Use insulating cement to fill voids. Elbows insulated using segments shall have not less than three segments per elbow. Place and joint the segments with manufacturer's recommended water-vapor resistant, fire retardant, and adhesive appropriate for the temperature limit of the service. Upon completion of installation of insulation, apply two coats lagging adhesive with glass tape embedded between coats. Overlap tape seams one inch. Extend adhesive onto adjoining insulation not less than two inches. The total dry film thickness shall be not less than 1/16 inch. Where unions are indicated not to be insulated, taper the insulation to the union at a 45 degree angle. Coat the insulation and all purpose jacket with two coats of lagging adhesive and with glass tape embedded between coats. The total dry film thickness shall be not less than 1/16 inch. At the option of the Contractor, factory premolded one-piece PVC fitting covers may be provided in lieu of two coats of adhesive with tape embedded between coats. Factory premolded field-fabricated segment or blanket insert insulation shall be provided under the fitting covers. Install factory premolded one-piece PVC fitting covers over the insulation and secure by stapling, taping with PVC vapor barrier tape, or with metal or plastic tacks made for securing PVC fitting covers. Do not provide PVC fitting covers where exposed to the weather. Provide PVC fitting covers only in ambient temperatures below 150 degrees F.

3.2.9 Piping Exposed to Weather

3.2.9.1 Metal Jackets

Install over the insulation. Metal jackets shall have side and end lap at least 2 inches wide with the cut edge of the side lap turned inside one inch to provide a smooth edge. Overlap the jacket not less than 2 inches at longitudinal and circumferential joints and secure with metal bands at not more than 9-inch centers or with screws at not more than 5-inch centers. Overlap longitudinal joints down to shed water. Seal circumferential joints with a coating recommended by the insulation manufacturer for weatherproofing.

3.2.9.2 Flanges, Unions, Valves, Fittings, and Accessories

Insulate and finish as specified for the applicable service. Apply two coats of an emulsion type weatherproof mastic for hot service and vapor barrier mastic for cold service recommended by the insulation manufacturer. Embed glass tape in the first coat. Overlap tape not less than one inch and the adjoining metal jacket not less than 2 inches. Factory preformed metal jackets may be provided in lieu of the above for hot service.

3.3 DUCTS PLENUMS AND CASINGS (HVAC) INSULATION

3.3.1 Rigid Insulation

Secure rigid insulation by impaling over pins or anchors located not more than 3 inches from joint edges of boards, spaced not more than 12 inches on centers and secure with washers and clips. Spot weld anchor pins or attach with a waterproof adhesive especially designed for use on metal surfaces. Apply insulation with joints tightly butted. Neatly bevel insulation around name plates and access plates and doors. Each pin or anchor shall be capable of supporting a 20-pound load. Cut off protruding ends of pins, after clips are sealed with coating compound for inside work or manufacturer's recommended weatherproof coating for outside work, and reinforced with open weave glass membrane.

3.3.2 Flexible Blanket Insulation

Apply insulation with all joints tightly butted. Secure insulation to ductwork with adhesive in 6-inch wide strips on 12-inch centers. Staple laps of jacket with outward clinching staples. Sealing shall be in accordance with paragraph 3.3.3 below. For ductwork over 24 inches on horizontal duct runs, provide pins, washers and clips. Provide pins on sides of vertical ductwork being insulated. Space pins and clips on 18-inch centers and not more than 18 inches from duct corners. Carry insulation over standing seams and trapeze-type hangers. Install speed washers with pins and pin trimmed to washer. Sagging of flexible duct insulation will not be permitted. Cut off protruding ends of pins after clips are secured and sealed with coating compound for inside work. For warm air ducts, overlap insulation not less than 2 inches at joints and secure the laps with outward clinch staples on 4-inch centers. In cold air ducts, vapor seal all joints and staple as specified.

3.3.3 Insulation Finishes and Joint Sealing

Fill all breaks, punctures, and voids with vapor barrier coating compound for inside work or manufacturer's recommended weatherproof coating for

outside service. Vapor seal all joints by embedding a single layer of 3-inch wide open weave glass membrane, 20 by 20 mesh maximum size between two 1/16-inch wet film thickness coats of vapor barrier coating compound. Draw glass fabric smooth and tight with a 1 1/2-inch overlap. At jacket penetrations such as hangers, thermometers, and damper operating rods, fill voids in the insulation with vapor barrier coating. Brush a coat of vapor barrier coating where required on HVAC ducts. Provide vapor barrier jacket continuous across seams, reinforcing, and projections. Where height of projections is greater than insulation thickness, carry insulation and jacket over the projection. For joints for heating only systems, provide insulation with two coats of fire resistant adhesive with glass fabric mesh embedded between coats.

3.3.4 Metal Jackets for Outside Ductwork

Ensure metal-jacket side and end laps at least 2 inches wide, with the cut edge of the side lap turned under one inch to provide a smooth edge. Place horizontal laps to shed water. Seal vertical laps with insulation manufacturer's recommended weatherproof coating. Secure jackets in place with aluminum or stainless steel bands on 9-inch centers aluminum or stainless steel screws on 5-inch centers. Where ducts penetrate exterior walls, continue the increased thickness required for ductwork exposed to weather and the metal jackets through the sleeve to a point 2 inches beyond the interior surface of the wall. Where metal jacket abuts an uninsulated surface, seal joints with a weatherproof mastic recommended by the insulation manufacturer. For rectangular ducts, provide corner angles to exposed corners of the insulation. Apply two coats of weatherproof coating recommended by the insulation manufacturer to the entire surface with a layer of glass cloth embedded between coats. Ensure glass cloth overlaps not less than 2 inches at joints and adjoining surface. Each coat of weatherproof coating shall be 1/16-inch minimum thickness.

3.3.5 Access Plates and Doors

On acoustically lined ducts, plenums, and casings, provide insulation on access plates and doors. On externally insulated ducts, plenums, and casings, provide insulation-filled hollow steel panels and doors for access openings. Bevel insulation around access plates and doors.

3.4 EQUIPMENT INSULATION

3.4.1 General Procedures

Apply equipment insulation suitable for temperature and service in rigid block or semirigid board or flexible form to fit as closely as possible to equipment. Groove or score insulation where necessary to fit the contours of equipment. Stagger end joints where possible. Bevel the edges of the insulation for cylindrical surfaces to provide tight joints. Join sections of cellular glass insulation with bedding compound. After the cellular glass insulation is in place on areas to be insulated, except where metal-encased, fill joints, seams, chipped edges, or depressions with bedding compound to form a smooth surface. Fill mineral fiber joints with insulating cement. Bevel insulation around name plates, ASME and access plates. For insulation on equipment that must be opened periodically for inspection, cleaning, or repair, construct insulation to be removable and replaceable without damage. Protect exposed insulation corners with corner angles under wires and bands.

3.4.2 Heating Equipment (Except Pumps)

Insulate shell and tube heat exchangers for the temperature of the shell medium indicated on the drawings. Insulation on heads of heat exchangers shall be removable. Fabricate a male-female shiplap type joint for the removable section. Use 16-gage galvanized steel, stainless steel or copper wire or 3/4-inch wide 20-gage stainless steel bands spaced on 12-inch centers. Seal joints with bedding compound for cellular glass or for mineral fiber with insulating cement and cover insulation with a smoothing coat of insulating cement. Apply two coats of adhesive with a layer of glass cloth embedded between coats. The dry film thickness of the finish shall be 1/32-inch minimum. On cylindrical equipment a metal jacket may be provided instead of the adhesive and glass cloths on the cylinder, ends must have adhesive and glass cloth.

3.4.3 Cold Equipment (Except Pumps)

Secure insulation with 16-gage, galvanized steel or copper clad wire or with 3/4-inch wide 20-gage stainless steel bands spaced on 12-inch centers. Seal joints with joint sealer. Cover non-removable irregular surfaces such as corner angles with a smoothing coat of insulating cement. Provide removable heat exchanger head covers with a male-female shiplap type joint. Apply two coats of vapor barrier coating with a layer of glass cloth embedded between coats. The dry film thickness of the finish shall be 1/32-inch minimum.

3.4.4 Pumps

Insulate pumps used for hot service with 2-inch thick rigid mineral fiber insulation and pumps used for chilled water and brine service with 2-inch thick flexible unicellular sheets as follows: Insulate pumps by forming a box around the pump housing, drive shaft, and piping. Apply insulation to inside surfaces of 20-gage galvanized or stainless steel sheet-metal boxes having openings for drive shaft and pipes. Construct the box by forming the bottom and sides using joints which do not leave raw ends of insulation exposed. Band bottom and sides to form a rigid housing that does not rest on the pump. Between top cover and sides, fit joints tightly forming a female shiplap joint on the side pieces and a male joint on the top cover to make the top cover removable. Secure insulation to the box with adhesive. Allow clearance for draining and adjustment of pump shaft seal.

3.5 PAINTING AND IDENTIFICATION

Paint in accordance with Section 09 90 00, "Paints and Coatings." Piping identification shall be as specified in other sections.

3.6 REPLACEMENT OF EXISTING ASBESTOS INSULATION

Remove existing asbestos insulation in accordance with Section 02 82 16, "Removal and Disposal of Asbestos Materials". When existing asbestos insulation is to be replaced, provide new asbestos-free insulation. Label or stencil new insulation "Asbestos-Free" after final finishing and painting.

3.7 FIELD INSPECTION

Visually inspect to ensure that materials provided conform to specifications. Inspect installations progressively for compliance with requirements.

TABLE I

Piping Insulation Wall Thickness

<u>Service</u>	<u>Material</u>	<u>Tube And Pipe Size (Inches)</u>						<u>Vapor Barrier Required</u>
		<u>1/4-1 1/4</u>	<u>1 1/2-3</u>	<u>3 1/2-5</u>	<u>6-& Larger</u>			
Brine Systems Cryogenics (Minus 30 to Zero Degrees F)	Cellular Glass	2.5 (3.5)	3.0 (4)	3 (4)	3.5 (4.5)			Yes
	Polyisocyanurate	1.5 (2.0)	1.5 (2)	N.P. (2)	N.P. (2.5)			Yes
	Polystyrene	2 (3)	2 (3)	2 (3)	2.5 (3.5)			Yes
Brine Systems, Cryogenics (Zero to 34 Degrees F)	Cellular Glass	2 (3.0)	2 (3.0)	2.5 (3.0)	2.5 (3.0)			Yes
	Polyisocyanurate	1.5 (1.5)	1.5 (2.0)	1.5 (2.0)	1.5 (2.0)			Yes
	Polystyrene	1.75 (2.5)	2 (2.5)	2 (2.5)	2 (2.5)			Yes
Chilled Water & Dual Temperature & Refrigerant Suction Pipe	Cellular Glass	1.5 (2.0)	1.5 (2.0)	2.0 (2.5)	2.0 (2.5)			Yes
	Polyisocyanurate	1 (1)	1 (1.0)	1.5 (2.0)	1.5 (2.0)			Yes
Domestic Cold Water, Drains and Horizontal Roof Drains	Polyisocyanurate	1	1	1	1			Yes
	Cellular Glass	1.5	1.5	1.5	1.5			Yes
Domestic Hot Water	Polyisocyanurate	1	1	1.5	1.5			No
	Calcium Silicate	1.5	1.5	1.5	1.5			No
	Mineral Fiber	1	1	1.5	1.5			No
	Cellular Glass	1.5	1.5	1.5	1.5			No
	Cellular Phenolic	1	1	1	1			No
	Polystyrene	1	1	1.5	1.5			Yes
Heating Hot Water & Pipes (150 to 200 Degrees F)	Polyisocyanurate	1 (1.5)	1 (1.5)	1.5 (2.0)	1.5 (2.0)			No
	Calcium Silicate	1.5 (2.5)	2 (2.5)	2 (2.5)	2.5 (3.0)			No
	Mineral Fiber	1.5 (2.0)	1.5 (2.5)	2 (2.5)	2 (2.5)			No
	Cellular Glass	1.5 (2.5)	1.5 (2.5)	2 (2.5)	2.5 (3.0)			No
	Cellular Phenolic	1 (1.25)	1 (1.25)	1 (1.25)	1.5 (1.5)			No
Compressed Air Discharge, Steam, and Condensate (201 to 250 Degrees F)	Calcium Silicate	1.5 (2.5)	2 (2.5)	2 (2.5)	2.5 (3.0)			No
	Mineral Fiber	1.5 (2.0)	1.5 (2.0)	2 (2.5)	2.5 (3.0)			No
	Cellular Glass	1.5 (2.5)	2 (2.5)	2 (2.5)	2.5 (3.0)			No
	Polyisocyanurate	1 (1.5)	1.5 (1.5)	1.5 (2.0)	1.5 (2.0)			No

TABLE I

Piping Insulation Wall Thickness

<u>Service</u>	<u>Material</u>	<u>Tube And Pipe Size (Inches)</u>							
		<u>1/4-1 1/4</u>	<u>1 1/2-3</u>	<u>3 1/2-5</u>	<u>6-& Larger</u>	<u>Vapor Barrier Required</u>			
High Temp- erature Hot Water and Steam (251 to 350 Degrees F)	Calcium Silicate	2 (3.0)	2.5 (3.5)	2.5 (3.5)	3 (4.0)	4 (5.0)	No		
	Mineral Fiber	2 (3.0)	2.5 (3.5)	2.5 (3.5)	3 (4.0)	4 (5.0)	No		
	Cellular Glass	2.5 (3.5)	3 (4.0)	3 (4.0)	4 (5.0)	4 (5.0)	No		
High Temp- erature Water & Steam (351 to 500 Degrees F)	Calcium Silicate	3 (4.0)	4 (5.0)	4 (5.0)	4 (5.0)	5 (6.0)	No		
	Mineral Fiber	3 (4.0)	4 (5.0)	4 (5.0)	4 (5.0)	5 (6.0)	No		
	Cellular Glass	4 (5.0)	5 (6.0)	5 (6.0)	5 (6.0)	5 (6.0)	No		

NOTE: Thickness in parenthesis are for:

- (1) Cold piping - crawl spaces, mechanical rooms, and outside locations
- (2) Hot Piping - outside locations, not including tunnels and crawl spaces.
- (3) NP - Not permitted.

=====

TABLE II

Insulation For Equipment

<u>Material</u>	<u>Spec</u>	<u>Type</u>	<u>Class</u>	<u>Vapor Barrier Required</u>
Flexible Mineral Fiber,	ASTM C 553	I	B-3	Yes*/No
Rigid Mineral Fiber,	ASTM C 612		2	Yes*/No
or Cellular Glass	ASTM C 552	I		No

*Yes for chilled water and brine service and no for other services.

<u>Equipment</u>	<u>Recommended Wall Thickness</u>	<u>Vapor Barrier Required</u>
Heat Exchangers Systems	2"	For Chilled Water and Brine
Expansion Tanks Systems	2"	For Chilled Water and Brine
Air Separators Systems	2"	For Chilled Water and Brine
All Pumps Systems	2"	For Chilled Water and Brine
Hot Water Storage Tanks	2"	No
Hot Water Heat Exchangers or Steam to Hot Water Convector		
Up to 249	2"	No
250 to 400oF	3-1/2"	No
401 to 600oF	6"	No
Hot Water Duct Mounted Coils	2"	No
Drain Pans	2"	For Chilled Water Systems
Pneumatic Water Tanks	2"	For Chilled Water Systems
Water Boxes and Headers	2"	For Chilled Water Systems

*Exact insulation thickness may be determined by proposed condition of use.

TABLE III

<u>Service And Surface</u> <u>Temperature Range</u> <u>Degrees F)</u>	<u>Material</u>	<u>Insulation Wall Thickness (Inches)</u>				
		<u>Outside Diameter (Inches)</u>				
		<u>1/4-1-1/4</u>	<u>1-1/2-3</u>	<u>3-1/2-5</u>	<u>6-10</u>	<u>11-36</u>
Boiler Breech and Stack (Up to 400 Degrees F)	Mineral Fiber ASTM C 553 Class B-3, ASTM C 547 Class 1, or ASTM C 612 Class 1	NA	NA	2	2	2
	Calcium Silicate ASTM C 533 Type 1	NA	NA	2	2	2
Boiler Breech and Stack (401 to 600 Degrees F)	Mineral Fiber ASTM C 547, Class 2, ASTM C 592 Class 1, or ASTM C 612 Class 3	NA	NA	3	3	3
	Calcium Silicate ASTM C 533 Type I	NA	NA	3	3	4
Boiler Breech and Stack (601 to 800 Degrees F)	Mineral Fiber ASTM C 547 Class 3,\ ASTM C 592 Class 1, or ASTM C 612 Class 3	NA	NA	4	4	4
	Calcium Silicate ASTM C 533 Type I	NA	NA	4	4	4
Diesel Engine Exhaust	Calcium Silicate ASTM C 533 Type I	6	6	6	6	6

-- End of Section --

SECTION 23 09 13.34 40

CONTROL VALVES, SELF-CONTAINED

02/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1003 (2009) Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems - (ANSI approved 2010)

ASME INTERNATIONAL (ASME)

ASME B16.1 (2010) Gray Iron Threaded Fittings; Classes 25, 125 and 250

ASME BPVC SEC VI (2010) BPVC Section VI-Recommended Rules for the Care and Operation of Heating Boilers

ASTM INTERNATIONAL (ASTM)

ASTM A48/A48M (2003; R 2008) Standard Specification for Gray Iron Castings

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-86 (2009; Errata 2011) Guidelines for Metric Data in Standards for Valves, Flanges, Fittings and Actuators

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Self-Contained Temperature Control Valves

Rate-of-Flow Controller

Water Pressure Regulating Valve

Water Pressure Relief Valve

Pilot-Operated Pressure-Relief Valve

Sample Warranty

SD-07 Certificates

Listing of Product Installation

Certificates of Conformance

Manufacturer's Warranty

1.3 GENERAL REQUIREMENTS

Section 23 73 33 HEATING, VENTILATING, AND COOLING SYSTEM applies to work specified in this section.

Submit [listing of product installation](#) for self-contained control and relief valves, identifying a minimum of five installed units, similar to those proposed for use, that have been in successful service for a minimum period of five years.

1.4 QUALITY ASSURANCE

Submit [certificates of conformance](#) for the following items showing conformance with the referenced standards contained in this section:

- a. Self-Contained Temperature Control Valves
- b. Self-Contained Temperature-Regulator Valves
- c. Rate-of-Flow Controller
- d. Water Pressure Regulating Valve
- e. Water Pressure Relief Valve
- f. Pilot-Operated Pressure-Relief Valve

Submit copy of manufacturer's [sample warranty](#), to the Contracting Officer for review.

PART 2 PRODUCTS

2.1 SELF-CONTAINED TEMPERATURE CONTROL VALVES

Provide self-contained temperature-control valves conforming to [MSS SP-86](#) and the following requirements:.

- a. Type I, Class II (integral temperature-sensing units for very hot water).

Mount set-point adjustment on the cabinet of the convector; ensure the control knob is accessible on the cabinet surface.

Wall-mount set-point adjustment and thermostat for finned-tube radiation. Provide nickel-plated brass thermostat surfaces.

Provide with armored capillary tubing, with remote element not be less than

18 inches long and contained within a guard.

Provide with renewable valve disks.

2.2 RATE-OF-FLOW CONTROLLER

Provide a hydraulically operated, pilot-controlled diaphragm-type globe valve for a rate of flow controller, with pilot control configured to actuate by differential pressure produced across an orifice installed at the inlet. Adjust rate of flow by varying spring loading on the pilot. Provide with cast iron valve body conforming to ASTM A48/A48M, with 125-pound ASME B16.1 flanges. Ensure valve trim is manufacturer's standard bronze or AISI 18-8 corrosion-resistant steel, orifice plate of AISI Type 303 corrosion-resistant steel, and diaphragm and seal are Buna-N. Ensure maximum-service-pressure rating is not less than 175 psi at 180 degrees F.

2.3 WATER PRESSURE-REGULATING VALVE

Provide direct acting pressure-regulating valve conforming to ASSE 1003.

Ensure pressure-regulating valve does not stick or allow pressure to build up on the low side. Set valve to maintain a terminal pressure of approximately 5 psi in excess of the static head on the system and operate within a 2-pound maximum variation regardless of initial pressure fluctuation, and without objectionable noise under any condition of operation.

2.4 WATER PRESSURE-RELIEF VALVE

Construct, label, and install pressure-relief valve in accordance with ASME BPVC SEC VI. Ensure relieving capacity is as specified by the referenced publication, with valves of nonferrous construction, complete with test lever.

2.5 PILOT-OPERATED PRESSURE-RELIEF VALVE

Provide pilot-operated pressure-relief valve, hydraulically operated, pilot-controlled modulating, with adjustable set point over the indicated range. Provide with cast iron valve body conforming to ASTM A48/A48M, with 125-psi ASME B16.1 flanges. Include with manufacturer's standard brass, bronze, or corrosion-resistant steel valve trim. Provide pilot control with AISI Type 303 or 304 corrosion-resistant steel trim with Buna-N diaphragm and seal material. Ensure maximum service-pressure rating is not less than 175 psi at 180 degrees F.

PART 3 EXECUTION

3.1 WARRANTY

Submit 3 copies of the manufacturer's warranty, signed by the Authority Having Jurisdiction (AHJ), assigned to the Government, to the Contracting Officer prior to project closeout.

-- End of Section --

SECTION 23 09 23.13

BACnet DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC

04/12

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)

AMCA 500-D (1998) Laboratory Methods of Testing Dampers for Rating

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 135 (2008; Addenda q Errata 2009, Addenda l, o, r, s, v 2009; Addenda j Errata 2010; Addenda h, k, n, t, u, w, x, y 2010; Errata 2010) BACnet-A Data Communication Protocol for Building Automation and Control Networks

ASME INTERNATIONAL (ASME)

ASME B16.34 (2009; Supp 2010) Valves - Flanged, Threaded and Welding End

ASME B16.5 (2009) Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard

ASME B31.1 (2010) Power Piping

ASTM INTERNATIONAL (ASTM)

ASTM A 126 (2004; R 2009) Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings

ASTM B 117 (2009) Standing Practice for Operating Salt Spray (Fog) Apparatus

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41.1 (2002; R 2008) Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits

IEEE C62.41.2 (2002) Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

IEEE C62.45 (2002; R 2008) Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000v and less)AC Power Circuits

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO/IEC 8802-3 (2000) Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD)Access Method and Physical Layer Specifications

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2011; Errata 2 2012) National Electrical Code

NFPA 72 (2010; TIA 10-4) National Fire Alarm and Signaling Code

NFPA 90A (2012) Standard for the Installation of Air Conditioning and Ventilating Systems

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1966 (2005) HVAC Duct Construction Standards Metal and Flexible, 3rd Edition

UNDERWRITERS LABORATORIES (UL)

UL 1449 (2006; R thru 2009) Surge Protective Devices

UL 506 (2008; Reprint Mar 2010) Specialty Transformers

UL 508A (2001; R thru 2010) Industrial Control Panels

UL 916 (2007; R 2009) Standard for Energy Management Equipment

1.2 DEFINITIONS

1.2.1 ANSI/ASHRAE Standard 135

ANSI/ASHRAE Standard 135: BACnet - A Data Communication Protocol for Building Automation and Control Networks, referred to as "BACnet". ASHRAE developed BACnet to provide a method for diverse building automation devices to communicate and share data over a network.

1.2.2 BACnet

Building Automation and Control Network; the common name for the communication standard ASHRAE 135. The standard defines methods and protocol for cooperating building automation devices to communicate over a variety of LAN technologies.

1.2.3 BACnet/IP

An extension of BACnet, Annex J, defines this mechanism using a reserved UDP socket to transmit BACnet messages over IP networks. A BACnet/IP network is a collection of one or more IP subnetworks that share the same BACnet network number. See also "BACnet Broadcast Management Device".

1.2.4 BACnet Internetwork

Two or more BACnet networks, possibly using different LAN technologies, connected with routers. In a BACnet internetwork, there exists only one message path between devices.

1.2.5 BACnet Network

One or more BACnet segments that have the same network address and are interconnected by bridges at the physical and data link layers.

1.2.6 BACnet Segment

One or more physical segments of BACnet devices on a BACnet network, connected at the physical layer by repeaters.

1.2.7 BBMD

BACnet Broadcast Management Device (BBMD). A communications device, typically combined with a BACnet router. A BBMD forwards BACnet broadcast messages to BACnet/IP devices and other BBMDs connected to the same BACnet/IP network. Every IP subnetwork that is part of a BACnet/IP network must have only one BBMD. See also "BACnet/IP".

1.2.8 BAS

Building Automation Systems, including DDC (Direct Digital Controls) used for facility automation and energy management.

1.2.9 BIBBs

BACnet Interoperability Building Blocks. A collection of BACnet services used to describe supported tasks. BIBBs are often described in terms of "A" (client) and "B" (server) devices. The "A" device uses data provided by the "B" device, or requests an action from the "B" device.

1.2.10 BI

BACnet International, formerly two organizations: the BACnet Manufacturers Association (BMA) and the BACnet Interest Group - North America (BIG-NA).

1.2.11 BI/BTL

BACnet International/BACnet Testing Laboratories (Formerly BMA/BTL). The organization responsible for testing products for compliance with the

BACnet standard, operated under the direction of BACnet International.

1.2.12 Bridge

Network hardware that connects two or more network (or BACnet internetwork) segments at the physical and data link layers. A bridge may also filter messages.

1.2.13 Broadcast

A message sent to all devices on a network segment.

1.2.14 DADMS

DON Applicaiton and Database Management System, (DADMS) is a listing of digital applications approved for purchase and use.

1.2.15 Device

Any control system component, usually a digital controller, that contains a BACnet Device Object and uses BACnet to communicate with other devices. See also "Digital Controller".

1.2.16 Device Object

Every BACnet device requires one Device Object, whose properties represent the network visible properties of that device. Every Device Object requires a unique Object Identifier number on the BACnet internetwork. This number is often referred to as the device instance.

1.2.17 Device Profile

A collection of BIBBs determining minimum BACnet capabilities of a device, defined in [ASHRAE 135](#), Annex L. Standard device profiles include BACnet Operator Workstations (B-OWS), BACnet Building Controllers (B-BC), BACnet Advanced Application Controllers (B-AAC), BACnet Application Specific Controllers (B-ASC), BACnet Smart Actuator (B-SA), and BACnet Smart Sensor (B-SS). Each device used in new construction is required to have a PICS statement listing BIBBs supported and must be tested and listed by BACnet Testing Laboratory (BTL).

1.2.18 Digital Controller

An electronic controller, usually with internal programming logic and digital and analog input/output capability, which performs control functions. In most cases, synonymous with a BACnet device described in this specification. See also "Device". There are different levels of controllers, with varying levels of complexity and flexibility.

1.2.18.1 Terminal Device Controllers

Terminal device controllers typically are controllers with less control features, may have integrated actuators, and may be mounted directly on equipment (with enclosures).

1.2.18.2 Field Controllers

Field controllers typically have a greater capability for input/output and customization, do not have integral actuators, are mounted in an enclosure

not on the equipment and are used for equipment such as VAV air handlers.

1.2.18.3 Plant Controllers

Plant Controllers are typically used to control various equipment in mechanical rooms such as pumps, heat exchangers, and chillers.

1.2.18.4 Supervisory Building Controller (SBC)

The Supervisory Building Controller is used to coordinate all equipment in a building, input scheduling, and is often used as a connection point for transferring configuration files to the other controllers. The SBC shall communicate with other controllers and equipment through a BACnet MS/TP bus. Depending on approvals and capabilities, the SBC may be used as a point of connection between the Camp Lejeune EMCS network (IP) and the building level control network (BACnet MS/TP).

1.2.19 Direct Digital Control (DDC)

Digital controllers performing control logic. Usually the controller directly senses physical values, makes control decisions with internal programs, and outputs control signals to directly operate switches, valves, dampers, and motor controllers.

1.2.20 DDC System

A distribution network of digital controllers, communication architecture, and user interfaces. A DDC system may include programming, sensors, actuators, switches, relays, factory controls, operator workstations, and various other devices, components, and attributes.

1.2.21 DITSCAP

Department of Defense Information Technology Security Certification and Accreditation Process (DITSCAP). DISCAP and DIACAP are processes that approve IP base equipment that is connected and communicates on the base Ethernet network. All devices using TCP/IP or Ethernet connectivity require prior approval to be listed in the DITSCAP and SSA document.

1.2.22 EMCS

Energy Management & Control System. The EMCS at Camp Lejeune is an enterprise system that actively receives energy and building condition information from multiple sources and provides load shedding, electric metering, alarming, trending, scheduling, set point adjustment and device status of all supervisory building controllers for maintenance personnel. The EMCS receives real time electrical utility pricing data and automatically manages to Camp Lejeune's energy target. The existing Camp Lejeune EMCS is manufactured by Johnson Controls and incorporates both the Metasys extended architecture system (for use with Johnson Controls NAE & NCE) and the Facilities Explorer (FX) network architecture (for use with an MS/TP to IP Router). Both of the systems communicate over the MRAN and either may be used to fulfill the requirements of this specification.

1.2.23 EMCS Owner

The regional or local user responsible for managing all aspects of the BAS operation, including: network connections, workstation management, submittal review, technical support, control parameters, and daily operation. The BAS

Owner for this project is Utility Monitoring & Control (UMAC) Director

1.2.24 Ethernet

A family of local-area-network technologies providing high-speed networking features over various media. Base Telephone manages all Ethernet connections to the IP networks.

1.2.25 Firmware

Software programmed into read only memory (ROM), flash memory, electrically erasable programmable read only memory (EEPROM), or erasable programmable read only memory (EPROM) chips.

1.2.26 Gateway

Communication hardware connecting two or more different protocols, similar to human language translators. The Gateway translates one protocol into equivalent concepts for the other protocol. In BACnet applications, a gateway has BACnet on one side and non-BACnet (usually proprietary) protocols on the other side.

1.2.27 Half Router

A device that participates as one partner in a BACnet point-to-point (PTP) connection. Two half-routers in an active PTP connection combine to form a single router.

1.2.28 Hub

A common connection point for devices on a network.

1.2.29 Internet Protocol (IP, TCP/IP, UDP/IP)

A communication method, the most common use is the World Wide Web. At the lowest level, it is based on Internet Protocol (IP), a method for conveying and routing packets of information over various LAN media. Two common protocols using IP are User Datagram Protocol (UDP) and Transmission Control Protocol (TCP). UDP conveys information to well-known "sockets" without confirmation of receipt. TCP establishes "sessions", which have end-to-end confirmation and guaranteed sequence of delivery.

1.2.30 Input/Output (I/O)

Physical inputs and outputs to and from a device, although the term sometimes describes software, or "virtual" I/O. See also "Points".

1.2.31 I/O Expansion Unit

An I/O expansion unit provides additional point capacity to a digital controller.

1.2.32 IP subnet

Internet protocol (IP) identifies individual devices with a 32-bit number divided into four groups from 0 to 255. Devices are often grouped and share some portion of this number. For example, one device has IP address 209.185.47.68 and another device has IP address 209.185.47.82. These two devices share Class C subnet 209.185.47.00

1.2.33 Local-Area Network (LAN)

A communication network that spans a limited geographic area and uses the same basic communication technology throughout.

1.2.34 MAC Address

Media Access Control address. The physical node address that identifies a device on a Local Area Network.

1.2.35 Master-Slave/Token-Passing (MS/TP)

[ISO/IEC 8802-3](#). The standard LAN for BACnet. MSTP uses twisted-pair wiring for relatively low speed and low cost communication (up to 4,000 ft at 76.8K bps).

1.2.36 Native BACnet Device

A device that uses BACnet as its primary, if not only, method of communication with other BACnet devices without intermediary gateways. A system that uses native BACnet devices at all levels is a native BACnet system.

1.2.37 Network

Communication technology for building network data communications. BACnet approved network types are Point to Point (PTP) Ethernet, and MS/TP. BACnet over Internet Protocol is not an approved method for building level controls.

1.2.38 Network Number

A site-specific number assigned to each network segment to identify for routing. This network number must be unique throughout the BACnet internetwork.

1.2.39 Object

The concept of organizing BACnet information into standard components with various associated properties. Examples include analog input objects and binary output objects.

1.2.40 Object Identifier

An object property used to identify the object, including object type and instance. Object Identifiers must be unique within a device.

1.2.41 Object Properties

Attributes of an object. Examples include present value and high limit properties of an analog input object. Properties are defined in [ASHRAE 135](#); some are optional and some are required. Objects are controlled by reading from and writing to object properties.

1.2.42 Peer-to-Peer

Peer-to-peer refers to devices where any device can initiate and respond to communication with other devices.

1.2.43 Performance Verification Test (PVT)

The procedure for determining if the installed BAS meets design criteria prior to final acceptance. The PVT is performed after installation, testing, and balancing of mechanical systems. Typically the PVT is performed by the Contractor in the presence of the Government.

1.2.44 PID

Proportional, integral, and derivative control; three parameters used to control modulating equipment to maintain a setpoint. Derivative control is often not required for HVAC systems (leaving "PI" control).

1.2.45 PICS

Protocol Implementation Conformance Statement (PICS), describing the BACnet capabilities of a device. See BACnet, Annex A for the standard format and content of a PICS statement.

1.2.46 Points

Physical and virtual inputs and outputs. See also "Input/Output".

1.2.47 PTP

Point-to-Point protocol connects individual BACnet devices or networks using serial connections.

1.2.48 Repeater

A network component that connects two or more physical segments at the physical layer.

1.2.49 Router

A BACnet router is a component that joins together two or more networks using different LAN technologies. Examples include joining a BACnet Ethernet LAN to a BACnet MS/TP LAN. If a router is connected directly to the MRAN, it must be listed on the approved DITSCAP or DIACAP equipment list and must be Marine Corps DADMS listed and approved.

1.2.50 Stand-Alone Control

Refers to devices performing equipment-specific and small system control without communication to other devices or computers for physical I/O, excluding outside air and other common shared conditions. Devices are located near controlled equipment, with physical input and output points limited to 64 or less per device, except for complex individual equipment or systems. Failure of any single device will not cause other network devices to fail. BACnet "Smart" actuators (B-SA profile) and sensors (B-SS profile) communicating on a network with a parent device are exempt from stand-alone requirements.

1.2.51 SSAA

System Security Authorization Agreement. The SSAA is a local document authorizing the use of the IP networks on Camp Lejeune.

1.2.52 Supervisory Building Controller (SBC)

The Supervisory Building Controller is the upper level controller on the building's MS/TP bus. It provides building wide points, scheduling, and interface with programming tools. The SBC may be used as the point of connection between the Camp Lejeune EMCS network (IP) and the building level control network (MS/TP). Since the EMCS network uses the Marine Air Ground Task Force Regional Network (MRAN) Ethernet network using TCP/IP, if the SBC is used as a point of connection, it must be listed on the approved DITSCAP or DIACAP equipment list and must be Marine Corps DADMS listed and approved.

1.3 BACnet DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC DESCRIPTION

- a. Provide new BACnet and merge with existing BACnet DDC systems including associated equipment and accessories. The existing DDC system is manufactured by JCI
- b. Provide a networked DDC system for standalone control in compliance with the latest revision of the ASHRAE 135 BACnet standard. Include all programming, objects, and service required to meet the sequence of control. Provide BACnet communication between the DDC system and the native BACnet devices furnished with HVAC equipment, and plant equipment including boilers, chillers, and variable frequency drives. Devices provided shall be BACnet Testing Laboratories (BTL) product listing certified. Provide a Supervisory Building Controller (SBC) that communicates with the field DDC controllers via the MS/TP bus using BACnet. Provide one of the two means listing in this guide specification to connect the building control system to the EMCS via the Marine Air-Ground Task Force Regional Area Network (MRAN) Ethernet network using TCP/IP. Provide 40 hours of assistance to the government to facilitate interfacing the building control system with the existing EMCS.
- c. Authority to Operate/Authority to Connect: Prior approval to communicate on the base MRAN is a requirement on this project. Supervisory Building Controllers (SBC) and any other device communicating on the MRAN without being DADMS listed and approved and approval from the Designated Approving Authority based on DITSCAP or DIACAP efforts will not be permitted.
- d. Only technicians authorized by the Camp Lejeune utilities department are approved to add, manage, or revise data in the EMCS. Authorization shall require a unique username and password managed by the Utilities Department.

1.3.1 Design Requirements

1.3.1.1 Control System Drawings Title Sheet

Provide a title sheet for the control system drawing set. Include the project title, project location, contract number, the controls contractor preparing the drawings, an index of the control drawings in the set, and a legend of the symbols and abbreviations used throughout the control system drawings.

1.3.1.2 List of I/O Points

Also known as a Point Schedule, provide for each input and output point

physically connected to a digital controller: point name, point description, point type (Analog Output (AO), Analog Input (AI), Binary Output (BO), Binary Input (BI)), point sensor range, point actuator range, point address, BACnet object, associated BIBBS (where applicable), and point connection terminal number. Typical schedules for multiple identical equipment are allowed unless otherwise requested in design or contract criteria. All points shall adhere to the Camp Lejeune standard naming conventions.

1.3.1.3 Control System Components List

Provide a complete list of control system components installed on this project. Include for each controller and device: control system schematic name, control system schematic designation, device description, manufacturer, and manufacturer part number. For sensors, include point name, sensor range, and operating limits. For valves, include body style, Cv, design flow rate, pressure drop, valve characteristic (linear or equal percentage), and pipe connection size. For actuators, include point name, spring or non-spring return, modulating or two-position action, normal (power fail) position, nominal control signal operating range (0-10 volts DC or 4-20 milliamps), and operating limits.

1.3.1.4 Control System Schematics

Provide control system schematics. Typical schematics for multiple identical equipment are allowed unless otherwise requested in design or contract criteria. Include the following:

- a. Location of each input and output device
- b. Flow diagram for each piece of HVAC equipment
- c. Name or symbol for each control system component, such as V-1 for a valve
- d. Setpoints, with differential or proportional band values
- e. Written sequence of operation for the HVAC equipment
- f. Valve and Damper Schedules, with normal (power fail) position

1.3.1.5 HVAC Equipment Electrical Ladder Diagrams

Provide HVAC equipment electrical ladder diagrams. Indicate required electrical interlocks.

1.3.1.6 Component Wiring Diagrams

Provide a wiring diagram for each type of input device and output device. Indicate how each device is wired and powered; showing typical connections at the digital controller and power supply. Show for all field connected devices such as control relays, motor starters, actuators, sensors, and transmitters.

1.3.1.7 Terminal Strip Diagrams

Provide a diagram of each terminal strip. Indicate the terminal strip location, termination numbers, and associated point names.

1.3.1.8 BACnet Communication Architecture Schematic

Provide a schematic showing the project's entire BACnet communication network, including addressing used for LANs, LAN devices including routers and bridges, gateways, controllers, workstations, and field interface devices. If applicable, show connection to existing networks.

1.4 SUBMITTALS

Submit detailed and annotated manufacturer's data, drawings, and specification sheets for each item listed, that clearly show compliance with the project specifications.

Submit the following according to 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Include the following in the project's control system drawing set:

Control system drawings title sheet

List of I/O Points

Control System Components List

Control system schematics

HVAC Equipment Electrical Ladder diagrams

Component wiring diagrams

Terminal strip diagrams

BACnet communication architecture schematic

SD-03 Product Data

Direct Digital Controllers

Include BACnet PICS for each controller/device type, including smart sensors (B-SS) and smart actuators (B-SA).

BACnet Gateways

Include BACnet and workstation display information; bi-directional communication ability; compliance with interoperability schedule; expansion capacity; handling of alarms, events, scheduling and trend data; and single device capability (not depending on multiple devices for exchanging information from either side of the gateway).

Sensors and Input Hardware

Output Hardware

Surge and transient protection

Duct smoke detectors

SD-05 Design Data

Performance Verification Testing Plan

Pre-Performance Verification Testing Checklist

SD-06 Test Reports

Performance Verification Testing Report

SD-07 Certificates

Contractor's Qualifications

SD-09 Manufacturer's Field Reports

Pre-PVT Checklist

SD-10 Operation and Maintenance Data

Comply with requirements for data packages in Section 01 78 23 OPERATION AND MAINTENANCE DATA, except as supplemented and modified in this specification.

BACnet Direct Digital Control Systems, Data Package 4

Controls System Operators Manuals, Data Package 4

VFD Service Manuals, Data Package 4

SD-11 Closeout Submittals

Training documentation

1.5 QUALITY ASSURANCE

1.5.1 Standard Products

Provide material and equipment that are standard manufacturer's products currently in production and supported by a local service organization.

1.5.2 Delivery, Storage, and Handling

Handle, store, and protect equipment and materials to prevent damage before and during installation according to manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.

1.5.3 Operating Environment

Protect components from humidity and temperature variation, dust, and contaminants. If components are stored before installation, keep them within the manufacturer's limits.

1.5.4 Finish of New Equipment

New equipment finishing shall be factory provided. Manufacturer's standard factory finishing shall be proven to withstand 125 hours in a salt-spray fog test. Equipment located outdoors shall be proven to withstand 500 hours in a salt-spray fog test.

Salt-spray fog test shall be according to [ASTM B 117](#), with acceptance criteria as follows: immediately after completion of the test, the finish shall show no signs of degradation or loss of adhesion beyond [0.125 inch](#) on either side of the scratch mark.

1.5.5 Verification of Dimensions

The contractor shall verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing work.

1.5.6 Contractor's Qualifications

Submit documentation certifying the controls Contractor performing the work has completed at least three DDC systems installations of a similar design to this project, and programmed similar sequences of operation for at least two years. Submit the name of the technician proposed to make additions/alterations to the EMCS servers. Submit supporting documentation demonstrating their qualifications.

1.5.7 Modification of References

The advisory provisions in [ASME B31.1](#) and [NFPA 70](#) are mandatory. Substitute "shall" for "should" wherever it appears and interpret all references to the "authority having jurisdiction" and "owner" to mean the Contracting Officer.

1.5.8 Project Sequence

The control system work for this project shall proceed in the following order:

- a. Submit and receive approval on the Shop Drawings, Product Data, and Certificates specified under the paragraph entitled "SUBMITTALS."
- b. Perform the control system installation work, including all field check-outs and tuning.
- c. Provide support to TAB personnel as specified under the paragraph "TEST AND BALANCE SUPPORT."
- d. Submit and receive approval of the Controls System Operators Manual specified under the paragraph "CONTROLS SYSTEM OPERATORS MANUALS."
- e. Submit and receive approval of the Performance Verification Testing Plan and the Pre-PVT Checklist specified under the paragraph "PERFORMANCE VERIFICATION TESTING."
- f. Perform the Performance Verification Testing.
- g. Submit and receive approval on the PVT Report.
- h. Submit and receive approval on the Training Documentation specified

under the paragraph "INSTRUCTION TO GOVERNMENT PERSONNEL" and "VFD Service Support". Submit at least 30 days before training.

- i. Deliver the final Controls System Operators Manuals and VFD Service Manuals.
- j. Conduct the Phase I Training and VFD on-site/hands-on training.
- k. Conduct the Phase II Training.
- l. Submit and receive approval of Closeout Submittals.

PART 2 PRODUCTS

2.1 DDC SYSTEM

Provide a networked DDC system for stand-alone control in compliance with the latest revision of the [ASHRAE 135](#) BACnet standard. Include all programming, objects, and services required to meet the sequence of control. Provide BACnet MSTP communications between the DDC system and native BACnet devices furnished with HVAC equipment, and plant equipment such as boilers, and chillers when provided with BACnet MSTP communications. DDC controllers provided shall be certified in the BACnet Testing Laboratories (BTL) Product Listing. BACnet over IP is not permitted.

2.1.1 Point of Connection to EMCS

The existing centralized Camp Lejeune DDC system is comprised of two separate systems. One utilizes the Johnson controls Metasys system to communicate with a central server and the other utilizes a BACnet MS/TP to IP router to communicate with a central server. Both of the systems communicate over the basewide Marine Air-Ground Task Force Regional Area Network (MRAN). These systems provide two different means to connect the building control system to the base wide energy management and control system (EMCS) and either system is acceptable for use. Each system requires a different component to connect to the EMCS; furthermore, any component that is directly connected to the MRAN must be approved and listed through the Department of Defense Information Assurance Certification and Accreditation Process (DIACAP) and must be Department of Navy Application and Database Management System (DADMS) listed and approved. Currently there are two products that are approved for use on Camp Lejeune: a Johnson Controls Metasys NAE or NCE and a LOYTEC LIP-ME201 BACnet IP Router. A Johnson Controls NAE & NCE serves as the building supervisory controller and connects directly to the MRAN, while the LOYTEC Router forms a direct connection between the building's BACnet MS/TP backbone and the MRAN. With the use of the LOYTEC Router, any manufacturer's supervisory building controller may be used, even if it is not listed through DIACAP because in this instance the supervisory building controller does not connect directly to the MRAN. Other routers that connect directly to the MRAN and supervisory building controllers that connect directly to the MRAN may be used if they are approved and listed through the above mentioned process. All IP addresses and network drops shall be furnished by base telephone. One of the two means to connect the building control system to the EMCS shall be provided.

2.1.2 Supervisory Building Controller (SBC)

Provide a SBC that communicates between the DDC system and the Camp Lejeune

EMCS server in one of two ways:

- 1) The SBC may connect directly to the MRAN
- 2) It may communicate via a BACnet IP router over the MRAN

Provide all necessary hardware, drivers, software, material and equipment which shall allow communication and control between the SBC and the field DDC controllers using BACnet on the MS/TP bus. Relevant supervisory controller information shall transfer back to the EMCS system via the Ethernet TCP/IP level 1 network. When the supervisory controller is disconnected from the enterprise system for maintenance, access to the supervisor controller shall be via a laptop computer. The laptop computer shall be provided with any required propriety licensed software and license keys.

2.1.3 Direct Digital Controllers

Direct digital controllers shall be UL 916 rated.

2.1.3.1 I/O Point Limitation

The total number of I/O hardware points used by a single stand-alone digital controller, including I/O expansion units, shall not exceed 64. Place I/O expansion units in the same cabinet as the digital controller.

2.1.3.2 Environmental Limits

Controllers shall be suitable for, or placed in protective enclosures suitable for the environment (temperature, humidity, dust, and vibration) where they are located.

2.1.3.3 Stand-Alone Control

Provide stand-alone digital controllers capable of meeting the complete sequence of operation with and without network connectivity (being connected to the EMCS).

2.1.3.4 Internal Clock

Provide internal clocks for all BACnet Building Controllers (B-BC) and BACnet Advanced Application Controllers (B-AAC) using BACnet time synchronization services. Automatically synchronize system clocks daily from an operator-designated controller. The system shall automatically adjust for daylight saving time.

2.1.3.5 Memory

Provide sufficient memory for each controller to support the required control, communication, trends, alarms, and messages. Protect programs residing in memory with EEPROM, flash memory, or by an uninterruptible power source (battery or uninterruptible power supply). The backup power source shall have capacity to maintain the memory during a 72-hour continuous power outage. Rechargeable power sources shall be constantly charged while the controller is operating under normal line power. Batteries shall be replaceable without soldering. Trend and alarm history collected during normal operation shall not be lost during power outages less than 72 hours long.

2.1.3.6 Immunity to Power Fluctuations

Controllers shall operate at 90 percent to 110 percent nominal voltage rating.

2.1.3.7 Transformer

The controller power supply shall be fused or current limiting and rated at 125 percent power consumption.

2.1.3.8 Wiring Terminations

Use screw terminal wiring terminations for all field-installed controllers. Provide field-removable modular terminal strip or a termination card connected by a ribbon cable for all controllers other than terminal units.

2.1.3.9 Input and Output Interface

Provide hard-wired input and output interface for all controllers as follows:

- a. Protection: Shorting an input or output point to itself, to another point, or to ground shall cause no controller damage. Input or output point contact with sources up to 24 volts AC or DC for any duration shall cause no controller damage.
- b. Binary Inputs: Binary inputs shall monitor two state devices.
- c. Pulse Accumulation Inputs: Pulse accumulation inputs shall conform to binary input requirements and accumulate pulses at a resolution suitable to the application.
- d. Analog Inputs: Analog inputs shall monitor low-voltage (0-10 VDC), current (4-20 mA), or resistance (thermistor or RTD) signals.
- e. Binary Outputs: Binary outputs shall have a toggle switch and send a pulsed 24 VDC low-voltage signal for modulation control, or provide a maintained open-closed position for on-off control. For HVAC equipment and plant controllers, provide for manual overrides, either with three-position (on-off-auto) override switches and status lights, or with an adjacent operator display and interface. Where appropriate, provide a method to select normally open or normally closed operation.
- f. Analog Outputs: Analog outputs shall send modulating 0-10 VDC or 4-20 mA signals to control output devices.
- g. Tri-State Outputs: Tri-State outputs shall provide three-point floating control of terminal unit electronic actuators.

2.1.3.10 Digital Controller Cabinet

Provide each digital controller as factory mounted or in a factory fabricated cabinet enclosure. Cabinets located indoors shall protect against dust and have a minimum NEMA 1 rating, **EXCEPT WHERE INDICATED OTHERWISE, CABINETS LOCATED OUTDOORS OR IN DAMP ENVIRONMENTS SHALL PROTECT AGAINST ALL OUTDOOR CONDITIONS AND HAVE A MINIMUM NEMA 4 RATING. MECHANICAL ROOMS THAT CONTAIN STEAM SERVICE OR EQUIPMENT (INCLUDING NEW STEAM BOILER ROOMS) ARE CONSIDERED DAMP ENVIRONMENTS.** Outdoor control

panels and controllers must be able to withstand extreme ambient conditions, without malfunction or failure, whether or not the controlled equipment is running. If necessary, provide a thermostatically controlled panel heater in freezing locations, and an internal ventilating fan in locations exposed to direct sunlight. Cabinets shall have a hinged lockable door and an offset removable metal back plate, except controllers integral with terminal units, like those mounted on VAV boxes. Provide like-keyed locks for all hinged panels provided and a set of two keys at each panel, with one key inserted in the lock.

2.1.3.11 Main Power Switch and Receptacle

Provide each control cabinet with a main external power on/off switch located inside the cabinet. Also provide each cabinet with a separate 120 VAC duplex receptacle.

2.1.3.12 DSL Modems

DSL modems and Rate Adaptive Asymmetric Digital Subscriber Line (RADSL) modems are provided by the government. Telephone modems are not permitted for any other communication with the DDC system.

2.1.3.13 BACnet Gateways

Provide gateways to connect BACnet to legacy systems, existing non-BACnet devices, and existing non-BACnet DDC controlled plant equipment, only when specifically requested and approved by the Government, and shown on the Government approved BACnet Communication Architecture Schematic. Communication shall be MS/TP. Communication using IP is not permitted. Provide with each gateway an interoperability schedule Use gateway interoperability schedules shown on design drawings or other project documents, showing each point or event on the legacy side that the BACnet "client" will read, and each parameter that the BACnet network will write to. Describe this interoperability in terms of BACnet services, or Interoperability Building Blocks (BIBBS), defined in ASHRAE 135 Annex K. Provide two-year minimum warranty for each gateway, including parts and labor.

The following minimum capabilities are required:

- a. Gateways shall be able to read and view all readable object properties listed in the interoperability schedule on the non-BACnet network to the BACnet network and vice versa where applicable.
- b. Gateways shall be able to write to all writeable object properties listed in the interoperability schedule on the non-BACnet network from the BACnet network and vice versa where applicable.
- c. Gateways shall provide single-pass (only one protocol to BACnet without intermediary protocols) translation from the non-BACnet protocol to BACnet and vice versa.
- d. Gateways shall meet the requirements of Data Sharing Read Property (DS-RP-B), Data Sharing Write Property (DS-WP-B), Device Management Dynamic Device Binding-B (DM-DDB-B), and Device Management Communication Control (DM-DCC-B) BIBBs, in accordance with [ASHRAE 135](#).
- e. Gateways shall include all hardware, software, software licenses, and configuration tools for operator-to-gateway communications. Provide

backup programming and parameters on CD media and the ability to modify, download, backup, and restore gateway configuration.

2.1.4 Notebook Computer

Provide a notebook computer, complete with the project's installed DDC software, configuration files and, applications database, to fully troubleshoot and program the project's devices. Provide the notebook computer with ballistic nylon carrying case with shoulder strap with all necessary cables and interface hardware needed for setup and communication with the controllers and control system components.

At a minimum the notebook computer shall include: Common Access Card reader, a Microsoft XP Professional operating system, processor with capability and speed required by application software, 40 giga-byte hard drive, 512 mega-byte RAM, 2 USB 2.0 ports, 10/100 network interface card, internal V.92 modem, 15-inch display, keyboard, 3-hour battery with charger, 52X internal CD-RW drive with CD creator software, and Microsoft Office bundled software. Provide all original licenses, installation media, documentation, and recovery CDs capable of restoring the original configuration. Provide the manufacturer's 3-year next business day on-site warranty with the Government listed as the warranty owner.

2.1.5 DDC Software

2.1.5.1 Programming

Provide programming to execute the sequence of operation indicated. Provide all programming, programming software tools, and programming hardware tools to configure and program all controllers. If the laptop computer provided elsewhere is used as a programming tool, provide all necessary accessories for full functionality. All software shall be licensed to Marine Corps Base, Camp Lejeune Complex for unrestricted use on Camp Lejeune Complex and reproduction for use on Camp Lejeune Complex. Software keys and "dongles" are not permitted. Provide sequence of operation routines in simple, easy-to-follow logic with detailed text comments describing what the logic does and how it corresponds to the project's written sequence of operation.

- a. Graphic-based programming shall use a library of function blocks made from pre-programmed code designed for BAS control. Function blocks shall be assembled with interconnecting lines, depicting the control sequence in a flowchart. If providing a computer with device programming tools as part of the project, graphic programs shall be viewable in real time showing present values and logical results from each function block.
- b. Menu-based programming shall be done by entering parameters, definitions, conditions, requirements, and constraints.
- c. For line-by-line and text-based programming, declare variable types (local, global, real, integer, etc.) at the beginning of the program. Use descriptive comments frequently to describe the programming.
- d. If providing a computer with device programming tools as part of the project, provide a means for detecting program errors and testing software strategies with a simulation tool. Simulation may be inherent within the programming software suite, or provided by physical controllers mounted in a NEMA 1 test enclosure. The test enclosure

shall contain one dedicated controller of each type provided under this contract, complete with power supply and relevant accessories.

2.1.5.2 Parameter Modification

All writeable object properties, and all other programming parameters needed to comply with the project specification shall be adjustable for devices at any network level, including those accessible with web-browser communication, and regardless of programming methods used to create the applications.

2.1.5.3 Short Cycling Prevention

Provide setpoint differentials and minimum on/off times to prevent equipment short cycling.

2.1.5.4 Equipment Status Delay

Provide an adjustable delay from when equipment is commanded on or off and when the control program looks to the status input for confirmation.

2.1.5.5 Run Time Accumulation

Use the Elapsed Time Property to provide re-settable run time accumulation for each Binary Output Object connected to mechanical loads greater than 1 HP, electrical loads greater than 10 KW, or wherever else specified.

2.1.5.6 Timed Local Override

Provide a non-cumulative adjustable override time for the push of a local override button.

2.1.5.7 Time Synchronization

Provide time synchronization, including adjustments for leap years, daylight saving time, and operator time adjustments.

2.1.5.8 Scheduling

Provide operating schedules as indicated, with equipment assigned to groups. Changing the schedule of a group shall change the operating schedule of all equipment in the group. Groups shall be capable of operator creation, modification, and deletion. Provide capability to view and modify schedules in a seven-day week format. Provide capability to enter holiday and override schedules one full year at a time.

2.1.5.9 Object Property Override

Allow writeable object property values to accept overrides to any valid value. Where specified or required for the sequence of control, the Out Of Service property of Objects shall be modifiable using BACnet's write property service. When documented, exceptions to these requirement are allowed for life, machine, and process safeties.

2.1.5.10 Alarms and Events

Alarms and events shall be capable of having programmed time delays and high-low limits. All alarms/events shall report to the EMCS server. Alarms/events shall be stored within the Supervisory Building Controller

(SBC). Provide alarms/events in agreement with the point schedule, sequence of operation, and the BAS Owner. At a minimum, provide programming to initiate alarms/events any time a piece of equipment fails to operate, a control point is outside normal range or condition shown on schedules, communication to a device is lost, a device has failed, or a controller has lost its memory.

2.1.5.11 Trending

Provide BACnet trend services capable of trending all object present values set points, and other parameters indicated for trending on project schedules. Trends may be associated into groups, and a trend report may be set up for each group. Trends are stored within a device on the BACnet network, with operator selectable trend intervals from 10 seconds up to 60 minutes. The minimum number of consecutive trend values stored at one time shall be 100 per variable. When trend memory is full, the most recent data shall overwrite the oldest data.

The SBC shall upload trends automatically upon reaching 3/4 of the device buffer limit (via Notification_Threshold property), by operator request, or by time schedule for archiving. Archived and real-time trend data shall be available for viewing numerically and graphically for at the workstation and connected notebook computers.

2.1.5.12 Device Diagnostics

Each controller shall have diagnostic LEDs for power, communication, and device fault condition. The DDC system shall recognize and report a non-responsive controller.

2.1.5.13 Power Loss

Upon restoration of power, the DDC system shall perform an orderly restart and restoration of control.

2.1.5.14 Access Control

Provide at least five levels of password protection for operator interfaces. The lowest level only allowing viewing of graphics. The second level allows viewing graphics and changing space temperature setpoints. The third level allows the previous level's capability, plus changing operating schedules. The fourth level allows access to all functions except passwords. The highest level provides all administrator rights and allows full access to all programming, including setting new passwords and access levels. Provide the BAS Owner with the highest level password access. Provide automatic log out if no keyboard or mouse activity is detected after a user-defined time delay.

2.1.5.15 Configuration Tool

Provide the software with the manufacturer's installation CDs and licenses. Licenses shall allow unrestricted use and reproduction for use at the Camp Lejeune Complex. Software shall not require the use of software keys or "dongles" Configure the software according to the DDC system manufacturer's specifications and in agreement with BACnet standards found in ASHRAE 135, Annex L.

The software shall permit complete monitoring, modification, and troubleshooting interface with the DDC system. The operator interface with

the software shall be menu-driven with appropriate displays and menu commands to manipulate the DDC system's objects, point data, operating schedules, control routines, system configuration, trends, alarms, messages, graphics, and reports. Trends shall be capable of graphic display in real time, with variables plotted as functions of time. Each alarmed point shall be capable of displaying its alarm history, showing when it went into alarm, if and when it was acknowledged, and when it went out of alarm. The modification of DDC system parameters and object properties shall be accomplished with "fill in the blank" and/or "point and drag" methods. Modifications shall download to the appropriate controllers at the operator's request.

2.2 SENSORS AND INPUT HARDWARE

Coordinate sensor types with the BAS Owner to keep them consistent with existing installations.

2.2.1 Field-Installed Temperature Sensors

Where feasible, provide the same sensor type throughout the project. Avoid using transmitters unless absolutely necessary.

2.2.1.1 Thermistors

Precision thermistors may be used in applications below 200 degrees F. Sensor accuracy over the application range shall be 0.36 degree F or less between 32 to 150 degrees F. Stability error of the thermistor over five years shall not exceed 0.25 degrees F cumulative. A/D conversion resolution error shall be kept to 0.1 degrees F. Total error for a thermistor circuit shall not exceed 0.5 degrees F.

2.2.1.2 Resistance Temperature Detectors (RTDs)

Provide RTD sensors with platinum elements compatible with the digital controllers. Encapsulate sensors in epoxy, series 300 stainless steel, anodized aluminum, or copper. Temperature sensor accuracy shall be 0.1 percent (1 ohm) of expected ohms (1000 ohms) at 32 degrees F. Temperature sensor stability error over five years shall not exceed 0.25 degrees F cumulative. Direct connection of RTDs to digital controllers without transmitters is preferred. When RTDs are connected directly, lead resistance error shall be less than 0.25 degrees F. The total error for a RTD circuit shall not exceed 0.5 degrees F. Allow an additional 0.5 percent accuracy for averaging sensors.

2.2.1.3 Temperature Sensor Details

- a. Room Type: Provide the sensing element components within a decorative protective cover suitable for surrounding decor. Provide a communication port for a portable operator interface like a notebook computer or PDA.
- b. Duct Probe Type: Ensure the probe is long enough to properly sense the air stream temperature.
- c. Duct Averaging Type: Continuous averaging sensors shall be one foot in length for each 4 square feet of duct cross-sectional area, and a minimum length of 6 feet.
- d. Pipe Immersion Type: Provide minimum three-inch immersion. Provide

each sensor with a corresponding pipe-mounted sensor well, unless indicated otherwise. Sensor wells shall be stainless steel when used in steel piping, and brass when used in copper piping. Provide the sensor well with a heat-sensitive transfer agent between the sensor and the well interior.

- e. Outside Air Type: Provide the sensing element on the building's north side with a protective weather shade that positions the sensor approximately 3 inches off the wall surface, does not inhibit free air flow across the sensing element, and protects the sensor from snow, ice, and rain.

2.2.2 Transmitters

Provide transmitters with 4 to 20 mA or 0 to 10 VDC linear output scaled to the sensed input. Transmitters shall be matched to the respective sensor, factory calibrated, and sealed. Size transmitters for an output near 50 percent of its full-scale range at normal operating conditions. The total transmitter error shall not exceed 0.1 percent at any point across the measured span. Supply voltage shall be 12 to 24 volts AC or DC. Transmitters shall have non-interactive offset and span adjustments. For temperature sensing, transmitter drift shall not exceed 0.03 degrees F a year.

2.2.2.1 Relative Humidity Transmitters

Provide transmitters with an accuracy equal to plus or minus 3 2 percent from 0 to 90 percent scale, and less than one percent drift per year. Sensing elements shall be the polymer type.

2.2.2.2 Pressure Transmitters

Provide transmitters integral with the pressure transducer.

2.2.3 Current Transducers

Provide current transducers to monitor motor amperage. Current switches may be used to indicate on/off status.

2.2.4 Pneumatic to Electric Transducers

Pneumatic to electronic transducers shall convert a 0 to 20 psig signal to a proportional 4 to 20 mA or 0 to 10 VDC signal (operator scaleable). Supply voltage shall be 24 VDC. Accuracy and linearity shall be 1.0 percent or better.

2.2.5 Air Quality Sensors

Provide power supply for each sensor.

2.2.5.1 CO2 Sensors

Provide photo-acoustic type CO2 sensors with integral transducers and linear output. The devices shall read CO2 concentrations between 0 and 2000 ppm with full scale accuracy of at least plus or minus 100 ppm.

2.2.5.2 Air Quality Sensors

Provide full spectrum air quality sensors using a hot wire element based on

the Taguchi principle. The sensor shall monitor a wide range of gaseous volatile organic components common in indoor air contaminants like paint fumes, solvents, cigarette smoke, and vehicle exhaust. The sensor shall automatically compensate for temperature and humidity, have span and calibration potentiometers, operate on 24 VDC power with output of 0-10 VDC, and have a service rating of 32 to 140 degrees F and 5 to 95 percent relative humidity.

2.2.6 Input Switches

2.2.6.1 Timed Local Overrides

Provide buttons or switches to override the DDC occupancy schedule programming for each major building zone during unoccupied periods, and to return HVAC equipment to the occupied mode. This requirement is waived for zones clearly intended for 24 hour continuous operation.

2.2.7 Freeze Protection Thermostats

Provide special purpose thermostats with flexible capillary elements 20 feet in length for coil face areas up to 40 square feet. Provide additional thermostats for larger coils. Provide switch contacts rated for the respective motor starter's control circuit voltage. Include auxiliary contacts for the switch's status condition. A freezing condition at any 18-inch increment along the sensing element's length shall activate the switch. The thermostat shall be equipped with a manual push-button reset switch so that when tripped, the thermostat requires manual resetting before the HVAC equipment can restart.

2.2.8 Air Flow Measurement Stations

Air flow measurement stations shall have an array of velocity sensing elements and straightening vanes inside a flanged sheet metal casing. The velocity sensing elements shall be the RTD or thermistor type, traversing the ducted air in at least two directions. The air flow pressure drop across the station shall not exceed 0.1 inch water gage at a velocity of 2,000 fpm. The station shall be suitable for air flows up to 2500 fpm, and a temperature range of 0 to 140 degrees F. The station's measurement accuracy over the range of 125 to 2,500 fpm shall be plus or minus 3 percent of the measured velocity. Station transmitters shall provide a linear, temperature-compensated 4 to 20 mA or 0 to 10 VDC output. The output shall be capable of being accurately converted to a corresponding air flow rate in cubic feet per minute. Transmitters shall be a 2-wire, loop powered device. The output error of the transmitter shall not exceed 0.5 percent of the measurement.

2.2.9 Air Flow Measurement For Terminal Devices

Air flow measurement for terminal devices such as variable air volume boxes, with or without fan power shall have an array of pressure sensing elements that sense total pressure and static pressure. The flow measurement shall be integral to the device controller and shall be by differential pressure sensor. The air flow shall measure flows down to 300 fpm with an accuracy of 5 percent of reading.

2.2.10 Energy Metering

Provide energy meters to collect steam and water consumption, and hot water solar collector generation for the facility and report to the EMCS database.

2.2.10.1 Steam Meters

Steam meters shall be the vortex type, with pressure compensation, a minimum turndown ratio of 10 to 1. Output signal shall be 4-20 ma, pulsed, or BACnet (MS/TP), all compatible with installed DDC system.

2.2.10.2 Water meters

Water meters 1" and smaller shall be positive displacement nutating disk. Water meters larger than 1" shall be compound type. Output signal shall be 4-10 ma, pulse, or BACnet (MS/TP).

2.2.10.3 Hot Water Solar Collector Meters

Meters for hot water solar collectors may be an integrated BTU meter with a BACnet output or may be a combination of temperature sensors and water flow meter monitored by a DDC controller with the DDC system calculating the BTU transfer. Water flow can be measured by orifice or venturi meter selected for the anticipated system flow rate. Temperature sensors shall be placed in both the supply to and the return from the solar collector array.

2.3 OUTPUT HARDWARE

2.3.1 Control Dampers

Provide factory manufactured aluminum blade/galvanized steel frame dampers where indicated. Control dampers shall comply with [SMACNA 1966](#) except as modified or supplemented by this specification. Published damper leakage rates and respective pressure drops shall have been verified by tests in compliance with [AMCA 500-D](#) requirements.

Provide damper assembly frames constructed of [13 gauge](#) minimum thickness galvanized steel channels with mitered and welded corners. Damper axles shall be [0.5 inches](#) minimum diameter plated steel rods supported in the damper frame by stainless steel or bronze bearings. Blades mounted vertically shall be supported by thrust bearings.

Dampers shall be rated for not less than [2000 fpm](#) air velocity. The pressure drop through each damper when full-open shall not exceed [0.04 inches water gage at 1000 fpm](#) face velocity. Damper assemblies in ductwork subject to above [3-inch](#) water gauge static air pressure shall be constructed to meet SMACNA Seal Class "A" construction requirements.

Provide the damper operating linkages outside of the air stream, including crank arms, connecting rods, and other hardware that transmits motion from the damper actuators to the dampers, shall be adjustable. Additionally, operating linkages shall be designed and constructed to have a 2 to 1 safety factor when loaded with the maximum required damper operating force. Linkages shall be brass, bronze, galvanized steel, or stainless steel.

Provide access doors or panels in hard ceilings and walls for access to all concealed damper operators and damper locking setscrews.

For field-installed control dampers, a single damper section shall have blades no longer than [48 inches](#) and no higher than [72 inches](#). The maximum damper blade width shall be [12 inches](#). Larger sized dampers shall be built using a combination of sections.

Frames shall be at least 2 inches wide. Flat blades shall have edges folded for rigidity. Blades shall be provided with compressible gasket seals along the full length of the blades to prevent air leakage when closed.

The damper frames shall be provided with jamb seals to minimize air leakage. Seals shall be suitable for an operating temperature range of minus 40 degrees F to 200 degrees F.

The leakage rate of each damper when full-closed shall be no more than 2 cfm per sq. foot of damper face area at 1.0 inches water gage static pressure.

2.3.2 Control Valves

2.3.2.1 Valve Assembly

Valve bodies shall be designed for 125 psig minimum working pressure or 150 percent of the operating pressure, whichever is greater. Valve stems shall be Type 300 series stainless steel. Valve leakage ratings shall be 0.01 percent of rated Cv value. Class 125 copper alloy valve bodies and Class 150 steel or stainless steel valves shall meet the requirements of ASME B16.5. Cast iron valve components shall meet the requirements of ASTM A 126 Class B or C.

2.3.2.2 Butterfly Valves

Butterfly valves shall be the threaded lug type suitable for dead-end service and for modulation to the fully-closed position, with stainless steel shafts supported by bearings, non-corrosive discs geometrically interlocked with or bolted to the shaft (no pins), and EPDM seats suitable for temperatures from minus 20 degrees F to plus 250 degrees F. Valves shall have a means of manual operation independent of the actuator.

2.3.2.3 Two-Way Valves

Two-way modulating valves shall have an equal percentage characteristic.

2.3.2.4 Three-Way Valves

Three-way valves shall have an equal percentage characteristic.

2.3.2.5 Valves for Chilled Water, Condenser Water, and Glycol Fluid Service

- a. Bodies for valves 1-1/2 inches and smaller shall be brass or bronze, with threaded or union ends. Bodies for valves from 2 inches to 3 inches inclusive shall be of brass, bronze, or iron. Bodies for 2 inch valves shall have threaded connections. Bodies for valves from 2-1/2 to 3 inches shall have flanged connections.
- b. Internal valve trim shall be brass or bronze, except that valve stems shall be stainless steel.
- c. Unless indicated otherwise, provide modulating valves sized for 2 psi minimum and 4 psi maximum differential across the valve at the design flow rate.
- d. Valves 4 inches and larger shall be butterfly valves, unless indicated otherwise.

2.3.2.6 Valves for Hot Water Service

Valves for hot water service below 250 Degrees F:

- a. Bodies for valves 1-1/2 inches and smaller shall be brass or bronze, with threaded or union ends. Bodies for valves from 2 inches to 3 inches inclusive shall be of brass, bronze, or iron. Bodies for 2 inch valves shall have threaded connections. Bodies for valves from 2-1/2 to 3 inches shall have flanged connections.
- b. Internal trim (including seats, seat rings, modulation plugs, valve stems, and springs) of valves controlling water above 210 degrees F shall be Type 300 series stainless steel.
- c. Internal trim for valves controlling water 210 degrees F or less shall be brass or bronze. Valve stems shall be Type 300 series stainless steel.
- d. Non-metallic parts of hot water control valves shall be suitable for a minimum continuous operating temperature of 250 degrees F or 50 degrees F above the system design temperature, whichever is higher.
- e. Unless indicated otherwise, provide modulating valves sized for 2 psi minimum and 4 psi maximum differential across the valve at the design flow rate.
- f. Valves 4 inches and larger shall be butterfly valves, unless indicated otherwise.

2.3.2.7 Valves for High Temperature Hot Water Service

Valves for hot water service 250 Degrees F above:

- a. Valve bodies shall conform to ASME B16.34 Class 300. Valve and actuator combination shall be normally closed. Bodies shall be carbon steel, globe type with welded ends on valves 1 inch and larger. Valves smaller than 1 inch shall have socket-weld ends. Packing shall be virgin polytetrafluoroethylene (PTFE).
- b. Internal valve trim shall be Type 300 series stainless steel.
- c. Unless indicated otherwise, provide modulating valves sized for 2 psi minimum and 4 psi maximum differential across the valve at the design flow rate.

2.3.3 Actuators

Provide direct-drive electric actuators for all control applications, except where indicated otherwise.

2.3.3.1 Electric Actuators

Each actuator shall deliver the torque required for continuous uniform motion and shall have internal end switches to limit the travel, or be capable of withstanding continuous stalling without damage. Actuators shall function properly within 85 to 110 percent of rated line voltage. Provide actuators with hardened steel running shafts and gears of steel or copper alloy. Fiber or reinforced nylon gears may be used for torques less than 16 inch-pounds. Provide two-position actuators of single direction,

spring return, or reversing type. Provide modulating actuators capable of stopping at any point in the cycle, and starting in either direction from any point. Actuators shall be equipped with a switch for reversing direction, and a button to disengage the clutch to allow manual adjustments. Provide the actuator with a hand crank for manual adjustments, as applicable. Actuators without spring-return may only be used on terminal fan coil units, terminal VAV units, convectors, and unit heaters. Spring return actuators shall be provided on all control dampers and all control valves except terminal fan coil units, terminal VAV units, convectors, and unit heaters; unless indicated otherwise. Each actuator shall have distinct markings indicating the full-open and full-closed position, and the points in-between.

2.3.4 Output Signal Conversion

2.3.5 Output Switches

2.3.5.1 Control Relays

Field installed and DDC panel relays shall be double pole, double throw, UL listed, with contacts rated for the intended application, indicator light, and dust proof enclosure. The indicator light shall be lit when the coil is energized and off when coil is not energized. Relays shall be the socket type, plug into a fixed base, and replaceable without tools or removing wiring. Encapsulated "PAM" type relays may be used for terminal control applications.

2.4 ELECTRICAL POWER AND DISTRIBUTION

2.4.1 Transformers

Transformers shall conform to [UL 506](#). For control power other than terminal level equipment, provide a fuse or circuit breaker on the secondary side of each transformer.

2.4.2 Surge and Transient Protection

Provide each digital controller with surge and transient power protection. Surge and transient protection shall consist of the following devices, installed externally to the controllers.

2.4.2.1 Power Line Surge Protection

Provide surge suppressors on the incoming power at each controller or grouped terminal controllers. Surge suppressors shall be rated in accordance with [UL 1449](#), have a fault indicating light, and conform to the following:

- a. The device shall be a transient voltage surge suppressor, hard-wire type individual equipment protector for 120 VAC/1 phase/2 wire plus ground.
- b. The device shall react within 5 nanoseconds and automatically reset.
- c. The voltage protection threshold, line to neutral, shall be no more than 211 volts.
- d. The device shall have an independent secondary stage equal to or greater than the primary stage joule rating.

- e. The primary suppression system components shall be pure silicon avalanche diodes.
- f. The secondary suppression system components shall be silicon avalanche diodes or metal oxide varistors.
- g. The device shall have an indication light to indicate the protection components are functioning.
- h. All system functions of the transient suppression system shall be individually fused and not short circuit the AC power line at any time.
- i. The device shall have an EMI/RFI noise filter with a minimum attenuation of 13 dB at 10 kHz to 300 MHz.
- j. The device shall comply with [IEEE C62.41.1](#) and [IEEE C62.41.2](#), Class "B" requirements and be tested according to [IEEE C62.45](#).
- k. The device shall be capable of operating between minus 20 degrees F and plus 122 degrees F.

2.4.3 Wiring

Provide complete electrical wiring for the DDC System, including wiring to transformer primaries. Unless indicated otherwise, provide all normally visible or otherwise exposed wiring in conduit. Where conduit is required, control circuit wiring shall not run in the same conduit as power wiring over 100 volts. Run all circuits over 100 volts in conduit, metallic tubing, covered metal raceways, or armored cable. Use plenum-rated cable for circuits under 100 volts in concealed accessible spaces. Examples of these spaces include HVAC plenums, within walls, above suspended ceilings, in attics, and within ductwork. All wiring in mechanical rooms and mezzanines shall be run in conduit.

2.4.3.1 Power Wiring

The following requirements are for field-installed wiring:

- a. Wiring for 24 V circuits shall be insulated copper 18 AWG minimum and rated for 300 VAC service.
- b. Wiring for 120 V circuits shall be insulated copper 14 AWG minimum and rated for 600 VAC service.

2.4.3.2 Analog Signal Wiring

Field-installed analog signal wiring shall be in accordance with manufacturer's installation instructions. Each cable shall be 100 percent shielded and have a 20 AWG drain wire. Each wire shall have insulation rated for 300 VAC service. Cables shall have an overall aluminum-polyester or tinned-copper cable-shield tape.

2.5 FIRE PROTECTION DEVICES

2.5.1 [Duct Smoke Detectors](#)

Provide duct smoke detectors in HVAC ducts in accordance with [NFPA 72](#) and [NFPA 90A](#), except as indicated otherwise. Provide UL listed or FM approved

detectors, designed specifically for duct installation.

2.6 VARIABLE FREQUENCY (MOTOR) DRIVES

Provide variable frequency drives (VFDs) as indicated. VFDs shall convert 240 or 460 volt (plus or minus 10 percent), three phase, 60 hertz (plus or minus 2Hz), utility grade power to adjustable voltage/frequency, three phase, AC power for stepless motor control from 5 percent to 105 percent of base speed. VFDs shall be UL listed as delivered to the end user. The VFD shall meet the requirements specified in the most current National Electrical Code. Each VFD shall also meet the following:

- a. The VFD shall use sine coded Pulse Width Modulation (PWM) technology. PWM calculations shall be performed by the VFD microprocessor.
- b. The VFD shall be capable of automatic control by a remote 4-20 mA 0 to 10 VDC signal, BACnet interface, or manually by the VFD control panel.

2.6.1 VFD Quality Assurance

VFDs shall be the manufacturer's current standard production unit with at least 10 identical units successfully operating in the field.

2.6.2 VFD Service Support

- a. **Warranty:** Provide the VFDs with a minimum 24-month full parts and labor warranty. The warranty shall start when the contract's HVAC system is accepted by the Government. Include warranty documentation, dates, and contact information with the VFD on-site service manuals.
- b. **VFD Service Manuals:** Provide the VFDs with all necessary installation, operation, maintenance, troubleshooting, service, and repair manuals in English including related factory technical bulletins. Provide the documents factory bound, in sturdy 3-ring binders, or hard bound covers. Provide a title sheet on the outside of each binder indicating the project title, project location, installing contractor, contract number, and the VFD manufacturer, address, and telephone number. Each binder shall include a table of contents and tabbed dividers, with all material neatly organized. The documentation provided shall be specifically applicable to this project, shall be annotated to reflect the actual project conditions, and shall provide a complete and concise depiction of the installed work.
- c. **Technical Support:** Provide the VFDs with manufacturer's technical telephone support in English, readily available during normal working hours, and free of charge for the life of the equipment.
- d. **Initial Start-Up:** Provide the VFDs with factory-trained personnel for the on-site start-up of the HVAC equipment and associated VFD. The personnel shall be competent in the complete start-up, operation, and repair of the particular model VFD installed. The factory start-up representative shall perform the factory's complete recommended start-up procedures and check-out tests on the VFD. Include a copy of the start-up test documentation with the VFD on-site service manuals.
- e. Provide the VFDs with on-site/hands-on training for the user and maintenance personnel. Provide a capable and qualified instructor with minimum two years field experience with the operation and maintenance of similar VFDs. The training shall occur during normal working hours

and last not less than 2 hours. Coordinate the training time with the Contracting Officer and the end user. The VFD service manuals shall be used during the training. The contractor shall ensure the manuals are on-site before the start of training. The training shall cover all operational aspects of the VFD.

- f. The VFD manufacturer shall have the capability to deliver a replacement VFD within 48 hours.

2.6.3 VFD Features

VFDs shall have the following features:

- a. A local operator control keypad capable of:
 - (1) Remote/Local operator selection with password access.
 - (2) Run/Stop and manual speed commands.
 - (3) All programming functions.
 - (4) Scrolling through all display functions.
- b. Digital display capable of indicating:
 - (1) VFD status.
 - (2) Frequency.
 - (3) Motor RPM.
 - (4) Phase current.
 - (5) Fault diagnostics in descriptive text.
 - (6) All programmed parameters.
- c. Standard PI loop controller with input terminal for controlled variable and parameter settings.
- d. User interface terminals for remote control of VFD speed, speed feedback, and an isolated form C SPDT relay, which energizes on a drive fault condition.
- e. An isolated form C SPDT auxiliary relay which energizes on a run command.
- f. A metal NEMA 1 enclosure for indoors, NEMA 4 with heater for outdoors.
- g. An adjustable carrier frequency with 16 KHz minimum upper limit.
- h. A built in or external line reactor with 3 percent minimum impedance to protect the VFDs DC buss capacitors and rectifier section diodes.

2.6.4 Programmable Parameters

VFDs shall include the following operator programmable parameters:

- a. Upper and lower limit frequency.

- b. Acceleration and Deceleration rate.
- c. Variable torque volts per Hertz curve.
- d. Starting voltage level.
- e. Starting frequency level.
- f. Display speed scaling.
- g. Enable/disable auto-restart feature.
- h. Enable/disable soft stall feature.
- i. Motor overload level.
- j. Motor stall level.
- k. Jump frequency and hysteresis band.
- l. PWM carrier frequency.

2.6.5 Protective Features

VFDs shall have the following protective features:

- a. An electronic adjustable inverse time current limit with consideration for additional heating of the motor at frequencies below 45Hz, for the protection of the motor.
- b. An electronic adjustable soft stall feature, allowing the VFD to lower the frequency to a point where the motor will not exceed the full-load amperage when an overload condition exists at the requested frequency. The VFD will automatically return to the requested frequency when load conditions permit.
- c. A separate electronic stall at 110 percent VFD rated current, and a separate hardware trip at 190 percent current.
- d. Ground fault protection that protects the output cables and motor from grounds during both starting and continuous running conditions.
- e. The ability to restart after the following faults:
 - (1) Overcurrent (drive or motor).
 - (2) Power outage.
 - (3) Phase loss.
 - (4) Over voltage/Under voltage.
- f. The ability shut down if inadvertently started into a rotating load without damaging the VFD or the motor.
- g. The ability to keep a log of a minimum of four previous fault conditions, indicating the fault type and time of occurrence in descriptive text.

- h. The ability to sustain 110 percent rated current for 60 seconds
- i. The ability to shutdown safely or protect against and record the following fault conditions:
 - (1) Over current (and an indication if the over current was during acceleration, deceleration, or running).
 - (2) Over current internal to the drive.
 - (3) Motor overload at start-up.
 - (4) Over voltage from utility power.
 - (5) Motor running overload.
 - (6) Over voltage during deceleration.
 - (7) VFD over heat.
 - (8) Load end ground fault.
 - (9) Abnormal parameters or data in VFD EEPROM.

2.6.6 Minimum Operating Conditions

VFDs shall be designed and constructed to operate within the following service conditions:

- a. Ambient Temperature Range, 0 to 120 degrees F.
- b. Non-condensing relative humidity to 90 percent.

2.6.7 Additional Features

Provide VFDs with the following additional features:

- a. BACnet MS/TP communication interface port
- b. RFI/EMI filters

PART 3 EXECUTION

3.1 INSTALLATION

Perform the installation under the supervision of competent technicians regularly employed in the installation of DDC systems.

3.1.1 BACnet Naming and Addressing

Coordinate with the EMCS Owner and provide naming and addressing consistent with existing buildings already loaded on the EMCS server. All DDC controllers shall have a Camp Lejeune unique instance number and all Supervisory Building Controllers shall have a Camp Lejeune unique name.

- a. MAC Address

Every BACnet device shall have an assigned and documented MAC Address

unique to its network. For Ethernet networks, document the MAC Address assigned at its creation. For ARCNET or MS/TP, assign from 1 to 128.

b. Network Numbering

Assign unique numbers to each new network installed on the BACnet internetwork. Provide ability for changing the network number; either by device switches, network computer, or field operator interface. The BACnet internetwork (all possible connected networks) can contain up to 65,534 possible unique networks.

c. Device Object Identifier Property Number

Assign unique Device "Object_Identifier" property numbers or device instances for each device on the BACnet internetwork. Provide for future modification of the device instance number; either by device switches, network computer, or field interface. BACnet allows up to 4,194,302 possible unique devices per internetwork.

Instance numbers are to be obtained from Camp Lejeune Operations to ensure duplicates do not occur. Point of contact:

Bill Schrader
Public Works Division/EMCS
1005 Michael Road / Building 1005
MCB, Camp Lejeune, NC 28547
(910) 450-7846

d. Point Name. Each object on the Camp Lejeune EMCS has a unique point name, which is made up of the object or short name stored in the controller and the equipment identifier, which is stored in the supervisory building controller (SBC). The long point name combines this object name with the name stored in the SBC that describes the controller or location of the object. The point name follows the general convention:

Area.Building.location.Equipment.Object Name.

Example: Hadnot Point.HP512.Second Floor.AHU-3.ASTATIC-SP. See Attachments one through four for equipment names, object names, object groupings, and area names.

e. Object Name. The object name identifies the specific point. Only object names on the approved Camp Lejeune list shall be used. From the example above, the point name is: "ASTATIC-SP." See Attachment for the approved Camp Lejeune list.

f. Object description. The controller shall also store an alpha numeric description of the object name. The controller shall support a minimum of 30 printable characters. From the example above the object description is: "Actual Static Pressure Setpoint."

g. List of Attachments

Attachment 1 - Equipment Names
Attachment 2 - Object Names
Attachment 3 - Object Grouping
Attachment 4 - Area Names

3.1.2 Minimum BACnet Object Requirements

- a. Use of Standard BACnet Objects in accordance with existing Camp Lejeune standards

For the following points and parameters, use standard BACnet objects, where all relevant object properties can be read using BACnet's Read Property Service, and all relevant object properties can be modified using BACnet's Write Property Service:
all device physical inputs and outputs, all set points, all PID tuning parameters, all calculated pressures, flow rates, and consumption values, all alarms, all trends, all schedules, and all equipment and lighting circuit operating status.

- b. BACnet Object Description Property

The Object Description property shall support 30 minimum printable characters. For each object, complete the description property field using a brief, narrative, plain English description specific to the object and project application. For example: "HW Pump 1 Proof." Document compliance, length restrictions, and whether the description is writeable in the device PICS.

- c. Analog Input, Output, and Value Objects

Support and provide Description and/or Device_Type text strings matching signal type and engineering units shown on the points list.

- d. Binary Input, Output, and Value Objects

Support and provide Inactive_Text and Active_Text property descriptions matching conditions shown on the points list.

- e. Calendar Object

For devices with scheduling capability, provide at least one Calendar Object with ten-entry capacity. All operators may view Calendar Objects; authorized operators may make modifications from a workstation. Enable the writeable Date List property and support all calendar entry data types.

- f. Schedule Object

Use Schedule Objects for all building system scheduling. All operators may view schedule entries; authorized operators may modify schedules from a workstation.

- g. Loop Object or Equal

Use Loop Objects or equivalent BACnet objects in each applicable field device for PID control. Regardless of program method or object used, allow authorized operators to adjust the Update Interval, Setpoint, Proportional Constant, Integral Constant, and Derivative Constant using BACnet read/write services.

3.1.3 Minimum BACnet Service Requirements

- a. Command Priorities

Use commandable BACnet objects to control machinery and systems, providing the priority levels listed below. If the sequence of operation requires a different priority, obtain approval from the Contracting Officer.

<u>Priority Level</u>	<u>Application</u>
1	Manual-Life Safety
2	Automatic-Life Safety
3	(User Defined)
4	(User Defined)
5	Critical Equipment Control
6	Minimum On/Off
7	(User Defined)
8	Manual Operator
9	(User Defined)
10	(User Defined)
11	Load Shedding
12	(User Defined)
13	(User Defined)
14	(User Defined)
15	(User Defined)
16	(User Defined)

b. Alarming

- (1) Alarm Priorities - Coordinate alarm and event notification with the BAS Owner.
- (2) Notification Class - Enable writeable Priority, Ack Required, and Recipient List properties of Notification Class objects.
- (3) Event Notification Message Texts - Use condition specific narrative text and numerical references for alarm and event notification.

c. Updating Displayed Property Values

Allow workstations to display property values at discrete polled intervals, or based on receipt of confirmed and unconfirmed Change of Value notifications. The COV increment shall be adjustable by an operator using BACnet services, and polled intervals shall be adjustable at the operator workstation.

3.1.4 Local Area Networks

Obtain Government approval before connecting new networks with existing networks. Network numbers and device instance numbers shall remain unique when joining networks. Do not change existing network addressing without Government approval. See also "BACnet Naming and Addressing".

3.1.5 BACnet Routers, Bridges, and Switches

Provide the quantity of BACnet routers, bridges, and switches necessary for communications shown on the BACnet Communication Architecture schematic. Provide BACnet routers with BACnet Broadcast Message Device (BBMD) capability on each BACnet internetwork communicating across an MS/TP network. Configure each BACnet device and bridge, router, or switch to communicate on its network segment. All switches provided by the

contractor shall be approved by base telephone.

3.1.6 Wiring Criteria

- a. Run circuits operating at more than 100 volts in rigid or flexible conduit, metallic tubing, covered metal raceways, or armored cable.
- b. Do not run binary control circuit wiring in the same conduit as power wiring over 100 volts. Where analog signal wiring requires conduit, do not run in the same conduit with AC power circuits or control circuits operating at more than 100 volts.
- c. Provide circuit and wiring protection required by **NFPA 70**.
- d. Run all wiring located inside mechanical rooms in conduit.
- e. Do not bury aluminum-sheathed cable or aluminum conduit in concrete.
- f. Input/output identification: Permanently label each field-installed wire, cable, and pneumatic tube at each end with descriptive text using a commercial wire marking system that fully encircles the wire, cable, or tube. Locate the markers within 2 inches of each termination. Match the names and I/O number to the project's point list. Similarly label all power wiring serving control devices, including the word "power" in the label. Number each pneumatic tube every six feet. Label all terminal blocks with alpha/numeric labels. All wiring and the wiring methods shall be in accordance with **UL 508A**.
- g. For controller power, provide new 120 VAC circuits, with ground, if not defined on the electrical drawings. Provide each circuit with a dedicated breaker, and run wiring in its own conduit, separate from any control wiring. Connect the controller's ground wire to the electrical panel ground; conduit grounds are not acceptable.
- h. Surge Protection: Install surge protection according to manufacturer's instructions. Multiple controllers fed from a common power supply may be protected by a common surge protector, properly sized for the total connected devices.
- i. Grounding: Ground controllers and cabinets to a good earth ground as specified in Section **26 20 00 INTERIOR DISTRIBUTION SYSTEM**. Conduit grounding is not acceptable; all grounding shall have a direct path to the building earth ground. Ground sensor drain wire shields at the controller end.
- j. The Contractor shall be responsible for correcting all associated ground loop problems.
- k. Run wiring in panel enclosures in covered wire track.

3.1.7 Accessibility

Install all equipment so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install digital controllers, data ports, and concealed actuators, valves, dampers, and like equipment in locations freely accessible through access doors.

3.1.8 Digital Controllers

- a. Install as stand alone control devices (see definitions).
- b. Locate control cabinets at the locations shown on the drawings. If not shown on the drawings, install in the most accessible space, close to the controlled equipment.

3.1.9 Hand-Off-Auto Switches

Wire safety controls such as smoke detectors and freeze protection thermostats to protect the equipment during both hand and auto operation.

3.1.10 Temperature Sensors

Install temperature sensors in locations that are accessible and provide a good representation of sensed media. Installations in dead spaces are not acceptable. Calibrate sensors according to manufacturer's instructions. Do not use sensors designed for one application in a different application.

3.1.10.1 Room Temperature Sensors

Mount the sensors on interior walls to sense the average room temperature at the locations indicated. Avoid locations near heat sources such as copy machines or locations by supply air outlet drafts. Mount the center of the sensor .

3.1.10.2 Duct Temperature Sensors

- a. Probe Type: Provide a gasket between the sensor housing and the duct wall. Seal the duct penetration air tight. Seal the duct insulation penetration vapor tight.
- b. Averaging Type (and coil freeze protection thermostats): Weave the capillary tube sensing element in a serpentine fashion perpendicular to the flow, across the duct or air handler cross-section, using durable non-metal supports. Prevent contact between the capillary and the duct or air handler internals. Provide a duct access door at the sensor location. The access door shall be hinged on the side, factory insulated, have cam type locks, and be as large as the duct will permit, maximum 18 by 18 inches. For sensors inside air handlers, the sensors shall be fully accessible through the air handler's access doors without removing any of the air handler's internals.

3.1.10.3 Immersion Temperature Sensors

Provide thermowells for sensors measuring piping, tank, or pressure vessel temperatures. Locate wells to sense continuous flow conditions. Do not install wells using extension couplings. Where piping diameters are smaller than the length of the wells, provide wells in piping at elbows to sense flow across entire area of well. Wells shall not restrict flow area to less than 70 percent of pipe area. Increase piping size as required to avoid restriction. Provide thermal conductivity material within the well to fully coat the inserted sensor.

3.1.10.4 Outside Air Temperature Sensors

Provide outside air temperature sensors in weatherproof enclosures on the north side of the building, away from exhaust hoods and other areas that

may affect the reading. Provide a shield to shade the sensor from direct sunlight.

3.1.11 Energy Meters

Locate energy meters as indicated. Connect each meter output to the DDC system, to measure both instantaneous and accumulated energy usage.

3.1.12 Damper Actuators

Where possible, mount actuators outside the air stream in accessible areas.

3.1.13 Thermometers and Gages

Mount devices to allow reading while standing on the floor or ground, as applicable.

3.1.14 Pressure Sensors

Locate pressure sensors as indicated.

3.1.15 Component Identification Labeling

Using an electronic hand-held label maker with white tape and bold black block lettering, provide an identification label on the exterior of each new control panel, control device, actuator, and sensor. Also provide labels on the exterior of each new control actuator indicating the (full) open and (full) closed positions. For labels located outdoors, use exterior grade label tape, and provide labels on both the inside and outside of the panel door or device cover. Acceptable alternatives are white plastic labels with engraved bold black block lettering permanently attached to the control panel, control device, actuator, and sensor. Have the labels and wording approved by the BAS Owner prior to installation.

3.1.16 Network and Telephone Communication Lines

When telephone lines or network connections by the Government are required, provide the Contracting Office at least 60 days advance notice of need. Provide one inch conduit and Cat 5 cable from the point of connection of the building control system to the point of connection to the network (most likely in the telephone equipment room).

3.2 INTERFACE WITH EXISTING EMCS

Interface the new DDC system with Camp Lejeune's existing EMCS. Obtain Government approval before connecting new DDC system to the EMCS. Any device connected directly to the EMCS must be approved by the Designated Approving Authority by following procedures listed in the DIACAP instruction. The servers are located in Building 24: workstations are located at Buildings 1005, 1023, and 1202. Complete installation and programming includes scheduling, alarming, trending, and verification that relevant building points can be read at and written from the EMCS server via the MRAN.

3.3 TEST AND BALANCE SUPPORT

The controls contractor shall coordinate with and provide on-site support to the test and balance (TAB) personnel specified under Section 23 05 92 TESTING, ADJUSTING AND BALANCING. This support shall include:

- a. On-site operation and manipulation of control systems during the testing and balancing.
- b. Control setpoint adjustments for balancing all relevant mechanical systems, including VAV boxes.
- c. Tuning control loops with setpoints and adjustments determined by TAB personnel.

3.4 CONTROLS SYSTEM OPERATORS MANUALS

Provide five electronic and three printed copies of a Controls System Operators Manual. The manual shall be specific to the project, written to actual project conditions, and provide a complete and concise depiction of the installed work. Provide information in detail to clearly explain all operation requirements for the control system.

Provide with each manual: CDs of the project's control system drawings, control programs, data bases, graphics, and all items listed below. Include gateway back-up data and configuration tools where applicable. Provide CDs in jewel case with printed and dated project-specific labels on both the CD and the case. For text and drawings, use Adobe Acrobat or MS Office file types. When approved by the Government, AutoCAD and Visio files are allowed. Give files descriptive English names and organize in folders.

Provide printed manuals in sturdy 3-ring binders with a title sheet on the outside of each binder indicating the project title, project location, contract number, and the controls contractor name, address, and telephone number. Each binder shall include a table of contents and tabbed dividers, with all material neatly organized. Manuals shall include the following:

- a. A copy of the as-built control system (shop) drawings set, with all items specified under the paragraph "Submittals." Indicate all field changes and modifications.
- b. A copy of the project's mechanical design drawings, including any official modifications and revisions.
- c. A copy of the project's approved Product Data submittals provided under the paragraph "Submittals."
- d. A copy of the project's approved Performance Verification Testing Plan and Report. Test report shall be a 48 hour trend report verifying all temperature setpoints listed in the sequence of operation. The trend report should be printed from the EMCS server. All systems (AHU's, ERV's, CHWS, HWS) should be part of this section.
- e. A copy of the project's approved final TAB Report. (Added by the Mechanical Contractor (Division 23)).
- f. Printouts of all control system programs, including controller setup pages if used. Include plain-English narratives of application programs, flowcharts, and source code.
- g. Printouts of all physical input and output object properties, including tuning values, alarm limits, calibration factors, and set points.

- h. A table entitled "AC Power Table" listing the electrical power source for each controller. Include the building electrical panel number, panel location, and circuit breaker number.
- i. The DDC manufacturer's hardware and software manuals in both print and CD format with printed project-specific labels. Include installation and technical manuals for all controller hardware, operator manuals for all controllers, programming manuals for all controllers, operator manuals for all workstation software, installation and technical manuals for the workstation and notebook, and programming manuals for the workstation and notebook software.
- j. A list of qualified control system service organizations for the work provided under this contract. Include their addresses and telephone numbers.
- k. A written statement entitled "Technical Support" stating the control system manufacturer or authorized representative will provide toll-free telephone technical support at no additional cost to the Government for a minimum of two years from project acceptance, will be furnished by experienced service technicians, and will be available during normal weekday working hours. Include the toll-free technical support telephone number.
- l. A written statement entitled "Software Upgrades" stating software and firmware patches and updates will be provided upon request at no additional cost to the Government for a minimum of two years from contract acceptance. Include a table of all DDC system software and firmware provided under this contract, listing the original release dates, version numbers, part numbers, and serial numbers.

3.4.1 Storage Cabinets

In one project mechanical room, provide a wall-mounted metal storage cabinet with hinged doors. Provide cabinets large enough to hold the entire set of Controls System Operators Manuals, and the HVAC operation and maintenance manuals. Locate cabinets adjacent to DDC control panels where applicable. Have each cabinet's proposed installation site approved in advance by the Contracting Officer and the BAS Owner. Prominently label each cabinet with the wording "OPERATION AND MAINTENANCE MANUALS." Place one of the three hard copies of the Operators Manual in this cabinet. Prominently label each binder with the wording "MECHANICAL ROOM COPY - DO NOT REMOVE."

3.5 PERFORMANCE VERIFICATION TESTING (PVT)

3.5.1 General

The PVT shall demonstrate compliance of the control system work with the contract requirements. The PVT shall be performed by the Contractor and witnessed and approved by the Government. If the project is phased, provide separate testing for each phase. A Pre-PVT meeting to review the [Pre-PVT Checklist](#) is required to coordinate all aspects of the PVT and shall include the Contractor's QA representative, the Contractor's PVT administrator, the Contracting Officer's representative, and the EMCS Owner.

3.5.2 [Performance Verification Testing Plan](#)

Submit a detailed PVT Plan of the proposed testing for Government

approval. Develop the PVT Plan specifically for the control system in this contract. The PVT Plan shall be a clear list of test items arranged in a logical sequence. Include the intended test procedure, the expected response, and the pass/fail criteria for every component tested.

The plan shall clearly describe how each item is tested, indicate where assisting personnel are required (like the mechanical contractor), and include what procedures are used to simulate conditions. Include a separate column for each checked item and extra space for comments. Where sequences of operations are checked, insert each corresponding routine from the project's sequence of operation. For each test area, include signature and date lines for the Contractor's PVT administrator, the Contractor's QA representative, the Contracting Officer's representative, and the EMCS Owner to acknowledge successful completion.

3.5.3 PVT Sample Size

Test all central plant equipment, primary air handling unit controllers, and fan coil unit controllers unless otherwise directed. Use the DDC system to verify all VAV boxes are controlling as specified. The Government may require testing of like controllers beyond a statistical sample if sample controllers require retesting or do not have consistent results.

The Government may witness all testing, or random samples of PVT items. When only random samples are witnessed, the Government may choose which ones.

3.5.4 Pre-Performance Verification Testing Checklist

Submit the following as a list with items checked off once verified. Provide a detailed explanation for any items that are not completed or verified.

- a. Verify all required mechanical installation work is successfully completed, and all HVAC equipment is working correctly (or will be by the time the PVT is conducted).
- b. Verify HVAC motors operate below full-load amperage ratings.
- c. Verify all required control system components, wiring, and accessories are installed.
- d. Verify the installed control system architecture matches approved drawings.
- e. Verify all control circuits operate at the proper voltage and are free from grounds or faults.
- f. Verify all required surge protection is installed.
- g. Verify the A/C Power Table specified in "CONTROLS SYSTEM OPERATORS MANUALS" is accurate.
- h. Verify all DDC network communications with the EMCS function properly, including commanding set points, and load shedding.
- i. Verify air handling unit and VAV box coil performance by commanding all valves 100 percent open in both heating and cooling. Record the

entering and leaving air temperatures. Record the entering water temperature. This data shall be printed, stored, and saved for future reference.

- j. Verify each digital controller's programming is backed up.
- k. Verify all wiring, components, and panels are properly labeled.
- l. Verify all required points are programmed into devices.
- m. Verify all TAB work affecting controls is complete.
- n. Verify all valve and actuator zero and span adjustments are set properly.
- o. Verify all sensor readings are accurate and calibrated.
- p. Verify each control valve and actuator goes to normal position upon loss of power.
- q. Provide 48 hours of trend data to verify all systems are functioning as specified. Trend reports will verify control set point adjustment per the temperature re-set schedules (as required by sequence of operation).

Provide the following Trends:

- (1) Chilled water System: supply temperature (actual), return temperature (actual)
 - (2) Hot Water System: supply temperature (actual), return temperature (actual), supply temperature set point.
 - (3) Air Handling Unit: discharge air temperature set point, return air temperature set point, discharge air temperature (actual), return air temperature (actual), valve command position.
 - (4) VAV Box (10 percent of VAV's): room temperature set point, room temperature (actual), associated AHU discharge air temperature (actual).
 - (5) Energy Recovery Unit: Wheel status, wheel discharge air temperature (actual), wheel discharge air humidity (actual), unit discharge air temperature set point, unit discharge air temperature (actual).
 - (6) Fan Coil Unit: valve command position, room temperature set point, room temperature (actual).
- r. Verify each controller works properly in stand-alone mode.
 - s. Verify all safety controls and devices function properly, including freeze protection and interfaces with building fire alarm systems.
 - t. Verify all electrical interlocks work properly.
 - u. Verify all workstations, notebooks and maintenance personnel interface tools are delivered, all system and database software is installed.
 - v. Verify the as-built (shop) control drawings are completed.

- w. Verify all required alarms are identified at the EMCS server and proper notification is setup for each alarm condition.

3.5.5 Conducting Performance Verification Testing

- a. Provide trend report for each HVAC system that is part of the buildings DDC system. The trend report shall include a value for each set point listed in the sequence of operation.
- b. Identify any values that do not meet the sequence of operation requirements, make repairs (re-program) and run a new trend for the system. Document each deficiency and corrective action taken.
- c. If re-testing is required, follow the procedures for the initial PVT. The Government may require re-testing of any control system components affected by the original failed test.

3.5.6 Controller Capability and Labeling

Test the following for each controller:

- a. Memory: Demonstrate that programmed data, parameters, and trend/ alarm history collected during normal operation is not lost during power failure.
- b. Direct Connect Interface: Demonstrate the ability to connect directly to each type of digital controller with a portable electronic device like a notebook computer or PDA. Show that maintenance personnel interface tools perform as specified in the manufacturer's technical literature.
- c. Stand Alone Ability: Demonstrate controllers provide stable and reliable stand-alone operation using default values or other method for values normally read over the network. Building DDC system shall function to the project's specifications if connection to the EMCS server is lost.
- d. Wiring and AC Power: Demonstrate the ability to disconnect any controller safely from its power source using the AC Power Table. Demonstrate the ability to match wiring labels easily with the control drawings. Demonstrate the ability to locate a controller's location using the BACnet Communication Architecture Schematic and floor plans.
- e. Nameplates and Tags: Show the nameplates and tags are accurate and permanently attached to control panel doors, devices, sensors, and actuators.

3.5.7 EMCS Server Operation

- a. Show points lists agree with naming conventions.
- b. Show that points are accessible through the MRAN.

3.5.8 BACnet Communications and Interoperability at the EMCS Server

Demonstrate proper interoperability of data sharing, alarm and event management, trending, scheduling, and device and network management. If available or required in this specification, use a BACnet protocol analyzer

to assist with identifying devices, viewing network traffic, and verifying interoperability. These requirements must be met even if there is only one manufacturer of equipment installed. Provide 40 hours of assistance to the Government to facilitate interfacing the building control system with the existing EMCS. Testing includes the following:

- a. Reading of Any Property: Demonstrate the ability to read and display any used readable object property of any device on the network.
- b. Setpoint and Parameter Modifications: Show the ability to modify all setpoints and tuning parameters in the sequence of control or listed on project schedules.
- c. Peer-to-Peer Data Exchange: Show all BACnet devices are installed and configured to perform BACnet read/write services directly (without the need for operator or workstation intervention), to implement the project sequence of operation, and to share global data.
- d. Alarm and Event Management: Show that alarms/events are installed and prioritized according to the BAS Owner. Demonstrate time delays and other logic is set up to avoid nuisance tripping, e.g., no status alarms during unoccupied times or high supply air during cold morning start-up. Show that operators with sufficient privilege can read and write alarm/event parameters for all standard BACnet event types. Show that operators with sufficient privilege can change routing (BACnet notification classes) for each alarm/event including the destination, priority, day of week, time of day, and the type of transition involved (TO-OFF NORMAL, TO-NORMAL, etc.).
- e. Schedule Lists: Show that schedules are configured for start/stop, mode change, occupant overrides, and night setback as defined in the sequence of operations.
- f. Schedule Display and Modification: Show the ability to display any schedule with start and stop times for the calendar year. Show that all calendar entries and schedules are modifiable from any connected workstation or notebook by an operator with sufficient privilege.
- g. Modification of Trend Log Object Parameters: Show that an operator with sufficient privilege can change the logged data points, sampling rate, and trend duration.
- h. Device and Network Management: Show the following capabilities:
 - (1) Display of Device Status Information
 - (2) Display of BACnet Object Information
 - (3) Silencing Devices that are Transmitting Erroneous Data
 - (4) Time Synchronization
 - (5) Remote Device Reinitialization
 - (6) Backup and Restore Device Programming and Master Database(s)
 - (7) Configuration Management of Half-Routers, Routers and BBMDs
 - (8) Demonstrate load shed operations if commanded by the EMCS.

3.5.9 Execution of Sequence of Operation

Demonstrate that the HVAC system operates properly through the complete sequence of operation. Use read/write property services to globally read and modify parameters over the internetwork.

3.5.10 Control Loop Stability and Accuracy

For all control loops tested, give the Government trend graphs of the control variable over time, demonstrating that the control loop responds to a 20 percent sudden change of the control variable set point without excessive overshoot and undershoot. If the process does not allow a 20 percent set point change, use the largest change possible. Show that once the new set point is reached, it is stable and maintained. Control loop trend data shall be in real-time with the time between data points 30 seconds or less.

3.5.11 Performance Verification Testing Report

Upon successful completion of the PVT, submit a PVT Report to the Government and prior to the Government taking use and possession of the facility. Do not submit the report until all problems are corrected and successfully re-tested. The report shall include the annotated PVT Plan used during the PVT. Where problems were identified, explain each problem and the corrective action taken. Include a written certification that the installation and testing of the control system is complete and meets all of the contract's requirements.

3.6 TRAINING REQUIREMENTS

Provide a qualified instructor (or instructors) with two years minimum field experience with the installation and programming of similar BACnet DDC systems. Orient training to the specific systems installed. Coordinate training times with the Contracting Officer and BAS Owner after receiving approval of the training course documentation. Training shall take place at the job site and/or a nearby Government-furnished location. A training day shall occur during normal working hours, last no longer than 8 hours and include a one-hour break for lunch and two additional 15-minute breaks. The project's approved Controls System Operators Manual shall be used as the training text. The Contractor shall ensure the manuals are submitted, approved, and available to hand out to the trainees before the start of training.

3.6.1 Training Documentation

Submit training documentation for review 30 days minimum before training. Documentation shall include an agenda for each training day, objectives, a synopsis of each lesson, and the instructor's background and qualifications. The training documentation can be submitted at the same time as the project's Controls System Operators Manual.

3.6.2 Phase I Training - Fundamentals

The Phase I training session shall last one day and be conducted in a classroom environment with complete audio-visual aids provided by the contractor. Provide each trainee a printed 8.5 by 11 inch hard-copy of all visual aids used. Upon completion of the Phase I Training, each trainee should fully understand the project's DDC system fundamentals. The

training session shall include the following:

- a. Review of O&M Manual
 1. Network Drawing
 2. Equipment
 3. Flow Diagram
 4. Sequence of Operation
 5. Wiring
 6. Valve Schedule
 7. Damper Schedule
 8. Bill of Material
- b. Network
 1. Communication Equipment
 2. Configuration Setup of Program
 3. Backup Procedures
- c. Mechanical Equipment
 1. Flow Diagram
 2. Wiring & Terminations
 3. Hardware Interlocks
 4. Sequence of Operation
 5. Program Decisions and Illustrations of How Program Meets the Sequence of Operation
 6. Global Programming Affecting Each Piece of Equipment
- d. Building Data Base
 1. Alarm Management
 2. Trend Management
 3. Building Global Interlocks
 4. System Load Shedding & Demand Limiting
 5. Utility Data (Water, Steam, Solar)
- e. System Tools
 1. Network Equipment
 2. Supervisory Controllers
 3. Equipment Controllers
 4. Archives

3.6.3 Phase II Training - Operation

Provide Phase II Training shortly after completing Phase I Training. The Phase II training session shall last one day and be conducted at the DDC system workstation, at a notebook computer connected to the DDC system in the field, and at other site locations as necessary. Upon completion of the Phase II Training, each trainee should fully understand the project's DDC system operation. The training session shall include the following:

- a. A walk-through tour of the mechanical system and the installed DDC components (controllers, valves, dampers, surge protection, switches, thermostats, sensors, etc.)
- b. Adding and removing network devices

-- End of Section --

SECTION 23 11 25

FACILITY GAS PIPING

11/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN GAS ASSOCIATION (AGA)

AGA XR0603 (2006; 8th Ed) AGA Plastic Pipe Manual for Gas Service

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z21.1 (2010; Addenda A 2011) Household Cooking Gas Appliances

ANSI Z21.15/CSA 9.1 (2009) Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves

ANSI Z21.18/CSA 6.3 (2007; Addenda A 2010) Gas Appliance Pressure Regulators

ANSI Z21.21/CSA 6.5 (2005; Addenda A 2010) Automatic Valves for Gas Appliances

ANSI Z21.24/CSA 6.10 (2006; Addenda A 2009) Connectors for Gas Appliances

ANSI Z21.41/CSA 6.9 (2011) Quick-Disconnect Devices for Use with Gas Fuel Appliances

ANSI Z21.69/CSA 6.16 (2009) Connectors for Movable Gas Appliances

ANSI Z21.80/CSA 6.22 (2011) Line Pressure Regulators

AMERICAN PETROLEUM INSTITUTE (API)

API RP 2009 (2002; R 2007; 7th Ed) Safe Welding, Cutting, and Hot Work Practices in Refineries, Gasoline Plants, and Petrochemical Plants

API Spec 6D (2008; Errata 1 2008; Errata 2 2008; Errata 3 2009; Addendum 1 2009; Errata 4 2010; Errata 5 2010; Errata 6 2011; Addendum 2 2011) Specification for Pipeline Valves

API Std 598	(2009) Valve Inspecting and Testing
API Std 607	(2010) Testing of Valves: Fire Test for Soft-Seated Quarter-Turn Valves
ASME INTERNATIONAL (ASME)	
ASME A13.1	(2007) Scheme for the Identification of Piping Systems
ASME B1.20.1	(1983; R 2006) Pipe Threads, General Purpose (Inch)
ASME B16.11	(2011) Forged Fittings, Socket-Welding and Threaded
ASME B16.21	(2011) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.3	(2011) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.33	(2002; R 2007) Manually Operated Metallic Gas Valves for Use in Gas Piping Systems Up to 125 psi, Sizes NPS 1/2 - NPS 2
ASME B16.39	(2009) Standard for Malleable Iron Threaded Pipe Unions; Classes 150, 250, and 300
ASME B16.5	(2009) Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard
ASME B16.9	(2007) Standard for Factory-Made Wrought Steel Buttwelding Fittings
ASME B31.9	(2011) Building Services Piping
ASME B40.100	(2005; R 2010) Pressure Gauges and Gauge Attachments
ASME BPVC SEC IX	(2010) BPVC Section IX-Welding and Brazing Qualifications
ASME BPVC SEC VIII D1	(2010) BPVC Section VIII-Rules for Construction of Pressure Vessels Division 1
ASTM INTERNATIONAL (ASTM)	
ASTM 01.01	(2012) Steel - Piping, Tubing, Fittings
ASTM A513	(2008a) Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing
ASTM A53/A53M	(2010) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

CSA STANDARDS (CSA)

CGA 3.11-M88 (1988; R 2009) Lever Operated Pressure Lubricated Plug Type Gas Shut-Off Valves

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-25 (2008) Standard Marking System for Valves, Fittings, Flanges and Unions

MSS SP-58 (2009) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation

MSS SP-69 (2003) Pipe Hangers and Supports - Selection and Application (ANSI Approved American National Standard)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 54 (2012) National Fuel Gas Code

NFPA 70 (2011; Errata 2 2012) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL Gas&Oil Dir (2011) Flammable and Combustible Liquids and Gases Equipment Directory

1.2 SYSTEM DESCRIPTION

The gas piping system includes piping and appurtenances from point of connection with supply system, as indicated, to gas operated equipment within the facility. Submit operation and maintenance data in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA, in three separate packages. Section 23 03 00 BASIC MECHANICAL MATERIALS AND METHODS applies to this section, with additions and modifications specified herein.

1.2.1 Gas Facility System and Equipment Operation

Include shop drawings showing piping layout, locations of system valves, gas line markers; step-by-step procedures for system start up, operation and shutdown (index system components and equipment to the system drawings); isolation procedures including valve operation to shutdown or isolate each section of the system (index valves to the system maps and provide separate procedures for normal operation and emergency shutdown if required to be different). Submit Data package No. 4.

1.2.2 Gas Facility System Maintenance

Include maintenance procedures and frequency for system and equipment; identification of pipe materials and manufacturer by locations, pipe repair procedures, and jointing procedures at transitions to other piping material or material from a different manufacturer. Submit Data Package No.4.

1.2.3 Gas Facility Equipment Maintenance

Include identification of valves, shut-offs, disconnects, and other equipment by materials, manufacturer, vendor identification and location; maintenance procedures and recommended tool kits for valves and equipment; recommended repair methods (i.e., field repair, factory repair, or replacement) for each valve and piece of equipment; and preventive maintenance procedures, possible failure modes and troubleshooting guide. Submit Data Package No. 3.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Pipe and Fittings

Pipe Coating Materials
Pressure regulators
Valves

SD-06 Test Reports

Testing
Pressure Tests
Test With Gas

SD-07 Certificates

Welders procedures and qualifications

1.4 QUALITY ASSURANCE

Submit manufacturer's descriptive data and installation instructions for approval for compression-type mechanical joints used in joining dissimilar materials and for insulating joints. Mark all valves, flanges and fittings in accordance with MSS SP-25.

1.4.1 Welding Qualifications

- a. Weld piping in accordance with qualified procedures using performance qualified welders and welding operators in accordance with API RP 2009, ASME BPVC SEC IX, and ASME B31.9. Welding procedures qualified by others, and welders and welding operators qualified by another employer may be accepted as permitted by ASME B31.9. Notify the Contracting Officer at least 24 hours in advance of tests, and perform at the work site if practicable.
- b. Submit a certified copy of welders procedures and qualifications metal and PE in conformance with ASME B31.9 for each welder and welding operator. Submit the assigned number, letter, or symbol that will be used in identifying the work of each welder to the Contracting Officer.

1.4.2 Jointing Thermoplastic and Fiberglass Piping

Perform all jointing of piping using qualified joiners and qualified procedures in accordance with AGA XR0603. Furnish the Contracting Officer

with a copy of qualified procedures and list of and identification symbols of qualified joiners. Submit manufacturer's installation instructions and manufacturer's visual joint appearance chart, including all PE pipe and fittings.

1.5 DELIVERY, STORAGE, AND HANDLING

Handle, transport, and store plastic pipe and fittings carefully. Plug or cap pipe and fittings ends during transportation or storage to minimize dirt and moisture entry. Do not subject piping to abrasion or concentrated external loads. Discard PE pipe sections and fittings that have been damaged.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Provide materials and equipment which are the standard products of a manufacturer regularly engaged in the manufacture of the products and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Asbestos or products containing asbestos are not allowed. Submit catalog data and installation instructions for pipe, valves, all related system components, pipe coating materials and application procedures. Conform to and with requirements specified herein. Provide supply piping to appliances or equipment at least as large as the inlets thereof.

2.2 GAS PIPING SYSTEM AND FITTINGS

2.2.1 Steel Pipe, Joints, and Fittings

- a. Pipe: Black carbon steel in accordance with ASTM A53/A53M, Schedule 40, threaded ends for sizes 2 inches and smaller; otherwise, plain end beveled for butt welding.
- b. Threaded Fittings: ASME B16.3, black malleable iron.
- c. Socket-Welding Fittings: ASME B16.11, forged steel.
- d. Butt-Welding Fittings: ASME B16.9, with backing rings of compatible material.
- e. Unions: ASME B16.39, black malleable iron.
- f. Flanges and Flanged Fittings: ASME B16.5 steel flanges or convoluted steel flanges conforming to ASME BPVC SEC VIII D1, with flange faces having integral grooves of rectangular cross sections which afford containment for self-energizing gasket material.

2.2.2 Steel Tubing, Joints and Fittings

Provide steel tubing conforming to ASTM 01.01, and ASTM A513, with tubing joints made up with gas tubing fittings recommended by the tubing manufacturer.

2.2.3 Sealants for Steel Pipe Threaded Joints

Provide joint sealing compound as listed in UL Gas&Oil Dir, Class 20 or less. For taping, use tetrafluoroethylene tape conforming to UL Gas&Oil Dir.

2.2.4 Warning and Identification

Provide pipe flow markings, warning and identification tape, and metal tags as required.

2.2.5 Flange Gaskets

Provide gaskets of nonasbestos compressed material in accordance with ASME B16.21, 1/16 inch thickness, full face or self-centering flat ring type, containing aramid fibers bonded with styrene butadiene rubber (SBR) or nitrile butadiene rubber (NBR) suitable for a maximum 600 degree F service, to be used for hydrocarbon service.

2.2.6 Pipe Threads

Provide pipe threads conforming to ASME B1.20.1.

2.2.7 Escutcheons

Provide chromium-plated steel or chromium-plated brass escutcheons, either one piece or split pattern, held in place by internal spring tension or set screw.

2.2.8 Gas Transition Fittings

- a. Provide lever operated pressure lubricated plug type gas shut-off valve conforming to CGA 3.11-M88.

2.2.9 Insulating Pipe Joints

2.2.9.1 Insulating Joint Material

Provide insulating joint material between flanged or threaded metallic pipe systems where shown to control galvanic or electrical action.

2.2.9.2 Threaded Pipe Joints

Provide threaded pipe joints of steel body nut type dielectric unions with insulating gaskets.

2.2.9.3 Flanged Pipe Joints

Provide joints for flanged pipe consisting of full face sandwich-type flange insulating gasket of the dielectric type, insulating sleeves for flange bolts, and insulating washers for flange nuts.

2.2.10 Flexible Connectors

- a. Provide flexible connectors for connecting gas utilization equipment to building gas piping conforming to ANSI Z21.24/CSA 6.10 or ANSI Z21.41/CSA 6.9 for quick disconnect devices, and flexible connectors for movable food service equipment conforming to ANSI Z21.69/CSA 6.16.
- b. Do not install the flexible connector through the appliance cabinet face. Provide rigid metallic pipe and fittings to extend the final connection beyond the cabinet, except when appliance is provided with an external connection point.

2.3 VALVES

Provide shutoff or service isolation valves conforming to the following:

2.3.1 Valves 2 Inches and Smaller

Provide valves 2 inches and smaller conforming to ASME B16.33 of materials and manufacture compatible with system materials used. Provide manually operated household cooking gas appliance valves conforming to ANSI Z21.1 and ANSI Z21.15/CSA 9.1.

2.3.2 Valves 2-1/2 Inches and Larger

Provide valves 2-1/2 inches and larger of carbon steel conforming to API Spec 6D, Class 150.

2.4 PIPE HANGERS AND SUPPORTS

Provide pipe hangers and supports conforming to MSS SP-58 and MSS SP-69.

2.5 REGULATORS AND SHUTOFF VALVES

Provide pressure gauges and attachments conforming to ASME B40.100. Provide regulators conforming to ANSI Z21.18/CSA 6.3 for appliances and ANSI Z21.80/CSA 6.22 for line pressure regulators. Provide shutoff valves conforming to ANSI Z21.15/CSA 9.1 for manually controlled gas shutoff valves and ANSI Z21.21/CSA 6.5 for automatic shutoff valves for gas appliances.

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy or areas of conflict before performing the work.

3.2 INSTALLATION

Install the gas system in conformance with the manufacturer's recommendations and applicable provisions of , AGA XR0603, and as indicated. Perform all pipe cutting without damage to the pipe, with an approved type of mechanical cutter, unless otherwise authorized. Use wheel cutters where practicable. On steel pipe 6 inches and larger, an approved gas cutting and beveling machine may be used. Cut thermoplastic and fiberglass pipe in accordance with AGA XR0603.

3.2.1 Metallic Piping Installation

Bury underground piping a minimum of 18 inches below grade. Make changes in direction of piping with fittings only; mitering or notching pipe to form elbows and tees or other similar type construction is not permitted. Branch connection may be made with either tees or forged branch outlet fittings. Provide branch outlet fittings which are forged, flared for improvement of flow where attached to the run, and reinforced against external strains. Do not use aluminum alloy pipe in exterior locations or underground.

3.2.2 Metallic Tubing Installation

Install metallic tubing using gas tubing fittings approved by the tubing manufacturer. Make branch connections with tees. Prepare all tubing ends with tools designed for that purpose. Do not use aluminum alloy tubing in exterior locations or underground.

3.2.3 Thermoplastic and Fiberglass Piping, Tubing, and Fittings

Installation of thermoplastic and fiberglass piping, tubing, and fittings is permitted only outside and underground. Bury piping a minimum of 18 inches below grade. Install the piping to avoid excessive stresses due to thermal contraction, and use only where indicated.

3.2.4 Connections Between Metallic and Plastic Piping

Connections between metallic and plastic piping are only allowed outside, underground, and with approved transition fittings.

3.2.5 Concealed Piping in Buildings

Do not use combinations of fittings (unions, tubing fittings, running threads, right- and left-hand couplings, bushings, and swing joints) to conceal piping within buildings.

3.2.5.1 Piping in Partitions

Locate concealed piping in hollow, rather than solid, partitions. Protect tubing passing through walls or partitions against physical damage both during and after construction, and provide appropriate safety markings and labels..

3.2.6 Aboveground Piping

Run aboveground piping as straight as practicable along the alignment and elevation indicated, with a minimum of joints, and separately supported from other piping system and equipment. Install exposed horizontal piping no farther than 6 inches from nearest parallel wall and at an elevation which prevents standing, sitting, or placement of objects on the piping.

3.2.7 Final Gas Connections

Unless otherwise specified, make final connections with rigid metallic pipe and fittings. Provide accessible gas shutoff valve and coupling for each gas equipment item.

3.3 PIPE JOINTS

Design and install pipe joints to effectively sustain the longitudinal pull-out forces caused by contraction of the piping or superimposed loads.

3.3.1 Threaded Metallic Joints

Provide threaded joints in metallic pipe with tapered threads evenly cut and made with UL approved graphite joint sealing compound for gas service or tetrafluoroethylene tape applied to the male threads only. Threaded joints up to 1-1/2 inches in diameter may be made with approved tetrafluoroethylene tape. Threaded joints up to 2 inches in diameter may be made with approved joint sealing compound. After cutting and before

threading, ream pipe and remove all burrs. Caulking of threaded joints to stop or prevent leaks is not permitted.

3.3.2 Welded Metallic Joints

Conform beveling, alignment, heat treatment, and inspection of welds to [NFPA 54](#). Remove weld defects and make repairs to the weld, or remove the weld joints entirely and reweld. After filler metal has been removed from its original package, protect and store so that its characteristics or welding properties are not affected adversely. Do not use electrodes that have been wetted or have lost any of their coating.

3.3.3 Flared Metallic Tubing Joints

Make flared joints in metallic tubing with special tools recommended by the tubing manufacturer. Use flared joints only in systems constructed from nonferrous pipe and tubing, when experience or tests have demonstrated that the joint is suitable for the conditions, and when adequate provisions are made in the design to prevent separation of the joints. Do not use metallic ball sleeve compression-type tubing fittings for tubing joints.

3.3.4 Solder or Brazed Joints

Make all joints in metallic tubing and fittings with materials and procedures recommended by the tubing supplier. Braze joints with material having a melting point above [1000 degrees F](#), containing no phosphorous.

3.3.5 Press Connections

Make press connections in accordance with manufacturer's installation instructions using tools approved by the manufacturer. Fully insert the tubing into the fitting and then mark at the shoulder of the fitting. Check the fitting alignment against the mark on the tubing to assure the tubing is fully inserted before the joint is pressed.

3.4 PIPE SLEEVES

Provide pipes passing through concrete or masonry walls or concrete floors or roofs with pipe sleeves fitted into place at the time of construction. Do not install sleeves in structural members except where indicated or approved. Make all rectangular and square openings as detailed. Extend each sleeve through its respective wall, floor or roof, and cut flush with each surface, except in mechanical room floors not located on grade where clamping flanges or riser pipe clamps are used. Extend sleeves in mechanical room floors above grade at least [4 inches](#) above finish floor. Unless otherwise indicated, use sleeves large enough to provide a minimum clearance of [1/4 inch](#) all around the pipe. Provide steel pipe for sleeves in bearing walls, waterproofing membrane floors, and wet areas. Provide sleeves in nonbearing walls, floors, or ceilings of steel pipe, galvanized sheet metal with lock-type longitudinal seam, or moisture-resistant fiber or plastic.

3.5 PIPES PENETRATING WATERPROOFING MEMBRANES

Install pipes penetrating waterproofing membranes as specified in Section [22 00 00 PLUMBING, GENERAL PURPOSE](#).

3.6 ESCUTCHEONS

Provide escutcheons for all finished surfaces where gas piping passes through floors, walls, or ceilings except in boiler, utility, or equipment rooms.

3.7 SPECIAL REQUIREMENTS

Provide drips, grading of the lines, freeze protection, and branch outlet locations as shown and conforming to the requirements of .

3.8 BUILDING STRUCTURE

Do not weaken any building structure by the installation of any gas piping. Do not cut or notch beams, joists or columns. Attach piping supports to metal decking. Do not attach supports to the underside of concrete filled floors or concrete roof decks unless approved by the Contracting Officer.

3.9 PIPING SYSTEM SUPPORTS

Support gas piping systems in buildings with pipe hooks, metal pipe straps, bands or hangers suitable for the size of piping or tubing. Do not support any gas piping system by other piping. Conform spacing of supports in gas piping and tubing installations to the requirements of . Conform the selection and application of supports in gas piping and tubing installations to the requirements of [MSS SP-69](#). In the support of multiple pipe runs on a common base member, use a clip or clamp where each pipe crosses the base support member. Spacing of the base support members is not to exceed the hanger and support spacing required for any of the individual pipes in the multiple pipe run. Rigidly connect the clips or clamps to the common base member. Provide a clearance of [1/8 inch](#) between the pipe and clip or clamp for all piping which may be subjected to thermal expansion.

3.10 ELECTRICAL BONDING AND GROUNDING

Provide a gas piping system within the building which is electrically continuous and bonded to a grounding electrode as required by [NFPA 70](#).

3.11 SHUTOFF VALVE

Install the main gas shutoff valve controlling the gas piping system to be easily accessible for operation, as indicated, protected from physical damage, and marked with a metal tag to clearly identify the piping system controlled.

3.12 TESTING

Submit test reports in booklet form tabulating test and measurements performed; dated after award of this contract, and stating the Contractor's name and address, the project name and location, and a list of the specific requirements which are being certified. Test entire gas piping system to ensure that it is gastight prior to putting into service. Prior to testing, blow out the system, clean, and clear all foreign material. Test each joint with an approved gas detector, soap and water, or an equivalent nonflammable solution. Inspect and test each valve in conformance with [API Std 598](#) and [API Std 607](#). Complete testing before any work is covered, enclosed, or concealed, and perform with due regard for the safety of

employees and the public during the test. Install bulkheads, anchorage and bracing suitably designed to resist test pressures if necessary, and as directed and or approved by the Contracting Officer. Do not use oxygen as a testing medium.

3.12.1 Pressure Tests

Submit test reports in booklet form tabulating test and measurements performed; dated after award of this contract, and stating the Contractor's name and address, the project name and location, and a list of the specific requirements which are being certified. Before appliances are connected, test by filling the piping systems with air or an inert gas to withstand a minimum pressure without showing any drop in pressure. Do not use Oxygen for test. Measure pressure with a mercury manometer, slope gauge, or an equivalent device calibrated to be read in increments of not greater than 0.1 pound. Isolate the source of pressure before the pressure tests are made.

3.12.2 Test With Gas

Before turning on gas under pressure into any piping, close all openings from which gas can escape. Immediately after turning on the gas, check the piping system for leakage by using a laboratory-certified gas meter, an appliance orifice, a manometer, or equivalent device. Conform all testing to the requirements of . If leakage is recorded, shut off the gas supply, repair the leak , and repeat the tests until all leaks have been stopped.

3.12.3 Purging

After testing is completed, and before connecting any appliances, fully purge all gas piping. Do not purge piping into the combustion chamber of an appliance. Do not purge the open end of piping systems into confined spaces or areas where there are ignition sources unless the safety precautions recommended in are followed.

3.12.4 Labor, Materials and Equipment

Furnish all labor, materials and equipment necessary for conducting the testing and purging.

3.13 PIPE COLOR CODE MARKING

Provide color code marking of piping as specified in Section 09 90 00 PAINTS AND COATINGS, conforming to ASME A13.1.

-- End of Section --

SECTION 23 25 00

CHEMICAL TREATMENT OF WATER FOR MECHANICAL SYSTEMS

11/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASME INTERNATIONAL (ASME)

ASME B40.100 (2005; R 2010) Pressure Gauges and Gauge Attachments

ASTM INTERNATIONAL (ASTM)

ASTM D 2688 (2011) Corrosivity of Water in the Absence of Heat Transfer (Weight Loss Methods)

1.2 SYSTEM DESCRIPTION

This section covers the provisions and installation procedures necessary for a complete and totally functional water system(s) chemical treatment. Provide and install the system with all necessary System Components, Accessories, Piping Components, and Supplemental Components/Services.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

- Field Instructions
- Tests;
- Training Course;

1.4 QUALITY ASSURANCE

1.4.1 Safety

Exposed moving parts, parts that produce high operating temperature, parts which may be electrically energized, and parts that may be a hazard to operating personnel shall be insulated, fully enclosed, guarded, or fitted with other types of safety devices. Install safety devices so that proper operation of equipment is not impaired.

1.4.2 Drawings

Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Carefully investigate the plumbing, fire protection, electrical, structural and

finish conditions that would affect the work to be performed and arrange such work accordingly, furnishing required offsets, fittings, and accessories to meet such conditions.

1.5 DELIVERY, STORAGE, AND HANDLING

Protect all equipment delivered and placed in storage from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

a. Provide materials and equipment which are standard products of a manufacturer regularly engaged in the manufacturing of such products, that are of a similar material, design and workmanship and that have been in satisfactory commercial or industrial use for two years prior to bid opening.

b. The two-year use shall include applications of equipment and materials under similar circumstances and of similar size. The two years experience shall have been satisfactorily completed by a product which has been sold or is offered for sale on the commercial market through advertisements, manufacturer's catalogs, or brochures. Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation, for not less than 6000 hours exclusive of the manufacturer's factory tests, can be shown.

c. All products shall be supported by a service organization. Submit a certified list of qualified permanent service organizations for support of the equipment, including their addresses and qualifications. These service organizations shall be reasonably convenient to the equipment installation and shall be able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

d. The selected service organization shall provide the chemicals required, the concentrations required, and the water treatment equipment sizes and flow rates required. The company shall provide all chemicals required for the chilled water system and fill the systems with chemicals to the levels specified. The chemical shall meet the requirements of this specification as well as the recommendations from the manufacturers of the condenser and cooling tower. Acid treatment chemicals shall not be used.

2.2 GAUGES

Gauges shall conform to ASME B40.100, Class 1, 2, or 3, Style X, Type I or III as required, 4-1/2 inches in diameter with phenolic or metal case.

2.3 CHILLED WATER SYSTEM

A 5 gallon shot feeder shall be provided on the chilled water piping as indicated. The feeder shall be furnished with an air vent, gauge glass, funnel, valves, fittings, and piping.

2.3.1 Chilled Water Treatment

Treat chilled water with either a borax/nitrite type treatment or a molybdate type treatment. Both types of treatment can be used with glycol. Borax/nitrite treatment shall be maintained at the limits of 600 to 1000 ppm nitrite, 40 - 50 ppm copper corrosion inhibitor (TT or MBT), and pH of 8.5 to 9.5. Molybdate treatment shall be maintained at the limits of 100 to 125 ppm molybdate, 40 - 50 ppm copper corrosion inhibitor (TT or MBT), and pH of 8.0 to 9.0.

2.3.2 Chilled Water Test Kits

One test kit of each type required to determine the water quality as outlined within the operation and maintenance manuals shall be provided (e.g. pH and nitrite or molybdate).

2.4 LOW AND MEDIUM TEMPERATURE HOT WATER SYSTEM

Low and medium temperature hot water systems are defined as those operating below 350 degrees F, (250 degrees F for Low Temperature).

2.4.1 Chemical Feeder

A 5 gallon shot feeder shall be provided on the hot water piping as indicated. Size and capacity of feeder shall be based on local requirements and water analysis. The feeder shall be furnished with an air vent, gauge glass, funnel, valves, fittings, and piping.

2.4.2 Low and Medium Temperature Hot Water Treatment

Hot water shall be treated with either a borax/nitrite type treatment or a molybdate type treatment. Both types of treatment can be used with glycol. Borax/nitrite treatment shall be maintained at the limits of 600 to 1000 ppm nitrite, 40 - 50 ppm copper corrosion inhibitor (TT or MBT) and pH of 8.5 to 9.5. Molybdate treatment shall be maintained at the limits of 100 to 125 ppm molybdate, 40 - 50 ppm copper corrosion inhibitor (TT or MBT) and pH of 8.0 to 9.0.

2.4.3 Test Kit Requirements

One test kit of each type required to determine the water quality as outlined within the operation and maintenance manuals shall be provided (e.g. pH and nitrite or molybdate).

2.5 Test Kit

One test kit of each type required to determine the water quality as outlined within the operation and maintenance manuals shall be provided (e.g. pH, hardness and sulfite).

2.6 SUPPLEMENTAL COMPONENTS/SERVICES

Drain and makeup water piping shall comply with the requirements of Section 22 00 00 PLUMBING, GENERAL PURPOSE. Drains which connect to sanitary sewer systems shall be connected by means of an indirect waste.

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy, before performing any work.

3.2 INSTALLATION

Provide all chemicals, equipment and labor necessary to bring all system waters in conformance with the specified requirements. Perform all work in accordance with the manufacturer's published diagrams, recommendations, and equipment warranty requirements.

3.3 PIPING

Connections between dissimilar metals shall be made with a dielectric union.

3.4 TRAINING COURSE

Submit a schedule, at least 2 weeks prior to the date of the proposed training course, that identifies the date, time, and location for the training. Conduct a training course for the operating staff as designated by the Contracting Officer. The training period shall consist of a total 8 hours of normal working time and start after the system is functionally completed but prior to final acceptance tests. Submit field instructions, at least 2 weeks prior to construction completion, including equipment layout, wiring and control diagrams, piping, valves and control sequences, and typed condensed operation instructions. The condensed operation instructions shall include preventative maintenance procedures, methods of checking the system for normal and safe operation, and procedures for safely starting and stopping the system. The posted instructions shall be framed under glass or laminated plastic and posted where indicated by the Contracting Officer. The field instructions shall cover all of the items contained in the Operation and Maintenance Manuals as well as demonstrations of routine maintenance operations.

3.5 TESTS

If the waters of the mechanical systems are not in conformance with the specified requirements or in accordance with manufacturer's recommendations, the water treatment company shall take corrective action to enable compliance. Daily operational tests shall be performed in the directed frequencies to maintain required control to prevent corrosion, scaling and damage to equipment during operation. Submit test schedules, at least 2 weeks prior to the start of related testing, for the condenser/chilled/boiler/condensate/feedwater water quality tests. The schedules shall identify the date, time, frequency and collection location for each test.

3.5.1 Chilled Water Testing (monthly)

Once a month, the following tests will be performed on chilled water.

PH	_____	
Nitrite or Molybdate	_____	ppm (mg/L)
Conductivity	_____	micromho/cm

3.5.2 Hot Water Quality Testing

3.5.2.1 Low and Medium Temperature Systems (monthly)

Monthly testing shall be completed and recorded for the following parameters.

PH _____
Nitrite or Molybdate _____ ppm (mg/L)

3.5.3 Quality Assurance Testing

Conduct QA testing periodically by an independent water treatment lab/consultant to verify to managers that the mechanical and water treatment systems are being maintained properly. Provide the QA evaluation reports to the government COR.

3.5.3.1 Chilled Water Quality Assurance Testing (quarterly)

Quarterly, the following tests shall be performed on chilled water.

PH _____
Nitrite or Molybdate _____ ppm (mg/L)
Conductivity _____ micromho/cm
Iron (total, as Fe(2)O(3)) _____ ppm (mg/L)
Written evaluation summary

3.5.3.2 Hot Water Quality Assurance Testing

a. Quarterly testing of Low and Medium Temperature Systems shall be completed and recorded for the following parameters.

PH _____
Nitrite or Molybdate _____ ppm (mg/L)
Iron (total, as Fe(2)O(3)) _____ ppm (mg/L)
Written evaluation summary

3.5.4 Corrosion Testers

Install corrosion coupon and rack systems to verify corrosion control in the systems. Testers or coupons are installed in flowing system water through a sidestream or rack system. Both mild steel and copper metal samples are to be tested in the corrosion testers in accordance with ASTM D 2688. Samples are to be replaced and analyzed every 3 months. Rates of corrosion less than 3 mpy for steel and 0.2 mpy for copper are acceptable. Corrosion testers shall be installed on the piping systems of the following systems.

Hot water loop

-- End of Section --

SECTION 23 52 00

HEATING BOILERS

04/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C606 (2011) Grooved and Shouldered Joints

AMERICAN WELDING SOCIETY (AWS)

AWS A5.8/A5.8M (2011) Specification for Filler Metals for Brazing and Braze Welding

AWS B2.2/B2.2M (2010) Specification for Brazing Procedure and Performance Qualification

ASME INTERNATIONAL (ASME)

ASME B1.20.1 (1983; R 2006) Pipe Threads, General Purpose (Inch)

ASME B16.11 (2011) Forged Fittings, Socket-Welding and Threaded

ASME B16.15 (2011) Cast Bronze Alloy Threaded Fittings Classes 125 and 250

ASME B16.18 (2012) Cast Copper Alloy Solder Joint Pressure Fittings

ASME B16.22 (2001; R 2010) Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

ASME B16.26 (2011) Standard for Cast Copper Alloy Fittings for Flared Copper Tubes

ASME B16.3 (2011) Malleable Iron Threaded Fittings, Classes 150 and 300

ASME B16.34 (2009; Supp 2010) Valves - Flanged, Threaded and Welding End

ASME B16.39 (2009) Standard for Malleable Iron Threaded Pipe Unions; Classes 150, 250, and 300

ASME B16.4	(2011) Standard for Gray Iron Threaded Fittings; Classes 125 and 250
ASME B16.5	(2009) Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard
ASME B16.9	(2007) Standard for Factory-Made Wrought Steel Buttwelding Fittings
ASME B31.1	(2010) Power Piping
ASME B31.5	(2010) Refrigeration Piping and Heat Transfer Components
ASME B40.100	(2005; R 2010) Pressure Gauges and Gauge Attachments
ASME BPVC SEC IV	(2010) BPVC Section IV-Rules for Construction of Heating Boilers
ASME BPVC SEC VIII D1	(2010) BPVC Section VIII-Rules for Construction of Pressure Vessels Division 1

ASTM INTERNATIONAL (ASTM)

ASTM A105/A105M	(2011a) Standard Specification for Carbon Steel Forgings for Piping Applications
ASTM A167	(2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A183	(2003; R 2009) Standard Specification for Carbon Steel Track Bolts and Nuts
ASTM A193/A193M	(2011a) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications
ASTM A234/A234M	(2011a) Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
ASTM A515/A515M	(2010) Standard Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service
ASTM A516/A516M	(2010) Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service
ASTM A53/A53M	(2010) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

- ASTM A536 (1984; R 2009) Standard Specification for Ductile Iron Castings
 - ASTM B32 (2008) Standard Specification for Solder Metal
 - ASTM B62 (2009) Standard Specification for Composition Bronze or Ounce Metal Castings
 - ASTM B75 (2002; R 2010) Standard Specification for Seamless Copper Tube
 - ASTM B813 (2010) Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube
 - ASTM B828 (2002; R 2010) Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings
 - ASTM B88 (2009) Standard Specification for Seamless Copper Water Tube
 - ASTM B88M (2005; R 2011) Standard Specification for Seamless Copper Water Tube (Metric)
 - ASTM D1784 (2011) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
 - ASTM D2000 (2012) Standard Classification System for Rubber Products in Automotive Applications
- COPPER DEVELOPMENT ASSOCIATION (CDA)
- CDA A4015 (1994; R 1995) Copper Tube Handbook
- EXPANSION JOINT MANUFACTURERS ASSOCIATION (EJMA)
- EJMA Stds (2008) EJMA Standards
- HYDRONICS INSTITUTE DIVISION OF GAMA (HYI)
- HYI-005 (2004) I=B=R Ratings for Boilers, Baseboard Radiation and Finned Tube (Commercial)
- MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)
- MSS SP-110 (2010) Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends
 - MSS SP-25 (2008) Standard Marking System for Valves, Fittings, Flanges and Unions
 - MSS SP-58 (2009) Pipe Hangers and Supports -

Materials, Design and Manufacture,
Selection, Application, and Installation

- MSS SP-69 (2003) Pipe Hangers and Supports - Selection and Application (ANSI Approved American National Standard)
- MSS SP-70 (2011) Gray Iron Gate Valves, Flanged and Threaded Ends
- MSS SP-71 (2011) Gray Iron Swing Check Valves, Flanged and Threaded Ends
- MSS SP-72 (2010) Ball Valves with Flanged or Butt-Welding Ends for General Service
- MSS SP-78 (2011) Cast Iron Plug Valves, Flanged and Threaded Ends
- MSS SP-80 (2008) Bronze Gate, Globe, Angle and Check Valves
- MSS SP-85 (2011) Gray Iron Globe & Angle Valves Flanged and Threaded Ends

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- NEMA MG 1 (2011) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 54 (2012) National Fuel Gas Code

UNDERWRITERS LABORATORIES (UL)

- UL 1738 (2010; Reprint May 2011) Venting Systems for Gas-Burning Appliances, Categories II, III and IV
- UL Gas&Oil Dir (2011) Flammable and Combustible Liquids and Gases Equipment Directory

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Materials and Equipment

Boiler Water Treatment

SD-10 Operation and Maintenance Data

Operation and Maintenance Instructions

1.3 DELIVERY, STORAGE, AND HANDLING

Protect equipment delivered and placed in storage from the weather, humidity and temperature variations, dirt and dust, and other contaminants.

1.4 EXTRA MATERIALS

Submit spare parts data for each different item of material and equipment specified, after approval of the detail drawings and no later than 2 months prior to the date of beneficial occupancy. Submit Detail Drawings consisting of equipment layout including installation details and electrical connection diagrams; combustion and safety control diagrams; ductwork layout showing the location of supports and hangers, typical hanger details, gauge reinforcement, reinforcement spacing rigidity classification, and static pressure and seal classifications; and piping layout showing the location of guides and anchors, the load imposed on each support or anchor (not required for radiant floor tubing), and typical support details. Include on the drawings any information required to demonstrate that the system has been coordinated and will properly function as a unit and to show equipment relationship to other parts of the work, including clearances required for operation and maintenance. Include in the data a complete list of parts and supplies, with current unit prices and source of supply, and a list of the parts recommended by the manufacturer to be replaced after 1 and 3 years of service.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Standard Products

Provide **materials and equipment** which are the standard products of a manufacturer regularly engaged in the manufacture of the products and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site. Submit manufacturer's catalog data included with the detail drawings for the following:

a. Data showing model, size, options, etc., that are intended for consideration. Data submitted shall be adequate to demonstrate compliance with contract requirements. Data shall include manufacturer's written installation instructions and manufacturer's recommendations for operation and maintenance clearances for the following:

- 1) Boilers

2.1.2 Nameplates

Secure a plate to each major component of equipment containing the manufacturer's name, address, type or style, model or serial number, and catalog number. Also, display an ENERGY STAR label as applicable. Each pressure vessel shall have an approved ASME stamp.

2.2 BOILERS

Each boiler shall have the output capacity in **British thermal units per hour (Btuh)** as indicated when fired with the specified fuels. The boiler

shall be furnished complete with the gas burning equipment, boiler fittings and trim, automatic controls, forced draft fan, electrical wiring, insulation, piping connections, and protective jacket. The boiler shall be completely assembled and tested at the manufacturer's plant. Boiler auxiliaries including fans, motors, drives, and similar equipment shall be provided with at least 10 percent excess capacity to allow for field variations in settings and to compensate for any unforeseen increases in pressure losses in appurtenant piping and ductwork. However, the boiler safety devices shall not be sized for a 10 percent excess capacity. The boiler and its accessories shall be designed and installed to permit ready accessibility for operation, maintenance, and service. Boilers shall be designed, constructed, and equipped in accordance with ASME BPVC SEC IV. Each boiler shall be of the condensing type and designed for water service as specified herein. The boiler capacity shall be based on the ratings shown in HYI-005 or as certified by the American Boiler Manufacturers Association, or American Gas Association.

2.2.1 Condensing Boiler

Each boiler shall be a self-contained packaged type, complete with accessories, mounted on a structural steel base or a steel base which is integral to the boiler shell. Each boiler shall conform to the commercial design used by the manufacturer and shall permit free thermal expansion without placing undue stress on any part of the boiler. Each boiler which experiences the formation of condensate within the flue gas shall be specifically designed for condensing application. Each boiler shall withstand the corrosive effects of condensate for each part which may be in contact with the condensate at all possible operating conditions. Each boiler shall be provided with a separate air intake, exhaust, and condensate drain. Each boiler shall be designed to withstand the water temperature differentials anticipated at the required operating conditions without experiencing any damage due to thermal shock.

2.2.2 Hot Water Heating Boilers

The hot water heating boiler shall be capable of operating at the specified maximum continuous capacity without damage or deterioration to the boiler, its setting, firing equipment, or auxiliaries. The rated capacity shall be the capacity at which the boiler will operate continuously while maintaining at least the specified minimum efficiency.

2.3 PUMPS

2.3.1 Hot Water and Boiler Circulating Pumps

Circulating pumps for hot water shall be electrically driven single-stage centrifugal type and have a capacity not less than indicated. Boiler circulating pumps shall be supported on a concrete foundation with a cast iron or structural steel base or by the piping on which installed and shall be closed-coupled shaft or flexible-coupled shaft. Hot water circulating pumps shall be supported on a concrete foundation with a cast iron or structural steel base or by the piping on which installed and shall have a closed-coupled shaft or flexible-coupled shaft. The pump shaft shall be constructed of corrosion-resistant alloy steel, sleeve bearings and glands of bronze designed to accommodate a mechanical seal, and the housing of close-grained cast iron. Pump seals shall be capable of withstanding 240 degrees F temperature without external cooling. The motor shall have sufficient power for the service required, shall be of a type approved by the manufacturer of the pump, shall be suitable for the available electric

service, and shall conform to the requirements of paragraph ELECTRICAL EQUIPMENT. Each pump suction and discharge connection shall be provided with a pressure gauge as specified. T

2.4 COLD WATER CONNECTIONS

Connections shall be provided which includes consecutively in line a strainer, reduced pressure principle backflow preventers, and water pressure regulator in that order in the direction of the flow. The reduced pressure principle backflow preventers shall be provided as indicated and in compliance with Section 22 00 00 PLUMBING, GENERAL PURPOSE. Cold water fill connections shall be made to the water supply system as indicated. Necessary pipe, fittings, and valves required for water connections between the boiler and cold water main shall be provided as shown. The pressure regulating valve shall be of a type that will not stick or allow pressure to build up on the low side. The valve shall be set to maintain a terminal pressure of approximately, lately 5 psi in excess of the static head on the system and shall operate within a 2 psi tolerance regardless of cold water supply piping pressure and without objectionable noise under any condition of operation.

2.5 FITTINGS AND ACCESSORIES

Boiler fittings and accessories shall be installed with each boiler in accordance with ASME BPVC SEC IV, unless otherwise specified.

2.5.1 Direct Vents

Direct venting shall be used for condensing type boilers. Both the air intake and exhaust vents shall be sized and located as indicated on the drawings and as recommended by the boiler manufacturer. A separate combustion air intake vent and exhaust vent shall be provided for each boiler.

2.5.1.1 Combustion Air Intake Vent

The combustion air intake piping shall be constructed of Schedule 40 PVC in accordance with ASTM D1784. The vent shall be suitable for the temperature at the boiler combustion air intake connection point. Each intake shall be provided complete with bird screen.

2.5.1.2 Exhaust Vent

The exhaust vent piping shall be constructed of Schedule 40 CPVC or stainless steel conforming to UL 1738 and the boiler manufacturer's recommendations. Plastic materials polyetherimide (PEI) and polyethersulfone (PES) are forbidden to be used for vent piping of combustion gases. The exhaust vent shall be suitable for the maximum anticipated boiler exhaust temperature and shall withstand the corrosive effects of the condensate. A 0.3125 inch diameter hole shall be provided in the stack not greater than 6 inches from the boiler flue outlet for sampling of the exit gases. A method shall be provided to seal the hole to prevent exhaust gases from entering the boiler room when samples are not being taken. Each exhaust stack shall be provided complete with bird screen.

2.5.2 Expansion Tank

The hot water pressurization system shall include a diaphragm-type

expansion tank which will accommodate the expanded water of the system generated within the normal operating temperature range, limiting the pressure increase at all components in the system to the maximum allowable pressure at those components. The only air in the system shall be the permanent sealed-in air cushion contained in the diaphragm-type tank. The sizes shall be as indicated. The expansion tank shall be welded steel, constructed, tested, and stamped in accordance with [ASME BPVC SEC VIII D1](#) for a working pressure of [125 psi](#) and precharged to the minimum operating pressure. The tank's air chamber shall be fitted with an air charging valve and pressure gauge. The tank shall be supported by steel legs or bases for vertical installation or steel saddles for horizontal installations. The tank shall have lifting rings and a drain connection. All components shall be suitable for a maximum operating temperature of [250 degrees F](#).

2.5.3 Air Separator

External air separation tank shall be steel, constructed, tested and stamped in accordance with [ASME BPVC SEC VIII D1](#) for a working pressure of [125 psi](#). The capacity of the air separation tank indicated is minimum.

2.5.4 Steel Pipe and Fittings

2.5.4.1 Steel Pipe

Steel pipe shall be [ASTM A53/A53M](#), Type E or S, Grade A or B, black steel, standard weight.

2.5.4.2 Steel Pipe Fittings

Fittings shall have the manufacturer's trademark affixed in accordance with [MSS SP-25](#) so as to permanently identify the manufacturer.

2.5.4.3 Steel Flanges

Flanged fittings including flanges, bolts, nuts, bolt patterns, etc. shall be in accordance with [ASME B16.5](#) class 150 and shall have the manufacturers trademark affixed in accordance with [MSS SP-25](#). Flange material shall conform to [ASTM A105/A105M](#). Flanges for high temperature water systems shall be serrated or raised-face type. Blind flange material shall conform to [ASTM A516/A516M](#) cold service and [ASTM A515/A515M](#) for hot service. Bolts shall be high strength or intermediate strength with material conforming to [ASTM A193/A193M](#). Submit written certification by the bolt manufacturer that the bolts furnished comply with the requirements of this specification. The certification shall include illustrations of product markings, the date of manufacture, and the number of each type of bolt to be furnished based on this certification.

2.5.4.4 Welded Fittings

Welded fittings shall conform to [ASTM A234/A234M](#) with WPA marking. Buttwelded fittings shall conform to [ASME B16.9](#), and socket-welded fittings shall conform to [ASME B16.11](#).

2.5.4.5 Cast-Iron Fittings

Fittings shall be [ASME B16.4](#), Class 125, type required to match connecting piping.

2.5.4.6 Malleable-Iron Fittings

Fittings shall be ASME B16.3, type as required to match connecting piping.

2.5.4.7 Unions

Unions shall be ASME B16.39, Class 150.

2.5.4.8 Threads

Pipe threads shall conform to ASME B1.20.1.

2.5.4.9 Grooved Mechanical fittings

Joints and fittings shall be designed for not less than 125 psig service and shall be the product of the same manufacturer. Fitting and coupling houses shall be ductile iron conforming to ASTM A536. Gaskets shall be molded synthetic rubber with central cavity, pressure responsive configuration and shall conform to ASTM D2000 for circulating medium up to 230 degrees F. Grooved joints shall conform to AWWA C606. Coupling nuts and bolts shall be steel and shall conform to ASTM A183.

2.5.5 Copper Tubing and Fittings

2.5.5.1 Copper Tubing

Tubing shall be ASTM B88, ASTM B88M, Type K or L. Adapters for copper tubing shall be brass or bronze for brazed fittings.

2.5.5.2 Solder-Joint Pressure Fittings

Wrought copper and bronze solder-joint pressure fittings shall conform to ASME B16.22 and ASTM B75. Cast copper alloy solder-joint pressure fittings shall conform to ASME B16.18 and ASTM B828.

2.5.5.3 Flared Fittings

Cast copper alloy fittings for flared copper tube shall conform to ASME B16.26 and ASTM B62.

2.5.5.4 Adapters

Adapters may be used for connecting tubing to flanges and to threaded ends of valves and equipment. Extracted brazed tee joints produced with an acceptable tool and installed as recommended by the manufacturer may be used.

2.5.5.5 Threaded Fittings

Cast bronze threaded fittings shall conform to ASME B16.15.

2.5.5.6 Brazing Material

Brazing material shall conform to AWS A5.8/A5.8M.

2.5.5.7 Brazing Flux

Flux shall be in paste or liquid form appropriate for use with brazing material. Flux shall be as follows: lead-free; have a 100 percent

flushable residue; contain slightly acidic reagents; contain potassium borides, and contain fluorides. Silver brazing materials shall be in accordance with [AWS A5.8/A5.8M](#).

2.5.5.8 Solder Material

Solder metal shall conform to [ASTM B32](#) 95-5 tin-antimony.

2.5.5.9 Solder Flux

Flux shall be either liquid or paste form, non-corrosive and conform to [ASTM B813](#).

2.5.5.10 Grooved Mechanical Fittings

Joints and fittings shall be designed for not less than [125 psig](#) service and shall be the product of the same manufacturer. Fitting and coupling houses shall be ductile iron conforming to [ASTM A536](#). Gaskets shall be molded synthetic rubber with central cavity, pressure responsible configuration and shall conform to [ASTM D2000](#), for circulating medium up to [230 degrees F](#). Grooved joints shall conform to [AWWA C606](#). Coupling nuts and bolts shall be steel and shall conform to [ASTM A183](#).

2.5.6 Dielectric Waterways and Flanges

Dielectric waterways shall have temperature and pressure rating equal to or greater than that specified for the connecting piping. Waterways shall have metal connections on both ends suited to match connecting piping. Dielectric waterways shall be internally lined with an insulator specifically designed to prevent current flow between dissimilar metals. Dielectric flanges shall meet the performance requirements described herein for dielectric waterways.

2.5.7 Flexible Pipe Connectors

Flexible pipe connectors shall be designed for [125 psi](#) or [150 psi](#) service. Connectors shall be installed where indicated. The flexible section shall be constructed of rubber, tetrafluoroethylene resin, or corrosion-resisting steel, bronze, monel, or galvanized steel. Materials used and the configuration shall be suitable for the pressure, vacuum, and temperature medium. The flexible section shall be suitable for service intended and may have threaded, welded, soldered, flanged, or socket ends. Flanged assemblies shall be equipped with limit bolts to restrict maximum travel to the manufacturer's standard limits. Unless otherwise indicated, the length of the flexible connectors shall be as recommended by the manufacturer for the service intended. Internal sleeves or liners, compatible with circulating medium, shall be provided when recommended by the manufacturer. Covers to protect the bellows shall be provided where indicated.

2.5.8 Pipe Supports

Pipe supports shall conform to [MSS SP-58](#) and [MSS SP-69](#).

2.5.9 Pipe Expansion

2.5.9.1 Expansion Loops

Expansion loops and offsets shall provide adequate expansion of the main

straight runs of the system within the stress limits specified in ASME B31.1. The loops and offsets shall be cold-sprung and installed where indicated. Pipe guides and anchors shall be provided as indicated.

2.5.9.2 Expansion Joints

Expansion joints shall provide for either single or double slip of the connected pipes, as required or indicated, and for not less than the transverse indicated. End connection shall be flanged. Anchor bases or support bases shall be provided as indicated or required. Sliding surfaces and water wetted surfaces shall be chromium plated or fabricated of corrosion resistant steel. Initial setting shall be made in accordance with the manufacturer's recommendations to compensate for an ambient temperature at time of installation. Pipe alignment guides shall be installed as recommended by the joint manufacturer, but in any case shall not be more than 5 feet from expansion joint, except in lines 4 inches or smaller guides shall be installed not more than 2 feet from the joint. Service outlets shall be provided where indicated.

a. Bellows-type joints shall be flexible, guided expansion joints. The expansion element shall be stabilized corrosion resistant steel. Bellows-type expansion joints shall conform to the applicable requirements of EJMA Stds and ASME B31.1 with internal lines. Guiding of piping on both sides of expansion joint shall be in accordance with the published recommendations of the manufacturer of the expansion joint. The joints shall be designed for the working temperature and pressure suitable for the application but shall not be less than 150 psig.

b. Flexible ball joints shall be constructed of alloys as appropriate for the service intended. The joints shall be threaded, grooved, flanged, or welded end as required and shall be capable of absorbing the normal operating axial, lateral, or angular movements or combination thereof. Balls and sockets shall be polished, chromium-plated when materials are not of corrosion-resistant steel. The ball type joint shall be designed and constructed in accordance with ASME B31.1 and EJMA Stds. Flanges shall conform to the diameter and drilling of ASME B16.5. Molded gaskets shall be suitable for the service intended.

c. Slip type expansion joints shall be EJMA Stds and ASME B31.1, Class 1 or 2. Type II joints shall be suitable for repacking under full line pressure.

2.5.10 Valves

Valves shall be Class 125 and shall be suitable for the application. Grooved ends in accordance with AWWA C606 may be used for water service only. Valves in nonboiler external piping shall meet the material, fabrication and operating requirements of ASME B31.1. The connection type of all valves shall match the same type of connection required for the piping on which installed.

2.5.10.1 Gate Valves

Gate valves 2-1/2 inches and smaller shall conform to MSS SP-80 bronze rising stem, threaded, solder, or flanged ends. Gate valves 3 inches and larger shall conform to MSS SP-70 cast iron bronze trim, outside screw and yoke, flanged, or threaded ends.

2.5.10.2 Globe Valves

Globe valves 2-1/2 inches and smaller shall conform to MSS SP-80, bronze, threaded, soldered, or flanged ends. Globe valves 3 inches and larger shall conform to MSS SP-85, cast iron, bronze trim, flanged, or threaded ends.

2.5.10.3 Check Valves

Check valves 2-1/2 inches and smaller shall conform to MSS SP-80, bronze, threaded, soldered, or flanged ends. Check valves 3 inches and larger shall conform to MSS SP-71, cast iron, bronze trim, flanged, or threaded ends.

2.5.10.4 Angle Valves

Angle valves 2-1/2 inches and smaller shall conform to MSS SP-80 bronze, threaded, soldered, or flanged ends. Angle valves 3 inches and larger shall conform to MSS SP-85, cast iron, bronze trim, flanged, or threaded ends.

2.5.10.5 Ball Valves

Ball valves 1/2 inch and larger shall conform to MSS SP-72 or MSS SP-110, ductile iron or bronze, threaded, soldered, or flanged ends.

2.5.10.6 Plug Valves

Plug valves 2 inch and larger shall conform to MSS SP-78. Plug valves smaller than 2 inch shall conform to ASME B16.34.

2.5.10.7 Grooved End Valves

Valves with grooved ends in accordance with AWWA C606 may be used if the valve manufacturer certifies that their performance meets the requirements of the standards indicated for each type of valve.

2.5.10.8 Balancing Valves

Balancing valves shall have meter connections with positive shutoff valves. An integral pointer shall register the degree of valve opening. Valves shall be calibrated so that flow rate can be determined when valve opening in degrees and pressure differential across valve is known. Each balancing valve shall be constructed with internal seals to prevent leakage and shall be supplied with preformed insulation. Valves shall be suitable for 250 degrees F temperature and working pressure of the pipe in which installed. Valve bodies shall be provided with tapped openings and pipe extensions with shutoff valves outside of pipe insulation. The pipe extensions shall be provided with quick connecting hose fittings for a portable meter to measure the pressure differential. One portable differential meter shall be furnished. The meter suitable for the operating pressure specified shall be complete with hoses, vent, and shutoff valves, and carrying case. In lieu of the balancing valve with integral metering connections, a ball valve or plug valve with a separately installed orifice plate or venturi tube may be used for balancing.

2.5.10.9 Automatic Flow Control Valves

In lieu of the specified balancing valves, automatic flow control valves may be provided to maintain constant flow and shall be designed to be sensitive to pressure differential across the valve to provide the required opening. Valves shall be selected for the flow required and provided with a permanent nameplate or tag carrying a permanent record of the factory-determined flow rate and flow control pressure levels. Valves shall control the flow within 5 percent of the tag rating. Valves shall be suitable for the maximum operating pressure of 125 psi or 150 percent of the system operating pressure, whichever is greater. Where the available system pressure is not adequate to provide the minimum pressure differential that still allows flow control, the system pump head capability shall be increased. Valves shall be suitable for 250 degrees F temperature service. Valve materials shall be same as specified for the heating system check, globe, angle, and gate valves. Valve operator shall be the electric motor type or pneumatic type as applicable. Valve operator shall be capable of positive shutoff against the system pump head. Valve bodies shall be provided with tapped openings and pipe extensions with shutoff valves outside of pipe insulation. The pipe extensions shall be provided with quick connecting hose fittings for a portable meter to measure the pressure differential across the automatic flow control valve. A portable meter shall be provided with accessory kit as recommended for the project by the automatic valve manufacturer.

2.5.10.10 Butterfly Valves

Butterfly valves shall be 2-flange type or lug wafer type, and shall be bubbletight at 150 psig. Valve bodies shall be cast iron, malleable iron, or steel. ASTM A167, Type 404 or Type 316, corrosion resisting steel stems, bronze, or corrosion resisting steel discs, and synthetic rubber seats shall be provided. Valves smaller than 8 inches shall have throttling handles with a minimum of seven locking positions. Valves 8 inches and larger shall have totally enclosed manual gear operators with adjustable balance return stops and position indicators. Valves in insulated lines shall have extended neck to accommodate insulation thickness.

2.5.10.11 Drain valves

Drain valves shall be provided at each drain point of blowdown as recommended by the boiler manufacturer. Piping shall conform to ASME BPVC SEC IV and ASTM A53/A53M.

2.5.10.12 Safety Valves

Safety valves shall have steel bodies and shall be equipped with corrosion-resistant trim and valve seats. The valves shall be properly guided and shall be positive closing so that no leakage can occur. Adjustment of the desired back-pressure shall cover the range between 2 and 10 psig. The adjustment shall be made externally, and any shafts extending through the valve body shall be provided with adjustable stuffing boxes having renewable packing. Boiler safety valves of proper size and of the required number, in accordance with ASME BPVC SEC IV, shall be installed so that the discharge will be through piping extended to the exterior. Each discharge pipe for hot water service shall be pitched away from the valve seat.

2.5.11 Strainers

Basket and "Y" type strainers shall be the same size as the pipelines in which they are installed. The strainer bodies shall be heavy and durable, fabricated of cast iron, and shall have bottoms drilled and tapped with a gate valve attached for blowdown purposes. The bodies shall have arrows clearly cast on the sides indicating the direction of flow. Each strainer shall be equipped with an easily removable cover and sediment screen. The screen shall be made of 22 gauge thick brass sheet with small perforations numbering not less than 400/square inch to provide a net free area through the basket of at least 3.30 times that of the entering pipe. The flow shall be into the screen and out through the perforations.

2.5.12 Pressure Gauges

Gauges shall conform to ASME B40.100 and shall be provided with throttling type needle valve or a pulsation dampener and shutoff valve. Minimum dial size shall be 3-1/2 inches. A pressure gauge shall be provided for each boiler in a visible location on the boiler. Pressure gauges shall be provided with readings in psi. Pressure gauges shall have an indicating pressure range that is related to the operating pressure of the fluid in accordance with the following table:

Operating Pressure (kPA)	Pressure Range (kPA)
519-1030	0-1400
105-518	0-690
14-104	0-210 (retard)
Operating Pressure (psi)	Pressure Range (psi)
76-150	0-200
16-75	0-100
2-15	0-30 (retard)

2.5.13 Thermometers

Thermometers shall be provided with wells and separable corrosion-resistant steel sockets. Mercury shall not be used in thermometers. Thermometers for inlet water and outlet water for each hot water boiler shall be provided in a visible location on the boiler. Thermometers shall have brass, malleable iron, or aluminum alloy case and frame, clear protective face, permanently stabilized glass tube with indicating-fluid column, white face, black numbers, and a minimum 9 inch scale. The operating range of the thermometers shall be 32-212 degrees F. The thermometers shall be provided with readings in degrees F.

2.5.14 Air Vents

2.5.14.1 Manual Air Vents

Manual air vents shall be brass or bronze valves or cocks suitable for the pressure rating of the piping system and furnished with threaded plugs or caps.

2.5.14.2 Automatic Air Vents

Automatic air vents shall be 3/4 inch quick-venting float and vacuum air valves. Each air vent valve shall have a large port permitting the

expulsion of the air without developing excessive back pressure, a noncollapsible metal float which will close the valve and prevent the loss of water from the system, an air seal that will effectively close and prevent the re-entry of air into the system when subatmospheric pressures prevail therein, and a thermostatic member that will close the port against the passage of steam from the system. The name of the manufacturer shall be clearly stamped on the outside of each valve. The air vent valve shall be suitable for the pressure rating of the piping system.

2.6 ELECTRICAL EQUIPMENT

Electric motor-driven equipment shall be provided complete with motors, motor starters, and necessary control devices. Electrical equipment, motor control devices, motor efficiencies and wiring shall be as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Motors which are not an integral part of a packaged boiler and which are integral in size shall be the premium efficiency type in accordance with NEMA MG 1. Motors which are an integral part of the packaged boiler shall be the highest efficiency available by the manufacturer of the packaged boiler. Motor starters shall be provided complete with properly sized thermal overload protections and other appurtenances necessary for the motor control specified. Starters shall be furnished in watertight enclosures. Manual or automatic control and protective or signal devices required for the operation specified and any control wiring required for controls and devices but not shown shall be provided.

2.6.1 Motor Ratings

Motors shall be suitable for the voltage and frequency provided. Motors 1/2 hp and larger shall be three-phase, unless otherwise indicated. Motors shall be of sufficient capacity to drive the equipment at the specified capacity without exceeding the nameplate rating on the motor.

2.6.2 Motor Controls

Motor controllers shall be provided complete with properly sized thermal overload protection. Manual or automatic control and protective or signal devices required for the operation specified and any wiring required to such devices shall be provided. Where two-speed or variable-speed motors are indicated, solid-state variable-speed controllers may be provided to accomplish the same function. Solid state variable speed controllers shall be utilized for fractional through 10 hp ratings. Adjustable frequency drives shall be used for larger motors.

2.7 INSULATION

Shop and field-applied insulation shall be as specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

2.8 TOOLS

Special tools shall be furnished. Special tools shall include uncommon tools necessary for the operation and maintenance of boilers, burners, pumps, fans, controls, meters, special piping systems, and other equipment. Small hand tools shall be furnished within a suitable cabinet, mounted where directed.

2.9 BOILER WATER TREATMENT

Submit the proposed water treatment plan. The plan shall include a layout, control scheme, a list of the existing water conditions including the items listed in this paragraph, a list of all chemicals, the proportion of chemicals to be added, the final treated water conditions, and a description of environmental concerns for handling the chemicals. The water treatment system shall be capable of feeding chemicals and bleeding the system to prevent corrosion and scale within the boiler and piping distribution system. Submit operating and maintenance manuals for the step-by-step water treatment procedures, including procedures for testing the water quality. The water shall be treated to maintain the conditions recommended by the boiler manufacturer. Chemicals shall meet required federal, state, and local environmental regulations for the treatment of boilers and discharge to the sanitary sewer. The services of a company regularly engaged in the treatment of boilers shall be used to determine the correct chemicals and concentrations required for water treatment. The company shall maintain the chemical treatment and provide all chemicals required for a period of 1 year from the date of occupancy. Filming amines and proprietary chemicals shall not be used. The water treatment chemicals shall remain stable throughout the operating temperature range of the system and shall be compatible with pump seals and other elements of the system.

2.9.1 Tanks

The tanks shall be constructed of high density polyethylene or stainless steel with a hinged cover. The tanks shall have sufficient capacity to require recharging only once per 7 days during normal operation. A level indicating device shall be included with each tank. An electric agitator shall be provided for each tank.

2.9.2 Chemical Shot Feeder

A shot feeder shall be provided as indicated. Size and capacity of feeder shall be based upon local requirements and water analysis. The feeder shall be furnished with an air vent, gauge glass, funnel, valves, fittings, and piping.

2.9.3 Chemical Piping

The piping and fittings shall be constructed of steel.

2.9.4 Test Kits

One test kit of each type required to determine the water quality as outlined within the operation and maintenance manuals shall be provided.

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with details of the work, verify dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work or ordering any materials.

3.2 ERECTION OF BOILER AND AUXILIARY EQUIPMENT

Boiler and auxiliary equipment shall be installed in accordance with

manufacturer's written instructions. Proper provision shall be made for expansion and contraction between boiler foundation and floor. This joint shall be packed with suitable nonasbestos rope and filled with suitable compound that will not become soft at a temperature of 100 degrees F. Boilers and firing equipment shall be supported from the foundations by structural steel completely independent of all brickwork. Boiler supports shall permit free expansion and contraction of each portion of the boiler without placing undue stress on any part of the boiler or setting. Boiler breeching shall be as indicated with full provision for expansion and contraction between all interconnected components.

3.3 PIPING INSTALLATION

Unless otherwise specified, nonboiler external pipe and fittings shall conform to the requirements of ASME B31.1. Pipe installed shall be cut accurately to suit field conditions, shall be installed without springing or forcing, and shall properly clear windows, doors, and other openings. Cutting or other weakening of the building structure to facilitate piping installation will not be permitted. Pipes shall be free of burrs, oil, grease and other foreign material and shall be installed to permit free expansion and contraction without damaging the building structure, pipe, pipe joints, or pipe supports. Changes in direction shall be made with fittings, except that bending of pipe 4 inches and smaller will be permitted provided a pipe bender is used and wide sweep bends are formed. The centerline radius of bends shall not be less than 6 diameters of the pipe. Bent pipe showing kinks, wrinkles, flattening, or other malformations will not be accepted. Vent pipes shall be carried through the roof as directed and shall be properly flashed. Unless otherwise indicated, horizontal supply mains shall pitch down in the direction of flow with a grade of not less than 1 inch in 40 feet. Open ends of pipelines and equipment shall be properly capped or plugged during installation to keep dirt or other foreign materials out of the systems. Pipe not otherwise specified shall be uncoated. Unless otherwise specified or shown, final connections to equipment shall be made with malleable-iron unions for steel pipe 2-1/2 inches or less in diameter and with flanges for pipe 3 inches or more in diameter. Unions for copper pipe or tubing shall be brass or bronze. Reducing fittings shall be used for changes in pipe sizes. In horizontal hot water lines, reducing fittings shall be eccentric type to maintain the top of the lines at the same level to prevent air binding.

3.3.1 Hot Water Piping and Fittings

Pipe shall be black steel or copper tubing. Fittings for steel piping shall be black malleable iron or cast iron to suit piping. Fittings adjacent to valves shall suit valve material. Grooved mechanical fittings will not be allowed for water temperatures above 230 degrees F.

3.3.2 Vent Piping and Fittings

Vent piping shall be black steel. Fittings shall be black malleable iron or cast iron to suit piping.

3.3.3 Gauge Piping

Piping shall be copper tubing.

3.3.4 Joints

Joints between sections of steel pipe and between steel pipe and fittings shall be threaded, grooved, flanged or welded as indicated or specified. Except as otherwise specified, fittings 1 inch and smaller shall be threaded; fittings 1-1/4 inches and up to but not including 3 inches shall be either threaded, grooved, or welded; and fittings 3 inches and larger shall be either flanged, grooved, or welded. Pipe and fittings 1-1/4 inches and larger installed in inaccessible conduit or trenches beneath concrete floor slabs shall be welded. Connections to equipment shall be made with black malleable-iron unions for pipe 2-1/2 inches or smaller in diameter and with flanges for pipe 3 inches or larger in diameter. Joints between sections of copper tubing or pipe shall be flared, soldered, or brazed.

3.3.4.1 Threaded Joints

Threaded joints shall be made with tapered threads properly cut and shall be made perfectly tight with a stiff mixture of graphite and oil or with polytetrafluoroethylene tape applied to the male threads only and in no case to the fittings.

3.3.4.2 Welded Joints

Welded joints shall be in accordance with paragraph GENERAL REQUIREMENTS unless otherwise specified. Changes in direction of piping shall be made with welding fittings only; mitering or notching pipe to form elbows and tees or other similar type construction will not be permitted. Branch connections may be made with either welding tees or forged branch outlet fittings, either being acceptable without size limitation. Branch outlet fittings, where used, shall be forged, flared for improved flow characteristics where attached to the run, reinforced against external strains, and designed to withstand full pipe bursting strength. Socket weld joints shall be assembled so that the space between the end of the pipe and the bottom of the socket is no less than 1/16 inch and no more than 1/8 inch.

3.3.4.3 Grooved Mechanical Joints

Grooved mechanical joints may be provided for hot water systems in lieu of unions, welded, flanged, or screwed piping connections in low temperature hot water systems where the temperature of the circulating medium does not exceed 230 degrees F. Grooves shall be prepared according to the coupling manufacturer's instructions. Pipe and groove dimensions shall comply with the tolerances specified by the coupling manufacturer. The diameter of grooves made in the field shall be measured using a "go/no-go" gauge, vernier or dial caliper, narrow-land micrometer or other method specifically approved by the coupling manufacturer for the intended application. Groove width and dimension of groove from end of pipe shall be measured and recorded for each change in grooving tool setup to verify compliance with coupling manufacturer's tolerances. Grooved joints shall not be used in concealed locations. Mechanical joints shall use rigid mechanical pipe couplings, except at equipment connections. At equipment connections, flexible couplings may be used. Coupling shall be of the bolted type for use with grooved end pipes, fittings, valves, and strainers. Couplings shall be self-centering and shall engage in a watertight couple.

3.3.4.4 Flared and Brazed Copper Pipe and Tubing

Tubing shall be cut square, and burrs shall be removed. Both inside of fittings and outside of tubing shall be cleaned thoroughly with sand cloth or steel wire brush before brazing. Annealing of fittings and hard-drawn tubing shall not occur when making connections. Installation shall be made in accordance with the manufacturer's recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Brazed joints shall be made in conformance with AWS B2.2/B2.2M and CDA A4015 with flux. Copper-to-copper joints shall include the use of copper-phosphorous or copper-phosphorous-silver brazing metal without flux. Brazing of dissimilar metals (copper to bronze or brass) shall include the use of flux with either a copper-phosphorous, copper-phosphorous-silver or a silver brazing filler metal. Joints for flared fittings shall be of the compression pattern. Swing joints or offsets shall be provided in all branch connections, mains, and risers to provide for expansion and contraction forces without undue stress to the fittings or to short lengths of pipe or tubing. Flared or brazed copper tubing to pipe adapters shall be provided where necessary for joining threaded pipe to copper tubing.

3.3.4.5 Soldered Joints

Soldered joints shall be made with flux and are only acceptable for lines 2 inches and smaller. Soldered joints shall conform to ASME B31.5 and CDA A4015.

3.3.4.6 Copper Tube Extracted Joint

An extruded mechanical tee joint may be made in copper tube. Joint shall be produced with an appropriate tool by drilling a pilot hole and drawing out the tube surface to form a collar having a minimum height of three times the thickness of the tube wall. To prevent the branch tube from being inserted beyond the depth of the extracted joint, dimpled depth stops shall be provided. The branch tube shall be notched for proper penetration into fitting to assure a free flow joint. Extracted joints shall be brazed using a copper phosphorous classification brazing filler metal. Soldered joints will not be permitted.

3.3.5 Flanges and Unions

Flanges shall be faced true, provided with 1/16 inch thick gaskets, and made square and tight. Where steel flanges mate with cast-iron flanged fittings, valves, or equipment, they shall be provided with flat faces and full face gaskets. Union or flange joints shall be provided in each line immediately preceding the connection to each piece of equipment or material requiring maintenance such as coils, pumps, control valves, and other similar items. Dielectric pipe unions shall be provided between ferrous and nonferrous piping to prevent galvanic corrosion. The dielectric unions shall have metal connections on both ends. The ends shall be threaded, flanged, or brazed to match adjacent piping. The metal parts of the union shall be separated so that the electrical current is below 1 percent of the galvanic current which would exist upon metal-to-metal contact. Gaskets, flanges, and unions shall be installed in accordance with manufacturer's recommendations.

3.3.6 Branch Connections

3.3.6.1 Branch Connections for Hot Water Systems

Branches from the main shall pitch up or down as shown to prevent air entrapment. Connections shall ensure unrestricted circulation, eliminate air pockets, and permit complete drainage of the system. Branches shall pitch with a grade of not less than **1 inch in 10 feet**. When indicated, special flow fittings shall be installed on the mains to bypass portions of the water through each radiator. Special flow fittings shall be standard catalog products and shall be installed as recommended by the manufacturer.

3.3.7 Flared, Brazed, and Soldered Copper Pipe and Tubing

Copper tubing shall be flared, brazed, or soldered. Tubing shall be cut square, and burrs shall be removed. Both inside of fittings and outside of tubing shall be cleaned thoroughly with sand cloth or steel wire brush before brazing. Annealing of fittings and hard-drawn tubing shall not occur when making connections. Installation shall be made in accordance with the manufacturer's recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Joints for flared fittings shall be of the compression pattern. Swing joints or offsets shall be provided on branch connections, mains, and risers to provide for expansion and contraction forces without undue stress to the fittings or to short lengths of pipe or tubing. Pipe adapters shall be provided where necessary for joining threaded pipe to copper tubing. Brazed joints shall be made in conformance with **CDA A4015**.

Copper-to-copper joints shall include the use of copper-phosphorous or copper-phosphorous-silver brazing metal without flux. Brazing of dissimilar metals (copper to bronze or brass) shall include the use of flux with either a copper-phosphorous, copper-phosphorous-silver, or a silver brazing filler metal. Soldered joints shall be made with flux and are only acceptable for lines **2 inches** or smaller. Soldered joints shall conform to **ASME B31.5** and shall be in accordance with **CDA A4015**.

3.3.8 Copper Tube Extracted Joint

An extracted mechanical tee joint may be made in copper tube. Joint shall be produced with an appropriate tool by drilling a pilot hole and drawing out the tube surface to form a collar having a minimum height of three times the thickness of the tube wall. To prevent the branch tube from being inserted beyond the depth of the extracted joint, dimpled depth stops shall be provided. The branch tube shall be notched for proper penetration into fitting to assure a free flow joint. Extracted joints shall be brazed using a copper phosphorous classification brazing filler metal. Soldered joints will not be permitted.

3.3.9 Supports

Hangers used to support piping **2 inches** and larger shall be fabricated to permit adequate adjustment after erection while still supporting the load. Pipe guides and anchors shall be installed to keep pipes in accurate alignment, to direct the expansion movement, and to prevent buckling, swaying, and undue strain. Piping subjected to vertical movement when operating temperatures exceed ambient temperatures shall be supported by variable spring hangers and supports or by constant support hangers. Threaded rods which are used for support shall not be formed or bent. Supports shall not be attached to the underside of concrete filled floors or concrete roof decks unless approved by the Contracting Officer.

3.3.9.1 Pipe Hangers, Inserts, and Supports

Pipe hangers, inserts, and supports shall conform to [MSS SP-58](#) and [MSS SP-69](#), except as modified herein.

- a. Types 5, 12, and 26 shall not be used.
- b. Type 3 shall not be used on insulated pipe which has a vapor barrier. Type 3 may be used on insulated pipe that does not have a vapor barrier if clamped directly to the pipe, if the clamp bottom does not extend through the insulation, and if the top clamp attachment does not contact the insulation during pipe movement.
- c. Type 18 inserts shall be secured to concrete forms before concrete is placed. Continuous inserts which allow more adjustment may be used if they otherwise meet the requirements for Type 18 inserts.
- d. Type 19 and 23 C-clamps shall be torqued in accordance with [MSS SP-69](#) and have both locknuts and retaining devices furnished by the manufacturer. Field fabricated C-clamp bodies or retaining devices are not acceptable.
- e. Type 20 attachments used on angles and channels shall be furnished with an added malleable-iron heel plate or adapter.
- f. Type 24 may be used only on trapeze hanger systems or on fabricated frames.
- g. Horizontal pipe supports shall be spaced as specified in [MSS SP-69](#) and a support shall be installed not over 1 foot from the pipe fitting joint at each change in direction of the piping. Pipe supports shall be spaced not over 5 feet apart at valves.
- h. Vertical pipe shall be supported at each floor, except at slab-on-grade, and at intervals of not more than 15 feet, not more than 8 feet from end of risers, and at vent terminations.
- i. Type 35 guides using steel, reinforced polytetrafluoroethylene (PTFE) or graphite slides shall be provided where required to allow longitudinal pipe movement. Lateral restraints shall be provided as required. Slide materials shall be suitable for the system operating temperatures, atmospheric conditions, and bearing loads encountered.
 - (1) Where steel slides do not require provisions for restraint of lateral movement, an alternate guide method may be used. On piping 4 inches and larger, a Type 39 saddle may be welded to the pipe and freely rested on a steel plate. On piping under 4 inches, a Type 40 protection shield may be attached to the pipe or insulation and freely rested on a steel slide plate.
 - (2) Where there are high system temperatures and welding to piping is not desirable, the Type 35 guide shall include a pipe cradle welded to the guide structure and strapped securely to the pipe. The pipe shall be separated from the slide material by at least 4 inches or by an amount adequate for the insulation, whichever is greater.
- j. Except for Type 3, pipe hangers on horizontal insulated pipe shall

be the size of the outside diameter of the insulation.

k. Piping in trenches shall be supported as indicated.

l. Structural steel attachments and brackets required to support piping, headers, and equipment, but not shown, shall be provided under this section. Pipe hanger loads suspended from steel joist between panel points shall not exceed 50 pounds. Loads exceeding 50 pounds shall be suspended from panel points.

3.3.9.2 Multiple Pipe Runs

In the support of multiple pipe runs on a common base member, a clip or clamp shall be used where each pipe crosses the base support member. Spacing of the base support member shall not exceed the hanger and support spacing required for any individual pipe in the multiple pipe run. The clips or clamps shall be rigidly attached to the common base member. A clearance of 1/8 inch shall be provided between the pipe insulation and the clip or clamp for piping which may be subjected to thermal expansion.

3.3.10 Anchors

Anchors shall be provided where necessary to localize expansion or to prevent undue strain on piping. Anchors shall consist of heavy steel collars with lugs and bolts for clamping and attaching anchor braces, unless otherwise indicated. Anchor braces shall be installed in the most effective manner to secure the desired results, using turnbuckles where required. Supports, anchors, or stays shall not be attached where they will injure the structure or adjacent construction during installation or by the weight of expansion of the pipeline.

3.3.11 Valves

Valves shall be installed where indicated, specified, and required for functioning and servicing of the systems. Valves shall be safely accessible. Swing check valves shall be installed upright in horizontal lines and in vertical lines only when flow is in the upward direction. Gate and globe valves shall be installed with stems horizontal or above. Valves to be brazed shall be disassembled prior to brazing and all packing removed. After brazing, the valves shall be allowed to cool before reassembling.

3.3.12 Pipe Sleeves

Pipe passing through concrete or masonry walls or concrete floors or roofs shall be provided with pipe sleeves fitted into place at the time of construction. A waterproofing clamping flange shall be installed as indicated where membranes are involved. Sleeves shall not be installed in structural members except where indicated or approved. Rectangular and square openings shall be as detailed. Each sleeve shall extend through its respective wall, floor, or roof. Sleeves through walls shall be cut flush with wall surface. . Sleeves through roofs shall extend above the top surface of roof at least 6 inches for proper flashing or finishing. Unless otherwise indicated, sleeves shall be sized to provide a minimum clearance of 1/4 inch between bare pipe and sleeves or between jacket over insulation and sleeves. Sleeves in waterproofing membrane floors, bearing walls, and wet areas shall be galvanized steel pipe or cast-iron pipe. Sleeves in nonbearing walls, floors, or ceilings may be galvanized steel pipe, cast-iron pipe, or galvanized sheet metal with lock-type longitudinal

seam. Except in pipe chases or interior walls, the annular space between pipe and sleeve or between jacket over insulation and sleeve in nonfire rated walls shall be sealed. Metal jackets shall be provided over insulation passing through exterior walls, firewalls, fire partitions, floors, or roofs.

a. Metal jackets shall not be thinner than 0.006 inch thick aluminum, if corrugated, and 0.016 inch thick aluminum, if smooth.

b. Metal jackets shall be secured with aluminum or stainless steel bands not less than 3/8 inch wide and not more than 8 inches apart. When penetrating roofs and before fitting the metal jacket into place, a 1/2 inch wide strip of sealant shall be run vertically along the inside of the longitudinal joint of the metal jacket from a point below the backup material to a minimum height of 36 inches above the roof. If the pipe turns from vertical to horizontal, the sealant strip shall be run to a point just beyond the first elbow. When penetrating waterproofing membrane for floors, the metal jacket shall extend from a point below the back-up material to a minimum distance of 2 inches above the flashing. For other areas, the metal jacket shall extend from a point below the backup material to a point 12 inches above material to a minimum distance of 2 inches above the flashing. For other areas, the metal jacket shall extend from a point below the backup material to a point 12 inches above the floor; when passing through walls above grade, the jacket shall extend at least 4 inches beyond each side of the wall.

3.3.12.1 Pipes Passing Through Waterproofing Membranes

In addition to the pipe sleeves referred to above, pipes passing through waterproofing membranes shall be provided with a 4 pound lead flashing or a 16 ounce copper flashing, each within an integral skirt or flange. Flashing shall be suitably formed, and the skirt or flange shall extend not less than 8 inches from the pipe and shall set over the membrane in a troweled coating of bituminous cement. The flashing shall extend above the roof or floor a minimum of 10 inches. The annular space between the flashing and the bare pipe or between the flashing and the metal-jacket-covered insulation shall be sealed as indicated. Pipes up to and including 10 inches in diameter which pass through waterproofing membrane may be installed through a cast-iron sleeve with caulking recess, anchor lugs, flashing clamp device, and pressure ring with brass bolts. Waterproofing membrane shall be clamped into place and sealant shall be placed in the caulking recess.

3.3.12.2 Optional Modular Mechanical Sealing Assembly

At the option of the Contractor, a modular mechanical type sealing assembly may be installed in the annular space between the sleeve and conduit or pipe in lieu of a waterproofing clamping flange and caulking and sealing specified above. The seals shall include interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe/conduit and sleeve with corrosion-protected carbon steel bolts, nuts, and pressure plates. The links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and each nut. After the seal assembly is properly positioned in the sleeve, tightening of the bolt shall cause the rubber sealing elements to expand and provide a watertight seal between the pipe/conduit and the sleeve. Each seal assembly shall be sized as recommended by the manufacturer to fit the pipe/conduit and sleeve involved.

3.3.12.3 Optional Counterflashing

As alternates to caulking and sealing the annular space between the pipe and flashing or metal-jacket-covered insulation and flashing, counterflashing may consist of standard roof coupling for threaded pipe up to 6 inches in diameter, lead flashing sleeve for dry vents with the sleeve turned down into the pipe to form a waterproof joint, or a tack-welded or banded-metal rain shield around the pipe, sealed as indicated.

3.3.13 Balancing Valves

Balancing valves shall be installed as indicated.

3.3.14 Thermometer Wells

A thermometer well shall be provided in each return line for each circuit in multicircuit systems.

3.3.15 Air Vents

Air vents shall be installed where shown or directed. Air vents shall be installed in piping at all system high points. The vent shall remain open until water rises in the tank or pipe to a predetermined level at which time it shall close tight. An overflow pipe from the vent shall be run to a point designated by the Contracting Officer's representative. The inlet to the air vent shall have a gate valve or ball valve.

3.3.16 Escutcheons

Escutcheons shall be provided at all finished surfaces where exposed piping, bare or insulated, passes through floors, walls, or ceilings except in boiler, utility, or equipment rooms. Escutcheons shall be fastened securely to pipe or pipe covering and shall be chromium-plated iron or chromium-plated brass, either one-piece or split pattern, held in place by internal spring tension or setscrews.

3.3.17 Drains

A drain connection with a 1 inch gate valve or 3/4 inch hose bib shall be installed at the lowest point in the return main near the boiler. In addition, threaded drain connections with threaded cap or plug shall be installed on the heat exchanger coil on each unit heater or unit ventilator and wherever required for thorough draining of the system.

3.3.18 Strainer Blow-Down Piping

Strainer blow-down connections shall be fitted with a black steel blow-down pipeline routed to an accessible location and provided with a blow-down valve.

3.3.19 Direct Venting for Combustion Intake Air and Exhaust Air

The intake air and exhaust vents shall be installed in accordance with NFPA 54 and boiler manufacturer's recommendations. The exhaust vent shall be sloped 1/4 inch/ft toward the boiler's flue gas condensate collection point.

3.4 GAS FUEL SYSTEM

Gas piping, fittings, valves, regulators, tests, cleaning, and adjustments shall be in accordance with the Section 23 11 25 FACILITY GAS PIPING. Submit proposed test schedules for the heating system and fuel system tests, at least 2 weeks prior to the start of related testing. NFPA 54 shall be complied with unless otherwise specified. Burners, pilots, and all accessories shall be listed in UL Gas&Oil Dir. The fuel system shall be provided with a gas tight, manually operated, UL listed stop valve at the gas-supply connections, a gas strainer, a pressure regulator, pressure gauges, a burner-control valve, a safety shutoff valve suitable for size of burner and sequence of operation, and other components required for safe, efficient, and reliable operation as specified. Approved permanent and ready facilities to permit periodic valve leakage tests on the safety shutoff valve or valves shall be provided.

3.5 MANUFACTURER'S SERVICES

Provide the services of a manufacturer's representative who is experienced in the installation, adjustment, and operation of the equipment specified to supervise the installing, adjusting, and testing of the equipment.

3.6 TEST OF BACKFLOW PREVENTION ASSEMBLIES

Backflow prevention assemblies shall be tested in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE.

3.7 CLEANING

3.7.1 Boilers and Piping

After the hydrostatic tests have been made and before the system is balanced and operating tests are performed, the boilers and piping shall be thoroughly cleaned by filling the system with a solution consisting of either 1 pound of caustic soda or 1 pound of trisodium phosphate per 50 gallons of water. The proper safety precautions shall be observed in the handling and use of these chemicals. The water shall be heated to approximately 150 degrees F and the solution circulated in the system for a period of 48 hours. The system shall then be drained and thoroughly flushed out with fresh water. Strainers and valves shall be thoroughly cleaned. Prior to operating tests, air shall be removed from all water systems by operating the air vents.

3.7.2 Heating Units

Inside space heating equipment, ducts, plenums, and casing shall be thoroughly cleaned of debris and blown free of small particles of rubbish and dust and then vacuum cleaned before installing outlet faces. Equipment shall be wiped clean, with all traces of oil, dust, dirt, or paint spots removed. Temporary filters shall be provided for fans that are operated during construction, and new filters shall be installed after construction dirt has been removed from the building, and the ducts, plenum, casings, and other items specified have been vacuum cleaned. System shall be maintained in this clean condition until final acceptance. Bearings shall be properly lubricated with oil or grease as recommended by the manufacturer. Belts shall be tightened to proper tension. Control valves and other miscellaneous equipment requiring adjustment shall be adjusted to setting indicated or directed. Fans shall be adjusted to the speed indicated by the manufacturer to meet specified conditions.

-- End of Section --

SECTION 23 73 33

HEATING, VENTILATING, AND COOLING SYSTEM

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)

AMCA 210 (2007) Laboratory Methods of Testing Fans for Aerodynamic Performance Rating

AMCA 500 (1994) Test Methods for Louvers, Dampers and Shutters

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z21.22 (1999; 2001) Relief Valves for Hot Water Supply Systems

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

ARI 410 (1991) Forced-Circulation Air-Cooling and Air-Heating Coils

ARI 430 (1999) Central-Station Air-Handling Units

ASME INTERNATIONAL (ASME)

ASME B16.3 (2011) Malleable Iron Threaded Fittings, Classes 150 and 300

ASME B16.5 (2009) Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard

ASME B16.9 (2007) Standard for Factory-Made Wrought Steel Butt welding Fittings

ASME B16.11 (2011) Forged Fittings, Socket-Welding and Threaded

ASME B16.18 (2012) Cast Copper Alloy Solder Joint Pressure Fittings

ASME/ANSI B16.22 (1995) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

ASME B16.23 (2002; R 2006) Cast Copper Alloy Solder Joint Drainage Fittings - DWV

- ASME/ANSI B16.26 (1988) Cast Copper Alloy Fittings for Flared Copper Tubes
- ASME/ANSI B16.39 (1998) Malleable Iron Threaded Pipe Unions
- ASME B31.1 (2010) Power Piping
- ASME/ANSI B31.5 (2001) Refrigeration Piping and Heat Transfer Components

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

- ASSE 1003 (2009) Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems - (ANSI approved 2010)

ASTM INTERNATIONAL (ASTM)

- ASTM A 53/A 53M (2006a) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
- ASTM A 106 (1999e1) Seamless Carbon Steel Pipe for High-Temperature Service
- ASTM A 193/A 193M (2001b) Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
- ASTM A 194/A 194M (2001a) Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service
- ASTM A 525 (1991; Rev. B) Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
- ASTM A 653/A 653M (2009a) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- ASTM B 32 (2004) Standard Specification for Solder Metal
- ASTM B 42 (1998) Seamless Copper Pipe, Standard Sizes
- ASTM B 88 (1999e1) Seamless Copper Water Tube
- ASTM B 280 (1999e1) Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
- ASTM B 306 (1999) Copper Drainage Tube (DWV)

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

- MSS SP-58 (2009) Pipe Hangers and Supports -

Materials, Design and Manufacture,
Selection, Application, and Installation

- MSS SP-67 (2002a) Butterfly Valves
- MSS SP-69 (2003) Pipe Hangers and Supports - Selection and Application (ANSI Approved American National Standard)
- MSS SP-70 (2011) Gray Iron Gate Valves, Flanged and Threaded Ends
- MSS SP-71 (2011) Gray Iron Swing Check Valves, Flanged and Threaded Ends
- MSS SP-80 (2008) Bronze Gate, Globe, Angle and Check Valves
- MSS SP-85 (2011) Gray Iron Globe & Angle Valves Flanged and Threaded Ends

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 70 (2011; Errata 2 2012) National Electrical Code
- NFPA 90A (2012) Standard for the Installation of Air Conditioning and Ventilating Systems

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

- SMACNA HVAC Duct Const Stds (1995; Addenda Nov 1997; 6th Printing 2001) HVAC Duct Construction Standards - Metal and Flexible
- SMACNA Leakage Test Mn1 (1985; 6th Printing 1997) HVAC Air Duct Leakage Test Manual

UNDERWRITERS LABORATORIES (UL)

- UL Bld Mat Dir (2011) Building Materials Directory
- UL 181 (1996; Rev Dec 1998) Factory-Made Air Ducts and Air Connectors
- UL 507 (1999; Rev thru Sep 2001) Electric Fans
- UL 555 (1999; Rev thru Jan 2002) Fire Dampers

1.2 SYSTEM DESCRIPTION

Provide new and modify existing heating, ventilating, and cooling (HVAC) systems complete and ready for operation. HVAC systems include equipment, ducts, and piping which is located within, on, under, and adjacent to buildings.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-03 Product Data

Packaged air-handling units

Exhaust fans

Fire dampers

Pipe hangers and supports

Dampers

Diffusers, registers, and grilles

Outside air intake louvers

Flexible round ducts

Valves

Pipe and fittings

SD-06 Test Reports

Packaged air-handling units: greater than 2,000 cfm.

SD-07 Certificates

Certification of welders' qualifications

SD-10 Operation and Maintenance Data

Packaged air-handling units, Data Package 3

Exhaust fans, Data Package 2

Fire dampers, Data Package 1

Submit in accordance with Section 01 78 23, "Operation and Maintenance Data."

1.3.1 Certification of Welders' Qualifications

Submit copy of Welder Qualification Tests (Form QW-482) prior to site welding.

PART 2 PRODUCTS

2.1 Air-Handling Units

Provide units factory assembled, designed, tested, and rated in accordance with ARI 430. Units shall be ARI certified for cooling. Provide heating and cooling units including hot water coils and chilled water coils. Unit shall include fan section, coil section with drain

pan, filter section and access panels. Insulate interior of casing with manufacturer's standard insulation. Provide nylon bushings for dampers.

- a. Fan section: Provide draw-through fan section including motor, starter, and drives. Provide adjustable sheaves to permit fan capacity variation from 5 percent above to 5 percent below rated capacity. Provide fan with discharge dampers or variable inlet vanes as indicated.
- b. Coil section: Provide **ARI 410** coils and slope for drainage. Provide insulated drain pans under cooling coils and valves.
- c. Filter section: Provide UL listed throwaway 2 inch thick fiberglass filters, standard dust-holding capacity, 350 fpm maximum face velocity. Provide gasketed hinged access panel with quick opening half-twist latches at end of filter rack. Filter rack shall accept 2 inch thick filters.
- d. Space temperature controls: Provide controls under Section **23 09 23.13 20**, "BACnet Direct Digital Control Systems For HVAC."

2.2 Exhaust Fans

AMCA 210 with AMCA seal. Provide centrifugal type exhaust fans with aluminum housing, fan wheel, and bird screen. Motors shall be completely shielded from the airstream. Provide exhaust opening and gravity closing type automatic backdraft dampers.

2.3 Bathroom Exhaust Fans

UL 507 and UL listed for ceiling installation, HVI (Home Ventilating Institute) certified, with AMCA seal. Unit shall be 2.5 zones or less at rated cfm and static pressure.

2.4 ELECTRICAL

2.4.1 Electrical Motors, Controllers, Contactors, and Disconnects

Furnish with respective pieces of equipment. Motors, controllers, contactors, and disconnects shall conform to Section **26 20 00**, "Interior Wiring Systems." Provide electrical connections under Section, **26 20 00**, "Interior Wiring Systems." Provide controllers and contactors with maximum of 120-volt control circuits, and auxiliary contacts for use with controls furnished. When motors and equipment furnished are larger than sizes indicated, the cost of providing additional electrical service and related work shall be included under this section.

2.5 METAL DUCT SYSTEMS

Provide shop-fabricated, zinc-coated steel ducts conforming to **ASTM A 525** or **ASTM A 653/A 653M** coating designation G60. Fabricate, construct, brace, reinforce, install, support, and seal ducts and accessories, and test ducts in accordance with **SMACNA HVAC Duct Const Stds** and **SMACNA Leakage Test Mn1**. All ducts shall be sealed to SMACNA seal class "A". Cover duct transverse joints with single component synthetic rubber type compound suitable for use with passivated coating on zinc-coated steel. Lap joints in direction of flow. Provide ducts straight and smooth on inside with neatly finished airtight joints. Provide air

supply and return openings in ducts with air diffusers, registers, or grilles.

2.5.1 Flexible Duct Connectors

Provide airtight flexible duct connectors at duct connections to each air-conditioning unit, air-handling unit, exhaust fan, and ventilating fan. Support connectors at each end with metal angle frame bands, securely bolt in place. Provide not less than 20 ounce glass fabric duct connectors coated on both sides with neoprene.

2.5.2 Turning Vanes

Provide fabricated tees and square elbows with turning vanes in accordance with [SMACNA HVAC Duct Const Stds](#) for vanned elbows. Turning vanes shall be single wall with trailing edges.

2.5.3 Dampers

Provide factory manufactured opposed blade adjustable manual dampers where indicated for duct heights of 12 inches and larger. Provide factory manufactured single leaf dampers for duct heights less than 12 inches. Provide damper shafts with 2 inch standoffs to clear 2 inches of duct insulation with bearings at both ends of the shafts. Provide adjustment quadrant with indicator and locking devices. Provide galvanized steel dampers one gage heavier than duct in which dampers are installed.

2.5.4 Diffusers, Registers, and Grilles

Provide factory-fabricated metal units with edges rolled or rounded where exposed to view, and factory primed with white enamel finish. Provide each diffuser and register with factory-fabricated, group-operated, adjustable, opposed-blade, air-volume-control dampers, key or screwdriver operated from the face of unit without the use of a tool. Provide each unit with rubber or plastic installation gaskets. Diffusers in same room shall have same face design.

- a. Diffusers: Provide round, square, or rectangular diffusers as indicated. Ceiling diffusers shall be designed to deliver air in a horizontal direction. Provide baffles or other devices as required for proper air distribution pattern.
- b. Registers: Provide double deflection supply registers arranged to control air direction, throw, and drop. Exhaust and return air registers shall have single set of nondirectional face bars or vanes having the same appearance as supply registers. Provide face bars or vanes spaced not more than 0.75 inch on center and not less than 0.62 inch depth.
- c. Grilles: Provide as specified for registers without air-volume-control dampers.

2.5.5 Outside Air Intake Louvers

Louvers shall bear AMCA certified ratings program seal for air performance and water penetration in accordance with [AMCA 500](#). Maximum pressure drop shall be 0.1 inch WG, unless indicated otherwise. Louvers shall have maximum water penetration of 0.20 ounce per square foot of free area at free velocity of 800 fpm. Provide aluminum alloy with anodized finish

frames and blades assembled with stainless steel screws, including 0.5-inch mesh aluminum screen mounted in extruded aluminum frame.

2.5.6 Access Doors

Provide for access to volume dampers, fire dampers, plenum chambers, and where indicated. Provide each door with double wall zinc-coated steel construction, gasketed airtight, with continuous hinges and cam latches. Insulate access doors with one-inch thick rigid insulation. Provide 12 inch by 12 inch door, except where larger sizes are indicated, or provide 12 inches by height of duct when duct is less than 12 inches high.

2.5.7 Fire Dampers

UL 555 and NFPA 90A. Dampers shall be listed in UL Bld Mat Dir. Dampers when open shall not protrude into the ducts.

2.5.8 Flexible Round Ducts

UL 181 and NFPA 90A with factory-applied insulation, vapor barrier, and end connections. Fire hazard rating of duct assembly shall not exceed 25 for flame spread and 50 for smoke developed. Provide ducts designed for working pressures of 2 inches W.G. positive and 1.5 inches W.G. negative. Flexible round duct length shall not exceed 5 feet. Secure connections by applying adhesive for 2 inches over rigid duct, apply flexible duct 2 inches over rigid duct, apply metal clamp, and provide minimum of three No. 8 sheet metal screws through clamp and rigid duct.

- a. Inner duct core: Flexible core shall be interlocking spiral or helically corrugated and constructed of zinc-coated steel, aluminum, or stainless steel; or shall be constructed of inner liner of continuous galvanized spring steel wire helix fused to continuous, fire-retardant, flexible vapor barrier film, inner duct core.
- b. Insulation: Inner duct core shall be insulated with mineral fiber blanket type flexible insulation, minimum of one inch thick. Insulation shall be covered on exterior with manufacturer's standard fire retardant vapor barrier jacket for flexible round duct.

2.6 PIPING SYSTEMS

Provide the following pipe and fittings. Provide dielectric fittings, unions or flanges between steel piping and copper tubing for all piping sizes; except that copper alloy valves and strainers may be used without dielectric fittings, unions or flanges. Water piping sizes 4 inches and smaller shall be copper tubing. Water piping sizes larger than 4 inches shall be copper tubing or steel piping. If steel piping is provided, provide a solids-from-water separator.

2.6.1 Soldered Joint Copper Tubing

Provide ASTM B 88, Type L for aboveground piping, Type K for buried piping, with ASME B16.18 or ASME/ANSI B16.22 solder joint fittings, unions, and flanges; provide adapters as required. Provide ASTM B 42 copper pipe nipples with threaded end connections. Provide ASTM B 32, 95-5 tin-antimony solder, or provide Plumbing Code approved lead-free solder.

2.6.2 Copper Tubing Piping Systems

Provide copper tubing for the following piping systems, except water piping sizes larger than 4 inches shall be copper tubing or steel piping.

- a. Chilled water, chilled-hot water, and hot water piping.
- b. Cold drain piping from drain pans.
- c. Fuel oil supply and return piping with ASME/ANSI B16.26 flared fittings or compression type fittings.

2.6.3 Copper Cold Drain Piping

Provide copper tubing in accordance with paragraph entitled "Copper Tubing" for piping sizes one inch and smaller. Provide ASTM B 306 copper tubing and ASME B16.23 solder joint fittings for piping sizes larger than one inch. In lieu of copper tubing, 1.25 inch Schedule 40 polyvinyl chloride (PVC) plastic pipe, fittings, and solvent cement may be provided.

2.6.4 Copper Refrigerant Tubing

Provide ASTM B 280, cleaned, dehydrated, and sealed. Provide ASME/ANSI B16.22 solder joint refrigerant fittings and adapters. Provide silver brazing alloy solder and silver brazing alloy flux. During brazing operations bleed a small amount of dry oil-free nitrogen continuously through the refrigerant tubing. Provide ASME/ANSI B16.26 flared fittings.

2.6.5 Steel Piping Systems

Provide steel piping for the following piping systems.

- a. Hot and Chilled water piping, larger than 4 in.

2.6.5.1 Steel Pipe

Provide ASTM A 53/A 53M Type E or Type S, or ASTM A 106 steel pipe; except ASTM A 53/A 53M, Type F steel pipe may be provided for water pipe sizes larger than 4 inches and for steam pipe less than 100 psig. Provide Weight Class STD or Schedule No. 40 black steel pipe for welding end connections. Provide Weight Class XS or Schedule No. 80 black steel pipe for threaded end connections and for condensate piping.

2.6.5.2 Steel Pipe Fittings

Provide ASME B16.3 or ASME B16.11 threaded fittings, and ASME/ANSI B16.39 threaded unions. Provide ASME B16.9 butt welding fittings of the same material and weight as the piping in which fittings are installed; provide backing rings compatible with piping materials being butt welded. Provide ASME B16.11 socket welding fittings.

2.6.5.3 Steel Pipe Unions

Provide ASME/ANSI B16.39, Class 150, unions with threaded end connections on one side of threaded valve in steel piping systems.

2.6.5.4 Steel Pipe Flanges

Provide ASME B16.5, Class 150 welding neck flanges. Extend bolts no less than two full threads beyond the nut with the bolts tightened to the required torque.

- a. Gaskets: Provide one piece factory cut gaskets suitable for the intended service. Provide full-face gaskets for flat-face flanged joints, and ring gaskets for raised-face flanged joints.
- b. Bolts: Provide ASTM A 193/A 193M, Grade B7 bolts.
- c. Nuts: ASTM A 194/A 194M, Grade 7.
- d. Washers: Provide steel flat circular washers under bolt heads and nuts.

2.6.6 Valves

Valves shall have flanged end connections, except valves smaller than 2.5 inches may have threaded end connections with a union on one side of the valve. Solder end connections may be used for connections between copper alloy valves and copper tubing.

2.6.6.1 Gate Valves

MSS SP-80, Class 125, except sizes 2.5 inches and larger shall conform to MSS SP-70, Class 125.

2.6.6.2 Globe and Angle Valves

MSS SP-80, Class 125, except sizes 2.5 inches and larger shall conform to MSS SP-85, Class 125.

2.6.6.3 Check Valves

MSS SP-80, Class 125, swing check; except sizes 2.5 inches and larger shall conform to MSS SP-71, Class 125.

2.6.6.4 Butterfly Valves

MSS SP-67, except sizes 2.5 inches and larger shall have lugged or wafer body designed for installation between ASME Class 150 flanges. Valves shall have two-position lever handles, except when infinite position lever handles are indicated.

2.6.6.5 Ball Valves

Full port design, copper alloy body, except sizes 2.5 inches and larger shall be cast-iron body. Valves shall have two-position lever handles. Ball valves may be provided in lieu of gate valves.

2.6.6.6 Square Head Cocks

Provide copper alloy or cast-iron body with copper alloy plugs, suitable for 125 psig water working pressure.

2.6.6.7 Air Venting Valves

Provide copper alloy body valves with automatic or manual air vent as indicated.

2.6.6.8 Combination Pressure and Temperature Relief Valves

ANSI Z21.22, copper alloy body, automatic reseating, test lever, and discharge capacity based on AGA temperature steam rating.

2.6.6.9 Water Pressure Reducing Valves

ASSE 1003, copper alloy body, automatic reseating, with test lever.

2.6.6.10 Water Temperature Regulating Valves

Provide copper alloy body, direct acting, pilot operated, for the intended service.

2.6.6.11 Automatic Flow Control Valves

Valve shall be tamperproof, factory calibrated, direct acting, automatic pressure compensating valve which limits flow rates to within range of plus or minus 10 percent accuracy, regardless of system pressure fluctuations. Select each valve for mid-range control of indicated capacity. Flow control mechanism includes self-cleaning spring loaded cut with open chambers and unobstructed flow passages. Valves shall be furnished by same manufacturer. Valve body shall have flow direction arrow. Provide strainer and union connection on inlet to valve. Copper alloy or cast-iron body, copper alloy or stainless internal working parts. Valves shall be suitable for 125 psig at 190 degrees F hot water. Valve body shall have factory-installed tappings for differential pressure meter connections for verification of pressure differential across valve orifice. Meter connections shall have positive check valves or shutoff valves.

2.7 PIPING ACCESSORIES

2.7.1 Pipe Hangers and Supports

Provide MSS SP-58 and MSS SP-69, Type 1 with adjustable type steel support rods, except as specified or indicated otherwise. Attach to steel joists with Type 19 or 23 clamps and retaining straps. Attach to Steel W or S beams with Type 21, 28, 29, or 30 clamps. Attach to steel angles and vertical web steel channels with Type 20 clamp with beam clamp channel adapter. Attach to horizontal web steel channel and wood with drilled hole on centerline and double nut and washer. Attach to concrete with Type 18 insert or drilled expansion anchor. Provide Type 40 insulation protection shield for insulated piping.

2.7.2 Pressure Gages

Provide single style pressure gage with 4.5-inch dial, brass or aluminum case, bronze tube, gage cock, pressure snubber, and syphon. Provide scale range for intended service.

2.7.3 Thermometers

Provide bi-metal dial type thermometers with stainless steel case, stem, and fixed thread connection; 3 inch diameter dial with glass face gasketed

within the case; and accuracy within 2 percent of scale range. Provide scale range for intended service.

2.7.4 Pipe Sleeves

Provide where piping passes entirely through walls, ceilings, roofs, and floors. Secure sleeves in position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, ceilings, roofs, and floors. Provide one-inch minimum clearance between exterior of piping or pipe insulation, and interior of sleeve or core-drilled hole. Firmly pack space with mineral wool insulation. Seal space at both ends of sleeve or core-drilled hole with plastic waterproof cement which will dry to a firm but pliable mass, or provide a mechanically adjustable segmented elastomeric seal. In fire walls and fire floors, seal both ends of sleeves or core-drilled holes with UL listed fill, void, or cavity material.

2.7.4.1 Sleeves in Masonry and Concrete

Provide steel pipe sleeves or schedule 40 PVC plastic pipe sleeves. Sleeves are not required where drain, waste, and vent (DWV) piping passes through concrete floor slabs located on grade. Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in the core-drilled hole are completely grouted smooth.

2.7.4.2 Sleeves not in Masonry and Concrete

Provide 26 gage galvanized steel sheet or PVC plastic pipe sleeves.

2.7.5 Flexible Pipe Connectors

Provide flexible bronze or stainless steel piping connectors with single braid where indicated. Connectors shall be suitable for the intended service.

2.7.6 Escutcheon Plates

Provide one piece or split hinge metal plates for piping entering floors, walls, and ceilings in exposed spaces. Provide polished stainless steel plates or chromium-plated finish on copper alloy plates in finished spaces. Provide paint finish on metal plates in unfinished spaces.

2.8 HEAT TAPE FOR FREEZE PROTECTION OF PIPING

Provide parallel conduction type that is composed of two copper conductors separated by conductive material and all encased in an insulating jacket. The heat tape shall be self-regulating that decreases heat output as temperature increases at each point along the length of tape. Provide voltage as indicated. Provide heat tape complete with fittings, adapters, and fittings, adapters, and other devices to connect tape to standard rigid steel conduit junction boxes, switches, or other devices as indicated. Provide tape sealants and jumper connectors up to 5-inches in length for connecting multiple runs. Provide a thermostat that activates the heat tape on drop of outside air temperature at 38 F. Thermostat shall have maximum tolerance of plus or minus 5 degrees F and maximum operating differential of 6 degrees F within temperature operating range. Wattage per foot of pipe at 50 F shall be as follows. This wattage may be achieved by spiraling the tape around the pipe.

Pipe Diameter (Inches)	1/2	3/4	1	1.25	1.5	2	3	4	6	8
Watt/Foot	2	2	2.5	2.5	3	3.5	4	6	7	8

2.8.1 Pressure/Temperature Test Ports (Plugs)

Provide solid bras test plugs where indicated. Test plug shall be capable of receiving a pressure or temperature probe 1/8-inch o.d. Dual seal core shall be rated zero leakage from vacuum to 200 psig and 0 F to 220 F. Each plug shall be extended through pipe insulation and be capped. Provide 2 each, pressure gauge adapters with 1/8-inch o.d. probe, 5-inch stem pocket testing thermometers for 25 F to 125 F.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 HVAC System

Installation of HVAC system including equipment, materials, installation, workmanship, fabrication, assembly, erection, examination, inspection, and testing shall be in accordance with ASME B31.1, ASME/ANSI B31.5, NFPA 70, and in accordance with the manufacturer's recommendations.

3.1.2 Connections to Existing Systems

Notify the Contracting Officer in writing at least 15 calendar days prior to the date the connections are required. Obtain approval before interrupting service. Furnish materials required to make connections into existing systems and perform excavating, backfilling, compacting, and other incidental labor as required. Furnish labor and tools for making actual connections to existing systems.

3.2 PIPING

Test, inspect, and approve piping before burying, covering, or concealing. Provide fittings for changes in direction of piping and for connections. Make changes in piping sizes through tapered reducing fittings; bushings will not be permitted. Install valves with stems horizontal or above. Provide flanges or unions at valves, traps, strainers, and connections to equipment; unions are not required in copper tubing piping systems.

- a. Threaded connections: Provide Teflon pipe thread paste on male threads. Do not thread metal pipe into plastic piping.
- b. Pipe hangers and supports: Provide additional pipe hangers and supports at in-line water pumps and flanged valves.
- c. Piping to receive insulation: Provide temporary wood spacers between the pipe hangers and supports, and the pipe in order to properly slope the piping and establish final elevations. Provide temporary wood spacers of same thickness as insulation to be provided under Section 23 07 00, "Insulation of Mechanical Systems." Support plastic piping every 4 feet. Support metal piping as follows.

MAXIMUM SPACING (FEET)

Nominal Pipe Size (inches)	One and under	1.25	1.5	2	2.5	3	3.5	4	5	6
Copper Tubing	6	7	8	8	9	10	11	12	13	14
Steel Pipe	7	8	9	10	11	12	13	14	16	17

- d. Cleaning of piping: Keep interior and ends of new piping and existing piping affected by Contractor's operations, cleaned of water and foreign matter during installation by using plugs or other approved methods. When work is not in progress, securely close open ends of pipe and fittings to prevent entry of water and foreign matter. Inspect piping before placing into position.
- e. Demolition: Remove materials so as not to damage materials which are to remain. Replace existing work damaged by Contractor's operations with new work of same construction.
- f. Tee Joints: Extracted tee joints may be made in copper tube. Make joint with an appropriate tool by drilling a pilot hole and drawing out the tube surface to form a collar having a minimum height of three times the thickness of the tube wall. To prevent the branch tube from being inserted beyond the depth of the extracted joint, provide dimpled depth stops. Notch the branch tube for proper penetration into fitting to assure a free flow joint. Braze extracted joints using a copper phosphorous classification brazing filler metal. Soldered joints shall not be permitted.

3.3 ADJUSTMENTS

Adjust controls and equipment so as to give satisfactory operation. Adjust entire water temperature control system and place in operation so that water quantities circulated are as indicated. Air duct systems shall be adjusted and balanced so that air quantities at outlets are as indicated and so that distribution from supply outlets is free from drafts and has uniform velocity over the face of each outlet.

3.4 INSTRUCTING OPERATING PERSONNEL

Upon completion of work and at time designated by Contracting Officer, provide services of competent technician for period of not less than one 8-hour working day for instruction of Government operating personnel in proper operation and maintenance of equipment.

3.5 FIELD QUALITY CONTROL

Upon completion and before final acceptance of work, test each new system in service to demonstrate compliance with the contract requirements. Adjust controls and balance systems prior to final acceptance of completed systems. Test controls through every cycle of operation. Test safety controls to demonstrate performance of required function. Correct defects in work provided by Contractor and repeat tests. Flush and clean piping before placing in operation. Clean equipment, piping, strainers, ducts, and filters.

3.5.1 Piping Systems Except for Refrigerant Piping

Before insulating, hydrostatically test each new piping system at not less than 188 psig. Maintain pressure for 2 hours with no leakage or reduction in gage pressure. Obtain approval before applying insulation.

3.5.2 Air Ducts

Obtain approval before applying insulation.

3.5.3 Equipment

3.5.3.1 Field Testing

Test each item of equipment in operation for continuous period of not less than 24 hours under every condition of operation in accordance with each equipment manufacturer's recommendation. Verify that the equipment operating parameters are within limits recommended by the manufacturer.

3.5.4 Additional Field Testing

Provide testing, adjusting, and balancing (TAB) of ducts, piping, and equipment under Section 23 05 92, "Testing/Adjusting/Balancing: Heating/Ventilating/Cooling Systems."

3.5.5 Testing EMCS Equipment

- a. All EMCS equipment shall be given an operation test.
- b. Items not operating properly shall be repaired or replaced and retested.

-- End of Section --

SECTION 23 84 16.00 20

DESICCANT DEHUMIDIFICATION EQUIPMENT

11/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2011; Errata 2 2012) National Electrical Code

1.2 RELATED REQUIREMENTS

Section 23 03 00 BASIC MECHANICAL MATERIALS AND METHODS applies to this section with the addition and modifications specified herein.

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Desiccant Dehumidification Unit

SD-07 Certificates

Desiccant dehumidification unit

SD-10 Operation and Maintenance Data

Desiccant dehumidification unit, Data Package 5

Submit in accordance with Section 01 78 23 OPERATION MAINTENANCE DATA.

PART 2 PRODUCTS

2.1 DESICCANT DEHUMIDIFICATION UNIT

2.1.1 Air Handling Components

All air handling components of the desiccant dehumidification unit (casing, dampers, fans vibration isolation, filter sections, mixing boxes, outside air intake, heating, and cooling, sections shall meet the requirements of Section 23 73 33 HEATING, VENTILATING, AND COOLING SYSTEM. Units shall include humidity controls (humidistat) and temperature controls (thermostat).

2.1.2 Total Heat Recovery Devices

2.1.3 Desiccant Wheel

Supply and regeneration airstreams shall be counterflow. The dehumidifier shall be a rotary type designed for continuous operation. The wheel structure shall be of the extended surface type in the axial flow direction and the geometry shall provide for laminar flow over the operating range for minimum air pressure differentials. The dehumidifier shall be complete with a drive system utilizing a fractional-horsepower electric motor and speed reducer assembly driving the rotor. A slack-side tensioner shall be included for automatic take-up for belt-driven wheels. The desiccant material shall be an adsorbing type. The desiccant material shall be applied to the wheel such that the entire surface is active as a desiccant and the desiccant material does not degrade or detach from the surface of the wheel. The wheel shall be fitted with full-face, low-friction contact seals on both sides to prevent cross leakage. The rotary structure shall have underheat, overheat and rotation fault circuitry. The wheel assembly shall be warranted for a minimum of five years.

PART 3 EXECUTION

3.1 PREPARATION

Provide storage for equipment and materials at the project site. Parts shall be readily accessible for inspection, repair, and renewal. Protect materials and equipment from weather.

3.2 INSTALLATION

Install desiccant dehumidification equipment as indicated and in accordance with the manufacturer's instructions. Provide clearance for inspection, repair, replacement, and service. Electrical work shall conform with [NFPA 70](#) and Division 16, "Electrical". Provide overload protection in the operating disconnect switches and magnetic starters. Locate outside air intake at a minimum of [25 feet](#) from industrial stacks, bathroom vents, and sanitary risers. Prevailing wind direction shall not be used as justification for placing air intake closer than [25 feet](#) of exhaust stacks. Install assembled units on vibration isolators. Bolt sections together in high pressure units. Pipe drain pan to nearest floor drain.

3.3 FIELD QUALITY CONTROL

Schedule and administer specified tests. Provide personnel, instruments and equipment for such tests. Correct defects and repeat the respective inspection and tests. Give the Contracting Officer ample notice of the dates and times scheduled for tests and trial operations. Conduct inspection and testing in the presence of the Contracting Officer.

Inspection

Prior to initial operation, inspect equipment installation for conformance with drawings and specifications.

3.3.1 Testing and Balancing

After preliminary tests, perform air handling and distribution equipment tests adjustment, and balancing in accordance with [Section 23 05 92](#) TESTING, ADJUSTING AND BALANCING.

3.4 FIELD TRAINING

The contractor shall conduct a training course for operating and maintenance personnel as designated by the Contracting Officer. Training shall be provided for a period of 4 hours of normal working time and shall start after the system is functionally complete but prior to the performance of tests. The field instruction shall cover all of the items contained in the approved Operating and Maintenance Instructions.

-- End of Section --

SECTION 26 00 00

BASIC ELECTRICAL MATERIALS AND METHODS

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D 709 (2001; R 2007) Laminated Thermosetting Materials

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.147 Control of Hazardous Energy (Lock Out/Tag Out)

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE Std 100 (2000) The Authoritative Dictionary of IEEE Standards Terms

IEEE C2 (2012) National Electrical Safety Code

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 6 (1993; R 2011) Enclosures

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2011; Errata 2 2012) National Electrical Code

1.2 DEFINITIONS

- a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE Std 100.
- b. The technical sections referred to herein are those specification sections that describe products, installation procedures, and equipment operations and that refer to this section for detailed description of submittal types.
- c. The technical paragraphs referred to herein are those paragraphs in PART 2 - PRODUCTS and PART 3 - EXECUTION of the technical sections that describe products, systems, installation procedures, equipment, and test methods.

1.3 SUBMITTALS

Submittals required in the sections which refer to this section shall conform to the requirements of Section 01 33 00, "Submittal Procedures" and to the following additional requirements. Submittals shall include the manufacturer's name, trade name, place of manufacture, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and technical paragraph reference. Submittals shall also include applicable federal, military, industry, and technical society publication references, and years of satisfactory service, and other information necessary to establish contract compliance of each item to be provided. Photographs of existing installations are unacceptable and will be returned without approval.

1.3.1 Manufacturer's Catalog Data

Submittals for each manufactured item shall be current manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog cuts. Handwritten and typed modifications and other notations not part of the manufacturer's preprinted data will result in the rejection of the submittal. Should manufacturer's data require supplemental information for clarification, the supplemental information shall be submitted as specified for certificates of compliance.

1.3.2 Drawings

Submit drawings a minimum of 14 by 20 inches in size using a minimum scale of 1/8 inch per foot, except as specified otherwise. Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.

1.3.3 Instructions

Where installation procedures or part of the installation procedures are required to be in accordance with manufacturer's instructions, submit printed copies of those instructions prior to installation. Installation of the item shall not proceed until manufacturer's instructions are received. Failure to submit manufacturer's instructions shall be cause for rejection of the equipment or material.

1.3.4 Certificates

Submit manufacturer's certifications as required for products, materials, finishes, and equipment as specified in the technical sections. Certificates from material suppliers are not acceptable. Preprinted certifications and copies of previously submitted documents will not be acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item. Certification shall not contain statements to imply that the item does not meet requirements specified, such as "as good as"; "achieve the same end use and results as materials formulated in accordance with the referenced publications"; or "equal or

exceed the service and performance of the specified material." Certifications shall simply state that the item conforms to the requirements specified. Certificates shall be printed on the manufacturer's letterhead and shall be signed by the manufacturer's official authorized to sign certificates of compliance.

1.3.4.1 Reference Standard Compliance

Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations such as American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA), Underwriters Laboratories (UL), and Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance.

1.3.5 Operation and Maintenance Manuals

Comply with the requirements of Section 01 78 23, "Operation and Maintenance Data" and the technical sections.

1.3.5.1 Operating Instructions

Submit text of posted operating instructions for each system and principal item of equipment as specified in the technical sections.

1.4 QUALITY ASSURANCE

1.4.1 Material and Equipment Qualifications

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in the technical section.

1.4.2 Regulatory Requirements

Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70.

1.4.3 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.4.4 Service Support

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis

during the warranty period of the contract.

1.4.5 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.4.6 Modification of References

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer.

1.4.7 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

1.5 POSTED OPERATING INSTRUCTIONS

Provide for each system and principal item of equipment as specified in the technical sections for use by operation and maintenance personnel. The operating instructions shall include the following:

- a. Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
- b. Start up, proper adjustment, operating, lubrication, and shutdown procedures.
- c. Safety precautions.
- d. The procedure in the event of equipment failure.
- e. Other items of instruction as recommended by the manufacturer of each system or item of equipment.

Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions where directed. For operating instructions exposed to the weather, provide weather-resistant materials or weatherproof enclosures. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

1.6 NAMEPLATES

ASTM D 709. Provide laminated plastic nameplates for each panelboard, equipment enclosure, relay, switch, and device; as specified in the technical sections or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, 0.125 inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be one by 2.5 inches. Lettering shall be a minimum of 0.25 inch high normal block style.

1.7 ELECTRICAL REQUIREMENTS

Electrical installations shall conform to IEEE C2, NFPA 70, and requirements specified herein.

1.7.1 Wiring and Conduit

Provide internal wiring for components of packaged equipment as an integral part of the equipment. Provide power wiring and conduit for field-installed equipment under Section 26 20 00, "Interior Distribution System." Power wiring and conduit shall conform to Section 26 20 00, "Interior Distribution System." Control wiring and conduit shall be provided under, and conform to the requirements of the section specifying the associated equipment.

1.8 INSTRUCTION TO GOVERNMENT PERSONNEL

Where specified in the technical sections, furnish the services of competent instructors to give full instruction to designated Government personnel in the adjustment, operation, and maintenance of the specified systems and equipment, including pertinent safety requirements as required. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section.

1.9 LOCKOUT REQUIREMENTS

Provide disconnecting means capable of being locked out for machines and other equipment to prevent unexpected startup or release of stored energy in accordance with 29 CFR 1910.147. Mechanical isolation of machines and other equipment shall be in accordance with requirements of Division 15, "Mechanical."

1.10 EQUIPMENT INVENTORY UPDATE

Submit information for each piece of equipment removed and supplied for use of Camp Lejeune to update the Maximo equipment inventory. For the purposes of this paragraph, inventoried equipment is defined as equipment listed on the Maximo Equipment Inventory Update form.

1.10.1 Requirements

The contractor shall prepare and submit one Maximo Equipment Inventory Update form for each individual item of inventoried equipment that is demolished, removed, replaced, or installed. (ex: three new condensing units would require the submission of three Equipment Inventory Update forms. The replacement of two existing air handling units with two new air handling units would require the submission of two Equipment Inventory Update forms). The contractor shall prepare and submit a VAV/TAB Room Number List for each VAV/Tab model installed in a single building. Only one Maximo Equipment Inventory Update form is required for each model of VAV or TAB in a single building.

1.10.1.1 Demolition of all equipment in a structure or facility

When all the inventoried equipment in a building or structure is demolished or removed, and not replaced, an Equipment Inventory Update form is not required.

1.10.1.2 Standards

The contractor shall provide accurate, complete, and legible information on all required forms. All required forms shall be completed and delivered to the Contracting Officer on or before the Beneficial Occupancy Date. All information on Equipment Inventory Update forms shall be obtained by visual inspection of equipment data plate(s).

1.10.1.3 Form Preparation

Each required Maximo Equipment Inventory Update form shall contain the following information:

- (1) The name and telephone number of an individual who can be contacted for clarification or additional information pertaining to the data on the form.
- (2) The date of data collection
- (3) The building or structure identification number and the specific location of the equipment within the structure (ex: 3d deck mech room)
- (4) A check adjacent to the description of the new or replacement item, and a check adjacent to the supplemental description if applicable (ex: circulating pump and HVAC or steam)
- (5) The Maximo number or serial number of the demolished or removed item, if applicable
- (6) All applicable data from the equipment data plate

Each Room Number List form shall contain the following information:

- (1) The name and telephone number of the individual providing the information
- (2) The date the form was completed
- (3) The building or structure identification number
- (4) A check in the box adjacent to each applicable room number

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 PAINTING OF EQUIPMENT

3.1.1 Factory Applied

Electrical equipment shall have factory-applied painting systems which

shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test.

3.1.2 Field Applied

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be as specified in the section specifying the associated electrical equipment.

3.2 NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

3.3 WARNING SIGN MOUNTING

Provide the number of signs required to be readable from each accessible side, but space the signs a maximum of 30 feet apart.

3.4 CABLE TAG INSTALLATION

Install cable tags in each manhole, handhole, and vault as specified, including each splice. Install cable tags over the fireproofing, if any, and locate the tags so that they are clearly visible without disturbing any cabling or wiring in the manholes, handholes, and vaults.

MAXIMO EQUIPMENT INVENTORY UPDATE

Employee: _____ Phone: _____ Date: ____/____/____

Bldg: _____ Specific Location: _____

- AC, Computer Room
- AC, Package
- AC, Package Terminal
- Assembly, Trap line
- Backflow Preventer
- Boiler
- Chiller, Air Cooled Recip
- Chiller, Air Cooled Screw
- Chiller, Air Cooled Scroll
- Chiller, Water Cooled Recip
- Chiller, Water Cooled Screw
- Compressor, Control Air
- Compressor, Industrial Air
- Dryer, Refrigerated Air
- Exchanger, Heat
- Evaporator, Freezer
- Evaporator, Refrigerator
- Fan, Exhaust
- Generator
- Heater, Space
- Heater, Unit
- Heat Pump, Geo-Thermal
- Heat Pump, Indoor Unit
- Heat Pump, Outdoor Unit
- Heat Pump, Package
- Heat Pump, Package Terminal
- Pump, Circulating, Chilled Water
- Pump, Circulating, Domestic Water
- Pump, Circulating, Dual Temp Water
- Pump, Circulating, Heating Water
- Pump, Condensate
- Pump, Sump
- Regulator, Temperature
- Tank, Hot Water Storage
- Tower, Cooling
- Unit, Air Handling
- Unit, AC Condensing
- Unit, Freezer Condensing
- Unit, Refrigerator Condensing
- Unit, Fan Coil
- Unit, TAB (Attach Room No. List)
- Unit, VAV (Attach Room No. List)
- Valve, Pressure Reducing
- Valve, Steam Pilot
- Water Heater

Demolished/Removed Equipment

Maximo no: _____ or Ser no: _____

New Equipment

Manufacturer: _____

Model no: _____

Ser no: _____

Type: __Elec __Oil __LP Gas __Nat Gas __Steam __Water __Air

Motor Data: HP____ Volts____ Phase____ RLA____ RPM____ Frame____

Tons____ No. of Motors____ no. of Belts____ Belt size(s)____ CFM____

KW____ Refrig type____ Refrig Qty____ Filter Size(s)_____

VAV/TAB Room Number List

Employee: _____

Phone: _____

Bldg: _____

Date: _____

VAV/TAB Model Number: _____

100 <input type="checkbox"/>	130 <input type="checkbox"/>	160 <input type="checkbox"/>	200 <input type="checkbox"/>	230 <input type="checkbox"/>	260 <input type="checkbox"/>	300 <input type="checkbox"/>	330 <input type="checkbox"/>	360 <input type="checkbox"/>
101 <input type="checkbox"/>	131 <input type="checkbox"/>	161 <input type="checkbox"/>	201 <input type="checkbox"/>	231 <input type="checkbox"/>	261 <input type="checkbox"/>	301 <input type="checkbox"/>	331 <input type="checkbox"/>	361 <input type="checkbox"/>
102 <input type="checkbox"/>	132 <input type="checkbox"/>	162 <input type="checkbox"/>	202 <input type="checkbox"/>	232 <input type="checkbox"/>	262 <input type="checkbox"/>	302 <input type="checkbox"/>	332 <input type="checkbox"/>	362 <input type="checkbox"/>
103 <input type="checkbox"/>	133 <input type="checkbox"/>	163 <input type="checkbox"/>	203 <input type="checkbox"/>	233 <input type="checkbox"/>	263 <input type="checkbox"/>	303 <input type="checkbox"/>	333 <input type="checkbox"/>	363 <input type="checkbox"/>
104 <input type="checkbox"/>	134 <input type="checkbox"/>	164 <input type="checkbox"/>	204 <input type="checkbox"/>	234 <input type="checkbox"/>	264 <input type="checkbox"/>	304 <input type="checkbox"/>	334 <input type="checkbox"/>	364 <input type="checkbox"/>
105 <input type="checkbox"/>	135 <input type="checkbox"/>	165 <input type="checkbox"/>	205 <input type="checkbox"/>	235 <input type="checkbox"/>	265 <input type="checkbox"/>	305 <input type="checkbox"/>	335 <input type="checkbox"/>	365 <input type="checkbox"/>
106 <input type="checkbox"/>	136 <input type="checkbox"/>	166 <input type="checkbox"/>	206 <input type="checkbox"/>	236 <input type="checkbox"/>	266 <input type="checkbox"/>	306 <input type="checkbox"/>	336 <input type="checkbox"/>	366 <input type="checkbox"/>
107 <input type="checkbox"/>	137 <input type="checkbox"/>	167 <input type="checkbox"/>	207 <input type="checkbox"/>	237 <input type="checkbox"/>	267 <input type="checkbox"/>	307 <input type="checkbox"/>	337 <input type="checkbox"/>	367 <input type="checkbox"/>
108 <input type="checkbox"/>	138 <input type="checkbox"/>	168 <input type="checkbox"/>	208 <input type="checkbox"/>	238 <input type="checkbox"/>	268 <input type="checkbox"/>	308 <input type="checkbox"/>	338 <input type="checkbox"/>	368 <input type="checkbox"/>
109 <input type="checkbox"/>	139 <input type="checkbox"/>	169 <input type="checkbox"/>	209 <input type="checkbox"/>	239 <input type="checkbox"/>	269 <input type="checkbox"/>	309 <input type="checkbox"/>	339 <input type="checkbox"/>	369 <input type="checkbox"/>
110 <input type="checkbox"/>	140 <input type="checkbox"/>	170 <input type="checkbox"/>	210 <input type="checkbox"/>	240 <input type="checkbox"/>	270 <input type="checkbox"/>	310 <input type="checkbox"/>	340 <input type="checkbox"/>	370 <input type="checkbox"/>
111 <input type="checkbox"/>	141 <input type="checkbox"/>	171 <input type="checkbox"/>	211 <input type="checkbox"/>	241 <input type="checkbox"/>	271 <input type="checkbox"/>	311 <input type="checkbox"/>	341 <input type="checkbox"/>	371 <input type="checkbox"/>
112 <input type="checkbox"/>	142 <input type="checkbox"/>	172 <input type="checkbox"/>	212 <input type="checkbox"/>	242 <input type="checkbox"/>	272 <input type="checkbox"/>	312 <input type="checkbox"/>	342 <input type="checkbox"/>	372 <input type="checkbox"/>
113 <input type="checkbox"/>	143 <input type="checkbox"/>	173 <input type="checkbox"/>	213 <input type="checkbox"/>	243 <input type="checkbox"/>	273 <input type="checkbox"/>	313 <input type="checkbox"/>	343 <input type="checkbox"/>	373 <input type="checkbox"/>
114 <input type="checkbox"/>	144 <input type="checkbox"/>	174 <input type="checkbox"/>	214 <input type="checkbox"/>	244 <input type="checkbox"/>	274 <input type="checkbox"/>	314 <input type="checkbox"/>	344 <input type="checkbox"/>	374 <input type="checkbox"/>
115 <input type="checkbox"/>	145 <input type="checkbox"/>	175 <input type="checkbox"/>	215 <input type="checkbox"/>	245 <input type="checkbox"/>	275 <input type="checkbox"/>	315 <input type="checkbox"/>	345 <input type="checkbox"/>	375 <input type="checkbox"/>
116 <input type="checkbox"/>	146 <input type="checkbox"/>		216 <input type="checkbox"/>	246 <input type="checkbox"/>		316 <input type="checkbox"/>	346 <input type="checkbox"/>	
117 <input type="checkbox"/>	147 <input type="checkbox"/>		217 <input type="checkbox"/>	247 <input type="checkbox"/>		317 <input type="checkbox"/>	347 <input type="checkbox"/>	
118 <input type="checkbox"/>	148 <input type="checkbox"/>		218 <input type="checkbox"/>	248 <input type="checkbox"/>		318 <input type="checkbox"/>	348 <input type="checkbox"/>	
119 <input type="checkbox"/>	149 <input type="checkbox"/>		219 <input type="checkbox"/>	249 <input type="checkbox"/>		319 <input type="checkbox"/>	349 <input type="checkbox"/>	
120 <input type="checkbox"/>	150 <input type="checkbox"/>		220 <input type="checkbox"/>	250 <input type="checkbox"/>		320 <input type="checkbox"/>	350 <input type="checkbox"/>	
121 <input type="checkbox"/>	151 <input type="checkbox"/>		221 <input type="checkbox"/>	251 <input type="checkbox"/>		321 <input type="checkbox"/>	351 <input type="checkbox"/>	
122 <input type="checkbox"/>	152 <input type="checkbox"/>		222 <input type="checkbox"/>	252 <input type="checkbox"/>		322 <input type="checkbox"/>	352 <input type="checkbox"/>	
123 <input type="checkbox"/>	153 <input type="checkbox"/>		223 <input type="checkbox"/>	253 <input type="checkbox"/>		323 <input type="checkbox"/>	353 <input type="checkbox"/>	
124 <input type="checkbox"/>	154 <input type="checkbox"/>		224 <input type="checkbox"/>	254 <input type="checkbox"/>		324 <input type="checkbox"/>	354 <input type="checkbox"/>	
125 <input type="checkbox"/>	155 <input type="checkbox"/>		225 <input type="checkbox"/>	255 <input type="checkbox"/>		325 <input type="checkbox"/>	355 <input type="checkbox"/>	
126 <input type="checkbox"/>	156 <input type="checkbox"/>		226 <input type="checkbox"/>	256 <input type="checkbox"/>		326 <input type="checkbox"/>	356 <input type="checkbox"/>	
127 <input type="checkbox"/>	157 <input type="checkbox"/>		227 <input type="checkbox"/>	257 <input type="checkbox"/>		327 <input type="checkbox"/>	357 <input type="checkbox"/>	
128 <input type="checkbox"/>	158 <input type="checkbox"/>		228 <input type="checkbox"/>	258 <input type="checkbox"/>		328 <input type="checkbox"/>	358 <input type="checkbox"/>	
129 <input type="checkbox"/>	159 <input type="checkbox"/>		229 <input type="checkbox"/>	259 <input type="checkbox"/>		329 <input type="checkbox"/>	359 <input type="checkbox"/>	

Instructions

- (1) Confirm room numbers by visual inspection
- (2) Check the box next to each applicable room number

End of Section

SECTION 26 05 00.00 40

COMMON WORK RESULTS FOR ELECTRICAL

11/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D 709 (2001; R 2007) Laminated Thermosetting Materials

ELECTRONIC INDUSTRIES ALLIANCE (EIA)

EIA 480 (1981) Toggle Switches

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE Stds Dictionary (2009) IEEE Standards Dictionary: Glossary of Terms & Definitions

INTERNATIONAL CODE COUNCIL (ICC)

ICC/ANSI A117.1 (2009) Accessible and Usable Buildings and Facilities

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI Z535.1 (2006) American National Standard for Safety--Color Code

ANSI/NEMA FB 1 (2007; AMD 2010) Standard for Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable

ANSI/NEMA OS 1 (2008; Amd 2010) Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports

NEMA 250 (2008) Enclosures for Electrical Equipment (1000 Volts Maximum)

NEMA KS 1 (2001; R 2006) Enclosed and Miscellaneous Distribution Equipment Switches (600 V Maximum)

NEMA PB 1 (2006; Errata 2008) Panelboards

NEMA RN 1 (2005) Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and

Intermediate Metal Conduit

NEMA TC 2 (2003) Standard for Electrical Polyvinyl Chloride (PVC) Conduit

NEMA TC 3 (2004) Standard for Polyvinyl Chloride (PVC) Fittings for Use With Rigid PVC Conduit and Tubing

NEMA WD 6 (2002; R 2008) Wiring Devices Dimensions Specifications

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2011; Errata 2 2012) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 1 (2005; Reprint Jul 2007) Standard for Flexible Metal Conduit

UL 1242 (2006; Reprint Jul 2007) Standard for Electrical Intermediate Metal Conduit -- Steel

UL 489 (2009; Reprint Jun 2011) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures

UL 506 (2008; Reprint Mar 2010) Specialty Transformers

UL 6 (2007; reprint Nov 2010) Electrical Rigid Metal Conduit-Steel

UL 797 (2007) Electrical Metallic Tubing -- Steel

1.2 DEFINITIONS

- a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE Stds Dictionary.
- b. The technical sections referred to herein are those specification sections that describe products, installation procedures, and equipment operations and that refer to this section for detailed description of submittal types.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Submit Material, Equipment, and Fixture Lists for the following:

Circuit Breakers

Panelboards

Lamps and Lighting Fixtures

Dry-Type Distribution Transformers

SD-03 Product Data

Submit manufacturer's catalog data for the following items:

Circuit Breakers

Panelboards

Lamps and Lighting Fixtures

Dry-Type Distribution Transformers

Certification

Submittal for vertical assemblies will be reviewed by a licensed Mechanical, Civil or Structural Engineer to determine that the entire assembly will withstand 135 mph wind loading.

SD-06 Test Reports

Continuity Test

SD-08 Manufacturer's Instructions

Submit Manufacturer's Instructions.

1.4 PREVENTION OF CORROSION

Protect metallic materials against corrosion. Provide equipment enclosures with the standard finish by the manufacturer when used for most indoor installations. Do not use aluminum when in contact with earth or concrete and, where connected to dissimilar metal, protect by approved fittings and treatment. Ferrous metals such as, but not limited to, anchors, bolts, braces, boxes, bodies, clamps, fittings, guards, nuts, pins, rods, shims, thimbles, washers, and miscellaneous spare parts not of corrosion-resistant steel shall be hot-dip galvanized except where other equivalent protective treatment is specifically approved in writing.

1.5 GENERAL REQUIREMENTS

Submit material, equipment, and fixture lists for the following items showing manufacturer's style or catalog numbers, specification and drawing reference numbers, warranty information, and fabrication site.

Submit manufacturer's instructions including special provisions required to install equipment components and system packages. Special notices shall detail impedances, hazards and safety precautions.

Submit certification required to install equipment components and system packages.

1.6 POSTED OPERATING INSTRUCTIONS

Provide for each system and principal item of equipment as specified in the technical sections for use by operation and maintenance personnel. The operating instructions shall include the following:

- a. Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
- b. Start up, proper adjustment, operating, lubrication, and shutdown procedures.
- c. Safety precautions.
- d. The procedure in the event of equipment failure.
- e. Other items of instruction as recommended by the manufacturer of each system or item of equipment.

Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions where directed. For operating instructions exposed to the weather, provide weather-resistant materials or weatherproof enclosures. Operating instructions shall not fade when exposed to sunlight and be secured to prevent easy removal or peeling.

1.7 MANUFACTURER'S NAMEPLATE

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.8 FIELD FABRICATED NAMEPLATES

ASTM D 709. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified in the technical sections or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, **0.125 inch** thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be **one by 2.5 inches**. Lettering shall be a minimum of **0.25 inch** high normal block style.

PART 2 PRODUCTS

2.1 MATERIALS

Materials and equipment to be provided shall be the standard cataloged products of manufacturers regularly engaged in the manufacture of the products.

2.1.1 Rigid Steel Conduit

Rigid steel conduit shall comply with **UL 6** and be galvanized by the hot-dip process. Rigid steel conduit shall be polyvinylchloride (PVC) coated in accordance with **NEMA RN 1**, where underground and in corrosive areas, or must be painted with bitumastic.

Fittings for rigid steel conduit shall be threaded.

Gaskets shall be solid. Conduit fittings with blank covers shall have gaskets, except in clean, dry areas or at the lowest point of a conduit run where drainage is required.

Covers shall have captive screws and be accessible after the work has been completed.

2.1.2 Electrical Metallic Tubing (EMT)

EMT shall be in accordance with [UL 797](#) and be zinc coated steel. Couplings and connectors shall be zinc-coated, raintight, gland compression with insulation throat. Crimp, spring, or setscrew type fittings are not acceptable.

2.1.3 Flexible Metallic Conduit

Flexible metallic conduit shall comply with [UL 1](#) and be galvanized steel.

Fittings for flexible metallic conduit shall be specifically designed for such conduit.

Provide liquidtight flexible metallic conduit with a protective jacket of PVC extruded over a flexible interlocked galvanized steel core to protect wiring against moisture, oil, chemicals, and corrosive fumes.

Specifically design fittings for liquidtight flexible metallic conduit for such conduit.

2.1.4 Intermediate Metal Conduit

Intermediate metal conduit shall comply with [UL 1242](#) and be galvanized.

2.1.5 Rigid Nonmetallic Conduit

Rigid nonmetallic conduit shall comply with [NEMA TC 2](#) and [NEMA TC 3](#) with wall thickness not less than Schedule 40.

2.2 WIRE AND CABLE

Conductors installed in conduit shall be copper 600-volt type THHN. All conductors [AWG No. 8](#) and larger, shall be stranded. All conductors smaller than [AWG No. 8](#) shall be solid.

Flexible cable shall be Type SO and contain a grounding conductor with green insulation.

Conductors installed in plenums shall be marked plenum rated.

2.3 SPLICES AND CONNECTORS

Make all splices in [AWG No. 8](#) and smaller with approved indenter crimp-type connectors and compression tools.

Make all splices in [AWG No. 6](#) and larger with bolted clamp-type connectors. Joints shall be wrapped with an insulating tape that has an insulation and temperature rating equivalent to that of the conductor.

2.4 SWITCHES

2.4.1 Safety Switches

Safety switches shall comply with [NEMA KS 1](#), and be the heavy-duty type with enclosure, voltage, current rating, number of poles, and fusing as indicated. Switch construction shall be such that, when the switch handle in the "ON" position, the cover or door cannot be opened. Cover release device shall be coinproof and be so constructed that an external tool shall be used to open the cover. Make provisions to lock the handle in the "OFF" position, but the switch shall not be capable of being locked in the "ON" position.

Provide switches of the quick-make, quick-break type. Approve terminal lugs for use with copper conductors.

Safety color coding for identification of safety switches shall conform to [ANSI Z535.1](#).

2.4.2 Toggle Switches

Toggle switches shall comply with [EIA 480](#), control incandescent, mercury, and fluorescent lighting fixtures and be of the heavy duty, general purpose, noninterchangeable flush-type.

Toggle switches shall be commercial grade toggle type devices rated 20 amperes at 277 volts, 60 hertz alternating current (ac) only.

All toggle switches shall be products of the same manufacturer.

2.5 RECEPTACLES

Receptacles shall be commercial grade, 20A, 125 VAC, 2-pole, 3-wire duplex conforming to [NEMA WD 6](#), NEMA 5-20R.

2.6 OUTLETS, OUTLET BOXES, AND PULL BOXES

Outlet boxes for use with conduit systems shall be in accordance with [ANSI/NEMA FB 1](#) and [ANSI/NEMA OS 1](#) and be not less than 1-1/2 inches deep. Furnish all pull and junction boxes with screw-fastened covers.

2.7 PANELBOARDS

Lighting and appliance branch circuit panelboards shall be the circuit-breaker type in accordance with [NEMA PB 1](#). Bolt circuit breakers to the bus. Plug-in circuit breakers are not acceptable. Buses shall be copper of the rating indicated, with main lugs or main circuit breaker as indicated. Provide all panelboards for use on grounded ac systems with a full-capacity isolated neutral bus and a separate grounding bus bonded to the panelboard enclosure. Panelboard enclosures shall be [NEMA 250](#), Type 1, in accordance with [NEMA PB 1](#). Provide enclosure fronts with latchable hinged doors.

2.8 CIRCUIT BREAKERS

Circuit-breaker interrupting rating shall be not less than those indicated and in no event less than 10,000 amperes root-mean-square (rms) symmetrical at 208 volts, respectively. Multipole circuit breakers shall be the

common-trip type with a single handle. Molded case circuit breakers shall be bolt-on type conforming to [UL 489](#).

2.9 LAMPS AND LIGHTING FIXTURES

Manufacturers and catalog numbers shown are indicative of the general type desired and are not intended to restrict the selection to fixtures of any particular manufacturer. Fixtures with the same salient features and equivalent light distribution and brightness characteristics, of equal finish and quality, are acceptable. Provide lamps of the proper type and wattage for each fixture.

Ballasts shall be high power factor and be energy efficient. Ballasts shall have a Class P terminal protective device for 120-volt operation as indicated and be rapid-start fluorescent. Ballasts shall be "A" sound rated. Fluorescent lamps shall be standard reduced wattage type.

High intensity discharge (HID) lighting fixtures shall have prewired integral ballasts and cast aluminum housings complete with tempered glass lenses suitable for installation in damp or wet locations. Provide fixtures and lamps.

2.10 DRY-TYPE DISTRIBUTION TRANSFORMERS

General purpose dry-type transformers with windings 600 volts or less shall be two-winding, 60 hertz, self-cooled in accordance with [UL 506](#). Windings shall have a minimum of two 2-1/2-percent taps above and below nominal voltage.

PART 3 EXECUTION

3.1 CONDUITS, RACEWAYS AND FITTINGS

Conduit runs between outlet and outlet, between fitting and fitting, or between outlet and fitting shall not contain more than the equivalent of three 90-degree bends, including those bends located immediately at the outlet or fitting.

Do not install crushed or deformed conduit. Avoid trapped conduit runs where possible. Take care to prevent the lodgment of foreign material in the conduit, boxes, fittings, and equipment during the course of construction. Clear any clogged conduit of obstructions or be replaced.

Conduit and raceway runs concealed in or behind walls, above ceilings, or exposed on walls and ceilings [5 feet](#) or more above finished floors and not subject to mechanical damage may be electrical metallic tubing (EMT).

3.1.1 Rigid Steel Conduit

Make field-made bends and offsets with approved hickey or conduit bending machine. Conduit elbows larger than [2-1/2 inches](#) shall be long radius.

Provide all conduit stubbed-up through concrete floors for connections to free-standing equipment with the exception of motor-control centers, cubicles, and other such items of equipment, with a flush coupling when the floor slab is of sufficient thickness. Otherwise, provide a floor box set flush with the finished floor. Conduits installed for future use shall be terminated with a coupling and plug set flush with the floor.

3.1.2 Electrical Metallic Tubing (EMT)

EMT shall be grounded in accordance with NFPA 70, using pressure grounding connectors especially designed for EMT.

3.1.3 Flexible Metallic Conduit

Use flexible metallic conduit to connect recessed fixtures from outlet boxes in ceilings, transformers, and other approved assemblies.

Bonding wires shall be used in flexible conduit as specified in NFPA 70, for all circuits. Flexible conduit shall not be considered a ground conductor.

Electrical connections to vibration-isolated equipment shall be made with flexible metallic conduit.

Liquidtight flexible metallic conduit shall be used in wet and oily locations and to complete the connection to motor-driven equipment.

3.1.4 Intermediate Conduit

Make all field-made bends and offsets with approved hickey or conduit bending machine. Use intermediate metal conduit only for indoor installations.

3.1.5 Rigid Nonmetallic Conduit

Rigid PVC conduit shall be direct buried.

A green insulated copper grounding conductor shall be in conduit with conductors and be solidly connected to ground at each end. Grounding wires shall be sized in accordance with NFPA 70.

3.2 WIRING

Feeder and branch circuit conductors shall be color coded as follows:

<u>CONDUCTOR</u>	<u>COLOR AC</u>
Phase A	_____
Phase B	_____
Phase C	_____
Neutral	White
Equipment Grounds	Green

Conductors up to and including AWG No. 2 shall be manufactured with colored insulating materials. Conductors larger than AWG No. 2 shall have ends identified with color plastic tape in outlet, pull, or junction boxes.

Splice in accordance with the NFPA 70. Provide conductor identification within each enclosure where a tap, splice, or termination is made and at the equipment terminal of each conductor. Terminal and conductor identification shall match as indicated.

Where several feeders pass through a common pullbox, the feeders shall be tagged to clearly indicate the electrical characteristics, circuit number, and panel designation.

3.3 SAFETY SWITCHES

Securely fasten switches to the supporting structure or wall, utilizing a minimum of four 1/4 inch bolts. Do not use sheet metal screws and small machine screws for mounting. Do not mount switches in an inaccessible location or where the passageway to the switch may become obstructed. Mounting height shall be 5 feet above floor level, when possible.

3.4 WIRING DEVICES

3.4.1 Wall Switches and Receptacles

Install wall switches and receptacles so that when device plates are applied, the plates will be aligned vertically to within 1/16 inch.

Ground terminal of each flush-mounted receptacle shall be bonded to the outlet box with an approved green bonding jumper when used with dry wall type construction.

3.4.2 Device Plates

Device plates for switches that are not within sight of the loads controlled shall be suitably engraved with a description of the loads.

Device plates and receptacle cover plates for receptacles other than 125-volt, single-phase, duplex, convenience outlets shall be suitably marked, showing the circuit number, voltage, frequency, phasing, and amperage available at the receptacle. Required marking shall consist of a self-adhesive label having 1/4 inch embossed letters.

Device plates for convenience outlets shall be similarly marked indicating the supply panel and circuit number.

3.5 BOXES AND FITTINGS

Furnish and install pullboxes where necessary in the conduit system to facilitate conductor installation. Conduit runs longer than 100 feet or with more than three right-angle bends shall have a pullbox installed at a convenient intermediate location.

Securely mount boxes and enclosures to the building structure with supporting facilities independent of the conduit entering or leaving the boxes.

Mounting height of wall-mounted outlet and switch boxes, measured between the bottom of the box and the finished floor, shall be in accordance with ICC/ANSI A117.1 and as follows:

<u>LOCATION</u>	<u>MOUNTING HEIGHT</u>
Receptacles in offices	18 inches
Receptacles in corridors	18 inches
Receptacles in shops and laboratories	48 inches

<u>LOCATION</u>	<u>MOUNTING HEIGHT</u>
Receptacles in rest rooms	48 inches
Switches for light control	48 inches

3.6 LAMPS AND LIGHTING FIXTURES

Install new lamps of the proper type and wattage in each fixture. Securely fasten fixtures and supports to structural members and install parallel and perpendicular to major axes of structures.

3.7 PANELBOARDS

Securely mount panelboards so that the top operating handle does not exceed 72-inches above the finished floor. Do not mount equipment within 36 inches of the front of the panel. Directory card information shall be complete and legible.

3.8 DRY-TYPE DISTRIBUTION TRANSFORMERS

Connect dry-type transformers with flexible metallic conduit.

3.9 IDENTIFICATION PLATES AND WARNINGS

Furnish and install identification plates for lighting and power panelboards, motor control centers, all line voltage heating and ventilating control panels, fire detector and sprinkler alarms, door bells, pilot lights, disconnect switches, manual starting switches, and magnetic starters. Process control devices and pilot lights shall have identification plates.

Furnish identification plates for all line voltage enclosed circuit breakers, identifying the equipment served, voltage, phase(s) and power source. Circuits 480 volts and above shall have conspicuously located warning signs in accordance with OSHA requirements.

3.10 PAINTING

Exposed conduit, supports, fittings, cabinets, pull boxes, and racks shall be thoroughly cleaned and painted as specified in Section 09 90 00 PAINTS AND COATINGS.

3.11 FIELD TESTING

Submit Test Reports in accordance with referenced standards in this section.

After completion of the installation and splicing, and prior to energizing the conductors, perform wire and cable continuity and insulation tests as herein specified before the conductors are energized.

Contractor shall provide all necessary test equipment, labor, and personnel to perform the tests, as herein specified.

Isolate completely all wire and cable from all extraneous electrical connections at cable terminations and joints. Substation and switchboard feeder breakers, disconnects in combination motor starters, circuit

breakers in panel boards, and other disconnecting devices shall be used to isolate the circuits under test.

Perform insulation-resistance test on each field-installed conductor with respect to ground and adjacent conductors. Applied potential shall be 500 volts dc for 300 volt rated cable and 1000 volts dc for 600 volt rated cable. Take readings after 1 minute and until the reading is constant for 15 seconds. Minimum insulation-resistance values shall not be less than 25 Megohms for 300 volt rated cable and 100 Megohms for 600 volt rated cable. For circuits with conductor sizes 8AWG and smaller insulation resistance testing is not required.

Perform [continuity test](#) to insure correct cable connection (i.e correct phase conductor, grounded conductor, and grounding conductor wiring) end-to-end. Any damages to existing or new electrical equipment resulting from contractor mis-wiring will be repaired and re-verified at contractor's expense. All repairs shall be approved by the CO prior to acceptance of the repair.

Conduct phase-rotation tests on all three-phase circuits using a phase-rotation indicating instrument. Perform phase rotation of electrical connections to connected equipment clockwise, facing the source.

Final acceptance will depend upon the successful performance of wire and cable under test. Do not energize any conductor until the final test reports are reviewed and approved by the CO.

-- End of Section --

SECTION 26 05 19.00 10

INSULATED WIRE AND CABLE

11/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES (AEIC)

AEIC C8 (2000) Extruded Dielectric Shielded Power Cables Rated 5 Through 46 kV

AEIC CS8 (2000) Extruded Dielectric Shielded Power Cables Rated 5 Through 46 kV

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA WC 70 (2009) Power Cable Rated 2000 V or Less for the Distribution of Electrical Energy--S95-658

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Installation Instructions

SD-06 Test Reports

Tests, Inspections, and Verifications

1.3 DELIVERY, STORAGE, AND HANDLING

Furnish cables on reels or coils. Each cable and the outside of each reel or coil, shall be plainly marked or tagged to indicate the cable length, voltage rating, conductor size, and manufacturer's lot number and reel number. Each coil or reel of cable shall contain only one continuous cable without splices. Cables for exclusively dc applications, as specified in paragraph HIGH VOLTAGE TEST SOURCE, shall be identified as such. Shielded cables rated 2,001 volts and above shall be reeled and marked in accordance with Section I of AEIC C8 or AEIC CS8, as applicable. Reels shall remain the property of the Contractor.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Wire Table

Furnish wire and cable in accordance with requirements specified on plans.

2.1.2 Rated Circuit Voltages

All wire and cable shall have minimum rated circuit voltages in accordance with NEMA WC 70.

2.1.3 Conductors

2.1.3.1 Material for Conductors

Conductors shall conform to all the applicable requirements of NEMA WC 70, as applicable, and shall be annealed copper. Copper conductors may be bare, or tin- or lead-alloy-coated, if required by the type of insulation used.

2.1.3.2 Size

Minimum wire size shall be No. 12 AWG for power and lighting circuits; No. 10 AWG for current transformer secondary circuits; No. 14 AWG for potential transformer, relaying, and control circuits; No. 16 AWG for annunciator circuits; and No. 19 AWG for alarm circuits. Minimum wire sizes for rated circuit voltages of 2,001 volts and above shall not be less than those listed for the applicable voltage in NEMA WC 70, as applicable.

2.1.3.3 Stranding

Conductor stranding classes cited herein shall be as defined in NEMA WC 70, as applicable. Lighting conductors No. 10 AWG and smaller shall be solid or have Class B stranding. Any conductors used between stationary and moving devices, such as hinged doors or panels, shall have Class H or K stranding. All other conductors shall have Class B or C stranding, except that conductors shown on the drawings, or in the schedule, as No. 12 AWG may be 19 strands of No. 25 AWG, and conductors shown as No. 10 AWG may be 19 strands of No. 22 AWG.

2.1.3.4 Conductor Shielding

Use conductor shielding conforming to NEMA WC 70, as applicable, on power cables having a rated circuit voltage above 2,000 volts. In addition, conductor shielding for shielded cables shall also comply with Section C of AEIC C8 or AEIC CS8. Strict precautions shall be taken after application of the conductor shielding to prevent the inclusion of voids or contamination between the conductor shielding and the subsequently applied insulation.

2.1.3.5 Separator Tape

Where conductor shielding, strand filling, or other special conductor treatment is not required, a separator tape between conductor and insulation is permitted.

2.1.4 Insulation

2.1.4.1 Insulation Material

Provide insulation which is a cross-linked thermosetting polyethylene (XLPE) type, meeting the requirements of NEMA WC 70, as applicable, or an ethylene-propylene rubber (EPR) type meeting the requirements of NEMA WC 70. For shielded cables of rated circuit voltages above 2,000 volts, the following provisions shall also apply:

- a. XLPE, if used, shall be tree-retardant.
- b. Insulation shall be chemically bonded to conductor shielding.
- c. The insulation material and its manufacturing, handling, extrusion and vulcanizing processes, shall all be subject to strict procedures to prevent the inclusion of voids, contamination, or other irregularities on or in the insulation. Insulation material shall be inspected for voids and contaminants. Inspection methods, and maximum allowable void and contaminant content shall be in accordance with Section B of AEIC C8 or AEIC CS8, as applicable.
- d. Cables with repaired insulation defects discovered during factory testing, or with splices or insulation joints, are not acceptable unless specifically approved.

2.1.4.2 Insulation Thickness

The insulation thickness for each conductor shall be based on its rated circuit voltage.

- a. Power Cables/Single-Conductor Control Cables, 2,000 Volts and Below - The insulation thickness for single-conductor cables rated 2,000 volts and below shall be as required by NEMA WC 70, as applicable. Some thicknesses of NEMA WC 70 will be permitted only for single-conductor cross-linked thermosetting polyethylene insulated cables without a jacket. NEMA WC 70 ethylene-propylene rubber-insulated conductors shall have a jacket.
- b. Power Cables, Rated 2,001 Volts and Above - Thickness of insulation for power cables rated 2,001 volts and above shall be in accordance with the following:
 - (1) Non-shielded cables, 2,001 to 5,000 volts, shall comply with NEMA WC 70, as applicable.
 - (2) Shielded cables rated 2,001 volts and above shall comply with Column B of Table B1, of AEIC C8 or AEIC CS8, as applicable.
- c. Multiple-Conductor Control Cables - The insulation thickness of multiple-conductor cables used for control and related purposes shall be as required by NEMA WC 70, as applicable.

2.1.4.3 Insulation Shielding

Unless otherwise specified, provide insulation shielding for conductors having rated circuit voltages of 2,001 volts and above. The voltage limits above which insulation shielding is required, and the material requirements, are given in NEMA WC 70, as applicable. The material, if

thermosetting, shall meet the wafer boil test requirements as described in Section D of **AEIC C8** or **AEIC CS8**, as applicable. The method of shielding shall be in accordance with the current practice of the industry; however, the application process shall include strict precautions to prevent voids or contamination between the insulation and the nonmetallic component. Voids, protrusions, and indentations of the shield shall not exceed the maximum allowances specified in Section C of **AEIC C8** or **AEIC CS8**, as applicable. The cable shall be capable of operating without damage or excessive temperature when the shield is grounded at both ends of each conductor. All components of the shielding system shall remain tightly applied to the components they enclose after handling and installation in accordance with the manufacturer's recommendations. Shielding systems which require heat to remove will not be permitted unless specifically approved.

2.1.5 Jackets

All cables shall have jackets meeting the requirements of **NEMA WC 70**, as applicable, and as specified herein. Individual conductors of multiple-conductor cables shall be required to have jackets only if they are necessary for the conductor to meet other specifications herein. Jackets of single-conductor cables and of individual conductors of multiple-conductor cables, except for shielded cables, shall be in direct contact and adhere or be vulcanized to the conductor insulation. Multiple-conductor cables and shielded single-conductor cables shall be provided with a common overall jacket, which shall be tightly and concentrically formed around the core. Repaired jacket defects found and corrected during manufacturing are permitted if the cable, including jacket, afterward fully meets these specifications and the requirements of the applicable standards.

2.1.5.1 Jacket Material

The jacket shall be one of the materials listed below. Polyvinyl chloride compounds will not be permitted. Variations from the materials required below will be permitted only if approved for each specific use, upon submittal of sufficient data to prove that they exceed all specified requirements for the particular application.

a. General Use

- (1) Heavy-duty black neoprene (**NEMA WC 70**).
- (2) Heavy-duty chlorosulfonated polyethylene (**NEMA WC 70**).
- (3) Heavy-duty cross-linked (thermoset) chlorinated polyethylene (**NEMA WC 70**).

b. Accessible Use Only, 2,000 Volts or Less - Cables installed where they are entirely accessible, such as cable trays and raceways with removable covers, or where they pass through less than 10 feet of exposed conduit only, shall have jackets of one of the materials specified in above paragraph GENERAL USE, or the jackets may be of one of the following:

- (1) General-purpose neoprene (**NEMA WC 70**).
- (2) Black polyethylene (**NEMA WC 70**).

- (3) Thermoplastic chlorinated polyethylene (NEMA WC 70).

2.1.5.2 Jacket Thickness

The minimum thickness of the jackets at any point shall be not less than 80 percent of the respective nominal thicknesses specified below.

a. Multiple-Conductor Cables - Thickness of the jackets of the individual conductors of multiple-conductor cables shall be as required by NEMA WC 70, and shall be in addition to the conductor insulation thickness required by Column B of Table 3-1 of the applicable NEMA publication for the insulation used. Thickness of the outer jackets or sheaths of the assembled multiple-conductor cables shall be as required by NEMA WC 70.

b. Single-Conductor Cables - Single-conductor cables, if nonshielded, shall have a jacket thickness as specified in NEMA WC 70. If shielded, the jacket thickness shall be in accordance with the requirements of NEMA WC 70.

2.1.6 Metal-Clad Cable

2.1.6.1 General

The metallic covering shall be interlocked steel tape, conforming to the applicable requirements of NEMA WC 70. If the covering is of ferrous metal, it shall be galvanized. Copper grounding conductor(s) conforming to NEMA WC 70 shall be furnished for each multiple-conductor metal-clad cable. Assembly and cabling shall be as specified in paragraph CABLING. The metallic covering shall be applied over an inner jacket or filler tape. The cable shall be assembled so that the metallic covering will be tightly bound over a firm core.

2.1.6.2 Jackets

Metal-clad cables may have a jacket under the armor, and shall have a jacket over the armor. Jackets shall comply with the requirements of NEMA WC 70. The outer jacket for the metal-clad cable may be of polyvinyl chloride only if specifically approved.

2.2 CABLE IDENTIFICATION

2.2.1 Color-Coding

Insulation of individual conductors of multiple-conductor cables shall be color-coded in accordance with NEMA WC 70, except that colored braids will not be permitted. Only one color-code method shall be used for each cable construction type. Control cable color-coding shall be in accordance with NEMA WC 70. Power cable color-coding shall be black for Phase A, red for Phase B, blue for Phase C, white for grounded neutral, and green for an insulated grounding conductor, if included.

2.2.2 Shielded Cables Rated 2,001 Volts and Above

Marking shall be in accordance with Section H of AEIC C8 or AEIC CS8, as applicable.

2.2.3 Cabling

Individual conductors of multiple-conductor cables shall be assembled with flame-and moisture-resistant fillers, binders, and a lay conforming to **NEMA WC 70**, except that flat twin cables will not be permitted. Fillers shall be used in the interstices of multiple-conductor round cables with a common covering where necessary to give the completed cable a substantially circular cross section. Fillers shall be non-hygroscopic material, compatible with the cable insulation, jacket, and other components of the cable. The rubber-filled or other approved type of binding tape shall consist of a material that is compatible with the other components of the cable and shall be lapped at least 10 percent of its width.

2.2.4 Dimensional Tolerance

The outside diameters of single-conductor cables and of multiple-conductor cables shall not vary more than 5 percent and 10 percent, respectively, from the manufacturer's published catalog data.

PART 3 EXECUTION

3.1 **INSTALLATION INSTRUCTIONS**

Submit cable manufacturing data as requested. The following information shall be provided by the cable manufacturer for each size, conductor quantity, and type of cable furnished:

- a. Minimum bending radius, in inches - For multiple-conductor cables, this information shall be provided for both the individual conductors and the multiple-conductor cable.
- b. Pulling tension and sidewall pressure limits, in **pounds**.
- c. Instructions for stripping semiconducting insulation shields, if furnished, with minimum effort without damaging the insulation.
- d. Upon request, compatibility of cable materials and construction with specific materials and hardware manufactured by others shall be stated. Also, if requested, recommendations shall be provided for various cable operations, including installing, splicing, terminating, etc.

3.2 **TESTS, INSPECTIONS, AND VERIFICATIONS**

3.2.1 Cable Data

Manufacture of the wire and cable shall not be started until all materials to be used in the fabrication of the finished wire or cable have been approved by the Contracting Officer. Cable data shall be submitted for approval including dimensioned sketches showing cable construction, and sufficient additional data to show that these specifications will be satisfied.

3.2.2 Inspection and Tests

Inspection and tests of wire and cable furnished under these specifications shall be made by and at the plant of the manufacturer, and shall be witnessed by the Contracting Officer or his authorized representative, unless waived in writing. The Government may perform further tests before

or after installation. Testing in general shall comply with NEMA WC 70. Specific tests required for particular materials, components, and completed cables shall be as specified in the sections of the above standards applicable to those materials, components, and cable types. Tests shall also be performed in accordance with the additional requirements specified below. Submit 3 certified copies of test reports.

3.2.2.1 Shielded Cables Rated 2,001 Volts or Greater

The following tests shall be performed in addition to those specified above. Section or paragraph references are to AEIC C8 or AEIC CS8 as applicable, unless otherwise stated.

3.2.2.2 Independent Tests

The Government may at any time make visual inspections, continuity or resistance checks, insulation resistance readings, power factor tests, or dc high-potential tests at field test values. A cable's failure to pass these tests and inspections, or failure to produce readings consistent with acceptable values for the application, will be grounds for rejection of the cable.

3.2.2.3 Reports

Furnish results of tests made. No wire or cable shall be shipped until authorized. Lot number and reel or coil number of wire and cable tested shall be indicated on the test reports.

-- End of Section --

SECTION 26 05 71.00 40

LOW VOLTAGE OVERCURRENT PROTECTIVE DEVICES

05/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C37.90 (2005) Standard for Relays and Relay Systems Associated With Electric Power Apparatus

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250 (2008) Enclosures for Electrical Equipment (1000 Volts Maximum)

NEMA AB 3 (2006) Molded Case Circuit Breakers and Their Application

NEMA FU 1 (2002; R 2007) Low Voltage Cartridge Fuses

NEMA ICS 1 (2000; R 2005; R 2008) Standard for Industrial Control and Systems: General Requirements

NEMA ICS 2 (2000; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2011; Errata 2 2012) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 489 (2009; Reprint Jun 2011) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Prior to the beginning of construction, submit manufactures

equipment and performance data for the following items including use life, system functional flows, safety features, and mechanical automated details..

Fuses

SD-03 Product Data

Submit manufacturer's equipment and performance data for the following items including use life, system functional flows, safety features, and mechanical automated details.

Enclosures

Circuit Breakers

SD-08 Manufacturer's Instructions

Submit manufacturer's instructions for the following items, including special provisions required to install equipment components and system packages. Provide detail on resistance impedances, hazards and safety precautions within the special notices.

Control Devices

Protective Devices

SD-10 Operation and Maintenance Data

Submit Operation and Maintenance Manuals for the following equipment:

Circuit Breakers

1.3 GENERAL REQUIREMENTS

Section 26 00 00 BASIC ELECTRICAL MATERIALS AND METHODS applies to work specified in this section.

PART 2 PRODUCTS

2.1 ENCLOSURES

2.1.1 Equipment Enclosures

Provide enclosures for equipment in accordance with NEMA 250.

Contain equipment installed inside, clean, dry locations in a NEMA Type 1, general-purpose sheet-steel enclosure.

2.2 CIRCUIT BREAKERS

Provide circuit breakers that conform to UL 489, and NEMA AB 3.

2.2.1 Molded-Case Circuit Breakers

Provide molded case, manually operated, trip-free, circuit breakers, with inverse-time thermal-overload protection and instantaneous magnetic short-circuit protection as required. Completely enclose circuit breakers in a molded case, with the calibrated sensing element factory-sealed to

prevent tampering.

Locate thermal-magnetic tripping elements in each pole of the circuit breaker, and provide inverse-time-delay thermal overload protection and instantaneous magnetic short-circuit protection. Provide instantaneous magnetic tripping element, that is adjustable and accessible from the front of the breaker on frame sizes larger than 100 amperes.

Size breaker as required for the continuous current rating of the circuit. Provide breaker class as required.

Provide sufficient interrupting capacity of the panel and lighting branch circuit breakers, to successfully interrupt the maximum short-circuit current imposed on the circuit at the breaker terminals. Provide circuit breaker interrupting capacities with a minimum of 10,000 amperes and that conform to [NEMA AB 3](#).

Provide the common-trip type multipole circuit breakers having a single operating handle and a two-position on/off indication. Provide circuit breakers with temperature compensation for operation in an ambient temperature of 104 degrees F. Provide circuit breakers that have root mean square (rms) symmetrical interrupting ratings sufficient to protect the circuit being supplied. Interrupting ratings may have selective type tripping (time delay, magnetic, thermal, or ground fault).

Provide phenolic composition breaker body capable of having such accessories as handle-extension, handle-locking, and padlocking devices attached where required.

Provide circuit breakers used for meter circuit disconnects that meet the applicable requirements of [NFPA 70](#) and that are of the motor-circuit protector type.

For circuit breakers used for service disconnection, provide an enclosed circuit-breaker type with external handle for manual operation. Provide sheet metal enclosures with a hinged cover suitable for surface mounting.

2.2.2 Enclosed Molded-Case Circuit Breakers

For enclosed circuit breakers, provide thermal-magnetic molded-case circuit breakers in surface-mounted, nonventilated enclosures conforming to the appropriate articles of [NEMA 250](#) and [UL 489](#).

Provide enclosed circuit breakers in nonhazardous locations as follows:

Contain circuit breakers installed inside clean, dry locations in NEMA Type 1, general purpose sheet steel enclosures.

Contain circuit breakers installed in unprotected outdoor locations, in NEMA Type 3R, weather-resistant sheet steel enclosures that are splashproof, weatherproof, sleetproof, and moisture resistant.

2.3 FUSES

Provide a complete set of fuses for all switches and switchgear. Rate fuses that have a voltage rating of not less than the circuit voltage.

Make no change in continuous-current rating, interrupting rating, and clearing or melting time of fuses unless written permission has first been

secured.

Provide nonrenewable cartridge type fuses for ratings 30 amperes, 125 volts or less. Provide renewable cartridge type fuses for ratings above 30 amperes 600 volts or less with time-delay dual elements, except where otherwise indicated. Conform to [NEMA FU 1](#) for fuses.

Label fuses showing UL class, interrupting rating, and time-delay characteristics, when applicable. Additionally, clearly list fuse information on equipment drawings.

Provide porcelain fuse holders when field-mounted in a cabinet or box. Do not use fuse holders made of such materials as ebony asbestos, Bakelite, or pressed fiber for field installation.

2.4 CONTROL DEVICES

2.4.1 Magnetic Contactors

Provide magnetic contactors in accordance with [NEMA ICS 1](#) and [NEMA ICS 2](#) as required for the control of low-voltage, 60-hertz, tungsten-lamp loads, fluorescent-lamp loads, resistance-heating loads, and the primary windings of low-voltage transformers.

Provide core-and-coil assembly that operates satisfactorily with coil voltage between 85 and 110 percent of its voltage rating.

Provide contactor that is designed with a normally open holding circuit auxiliary contact for control circuits, with a rating in accordance with [NEMA ICS 1](#) and [NEMA ICS 2](#).

Furnish solderless pressure wire terminal connectors, or make available for line-and-load connections to contactors in accordance with [NEMA ICS 1](#) and [NEMA ICS 2](#).

Provide magnetic contactors with a rating in accordance with [NEMA ICS 1](#) and [NEMA ICS 2](#).

2.4.2 Magnetic Control Relays

Provide magnetic control relays for energizing and de-energizing the coils of magnetic contactors or other magnetically operated devices, in response to variations in the conditions of electric control devices in accordance with [NEMA ICS 1](#), and [NEMA ICS 2](#).

Provide core-and-coil assembly that operates satisfactorily with coil voltages between 85 and 110 percent of their voltage rating.

Provide relays that are designed to accommodate normally open and normally closed contacts.

Provide 120 -volt, 60-hertz, Class AIB magnetic control relays with a continuous contact rating of 10 amperes, and with current-making and -breaking ability in accordance with [NEMA ICS 1](#) and [NEMA ICS 2](#), two normally open and two normally closed.

2.5 PROTECTIVE RELAYS

2.5.1 Overcurrent Relays

Conform to [IEEE C37.90](#) for overcurrent relays.

For protection against phase and ground faults, provide single-phase nondirectional removable induction type overcurrent relays with built-in testing facilities designed for operation on the dc or ac control circuit indicated.

Provide ground-fault overcurrent relays with short-time inverse time characteristics with adjustable current tap range as required.

2.6 FINISH

Protect metallic materials against corrosion. Provide equipment with the standard finish by the manufacturer when used for most indoor installations.

PART 3 EXECUTION

3.1 INSTALLATION

Install [Control devices](#) and [protective devices](#) that are not factory installed in equipment, in accordance with the manufacturer's recommendations and field adjusted and operation tested. Conform to [NFPA 70](#), [NEMA ICS 1](#) and [NEMA ICS 2](#) requirements for installation of control and protective devices.

3.2 FIELD TESTING

Demonstrate to operate as indicated control and protective devices not factory installed in equipment.

Ratio and verify tap settings of instrumentation, potential, and current transformers.

Do not energize control and protective devices until recorded test data has been approved. Provide final test reports with a cover letter/sheet clearly marked with the System name, Date, and the words "Final Test Reports - Forward to the Systems Engineer/Condition Monitoring Office/Predictive Testing Group for inclusion in the Maintenance Database."

-- End of Section --

SECTION 26 09 23.00 40

LIGHTING CONTROL DEVICES

08/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

GREEN SEAL (GS)

GC-12 (1997) Occupancy Sensors

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 6 (1993; R 2011) Enclosures

UNDERWRITERS LABORATORIES (UL)

UL 773 (1995; Reprint Mar 2002) Standard for Plug-In, Locking Type Photocontrols for Use with Area Lighting

UL 773A (2006; Reprint Mar 2011) Standard for Nonindustrial Photoelectric Switches for Lighting Control

UL 98 (2004; Reprint Jan 2011) Enclosed and Dead-Front Switches

1.2 GENERAL REQUIREMENTS

Section 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS applies to work specified in this section.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Time Switch;

Photocell Switch;

Occupancy Sensors;

PART 2 PRODUCTS

2.1 TIME CONTROL SWITCHES

Install switches with not less than four 1/4 inch bolts. The use of sheet metal screws is not allowed.

2.2 MANUAL AND SAFETY SWITCHES

Provide Astronomic dial type arranged to turn "ON" at sunset, and turn "OFF" at a pre-determined time or sunrise, automatically changing the settings each day in accordance with seasonal changes of sunset and sunrise. Provide a switch rated 120 volts, having automatically wound spring mechanism to maintain accurate time for a minimum of 7 hours following a power failure, with a time switch with a manual on-off bypass switch. Provide surface mounted housing for the time switch, type NEMA 1 (indoor) enclosure.

Provide switch mechanism consisting of a heavy-duty general-purpose precision snap-acting switch, single-pole, single-throw, suitable for operation on a 208Y/120 volt, 60 Hz, three-phase system. Provide with a selector switch having a minimum of three positions: ON, OFF, and AUTOMATIC. Use the automatic position when photoelectric or timer control is desired. Interface the selector switch with the lighting system magnetic contactor to control system activity.

Provide switches conforming to UL 98. Provide switch construction of the quick-make, quick-break type, such that a screwdriver is required to open the switch door when the switch is on, with blades visible when the door is open. Coordinate terminal lugs with the wire size.

2.3 TIME SWITCH

Provide astronomic dial type or electronic type, arranged to turn "ON" at sunset and turn "OFF" at predetermined time between 8:30 p.m. and 2:30 a.m. or sunrise, automatically changing the settings each day in accordance with seasonal changes of sunset and sunrise. Provide switch rated 120 volts, having automatically wound spring mechanism or capacitor, to maintain accurate time for a minimum of 7 hours following power failure. Provide time switch with a manual on-off bypass switch. Surface mount the housing for the time switch, NEMA 1 enclosure conforming to NEMA ICS 6.

2.4 PHOTOCCELL SWITCH

Provide photocell switch conforming to UL 773 or UL 773A, hermetically sealed cadmium-sulfide or silicon diode type cell rated 120 volts ac, 60 Hz with single-throw contacts designed to fail to the ON position. Provide switch which turns on at or below 3 footcandles and off at 4 to 10 footcandles. Provide time delay to prevent accidental switching from transient light sources. Provide a directional lens in front of the cell to prevent fixed light sources from creating a turnoff condition. Provide switch:

2.5 OCCUPANCY SENSORS

Provide UL listed occupancy sensor complying with GC-12. Design occupancy sensors and power packs to operate on the voltage indicated. Provide sensors and power packs with circuitry that only allows load switching at or near zero current crossing of supply voltage, with mounting as

indicated. Provide sensor with an LED occupant detection indicator, adjustable sensitivity, and adjustable delayed-off time range of 5 minutes to 15 minutes. Provide color matching the adjacent wall plates as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM wall mounted sensors, and white ceiling mounted sensors. Provide ceiling mounted sensors with 360 degree coverage unless otherwise indicated.

2.6 EQUIPMENT IDENTIFICATION

2.6.1 Manufacturer's Nameplate

Provide each item of equipment with a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in an inconspicuous place; the nameplate of the distributing agent is not acceptable.

2.6.2 Labels

Provide labeled control devices, clearly marked for operation of specific lighting functions according to type. Note the following devices characteristics in the format "Use Only _____":

Make markings related to control device type clear and locate to be readily visible to service personnel, but unseen from normal viewing angles when devices are in place.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Time Control Switches

Install switches with not less than four 1/4 inch bolts. The use of sheet metal screws is not allowed.

3.1.2 Manual and Safety Switches

Coordinate terminal lugs with the wire size. Securely fasten switches to the supporting structure or wall using not less than four 1/4 inch bolts. The use of sheet metal screws is not allowed.

3.2 FIELD TESTING

Demonstrate that photoconductive control devices operate satisfactorily in the presence of the Contracting Officer.

Perform System Operation Tests in accordance with referenced standards in this section.

-- End of Section --

SECTION 26 20 00

INTERIOR DISTRIBUTION SYSTEM

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C80.5 (1994) Aluminum Rigid Conduit-(ARC)

ASTM INTERNATIONAL (ASTM)

ASTM B 1 (2001; R 2007) Standard Specification for Hard-Drawn Copper Wire

ASTM B 8 (2011) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS (1999) Electrical Power Distribution Equipment and Systems

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA C80.1 (1994) Rigid Steel Conduit - Zinc Coated

NEMA C80.3 (1994) Electrical Metallic Tubing - Zinc Coated (EMT)

NEMA FU 1 (2002; R 2007) Low Voltage Cartridge Fuses

NEMA ICS 6 (1993; R 2011) Enclosures

NEMA KS 1 (2001; R 2006) Enclosed and Miscellaneous Distribution Equipment Switches (600 V Maximum)

NEMA RN 1 (2005) Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit

NEMA ST 20 (1992; R 1997) Dry-Type Transformers for General Applications

NEMA TC 14 (2002) Filament-Wound Reinforced Thermosetting Resin Conduit (RTRC) and Fittings

NEMA TC 2	(2003) Standard for Electrical Polyvinyl Chloride (PVC) Conduit
NEMA TC 3	(2004) Standard for Polyvinyl Chloride (PVC) Fittings for Use With Rigid PVC Conduit and Tubing
NEMA WD 1	(1999) General Color Requirements for Wiring Devices
NEMA WD 6	(2002; R 2008) Wiring Devices Dimensions Specifications

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2011; Errata 2 2012) National Electrical Code
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UNDERWRITERS LABORATORIES (UL)

UL 1	(2005; Reprint Jul 2007) Standard for Flexible Metal Conduit
UL 1242	(2006; Reprint Jul 2007) Standard for Electrical Intermediate Metal Conduit -- Steel
UL 1569	(1999; R 2001, Bul. 2001, 2002) Metal-Clad Cables
UL 1660	(2000; R 2002, Bul. 2002) Liquid-Tight Flexible Nonmetallic Conduit
UL 198C	(1986; R 1998) High-Interrupting-Capacity Fuses, Current-Limiting Types
UL 198E	(1988; R 1988) Class R Fuses
UL 198H	(1988; R 1993) Class T Fuses
UL 20	(2000; R 2002, Bul. 2002) General-Use Snap Switches
UL 360	(1996; R 2001, Bul. 2002) Liquid-Tight Flexible Steel Conduit
UL 4	(1996; R 2001) Armored Cable
UL 467	(2007) Grounding and Bonding Equipment
UL 486A	(1997; R 2001, Bul. 2002, 2003) Wire Connectors and Soldering Lugs for Use with Copper Conductors
UL 486C	(2000; R 2002) Splicing Wire Connectors
UL 489	(2009; Reprint Jun 2011) Molded-Case Circuit Breakers, Molded-Case Switches,

- and Circuit-Breaker Enclosures
- UL 498 (2001; R 2002) Attachment Plugs and Receptacles
- UL 50 (2007) Enclosures for Electrical Equipment, Non-environmental Considerations
- UL 510 (1994; R 1998) Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
- UL 514A (1996; R 2001, Bul. 2002) Metallic Outlet Boxes
- UL 514B (1997; R 2002, Bul. 2002) Fittings for Cable and Conduit
- UL 514C (1996; Reprint Novy 2011) Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
- UL 6 (2007; reprint Nov 2010) Electrical Rigid Metal Conduit-Steel
- UL 651 (1995; R 2002) Schedule 40 and 80 Rigid PVC Conduit
- UL 67 (2009; Reprint Sep 2010) Standard for Panelboards
- UL 6A (2000; Bul. 2002) Electrical Rigid Metal Conduit - Aluminum, Bronze, and Stainless Steel
- UL 719 (2002) Nonmetallic-Sheathed Cables
- UL 797 (2007) Electrical Metallic Tubing -- Steel
- UL 83 (2008) Thermoplastic-Insulated Wires and Cables
- UL 854 (1999; R 2002) Service-Entrance Cables
- UL 869A (1998; Bul. 2002) Reference Standard for Service Equipment
- UL 943 (1993; R 2002, Bul. 2002) Ground-Fault Circuit-Interrupters

1.2 RELATED REQUIREMENTS

Section 26 00 00, "Basic Electrical Materials and Methods," applies to this section with additions and modifications specified herein.

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Panelboards

Transformers

SD-03 Product Data

Receptacles

Circuit breakers

Switches

Transformers

SD-06 Test Reports

600-volt wiring test

Grounding system test

Transformer tests

Ground-fault receptacle test

SD-07 Certificates

Fuses

SD-09 Manufacturer's Field Reports

Transformer factory tests

SD-10 Operation and Maintenance Data

Electrical Systems, Data Package 5

Submit operation and maintenance data in accordance with Section 01 78 23, "Operation and Maintenance Data" and as specified herein.

1.4 QUALITY ASSURANCE

1.4.1 Fuses

Submit coordination data as specified in article entitled, "FUSES" of this section.

1.5 MAINTENANCE

1.5.1 Electrical Systems

Submit operation and maintenance manuals for electrical systems that provide basic data relating to the design, operation, and maintenance of the electrical distribution system for the building. This shall include:

- a. Single line diagram of the "as-built" building electrical system.
- b. Schematic diagram of electrical control system (other than HVAC,

covered elsewhere).

- c. Manufacturers' operating and maintenance manuals on active electrical equipment.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials, equipment, and devices shall, as a minimum, meet requirements of UL, where UL standards are established for those items, and requirements of NFPA 70.

2.2 CONDUIT AND FITTINGS

Shall conform to the following:

2.2.1 Rigid Metallic Conduit

2.2.1.1 Rigid, Threaded Zinc-Coated Steel Conduit

NEMA C80.1, UL 6.

2.2.1.2 Rigid Aluminum Conduit

ANSI C80.5, UL 6A.

2.2.2 Rigid Nonmetallic Conduit

PVC Type EPC-40, in accordance with NEMA TC 2, UL 651, or fiberglass conduit, in accordance with NEMA TC 14.

2.2.3 Intermediate Metal Conduit (IMC)

UL 1242, zinc-coated steel only.

2.2.4 Electrical, Zinc-Coated Steel Metallic Tubing (EMT)

UL 797, NEMA C80.3.

2.2.5 Plastic-Coated Rigid Steel and IMC Conduit

NEMA RN 1, Type 40 (40 mils thick).

2.2.6 Flexible Metal Conduit

UL 1.

2.2.6.1 Liquid-Tight Flexible Metal Conduit, Steel

UL 360.

2.2.7 Fittings for Metal Conduit, EMT, and Flexible Metal Conduit

UL 514B. Ferrous fittings shall be cadmium- or zinc-coated in accordance with UL 514B.

2.2.7.1 Fittings for Rigid Metal Conduit and IMC

Threaded-type. Split couplings unacceptable.

2.2.7.2 Fittings for EMT

Steel compression type.

2.2.8 Fittings for Rigid Nonmetallic Conduit

NEMA TC 3, UL 514B.

2.2.9 Liquid-Tight Flexible Nonmetallic Conduit

UL 1660.

2.3 OUTLET BOXES AND COVERS

UL 514A, cadmium- or zinc-coated, if ferrous metal. UL 514C, if nonmetallic.

2.4 CABINETS, JUNCTION BOXES, AND PULL BOXES

Volume greater than 100 cubic inches, UL 50, hot-dip, zinc-coated, if sheet steel.

2.5 WIRES AND CABLES

Wires and cables shall meet applicable requirements of NFPA 70 and UL for type of insulation, jacket, and conductor specified or indicated. Wires and cables manufactured more than 12 months prior to date of delivery to site shall not be used.

2.5.1 Conductors

Conductors No. 8 AWG and larger diameter shall be stranded. Conductors No. 10 AWG and smaller diameter shall be solid, except that conductors for remote control, alarm, and signal circuits, classes 1, 2, and 3, shall be stranded unless specifically indicated otherwise. Conductor sizes and ampacities shown are based on copper, unless indicated otherwise. All conductors shall be copper.

2.5.1.1 Equipment Manufacturer Requirements

When manufacturer's equipment requires copper conductors at the terminations or requires copper conductors to be provided between components of equipment, provide copper conductors or splices, splice boxes, and other work required to satisfy manufacturer's requirements.

2.5.1.2 Minimum Conductor Sizes

Minimum size for branch circuits shall be No. 12 AWG; for Class 1 remote-control and signal circuits, No. 14 AWG; for Class 2 low-energy, remote-control and signal circuits, No. 16 AWG; and for Class 3 low-energy, remote-control, alarm and signal circuits, No. 22 AWG.

2.5.2 Color Coding

Provide for service, feeder, branch, control, and signaling circuit

conductors. Color shall be green for grounding conductors and white for neutrals; except where neutrals of more than one system are installed in same raceway or box, other neutral shall be white with colored (not green) stripe. Color of ungrounded conductors in different voltage systems shall be as follows:

a. 208/120 volt, three-phase

- (1) Phase A - black
- (2) Phase B - red
- (3) Phase C - blue

b. 480/277 volt, three-phase

- (1) Phase A - brown
- (2) Phase B - orange
- (3) Phase C - yellow

2.5.3 Insulation

Unless specified or indicated otherwise or required by [NFPA 70](#), power and lighting wires shall be 600-volt, Type THWN/THHN conforming to [UL 83](#), except that grounding wire may be type TW conforming to [UL 83](#); remote-control and signal circuits shall be Type TW or TF, conforming to [UL 83](#). Where lighting fixtures require 90-degree Centigrade (C) conductors, provide only conductors with 90-degree C insulation or better.

2.5.4 Bonding Conductors

[ASTM B 1](#), solid bare copper wire for sizes No. 8 AWG and smaller diameter; [ASTM B 8](#), Class B, stranded bare copper wire for sizes No. 6 AWG and larger diameter.

2.5.5 Service Entrance Cables

Service Entrance (SE) and Underground Service Entrance (USE) Cables, [UL 854](#).

2.5.6 Nonmetallic Sheathed Cable

[UL 719](#), Type NM or NMC.

2.5.7 Metal-Clad Cable

[UL 1569](#); [NFPA 70](#), Type MC cable.

2.5.8 Armored Cable

[UL 4](#); [NFPA 70](#), Type AC cable.

2.6 SPLICES AND TERMINATION COMPONENTS

[UL 486A](#) for wire connectors and [UL 510](#) for insulating tapes. Connectors for No. 10 AWG and smaller diameter wires shall be insulated, pressure-type in accordance with [UL 486A](#) or [UL 486C](#) (twist-on splicing connector). Provide solderless terminal lugs on stranded conductors.

2.7 DEVICE PLATES

Provide UL listed, one-piece device plates for outlets to suit the devices installed. For metal outlet boxes, plates on unfinished walls shall be of zinc-coated sheet steel or cast metal having round or beveled edges. For nonmetallic boxes and fittings, other suitable plates may be provided. Plates on finished walls shall be nylon or lexan, minimum 0.03 inch wall thickness. Plates shall be same color as receptacle or toggle switch with which they are mounted. Screws shall be machine-type with countersunk heads in color to match finish of plate. Sectional type device plates will not be permitted. Plates installed in wet locations shall be gasketed and UL listed for "wet locations."

2.8 SWITCHES

2.8.1 Toggle Switches

NEMA WD 1, UL 20, totally enclosed with bodies of thermoplastic and/or thermoset plastic and mounting strap with grounding screw. Handles shall be thermoplastic. Wiring terminals shall be screw-type, side-wired. Contacts shall be silver-cadmium and contact arm shall be one-piece copper alloy. Switches shall be rated quiet-type ac only, 120/277 volts, with current rating and number of poles indicated.

2.8.2 Disconnect Switches

NEMA KS 1. Provide heavy duty-type switches where indicated, where switches are rated higher than 240 volts, and for double-throw switches. Fused switches shall utilize Class R fuseholders and fuses, unless indicated otherwise. Switches serving as motor-disconnect means shall be horsepower rated. Provide switches in NEMA enclosure as indicated per NEMA ICS 6.

2.8.3 Breakers Used as Switches

For 120- and 277-Volt fluorescent fixtures, mark breakers "SWD" in accordance with UL 489.

2.9 RECEPTACLES

UL 498, hard use, heavy-duty, grounding-type. Ratings and configurations shall be as indicated. Bodies shall be per NEMA WD 1. Face and body shall be thermoplastic supported on a metal mounting strap. Dimensional requirements shall be per NEMA WD 6. Provide screw-type, side-wired wiring terminals. Connect grounding pole to mounting strap. The receptacle shall contain triple-wipe power contacts and double or triple-wipe ground contacts.

2.9.1 Weatherproof Receptacles

Provide in cast metal box with gasketed, weatherproof, cast-metal cover plate and gasketed cap over each receptacle opening. Provide caps with a spring-hinged flap. Receptacle shall be UL listed for use in "wet locations with plug in use."

2.9.2 Ground-Fault Circuit Interrupter Receptacles

UL 943, duplex type for mounting in standard outlet box. Device shall be

capable of detecting current leak of 6 milliamperes or greater and tripping per requirements of UL 943 for Class A GFCI devices. Provide screw-type, side-wired wiring terminals or pre-wired (pigtail) leads.

2.10 PANELBOARDS

UL 67 and UL 50 having a short-circuit current rating as indicated . Panelboards for use as service disconnecting means shall additionally conform to UL 869A. Panelboards shall be circuit breaker-equipped unless indicated otherwise. Design shall be such that individual breakers can be removed without disturbing adjacent units or without loosening or removing supplemental insulation supplied as means of obtaining clearances as required by UL. "Specific breaker placement" is required in panelboards to match the breaker placement indicated in the panelboard schedule on the drawings. Use of "Subfeed Breakers" is not acceptable unless specifically indicated otherwise. Where "space only" is indicated, make provisions for future installation of breakers. Panelboard locks shall be keyed same. Directories shall indicate load served by each circuit in panelboard. Directories shall also indicate source of service to panelboard (e.g., Panel PA served from Panel MDP). Provide new directories for existing panels modified by this project as indicated. Type directories and mount in holder behind transparent protective covering. Panelboards shall be listed and labeled for their intended use.

2.10.1 Panelboard Buses

Support bus bars on bases independent of circuit breakers. Main buses and back pans shall be designed so that breakers may be changed without machining, drilling, or tapping. Provide isolated neutral bus in each panel for connection of circuit neutral conductors. Provide separate ground bus identified as equipment grounding bus per UL 67 for connecting grounding conductors; bond to steel cabinet.

2.10.2 Circuit Breakers

UL 489, thermal magnetic-type having a minimum short-circuit current rating equal to the short-circuit current rating of the panelboard in which the circuit breaker shall be mounted. Breaker terminals shall be UL listed as suitable for type of conductor provided. Series rated circuit breakers and plug-in circuit breakers are unacceptable.

2.10.2.1 Multipole Breakers

Provide common trip-type with single operating handle. Breaker design shall be such that overload in one pole automatically causes all poles to open. Maintain phase sequence throughout each panel so that any three adjacent breaker poles are connected to Phases A, B, and C, respectively.

2.10.2.2 Circuit Breakers for HVAC Equipment

Circuit breakers for HVAC equipment having motors (group or individual) shall be marked for use with HACR type and UL listed as HACR type.

2.11 FUSES

NEMA FU 1. Provide complete set of fuses for each fusible switch. Time-current characteristics curves of fuses serving motors or connected in series with circuit breakers shall be coordinated for proper operation. Submit coordination data for approval. Fuses shall have voltage rating not

less than circuit voltage.

2.11.1 Cartridge Fuses, Current Limiting Type (Class R)

UL 198E, Class RK-1. Associated fuseholders shall be Class R only.

2.11.2 Cartridge Fuses, Current Limiting Type (Classes J, L, and CC)

UL 198C, Class J for zero to 600 amperes, Class L for 601 to 6,000 amperes, and Class CC for zero to 30 amperes.

2.11.3 Cartridge Fuses, Current Limiting Type (Class T)

UL 198H, Class T for zero to 1,200 amperes, 300 volts; and zero to 800 amperes, 600 volts.

2.12 TRANSFORMERS

NEMA ST 20, general purpose, dry-type, self-cooled, ventilated. Provide transformers in NEMA 1 enclosure. Transformer shall have 220 degrees C insulation system for transformers 15 kVA and greater, and shall have 180 degrees C insulation for transformers rated 10 kVA and less, with temperature rise not exceeding 150 degrees C under full-rated load in maximum ambient of 40 degrees C. Transformer of 150 degrees C temperature rise shall be capable of carrying continuously 100 percent of nameplate kVA without exceeding insulation rating.

2.13 TELEPHONE SYSTEM

Provide system of telephone wire-supporting structures, including: conduits with pull wires terminal boxes, outlet and junction boxes, other accessories for telephone outlets, and backboards. Additional requirements are in Section 27 10 00, "Structured Telecommunications Cabling and Pathway System."

2.13.1 Outlet Boxes for Telephone System

Standard type, as specified herein, 2 by 4 in. Mount flush in finished walls at height indicated.

2.13.2 Cover Plates

Modular telephone type with same finish specified for receptacle and switch cover plates.

2.13.3 Conduit Sizing

Conduit for single outlets shall be minimum of 1 in and for multiple outlets minimum of one inch. Size conduits for telephone risers to telephone cabinets, junction boxes, distribution centers, and telephone service, as indicated.

2.13.4 Backboards

Interior grade plywood, 3/4 in thick, 4 by 8 ft minimum. Paint with gray fire resistant paint.

2.13.5 Terminal Cabinets

Construct of zinc-coated sheet steel. Cabinets shall be constructed with interior dimensions not less than those indicated. Trim shall be fitted with hinged door and flush catch. Doors shall provide maximum-size openings to the box interiors. Boxes shall be provided with 5/8 in backboard having a two-coat insulating varnish finish. Match trim, hardware, doors, and finishes to lighting panelboards.

2.14 GROUNDING AND BONDING EQUIPMENT

UL 467. Ground rods shall be sectional type, copper-clad steel, with minimum diameter of 3/4 in and minimum length of 10 ft.

2.15 NAMEPLATES

Provide as specified in Section 26 00 00, "Basic Electrical Materials and Methods."

2.16 FIRESTOPPING MATERIALS

Provide firestopping around electrical penetrations in accordance with Section 07 84 00, "Firestopping."

2.17 SOURCE QUALITY CONTROL

2.17.1 Transformer Factory Tests

Submittal shall include routine NEMA ST 20 transformer test results on each transformer and also contain the results of NEMA "design" and "prototype" tests that were made on transformers electrically and mechanically equal to those specified.

PART 3 EXECUTION

3.1 INSTALLATION

Electrical installations shall conform to requirements of NFPA 70 and to requirements specified herein.

3.1.1 Underground Service

Underground service conductors and associated conduit shall be continuous from service entrance equipment to outdoor power system connection.

3.1.2 Service Entrance Identification

Service entrance disconnect devices, switches, and enclosures shall be labeled and identified as such.

3.1.2.1 Labels

Wherever work results in service entrance disconnect devices in more than one enclosure, as permitted by NFPA 70, each enclosure, new and existing, shall be labeled as one of several enclosures containing service entrance disconnect devices. Label, at minimum, shall indicate number of service disconnect devices housed by enclosure and shall indicate total number of enclosures that contain service disconnect devices. Provide laminated plastic labels conforming to paragraph entitled "Nameplates." Use

lettering of at least 0.25 in in height, and engrave on black-on-white matte finish. Service entrance disconnect devices in more than one enclosure, shall be provided only as permitted by NFPA 70.

3.1.3 Wiring Methods

Provide insulated conductors installed in rigid steel conduit, IMC, rigid nonmetallic conduit, or EMT, except where specifically indicated or specified otherwise or required by NFPA 70 to be installed otherwise. Grounding conductor shall be separate from electrical system neutral conductor. Provide insulated green equipment grounding conductor for circuit(s) installed in conduit and raceways. Minimum conduit size shall be 1/2 in in diameter for low voltage lighting and power circuits. Vertical distribution in multiple story buildings shall be made with metal conduit in fire-rated shafts. Metal conduit shall extend through shafts for minimum distance of 6 in. Conduit which penetrates fire-rated walls, fire-rated partitions, or fire-rated floors shall be firestopped in accordance with Section 07 84 00, "Firestopping".

3.1.3.1 Restrictions Applicable to EMT

- a. Do not install underground.
- b. Do not encase in concrete, mortar, grout, or other cementitious materials.
- c. Do not use in areas subject to severe physical damage including but not limited to equipment rooms where moving or replacing equipment could physically damage the EMT.
- d. Do not use in hazardous areas.
- e. Do not use outdoors.
- f. Do not use in fire pump rooms.

3.1.3.2 Restrictions Applicable to Nonmetallic Conduit

- a. PVC Schedule 40 and PVC Schedule 80
 - (1) Do not use in areas where subject to severe physical damage, including but not limited to, mechanical equipment rooms, electrical equipment rooms, hospitals, power plants, missile magazines, and other such areas.
 - (2) Do not use in hazardous (classified) areas.
 - (3) Do not use in fire pump rooms.
 - (4) Do not use in penetrating fire-rated walls or partitions, or fire-rated floors.
 - (5) Do not use above grade, except where allowed in this section for rising through floor slab or indicated otherwise.
- b. Electrical Nonmetallic Tubing
 - (1) Do not install underground.

(2) Do not encase in concrete except when provided with fittings identified for this purpose are used for connections.

(3) Do not use in areas where subject to severe physical damage, including but not limited to, mechanical equipment rooms, electrical equipment rooms, hospitals, power plants, missile magazines, and other such areas.

(4) Do not use in hazardous areas.

(5) Do not use outdoors.

(6) Do not use in sizes larger than 2 in.

(7) Do not run exposed in buildings exceeding three floors above grade, where "first floor" is as defined in NFPA 70.

3.1.3.3 Restrictions Applicable to Flexible Conduit

Use only as specified in paragraph entitled "Flexible Connections."

3.1.3.4 Service Entrance Conduit, Underground

PVC, Type-EPC 40, galvanized rigid steel or steel IMC. Underground portion shall be encased in minimum of 3 in of concrete and shall be installed minimum 18 in below slab or grade.

3.1.3.5 Underground Conduit Other Than Service Entrance

Plastic-coated rigid steel; plastic-coated steel IMC; PVC, Type EPC-40
Plastic coating shall extend minimum 6 in above floor.

3.1.3.6 Conduit in Floor Slabs

Rigid steel; steel IMC; fiberglass, or PVC, Type EPC-40.

3.1.3.7 Metal Clad Cable

Install in accordance with NFPA 70, Type MC cable.

3.1.3.8 Armored Cable

Install in accordance with NFPA 70, Type AC cable.

3.1.3.9 Flat Conductor Cable

Install in accordance with NFPA 70, Type FCC cable.

3.1.4 Conduit Installation

Unless indicated otherwise, conceal conduit under floor slabs and within finished walls, ceilings, and floors. Keep conduit minimum 6 in away from parallel runs of flues and steam or hot water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit will be visible after completion of project.

3.1.4.1 Conduit Installed Under Floor Slabs

Conduit run under floor slab shall be located a minimum of 12 in below the vapor barrier. Seal around conduits at penetrations thru vapor barrier.

3.1.4.2 Conduit Through Floor Slabs

Where conduits rise through floor slabs, curved portion of bends shall not be visible above finished slab.

3.1.4.3 Conduit Support

Support conduit by pipe straps, wall brackets, hangers, or ceiling trapeze. Fasten by wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; and by machine screws, welded threaded studs, or spring-tension clamps on steel work. Threaded C-clamps may be used on rigid steel conduit only. Do not weld conduits or pipe straps to steel structures. Load applied to fasteners shall not exceed one-fourth proof test load. Fasteners attached to concrete ceiling shall be vibration resistant and shock-resistant. Holes cut to depth of more than 1 1/2 in in reinforced concrete beams or to depth of more than 3/4 in in concrete joints shall not cut main reinforcing bars. Fill unused holes. In partitions of light steel construction, use sheet metal screws. In suspended-ceiling construction, run conduit above ceiling. Do not support conduit by ceiling support system. Conduit and box systems shall be supported independently of both (a) tie wires supporting ceiling grid system, and (b) ceiling grid system into which ceiling panels are placed. Supporting means shall not be shared between electrical raceways and mechanical piping or ducts. Installation shall be coordinated with above-ceiling mechanical systems to assure maximum accessibility to all systems. Spring-steel fasteners may be used for lighting branch circuit conduit supports in suspended ceilings in dry locations. Where conduit crosses building expansion joints, provide suitable expansion fitting that maintains conduit electrical continuity by bonding jumpers or other means. For conduits greater than 2 1/2 in inside diameter, provide supports to resist forces of 0.5 times the equipment weight in any direction and 1.5 times the equipment weight in the downward direction.

3.1.4.4 Directional Changes in Conduit Runs

Make changes in direction of runs with symmetrical bends or cast-metal fittings. Make field-made bends and offsets with hickey or conduit-bending machine. Do not install crushed or deformed conduits. Avoid trapped conduits. Prevent plaster, dirt, or trash from lodging in conduits, boxes, fittings, and equipment during construction. Free clogged conduits of obstructions.

3.1.4.5 Pull Wire

Install pull wires in empty conduits. Pull wire shall be plastic having minimum 200-lb tensile strength. Leave minimum 36 in of slack at each end of pull wire.

3.1.4.6 Telephone and Signal System Conduits

Refer to Section 27 10 00, "Structured Telecommunications Cabling and Pathway System."

3.1.4.7 Conduit Installed in Concrete Floor Slabs

Locate so as not to adversely affect structural strength of slabs. Install conduit within middle one-third of concrete slab. Space conduits horizontally not closer than three diameters, except at cabinet locations. Curved portions of bends shall not be visible above finish slab. Increase slab thickness as necessary to provide minimum **one inch** cover over conduit. Where embedded conduits cross building and/or expansion joints, provide suitable watertight expansion/deflection fittings and bonding jumpers. Expansion/deflection fittings shall allow horizontal and vertical movement of raceway. Conduit larger than **one inch** trade size shall be parallel with or at right angles to main reinforcement; when at right angles to reinforcement, conduit shall be close to one of supports of slab. Where nonmetallic conduit is used, raceway shall be converted to plastic coated rigid steel or plastic coated steel IMC before rising above floor, unless specifically indicated.

3.1.4.8 Locknuts and Bushings

Fasten conduits to sheet metal boxes and cabinets with two locknuts where required by **NFPA 70**, where insulated bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, use at least minimum single locknut and bushing. Locknuts shall have sharp edges for digging into wall of metal enclosures. Install bushings on ends of conduits, and provide insulating type where required by **NFPA 70**.

3.1.4.9 Stub-Ups

Provide conduits stubbed up through concrete floor for connection to free-standing equipment with adjustable top or coupling threaded inside for plugs, set flush with finished floor. Extend conductors to equipment in rigid steel conduit, except that flexible metal conduit may be used **6 in** above floor. Where no equipment connections are made, install screwdriver-operated threaded flush plugs in conduit end.

3.1.4.10 Flexible Connections

Provide flexible steel conduit between **3 and 6 ft** in length for recessed and semirecessed lighting fixtures. Install flexible conduit to allow 20 percent slack. Minimum flexible steel conduit size shall be **1/2 in** diameter. Provide liquidtight flexible conduit in wet and damp locations for equipment subject to vibration, noise transmission, movement or motors. Provide separate ground conductor across flexible connections.

3.1.5 Boxes, Outlets, and Supports

Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways shall be cast-metal, hub-type when located in wet locations, when surface mounted on outside of exterior surfaces, and when specifically indicated. Boxes in other locations shall be sheet steel, except that aluminum boxes may be used with aluminum conduit, and nonmetallic boxes may be used with nonmetallic conduit system. Each box shall have volume required by **NFPA 70** for number of conductors enclosed in box. Boxes for mounting lighting fixtures shall be minimum **4 in** square, or octagonal, except that smaller boxes may be installed as required by fixture configurations, as approved. Boxes for use in masonry-block or tile walls shall be square-cornered, tile-type, or standard boxes having square-cornered, tile-type covers. Provide gaskets for cast-metal boxes

installed in wet locations and boxes installed flush with outside of exterior surfaces. Provide separate boxes for flush or recessed fixtures when required by fixture terminal operating temperature; fixtures shall be readily removable for access to boxes unless ceiling access panels are provided. Support boxes and pendants for surface-mounted fixtures on suspended ceilings independently of ceiling supports. Fasten boxes and supports with wood screws on wood, with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel. In open overhead spaces, cast boxes threaded to raceways need not be separately supported except where used for fixture support; support sheet metal boxes directly from building structure or by bar hangers. Where bar hangers are used, attach bar to raceways on opposite sides of box, and support raceway with approved-type fastener maximum 24 in from box. When penetrating reinforced concrete members, avoid cutting reinforcing steel.

3.1.5.1 Boxes

Boxes for use with raceway systems shall be minimum 1 1/2 in deep, except where shallower boxes required by structural conditions are approved. Boxes for other than lighting fixture outlets shall be minimum 4 in square, except that 4 by 2 in boxes may be used where only one raceway enters outlet. Telephone outlets shall be minimum of 4 in square by 2 1/8 in deep .

3.1.5.2 Pull Boxes

Construct of at least minimum size required by NFPA 70 except where cast-metal boxes are required in locations specified herein. Provide boxes with screw-fastened covers. Where several feeders pass through common pull box, tag feeders to indicate clearly electrical characteristics, circuit number, and panel designation.

3.1.5.3 Extension Rings

Extension rings are not permitted for new construction. Use only on existing boxes in concealed conduit systems where wall is furred out for new finish.

3.1.6 Mounting Heights

Mount panelboards, and disconnecting switches so height of operating handle at its highest position is maximum 78 in above floor. Mount lighting switches 48 in above finished floor, receptacles 18 in above finished floor unless otherwise indicated, and other devices as indicated. Measure mounting heights of wiring devices and outlets to center of device or outlet.

3.1.7 Conductor Identification

Provide conductor identification within each enclosure where tap, splice, or termination is made. For conductors No. 6 AWG and smaller diameter, color coding shall be by factory-applied, color-impregnated insulation. For conductors No. 4 AWG and larger diameter, color coding shall be by plastic-coated, self-sticking markers; colored nylon cable ties and plates; or heat shrink-type sleeves. Identify control circuit terminations in accordance with manufacturer's recommendations.

3.1.8 Splices

Make splices in accessible locations. Make splices in conductors No. 10 AWG and smaller diameter with insulated, pressure-type connector. Make splices in conductors No. 8 AWG and larger diameter with solderless connector, and cover with insulation material equivalent to conductor insulation.

3.1.9 Covers and Device Plates

Install with edges in continuous contact with finished wall surfaces without use of mats or similar devices. Plaster fillings are not permitted. Install plates with alignment tolerance of 1/16 in. Use of sectional-type device plates are not permitted. Provide gasket for plates installed in wet locations.

3.1.10 Electrical Penetrations

Seal openings around electrical penetrations through fire resistance-rated walls, partitions, floors, or ceilings in accordance with Section 07 84 00, "Firestopping."

3.1.11 Grounding and Bonding

In accordance with NFPA 70. Ground exposed, non-current-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in metallic and nonmetallic raceways, telephone system grounds, and neutral conductor of wiring systems. Make ground connection at main service equipment, and extend grounding conductor to point of entrance of metallic water service. Make connection to water pipe by suitable ground clamp or lug connection to plugged tee. If flanged pipes are encountered, make connection with lug bolted to street side of flanged connection. Supplement metallic water service grounding system with additional made electrode in compliance with NFPA 70.

3.1.11.1 Resistance

Maximum resistance-to-ground of grounding system shall not exceed 5 ohms under dry conditions. Where resistance obtained exceeds 5 ohms, contact Contracting Officer for further instructions.

3.1.11.2 Telephone Service

Provide main telephone service equipment ground consisting of separate ground wire, No. 6 AWG, in conduit between equipment backboard and readily accessible grounding connection. Equipment end of ground wire shall consist of coiled length at least twice as long as terminal cabinet or backboard height.

3.1.12 Equipment Connections

Provide power wiring for the connection of motors and control equipment under this section of the specification. Except as otherwise specifically noted or specified, automatic control wiring, control devices, and protective devices within the control circuitry are not included in this section of the specifications but shall be provided under the section specifying the associated equipment.

3.2 FIELD QUALITY CONTROL

Furnish test equipment and personnel and submit written copies of test results. Give Contracting Officer 5 working days notice prior to each test.

3.2.1 Devices Subject to Manual Operation

Each device subject to manual operation shall be operated at least five times, demonstrating satisfactory operation each time.

3.2.2 600-Volt Wiring Test

Test wiring rated 600 volt and less to verify that no short circuits or accidental grounds exist. Perform insulation resistance tests on wiring No. 6 AWG and larger diameter using instrument which applies voltage of approximately 500 volts to provide direct reading of resistance. Minimum resistance shall be 250,000 ohms.

3.2.3 Transformer Tests

Perform the standard, not optional, tests in accordance with the Inspection and Test Procedures for transformers, dry type, air-cooled, 600 volt and below; as specified in **NETA ATS**. Measure primary and secondary voltages for proper tap settings. Tests need not be performed by a recognized independent testing firm or independent electrical consulting firm.

3.2.4 Ground-Fault Receptacle Test

Test ground-fault receptacles with a "load" (such as a plug in light) to verify that the "line" and "load" leads are not reversed.

3.2.5 Grounding System Test

Test grounding system to ensure continuity, and that resistance to ground is not excessive. Test each ground rod for resistance to ground before making connections to rod; tie grounding system together and test for resistance to ground. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall. Submit written results of each test to Contracting Officer, and indicate location of rods as well as resistance and soil conditions at time measurements were made.

-- End of Section --

SECTION 26 51 00

INTERIOR LIGHTING

04/04

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A 641/A 641M (2009a) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire

ASTM A 653/A 653M (2009a) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A 1008/A 1008M (2009) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened

ASTM B 633 (1998; E 2001) Electrodeposited Coatings of Zinc on Iron and Steel

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA)

IESNA HB-9 (2000) Lighting Handbook, Reference and Application

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41 (1991; R 1995) Surge Voltages in Low-Voltage AC Power Circuits (ANSI/IEEE)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA C78.81 (2001) Electric Lamps - Double-capped Fluorescent Lamps

NEMA C78.901 (2001) Electric Lamps - Single Base Fluorescent Lamps

NEMA C82.11 (2002) High-Frequency Fluorescent Lamp Ballasts

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2011; Errata 2 2012) National Electrical

Code

- NFPA 101 (2012) Life Safety Code
- UNDERWRITERS LABORATORIES (UL)
- UL 924 (2006; Reprint Feb 2011) Standard for Emergency Lighting and Power Equipment
- UL 935 (2001; Bul. 2001) Fluorescent-Lamp Ballasts
- UL 1598 (2008; Reprint Jan 2010) Luminaires

1.2 RELATED REQUIREMENTS

Section 26 00 00, "Basic Electrical Materials and Methods," applies to this section, with the additions and modifications specified herein. Materials not considered to be lighting equipment or lighting fixture accessories are specified in Section 26 51 00, "Interior Distribution System." Lighting fixtures and accessories mounted on exterior surfaces of buildings are specified in this section.

1.3 DEFINITIONS

1.3.1 Average Life

Time after which 50 percent will have failed and 50 percent will have survived under normal conditions.

1.3.2 Total Harmonic Distortion (THD)

The root mean square (RMS) of all the harmonic components divided by the total fundamental current.

1.4 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Data, drawings, and reports shall employ the terminology, classifications, and methods prescribed by the IESNA HB-9, as applicable, for the lighting system specified.

SD-03 Product Data

- Fluorescent lighting fixtures
- Fluorescent electronic ballasts
- Fluorescent lamps
- Exit signs
- Emergency lighting equipment
- Occupancy sensors

SD-06 Test Reports

Operating test

Submit test results as stated in paragraph entitled "Field Quality Control."

1.5 QUALITY ASSURANCE

1.5.1 Fluorescent Electronic Ballasts

Submit ballast catalog data as required in the paragraph entitled "Fluorescent Lamp Electronic Ballasts" contained herein. As an option, submit the fluorescent fixture manufacturer's electronic ballast specification information in lieu of the actual ballast manufacturer's catalog data. This information shall include published specifications and sketches, which covers the information required by the paragraph entitled "Fluorescent Lamp Electronic Ballasts" herein. This information may be supplemented by catalog data if required, and shall contain a list of vendors with vendor part numbers.

1.5.2 Lighting Fixtures, Complete With Lamps and Ballasts

Submit one sample of each fixture type and large order item for inspection, review, and approval. The sample shall be retained for comparison against the remainder of the fixtures. The sample may be used in the final fixture installation.

1.6 ELECTRONIC BALLAST WARRANTY

Furnish the electronic ballast manufacturer's warranty. The warranty period shall not be less than 5 years from the date of manufacture of the electronic ballast. Ballast assembly in the lighting fixture, transportation, and on-site storage shall not exceed 12 months, thereby permitting 4 years of the ballast 5 year warranty to be in service and energized. The warranty shall state that the malfunctioning ballast shall be exchanged by the manufacturer and promptly shipped to the using Government facility. The replacement ballast shall be identical to, or an improvement upon, the original design of the malfunctioning ballast.

PART 2 PRODUCTS

2.1 FLUORESCENT LIGHTING FIXTURES

UL 1598. Fluorescent fixtures shall have electronic ballasts unless specifically indicated otherwise.

2.1.1 Fluorescent Lamp Electronic Ballasts

The electronic ballast shall as a minimum meet the following characteristics:

- a. Ballast shall comply with **UL 935**, **NEMA C82.11**, and **NFPA 70** unless specified otherwise. Ballast shall provide transient immunity as recommended by **IEEE C62.41**. Ballast shall be designed for the wattage of the lamps used in the indicated application. Ballasts shall be designed to operate on the voltage system to which they are connected.
- b. Power factor shall be 0.95 (minimum).
- c. Ballast shall operate at a frequency of 20,000 Hertz (minimum).

Ballast shall be compatible with and not cause interference with the operation of occupancy sensors or other infrared control systems. Provide ballasts operating at or above 40,000 Hertz where available.

- d. Ballast shall have light regulation of plus or minus 10 percent lumen output with a plus or minus 10 percent input voltage regulation. Ballast shall have 10 percent flicker (maximum) using any compatible lamp.
- e. Ballast shall be UL listed Class P with a sound rating of "A."
- f. Ballast shall have circuit diagrams and lamp connections displayed on the ballast.
- g. Ballasts shall be instant start unless otherwise indicated. Ballasts shall be programmed start where indicated. Instant start ballasts shall operate lamps in a parallel circuit configuration that permits the operation of remaining lamps if one or more lamps fail or are removed. Programmed start ballasts may operate lamps in a series circuit configuration. Provide series/parallel wiring for programmed start ballasts where available.
- h. Ballasts for T-5 and smaller lamps shall have end-of-life protection circuits as required by [NEMA C78.81](#) and [NEMA C78.901](#) as applicable.
- i. Electronic ballast shall have a full replacement warranty of 5 years from date of manufacture as specified in paragraph entitled "Electronic Ballast Warranty" herein.

2.1.1.1 T-8 Lamp Ballast

- a. Total harmonic distortion (THD): Shall be 20 percent (maximum).
- b. Input wattage.
 - 1. 32 watts (maximum) when operating one F32T8 lamp
 - 2. 62 watts (maximum) when operating two F32T8 lamps
 - 3. 92 watts (maximum) when operating three F32T8 lamps
 - 4. 114 watts (maximum) when operating four F32T8 lamps
- c. Provide three lamp fixtures with two ballasts per fixture where multilevel switching is indicated.

2.1.1.2 F17T8 Lamp Ballast

- a. Total harmonic distortion (THD): Shall be 25 percent (maximum).
- b. Input wattage:
 - 1. 34 watts (maximum) when operating two F17T8 lamps.

2.1.2 Fluorescent Lamps

- a. T-8 rapid start low mercury lamps shall be rated 32 watts (maximum), 2800 initial lumens (minimum), CRI of 75 (minimum), color temperature of 3500 K, and an average rated life of 20,000 hours.

- b. T-8 instant start lamp, 59 watts (maximum), nominal length of 96 inches, minimum CRI of 75, 5800 initial lumens, color temperature of 3500 K, and average rated life of 15,000 hours.
- c. Compact fluorescent lamps shall be: CRI 80, minimum, 3500 K , 10,000 hours average rated life, and as follows:
 - 1. T-4, twin tube, rated as indicated.
 - 2. T-4, double twin tube, rated as indicated.

Average rated life is based on 3 hours operating per start.

2.1.3 Compact Fluorescent Fixtures

Compact fluorescent fixtures shall be manufactured specifically for compact fluorescent lamps with ballasts integral to the fixture. Providing assemblies designed to retrofit incandescent fixtures is prohibited except when specifically indicated for renovation of existing fixtures. Fixtures shall use lamps as indicated.

2.2 RECESS- AND FLUSH-MOUNTED FIXTURES

Provide type that can be relamped from the bottom. Access to ballast shall be from the bottom. Trim for the exposed surface of flush-mounted fixtures shall be as indicated.

2.3 EXIT SIGNS

UL 924, NFPA 70, and NFPA 101. Exit signs shall be self-powered type.

2.3.1 Self-Powered LED Type Exit Signs (Battery Backup)

Provide with automatic power failure device, test switch, pilot light, integral self-testing module and fully automatic high/low trickle charger in a self-contained power pack. Battery shall be sealed electrolyte type, shall operate unattended, and require no maintenance, including no additional water, for a period of not less than 5 years. LED exit sign shall have emergency run time of 1 1/2 hours (minimum). The light emitting diodes shall have rated lamp life of 70,000 hours (minimum).

2.4 EMERGENCY LIGHTING EQUIPMENT

UL 924, NFPA 70, and NFPA 101. Provide lamps in wattage indicated. Provide accessories required for remote-mounted lamps where indicated. Remote-mounted lamps shall be as indicated.

2.4.1 Emergency Lighting Unit

Provide as indicated. Emergency lighting units shall be rated for 12 volts, except units having no remote-mounted lamps and having no more than two unit-mounted lamps may be rated 6 volts. Provide integral self-testing module.

2.5 SELF-TESTING MODULE

Self-testing module for exit signs and emergency lighting equipment shall perform the following functions:

- a. Continuous monitoring of charger operation and battery voltage with visual indication of normal operation and of malfunction.
- b. Monthly discharge cycling of battery with monitoring of transfer circuit function, battery capacity and emergency lamp operation with visual indication of malfunction. The battery capacity test may be conducted by using a synthetic load.
- c. Manual test switch to simulate a discharge test cycle.
- d. Module shall have low voltage battery disconnect (LVD) and brown-out protection circuit.

2.6 OCCUPANCY SENSORS

UL listed. Occupancy sensors and power packs shall be designed to operate on the voltage indicated. Sensors and power packs shall have circuitry that only allows load switching at or near zero current crossing of supply voltage. Occupancy sensor mounting as indicated. Sensor shall have an LED occupant detection indicator. Sensor shall have adjustable sensitivity and adjustable delayed-off time range of 5 minutes to 15 minutes, minimum. Wall mounted sensors shall be ivory, ceiling mounted sensors shall be white. Ceiling mounted sensors shall have 360 degree coverage unless otherwise indicated.

2.7 SUPPORT HANGERS FOR LIGHTING FIXTURES IN SUSPENDED CEILINGS

2.7.1 Wires

ASTM A 641/A 641M, galvanized regular coating, soft temper, 0.1055inches in diameter (12 gage).

2.7.2 Straps

Galvanized steel, one by 3/16 inch, conforming to ASTM A 653/A 653M, with a light commercial zinc coating or ASTM A 1008/A 1008M with an electrodeposited zinc coating conforming to ASTM B 633, Type RS.

2.7.3 Rods

Threaded steel rods, 3/16 inch diameter, zinc or cadmium coated.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Lamps

Lamps of the type, wattage, and voltage rating indicated shall be delivered to the project in the original cartons and installed just prior to project completion. Lamps installed and used for working light during construction shall be replaced prior to turnover to the Government if more than 15 percent of their rated life has been used. Lamps shall be tested for proper operation prior to turn-over and shall be replaced if necessary with new lamps from the original manufacturer. Provide 10 percent spare lamps of each type from the original manufacturer.

3.1.2 Lighting Fixtures

Set lighting fixtures plumb, square, and level with ceiling and walls, in alignment with adjacent lighting fixtures, and secure in accordance with manufacturers' directions and approved drawings. Installation shall meet requirements of [NFPA 70](#). Mounting heights specified or indicated shall be to the bottom of fixture for ceiling-mounted fixtures and to center of fixture for wall-mounted fixtures. Obtain approval of the exact mounting for lighting fixtures on the job before commencing installation and, where applicable, after coordinating with the type, style, and pattern of the ceiling being installed. Recessed and semi-recessed fixtures shall be independently supported from the building structure by a minimum of four wires or straps per fixture and located near each corner of each fixture. Ceiling grid clips are not allowed as an alternative to independently supported light fixtures. Round fixtures or fixtures smaller in size than the ceiling grid shall be independently supported from the building structure by a minimum of four wires or straps per fixture spaced approximately equidistant around the fixture. Do not support fixtures by ceiling acoustical panels. Where fixtures of sizes less than the ceiling grid are indicated to be centered in the acoustical panel, support such fixtures independently and provide at least two $\frac{3}{4}$ inch metal channels spanning, and secured to, the ceiling tees for centering and aligning the fixture. Provide wires or straps for lighting fixture support in this section.

3.1.3 Ballasts

3.1.3.1 Remote Ballasts

Remote type ballasts or transformers, where indicated, shall be mounted in a well ventilated, easily accessible location, within the maximum operating distance from the lamp, as designated by the manufacturer.

3.1.4 Exit Signs and Emergency Lighting Units

Wire exit signs and emergency lighting units ahead of the switch to the normal lighting circuit located in the same room or area.

3.1.4.1 Exit Signs

Wire exit signs as indicated on plans.

3.1.5 Occupancy Sensor

Provide quantity of sensor units indicated as a minimum. Provide additional units to give full coverage over controlled area. Full coverage shall provide hand and arm motion detection for office and administration type areas and walking motion for industrial areas, warehouses, storage rooms and hallways. Locate the sensor(s) as indicated and in accordance with the manufacturer's recommendations to maximize energy savings and to avoid nuisance activation and deactivation due to sudden temperature or airflow changes and usage. Set sensor "on" duration to 15 minutes.

3.2 FIELD QUALITY CONTROL

Upon completion of installation, conduct an [operating test](#) to show that equipment operates in accordance with requirements of this section.

3.2.1 Occupancy Sensor

Test sensors for proper operation. Observe for light control over entire area being covered.

-- End of Section --

SECTION 26 52 00.00 40

EMERGENCY LIGHTING

08/11

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101 (2012) Life Safety Code

NFPA 70 (2011; Errata 2 2012) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 924 (2006; Reprint Feb 2011) Standard for Emergency Lighting and Power Equipment

1.2 ADMINISTRATIVE REQUIREMENTS

Section 26 00 00 BASIC ELECTRICAL MATERIALS AND METHODS applies to work specified in this section.

1.2.1 Pre-Installation Meetings

Submit material, equipment, and fixture lists showing manufacturer's style or catalog numbers, specification and drawing reference numbers, sample warranty, and fabrication site location. Also submit manufacturer's catalog data and certificates of conformance for the following items:

- a. Emergency Lighting Egress Units
- b. Emergency Fluorescent Lighting
- c. Central Emergency Lighting Systems
- d. Accessories

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Material, Equipment, and Fixture Lists;

Sample Warranty;

SD-03 Product Data

Emergency Lighting Egress Units;

Emergency Fluorescent Lighting;

SD-06 Test Reports

System Operational Tests;

SD-07 Certificates

Certificates of Conformance;

Warranty;

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Furnish emergency lighting units completely assembled with wiring and mounting devices, ready for installation at the locations indicated. Equip fixtures with lamps. Ensure emergency lighting units are suitable for operation on the ac supply circuit to which they are to be electrically connected.

2.1.1 Performance Requirements

Provide emergency lighting units conforming to [UL 924](#) and [NFPA 101](#).

2.2 MANUFACTURED UNITS

2.2.1 Emergency Lighting Egress Units

Provide complete self-contained emergency lighting units with batteries, battery charger, one or more local or remote lamp heads with lamps, under-voltage relay, indicator lights, on/off switch, and test switch, in accordance with [UL 924](#) for Type I (emergency light set), Class I , Style D , as indicated.

2.2.1.1 Batteries

Provide batteries rated not less than 6-12volts. Provide batteries with the capacity and rating to supply the lamp load with maintained 87.5 -percent power, minimum, for 1.5 hours, or the battery-lamp combination maintaining 60-percent, minimum, illumination. Provide maintenance-free nickel-cadmium type batteries, with a minimum normal life of 10 years.

2.2.1.2 Battery Charger

Include in battery charger a dry-type full-wave rectifier with two charging rates, one to automatically maintain the battery in a fully charged state under normal conditions and the other to automatically recharge the battery to a fully charged state within 12hours after continuous discharge of 1-1/2 hours through the connected lampload.

2.2.1.3 Unit Enclosure

Fabricate the unit enclosure from sheet steel not less than [18gage](#). Design

of cover is to provide access to the battery and battery-charger compartments and have a full-length piano hinge and a latching device. Protect component parts within the enclosure from dust, moisture, and oxidizing fumes from the battery. Coat interior and exterior surfaces of enclosure with a corrosion-resistant gray baked-enamel finish.

2.2.1.4 Lampheads, Lamps, and Indicating Lights

Mount the lampheads on the top of the unit enclosure, or wall mount, except where otherwise indicated and fully adjustable in the horizontal and vertical planes. Provide steel lamp head assembly with nickelplating. Form the exterior housing of the lamp from nickel -plated sheet steel.

Provide sealed-beam type lamps, rated not less than 12 watts at the specified dc voltage.

Mount an amber "ready-for-use on alternating current" indicating light, a red "recharging on alternating current" indicating light, and a momentary-contact pushbutton test switch on the cover of the unit enclosure. The amber light indicates, when illuminated, that the unit is electrically connected to the normal ac supply source and that the battery is fully charged. The red light indicates, when illuminated, that the battery is being recharged. The momentary-contact pushbutton test switch transfers the unit from normal supply to battery supply and tests operation of equipment under simulated ac source power failure.

2.2.1.5 Relays and Switches

Provide an under-voltage relay of the self-clearing type which automatically connects the lampload to the battery supply upon failure of the alternating current supply. Mount an on-off toggle switch inside the unit enclosure to disconnect the battery from the lampload when the unit is taken out of service for maintenance purposes. The relay energizes when the ac supply falls to 70 percent of normal voltage.

2.2.1.6 Mounting Shelves

Provide emergency lighting units with angle iron mounting shelves and with a protective screen designed by the equipment manufacturer for this purpose. Coat the mounting shelf and screen with a corrosion-resistant finish in accordance with manufacturer's standard practice.

2.2.2 Emergency Fluorescent Lighting

Provide each unit with an automatic power failure device, test switch, pilot light, and fully automatic high/low trickle charger in a self-contained solid-state, temperature-compensated power-pack. Provide sealed-wet type battery with capacity as required to supply power to provide a minimum of 1100 lumens or as indicated on plans. Provide a sealed and maintenance-free battery, with an active life of not less than 10 years under normal operating conditions.

2.2.3 Self-Testing Module

Provide self-testing module for exit signs and emergency lighting equipment which performs the following functions:

- a. Continuous monitoring of charger operation and battery voltage with visual indication of normal operation and of malfunction.

- b. Monthly discharge cycling of battery with monitoring of transfer circuit function, battery capacity and emergency lamp operation with visual indication of malfunction. Conduct the battery capacity test using a synthetic load.
- c. Manual test switch to simulate a discharge test cycle.
- d. Provide module with low voltage battery disconnect (LVD) and brown-out protection circuit.

PART 3 EXECUTION

3.1 INSTALLATION

Permanently fix in place the emergency lighting unit and install wiring for each unit in accordance with [NFPA 70](#). Use the same panel bus or branch circuit as that serving the normal lighting in the area for the branch circuit feeding the unit equipment, and connect ahead of area switches. Keep remotely connected emergency lighting circuit wiring independent of all other wiring and equipment and do not enter the same conduit, cable, box, or cabinet with other wiring unless the fixture is supplied from two sources.

Mount emergency lighting units and remote lamps at a minimum of [7 feet](#) above the finished floor.

3.2 FIELD TESTING

Demonstrate emergency lighting units to operate satisfactorily in the presence of the Contracting Officer.

Perform and submit [system operational tests](#) in accordance with referenced standards in this section.

3.3 WARRANTY

Submit [3](#) copies of [warranty](#), signed by Authority Having Jurisdiction (AHJ), designating the Government as warrantee, to the Contracting Officer, [5 days](#) prior to project closeout.

-- End of Section --

SECTION 26 53 00.00 40

EXIT SIGNS

11/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101 (2012) Life Safety Code

U.S. DEPARTMENT OF ENERGY (DOE)

DOE LT-4 (2000) How to Buy Energy-Efficient Exit Signs

UNDERWRITERS LABORATORIES (UL)

UL 924 (2006; Reprint Feb 2011) Standard for Emergency Lighting and Power Equipment

1.2 GENERAL REQUIREMENTS

Section 26 00 00 BASIC ELECTRICAL MATERIALS AND METHODS applies to work specified in this section.

Material, Equipment, and Fixture Lists shall be submitted for the following showing manufacturer's style or catalog numbers, specification and drawing reference numbers, warranty information, and fabrication site.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Material, Equipment, and Fixture Lists shall be submitted for the following in accordance with paragraph entitled, "General Requirements," of this section.

Exit Lighting Units

SD-03 Product Data

Manufacturer's catalog data shall be submitted for the following items:

Exit Lighting Units

SD-06 Test Reports

Test reports shall be submitted showing results of **Operational Tests** of exit lighting systems.

SD-07 Certificates

Certificates shall be submitted showing compliance with the following requirements.

Efficiencies

PART 2 PRODUCTS

2.1 PRODUCT STANDARDS

Emergency exit lighting fixtures shall conform to **UL 924**, **NFPA 101**, and as specified.

Exit lighting fixtures shall be furnished completely assembled with wiring and mounting devices and ready for installation at the locations indicated. Ceiling-mounted fixtures shall be designed to be supported independent of the ceiling. Fixtures shall be equipped with lamps.

2.1.1 Efficiencies

Exit lighting fixtures shall have efficiencies in accordance with the recommended levels specified in **DOE LT-4**.

2.2 EMERGENCY POWER LOSS EXIT LIGHTING UNITS

Each self-contained unit shall have an automatic power failure device, test switch, pilot light, and fully automatic high/low solid-state trickle charger in a self-contained power pack. Battery shall be the sealed-wet type and shall be maintenance-free for a period of not less than 10-years under normal operating conditions. Normal operation shall be with 277 -volts.

2.3 LIGHT EMITTING DIODES (LEDs) EXIT LIGHTING FIXTURES

Exit lighting fixtures shall include sheetmetal enclosures with frames, battery charger, batteries, red light emitting diodes (LEDs) and mounting brackets. Fixtures shall be single or double faced; as indicated on plans. Mounting plates shall be suitable for securing the fixture to a 4 inch outlet box. Fixture features shall include continuous charging, automatic switching to standby batteries upon loss of power, overload protection, short circuit protection, test switch, low voltage disconnect, switch controlled left and right LED directional arrows, and shall be field connectable to operate from 277 volts. Minimum operating time of the battery system shall be three (3) hours for double faced fixtures and seven (7) hours for single faced fixtures. Brightness shall not be less than ten (10) **candlepower**. All components shall have a five year warranty.

PART 3 EXECUTION

3.1 INSTALLATION

Fixtures shall be connected to the main panel bus through overcurrent protection. Emergency lighting panel shall be used where available.

3.2 FIELD TESTING

Exit lighting shall be demonstrated to operate satisfactorily in the presence of the Contracting Officer.

[Operational Tests](#) shall be performed in accordance with referenced standards in this section.

-- End of Section --

SECTION 26 56 00

EXTERIOR LIGHTING

07/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100 (2000; Archived) The Authoritative Dictionary of IEEE Standards Terms

IEEE C2 (2012) National Electrical Safety Code

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250 (2008) Enclosures for Electrical Equipment (1000 Volts Maximum)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2011; Errata 2 2012) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 1598 (2008; Reprint Jan 2010) Luminaires

1.2 DEFINITIONS

- a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE 100.
- b. Average life is the time after which 50 percent will have failed and 50 percent will have survived under normal conditions.
- c. Groundline section is that portion between one foot above and 2 feet below the groundline.

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Luminaires;

SD-06 Test Reports

Operating test

Submit operating test results as stated in paragraph entitled "Field Quality Control."

1.4 QUALITY ASSURANCE

1.4.1 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.4.2 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.4.2.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.4.2.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

1.5 WARRANTY

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

PART 2 PRODUCTS

2.1 LUMINAIRES

UL 1598. Provide luminaires as indicated. Provide luminaires complete with lamps of number, type, and wattage indicated. Details, shapes, and dimensions are indicative of the general type desired, but are not intended

to restrict selection to luminaires of a particular manufacturer. Luminaires of similar designs and of equal finish and quality will be acceptable as approved.

2.2 EQUIPMENT IDENTIFICATION

2.2.1 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

2.2.2 Labels

Provide labeled luminaires in accordance with [UL 1598](#) requirements. Luminaires shall be clearly marked for operation of specific lamps and ballasts according to proper lamp type. The following lamp characteristics shall be noted in the format "Use Only _____":

- a. Lamp diameter code (T-4, T-5, T-8, T-12), tube configuration (twin, quad, triple), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
- b. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
- c. Start type (preheat, rapid start, instant start) for fluorescent and compact fluorescent luminaires.
- d. ANSI ballast type (M98, M57, etc.) for HID luminaires.
- e. Correlated color temperature (CCT) and color rendering index (CRI) for all luminaires.

Markings related to lamp type shall be clear and located to be readily visible to service personnel, but unseen from normal viewing angles when lamps are in place. Ballasts shall have clear markings indicating multi-level outputs and indicate proper terminals for the various outputs.

2.3 FACTORY APPLIED FINISH

Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of [NEMA 250](#) corrosion-resistance test.

PART 3 EXECUTION

3.1 INSTALLATION

Electrical installations shall conform to [IEEE C2](#), [NFPA 70](#), and to the requirements specified herein.

3.2 FIELD QUALITY CONTROL

Upon completion of installation, verify that equipment is properly installed, connected, and adjusted. Conduct an [operating test](#) to show that the equipment operates in accordance with the requirements of this section.

-- End of Section --

**TELECOMMUNICATIONS INFRASTRUCTURE STANDARDS
MARINE CORPS BASE CAMP LEJEUNE**

SECTION 27 10 00

BUILDING TELECOMMUNICATIONS CABLING SYSTEM

02/12

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D 709 (2001; R 2007) Laminated Thermosetting Materials

ASTM E 814 (2011a) Standard Test Method for Fire Tests of Through-Penetration Fire Stops

ELECTRONIC COMPONENTS ASSOCIATION (ECA)

ECA EIA/ECA 310 (2005) Cabinets, Racks, Panels, and Associated Equipment

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100 (2000; Archived) The Authoritative Dictionary of IEEE Standards Terms

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA WC 66 (2001; Errata 2003) Performance Standard for Category 6 and Category 7 100 Ohm Shielded and Unshielded Twisted Pairs

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2011; Errata 2 2012) National Electrical Code

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA J-STD-607 (2002a) Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

TIA-568-2 (2009c; Errata 2010) Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted Pair Cable Components

TIA-568-C.1 (2009) Commercial Building

Telecommunications Cabling Standard

- TIA-568-C.3 (2008; Corrections 2008) Optical Fiber Cabling Components Standard
- TIA-569 (2004b; Add 1 2009) Commercial Building Standard for Telecommunications Pathways and Spaces
- TIA/EIA-604-2 (2004b) FOCIS 2 Fiber Optic Connector Intermateability Standard
- TIA/EIA-606 (2002a; Errata 2007; R 2007; Adm 1 2008) Administration Standard for the Telecommunications Infrastructure

U.S. DEPARTMENT OF AGRICULTURE (USDA)

- RUS Bull 345-83 (1979; Rev Oct 1982) Gas Tube Surge Arrestors (PE-80)

U.S. FEDERAL COMMUNICATIONS COMMISSION (FCC)

- FCC Part 68 Connection of Terminal Equipment to the Telephone Network (47 CFR 68)

UNDERWRITERS LABORATORIES (UL)

- UL 1286 (2008; Reprint Jan 2011) Office Furnishings
- UL 1863 (2004; Reprint Aug 2008) Communication Circuit Accessories
- UL 497 (2001; Reprint Apr 2009) Protectors for Paired Conductor Communication Circuits
- UL 50 (2007) Enclosures for Electrical Equipment, Non-environmental Considerations
- UL 514C (1996; Reprint Novy 2011) Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
- UL 969 (1995; Reprint Nov 2008) Standard for Marking and Labeling Systems

1.2 RELATED REQUIREMENTS

Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM apply to this section with additions and modifications specified herein.

1.3 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in this specification shall be as defined in TIA-568-C.1, TIA-568-2, TIA-568-C.3, TIA-569, TIA/EIA-606 and IEEE 100 and herein.

1.3.1 Main Distribution Frame (MDF)

A physical structure at a central location for terminating permanent backbone cables to interconnect with service provider (SP) equipment at the activity minimum point of presence. The MDF generally includes vendor specific components to support voice and data circuits, building surge protector assemblies, main cross connect blocks, equipment support frames, and fire rated plywood backboard. Depending upon local site conditions, the MDF and BDF may be the same space.

1.3.2 Building Distribution Frame (BDF)

A structure with terminations for connecting backbone, campus, and horizontal cabling. The BDF generally includes a cross connect, equipment support frame or lockable terminal cabinet, cable supports, and fire rated plywood backboard. The BDF shall include building protector assemblies when used for campus backbone or SP cabling.

1.3.3 Intermediate Distribution Frame (IDF)

An intermediate termination point for horizontal wiring and cross-connections within telecommunications rooms. Shall be connected to MDF with both fiber and copper. Secure Internet Protocol (SIPR) vault or cabinet is considered an IDF.

1.4 ENVIRONMENTAL REQUIREMENTS

Connecting hardware shall be rated for operation under ambient conditions of 0 to 60 degrees C (32 to 140 degrees F) and in the range of 0 to 95 percent relative humidity, non-condensing. Provide HVAC tied into building system or separate that will maintain continuous cooling environmental control (24 hours per day, 365 days per year). If emergency power is available, consider connecting it to the HVAC system.

1.5 SYSTEM DESCRIPTION

The structured telecommunications pathway system shall include permanently installed horizontal and backbone pathways, service entrance facilities, work area pathways, telecommunications outlet boxes, conduit, and raceway, and hardware for splicing, terminating, and interconnecting. The horizontal system includes the pathway between the telecommunications room and the work area telecommunications outlet. The horizontal system shall be suitable for star topology with the MDF/IDF at the center or hub of the star. The backbone pathway system includes intrabuilding and interbuilding interconnecting pathway to provide connectivity between the MDF's, BDF's, and IDF's. The backbone system shall be suitable for star topology with the MDF at the center or hub of the star.

1.6 SUBMITTALS

The following shall be submitted in accordance with [Section 01 33 00 SUBMITTAL PROCEDURES](#):

[SD-03 Product Data](#)

[Telecommunications cabling](#) (backbone and horizontal);

[Telecommunications outlet/connector assemblies](#);

Submittals shall include the manufacturer's name, trade name, place of manufacture, and catalog model or number. Include performance and characteristic curves. Submittals shall also include applicable federal, military, industry, and technical society publication references. Should manufacturer's data require supplemental information for clarification, the supplemental information shall be submitted as specified in paragraph REGULATORY REQUIREMENTS and as required in [Section 01 33 00 SUBMITTAL PROCEDURES](#).

SD-06 Test Reports

Telecommunications cabling testing;

SD-07 Certificates

Telecommunications Contractor Qualifications;

Manufacturer Qualifications;

Test plan;

1.7 ADDITIONAL SUBMITTAL REQUIREMENTS

All submittals of material, equipment and design must be approved by the Base Telephone Office via the Contracting Officer prior to installing any telecommunications wiring and equipment.

1.7.1 Qualifications

1.7.1.1 Minimum Contractor Qualifications

Prior to installation, submit data of provider's experience and qualifications. All work under this section shall be performed by and all equipment shall be provided by a certified [Telecommunications Contractor](#), hereinafter referred to as the Contractor. The Contractor shall have the following qualifications in Telecommunications Systems installation:

- a. Contractor shall have a minimum of 3 years experience in the application, installation and testing of the specified systems and equipment to be installed.
- b. All supervisors and installers assigned to the installation of this system or any of its components shall be Building Industry Consulting Services International (BICSI) Certified Cabling Installation Technicians, Installer Level 2, or have a minimum of 3 current consecutive years experience in the installation of the specified copper and fiber optic cable and components.
- c. Contractor shall include names and locations of two projects successfully completed using optical fiber and copper communications cabling systems. Include specific experience in installing and testing structured telecommunications distribution systems using optical fiber and Category 5E/6 cabling systems. Include written correspondence from users that systems have performed satisfactorily for not less than 18 months.

1.7.1.2 Minimum [Manufacturer Qualifications](#)

The equipment and hardware provided under this contract will be from manufacturers that have a minimum of 3 years experience in producing the types of systems and equipment specified.

1.7.2 [Test Plan](#)

Provide a complete and detailed test plan for the telecommunications cabling system including a complete list of test equipment for the UTP and optical fiber components and accessories 60 days prior to the proposed test date. Include procedures for certification, validation, and testing.

1.8 DELIVERY AND STORAGE

Provide protection from weather, moisture, extreme heat and cold, dirt, dust, and other contaminants for telecommunications cabling and equipment placed in storage.

PART 2 PRODUCTS

2.1 PATHWAYS (BACKBONE AND HORIZONTAL)

[TIA-569](#). Pathway shall be conduit, cable tray, or access flooring. Under floor duct and wireway is not recommended and may require water block / outdoor cabling. Cantilever-type center hung tray shall not be used. Provide grounding and bonding as required by [TIA J-STD-607](#). Cable wiring shall comply with [NFPA 70](#). All conduits entering the Telecommunications Room should be grouped and consolidated, conduits can be "Home Run" or stubbed to cable tray, all should have bonding bushing / plastic insert, and shall extend down from the ceiling 3 to 4 inches or extended to ladder rack or onto the backboard. Conduit will be bonded to the TMGB or TGB by minimum #6 AWG green sheathed stranded conductors. All penetrations will be sealed with firestopping material in accordance with the requirements of Section 07 84 00 FIRESTOPPING. A minimum of two 3 inch conduits will be installed between the Main Telecommunications Room and other communication rooms (IDFs).

2.1.1 Work Area Pathways

Comply with [TIA-569](#), except 1-inch diameter conduit shall not be permitted. Minimum conduit size shall be 1-1/4 inches. System furniture pathways shall comply with [UL 1286](#). Horizontal cabling for open offices shall comply with [TIA-568-C.1](#).

2.1.2 Pull Boxes

Construct of galvanized sheet steel with screw-fastened covers. Minimum size of boxes shall be not less than 4-11/16-inches wide by 4-11/16-inches in length by 2 1/8-inches deep for individual 1-1/4-inch diameter conduit; minimum size of boxes shall be not less than 12"W x 48"L x 5"D for 3" conduit, 15"W x 60"L x 8"D for 4" conduit per [TIA-569](#), provide pull boxes where length of conduit exceeds 100 feet or where there are more than two 90 degree bends, or equivalent. Align conduit ends on opposite sides of pull boxes as in a pull through, do not turn or change direction in pull boxes. Provide pull boxes in straight lengths of conduit; pull points, LC, LB, condulets are not authorized.

2.2 BENDS

Inside radius of conduit bend shall be a minimum of 6 times the internal diameter of conduit for conduits of 2 inches or less. Inside radius of conduit bend shall be a minimum of 10 times the internal diameter of conduit for conduits larger than 2 inches.

2.3 TELECOMMUNICATIONS OUTLET BOXES

Telecommunications outlet boxes should be placed in all work areas and any area that can be converted to work areas; so any furniture package configuration will have a connection along the wall with a 6' base cord. Good practice is 6" to the left or right of every electrical outlet box in workable office areas or any area that could be converted into workable office area such as a storage closet; also any conference room should have one floor and one ceiling box. Boxes shall be standard type 5 inches square by 2 7/8 inches deep for CAT6 with 1¼-inch diameter side knock-outs, with a single gang plaster ring. Mount flush in finished walls at height indicated by drawings. Outlet boxes for wall-mounted telephones shall be 2 by 4 by 2 1/8 inches deep with 1 CAT6 cable terminated in a standard wall phone plate; mounted at 54 inches above finished floor. Outlet boxes for handicapped telephone station or work counter area shall be mounted at a height 48 inches above finished floor. Outlet boxes installed in floor for classrooms or open spaces shall be telecommunications floor boxes large enough to support a surge of users with proper cable protection and ports that are not parallel to the floor. Floor boxes and under slab cabling should not be used on the first floor in wet areas. Tele electric poles or furniture managed pathways fed from above the wet area should be used. Multi-user Telecommunications Outlet Assembly i.e. Multimedia Outlet Assemblies (MUTOA) should be placed where best suited for the furniture used in open office spaces.

2.3.1 Telecommunications Cabling

Cabling shall be UL listed for the application and shall comply with [TIA-568-C.1](#), [TIA-568-2](#), [TIA-568-C.3](#) and [NFPA 70](#). Provide a labeling system in accordance with Paragraph "LABELING" and Base Telephone via the Contracting Officer guidance for cabling as required by [TIA/EIA-606](#) and [UL 969](#). Cable specifications must be provided in submittal and approved by Base Telephone via the Contracting Officer before installation. Cabling manufactured more than 12 months prior to date of installation shall not be used.

2.3.2 Horizontal Cabling

Comply with [NFPA 70](#), and performance characteristics in [TIA-568-C.1](#).

2.3.2.1 Horizontal Copper

[TIA-568-2](#), [ANSI/NEMA WC 66](#), [NFPA 70](#), UTP (unshielded twisted pair), 100 ohm. Provide a minimum of four cables to each work area outlet (faceplate), each unshielded twisted pair, 24 AWG conductors, Category 6 general purpose cable, with white PVC jacket for all odd numbered jacks, and blue PVC jacket for all even numbered jacks (unclassified service). Plenum (CMP) or riser (CMR) cable may be substituted for general purpose cable. If the cabling passes thru a plenum air space then plenum (CMP) rated cable is required. If the cabling is run in under slab conduit, outdoor rated cable shall be used. Contact Base Telephone via the Contracting Officer for special requirements on classified service,

unclassified service, under slab cabling, using water block, and any item not covered in this document.

2.4 DISTRIBUTION FRAMES

Provide building distribution frames (BDF's), intermediate distribution frames (IDF's), and main distribution frames (MDF's) as shown on design drawings for terminating and cross connecting permanent cabling.

2.4.1 Equipment Support Frame

Provide in accordance with ECA EIA/ECA 310 and UL 50.

- a. Cabinets should be used in areas that are not secured. Cabinets, freestanding modular type, 16 gauge steel construction, minimum, treated to resist corrosion. Cabinets shall be no smaller than 24"W X 48"H X 30"D but can be as large as 7'H X 24"W X 30"D. Cabinet shall have removable and lockable side panels, front and rear doors. Cabinet shall be vented in the roof and rear door. Cabinet shall have cable access in the roof and base and be compatible with 19 inches panel mounting. Provide cabinet with grounding bar, roof mounted 550 CFM fan with filter and a surge protected power strip with 6 duplex 20 amp receptacles and cord long enough to reach dedicated building power. All cabinets shall be lockable (keyed to current base key) and large enough to support all telephone / data equipment required in the building plus 25 percent spare. Dedicated electrical outlets should be installed on backboard within 6' of the cabinet. A backboard for mounting equipment is still needed when a cabinet is installed (see paragraph "BACKBOARDS" below).

2.4.2 Building Protector Assemblies

Building protector assembly shall have 710 type connector blocks for connection to the exterior cable at full capacity. M150-66 type IDC for connection to the voice cross connect blocks. 110 type IDC protector assemblies are not approved.

2.4.2.1 Protector Modules

UL 497, RUS Bull 345-83, three-electrode gas tube or solid state type rated for the application. Provide the number of surge protection modules equal to the number of pairs of exterior cable of the building protector assembly.

2.4.3 Connector Blocks

Provide insulation displacement connector (IDC) 50 pair 89D-Style with industry standard 110 blade punch down for Category 5e and higher systems. Provide blocks for the number of backbone cables terminated on the block plus 25 percent spare. Also provide sufficient blocks for cross connects for all IDFs.

2.4.4 Patch Panels

Provide ports for the number of horizontal and backbone cables terminated on the panel plus 25 percent spare within the top 2/3 of the equipment support frame (bottom 1/3 is reserved for DATA equipment). Provide pre-connectorized ST type Optical fiber and copper patch cords for patch panels. Provide patch cords, as complete assemblies, with matching connectors as specified. Patch cords shall meet minimum performance

requirements specified in TIA-568-C.1, TIA-568-2, and TIA-568-C.3 for cables, cable length and hardware specified.

2.4.4.1 Modular to Patch Panel

Provide in accordance with TIA-568-C.1 and TIA-568-2. Panels shall be third party verified and shall comply with EIA/TIA Category 6 requirements. Panel shall be constructed of 0.09 inches minimum aluminum and shall be cabinet mounted and compatible with an ECA EIA/ECA 310 19 inches equipment cabinet. Each panel shall provide 48 port, non-keyed, dual 8-pin modular ports, wired to T568A. Patch panels shall terminate the building cabling on Type 110 IDCs and shall utilize a printed circuit board interface. The rear of each panel shall have incoming cable strain-relief and routing guides. DO NOT USE ZIP TIES. Panels shall have each port factory numbered and be equipped with manufacturer's labels and laminated plastic covers above each port.

2.4.4.2 Fiber Optic Patch Panel

Provide panel for maintenance and cross-connecting of optical fiber cables. Panel shall be constructed of 16 gauge steel or 11 gauge aluminum minimum and shall be compatible with a ECA EIA/ECA 310 19 inch equipment rack. Each panel shall provide 12 multimode and 12 single-mode adapters as ST in accordance with TIA/EIA-604-2 with metallic alignment sleeves. Provide dust cover for unused adapters. The rear of each panel shall have a cable management tray a minimum of 8 inches deep with removable cover, incoming cable strain-relief and routing guides. DO NOT USE ZIP TIES. Panels shall have each adapter factory numbered.

2.4.5 Optical Fiber Distribution Panel

Rack mounted optical fiber distribution panel (OFDP) shall be constructed in accordance with ECA EIA/ECA 310 utilizing 11 gauge aluminum minimum. Panel shall have strain relief, routing guides, splice tray and shall have a cover for patch cord protection. Each panel shall provide 12 multimode and 12 single-mode adapters. Provide adapters as ST with metallic alignment sleeves. Provide dust covers for adapters. Provide patch cords as specified in the paragraph PATCH PANELS. Pigtailed are not recommended.

2.5 TELECOMMUNICATIONS OUTLET BOXES

Standard type 5" x 5" x 2 7/8" square box with a single gang plaster ring. Mount flush in finished walls at height indicated by drawings. Depth of boxes shall be large enough to allow manufacturer's recommended conductor bend radii normally 2 7/8".

2.6 TELECOMMUNICATIONS OUTLET/CONNECTOR ASSEMBLIES

2.6.1 Outlet/Connector Copper

Outlet/connectors shall comply with FCC Part 68.5, TIA-568-C.1, and TIA-568-2. UTP Outlet/connectors shall be UL 1863 listed, non-keyed, 4-pair, dual 8-pin modular, constructed of high impact rated thermoplastic housing and shall be third party verified and shall comply with TIA-568-2 Category 6 requirements. Provide outlet/connectors in indicated color (normally ivory or white and should match electrical coverplates). Outlet/connectors provided for Category 6 UTP cabling shall meet or exceed the requirements for the cable provided. Outlet/connectors shall be terminated using a Type 110 IDC PC board connector, color-coded for both

T568A and T568B wiring. Each outlet/connector shall be wired **T568A**. UTP outlet/connectors shall comply with **TIA-568-2** for 750 mating cycles. UTP outlet/connectors installed in outdoor or marine environments shall be rated for that use or protected with weatherproof enclosure.

2.6.2 Cover Plates

Telecommunications cover plates shall comply with **UL 514C**, and **TIA-568-C.1**, **TIA-568-2**, **TIA-568-C.3**; flush or oversized design constructed of high impact thermoplastic material, equipped with laminated plastic cover for label, and able to accept 2 dual 8-pin modular couplers. Color should match color of receptacle/switch cover plates specified in Section **26 20 00 INTERIOR DISTRIBUTION SYSTEMS**. Provide labeling in accordance with the paragraph **LABELING** in this section.

2.7 FIRESTOPPING MATERIAL

Provide in accordance with Section **07 84 00 FIRESTOPPING**. Provide asbestos-free fire stopping system capable of maintaining an effective barrier against flame and gases. System shall be UL listed and comply with **ASTM E 814**. Include UL system number UL listed print from manufacturer for each type of floor, wall, and ceiling penetration.

2.8 MANUFACTURER'S NAMEPLATE

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

2.9 FIELD FABRICATED NAMEPLATES

ASTM D 709. Provide nameplates for equipment rooms and telecommunication room doors in accordance with schedule provided on drawings. Telephone rooms should not be labeled NMCI. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, **0.125 inch** thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be **one by 2.5 inches**. Lettering shall be a minimum of **0.25 inch** high normal block style.

PART 3 EXECUTION

3.1 INSTALLATION

Telecommunications pathway systems, including the horizontal and backbone pathway systems, telecommunications outlet/connector assemblies, and associated hardware shall be installed in accordance with **TIA-568-C.1**, **TIA-568-2**, **TIA-568-C.3**, **TIA-569**, **NFPA 70**, manufacturer instructions, current industry best practices, UL standards as applicable, and approval of Base Telephone via the Contracting Officer. Base Telephone requirements will be coordinated through the Contracting Officer. Metal raceway bases, covers, and dividers shall be bonded and grounded in accordance with **TIA J-STD-607**. Pathways shall be installed in accordance with the following minimum clearance distances of 1.2 meters (4 feet) from motors, generators, frequency converters, transformers, x-ray equipment or uninterruptible power system, 300 mm (12 in) from power conduits and cable

systems, 125 mm (5 inches) from fluorescent or high frequency lighting system fixtures.

3.1.1 Cabling

Install Category 6 UTP and optical fiber telecommunications cabling and pathway system as detailed in [TIA-568-C.1](#), [TIA-568-2](#), and [TIA-568-C.3](#). Use an approved insulation displacement connection (IDC) tool kit for copper cable terminations. Screw terminals shall not be used. Do not untwist Category 6 UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry. Provide service loop on each end of the cable, 10 feet (3 meters) in the telecommunications room, 6" (150mm) in or close to the work area outlet for UTP. Do not exceed manufacturers' cable pull tensions for copper cables. Provide a device to monitor cable pull tensions. Do not exceed 110 Newton pull tension for four pair copper cables. Do not chafe or damage outer jacket materials. Use only lubricants approved by cable manufacturer. Do not over cinch cables, or crush cables with staples. Only Velcro type cable straps are allowed on Category 6 cable and optical fiber cable. DO NOT USE ZIP TIES. UTP cable bend radii shall not be less than four times the cable diameter.

3.1.1.1 Horizontal Cabling

Install horizontal cabling in an approved pathway as indicated in this specification and on drawings between MDF, BDF, IDF, and telecommunications outlet assemblies at workstations. All under slab cables shall be rated for outdoor use.

3.1.2 Pathway Installations

Comply with [TIA-569](#), except provide 1-1/4 inch (32 mm) diameter conduit to each work area outlet from cable tray or telecommunication room backboard. Conceal conduit within finished walls, ceilings, and floors (not in wet areas). Keep conduit minimum 305 mm (12 inches) away from parallel runs of electrical power equipment, flues, steam, light ballast, and hot water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit is visible after completion of project. Run conduits in crawl spaces as if exposed. Install no more than two 90 degree bends for a single horizontal cable run. All bends/turns in conduits will be in straight runs of conduit; a pull box shall be installed after every 180 degrees of bends or 100'; in no case will a turn be made within a pull box. The minimum size for a pull box for a single 1 1/4" conduit will be 4 11/16" long by 4 11/16" wide by 2 1/8" deep, and for a 3" conduit 30"W x 54"L x9"D. All conduits should contain a bushing at the end to protect the cable from damage and required bonding. Pull points, LC, LB, condulets and consolidation points are not authorized.

3.1.3 Work Area Outlets

All work areas will contain a minimum of two face plates. Any work area larger than 80 sq feet will require additional face plates to service any work location in the room within 6 feet of a faceplate. This also applies to any area that could be converted to work space in the future. Recommend a Telecommunications outlet box be placed 6" to the left or right of every electrical outlet box in workable office areas or any area that could be converted into workable office area such as a storage closet. All work area faceplates will contain four category 6 jacks/ports unless otherwise approved by Base Telephone via the Contracting Officer.

3.1.3.1 Terminations

Terminate UTP cable in accordance with [TIA-568-C.1](#), [TIA-568-2](#), [TIA-568-C.3](#) and wiring configuration as specified, [T568A](#).

3.1.3.2 Faceplates

As a minimum, each jack shall have manufacturer labels numbered and be equipped with laminated plastic cover over the label. Also it shall be labeled as to its function with a blue computer icon on all even ports and a red phone icon on all the odd ports. (For secured networks contact Base Telephone via the Contracting Officer.)

3.1.3.3 Cables

Unshielded twisted pair shall have a minimum of 152 mm (6 inch) slack cable loosely coiled in or close to the telecommunications outlet boxes. Minimum manufacturer's bend radius for each type of cable shall not be exceeded. All telecommunications outlet boxes should have 4 cables to a double gang box if wiring is included in contract (no rough in or future use allowed).

3.1.3.4 Pull Cords

Pull cords shall be installed in all conduit serving telecommunications outlets if wiring is not included in contract, label each end.

3.1.4 Telecommunications Room Termination

Install termination hardware required for Category 6 and optical fiber system. A **single punch** insulation displacement tool shall be used for terminating copper cable to insulation displacement connectors (no multi punch tools).

3.1.4.1 Equipment Support Frames

Install in accordance with [TIA-569](#):

- b. Racks / lockable cabinet, floor mounted modular type. Permanently anchor rack to the floor per manufacturer's recommendations. Mount so there is sufficient space remaining on backboard to mount lightning protection, bonding, and cable managers, or install additional backboard. Install sections of ladder rack anchored to telephone rack/cabinet and at least two walls. Ensure proper low voltage clearance in accordance with [NFPA 70](#).

3.1.5 Electrical Penetrations

Seal openings around electrical penetrations through fire resistance-rated wall, partitions, floors, or ceilings as specified in Section 07 84 00, FIRESTOPPING.

3.1.6 Grounding and Bonding

Will be conducted in accordance with [TIA J-STD-607](#), and [NFPA 70](#) except only two hole compression lugs will be accepted.

3.1.7 Firestopping

Seal openings around raceway penetrations through fire resistance rated walls, partitions, floors and ceiling utilizing proper firestopping materials to maintain fire resistive integrity in accordance with Section 07 84 00 FIRESTOPPING.

3.2 LABELING

3.2.1 Labels

All labels shall be in accordance with TIA/EIA-606; except jacks will be numbered in a logical, sequential, clockwise numbering system from 1 to X with a closet designator. Example would be 145 C 146, would be the 145th & 146th jacks from the C comm. room. All labels shall be numbered with manufacturers labeling system (not fabricated or P-touch) and be equipped with laminated plastic cover. All terminations that are not to work area outlets should be in the last patch panel locations and labeled accordingly, i.e. DDC, FACP, Elevator, Wall phones.

3.2.2 Cable

Cables shall be labeled using color labels on both ends with encoded identifiers per TIA/EIA-606.

3.2.3 Termination Hardware

Workstation outlets and patch panel connections shall be labeled using manufacturer labeling system, color coded with identifiers in accordance with TIA/EIA-606.

3.3 TESTING

3.3.1 Telecommunications Cabling Testing

Perform telecommunications cabling inspection, verification, and performance tests in accordance with TIA-568-C.1, TIA-568-2, and TIA-568-C.3. Perform optical fiber field inspection tests via attenuation measurements on factory reels and provide results along with manufacturer certification for factory reel tests. Remove failed cable reels from project site upon attenuation test failure.

3.3.1.1 Inspection

Visually inspect cabling jacket materials for UL or third party certification markings. Visually inspect UTP and optical fiber jacket materials for UL or third party certification markings. Inspect cabling terminations in telecommunications rooms and at workstations to confirm color code for tip and ring pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1, TIA-568-2, and TIA-568-C.3. Visually confirm Category 6 marking of outlets, wallplates, outlet/ connectors, cables, and patch panels.

3.3.1.2 Verification Tests

UTP backbone copper cabling shall be tested for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors, and between conductors and shield, if cable has overall shield. Test operation of shorting bars in connection blocks. Test cables after termination but not

cross connected. Perform 100 MHz near-end-cross-talk (NEXT) and attenuation tests for Category 6 systems installations.

3.3.1.3 Performance Tests

- a. Category 6 Links. Perform UTP **permanent link** tests in accordance with **TIA-568-C.1, TIA-568-2, TIA-568-C.3**. Tests shall include wire map, length, attenuation, NEXT, and propagation delay. A channel test is not acceptable.
- b. As built drawings (not hand written, AutoCAD and .pdf preferred) showing all telecommunications outlets and their numbers.

3.3.1.4 Final Verification Tests

Perform verification tests for UTP and optical fiber systems after the complete telecommunications cabling and workstation outlet/connectors are installed. Provide summary in .pdf and detailed test results in tester format .flw, as built drawings in .pdf and .dwg, and fiber power meter/OTDR reports on a CD/CDRW to Base Telephone office. All Test reports should have a building or project number on it. The final QC and certification of installation will be performed by Base Telephone after the contractor has provided passing and acceptable results on all test and As Built drawings showing all telecommunications outlets and their numbers. Test results that are a marginal may not be accepted. Also Fiber tests that pass the link budget but exceed tolerance on any connector or splice are considered a failure. All discrepancies shall be repaired and retested.

3.3.1.5 Records

- a. Records to be provided for copper shall include the cable specification sheets from the manufacturer, the cable routing and locations, all splice point locations, patch panel and jack locations, cable length, cable reel numbers and installation location, building or project number. The test results shall be submitted in an electronic version on a CD/CDRW (do not e-mail).
- b. As built drawings showing all telecommunications outlets and their numbers, Rack Elevations, communication room locations, building or project number, and pathways should be submitted in an electronic version on a CD/CDRW (do not e-mail) and a hard copy should be posted in the communication room.

3.4 SCHEDULE

Some metric measurements in this section are based on mathematical conversion of inch-pound measurements, and not on metric measurement commonly agreed to by the manufacturers or other parties. The inch-pound and metric measurements are as follows:

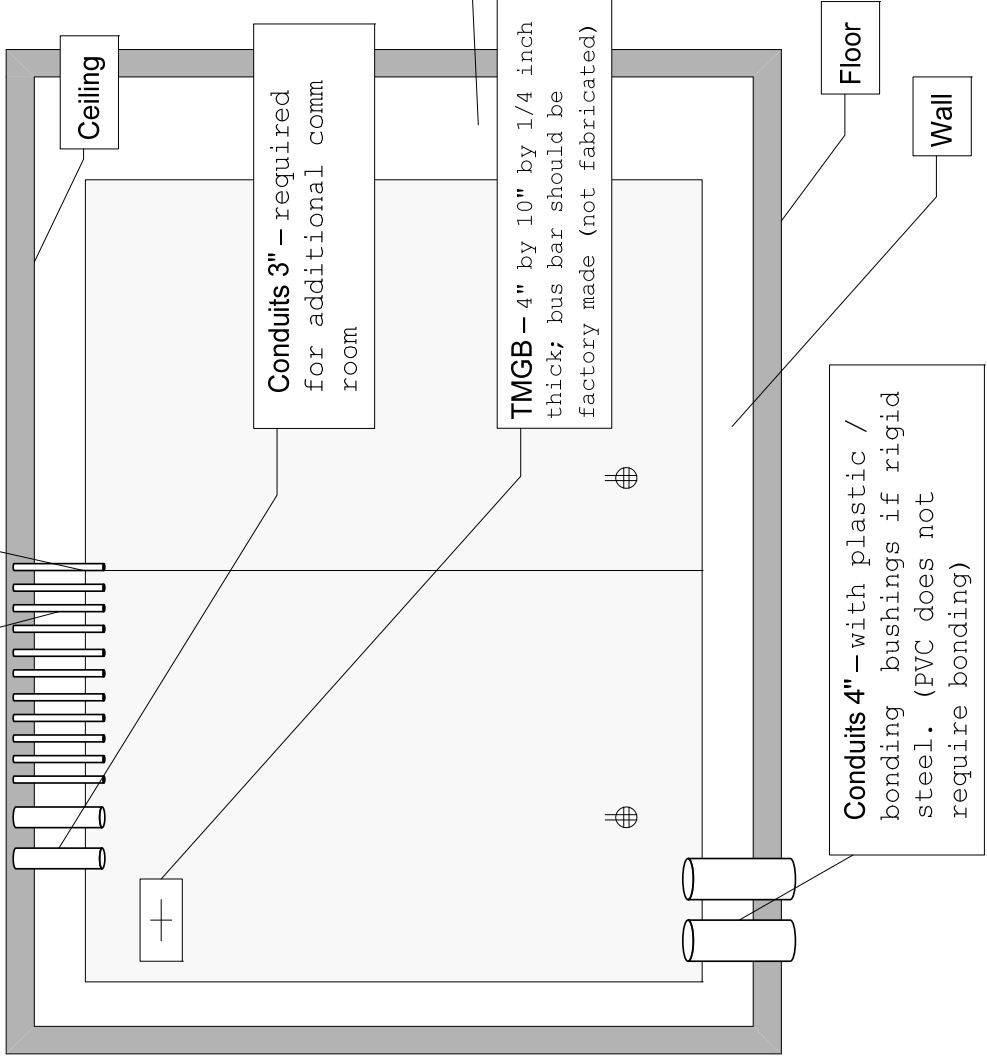
PRODUCTS	INCH-POUND	METRIC
Outlet Boxes		
1. Standard		
- Length/width	5 inches (square)	127 mm (square)
- Depth	2 1/8 inches	55 mm
2. Telephone Outlet		
- Length	4 inches	100 mm

PRODUCTS	INCH-POUND	METRIC
- Width	2 inches	50 mm
- Depth	2 1/8 inches	55 mm
- Depth	1 1/2 inches	38 mm
-- End of Section --		

Telecommunications Backboard Example

Conduits 1" – with plastic / bonding bushings – home run to work area outlet or cable tray.

Telephone backboard - 4'x8' Provide min 2 void-free, interior grade plywood 19 mm (3/4 inch) thick as indicated. Backboards shall be fire rated, with the fire stamp visible or covered with two coats of gray or a lighter color nonconductive fire-retardant paint on all sides. Boards should be installed 4' Width x 8' Height securely fastened to the wall anywhere equipment is to be mounted.



Conduits 3" – required for additional comm room

TMGB – 4" by 10" by 1/4 inch thick; bus bar should be factory made (not fabricated)

Conduits 4" – with plastic / bonding bushings if rigid steel. (PVC does not require bonding)

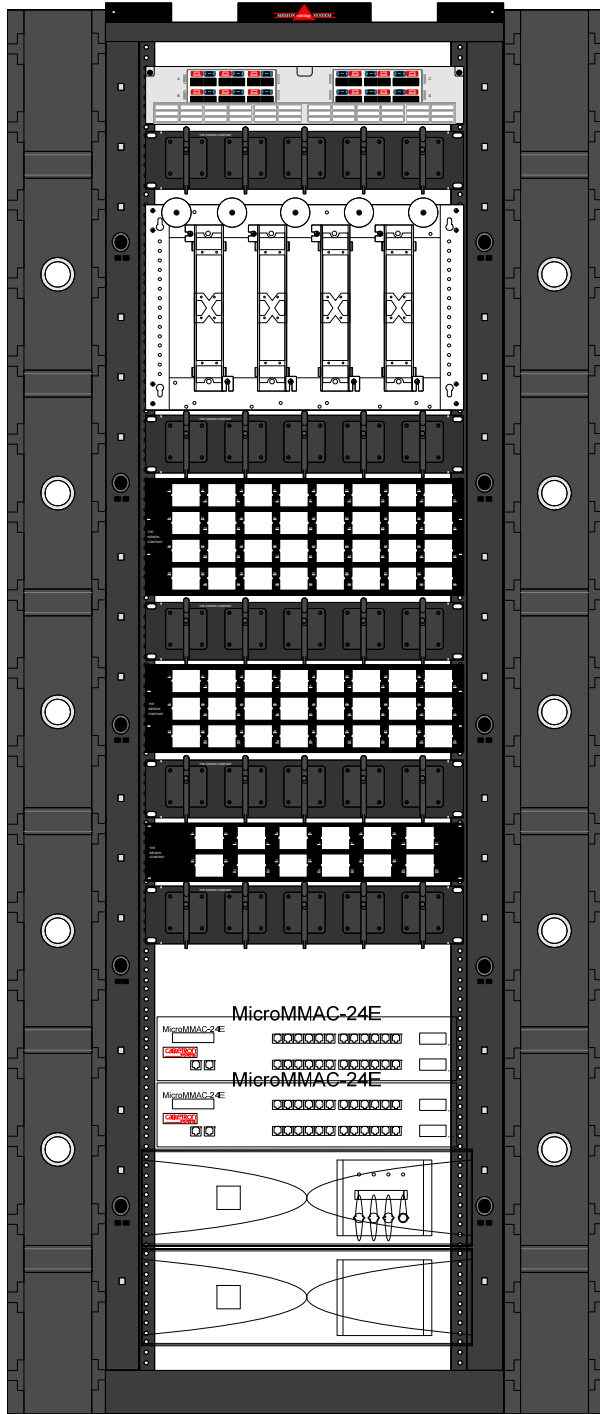
General notes

- all metallic conduit and equipment must be bonded to the TMGB and building ground per TIA J-STD-607-A with min #6AWG stranded green sheath conductor.
- all conduits need to be securely mounted, fire stopped, and over lap the back board by 3-6".
- 1 dedicated 20 amp quad power is required per comm. rack/cabinet.
- If wired by base telephone; contractor should install all except the below and add pull strings in conduits.
- if wired by contractor; install 4 CAT5E/6A cables in each 1" conduit to typical work area outlet; also install all ladder racks, patch panels, cabinets, building protectors, OSP cable, riser cable, and equipment IAW Base Tele 27 10 00 .

NOT to Scale for reference only

**On Backboard – PROTECTOR / BUILDING ENTRANCE BEP, TMGB,
Proper Bonding & grounding, Cable management / slack on ladder rack**

**RS3-07-S Rack or
T1030-712 Cabinet if in unsecure area**



**PCH-0XU
ST connectors**

**FIBER
Distribution**

**CABLE MANAGER
WM-145-5**

**CC-2014-TS-DC
KRONE' BLOCKS
6652-1-880-10**

COPPER

**CABLE MANAGER
WM-145-5**

**Number of
telecommunications work
outlets determine number
and size of patch panel and
need for additional racks**

**CT-PNL-64
CT-F-C5-C5-01
WM-BK**

**CABLE MANAGER
WM-145-5
CT-PNL-48
CT-F-C5-C5-01
WM-BK**

**If more than 3 racks are used:
place the NMCI switch / cable
termination rack towards the
center**

**CABLE MANAGER
WM-145-5
CT-PNL-24
CT-F-C5-C5-01
WM-BK**

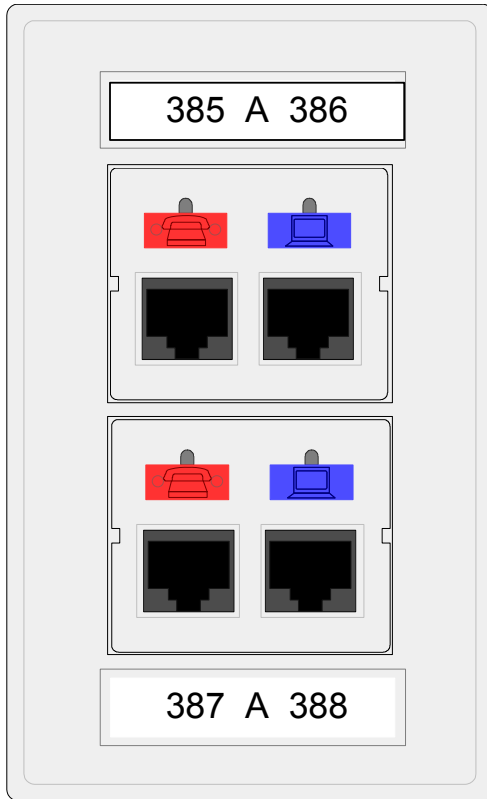
**CABLE MANAGER
WM-145-5**

**TELECOMMUNICATIONS
INFRASTRUCTURE
STANDARDS
MARINE CORPS BASE
CAMP LEJEUNE**

**Bottom 15 RU is
reserved for DATA
equipment**

**SECTION 27 10 00
Encl A
RACK ELEVATION
EXAMPLE**

Part #s shown are indicative of supplies/materials currently used by Base Telephone. However, equivalent parts/components from another manufacturer/vendor are acceptable for this project.



CT-FP-LBL-104

CT4-FP-20

CT-F-CX-CX-20

CT-F-CX-CX-20

**FOR COPPER
ONLY
TO THE
FACEPLATE**

**TELECOMMUNICATIONS
INFRASTRUCTURE STANDARDS
MARINE CORPS BASE CAMP
LEJEUNE**

SECTION 27 10 00
Encl C
FACEPLATE EXAMPLE

Part #s shown are indicative of supplies/materials currently used by Base Telephone. However, equivalent parts/components from another manufacturer/vendor are acceptable for this project.

SECTION 28 31 76

INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM

08/11

PART 1 GENERAL

1.1 RELATED SECTIONS

Section 26 00 00 BASIC ELECTRICAL MATERIALS AND METHODS, applies to this section, with the additions and modifications specified herein. In addition, refer to the following sections for related work and coordination:

Section 21 13 13.00 20 WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION

Section 07 84 00 FIRESTOPPING for additional work related to firestopping.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ACOUSTICAL SOCIETY OF AMERICA (ASA)

ASA S3.2 (2009) Method for Measuring the Intelligibility of Speech Over Communication Systems (ASA 85)

FM GLOBAL (FM)

FM APP GUIDE (updated on-line) Approval Guide <http://www.approvalguide.com/>

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41.1 (2002; R 2008) Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits

IEEE C62.41.2 (2002) Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

IEC 60268-16 (2003) Sound System Equipment - Part 16: Objective Rating Of Speech Intelligibility By Speech Transmission Index; Ed 3.0

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 7240-16 (2007) Fire Detection And Alarm Systems - Part 16: Sound System Control And Indicating Equipment

ISO 7240-19 (2007) Fire Detection and Alarm Systems – Part 19: Design, Installation, Commissioning and Service of Sound Systems for Emergency Purposes

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 170 (2012) Standard for Fire Safety and Emergency Symbols

NFPA 70 (2011; Errata 2 2012) National Electrical Code

NFPA 72 (2010; TIA 10-4) National Fire Alarm and Signaling Code

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-601-02 (2010) Operations and Maintenance: Inspection, Testing, and Maintenance of Fire Protection Systems

UFC 4-021-01 (2008; Change 1 2010) Design and O&M: Mass Notification Systems

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

47 CFR 15 Radio Frequency Devices

47 CFR 90 Private Land Mobile Radio Services

UNDERWRITERS LABORATORIES (UL)

UL 1480 (2003; Reprint Jun 2010) Standard for Speakers for Fire Alarm, Emergency, and Commercial and Professional Use

UL 1638 (2001; Reprint Oct 2008) Visual Signaling Appliances - Private Mode Emergency and General Utility Signaling

UL 1971 (2002; Reprint Oct 2008) Signaling Devices for the Hearing Impaired

UL 2017 (2008; Reprint May 2011) General-Purpose Signaling Devices and Systems

UL 268 (2009) Smoke Detectors for Fire Alarm Systems

UL 464 (2009; Reprint Jan 2011) Standard for Audible Signal Appliances

UL 864 (2003; Reprint Jan 2011) Standard for Control Units and Accessories for Fire Alarm Systems

UL Electrical Constructn (2011) Electrical Construction Equipment

Directory

UL Fire Prot Dir

(2011) Fire Protection Equipment Directory

1.3 DEFINITIONS

Wherever mentioned in this specification or on the drawings, the equipment, devices, and functions shall be defined as follows:

- a. Interface Device: An addressable device that interconnects hard wired systems or devices to an analog/addressable system.
- b. Remote Fire Alarm and Mass Notification Control Unit: A control panel, electronically remote from the fire alarm and mass notification control panel, that receives inputs from automatic and manual fire alarm devices; may supply power to detection devices and interface devices; may provide transfer of power to the notification appliances; may provide transfer of condition to relays or devices connected to the control unit; and reports to and receives signals from the fire alarm control panel.
- c. Fire Alarm Control Unit and Mass Notification Autonomous Control Unit (FMCP): A master control panel having the features of a fire alarm and mass notification control unit and fire alarm and mass notification control units are interconnected. The panel has central processing, memory, input and output terminals.
- d. Local Operating Console (LOC): A unit designed to allow emergency responders and/or building occupants to operate the MNS including delivery or recorded and/or live messages, initiate strobe and textural visible appliance operation and other relayed functions.
- e. Terminal Cabinet: A steel cabinet with locking, hinge-mounted door that terminal strips are securely mounted.

1.4 SYSTEM DESCRIPTION

1.4.1 Scope

- a. This work includes completion of design and providing a new, complete, and modifying the existing fire alarm and mass notification system as described herein and on the contract drawings for the AS-302. Include in the system wiring, raceways, pull boxes, terminal cabinets, outlet and mounting boxes, control equipment, alarm, and supervisory signal initiating devices, alarm notification appliances, supervising station fire alarm system transmitter, and other accessories and miscellaneous items required for a complete operating system even though each item is not specifically mentioned or described. Provide systems complete and ready for operation.
- b. Provide equipment, materials, installation, workmanship, inspection, and testing in strict accordance with the required and advisory provisions of NFPA 72, ISO 7240-16, IEC 60268-16, except as modified herein. The system layout on the drawings show the intent of coverage and are shown in suggested locations. Submit plan view drawing showing device locations, terminal cabinet locations, junction boxes, other related equipment, conduit routing, wire counts, circuit identification in each conduit, and circuit layouts for all floors. Drawings shall comply with the requirements of NFPA 170. Final quantity, system

layout, and coordination are the responsibility of the Contractor.

1.4.2 Technical Data and Computer Software

Technical data and computer software (meaning technical data that relates to computer software) that are specifically identified in this project, and may be defined/required in other specifications, shall be delivered, strictly in accordance with the CONTRACT CLAUSES. Identify data delivered by reference to the particular specification paragraph against which it is furnished. Data to be submitted shall include complete system, equipment, and software descriptions. Descriptions shall show how the equipment will operate as a system to meet the performance requirements of this contract. The data package shall also include the following:

- a. Identification of programmable portions of system equipment and capabilities.
- b. Description of system revision and expansion capabilities and methods of implementation detailing both equipment and software requirements.
- c. Provision of operational software data on all modes of programmable portions of the fire alarm and detection system.
- d. Description of Fire Alarm and Mass Notification Control Panel equipment operation.
- e. Description of auxiliary and remote equipment operations.
- f. Library of application software.
- g. Operation and maintenance manuals.

1.4.3 Keys

Keys and locks for equipment shall be identical. Provide not less than six keys of each type required. Master all keys and locks to a single key as required by the Installation Fire Department.

LOC is not permitted to be locked or lockable.

1.5 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

- Nameplates
- Wiring Diagrams
- System Layout
- System Operation
- Notification Appliances
- Amplifiers

SD-03 Product Data

- Technical Data And Computer Software
- Fire Alarm Control Unit and Mass Notification Control Unit (FMCP)

- Manual stations
- Transmitters (including housing)
- Batteries
- Battery chargers
- Smoke sensors
- Notification appliances
- Addressable interface devices
- Amplifiers
- Tone generators
- Digitalized voice generators
- Radio transmitter and interface panels
- Local Operating Console (LOC)

SD-05 Design Data

- Battery power
- Battery chargers

SD-06 Test Reports

- Field Quality Control
- Testing Procedures
- Smoke sensor testing procedures

SD-07 Certificates

- Installer
- Formal Inspection and Tests
- Final Testing

SD-09 Manufacturer's Field Reports

- System Operation
- Fire Alarm/Mass Notification System

SD-10 Operation and Maintenance Data

- Operation and Maintenance (O&M) Instructions
- Instruction of Government Employees

SD-11 Closeout Submittals

- As-Built Drawings

1.6 QUALITY ASSURANCE

Equipment and devices shall be compatible and operable with existing station fire alarm system and shall not impair reliability or operational functions of existing supervising station fire alarm system. The supervising equipment is existing and consists of the following brands and models: supervising station control panel Monaco radio system.

- a. In NFPA publications referred to herein, consider advisory provisions to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears; interpret reference to "authority having jurisdiction" to mean the Naval Facilities Engineering Command, mid-lant, Fire Protection Engineer.
- b. The recommended practices stated in the manufacturer's literature or

documentation shall be considered as mandatory requirements.

- c. Devices and equipment for fire alarm service shall be listed by [UL Fire Prot Dir](#) or approved by [FM APP GUIDE](#).

1.6.1 Qualifications

1.6.1.1 Design Services

Installations requiring completion of installation drawings and specification or modifications of fire detection, fire alarm, mass notification system, fire suppression systems or mass notification systems shall require the services and review of a qualified engineer. For the purposes of meeting this requirement, a qualified engineer is defined as an individual meeting one of the following conditions:

- a. A registered professional engineer having a Bachelor of Science or Masters of Science Degree in Fire Protection Engineering from an accredited university engineering program, plus a minimum of four years work experience in fire protection engineering.
- b. A registered professional engineer (P.E.) in fire protection engineering.
- c. Registered Professional Engineer with verification of experience and at least five years of current experience in the design of the fire protection and detection systems.

1.6.1.2 Supervisor

NICET Fire Alarm Technicians to perform the installation of the system. A NICET Level 3 Fire Alarm Technician shall supervise the installation of the fire alarm system/mass notification system. A Fire Alarm Technician with a minimum of 8 years of experience shall perform/supervise the installation of the fire alarm/mass notification system. The Fire Alarm technicians supervising the installation of equipment shall be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

1.6.1.3 Technician

Fire Alarm Technicians with a minimum of four years of experience utilized to install and terminate fire alarm/mass notification devices, cabinets and panels. The Fire Alarm technicians installing the equipment shall be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

1.6.1.4 [Installer](#)

Fire Alarm installer with a minimum of two years of experience utilized to assist in the installation of fire alarm/mass notification devices, cabinets and panels. An electrician shall be allowed to install wire, cable, conduit and backboxes for the fire alarm system/mass notification system. The Fire Alarm installer shall be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

1.6.1.5 Test Personnel

Fire Alarm Technicians with a minimum of eight years of experience (NICET Level IV) utilized to test and certify the installation of the fire alarm/mass notification devices, cabinets and panels. The Fire Alarm technicians testing the equipment shall be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

1.6.1.6 Manufacturer's Representative

The fire alarm and mass notification equipment manufacturer's representative shall be present for the connection of wiring to the control panel. The Manufacturer's Representative shall be an employee of the manufacturer with necessary technical training (NICET Level IV) on the system being installed.

1.6.1.7 Manufacturer

Components shall be of current design and shall be in regular and recurrent production at the time of installation. Provide design, materials, and devices for a protected premises fire alarm system, complete, conforming to [NFPA 72](#), except as otherwise or additionally specified herein.

1.6.2 Regulatory Requirements

1.6.2.1 Requirements for Fire Protection Service

Equipment and material shall have been tested by UL and listed in [UL Fire Prot Dir](#) or approved by FM and listed in [FM APP GUIDE](#). Where the terms "listed" or "approved" appear in this specification, they shall mean listed in [UL Fire Prot Dir](#) or [FM APP GUIDE](#). The omission of these terms under the description of any item of equipment described shall not be construed as waiving this requirement. All listings or approval by testing laboratories shall be from an existing ANSI or UL published standard.

1.6.2.2 Fire Alarm/Mass Notification System

Furnish equipment that is compatible and is UL listed, FM approved, or listed by a nationally recognized testing laboratory for the intended use. All listings by testing laboratories shall be from an existing ANSI or UL published standard. Submit a unique identifier for each device, including the control panel and initiating and indicating devices, with an indication of test results, and signature of the factory-trained technician of the control panel manufacturer and equipment installer. With reports on preliminary tests, include printer information. Include the [NFPA 72](#) Record of Completion and [NFPA 72](#) Inspection and Testing Form, with the appropriate test reports.

1.6.2.3 Fire alarm Testing Services or Laboratories

construct fire alarm and fire detection equipment in accordance with [UL Fire Prot Dir](#), [UL Electrical Constructn](#), or [FM APP GUIDE](#).

1.7 DELIVERY, STORAGE, AND HANDLING

Protect equipment delivered and placed in storage from the weather, humidity, and temperature variation, dirt and dust, and other contaminants.

1.8 OPERATION AND MAINTENANCE (O&M) INSTRUCTIONS

Submit 6 copies of the Operation and Maintenance Instructions, indexed and in booklet form. The Operation and Maintenance Instructions shall be a single volume or in separate volumes, and may be submitted as a Technical Data Package. Manuals shall be approved prior to training. The Interior Fire Alarm And Mass Notification System Operation and Maintenance Instructions shall include:

- a. "Manufacturer Data Package 5" as specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA.
- b. Operating manual outlining step-by-step procedures required for system startup, operation, and shutdown. The manual shall include the manufacturer's name, model number, service manual, parts list, and complete description of equipment and their basic operating features.
- c. Maintenance manual listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. The manuals shall include conduit layout, equipment layout and simplified wiring, and control diagrams of the system as installed.
- d. The manuals shall include complete procedures for system revision and expansion, detailing both equipment and software requirements.
- e. Software delivered for this project shall be provided, on each type of CD/DVD media utilized.
- f. Printouts of configuration settings for all devices.
- g. Routine maintenance checklist. The routine maintenance checklist shall be arranged in a columnar format. The first column shall list all installed devices, the second column shall state the maintenance activity or state no maintenance required, the third column shall state the frequency of the maintenance activity, and the fourth column for additional comments or reference. All data (devices, testing frequencies, etc.) shall comply with UFC 3-601-02.

1.9 EXTRA MATERIALS

1.9.1 Repair Service/Replacement Parts

Repair services and replacement parts for the system shall be available for a period of 10 years after the date of final acceptance of this work by the Contracting Officer. During guarantee period, the service technician shall be on-site within 24 hours after notification. All repairs shall be completed within 24 hours of arrival on-site.

1.9.2 Interchangeable Parts

Spare parts furnished shall be directly interchangeable with the corresponding components of the installed system. Spare parts shall be suitably packaged and identified by nameplate, tagging, or stamping. Spare parts shall be delivered to the Contracting Officer at the time of the final acceptance testing.

1.9.3 Spare Parts

Furnish the following spare parts and accessories:

- a. Four fuses for each fused circuit
- b. Two of each type of notification appliance in the system (e.g. speaker, FA strobe, MNS strobe, etc.)
- c. Two of each type of initiating device included in the system (e.g. smoke detector, thermal detector, manual station, etc.)

1.9.4 Special Tools

Software, connecting cables and proprietary equipment, necessary for the maintenance, testing, and reprogramming of the equipment shall be furnished to the Contracting Officer.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Submit annotated catalog data as required in the paragraph SUBMITTAL, in table format on the drawings, showing manufacturer's name, model, voltage, and catalog numbers for equipment and components. Submitted shop drawings shall not be smaller than ISO A1. Also provide UL or FM listing cards for equipment provided.

2.1.1 Standard Products

Provide materials, equipment, and devices that have been tested by a nationally recognized testing laboratory, such as UL or FM Approvals, LLC (FM), and listed or approved for fire protection service when so required by NFPA 72 or this specification. Select material from one manufacturer, where possible, and not a combination of manufacturers, for any particular classification of materials. Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least two years prior to bid opening.

2.1.2 Nameplates

Major components of equipment shall have the manufacturer's name, address, type or style, model or serial number, catalog number, date of installation, installing Contractor's name and address, and the contract number provided on a new plate permanently affixed to the item or equipment. Major components include, but are not limited to, the following:

- a. FMCPs
- b. Automatic transmitter/transceiver
- c. Terminal Cabinet

Furnish nameplate illustrations and data to obtain approval by the Contracting Officer before installation. Obtain approval by the Contracting Officer for installation locations. Nameplates shall be etched metal or plastic, permanently attached by screws to panels or adjacent walls.

2.2 GENERAL PRODUCT REQUIREMENT

All fire alarm and mass notification equipment shall be listed for use

under the applicable reference standards. Interfacing of Listed UL 864 or similar approved industry listing with Mass Notification Panels listed to UL 2017 shall be done in a laboratory listed configuration, if the software programming features cannot provide a listed interface control. If a field modification is needed, such as adding equipment like relays, the manufacturer of the panels being same or different brand from manufacturer shall provide the installing contractor for review and confirmation by the installing contractor. As part of the submittal documents, provide this information.

2.3 SYSTEM OPERATION

The Addressable Interior Fire Alarm and Mass Notification System shall be a complete, supervised, noncoded, analog/addressable fire alarm and mass notification system conforming to NFPA 72, UL 864, and UL 2017. The system shall be activated into the alarm mode by actuation of any alarm initiating device. The system shall remain in the alarm mode until the initiating device is reset and the control panel is reset and restored to normal. The system may be placed in the alarm mode by local microphones, LOC, or remotely from authorized locations/users.

Submit data on each circuit to indicate that there is at least 25 percent spare capacity for notification appliances, 25 percent spare capacity for initiating devices. Annotate data for each circuit on the drawings. Submit a complete description of the system operation in matrix format on the drawings. Submit a complete list of device addresses and corresponding messages.

2.3.1 Alarm Initiating Devices and Notification Appliances (Visual, Voice, Textural)

- a. Connect alarm initiating devices to initiating device circuits (IDC) Class "A", or to signal line circuits (SLC) Class "A" and installed in accordance with NFPA 72.
- b. Connect alarm notification appliances and speakers to notification appliance circuits (NAC) Class "A".
- c. The system shall operate in the alarm mode upon actuation of any alarm initiating device or a mass notification signal. The system shall remain in the alarm mode until initiating device(s) or mass notification signal is/are reset and the control panel is manually reset and restored to normal. Audible, and visual appliances and systems shall comply with NFPA 72 and as specified herein. Fire alarm system/mass notification system components requiring power, except for the control panel power supply, shall operate on 24 Volts dc.

2.3.2 Functions and Operating Features

The system shall provide the following functions and operating features:

- a. The FMCP shall provide power, annunciation, supervision, and control for the system. Addressable systems shall be microcomputer (microprocessor or microcontroller) based with a minimum word size of eight bits with sufficient memory to perform as specified.
- b. For Class "A" or "X" circuits with conductor lengths of 3m (10 feet) or less, the conductors shall be permitted to be installed in the same raceway in accordance with NFPA 72.

- c. Provide signaling line circuits for each floor.
- d. Provide signaling line circuits for the network.
- e. Provide notification appliance circuits. The visual alarm notification appliances shall have the flash rates synchronized as required by [NFPA 72](#).
- f. Provide electrical supervision of the primary power (AC) supply, presence of the battery, battery voltage, and placement of system modules within the control panel.
- g. Provide an audible and visual trouble signal to activate upon a single break or open condition, or ground fault (or short circuit for Class "X"). The trouble signal shall also operate upon loss of primary power (AC) supply, absence of a battery supply, low battery voltage, or removal of alarm or supervisory panel modules. Provide a trouble alarm silence feature that shall silence the audible trouble signal, without affecting the visual indicator. After the system returns to normal operating conditions, the trouble signal shall again sound until the trouble is acknowledged. A smoke sensor in the process of being verified for the actual presence of smoke shall not initiate a trouble condition.
- h. Provide program capability via switches in a locked portion of the FACP to bypass the automatic notification appliance circuits, fire reporting system features. Operation of this programming shall indicate this action on the FACP display and printer output.
- i. Alarm, supervisory, and/or trouble signals shall be automatically transmitted to the fire department..
- j. Alarm functions shall override trouble or supervisory functions. Supervisory functions shall override trouble functions.
- k. The system shall be capable of being programmed from the panels keyboard. Programmed information shall be stored in non-volatile memory.
- l. The system shall be capable of operating, supervising, and/or monitoring both addressable and non-addressable alarm and supervisory devices.
- m. There shall be no limit, other than maximum system capacity, as to the number of addressable devices, that may be in alarm simultaneously.
- n. Where the fire alarm/mass notification system is responsible for initiating an action in another emergency control device or system, the addressable fire alarm relay shall be in the vicinity of the emergency control device.
- o. An alarm signal shall automatically initiate the following functions:
 - (1) Transmission of an alarm signal to the fire department.
 - (2) Visual indication of the device operated on the control panel (FACP/MNCP), and on the annunciator. Indication on the annunciator shall be by floor, zone or circuit, and type of device.

- (3) Continuous actuation of all alarm notification appliances.
 - (4) Recording of the event via electronically in the history log of the fire control system unit.
 - (5) Release of doors held open by electromagnetic devices.
- p. A supervisory signal shall automatically initiate the following functions:
- (1) Visual indication of the device operated on the FACP, and on the annunciator, and sound the audible alarm at the respective panel.
 - (2) Transmission of a supervisory signal to the fire department.
 - (3) Recording of the event electronically in the history log of the control unit.
- q. A trouble condition shall automatically initiate the following functions:
- (1) Visual indication of the system trouble on the FACP, and on the annunciator, and sound the audible alarm at the respective panel.
 - (2) Transmission of a trouble signal to the fire department.
 - (3) Recording of the event in the history log of the control unit.
- r. The maximum permissible elapsed time between the actuation of an initiating device and its indication at the FACP is 10 seconds.
- s. The maximum elapsed time between the occurrence of the trouble condition and its indication at the FACP is 200 seconds.
- t. Activation of a LOC pushbutton shall activate the audible and visual alarms in the facility. The audible message shall be the one associated with the pushbutton activated.

2.4 SYSTEM MONITORING

2.4.1 Valves

Each valve affecting the proper operation of a fire protection system, including automatic sprinkler control valves, standpipe control valves, sprinkler service entrance valve, valves at fire pumps, isolating valves for pressure type waterflow or supervision switches, and valves at backflow preventers, whether supplied under this contract or existing, shall be electrically monitored to ensure its proper position. Provide each tamper switch with a separate address, unless they are within the same room, then a maximum of five can use the same address.

2.5 MASS NOTIFICATION SYSTEM FUNCTIONS

2.5.1 Notification Appliance Network

The audible notification appliance network consists of speakers located to provide intelligible instructions at all locations in the building. The Mass Notification System announcements shall take priority over all other

audible announcements of the system including the output of the fire alarm system in a normal or alarm state. When a mass notification announcement is activated during a fire alarm, all fire alarm system functions shall continue in an alarm state except for the output signals of the fire alarm audible and visual notification appliances.

2.5.2 Strobes

Provide strobes to alert hearing-impaired occupants.

2.5.3 Text Displays

LED text displays (textural visible appliances) for hearing impaired occupants. The textual displays shall be programmable and shall display the same content of the voice message being played. The signs shall be able to provide a minimum of 100 mm 4 inch high letters and be located in high traffic areas easily seen by building occupants. The system shall interface with the Programmable sign controller to activate the proper message.

2.5.4 Wide Area MNS

The Wide Area MNS system (if available) in the area of the building shall not be activated by the in-building MNS.

2.5.5 Voice Notification

An autonomous voice notification control unit is used to monitor and control the notification appliance network and provide consoles for local operation. Using a console, personnel in the building can initiate delivery of pre-recorded voice messages, provide live voice messages and instructions, and initiate visual strobe and optional textual message notification appliances. The autonomous voice notification control unit will temporarily override audible fire alarm notification while delivering Mass Notification messages to ensure they are intelligible.

2.5.6 Installation-Wide Control

If an installation-wide control system for mass notification exists on the base, the autonomous control unit shall communicate with the central control unit of the installation-wide system. The autonomous control unit shall receive commands/messages from the central control unit and provide status information.

2.6 OVERVOLTAGE AND SURGE PROTECTION

2.6.1 Signaling Line Circuit Surge Protection

For systems having circuits located outdoors, communications equipment shall be protected against surges induced on any signaling line circuit and shall comply with the applicable requirements of IEEE C62.41.1 and IEEE C62.41.2. Cables and conductors, that serve as communications links, shall have surge protection circuits installed at each end that meet the following waveform(s):

- a. A 10 microsecond by 1000 microsecond waveform with a peak voltage of 1500 volts and a peak current of 60 amperes.
- b. An 8 microsecond by 20 microsecond waveform with a peak voltage of 1000

volts and a peak current of 500 amperes. Protection shall be provided at the equipment. Additional triple electrode gas surge protectors, rated for the application, shall be installed on each wireline circuit within 3 feet of the building cable entrance. Fuses shall not be used for surge protection.

2.6.2 Sensor Wiring Surge Protection

Digital and analog inputs and outputs shall be protected against surges induced by sensor wiring installed outdoors and as shown. The inputs and outputs shall be tested with the following waveforms:

- a. A 10 by 1000 microsecond waveform with a peak voltage of 1500 volts and a peak current of 60 amperes.
- b. An 8 by 20 microsecond waveform with a peak voltage of 1000 volts and a peak current of 500 amperes. Fuses shall not be used for surge protection.

2.7 ADDRESSABLE INTERFACE DEVICES

The initiating device being monitored shall be configured as a Class "A" initiating device circuits. The system shall be capable of defining any module as an alarm module and report alarm trouble, loss of polling, or as a supervisory module, and reporting supervisory short, supervisory open or loss of polling such as waterflow switches, valve supervisory switches, fire pump monitoring, independent smoke detection systems, relays for output function actuation, etc. The module shall be UL or FM listed as compatible with the control panel. The monitor module shall provide address setting means compatible with the control panel's SLC supervision and store an internal identifying code. Monitor module shall contain an integral LED that flashes each time the monitor module is polled and is visible through the device cover plate. Pull stations with a monitor module in a common backbox are not required to have an LED.

2.8 ADDRESSABLE CONTROL MODULE

The control module shall be capable of operating as a relay (dry contact form C) for interfacing the control panel with other systems, and to control door holders or initiate elevator fire service. The module shall be UL or FM listed as compatible with the control panel. The indicating device or the external load being controlled shall be configured as a Class "B" notification appliance circuits. The system shall be capable of supervising, audible, visual and dry contact circuits. The control module shall have both an input and output address. The supervision shall detect a short on the supervised circuit and shall prevent power from being applied to the circuit. The control model shall provide address setting means compatible with the control panel's SLC supervision and store an internal identifying code. The control module shall contain an integral LED that flashes each time the control module is polled and is visible through the device cover plate. Control Modules shall be located in environmental areas that reflect the conditions to which they were listed.

2.9 ISOLATION MODULES

Provide isolation modules to subdivide each signaling line circuit into groups of not more than 20 addressable devices between adjacent isolation modules.

2.10 SMOKE SENSORS

2.10.1 Photoelectric Smoke Sensors

Provide addressable photoelectric smoke sensors as follows:

- a. Provide analog/addressable photoelectric smoke sensors utilizing the photoelectric light scattering principle for operation in accordance with **UL 268**. Smoke sensors shall be listed for use with the fire alarm control panel.
- b. Provide self-restoring type sensors that do not require any readjustment after actuation at the FACP to restore them to normal operation. Sensors shall be UL listed as smoke-automatic fire sensors.
- c. Components shall be rust and corrosion resistant. Vibration shall have no effect on the sensor's operation. Protect the detection chamber with a fine mesh metallic screen that prevents the entrance of insects or airborne materials. The screen shall not inhibit the movement of smoke particles into the chamber.
- d. Provide twist lock bases for the sensors. The sensors shall maintain contact with their bases without the use of springs. Provide companion mounting base with screw terminals for each conductor. Terminate field wiring on the screw terminals. The sensor shall have a visual indicator to show actuation.
- e. The sensor address shall identify the particular unit, its location within the system, and its sensitivity setting. Sensors shall be of the low voltage type rated for use on a 24 VDC system.
- f. An operator at the control panel, having a proper access level, shall have the capability to manually access the following information for each initiating device.
 - (1) Primary status
 - (2) Device type
 - (3) Present average value
 - (4) Present sensitivity selected
 - (5) Sensor range (normal, dirty, etc.)

2.10.2 Smoke Sensor Testing

Smoke sensors shall be tested in accordance with **NFPA 72** and manufacturer's recommended calibrated test method. Submit smoke sensor testing procedures for approval. In addition to the **NFPA 72** requirements, smoke detector sensitivity shall be tested during the preliminary tests.

2.11 ELECTRIC POWER

2.11.1 Primary Power

Power shall be 120 VAC service for the FMCP from the AC service to the building in accordance with **NFPA 72**.

2.12 SECONDARY POWER SUPPLY

Provide for system operation in the event of primary power source failure. Transfer from normal to auxiliary (secondary) power or restoration from auxiliary to normal power shall be automatic and shall not cause transmission of a false alarm.

2.12.1 Batteries

Provide sealed, maintenance-free, sealed lead acid batteries as the source for emergency power to the FMCP. Batteries shall contain suspended electrolyte. The battery system shall be maintained in a fully charged condition by means of a solid state battery charger. Provide an automatic transfer switch to transfer the load to the batteries in the event of the failure of primary power.

2.12.1.1 Capacity

Battery size shall be the greater of the following two capacities.

- a. Sufficient capacity to operate the fire alarm system under supervisory and trouble conditions, including audible trouble signal devices for 24 hours and audible and visual signal devices under alarm conditions for an additional 15 minutes.
- b. Sufficient capacity to operate the mass notification for 60 minutes after loss of AC power.

2.12.1.2 Battery Power Calculations

- a. Verify that battery capacity exceeds supervisory and alarm power requirements.
 - (1) Substantiate the battery calculations for alarm, alert, and supervisory power requirements. Include ampere-hour requirements for each system component and each panel component, and compliance with [UL 864](#).
 - (2) Provide complete battery calculations for both the alarm, alert, and supervisory power requirements. Submit ampere-hour requirements for each system component with the calculations.
 - (3) A voltage drop calculation to indicate that sufficient voltage is available for proper operation of the system and all components, at the minimum rated voltage of the system operating on batteries.
- b. For battery calculations use the following assumptions: Assume a starting voltage of 24 VDC for starting the calculations to size the batteries. Calculate the required Amp-Hours for the specified standby time, and then calculate the required Amp-Hours for the specified alarm time. Calculate the nominal battery voltage after operation on batteries for the specified time period. Using this voltage perform a voltage drop calculation for circuit containing device and/or appliances remote from the power sources.

2.12.2 Battery Chargers

Provide a solid state, fully automatic, variable charging rate battery charger. The charger shall be capable of providing 120 percent of the

connected system load and shall maintain the batteries at full charge. In the event the batteries are fully discharged (20.4 Volts dc), the charger shall recharge the batteries back to 95 percent of full charge within 48 hours after a single discharge cycle as described in paragraph CAPACITY above. Provide pilot light to indicate when batteries are manually placed on a high rate of charge as part of the unit assembly if a high rate switch is provided.

2.13 FIRE ALARM CONTROL UNIT AND MASS NOTIFICATION CONTROL UNIT (FMCP)

Provide a complete control panel fully enclosed in a lockable steel cabinet as specified herein. Operations required for testing or for normal care and maintenance of the systems shall be performed from the front of the enclosure. If more than a single unit is required at a location to form a complete control panel, the unit cabinets shall match exactly.

- a. Each control unit shall provide power, supervision, control, and logic for the entire system, utilizing solid state, modular components, internally mounted and arranged for easy access. Each control unit shall be suitable for operation on a 120 volt, 60 hertz, normal building power supply. Provide each panel with supervisory functions for power failure, internal component placement, and operation.
- b. Visual indication of alarm, supervisory, or trouble initiation on the fire alarm control panel shall be by liquid crystal display or similar means with a minimum of 80 characters. The mass notification control unit shall have the capability of temporarily deactivate the fire alarm audible notification appliances while delivering voice messages.
- c. Provide secure operator console for initiating recorded messages, strobes and displays; and for delivering live voice messages. Provide capacity for at least eight pre-recorded messages. Provide the ability to automatically repeat pre-recorded messages. Provide a secure microphone for delivering live messages. Provide adequate discrete outputs to temporarily deactivate fire alarm audible notification, and initiate/synchronize strobes. Provide a complete set of self-diagnostics for controller and appliance network. Provide local diagnostic information display and local diagnostic information and system event log file.

2.13.1 Cabinet

Install control panel components in cabinets large enough to accommodate all components and also to allow ample gutter space for interconnection of panels as well as field wiring. The enclosure shall be identified by an engraved laminated phenolic resin nameplate. Lettering on the nameplate shall say "Fire Alarm and Mass Notification Control Panel" and shall not be less than 1 inch high. Provide prominent rigid plastic or metal identification plates for lamps, circuits, meters, fuses, and switches. The cabinet shall be provided in a sturdy steel housing, complete with back box, hinged steel door with cylinder lock, and surface mounting provisions.

2.13.2 Control Modules

Provide power and control modules to perform all functions of the FACP. Provide audible signals to indicate any alarm, supervisory, or trouble condition. The alarm signals shall be different from the trouble signal. Connect circuit conductors entering or leaving the panel to screw-type

terminals with each terminal marked for identification. Locate diodes and resistors, if any, on screw terminals in the FACP. Circuits operating at 24 VDC shall not operate at less than the UL listed voltage at the sensor or appliance connected. Circuits operating at any other voltage shall not have a voltage drop exceeding 10 percent of nominal voltage

2.13.3 Silencing Switches

2.13.3.1 Alarm Silencing Switch

Provide an alarm silencing switch at the FMCP that shall silence the audible and visual. This switch shall be overridden upon activation of a subsequent alarm.

2.13.3.2 Supervisory/Trouble Silencing Switch

Provide supervisory and trouble silencing switch that shall silence the audible trouble and supervisory signal, but not extinguish the visual indicator. This switch shall be overridden upon activation of a subsequent alarm, supervision, or trouble condition. Audible trouble indication must resound automatically every 24 hours after the silencing feature has been operated.

2.13.4 Non-Interfering

Power and supervise each circuit such that a signal from one device does not prevent the receipt of signals from any other device. Circuits shall be manually reset by switch from the FACP after the initiating device or devices have been restored to normal.

2.13.5 Audible Notification System

The Audible Notification System shall comply with the requirements of [NFPA 72](#) for Emergency Voice/Alarm Communications System requirements [ISO 7240-16](#), [IEC 60268-16](#), except as specified herein. The system shall be a one-way multi-channel voice notification system incorporating user selectability of a minimum eight distinct sounds for tone signaling, and the incorporation of a voice module for delivery of prerecorded messages. Audible appliances shall produce a temporal code 3 tone for three cycles followed by a voice message that is repeated until the control panel is reset or silenced. Automatic messages shall be broadcast through speakers throughout the building/facility but not in stairs or elevator cabs. A live voice message shall override the automatic audible output through use of a microphone input at the control panel or the LOC.

- a. When using the microphone, live messages shall be broadcast throughout a selected floor or floors or all call. The system shall be capable of operating all speakers at the same time. The microprocessor shall actively interrogate circuitry, field wiring, and digital coding necessary for the immediate and accurate rebroadcasting of the stored voice data into the appropriate amplifier input. Loss of operating power, supervisory power, or any other malfunction that could render the digitalized voice module inoperative shall automatically cause the code 3 temporal tone to take over all functions assigned to the failed unit in the event an alarm is activated.
- b. The Mass Notification functions shall override the manual or automatic fire alarm notification or Public Address (PA) functions. Other fire alarm functions including transmission of a signal(s) to the fire

department shall remain operational. The system shall have the capability of utilizing LOC with redundant controls of the notification system control panel. Notification Appliance Circuits (NAC) shall be provided for the activation of strobe appliances. The activation of the NAC Circuits shall follow the operation of the speaker NAC circuits. Audio output shall be selectable for line level. Amplifier outputs shall be not greater than 100 watts RMS output. The strobe NAC Circuits shall provide at least 2 amps of 24 VDC power to operate strobes and have the ability to synchronize all strobes. A hand held microphone shall be provided and, upon activation, shall take priority over any tone signal, recorded message or PA microphone operation in progress, while maintaining the strobe NAC Circuits activation.

2.13.5.1 Outputs and Operational Modules

All outputs and operational modules shall be fully supervised with on-board diagnostics and trouble reporting circuits. Provide form "C" contacts for system alarm and trouble conditions. Provide circuits for operation of auxiliary appliance during trouble conditions. During a Mass Notification event the panel shall not generate nor cause any trouble alarms to be generated with the Fire Alarm system.

2.13.5.2 Mass Notification

- a. Mass Notification functions shall take precedence over all other function performed by the Audible Notification System. Messages shall utilize a female voice and shall be similar to the following:
 - (1) 1000 Hz tones (as required in 18.4.2.1 of NFPA 72)
 - (2) "May I have your attention please. May I have your attention please. An fire emergency has been reported in the building. Please leave the building by the nearest exit." (Provide a 2 second pause.) "May I have your attention please, (repeat the message)."
- b. Include ALL installation specific message in this section.
- c. The LOC shall incorporate a Push-To-Talk (PTT) microphone, redundant controls and system status indicators of/for the system. The unit shall incorporate microphone override of any tone generation or prerecorded messages. The unit shall be fully supervised from the control panel. The housing shall contain a latch (not lock).
- d. Auxiliary Input Module shall be designed to be an outboard expansion module to either expand the number of optional LOC's, or allow a telephone interface.
- e. LOC shall incorporate a Push-To-Talk (PTT) microphone, and controls to allow Public Address paging in the facility. The Public Address paging function shall not override any alarm or notification functions and shall be disabled by such signals. The microphone shall be handheld style. All wiring to the LOC shall be supervised in accordance with UFC 4-021-01. Systems that require field modification or are not supervised for multiple LOC's shall not be approved.
- f. When an installation has more than one LOC, the LOC's shall be programmed to allow only one LOC to be available for page or messaging at a time. Once one LOC becomes active, all other LOC's will have an

indication that the system is busy (Amber Busy Light) and cannot be used at that time. This is to avoid two messages being given at the same time. Also, it must be possible to override or lockout the LOC's from the Master Command Panel (in accordance with NFPA 72.)

2.13.6 Memory

Provide each control unit with non-volatile memory and logic for all functions. The use of long life batteries, capacitors, or other age-dependent devices shall not be considered as equal to non-volatile processors, PROMS, or EPROMS.

2.13.7 Field Programmability

Provide control units and control panels that are fully field programmable for control, initiation, notification, supervisory, and trouble functions of both input and output. The system program configuration shall be menu driven. System changes shall be password protected and shall be accomplished using personal computer based equipment. Any proprietary equipment and proprietary software needed by qualified technicians to implement future changes to the fire alarm system shall be provided as part of this contract.

2.13.8 Input/Output Modifications

The FMCP shall contain features that allow the bypassing of input devices from the system or the modification of system outputs. These control features shall consist of a panel mounted keypad. Any bypass or modification to the system shall indicate a trouble condition on the FMCP.

2.13.9 Resetting

Provide the necessary controls to prevent the resetting of any alarm, supervisory, or trouble signal while the alarm, supervisory or trouble condition on the system still exists.

2.13.10 Instructions

Provide a typeset printed or typewritten instruction card mounted behind a Lexan plastic or glass cover in a stainless steel or aluminum frame. Install the frame in a conspicuous location observable from the FACP. The card shall show those steps to be taken by an operator when a signal is received as well as the functional operation of the system under all conditions, normal, alarm, supervisory, and trouble. The instructions shall be approved by the Contracting Officer before being posted.

2.13.11 Walk Test

The FACP shall have a walk test feature. When using this feature, operation of initiating devices shall result in limited system outputs, so that the notification appliances operate for only a few seconds and the event is indicated on the system printer, but no other outputs occur.

2.13.12 History Logging

In addition to the required printer output, the control panel shall have the ability to store a minimum of 400 events in a log. These events shall be stored in a battery-protected memory and shall remain in the memory until the memory is downloaded or cleared manually. Resetting of the

control panel shall not clear the memory.

2.13.13 Remote LCD Text Display

An LCD text display shall be provided at locations as shown on the drawings. The size shall not exceed 16 inches length by 3 inches deep with a height necessary to meet the requirements of Chapter 24 of NFPA 72). The text display shall as a minimum meet the following requirements:

- a. Two lines of information for high priority messaging.
- b. Minimum of 20 characters per line (40 total) displayed.
- c. Text shall be no less than height requirements in Table 24.4.2.20.14.5 of NFPA 72 and color/contrast requirements of 24.4.2.20 of NFPA 72.
- d. 32K character memory.
- e. Display shall be wall or ceiling mounted.
- f. Mounting brackets for a convenient wall/cubicle mount.
- g. During non-emergency periods, display date and time.
- h. All programming shall be accomplished from the Mass Notification network. No user programming shall be required.

An LCD text display shall be provided at locations as shown on the drawings. The LCD text display shall spell out the words "EVACUATE" and "ANNOUNCEMENT" and the remainder of the emergency instructions. The design of LCD text display shall be such that it cannot be read when not illuminated.

2.14 AMPLIFIERS, PREAMPLIFIERS, TONE GENERATORS

Any amplifiers, preamplifiers, tone generators, digitalized voice generators, and other hardware necessary for a complete, operational, textual audible circuit conforming to NFPA 72 shall be housed in a remote FMCP, terminal cabinet, or in the FMCP. Submit data to indicate that the amplifiers have sufficient capacity to simultaneously drive all notification speakers at the maximum rating plus 50 percent spare capacity. Annotate data for each circuit on the drawings.

2.14.1 Operation

The system shall automatically operate and control all building speakers except those installed in the stairs and within elevator cabs. The speakers in the stairs and elevator cabs shall operate only when the microphone is used to deliver live messages.

2.14.2 Construction

Amplifiers shall utilize computer grade solid state components and shall be provided with output protection devices sufficient to protect the amplifier against any transient up to 10 times the highest rated voltage in the system.

2.14.3 Inputs

Equip each system with separate inputs for the tone generator, digitalized voice driver and panel mounted microphone . Microphone inputs shall be of the low impedance, balanced line type. Both microphone and tone generator input shall be operational on any amplifier.

2.14.4 Tone Generator

The tone generator shall be of the modular, plug-in type with securely attached labels to identify the component as a tone generator and to identify the specific tone it produces. The tone generator shall produce a code 3 temporal tone and shall be constantly repeated until interrupted by either the digitalized voice message, the microphone input, or the alarm silence mode as specified. The tone generator shall be single channel with an automatic backup generator per channel such that failure of the primary tone generator causes the backup generator to automatically take over the functions of the failed unit and also causes transfer of the common trouble relay.

2.14.5 Protection Circuits

Each amplifier shall be constantly supervised for any condition that could render the amplifier inoperable at its maximum output. Failure of any component shall cause automatic transfer to a designated backup amplifier, illumination of a visual "amplifier trouble" indicator on the control panel, appropriate logging of the condition on the system printer, and other actions for trouble conditions as specified.

2.15 ANNUNCIATOR

2.15.1 Annunciator Panel

Provide an annunciator that includes an LCD display. The display shall indicate the device in trouble/alarm or any supervisory device. Display the device name, address, and actual building location.

2.15.2 Programming

Where programming for the operation of the annunciator is accomplished by a separate software program than the software for the FMCP, the software program shall not require reprogramming after loss of power. The software shall be reprogrammable in the field.

2.16 MANUAL STATIONS

Provide metal or plastic, semi-flush mounted, single action, addressable manual stations, that are not subject to operation by jarring or vibration. Stations shall be equipped with screw terminals for each conductor. Stations that require the replacement of any portion of the device after activation are not permitted. Stations shall be finished in fire-engine red with molded raised lettering operating instructions of contrasting color. The use of a key or wrench shall be required to reset the station. Manual stations shall be mounted at 42 inches. Stations shall have a separate screw terminal for each conductor.

2.17 NOTIFICATION APPLIANCES

2.17.1 Fire Alarm/Mass Notification Speakers

Audible appliances shall conform to the applicable requirements of [UL 464](#). Appliances shall be connected into notification appliance circuits. Surface mounted audible appliances shall be painted white. Recessed audible appliances shall be installed with a grill that is painted white.

- a. Speakers shall conform to the applicable requirements of [UL 1480](#). Speakers shall have six different sound output levels and operate with audio line input levels of 70.7 VRMs and 25 VRMs, by means of selectable tap settings. Tap settings shall include taps of 1/8, 1/4, 1/2, 1, and 2 watt. Speakers shall incorporate a high efficiency speaker for maximum output at minimum power across a frequency range of 150 Hz to 10,000 Hz, and shall have a sealed back construction. Speakers shall be capable of installation on standard 4 inch square electrical boxes. Where speakers and strobes are provided in the same location, they may be combined into a single unit. All inputs shall be polarized for compatibility with standard reverse polarity supervision of circuit wiring via the FMCP.
- b. Provide speaker mounting plates constructed of cold rolled steel having a minimum thickness of 16 gauge or molded high impact plastic and equipped with mounting holes and other openings as needed for a complete installation. Fabrication marks and holes shall be ground and finished to provide a smooth and neat appearance for each plate. Each plate shall be primed and painted.
- c. Speakers shall utilize screw terminals for termination of all field wiring.

2.17.2 Visual Notification Appliances

Visual notification appliances shall conform to the applicable requirements of [UL 1971](#) and conform to the Architectural Barriers Act (ABA). Colored lens, such as amber, shall comply with [UL 1638](#). The manufacturer shall have the color lens tested to the full [UL 1971](#) polar plotting criteria, voltage drop, and temperature rise as stated in 1971. Fire Alarm/Mass Notification Appliances shall have clear high intensity optic lens, xenon flash tubes, and output white light and be marked "ALERT" in red letters. The light pattern shall be disbursed so that it is visible above and below the strobe and from a 90 degree angle on both sides of the strobe. Strobe flash rate shall be 1 flash per second and a minimum of 15 candela (actual output after derating for tinted lens) based on the [UL 1971](#) test. Strobe shall be surface mounted. Where more than two appliances are located in the same room or corridor or field of view, provide synchronized operation. Devices shall use screw terminals for all field wiring.

2.18 ENVIRONMENTAL ENCLOSURES OR GUARDS

Environmental enclosures shall be provided to permit Fire Alarm or Mass Notification components to be used in areas that exceed the environmental limits of the listing. The enclosure shall be listed for the device or appliance as either a manufactured part number or as a listed compatible accessory for the UL category that the component is currently listed. Guards required to deter mechanical damage shall be either a listed manufactured part or a listed accessory for the category of the initiating device or notification appliance.

2.19 INTERFACE TO THE BASE WIDE MASS NOTIFICATION NETWORK

2.19.1 Fiber Optic

The fiber optic transceiver shall be fully compatible with EIA standards for RS-232, RS-422 and RS-485 at data rates from 0 (DC) to 2.1 mbps (200 kbps for RS-232) in the low speed mode or from 10 kbps to 10 mbps in the high-speed mode. The fiber optic transceiver shall be capable of simplex or full duplex asynchronous transmissions in both point-to-point systems and drop-and-repeat data networks. The fiber optic transceiver shall be user configurable for the protocol, speed and mode of operation required. The fiber optic transceiver shall be installed as a stand-alone unit. The fiber optic transceiver shall operate on Multi-mode fiber optic cable. The fiber optic transceiver shall be supplied with ST or FCPC type optical connectors. Cabling: as specified in Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM.

2.19.2 Radio

The radio transceiver shall be bi-direction and meet all the requirements of paragraph, RADIO TRANSMITTER AND INTERFACE PANELS as specified in this Specification Section. The transceiver utilized in the Mass Notification System shall be capable of the following:

- a. Communication with the Central Control/Monitoring System to provide supervision of communication link and status changes are reported by automatic and manual poll/reply/acknowledge routines.
- b. All monitored points/status changes are transmitted immediately and at programmed intervals until acknowledged by the Central Control/Monitoring System.
- c. Each transceiver shall transmits a unique identity code as part of all messages; the code is set by the user at the transceiver.

2.19.2.1 Radio Frequency Communications

Use of radio frequency-type communications systems shall comply with National Telecommunications and Information Administration (NTIA) requirements.

2.19.2.2 Licensed Radio Frequency Systems

An approved DD Form 1494 for the system is required prior to operation.

2.19.3 Secure Radio System

2.19.3.1 Communications Network

The communications network provides two-way signals between central control units and autonomous control units (in individual building systems), and should include redundant (primary and backup) communication links. The system shall incorporate technology to prevent easy interruption of the radio traffic for MNS Alerting.

2.19.3.2 Radio Frequency Communications

Use of radio frequency-type communications systems shall comply with

National Telecommunications and Information Administration (NTIA) requirements. The systems shall be designed to minimize the potential for interference, jamming, eavesdropping, and spoofing.

2.19.3.3 Licensed Radio Frequency Systems

An approved DD Form 1494 for the system is required prior to operation.

2.20 AUTOMATIC FIRE TRANSMITTERS

2.20.1 Radio Transmitter and Interface Panels

Transmitters shall be compatible with proprietary supervising station receiving equipment. Each radio alarm transmitter shall be the manufacturer's recognized commercial product, completely assembled, wired, factory tested, and delivered ready for installation and operation. Transmitters shall be provided in accordance with applicable portions of NFPA 72, Federal Communications Commission (FCC) 47 CFR 90 and Federal Communications Commission (FCC) 47 CFR 15. Transmitter electronics module shall be contained within the physical housing as an integral, removable assembly. The proprietary supervising station receiving equipment is Monaco and the transceiver shall be fully compatible with this equipment. At the contractor's option, and if UL or FM listed, the transmitter may be housed in the same panel as the fire alarm control panel. The transmitter shall be Narrowband radio, with FCC certification for narrowband operation and meets the requirements of the NTIA (National Telecommunications and Information Administration) Manual of Regulations and Procedures for Federal Frequency Management.

- a. Operation: Each transmitter shall operate from 120-volt ac power. In the event of 120-volt ac power loss, the transmitter shall automatically switch to battery operation. Switchover shall be accomplished with no interruption of protective service, and shall automatically transmit a trouble message. Upon restoration of ac power, transfer back to normal ac power supply shall also be automatic.
- b. Battery Power: Transmitter standby battery capacity shall provide sufficient power to operate the transmitter in a normal standby status for a minimum of 72 hours and be capable of transmitting alarms during that period.
- c. Transmitter housing shall be NEMA Type 1. The housing shall contain a lock that is keyed identical to the fire alarm system for the building. Radio alarm transmitter housing shall be factory painted with a suitable priming coat and not less than two coats of a hard, durable weatherproof enamel.
- d. Antenna shall be omnidirectional, coaxial, halfwave dipole antennas for radio alarm transmitters with a driving point impedance to match transmitter output. The antenna and antenna mounts shall be corrosion resistant and designed to withstand wind velocities of 100 mph. Do not mount antennas to any portion of the building roofing system. Protect the antenna from physical damage.

2.20.2 Signals to Be Transmitted to the Base Receiving Station

The following signals shall be sent to the base receiving station:

- a. Sprinkler water flow

- b. Manual pull stations
- c. Smoke detectors
- d. Fire Extinguishing System
- e. Sprinkler valve supervision

2.21 WIRING

Provide wiring materials under this section as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM with the additions and modifications specified herein. NFPA 70 accepted fire alarm cables that do not require the use of raceways except as modified herein are permitted.

2.21.1 Alarm Wiring

The SLC wiring shall be fiber optic or solid copper cable in accordance with the manufacturers requirements. Copper signaling line circuits and initiating device circuit field wiring shall be No. 14 AWG size twisted and shielded solid conductors at a minimum. Visual notification appliance circuit conductors, that contain audible alarm appliances, shall be solid copper No. 14 AWG size conductors at a minimum. Speaker circuits shall be copper No. 16 AWG size twisted and shielded conductors at a minimum. Wire size shall be sufficient to prevent voltage drop problems. Circuits operating at 24 VDC shall not operate at less than the UL listed voltages for the sensors and/or appliances. Power wiring, operating at 120 VAC minimum, shall be a minimum No. 12 AWG solid copper having similar insulation. Acceptable power-limited cables are FPL, FPLR or FPLP as appropriate with red colored covering. Nonpower-limited cables shall comply with NFPA 70.

PART 3 EXECUTION

3.1 INSTALLATION OF FIRE ALARM INITIATING DEVICES AND NOTIFICATION APPLIANCES

3.1.1 FMCP

Locate the FMCP where indicated on the drawings. Surface mount the enclosure with the top of the cabinet 6 feet above the finished floor or center the cabinet at 5feet, whichever is lower. Conductor terminations shall be labeled and a drawing containing conductors, their labels, their circuits, and their interconnection shall be permanently mounted in the FMCP.

3.1.2 Manual Stations:

Locate manual stations as required by NFPA 72 and as shown on the drawings. Mount stations so that their operating handles are 4 feet above the finished floor. Mount stations so they are located no farther than 5 feet from the exit door they serve, measured horizontally.

3.1.3 Notification Appliance Devices

Locate notification appliance devices as required by NFPA 72. Mount assemblies on walls as required by NFPA 72 and to meet the intelligibility requirements. Ceiling mounted speakers shall conform to NFPA 72.

3.1.4 Smoke and Heat Sensors

Locate sensors as required by **NFPA 72** and their listings on a **4 inch** mounting box. Locate smoke and heat sensors on the ceiling. Install heat sensors not less than **4 inches** from a side wall to the near edge. Heat sensors located on the wall shall have the top of the sensor at least **4 inches** below the ceiling, but not more than **12 inches** below the ceiling. Smoke sensors are permitted to be on the wall no lower than **12 inches** from the ceiling with no minimum distance from the ceiling. In raised floor spaces, install the smoke sensors to protect **225 square feet** per sensor. Install smoke sensors no closer than **5 feet** from air handling supply outlets.

3.1.5 Annunciator

Locate the annunciator as shown on the drawings. Surface mount the panel, with the top of the panel **6 feet** above the finished floor or center the panel at **5 feet**, whichever is lower.

3.1.6 Water Flow Detectors and Tamper Switches

Connect to water flow detectors and tamper switches.

3.1.7 Local Operating Console (LOC)

Locate the LOC as required by **NFPA 72** and as indicated. Mount the console so that the top message button is no higher than **44 inches** above the floor.

3.2 SYSTEM FIELD WIRING

3.2.1 Wiring within Cabinets, Enclosures, and Boxes

Provide wiring installed in a neat and workmanlike manner and installed parallel with or at right angles to the sides and back of any box, enclosure, or cabinet. Conductors that are terminated, spliced, or otherwise interrupted in any enclosure, cabinet, mounting, or junction box shall be connected to screw-type terminal blocks. Mark each terminal in accordance with the **wiring diagrams** of the system. The use of wire nuts or similar devices is prohibited. Conform wiring to **NFPA 70**.

Indicate the following in the wiring diagrams.

- a. Point-to-point wiring diagrams showing the points of connection and terminals used for electrical field connections in the system, including interconnections between the equipment or systems that are supervised or controlled by the system. Diagrams shall show connections from field devices to the FACP and remote fire alarm control units, initiating circuits, switches, relays and terminals.
- b. Complete riser diagrams indicating the wiring sequence of devices and their connections to the control equipment. Include a color code schedule for the wiring. Include floor plans showing the locations of devices and equipment.

3.2.2 Alarm Wiring

Voltages shall not be mixed in any junction box, housing, or device, except those containing power supplies and control relays. Provide all wiring in

electrical metallic. Conceal conduit in finished areas of new construction and wherever practicable in existing construction. The use of flexible conduit not exceeding a 6 foot length shall be permitted in initiating device or notification appliance circuits. Run conduit or tubing (rigid, IMC, EMT, FMC, etc. as permitted by NFPA 72 and NFPA 70) concealed unless specifically indicated otherwise.

Use of cables that do not require a raceway as stated hereinbefore are permitted; install them in accordance with NFPA 70. Protect any exposed (as defined in NFPA 70) cables against physical damage by the use of magnetic raceways which shall also be red colored. Utilize shielded wiring where recommended by the manufacturer. For shielded wiring, ground the shield at only one point, that is in or adjacent to the FMCP. Pigtail or T-tap connections to signal line circuits, initiating device circuits, supervisory alarm circuits, and notification appliance circuits are prohibited. T-tapping using screw terminal blocks is allowed for Class "B" signaling line circuits. Color coding is required for circuits and shall be maintained throughout the circuit. Conductors used for the same functions shall be similarly color coded. Conform wiring to NFPA 70.

3.2.3 Conductor Terminations

Labeling of conductors at terminal blocks in terminal cabinets, FMCP, and remote FMCP and the LOC shall be provided at each conductor connection. Each conductor or cable shall have a shrink-wrap label to provide a unique and specific designation. Each terminal cabinet, FMCP, and remote FMCP shall contain a laminated drawing that indicates each conductor, its label, circuit, and terminal. The laminated drawing shall be neat, using 12 point lettering minimum size, and mounted within each cabinet, panel, or unit so that it does not interfere with the wiring or terminals. Maintain existing color code scheme where connecting to existing equipment.

3.3 DISCONNECTION AND REMOVAL OF EXISTING SYSTEM

Maintain existing fire alarm equipment fully operational until the new equipment has been tested and accepted by the Contracting Officer. As new equipment is installed, label it "NOT IN SERVICE" until the new equipment is accepted. Once the new system is completed, tested, and accepted by the Government, it shall be placed in service and connected to the station fire alarm system. Remove tags from new equipment and tag the existing equipment "NOT IN SERVICE" until removed from the building.

- a. After acceptance of the new system by the Contracting Officer, remove existing equipment not connected to the new system, remove unused exposed conduit, and restore damaged surfaces. Remove the material from the site and dispose.
- b. Disconnect and remove the existing fire alarm and smoke detection systems where indicated and elsewhere in the specification.
- c. Control panels and fire alarm devices and appliances disconnected and removed shall be turned over to the Contracting Officer.
- d. Properly dispose of fire alarm outlet and junction boxes, wiring, conduit, supports, and other such items.

3.4 CONNECTION OF NEW SYSTEM

The following new system connections shall be made during the last phase of

construction, at the beginning of the preliminary tests. New system connections shall include:

- a. Connection of new control modules to existing magnetically held smoke door (hold-open) devices.
- b. Connection of new elevator recall smoke sensors to existing wiring and conduit.
- c. Connection of new system transmitter to existing base fire reporting system.

Once these connections are made, system shall be left energized and new audio/visual devices deactivated. Report immediately to the Contracting Officer, coordination and field problems resulting from the connection of the above components.

3.5 FIRESTOPPING

Provide firestopping for holes at conduit penetrations through floor slabs, fire rated walls, partitions with fire rated doors, corridor walls, and vertical service shafts in accordance with Section 07 84 00 FIRESTOPPING.

3.6 PAINTING

Paint exposed electrical, fire alarm conduit, and surface metal raceway to match adjacent finishes in exposed areas. Paint junction boxes red in unfinished areas and conduits and surface metal raceways shall be painted with a 1-inch wide red band every 10 feet in unfinished areas.. Painting shall comply with Section 09 90 00 PAINTS AND COATINGS.

3.7 FIELD QUALITY CONTROL

3.7.1 Testing Procedures

Submit detailed test procedures, prepared and signed by a Registered Professional Engineer or a NICET Level 4 Fire Alarm Technician, and signed by representative of the installing company, for the fire detection and alarm system 60 days prior to performing system tests. Detailed test procedures shall list all components of the installed system such as initiating devices and circuits, notification appliances and circuits, signaling line devices and circuits, control devices/equipment, batteries, transmitting and receiving equipment, power sources/supply, annunciators, special hazard equipment, emergency communication equipment, interface equipment, Guard's Tour equipment, and transient (surge) suppressors. Test procedures shall include sequence of testing, time estimate for each test, and sample test data forms. The test data forms shall be in a check-off format (pass/fail with space to add applicable test data; similar to the forma in NFPA 72) and shall be used for the preliminary testing and the acceptance testing. The test data forms shall record the test results and shall:

- a. Identify the NFPA Class of all Initiating Device Circuits (IDC), Notification Appliance Circuits (NAC), Voice Notification System Circuits (NAC Audio), and Signaling Line Circuits (SLC).
- b. Identify each test required by NFPA 72 Test Methods and required test herein to be performed on each component, and describe how this test shall be performed.

- c. Identify each component and circuit as to type, location within the facility, and unique identity within the installed system. Provide necessary floor plan sheets showing each component location, test location, and alphanumeric identity.
- d. Identify all test equipment and personnel required to perform each test (including equipment necessary for testing smoke detectors using real smoke).
- e. Provide space to identify the date and time of each test. Provide space to identify the names and signatures of the individuals conducting and witnessing each test.

3.7.2 Tests Stages

3.7.2.1 Preliminary Testing

Conduct preliminary tests to ensure that devices and circuits are functioning properly. Tests shall meet the requirements of paragraph entitled "Minimum System Tests." After preliminary testing is complete, provide a letter certifying that the installation is complete and fully operable. The letter shall state that each initiating and indicating device was tested in place and functioned properly. The letter shall also state that panel functions were tested and operated properly. The letter shall include the names and titles of the witnesses to the preliminary tests. The Contractor and an authorized representative from each supplier of equipment shall be in attendance at the preliminary testing to make necessary adjustments.

3.7.2.2 Request for [Formal Inspection and Tests](#)

When tests have been completed and corrections made, submit a signed, dated certificate with a request for formal inspection and tests to the Naval Facilities Engineering Command, mid-lant, Fire Protection Engineer.

3.7.2.3 [Final Testing](#)

Notify the Contracting Officer in writing when the system is ready for final acceptance testing. Submit request for test at least 15 calendar days prior to the test date. The tests shall be performed in accordance with the approved test procedures in the presence of the Contracting Officer. Furnish instruments and personnel required for the tests. A final acceptance test will not be scheduled until the following are provided at the job site:

- a. The systems manufacturer's technical representative
- b. Marked-up red line drawings of the system as actually installed
- c. Megger test results
- d. Loop resistance test results
- e. Complete program printout including input/output addresses

The final tests will be witnessed by the Naval Facilities Engineering Command, mid-lant, Fire Protection Engineer. At this time, any and all required tests shall be repeated at their discretion.

3.7.2.4 System Acceptance

Following acceptance of the system, **as-built drawings** and O&M manuals shall be delivered to the Contracting Officer for review and acceptance. Submit six sets of detailed as-built drawings. The drawings shall show the system as installed, including deviations from both the project drawings and the approved shop drawings. These drawings shall be submitted within two weeks after the final acceptance test of the system. At least one set of as-built (marked-up) drawings shall be provided at the time of, or prior to the final acceptance test.

- a. Furnish one set of full size paper as-built drawings and schematics. The drawings shall be prepared on uniform sized sheets not less than **30 by 42 inches** with **8 by 4 inch** title block similar to contract drawings. Furnish one set of CD or DVD discs containing software back-up and CAD based drawings in latest version of AutoCAD and DXF format of as-built drawings and schematics.
- b. Include complete wiring diagrams showing connections between devices and equipment, both factory and field wired.
- c. Include a riser diagram and drawings showing the as-built location of devices and equipment.

In existing buildings, the transfer of devices from the existing system to the new system and the permission to begin demolition of the old fire alarm system will not be permitted until the as-built drawings and O&M manuals are received.

3.7.3 Minimum System Tests

Test the system in accordance with the procedures outlined in **NFPA 72**, **ISO 7240-16**, **IEC 60268-16**. The required tests are as follows:

- a. Megger Tests: After wiring has been installed, and prior to making any connections to panels or devices, wiring shall be megger tested for insulation resistance, grounds, and/or shorts. Conductors with 300 volt rated insulation shall be tested at a minimum of 250 VDC. Conductors with 600 volt rated insulation shall be tested at a minimum of 500 VDC. The tests shall be witnessed by the Contracting Officer and test results recorded for use at the final acceptance test.
- b. Loop Resistance Tests: Measure and record the resistance of each circuit with each pair of conductors in the circuit short-circuited at the farthest point from the circuit origin. The tests shall be witnessed by the Contracting Officer and test results recorded for use at the final acceptance test.
- c. Verify the absence of unwanted voltages between circuit conductors and ground. The tests shall be accomplished at the preliminary test with results available at the final system test.
- d. Verify that the control unit is in the normal condition as detailed in the manufacturer's O&M manual.
- e. Test each initiating device and notification appliance and circuit for proper operation and response at the control unit. Smoke sensors shall be tested in accordance with manufacturer's recommended calibrated test

method. Use of magnets is prohibited. Testing of duct smoke detectors shall comply with the requirements of [NFPA 72](#) except that, for item 12(e) (Supervision) in Table 14.4.2.2, disconnect at least 20 percent of devices. If there is a failure at these devices, then supervision shall be tested at each device.

- f. Test the system for specified functions in accordance with the contract drawings and specifications and the manufacturer's O&M manual.
- g. Test both primary power and secondary power. Verify, by test, the secondary power system is capable of operating the system for the time period and in the manner specified.
- h. Determine that the system is operable under trouble conditions as specified.
- i. Visually inspect wiring.
- j. Test the battery charger and batteries.
- k. Verify that software control and data files have been entered or programmed into the FACP. Hard copy records of the software shall be provided to the Contracting Officer.
- l. Verify that red-line drawings are accurate.
- m. Measure the current in circuits to ensure there is the calculated spare capacity for the circuits.
- n. Measure voltage readings for circuits to ensure that voltage drop is not excessive.
- o. Disconnect the verification feature for smoke sensors during tests to minimize the amount of smoke needed to activate the sensor. Testing of smoke sensors shall be conducted using real smoke or the use of canned smoke which is permitted.
- p. Measure the voltage drop at the most remote appliance (based on wire length) on each notification appliance circuit.

3.7.3.1 Intelligibility Tests

Intelligibility testing of the System shall be accomplished in accordance with [NFPA 72](#) for Voice Evacuation Systems, [IEC 60268-16](#), and [ASA S3.2](#). Following are the specific requirements for intelligibility tests:

- a. Intelligibility Requirements: Verify intelligibility by measurement after installation.
- b. Ensure that a CIS value greater than the required minimum value is provided in each area where building occupants typically could be found. The minimum required value for CIS is .7.
- c. Areas of the building provided with hard wall and ceiling surfaces (such as metal or concrete) that are found to cause excessive sound reflections may be permitted to have a CIS score less than the minimum required value if approved by the DOD installation, and if building occupants in these areas can determine that a voice signal is being broadcast and they must walk no more than [33 feet](#) to find a location

with at least the minimum required CIS value within the same area.

- d. Areas of the building where occupants are not expected to be normally present are permitted to have a CIS score less than the minimum required value if personnel can determine that a voice signal is being broadcast and they must walk no more than 50 feet to a location with at least the minimum required CIS value within the same area.
- e. Take measurements near the head level applicable for most personnel in the space under normal conditions (e.g., standing, sitting, sleeping, as appropriate).
- f. The distance the occupant must walk to the location meeting the minimum required CIS value shall be measured on the floor or other walking surface as follows:
 - (1) Along the centerline of the natural path of travel, starting from any point subject to occupancy with less than the minimum required CIS value.
 - (2) Curving around any corners or obstructions, with a 12 inches clearance there from.
 - (3) Terminating directly below the location where the minimum required CIS value has been obtained.

Use commercially available test instrumentation to measure intelligibility as specified by ISO 7240-19 and ISO 7240-16 as applicable. Use the mean value of at least three readings to compute the intelligibility score at each test location.

3.8 INSTRUCTION OF GOVERNMENT EMPLOYEES

3.8.1 Instructor

Include in the project the services of an instructor, who has received specific training from the manufacturer for the training of other persons regarding the inspection, testing, and maintenance of the system provided. The instructor shall train the Government employees designated by the Contracting Officer, in the care, adjustment, maintenance, and operation of the fire alarm system. Each instructor shall be thoroughly familiar with all parts of this installation. The instructor shall be trained in operating theory as well as in practical O&M work. Submit the instructors information and qualifications including the training history.

3.8.2 Required Instruction Time

Provide 8 hours of instruction after final acceptance of the system. The instruction shall be given during regular working hours on such dates and times as are selected by the Contracting Officer. The instruction may be divided into two or more periods at the discretion of the Contracting Officer. The training shall allow for rescheduling for unforeseen maintenance and/or fire department responses.

3.8.2.1 Technical Training

Equipment manufacturer or a factory representative shall provide 1 days of on site. Training shall allow for classroom instruction as well as individual hands on programming, troubleshooting and diagnostics

exercises. Training shall occur within 6 months of system acceptance.

3.9 Technical Data and Computer Software

Provide, in manual format, lesson plans, operating instructions, maintenance procedures, and training data for the training courses. The operations training shall familiarize designated government personnel with proper operation of the installed system. The maintenance training course shall provide the designated government personnel adequate knowledge required to diagnose, repair, maintain, and expand functions inherent to the system.

-- End of Section --

SECTION 31 11 00

CLEARING AND GRUBBING

04/06

PART 1 GENERAL

1.1 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00
SUBMITTAL PROCEDURES:

SD-03 Product Data

Nonsaleable Materials;

Written permission to dispose of such products on private
property shall be filed with the Contracting Officer.

SD-04 Samples

Tree wound paint

Herbicide

Submit samples in cans with manufacturer's label.

1.2 DELIVERY, STORAGE, AND HANDLING

Deliver materials to, store at the site, and handle in a manner which will
maintain the materials in their original manufactured or fabricated
condition until ready for use.

PART 2 PRODUCTS

2.1 TREE WOUND PAINT

Bituminous based paint of standard manufacture specially formulated for
tree wounds.

2.2 HERBICIDE

Comply with Federal Insecticide, Fungicide, and Rodenticide Act (Title 7
U.S.C. Section 136) for requirements on Contractor's licensing,
certification and record keeping. Contact the command Pest Control
Coordinator prior to starting work.

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Roads and Walks

Keep roads and walks free of dirt and debris at all times.

3.1.2 Trees, Shrubs, and Existing Facilities

Protection shall be in accordance with Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require.

3.1.3 Utility Lines

Protect existing utility lines that are indicated to remain from damage. Notify the Contracting Officer immediately of damage to or an encounter with an unknown existing utility line. The Contractor shall be responsible for the repairs of damage to existing utility lines that are indicated or made known to the Contractor prior to start of clearing and grubbing operations. When utility lines which are to be removed are encountered within the area of operations, the Contractor shall notify the Contracting Officer in ample time to minimize interruption of the service. Refer to Section 01 30 00, ADMINISTRATIVE REQUIREMENTS and Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS for additional utility protection.

3.2 CLEARING

Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within the areas to be cleared. Clearing shall also include the removal and disposal of structures that obtrude, encroach upon, or otherwise obstruct the work. Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface, except such trees and vegetation as may be indicated or directed to be left standing. Trees designated to be left standing within the cleared areas shall be trimmed of dead branches 1-1/2 inches or more in diameter and shall be trimmed of all branches the heights indicated or directed. Limbs and branches to be trimmed shall be neatly cut close to the bole of the tree or main branches. Cuts more than 1-1/2 inches in diameter shall be painted with an approved tree-wound paint. Apply herbicide in accordance with the manufacturer's label to the top surface of stumps designated not to be removed.

3.3 TREE REMOVAL

Where indicated or directed, trees and stumps that are designated as trees shall be removed from areas outside those areas designated for clearing and grubbing. This work shall include the felling of such trees and the removal of their stumps and roots as specified in paragraph GRUBBING. Trees shall be disposed of as specified in paragraph DISPOSAL OF MATERIALS.

3.4 PRUNING

Prune trees designated to be left standing within the cleared areas of dead branches 1 1/2 inches or more in diameter; and trim branches to heights and in a manner as indicated. Neatly cut limbs and branches to be trimmed close to the bole of the tree or main branches. Paint cuts more than 1 1/4 inches in diameter with an approved tree wound paint.

3.5 GRUBBING

Grubbing shall consist of the removal and disposal of stumps, roots larger

than 3 inches in diameter, and matted roots from the designated grubbing areas. Material to be grubbed, together with logs and other organic or metallic debris not suitable for foundation purposes, shall be removed to a depth of not less than 18 inches below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas under this contract, such as areas for buildings, and areas to be paved. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.

3.6 DISPOSAL OF MATERIALS

3.6.1 Saleable Timber

1. The Government shall, by separate contract, harvest all saleable timber from the project site. All remaining timber, limbs, tops, stumps, and debris shall be cleared and disposed of by the Contractor as specified.

3.6.2 Nonsaleable Materials

Logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations, except for salable timber, shall be disposed of in the designated waste disposal area, except when otherwise directed in writing. Such directive will state the conditions covering the disposal of such products and will also state the areas in which they may be placed.

-- End of Section --

SECTION 31 23 00.00 20

EXCAVATION AND FILL

04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C600 (2005) Installation of Ductile-Iron Water Mains and Their Appurtenances

ASTM INTERNATIONAL (ASTM)

ASTM C 136 (2005) Sieve Analysis of Fine and Coarse Aggregates

ASTM C 33 (2003) Concrete Aggregates

ASTM D 1140 (2000) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve

ASTM D 1556 (2000) Density and Unit Weight of Soil in Place by the Sand-Cone Method

ASTM D 1557 (2007) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2700 kN-m/m³)

ASTM D 2321 (2005) Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

ASTM D 2487 (2000) Soils for Engineering Purposes (Unified Soil Classification System)

ASTM D 2922 (2004) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

ASTM D 3017 (2004) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

ASTM D 3786 (2001) Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method

ASTM D 4318 (2000) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

ASTM D 4355	(2002) Deterioration of Geotextiles from Exposure to Light, Moisture and Heat in a Xenon-Arc Type Apparatus
ASTM D 4491	(1999; R 2004) Water Permeability of Geotextiles by Permittivity
ASTM D 4533	(2004) Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	(1991; R 2003) Grab Breaking Load and Elongation of Geotextiles
ASTM D 4759	(2002) Determining the Specification Conformance of Geosynthetics
ASTM D 4833	(2000e1) Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D 698	(2007e1) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.))

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2008; Errata 1-2010; Changes 1-3 2010; Changes 4-6 2011) Safety and Health Requirements Manual
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U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 530/F-93/004	(1993; Rev O; Updates I, II, IIA, IIB, and III) Test Methods for Evaluating Solid Waste (Vol IA, IB, IC, and II) (SW-846)
EPA 600/4-79/020	(1983) Methods for Chemical Analysis of Water and Wastes

1.2 DEFINITIONS

1.2.1 Degree of Compaction

Degree of compaction is expressed as a percentage of the maximum density obtained by the test procedure presented in [ASTM D 698](#), for general soil types, abbreviated as percent laboratory maximum density.

1.2.2 Hard Materials

Weathered rock, dense consolidated deposits, or conglomerate materials which are not included in the definition of "rock" but which usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.

1.2.3 Rock

Solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which

can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers; also large boulders, buried masonry, or concrete other than pavement exceeding 1/2 cubic yard in volume. Removal of hard material will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production.

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Shoring and Sheeting Plan

Dewatering work plan

Submit 15 days prior to starting work.

SD-06 Test Reports

Borrow Site Testing

Fill and backfill test

Select material test

Density tests

Moisture Content Tests

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

1.4 DELIVERY, STORAGE, AND HANDLING

Perform in a manner to prevent contamination or segregation of materials.

1.5 CRITERIA FOR BIDDING

Base bids on the following criteria:

- a. Surface elevations are as indicated.
- b. Pipes or other artificial obstructions, except those indicated, will not be encountered.
- c. Hard materials and rock will not be encountered.
- d. Borrow material in the quantities required is not available on Government property.
- e. Blasting will not be permitted. Remove material in an approved manner.

1.6 REQUIREMENTS FOR OFF SITE SOIL

Soils brought in from off site for use as backfill shall be tested for TPH, BTEX and full TCLP including ignitability, corrosivity and reactivity. Backfill shall contain less than 100 parts per million (ppm) of total petroleum hydrocarbons (TPH) and less than 10 ppm of the sum of Benzene, Toluene, Ethyl Benzene, and Xylene (BTEX) and shall not fail the TCPL test. TPH concentrations shall be determined by using EPA 600/4-79/020 Method 418.1. BTEX concentrations shall be determined by using EPA 530/F-93/004 Method 5030/8020. TCLP shall be performed in accordance with EPA 530/F-93/004 Method 1311. Provide Borrow Site Testing for TPH, BTEX and TCLP from a composite sample of material from the borrow site, with at least one test from each borrow site. Material shall not be brought on site until tests have been approved by the Contracting Officer.

1.7 QUALITY ASSURANCE

1.7.1 Shoring and Sheet piling Plan

Submit drawings and calculations, certified by a registered professional engineer, describing the methods for shoring and sheet piling of excavations. Drawings shall include material sizes and types, arrangement of members, and the sequence and method of installation and removal. Calculations shall include data and references used.

The Contractor is required to hire a Professional Geotechnical Engineer to provide inspection of excavations and soil/groundwater conditions throughout construction. The Geotechnical Engineer shall be responsible for performing pre-construction and periodic site visits throughout construction to assess site conditions. The Geotechnical Engineer shall update the excavation, sheet piling and dewatering plans as construction progresses to reflect changing conditions and shall submit an updated plan if necessary. A written report shall be submitted, at least monthly, informing the Contractor and Contracting Officer of the status of the plan and an accounting of the Contractor's adherence to the plan addressing any present or potential problems. The Geotechnical Engineer shall be available to meet with the Contracting Officer at any time throughout the contract duration.

1.7.2 Dewatering Work Plan

Submit procedures for accomplishing dewatering work.

1.7.3 Utilities

Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk. Perform work adjacent to non-Government utilities as indicated in accordance with procedures outlined by utility company. Excavation made with power-driven equipment is not permitted within two feet of known Government-owned utility or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the contract excavation until approval for backfill is granted by the Contracting Officer. Report damage to utility lines or subsurface construction immediately to the Contracting Officer.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

2.1.1 Satisfactory Materials

Any materials classified by [ASTM D 2487](#) as GW, GP, SW, SP free of debris, roots, wood, scrap material, vegetation, refuse, soft unsound particles, and frozen, deleterious, or objectionable materials. Unless specified otherwise, the maximum particle diameter shall be one-half the lift thickness at the intended location.

2.1.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials. Unsatisfactory materials also include man-made fills, trash, refuse, or backfills from previous construction. Unsatisfactory material also includes material classified as satisfactory which contains root and other organic matter, frozen material, and stones larger than 1/2 inches. The Contracting Officer shall be notified of any contaminated materials.

2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in [ASTM D 2487](#) as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM, GP-GM, GW-GM, SW-SM, SP-SM, and SM shall be identified as cohesionless only when the fines are nonplastic (plasticity index equals zero). Materials classified as GM and SM will be identified as cohesive only when the fines have a plasticity index greater than zero.

2.1.4 Common Fill

Approved, unclassified soil material with the characteristics required to compact to the soil density specified for the intended location.

2.1.5 Backfill and Fill Material

[ASTM D 2487](#), classification GW, GP, SW, SP with a maximum [ASTM D 4318](#) liquid limit of 35, maximum [ASTM D 4318](#) plasticity index of 12, and a maximum of 25 percent by weight passing [ASTM D 1140](#), No. 200 sieve.

2.1.6 Select Material

Provide materials classified as GW, GP, SW, SP, by [ASTM D 2487](#) where indicated. The liquid limit of such material shall not exceed 35 percent when tested in accordance with [ASTM D 4318](#). The plasticity index shall not be greater than 12 percent when tested in accordance with [ASTM D 4318](#), and not more than 35 percent by weight shall be finer than No. 200 sieve when tested in accordance with [ASTM D 1140](#).

2.1.7 Topsoil

Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than one inch diameter, brush, weeds, toxic substances, and other material detrimental to plant growth. Amend topsoil pH range to obtain a pH of 5.5 to 7.

2.2 UTILITY BEDDING MATERIAL

Except as specified otherwise in the individual piping section, provide bedding for buried piping in accordance with [AWWA C600](#), Type 4, except as specified herein. Backfill to top of pipe shall be compacted to 95 percent of [ASTM D 698](#) maximum density. Plastic piping shall have bedding to spring line of pipe. Provide [ASTM D 2321](#) materials as follows:

- a. Class I: Angular, 0.25 to 1.5 inches, graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, and crushed shells.
- b. Class II: Coarse sands and gravels with maximum particle size of 1.5 inches, including various graded sands and gravels containing small percentages of fines, generally granular and noncohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class as specified in [ASTM D 2487](#).

2.2.1 Gravel

Clean, coarsely graded natural gravel, crushed stone or a combination thereof having a classification of GW, GP in accordance with [ASTM D 2487](#) for bedding. Maximum particle size shall not exceed 3 inches.

2.3 BORROW

Obtain borrow materials required in excess of those furnished from excavations from sources outside of Government property.

2.4 FILTER FABRIC

Provide a pervious sheet of polyester, nylon, glass or polypropylene, ultraviolet resistant filaments nonwoven, spun bonded, fused, or otherwise manufactured into a nonraveling fabric with uniform thickness and strength. Fabric shall have the following manufacturer certified minimum average roll properties as determined by [ASTM D 4759](#):

	<u>Class A</u>	<u>Class B</u>
a. Grab tensile strength (ASTM D 4632) machine and transversed direction	min. 300	80 lbs.
b. Grab elongation (ASTM D 4632) machine and transverse direction	min. 15	15 percent
c. Puncture resistance (ASTM D 4833)	min. 130	40 lbs.
d. Mullen burst strength (ASTM D 3786)	min. 500	170 psi.
e. Trapezoidal Tear (ASTM D 4533)	min. 100	30 lbs.
f. Permeability (ASTM D 4491)	min. 0.34	0.26
g. Ultraviolet Degradation (ASTM D 4355)	70 percent Strength retained at 150 hours	

2.5 MATERIAL FOR RIP-RAP

Bedding material, Grout, Filter fabric and rock conforming to these

requirements for construction indicated.

2.5.1 Bedding Material

Consisting of sand, gravel, or crushed rock, well graded, or poorly graded with a maximum particle size of 2 inches. Material shall be composed of tough, durable particles. Fines passing the No. 200 standard sieve shall have a plasticity index less than six.

2.5.2 Grout

Composed of cement, water, an air-entraining admixture, and sand mixed in proportions of one part portland cement to two parts of sand, sufficient water to produce a workable mixture, and an amount of admixture which will entrain sufficient air to produce durable grout, as determined by the Contracting Officer. Mix grout in a concrete mixer. Mixing time shall be sufficient to produce a mixture having a consistency permitting gravity flow into the interstices of the rip-rap with limited spading and brooming.

2.5.3 Rock

Rock fragments sufficiently durable to ensure permanence in the structure and the environment in which it is to be used. Rock fragments shall be free from cracks, seams, and other defects that would increase the risk of deterioration from natural causes. The size of the fragments shall be such that no individual fragment exceeds a weight of 150 pounds and that no more than 10 percent of the mixture, by weight, consists of fragments weighing 2 pounds or less each. Specific gravity of the rock shall be a minimum of 2.50. The inclusion of more than trace 1 percent quantities of dirt, sand, clay, and rock fines will not be permitted.

2.6 BURIED WARNING AND IDENTIFICATION TAPE

Polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 inch minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.

Warning Tape Color Codes

Yellow:	Electric
Yellow:	Gas, Oil; Dangerous Materials
Orange:	Telephone and Other Communications
Blue:	Water Systems
Green:	Sewer Systems
White:	Steam Systems
Gray:	Compressed Air

2.6.1 Warning Tape for Metallic Piping

Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.003 inch. Tape shall have a minimum strength of 1500 psi

lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.

2.6.2 Detectable Warning Tape for Non-Metallic Piping

Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.004 inch. Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.7 DETECTION WIRE FOR NON-METALLIC PIPING

Detection wire shall be insulated single strand, solid copper with a minimum of 12 AWG.

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Shoring and Sheeting

Provide shoring bracing, cribbing, trench boxes, underpinning and sheeting. In addition to Section 25 A and B of EM 385-1-1 and other requirements set forth in this contract, include provisions in the shoring and sheeting plan that will accomplish the following:

- a. Prevent undermining of pavements, foundations and slabs.
- b. Prevent slippage or movement in banks or slopes adjacent to the excavation.

3.1.2 Drainage and Dewatering

Provide for the collection and disposal of surface and subsurface water encountered during construction.

3.1.2.1 Drainage

So that construction operations progress successfully, completely drain construction site during periods of construction to keep soil materials sufficiently dry. The Contractor shall establish/construct storm drainage features (ponds/basins) at the earliest stages of site development, and throughout construction grade the construction area to provide positive surface water runoff away from the construction activity and/or provide temporary ditches, swales, and other drainage features and equipment as required to maintain dry soils, prevent erosion and undermining of foundations. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified herein. It is the responsibility of the Contractor to assess the soil and ground water conditions presented by the plans and specifications and to employ necessary measures to permit construction to proceed. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site, the area immediately surrounding the site, and the area affecting operations at the site shall be continually and effectively drained.

3.1.2.2 Dewatering

Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, the water level shall be maintained continuously, at least two feet below the working level.

3.1.3 Underground Utilities

Location of the existing utilities indicated is approximate. The Contractor shall physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor shall scan the construction site with electromagnetic and sonic equipment and mark the surface of the ground where existing underground utilities are discovered.

3.1.4 Machinery and Equipment

Movement of construction machinery and equipment over pipes during construction shall be at the Contractor's risk. Repair, or remove and provide new pipe for existing or newly installed pipe that has been displaced or damaged.

3.2 SURFACE PREPARATION

3.2.1 Clearing and Grubbing

Unless indicated otherwise, remove trees, stumps, logs, shrubs, brush and vegetation and other items that would interfere with construction operations within the clearing limits. Remove stumps entirely. Grub out matted roots and roots over 2 inches in diameter to at least 18 inches below existing surface.

3.2.2 Stripping

Strip suitable soil from the site where excavation or grading is indicated and stockpile separately from other excavated material. Material unsuitable for use as topsoil shall be wasted. Locate topsoil so that the material can be used readily for the finished grading. Where sufficient existing topsoil conforming to the material requirements is not available on site, provide borrow materials suitable for use as topsoil. Protect topsoil and keep in segregated piles until needed.

3.2.3 Unsuitable Material

Remove vegetation, debris, decayed vegetable matter, sod, mulch, and rubbish underneath paved areas or concrete slabs.

3.3 EXCAVATION

Excavate to contours, elevation, and dimensions indicated. Reuse excavated materials that meet the specified requirements for the material type

required at the intended location. Keep excavations free from water. Excavate soil disturbed or weakened by Contractor's operations, soils softened or made unsuitable for subsequent construction due to exposure to weather. Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be removed as directed. Refill with select material and compact to 95 percent of ASTM D 698 maximum density. Unless specified otherwise, refill excavations cut below indicated depth with select material and compact to 95 percent of ASTM D 698 maximum density. Satisfactory material removed below the depths indicated, without specific direction of the Contracting Officer, shall be replaced with satisfactory materials to the indicated excavation grade; except as specified for spread footings. Determination of elevations and measurements of approved overdepth excavation of unsatisfactory material below grades indicated shall be done under the direction of the Contracting Officer.

3.3.1 Structures With Spread Footings

Ensure that footing subgrades have been inspected and approved by the Contracting Officer prior to concrete placement. Fill over excavations with concrete during foundation placement.

3.3.2 Pipe Trenches

Excavate to the dimension indicated. Grade bottom of trenches to provide uniform support for each section of pipe after pipe bedding placement. Tamp if necessary to provide a firm pipe bed. Recesses shall be excavated to accommodate bells and joints so that pipe will be uniformly supported for the entire length. Rock, where encountered, shall be excavated to a depth of at least 6 inches below the bottom of the pipe.

3.3.3 Hard Material Excavation

Remove hard material to elevations indicated in a manner that will leave foundation material in an unshattered and solid condition. Roughen level surfaces and cut sloped surfaces into benches for bond with concrete. Protect shale from conditions causing decomposition along joints or cleavage planes and other types of erosion. Removal of hard material beyond lines and grades indicated will not be grounds for a claim for additional payment unless previously authorized by the Contracting Officer. Excavation of the material claimed as rock shall not be performed until the material has been cross sectioned by the Contractor and approved by the Contracting Officer. Common excavation shall consist of all excavation not classified as rock excavation.

3.3.4 Excavated Materials

Satisfactory excavated material required for fill or backfill shall be placed in the proper section of the permanent work required or shall be separately stockpiled if it cannot be readily placed. Satisfactory material in excess of that required for the permanent work and all unsatisfactory material shall be disposed of as specified in Paragraph "DISPOSITION OF SURPLUS MATERIAL."

3.3.5 Final Grade of Surfaces to Support Concrete

Excavation to final grade shall not be made until just before concrete is to be placed. Only excavation methods that will leave the foundation rock in a solid and unshattered condition shall be used. Approximately level

surfaces shall be roughened, and sloped surfaces shall be cut as indicated into rough steps or benches to provide a satisfactory bond. Shales shall be protected from slaking and all surfaces shall be protected from erosion resulting from ponding or flow of water.

3.4 SUBGRADE PREPARATION

Unsatisfactory material in surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials as directed by the Contracting Officer. The surface shall be scarified to a depth of 6 inches before the fill is started. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When subgrades are less than the specified density, the ground surface shall be broken up to a minimum depth of 6 inches, pulverized, and compacted to the specified density. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Minimum subgrade density shall be as specified herein.

3.4.1 Proof Rolling

Proof rolling shall be done on an exposed subgrade free of surface water (wet conditions resulting from rainfall) which would promote degradation of an otherwise acceptable subgrade. After stripping, proof roll the existing subgrade of the building and paved areas with six passes of a dump truck loaded with 6 cubic meters of soil. Operate the truck in a systematic manner to ensure the number of passes over all areas, and at speeds between 2 1/2 to 3 1/2 miles per hour. When proof rolling under buildings, the building subgrade shall be considered to extend 5 feet beyond the building lines, and one-half of the passes made with the roller shall be in a direction perpendicular to the other passes. Notify the Contracting Officer a minimum of 3 days prior to proof rolling. Proof rolling shall be performed in the presence of the Contracting Officer. Rutting or pumping of material shall be undercut as directed by the Contracting Officer.

3.5 FILLING AND BACKFILLING

Fill and backfill to contours, elevations, and dimensions indicated. Compact each lift before placing overlaying lift.

3.5.1 Common Fill Placement

Provide for general site. Use satisfactory materials. Place in 6 inch lifts. Compact areas not accessible to rollers or compactors with mechanical hand tampers. Aerate material excessively moistened by rain to a satisfactory moisture content. Finish to a smooth surface by blading, rolling with a smooth roller, or both.

3.5.2 Backfill and Fill Material Placement

Provide for paved areas and under concrete slabs, except where select material is provided. Place in 6 inch lifts. Do not place over wet or

frozen areas. Place backfill material adjacent to structures as the structural elements are completed and accepted. Backfill against concrete only when approved. Place and compact material to avoid loading upon or against the structure.

3.5.3 Select Material Placement

Provide under porous fill of structures not pile supported. Place in 6 inch lifts. Do not place over wet or frozen areas. Backfill adjacent to structures shall be placed as structural elements are completed and accepted. Backfill against concrete only when approved. Place and compact material to avoid loading upon or against structure.

3.5.4 Backfill and Fill Material Placement Over Pipes and at Walls

Backfilling shall not begin until construction below finish grade has been approved, underground utilities systems have been inspected, tested and approved, forms removed, and the excavation cleaned of trash and debris. Backfill shall be brought to indicated finish grade and shall include backfill for outside grease interceptors and underground fuel tanks. Where pipe is coated or wrapped for protection against corrosion, the backfill material up to an elevation 2 feet above sewer lines and 1 foot above other utility lines shall be free from stones larger than 1 inch in any dimension. Heavy equipment for spreading and compacting backfill shall not be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of footing; the area remaining shall be compacted in layers not more than 4 inches in compacted thickness with power-driven hand tampers suitable for the material being compacted. Backfill shall be placed carefully around pipes or tanks to avoid damage to coatings, wrappings, or tanks. Backfill shall not be placed against foundation walls prior to 7 days after completion of the walls. As far as practicable, backfill shall be brought up evenly on each side of the wall and sloped to drain away from the wall.

3.5.5 Trench Backfilling

Backfill as rapidly as construction, testing, and acceptance of work permits. Place and compact backfill under structures and paved areas in 6 inch lifts to top of trench and in 6 inch lifts to one foot over pipe outside structures and paved areas.

3.6 BORROW

Where satisfactory materials are not available in sufficient quantity from required excavations, approved borrow materials shall be obtained as specified herein.

3.7 BURIED WARNING AND IDENTIFICATION TAPE

Provide buried utility lines with utility identification tape. Bury tape 12 inches below finished grade; under pavements and slabs, bury tape 6 inches below top of subgrade.

3.8 BURIED DETECTION WIRE

Bury detection wire directly above non-metallic piping at a distance not to exceed 12 inches above the top of pipe. The wire shall extend continuously and unbroken, from manhole to manhole. The ends of the wire shall terminate inside the manholes at each end of the pipe, with a minimum of 3

feet of wire, coiled, remaining accessible in each manhole. The wire shall remain insulated over its entire length. The wire shall enter manholes between the top of the corbel and the frame, and extend up through the chimney seal between the frame and the chimney seal. For force mains, the wire shall terminate in the valve pit at the pump station end of the pipe.

3.9 COMPACTION

Determine in-place density of existing subgrade; if required density exists, no compaction of existing subgrade will be required. Density requirements specified herein are for cohesionless materials. When cohesive materials are encountered or used, density requirements may be reduced by 5 percent.

3.9.1 General Site

Compact underneath areas designated for vegetation and areas outside the 5 foot line of the paved area or structure to 90 percent of ASTM D 698.

3.9.2 Structures, Spread Footings, and Concrete Slabs

Compact top 12 inches of subgrades to 95 percent of ASTM D 698. Compact common fill, fill and backfill material, select material to 95 percent of ASTM D 698.

3.9.3 Adjacent Area

Compact areas within 5 feet of structures to 90 percent of ASTM D 698.

3.9.4 Paved Areas

Compact top 12 inches of subgrades to 95 percent of ASTM D 698. Compact fill and backfill materials to 95 percent of ASTM D 698.

3.9.5 Geothermal Well Field Trenching

Compact trench fill to 98 percent of ASTM D 1557, at each lift.

3.10 PIPELINE CASING UNDER PAVEMENT

Provide new smooth wall steel pipeline casing under new and existing railroad and pavement by the boring and jacking method of installation. Provide each new pipeline casing, where indicated and to the lengths and dimensions shown, complete and suitable for use with the new piped utility as indicated.

3.11 RIP-RAP CONSTRUCTION

Construct rip-rap on filter fabric in accordance with NCDOT, Section 876.

3.11.1 Preparation

Trim and dress indicated areas to conform to cross sections, lines and grades shown within a tolerance of 0.1 foot.

3.11.2 Bedding Placement

Spread filter fabric on prepared subgrade as indicated.

3.11.3 Stone Placement

Place rock for rip-rap on prepared bedding material to produce a well graded mass with the minimum practicable percentage of voids in conformance with lines and grades indicated. Distribute larger rock fragments, with dimensions extending the full depth of the rip-rap throughout the entire mass and eliminate "pockets" of small rock fragments. Rearrange individual pieces by mechanical equipment or by hand as necessary to obtain the distribution of fragment sizes specified above.

3.12 FINISH OPERATIONS

3.12.1 Grading

Finish grades as indicated within **one-tenth of one foot**. Grade areas to drain water away from structures. Maintain areas free of trash and debris. For existing grades that will remain but which were disturbed by Contractor's operations, grade as directed.

3.12.2 Topsoil and Seed

Provide as specified in Section **02 82 30**, Re-Establishing Vegetation.

Scarify existing subgrade. Provide **4 inches** of topsoil for newly graded finish earth surfaces and areas disturbed by the Contractor. Topsoil shall not be placed when the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to seeding, planting, or proper grading. If there is insufficient on-site topsoil meeting specified requirements for topsoil, provide topsoil required in excess of that available.

3.12.3 Protection of Surfaces

Protect newly backfilled, graded, and topsoiled areas from traffic, erosion, and settlements that may occur. Repair or reestablish damaged grades, elevations, or slopes.

3.13 DISPOSITION OF SURPLUS MATERIAL

Remove from Government property surplus or other soil material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber.

3.14 FIELD QUALITY CONTROL

3.14.1 Sampling

Take the number and size of samples required to perform the following tests.

3.14.2 Testing

Perform one of each of the following tests for each material used. Provide additional tests for each source change.

3.14.2.1 **Fill and Backfill** Material Testing

Test fill and backfill material in accordance with **ASTM C 136** for conformance to **ASTM D 2487** gradation limits; **ASTM D 1140** for material finer than the **No. 200** sieve; **ASTM D 4318** for liquid limit and for plastic limit;

ASTM D 698 or ASTM D 1557 for moisture density relations, as applicable.

3.14.2.2 Select Material Testing

Test select material in accordance with ASTM C 136 for conformance to ASTM D 2487 gradation limits; ASTM D 1140 for material finer than the No. 200 sieve; ASTM D 698 or ASTM D 1557 for moisture density relations, as applicable.

3.14.2.3 Porous Fill Testing

Test porous fill in accordance with ASTM C 136 for conformance to gradation specified in ASTM C 33.

3.14.2.4 Density Tests

Test density in accordance with ASTM D 1556, or ASTM D 2922 and ASTM D 3017. When ASTM D 2922 and ASTM D 3017 density tests are used, verify density test results by performing an ASTM D 1556 density test at a location already ASTM D 2922 and ASTM D 3017 tested as specified herein. Perform an ASTM D 1556 density test at the start of the job, and for every 10 ASTM D 2922 and ASTM D 3017 density tests thereafter. Test each lift at randomly selected locations every 2000 square feet of existing grade in fills for structures and concrete slabs, and every 2500 square feet for other fill areas and every 2000 square feet of subgrade in cut. Include density test results in daily report.

- a. Bedding and backfill in trenches: One test per 50 linear feet in each lift.

-- End of Section --

SECTION 32 31 13.53

HIGH-SECURITY CHAIN LINK FENCES AND GATES

04/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A 116	(2005) Standard Specification for Metallic-Coated, Steel Woven Wire Fence Fabric
ASTM A 121	(2007) Standard Specification for Metallic-Coated Carbon Steel Barbed Wire
ASTM A 153/A 153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 392	(2007) Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric
ASTM A 702	(1989; R 2006) Standard Specification for Steel Fence Posts and Assemblies, Hot Wrought
ASTM A 780/A 780M	(2009) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A 824	(2001; R 2007) Standard Specification for Metallic-Coated Steel Marcellled Tension Wire for Use With Chain Link Fence
ASTM C 94/C 94M	(2009) Standard Specification for Ready-Mixed Concrete
ASTM F 1043	(2008) Strength and Protective Coatings on Metal Industrial Chain-Link Fence Framework
ASTM F 1083	(2008) Standard Specification for Pipe, Steel, Hot-Dipped Zinc Coated (Galvanized) Welded, for Fence Structures
ASTM F 1184	(2005) Industrial and Commercial Horizontal Slide Gates
ASTM F 567	(2007) Standard Practice for Installation of Chain Link Fence

ASTM F 626 (2008) Standard Specification for Fence Fittings

ASTM F 900 (2005) Industrial and Commercial Swing Gates

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS RR-F-191 (Rev K) Fencing, Wire and Post Metal (and Gates, Chain-Link Fence Fabric, and Accessories)

FS RR-F-191/1 (Rev D) Fencing, Wire and Post, Metal (Chain-Link Fence Fabric)

FS RR-F-191/2 (Rev D) Fencing, Wire and Post, Metal (Chain-Link Fence Gates)

FS RR-F-191/3 (Rev D) Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces)

FS RR-F-191/4 (Rev D) Fencing, Wire and Post, Metal (Chain-Link Fence Accessories)

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

- Fence Installation
Installation Drawings
Location of gate, corner, end, and pull posts
Gate Assembly
Gate Hardware and Accessories

Installation drawings in accordance with paragraph titled, "ASSEMBLY AND INSTALLATION DRAWINGS" of this section.

SD-03 Product Data

- Fence Installation
Gate Assembly
Gate Hardware and Accessories

Manufacturer's catalog data.

SD-06 Test Reports

Weight in ounces for zinc coating

SD-07 Certificates

Chain Link Fence

Submit reports, signed by an official authorized to certify on

behalf of the manufacturer, attesting that the chain link fence and component materials meet the specified requirements.

Zinc Coating
Fabric
Barbed Wire
Stretcher Bars
Gate Hardware and Accessories
Concrete

SD-08 Manufacturer's Instructions

Submit Manufacturer's instructions for the following items:

Fence Installation
Gate Assembly
Hardware Assembly
Accessories

1.3 QUALITY ASSURANCE

1.3.1 Required Report Data

Submit reports of chain-link fencing listing and accessories regarding weight in ounces for zinc coating. Submit reports demonstrating full compliance with the following standards: FS RR-F-191, FS RR-F-191/1, FS RR-F-191/2, FS RR-F-191/3, and FS RR-F-191/4

1.3.2 Assembly and Installation Drawings

Submit complete Fence Installation Drawings for review and approval by the Contracting Officer prior to shipment. Drawing details shall include, but are not limited to: Fence Installation, Location of gate, corner, end, and pull posts, Gate Assembly, and Gate Hardware and Accessories.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to site in an undamaged condition. Store materials off the ground to provide protection against oxidation caused by ground contact.

PART 2 PRODUCTS

2.1 FENCE FABRIC

2.1.1 General

Provide ASTM A 392, Class 1, zinc-coated steel wire with minimum coating weight of 1.2 ounces of zinc per square foot of coated surface. Fabricate fence fabric of 9 gauge wire woven in 2 inch mesh conforming to ASTM A 116. Set fabric height at 8 feet. Fabric shall be twisted and barbed on the top selvage and knuckled on the bottom selvage. Secure fabric to posts using stretcher bars or ties spaced 15 inches on center, or by integrally weaving to integral fastening loops of end, corner, pull, and gate posts for full length of each post. Install fabric on opposite side of posts from area being secured.

2.2 POSTS

2.2.1 Metal Posts for Chain Link Fence

- a. Provide posts conforming to ASTM F 1083, zinc-coated. Group IA, with external coating Type A steel pipe. Group IC steel pipe, zinc-coated with external coating Type A or Type B and Group II, roll-formed steel sections, meeting the strength and coating requirements of ASTM F 1043 and ASTM A 702. Provide sizes as shown on the drawings. Line posts and terminal (corner, gate, and pull) posts selected shall be of the same designation throughout the fence. Provide gate post for the gate type specified subject to the limitation specified in ASTM F 900 and/or ASTM F 1184. Post spacing shall conform to the recommended guidelines as set forth in the CLFMI "Wind Load Guide for the Selection of Line Post Spacing and Size" unless specified to exceed those guidelines.
- b. FS RR-F-191/3 line posts; Class 1, steel pipe, Grade A. End, corner, and pull posts; Class 1, steel pipe, Grade A.

2.2.2 Accessories

- a. Provide accessories conforming to ASTM F 626. Ferrous accessories shall be zinc coated.
- b. Furnish truss rods for each terminal post. Provide truss rods with turnbuckles or other equivalent provisions for adjustment.
- c. Provide Barbed wire supporting arms of the 45 degree outward angle 3-strand arm type and of the design required for the post furnished. Secure arms by top tension wire.
- d. Furnish post caps in accordance with manufacturer's standard accessories.
- e. Provide 9 gauge steel tie wire for attaching fabric to rails, braces, and posts and match the coating of the fence fabric. Miscellaneous hardware coatings shall conform to ASTM A 153/A 153M unless modified.

2.3 BRACES AND RAILS

- a. ASTM F 1083, zinc-coated, Group IA, steel pipe, size NPS 1-1/4. Group IC steel pipe, zinc-coated, shall meet the strength and coating requirements of ASTM F 1043.
- b. Braces, top rail; Class 1, steel pipe, Grade A, size as indicated.

2.4 WIRE

2.4.1 Wire Ties

FS RR-F-191/4. Provide wire ties constructed of the same material as the fencing fabric.

2.4.2 Barbed Wire

Provide barbed wire conforming to ASTM A 121 zinc-coated, Type Z, Class 3,

with 12.5 gauge wire with 14 gauge, round, 4-point barbs spaced no more than 5 inches apart.

2.4.3 Tension Wire

Provide Type I or Type II tension wire, Class 4 coating, in accordance with ASTM A 824.

2.5 CONCRETE

ASTM C 94/C 94M, using 3/4 inch maximum size aggregate, and having minimum compressive strength of 3000 psi at 28 days. Grout shall consist of one part portland cement to three parts clean, well-graded sand and the minimum amount of water to produce a workable mix.

2.6 GATES

2.6.1 Gate Assembly

Provide gate assembly conforming to ASTM F 900 and/or ASTM F 1184 of the type and swing shown. Provide gate frames conforming to strength and coating requirements of ASTM F 1083 for Group IA, steel pipe, with external coating Type A, nominal pipe size (NPS) 1-1/2. Provide gate frames conforming to strength and coating requirements of ASTM F 1043, for Group IC, steel pipe with external coating Type A or Type B, nominal pipe size (NPS) 1-1/2. Gate fabric shall be as specified for chain link fabric.

2.6.2 Gate Leaves

For gate leaves, more than 8 feet wide, provide either intermediate members and diagonal truss rods or tubular members as necessary to provide rigid construction, free from sag or twist. Gate leaves less than 8 feet wide shall have truss rods or intermediate braces. Provide intermediate braces on all gate frames with an electro-mechanical lock. Attach fabric to the gate frame by method standard with the manufacturer except that welding will not be permitted.

2.6.3 Gate Hardware and Accessories

Furnish and install latches, hinges, stops, keepers, rollers, and other hardware items as required for the operation of the gate. Arrange latches for padlocking so that the padlock will be accessible from both sides of the gate. Provide stops for holding the gates in the open position. For high security applications, each end member of gate frames shall be extended sufficiently above the top member to carry three strands of barbed wire in horizontal alignment with barbed wire strands on the fence.

PART 3 EXECUTION

3.1 FENCE INSTALLATION

Perform complete installation conforming to ASTM F 567.

3.1.1 Line and Grade

Install fence to the lines and grades indicated. Clear the area on either side of the fence line to the extent indicated. Space line posts equidistant at intervals not exceeding 10 feet. Terminal (corner, gate, and pull) posts shall be set at abrupt changes in vertical and horizontal

alignment. Provide fabric continuous between terminal posts; however, runs between terminal posts shall not exceed 500 feet. Repair any damage to galvanized surfaces, including welding, with paint containing zinc dust in accordance with ASTM A 780/A 780M.

3.1.2 Excavation

Clear all post holes of loose material. Spread waste material where directed. Eliminate ground surface irregularities along the fence line to the extent necessary to maintain a 1 inch clearance between the bottom of the fabric and finish grade.

3.2 POST INSTALLATION

3.2.1 Earth and Bedrock

a. Set posts plumb and in alignment. Set post to the depths indicated. Posts set in concrete shall be set in holes not less than the diameter shown on the drawings. Thoroughly consolidate concrete and grout around each post, free of voids and finished to form a dome. Allow concrete and grout to cure for 72 hours prior to attachment of any item to the posts.

Test fence post rigidity by applying a 50 pound force on the post, perpendicular to the fabric, at 5 feet above ground. Post movement measured at the point where the force is applied shall be less than or equal to 3/4 inch from the relaxed position. Test every tenth post for rigidity. When a post fails this test, make further tests on the next four posts on either side of the failed post. All failed posts shall be removed, replaced, and retested at the Contractor's expense.

3.3 FABRIC INSTALLATION

a. Install chain link fabric on the side of the post indicated. Attach fabric to terminal posts with stretcher bars and tension bands. Space bands at approximately 15 inch intervals. Install fabric and pull taut to provide a smooth and uniform appearance free from sag, without permanently distorting the fabric diamond or reducing the fabric height. Fasten fabric to line posts at approximately 15 inch intervals and fastened to all rails and tension wires at approximately 24 inch intervals.

b. Cut fabric by untwisting and removing pickets. Accomplish splicing by weaving a single picket into the ends of the rolls to be joined. The bottom of the installed fabric shall be 2 plus or minus 1/2 inch above the ground.

c. After the fabric installation is complete, exercise the fabric by applying a 50 pound push-pull force at the center of the fabric between posts; the use of a 30 pound pull at the center of the panel shall cause fabric deflection of not more than 2.5 inches when pulling fabric from the post side of the fence; every second fence panel shall meet this requirement; resecure and retest all failed panels at the Contractor's expense.

3.4 SUPPORTING ARMS

Install barbed wire supporting arms and barbed wire as indicated on the drawings and as recommended by the manufacturer. Anchor supporting arms to

the posts in a manner to prevent easy removal with hand tools. Pull barbed wire taut and attach to the arms with clips or other means that will prevent easy removal.

3.5 GATE INSTALLATION

a. Install gates at the locations shown. Mount gates to swing as indicated. Install latches, stops, and keepers as required. Install Slide gates as recommended by the manufacturer.

3.6 GROUNDING

a. Ground fencing as indicated on drawings.

b. Ground fences crossed by overhead powerlines in excess of 600 volts.

c. Ground fences on each side of all gates, at each corner, at the closest approach to each building located within 50 feet of the fence, and where the fence alignment changes more than 15 degrees. Grounding locations shall not exceed 650 feet. Bond each gate panel with a flexible bond strap to its gate post. Ground fences crossed by powerlines of 600 volts or more at or near the point of crossing and at distances not exceeding 150 feet on each side of crossing.

d. Provide ground conductor consisting of No. 8 AWG solid copper wire. Grounding electrodes shall be 3/4 inch by 10 foot long copper-clad steel rod. Drive electrodes into the earth so that the top of the electrode is at least 6 inches below the grade. Where driving is impracticable, electrodes shall be buried a minimum of 12 inches deep and radially from the fence. The top of the electrode shall not be less than 2 feet or more than 8 feet from the fence. Clamp ground conductor to the fence and electrodes with bronze grounding clamps to create electrical continuity between fence posts, fence fabric, and ground rods. Total resistance of the fence to ground shall not be greater than 25 ohms.

3.7 CLEANUP

Remove waste fencing materials and other debris from the work site each workday.

-- End of Section --

SECTION 33 11 00

WATER DISTRIBUTION

04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA B300	(2010; Addenda 2011) Hypochlorites
AWWA B301	(2010) Liquid Chlorine
AWWA C105	(2005) Polyethylene Encasement for Ductile-Iron Pipe Systems
AWWA C111	(2000) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C500	(2002; A C500a-95) Metal-Seated Gate Valves for Water Supply Service
AWWA C600	(2005) Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C651	(2005; Errata 2005) Standard for Disinfecting Water Mains
AWWA C800	(2005) Underground Service Line Valves and Fittings
AWWA M11	(2004) Manual: Steel Pipe: A Guide for Design and Installation
AWWA M23	(2002) Manual: PVC Pipe - Design and Installation

ASME INTERNATIONAL (ASME)

ASME B16.26	(2011) Standard for Cast Copper Alloy Fittings for Flared Copper Tubes
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ASTM INTERNATIONAL (ASTM)

ASTM B 61	(2002) Steam or Valve Bronze Castings
ASTM B 62	(2002) Composition Bronze or Ounce Metal Castings
ASTM C 94/C 94M	(2009) Standard Specification for

Ready-Mixed Concrete

- ASTM D 1785 (2005) Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
- ASTM D 2241 (2005) Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
- ASTM D 2464 (1999e1) Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
- ASTM D 2466 (2005) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
- ASTM D 2467 (2005) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
- ASTM D 2564 (2004; R 2009e1) Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
- ASTM D 2774 (2004) Underground Installation of Thermoplastic Pressure Piping
- ASTM D 2855 (1996; R 2010) Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
- ASTM F 402 (1993; R 1999) Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

- MSS SP-80 (2008) Bronze Gate, Globe, Angle and Check Valves

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 24 (2010) Standard for the Installation of Private Fire Service Mains and Their Appurtenances
- NFPA 325-1 (1994) Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids
- NFPA 49 (3003) Hazardous Chemicals Data
- NFPA 704 (2001) Identification of the Hazards of Materials for Emergency Response

UNDERWRITERS LABORATORIES (UL)

- UL 262 (2004; Reprint Oct 2011) Gate Valves for Fire-Protection Service

UNI-BELL PVC PIPE ASSOCIATION (UBPPA)

UBPPA UNI-B-3 (1992) Recommended Practice for the Installation of Polyvinyl Chloride (PVC) Pressure Pipe (Nominal Diameters 4-36 Inch)

UBPPA UNI-B-8 (2000) Recommended Practice for the Direct Tapping of Polyvinyl Chloride (PVC) Pressure Water Pipe (Nominal Diameters 6-12 Inch)

1.2 DESIGN REQUIREMENTS

1.2.1 Water Service Lines

Provide water service lines indicated as less than 4 inch lines from water distribution main to building service at the points indicated. Water service lines shall be polyvinyl chloride (PVC) plastic pipe. Provide water service line appurtenances as specified and where indicated.

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Piping Materials

Water service line piping, fittings, joints, valves, and coupling

Corporation stops

Valve boxes

Submit manufacturer's standard drawings or catalog cuts. Include information concerning gaskets with submittal for joints and couplings.

SD-06 Test Reports

Bacteriological Disinfection

Test results from commercial laboratory verifying disinfection

SD-07 Certificates

Water distribution main piping, fittings, joints, valves, and coupling

Water service line piping, fittings, joints, valves, and coupling

Shop-applied lining and coating

Lining

Fire hydrants

SD-08 Manufacturer's Instructions

Installation procedures for water piping

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery and Storage

Inspect materials delivered to site for damage. Unload and store with minimum handling. Store materials on site in enclosures or under protective covering. Store plastic piping, jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes, fittings, and valves free of dirt and debris.

1.4.2 Handling

Handle pipe, fittings, valves, hydrants, and other accessories in a manner to ensure delivery to the trench in sound undamaged condition. Take special care to avoid injury to coatings and linings on pipe and fittings; make repairs if coatings or linings are damaged. Do not place any other material or pipe inside a pipe or fitting after the coating has been applied. Carry, do not drag pipe to the trench. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material without additional expense to the Government. Store rubber gaskets that are not to be installed immediately, under cover out of direct sunlight.

1.4.2.1 Miscellaneous Plastic Pipe and Fittings

Handle Polyvinyl Chloride (PVC), pipe and fittings in accordance with the manufacturer's recommendations. Store plastic piping and jointing materials that are not to be installed immediately under cover out of direct sunlight.

Storage facilities shall be classified and marked in accordance with [NFPA 704](#), with classification as indicated in [NFPA 49](#) and [NFPA 325-1](#).

PART 2 PRODUCTS

2.1 WATER SERVICE LINE MATERIALS

2.1.1 Piping Materials

2.1.1.1 Plastic Piping

Plastic pipe and fittings shall bear the seal of the National Sanitation Foundation (NSF) for potable water service. Plastic pipe and fittings shall be supplied from the same manufacturer.

- a. Polyvinyl Chloride (PVC) Plastic Piping with Screw Joints:
[ASTM D 1785](#), Schedule 40; or [ASTM D 2241](#), with SDR as necessary to provide 150 psi minimum pressure rating. Fittings, [ASTM D 2466](#) or [ASTM D 2467](#). Pipe and fittings shall be of the same PVC plastic material and shall be one of the following pipe/fitting

combinations, as marked on the pipe and fitting, respectively: PVC 1120/PVC I; PVC 1220/PVC 12; PVC 2120/PVC II; PVC 2116/PVC II. Solvent cement for jointing, [ASTM D 2564](#). Pipe couplings, when used shall be tested as required by [ASTM D 2464](#).

- b. Polyvinyl Chloride (PVC) Plastic Piping with Elastomeric-Gasket Joints:

Pipe shall conform to dimensional requirements of [ASTM D 1785](#) Schedule 40, with joints meeting the requirements of 150 psi working pressure, 200 psi hydrostatic test pressure, unless otherwise shown or specified.

- c. Polyvinyl Chloride (PVC) Plastic Piping with Solvent Cement Joints:

Pipe shall conform to dimensional requirements of [ASTM D 1785](#) or [ASTM D 2241](#) with joints meeting the requirements of 150 psi working pressure and 200 psi hydrostatic test pressure.

2.1.1.2 Insulating Joints

Joints between pipe of dissimilar metals shall have a rubber-gasketed or other suitable approved type of insulating joint or dielectric coupling which will effectively prevent metal-to-metal contact between adjacent sections of piping.

2.1.2 Water Service Line Appurtenances

2.1.2.1 Corporation Stops

Ground key type; bronze, [ASTM B 61](#) or [ASTM B 62](#); and suitable for the working pressure of the system. Ends shall be suitable for solder-joint, or flared tube compression type joint. Threaded ends for inlet and outlet of corporation stops, [AWWA C800](#); coupling nut for connection to flared copper tubing, [ASME B16.26](#).

2.1.2.2 Curb or Service Stops

Ground key, round way, inverted key type; made of bronze, [ASTM B 61](#) or [ASTM B 62](#); and suitable for the working pressure of the system. Ends shall be as appropriate for connection to the service piping. Arrow shall be cast into body of the curb or service stop indicating direction of flow.

2.1.2.3 Service Clamps

Service clamps used for repairing damaged cast-iron, steel, PVC or asbestos-cement pipe shall have a pressure rating not less than that of the pipe to be connected and shall be either the single or double flattened strap type. Clamps shall have a galvanized malleable-iron body with cadmium plated straps and nuts. Clamps shall have a rubber gasket cemented to the body.

2.1.2.4 Goosenecks

Type K copper tubing. Joint ends for goosenecks shall be appropriate for connecting to corporation stop and service line. Length of goosenecks shall be in accordance with standard practice.

2.1.2.5 Dielectric Fittings

Dielectric fittings shall be installed between threaded ferrous and nonferrous metallic pipe, fittings and valves, except where corporation stops join mains. Dielectric fittings shall prevent metal-to-metal contact of dissimilar metallic piping elements and shall be suitable for the required working pressure.

2.1.2.6 Check Valves

Check valves shall be designed for a minimum working pressure of 150 psi or as indicated. Valves shall have a clear waterway equal to the full nominal diameter of the valve. Valves shall open to permit flow when inlet pressure is greater than the discharge pressure, and shall close tightly to prevent return flow when discharge pressure exceeds inlet pressure. The size of the valve, working pressure, manufacturer's name, initials, or trademark shall be cast on the body of each valve. Valves 2 inches and larger shall be outside lever and spring type.

- a. Valves 2 inches and smaller shall be all bronze designed for screwed fittings, and shall conform to MSS SP-80, Class 150, Types 3 and 4 as suitable for the application.

2.1.2.7 Gate Valves 3 Inch Size and Larger on Buried Piping

Gate valves 3 inch size and larger on buried piping AWWA C500 or UL 262 and of one manufacturer. Valves, AWWA C500, nonrising stem type with double-disc gates. Valves, UL 262, inside-screw type with operating nut, split wedge or double disc type gate, and designed for a hydraulic working pressure of 175 psi. Materials for UL 262 valves conforming to the reference standards specified in AWWA C500. Valves shall open by counterclockwise rotation of the valve stem. Stuffing boxes shall have O-ring stem seals and shall be bolted and constructed so as to permit easy removal of parts for repair. Valves shall have ends suitable for joining to the pipe used.

2.1.2.8 Gate Valves Smaller than 3 Inch in Size on Buried Piping

Gate valves smaller than 3 inch size on Buried Piping MSS SP-80, Class 150, solid wedge, nonrising stem. Valves shall have flanged or threaded end connections, with a union on one side of the valve. Provide handwheel operators.

2.1.2.9 Curb Boxes

Provide a curb box for each curb or service stop. Curb boxes shall be of cast iron of a size suitable for the stop on which it is to be used. Provide a round head. Cast the word "WATER" on the lid. Each box shall have a heavy coat of bituminous paint.

2.1.2.10 Valve Boxes

Provide a valve box for each gate valve on buried piping. Valve boxes shall be of cast iron of a size suitable for the valve on which it is to be used and shall be adjustable. Provide a round head. Cast the word "WATER" on the lid. The least diameter of the shaft of the box shall be 5 1/4 inches. Cast-iron box shall have a heavy coat of bituminous paint.

2.1.2.11 Tapping Sleeves

Tapping sleeves of the sizes indicated for connection to existing main shall be the cast gray, ductile, or malleable iron, split-sleeve type with flanged or grooved outlet, and with bolts, follower rings and gaskets on each end of the sleeve. Construction shall be suitable for a maximum working pressure of 150 psi. Bolts shall have square heads and hexagonal nuts. Longitudinal gaskets and mechanical joints with gaskets shall be as recommended by the manufacturer of the sleeve. When using grooved mechanical tee, it shall consist of an upper housing with full locating collar for rigid positioning which engages a machine-cut hole in pipe, encasing an elastomeric gasket which conforms to the pipe outside diameter around the hole and a lower housing with positioning lugs, secured together during assembly by nuts and bolts as specified, pretorqued to 50 foot-pound.

2.1.2.12 Disinfection

Chlorinating materials shall conform to the following:

Chlorine, Liquid: AWWA B301.

Hypochlorite, Calcium and Sodium: AWWA B300.

PART 3 EXECUTION

3.1 INSTALLATION OF PIPELINES

3.1.1 General Requirements for Installation of Pipelines

These requirements shall apply to all pipeline installation except where specific exception is made in the "Special Requirements..." paragraphs.

3.1.1.1 Location of Water Lines

Terminate the work covered by this section at a point approximately 5 feet from the building, unless otherwise indicated. Do not lay water lines in the same trench with gas lines, fuel lines or electric wiring.

a. Water Piping Installation Parallel With Sewer Piping

(1) Normal Conditions: Lay water piping at least 10 feet horizontally from a sewer or sewer manhole whenever possible. Measure the distance edge-to-edge.

(2) Unusual Conditions: When local conditions prevent a horizontal separation of 10 feet, the water piping may be laid closer to a sewer or sewer manhole provided that:

(a) The bottom (invert) of the water piping shall be at least 18 inches above the top (crown) of the sewer piping.

(b) Where this vertical separation cannot be obtained, the sewer piping shall be constructed of AWWA-approved water pipe and pressure tested in place without leakage prior to backfilling. Approved waste water disposal method shall be utilized.

(c) The sewer manhole shall be of watertight construction and tested in place.

b. Installation of Water Piping Crossing Sewer Piping

(1) Normal Conditions: Water piping crossing above sewer piping shall be laid to provide a separation of at least 18 inches between the bottom of the water piping and the top of the sewer piping.

(2) Unusual Conditions: When local conditions prevent a vertical separation described above, use the following construction:

(a) Sewer piping passing over or under water piping shall be constructed of AWWA-approved ductile iron water piping, pressure tested in place without leakage prior to backfilling.

(b) Water piping passing under sewer piping shall, in addition, be protected by providing a vertical separation of at least 18 inches between the bottom of the sewer piping and the top of the water piping; adequate structural support for the sewer piping to prevent excessive deflection of the joints and the settling on and breaking of the water piping; and that the length, minimum 20 feet, of the water piping be centered at the point of the crossing so that joints shall be equidistant and as far as possible from the sewer piping.

c. Sewer Piping or Sewer Manholes: No water piping shall pass through or come in contact with any part of a sewer manhole.

3.1.1.2 Earthwork

Perform earthwork operations in accordance with Section 31 23 00.00 20, EXCAVATION AND FILL.

3.1.1.3 Pipe Laying and Jointing

Remove fins and burrs from pipe and fittings. Before placing in position, clean pipe, fittings, valves, and accessories, and maintain in a clean condition. Provide proper facilities for lowering sections of pipe into trenches. Do not under any circumstances drop or dump pipe, fittings, valves, or any other water line material into trenches. Cut pipe in a neat workmanlike manner accurately to length established at the site and work into place without springing or forcing. Replace by one of the proper length any pipe or fitting that does not allow sufficient space for proper installation of jointing material. Blocking or wedging between bells and spigots will not be permitted. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying. Grade the pipeline in straight lines; avoid the formation of dips and low points. Support pipe at proper elevation and grade. Secure firm, uniform support. Wood support blocking will not be permitted. Lay pipe so that the full length of each section of pipe and each fitting will rest solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings. Provide anchors and supports where indicated and where necessary for fastening work into place. Make proper provision for expansion and contraction of pipelines. Keep trenches free of water until joints have been properly made. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Do not lay pipe when conditions of trench or weather prevent installation. Depth of cover over top of pipe shall not be less than 2 1/2 feet.

3.1.1.4 Installation of Tracer Wire

Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe. Attach wire to top of pipe in such manner that it will not be displaced during construction operations.

3.1.1.5 Connections to Existing Water Lines

Make connections to existing water lines after approval is obtained and with a minimum interruption of service on the existing line. Make connections to existing lines under pressure in accordance with the recommended procedures of the manufacturer of the pipe being tapped.

3.1.2 Special Requirements for Installation of Water Mains

3.1.2.1 Installation of Ductile-Iron Piping

Unless otherwise specified, install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" and with the requirements of [AWWA C600](#) for pipe installation, joint assembly, valve-and-fitting installation, and thrust restraint.

- a. **Jointing:** Make push-on joints with the gaskets and lubricant specified for this type joint; assemble in accordance with the applicable requirements of [AWWA C600](#) for joint assembly. Make mechanical joints with the gaskets, glands, bolts, and nuts specified for this type joint; assemble in accordance with the applicable requirements of [AWWA C600](#) for joint assembly and the recommendations of Appendix A to [AWWA C111](#). Make flanged joints with the gaskets, bolts, and nuts specified for this type joint. Make flanged joints up tight; avoid undue strain on flanges, fittings, valves, and other accessories. Align bolt holes for each flanged joint. Use full size bolts for the bolt holes; use of undersized bolts to make up for misalignment of bolt holes or for any other purpose will not be permitted. Do not allow adjoining flange faces to be out of parallel to such degree that the flanged joint cannot be made watertight without overstraining the flange. When flanged pipe or fitting has dimensions that do not allow the making of a proper flanged joint as specified, replace it by one of proper dimensions. Use setscrewed flanges to make flanged joints where conditions prevent the use of full-length flanged pipe and assemble in accordance with the recommendations of the setscrewed flange manufacturer. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer.
- b. **Allowable Deflection:** The maximum allowable deflection shall be as given in [AWWA C600](#). If the alignment requires deflection in excess of the above limitations, special bends or a sufficient number of shorter lengths of pipe shall be furnished to provide angular deflections within the limit set forth.
- c. **Pipe Anchorage:** Provide concrete thrust blocks (reaction backing) for pipe anchorage. Thrust blocks shall be in accordance with the requirements of [AWWA C600](#) for thrust restraint, except that size and positioning of thrust blocks shall be as indicated. Use concrete, [ASTM C 94/C 94M](#), having a minimum compressive strength of **2,500 psi** at 28 days; or use concrete of a mix not leaner than one part cement, 2 1/2 parts sand, and 5 parts gravel, having the

same minimum compressive strength.

- d. Exterior Protection: Completely encase buried ductile iron pipelines with polyethylene tube or sheet, using Class A polyethylene film, in accordance with [AWWA C105](#).

3.1.3 Installation of Water Service Piping

3.1.3.1 Location

Connect water service piping to the building service where the building service has been installed. Where building service has not been installed, terminate water service lines approximately **5 feet** from the building line at the points indicated; such water service lines shall be closed with plugs or caps.

3.1.3.2 Service Line Connections to Water Mains

Connect service lines **2 inch** size to the main as indicated. Connect service lines to ductile-iron water mains in accordance with [AWWA C600](#) for service taps. Connect service lines to PVC plastic water mains in accordance with [UBPPA UNI-B-8](#) and the recommendations of [AWWA M23](#), Chapter 9, "Service Connections." Connect service lines to steel water mains in accordance with the recommendations of the steel water main pipe manufacturer and with the recommendations for special and valve connections and other appurtenances in [AWWA M11](#), Chapter 13, "Supplementary Design Data and Details."

3.1.4 Special Requirements for Installation of Water Service Piping

3.1.4.1 Installation of Plastic Piping

Install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" and with the applicable requirements of [ASTM D 2774](#) and [ASTM D 2855](#), unless otherwise specified. Handle solvent cements used to join plastic piping in accordance with [ASTM F 402](#).

- a. Jointing: Make solvent-cemented joints for PVC plastic piping using the solvent cement previously specified for this material; assemble joints in accordance with [ASTM D 2855](#). Make plastic pipe joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.
- b. Plastic Pipe Connections to Appurtenances: Connect plastic pipe service lines to corporation stops and gate valves in accordance with the recommendations of the plastic pipe manufacturer.

3.1.4.2 Service Lines for Sprinkler Supplies

Water service lines used to supply building sprinkler systems for fire protection shall be connected to the water distribution main in accordance with [NFPA 24](#).

3.1.5 Disinfection

Prior to disinfection, obtain Contracting Officer approval of the proposed method for disposal of waste water from disinfection procedures. Disinfect new water piping and existing water piping affected by Contractor's

operations in accordance with [AWWA C651](#). Fill piping systems with solution containing minimum of 50 parts per million of available chlorine and allow solution to stand for minimum of 24 hours. Flush solution from the systems with domestic water until maximum residual chlorine content is within the range of 0.2 and 0.5 parts per million, or the residual chlorine content of domestic water supply. Obtain at least two consecutive satisfactory bacteriological samples from new water piping, analyze by a certified laboratory, and submit the results prior to the new water piping being placed into service. Disinfection of systems supplying nonpotable water is not required.

3.2 FIELD QUALITY CONTROL

3.2.1 Field Tests and Inspections

Prior to hydrostatic testing, obtain Contracting Officer approval of the proposed method for disposal of waste water from hydrostatic testing. The Contracting Officer will conduct field inspections and witness field tests specified in this section. The Contractor shall perform field tests, and provide labor, equipment, and incidentals required for testing. The Contractor shall produce evidence, when required, that any item of work has been constructed in accordance with the drawings and specifications. Do not begin testing on any section of a pipeline where concrete thrust blocks have been provided until at least 5 days after placing of the concrete.

3.2.2 Testing Procedure

Test water mains and water service lines in accordance with the applicable specified standard, except for the special testing requirements given in paragraph entitled "Special Testing Requirements." Test ductile-iron water mains and water service lines in accordance with the requirements of [AWWA C600](#) for hydrostatic testing. The amount of leakage on ductile-iron pipelines with mechanical-joints or push-on joints shall not exceed the amounts given in [AWWA C600](#); no leakage will be allowed at joints made by any other method. Test PVC plastic water mains and water service lines made with PVC plastic water main pipe in accordance with the requirements of [UBPPA UNI-B-3](#) for pressure and leakage tests. The amount of leakage on pipelines made of PVC plastic water main pipe shall not exceed the amounts given in [UBPPA UNI-B-3](#), except that at joints made with sleeve-type mechanical couplings, no leakage will be allowed. Test water service lines in accordance with applicable requirements of [AWWA C600](#) for hydrostatic testing. No leakage will be allowed at plastic pipe joints or flanged joints.

3.2.3 Special Testing Requirements

For pressure test, use a hydrostatic pressure [50 psi](#) greater than the maximum working pressure of the system, except that for those portions of the system having pipe size larger than [2 inches](#) in diameter, hydrostatic test pressure shall be not less than [200 psi](#). Hold this pressure for not less than 2 hours. Prior to the pressure test, fill that portion of the pipeline being tested with water for a soaking period of not less than 24 hours. For leakage test, use a hydrostatic pressure not less than the maximum working pressure of the system. Leakage test may be performed at the same time and at the same test pressure as the pressure test.

3.3 CLEANUP

Upon completion of the installation of water lines, and appurtenances, all

debris and surplus materials resulting from the work shall be removed.

-- End of Section --

SECTION 33 30 00

SANITARY SEWERS

04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C 150	(2007) Standard Specification for Portland Cement
ASTM C 270	(2008a) Standard Specification for Mortar for Unit Masonry
ASTM C 94/C 94M	(2009) Standard Specification for Ready-Mixed Concrete
ASTM C 969	(2002; R 2009) Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
ASTM D 2321	(2005) Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D 2680	(2001) Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping
ASTM D 2751	(2005) Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings
ASTM D 3034	(2004a) Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 3212	(2007) Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM F 477	(2010) Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F 949	(2003) Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings

UNI-BELL PVC PIPE ASSOCIATION (UBPPA)

UBPPA UNI-B-6

(1998) Recommended Practice for
Low-Pressure Air Testing of Installed
Sewer Pipe

1.2 SYSTEM DESCRIPTION

1.2.1 Sanitary Sewer Gravity Pipeline

Provide mains and laterals polyvinyl chloride (PVC) plastic pipe. Provide building connections polyvinyl chloride (PVC) plastic pipe. Provide new and modify existing exterior sanitary gravity sewer piping and appurtenances. Provide each system complete and ready for operation. The exterior sanitary gravity sewer system includes equipment, materials, installation, and workmanship as specified herein more than 5 feet outside of building walls.

1.3 GENERAL REQUIREMENTS

The construction required herein shall include appurtenant structures and building sewers to points of connection with the building drains 5 feet outside the building to which the sewer system is to be connected. The Contractor shall replace damaged material and redo unacceptable work at no additional cost to the Government. Backfilling shall be accomplished after inspection by the Contracting Officer. Before, during, and after installation, plastic pipe and fittings shall be protected from any environment that would result in damage or deterioration to the material. The Contractor shall have a copy of the manufacturer's instructions available at the construction site at all times and shall follow these instructions unless directed otherwise by the Contracting Officer. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install the plastic pipe shall be stored in accordance with the manufacturer's recommendation and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.

1.4 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00
SUBMITTAL PROCEDURES:

SD-03 Product Data

Pipeline materials

Submit manufacturer's standard drawings or catalog cuts.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery and Storage

1.5.1.1 Piping

Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.

1.5.1.2 Metal Items

Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

1.5.1.3 Cement, Aggregate, and Reinforcement

As specified in Section 03 30 50 CAST-IN-PLACE CONCRETE.

1.5.2 Handling

Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. Carry, do not drag, pipe to trench.

1.6 EXISTING CONDITIONS

Submit drawings of existing conditions, after a thorough inspection of the area by the Contractor in the presence of the Contracting Officer. Details shall include the environmental conditions of the site and adjacent areas. Submit copies of the records for verification before starting work.

1.7 INSTALLER QUALIFICATIONS

Install specified materials by a licensed underground utility Contractor licensed for such work in the state where the work is to be performed. Installing Contractor's License shall be current and be state certified or state registered.

PART 2 PRODUCTS

2.1 PIPELINE MATERIALS

Pipe shall conform to the respective specifications and other requirements specified below.

2.1.1 PVC Plastic Gravity Sewer Piping

2.1.1.1 PVC Plastic Gravity Pipe and Fittings

ASTM D 3034, SDR 35, or ASTM F 949 with ends suitable for elastomeric gasket joints.

2.1.1.2 PVC Plastic Gravity Joints and Jointing Material

Joints shall conform to ASTM D 3212. Gaskets shall conform to ASTM F 477.

2.2 CONCRETE MATERIALS

2.2.1 Cement Mortar

Cement mortar shall conform to ASTM C 270, Type M with Type II cement.

2.2.2 Portland Cement

Portland cement shall conform to ASTM C 150, Type II for concrete used in

concrete pipe, concrete pipe fittings, and manholes and type optional with the Contractor for cement used in concrete cradle, concrete encasement, and thrust blocking.

2.2.3 Portland Cement Concrete

Portland cement concrete shall conform to **ASTM C 94/C 94M**, compressive strength of **4000 psi** at 28 days, except for concrete cradle and encasement or concrete blocks for manholes. Concrete used for cradle and encasement shall have a compressive strength of **2500 psi** minimum at 28 days. Concrete in place shall be protected from freezing and moisture loss for 7 days.

PART 3 EXECUTION

3.1 INSTALLATION OF PIPELINES AND APPURTENANT CONSTRUCTION

3.1.1 General Requirements for Installation of Pipelines

These general requirements apply except where specific exception is made in the following paragraphs entitled "Special Requirements."

3.1.1.1 Location

a. Sanitary piping installation parallel with water line:

(1) Normal conditions: Sanitary piping or manholes shall be laid at least **10 feet** horizontally from a water line whenever possible. The distance shall be measured edge-to-edge.

(2) Unusual conditions: When local conditions prevent a horizontal separation of **10 feet**, the sanitary piping or manhole may be laid closer to a water line provided that:

(a) The top (crown) of the sanitary piping shall be at least **18 inches** below the bottom (invert) of the water main.

(b) Where this vertical separation cannot be obtained, the sanitary piping shall be constructed of AWWA-approved ductile iron water pipe pressure tested in place without leakage prior to backfilling.

(c) The sewer manhole shall be of watertight construction and tested in place.

b. Installation of sanitary piping crossing a water line:

(1) Normal conditions: Lay sanitary sewer piping by crossing under water lines to provide a separation of at least **18 inches** between the top of the sanitary piping and the bottom of the water line whenever possible.

(2) Unusual conditions: When local conditions prevent a vertical separation described above, use the following construction:

(a) Sanitary piping passing over or under water lines shall be constructed of AWWA-approved ductile iron water pipe, pressure tested in place without leakage prior to backfilling.

(b) Sanitary piping passing over water lines shall, in addition,

be protected by providing:

1. A vertical separation of at least 18 inches between the bottom of the sanitary piping and the top of the water line.
2. Adequate structural support for the sanitary piping to prevent excessive deflection of the joints and the settling on and breaking of the water line.
3. That the length, minimum 20 feet, of the sanitary piping be centered at the point of the crossing so that joints shall be equidistant and as far as possible from the water line.

- c. Sanitary sewer manholes: No water piping shall pass through or come in contact with any part of a sanitary sewer manhole.

3.1.1.2 Earthwork

Perform earthwork operations in accordance with Section 31 23 00.00 20, EXCAVATION AND FILL.

3.1.1.3 Pipe Laying and Jointing

Inspect each pipe and fitting before and after installation; replace those found defective and remove from site. Provide proper facilities for lowering sections of pipe into trenches. Lay nonpressure pipe with the bell ends in the upgrade direction. Adjust spigots in bells to give a uniform space all around. Blocking or wedging between bells and spigots will not be permitted. Replace by one of the proper dimensions, pipe or fittings that do not allow sufficient space for installation of joint material. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Provide batterboards not more than 25 feet apart in trenches for checking and ensuring that pipe invert elevations are as indicated. Laser beam method may be used in lieu of batterboards for the same purpose. Branch connections shall be made by use of regular fittings or solvent cemented saddles as approved. Saddles for ABS and PVC composite pipe shall conform to Figure 2 of ASTM D 2680; saddles for ABS pipe shall comply with Table 3 of ASTM D 2751; and saddles for PVC pipe shall conform to Table 4 of ASTM D 3034.

3.1.1.4 Connections to Existing Lines

Obtain approval from the Contracting Officer before making connection to existing line. Conduct work so that there is minimum interruption of service on existing line.

3.1.2 Special Requirements

3.1.2.1 Installation of PVC Plastic Piping

Install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" of this section and with the requirements of ASTM D 2321 for laying and joining pipe and fittings. Make joints with the gaskets specified for joints with this piping and assemble in accordance with the requirements of ASTM D 2321 for assembly of joints. Make joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.

3.1.3 Concrete Work

Cast-in-place concrete is included in Section 03 30 50 CAST-IN-PLACE CONCRETE.

3.1.4 Miscellaneous Construction and Installation

3.1.4.1 Connecting to Existing Manholes

Pipe connections to existing manholes shall be made so that finish work will conform as nearly as practicable to the applicable requirements specified for new manholes, including all necessary concrete work, cutting, and shaping. The connection shall be centered on the manhole. Holes for the new pipe shall be of sufficient diameter to allow packing cement mortar around the entire periphery of the pipe but no larger than 1.5 times the diameter of the pipe. Cutting the manhole shall be done in a manner that will cause the least damage to the walls.

3.1.4.2 Metal Work

- a. Workmanship and finish: Perform metal work so that workmanship and finish will be equal to the best practice in modern structural shops and foundries. Form iron to shape and size with sharp lines and angles. Do shearing and punching so that clean true lines and surfaces are produced. Make castings sound and free from warp, cold shuts, and blow holes that may impair their strength or appearance. Give exposed surfaces a smooth finish with sharp well-defined lines and arises. Provide necessary rabbets, lugs, and brackets wherever necessary for fitting and support.
- b. Field painting: After installation, clean cast-iron frames, covers, gratings, and steps not buried in concrete to bare metal of mortar, rust, grease, dirt, and other deleterious materials and apply a coat of bituminous paint. Do not paint surfaces subject to abrasion.

3.1.5 Installations of Wye Branches

Cutting into piping for connections shall not be done except in special approved cases. When the connecting pipe cannot be adequately supported on undisturbed earth or tamped backfill, the pipe shall be encased in concrete backfill or supported on a concrete cradle as directed. Concrete required because of conditions resulting from faulty construction methods or negligence by the Contractor shall be installed at no additional cost to the Government. The installation of wye branches in an existing sewer shall be made by a method which does not damage the integrity of the existing sewer. One acceptable method consists of removing one pipe section, breaking off the upper half of the bell of the next lower section and half of the running bell of wye section. After placing the new section, it shall be rotated so that the broken half of the bell will be at the bottom. The two joints shall then be made with joint packing and cement mortar.

3.2 FIELD QUALITY CONTROL

3.2.1 Field Tests and Inspections

The Contracting Officer will conduct field inspections and witness field tests specified in this section. The Contractor shall perform field tests

and provide labor, equipment, and incidentals required for testing. Be able to produce evidence, when required, that each item of work has been constructed in accordance with the drawings and specifications.

3.2.2 Tests for Nonpressure Lines

Check each straight run of pipeline for gross deficiencies by holding a light in a manhole; it shall show a practically full circle of light through the pipeline when viewed from the adjoining end of line. When pressure piping is used in a nonpressure line for nonpressure use, test this piping as specified for nonpressure pipe.

3.2.2.1 Leakage Tests

Test lines for leakage by either infiltration tests or exfiltration tests, or by low-pressure air tests. Prior to testing for leakage, backfill trench up to at least lower half of pipe. When necessary to prevent pipeline movement during testing, place additional backfill around pipe sufficient to prevent movement, but leaving joints uncovered to permit inspection. When leakage or pressure drop exceeds the allowable amount specified, make satisfactory correction and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.

- a. Infiltration tests and exfiltration tests: Perform these tests for sewer lines made of the specified materials, not only concrete, in accordance with [ASTM C 969](#). Make calculations in accordance with the Appendix to [ASTM C 969](#).
- b. Low-pressure air tests: Perform tests as follows:
 - (1) PVC plastic pipelines: Test in accordance with [UBPPA UNI-B-6](#). Allowable pressure drop shall be as given in [UBPPA UNI-B-6](#). Make calculations in accordance with the Appendix to [UBPPA UNI-B-6](#).

-- End of Section --

SECTION 33 61 14

EXTERIOR BURIED PREINSULATED WATER PIPING

02/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASME INTERNATIONAL (ASME)

- ASME B16.11 (2011) Forged Fittings, Socket-Welding and Threaded
- ASME B16.18 (2012) Cast Copper Alloy Solder Joint Pressure Fittings
- ASME B16.22 (2001; R 2010) Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
- ASME B16.24 (2011) Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 600, 900, 1500, and 2500
- ASME B16.5 (2009) Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard
- ASME B16.9 (2007) Standard for Factory-Made Wrought Steel Butt-welding Fittings
- ASME B31.1 (2010) Power Piping

ASTM INTERNATIONAL (ASTM)

- ASTM A106/A106M (2011) Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service
- ASTM A193/A193M (2011a) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications
- ASTM A194/A194M (2011) Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both
- ASTM A53/A53M (2010) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM B32	(2008) Standard Specification for Solder Metal
ASTM B88	(2009) Standard Specification for Seamless Copper Water Tube
ASTM D1330	(2004; R 2010) Rubber Sheet Gaskets
ASTM D1784	(2011) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D1785	(2006) Standard Specification for Poly(Vinyl Chloride) (PVC), Plastic Pipe, Schedules 40, 80, and 120
ASTM D229	(2009b) Rigid Sheet and Plate Materials Used for Electrical Insulation
ASTM D2466	(2006) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D2564	(2004; R 2009e1) Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D2996	(2001; R 2007e1) Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe

1.2 SYSTEM DESCRIPTION

Provide new exterior buried factory-prefabricated preinsulated water piping system to the first piping connection aboveground or within each building complete and ready for operation. Piping system includes chilled water piping. Chilled water piping within building is specified under Section 23 73 33 HEATING, VENTILATING, AND COOLING SYSTEM.

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Pipe, fittings, and end connections

Factory-prefabricated preinsulated water piping system

Plastic reinforced thermosetting resin (RTR) piping

SD-07 Certificates

Certification of welders' qualifications

SD-08 Manufacturer's Instructions

Installation manual for buried factory-prefabricated preinsulated water piping system

1.4 QUALITY ASSURANCE

1.4.1 Certification of Welders' Qualifications

Submit prior to site welding of steel piping; certifications shall be not more than one year old.

PART 2 PRODUCTS

2.1 BURIED FACTORY-PREFABRICATED PREINSULATED WATER PIPING SYSTEM

Piping (pipe, fittings, and end connections) system shall be suitable for working pressure of 125 psig at 250 degrees F, except plastic polyvinyl chloride (PVC) chilled water piping shall be suitable for working pressure of 125 psig at 75 degrees F. Piping system shall withstand H-20 highway loading with 2 feet of compacted backfill over top of conduit. Mark each section of conduit with fabricator's name, product identification, and publications to which the items conform. Provide each section of carrier pipe including factory-applied insulation and conduit, with waterproof conduit ends at both ends of each section of carrier pipe, except for piping systems which have the field joints insulated and covered with waterproof shrink sleeves.

2.1.1 Factory-Applied Insulation

Polyurethane or polyisocyanate insulation, minimum density of 1.7 pcf, rated for not less than 250 degrees F, completely filling space between carrier pipe and conduit.

2.1.2 Factory-Applied Conduit

Conduit material, size, and thickness shall be as follows:

Carrier Pipe (Inches)	Minimum Conduit Size (Inches)	Minimum Conduit Thickness (Inches)
2	4	0.060
3	6	0.060
4	8	0.080
6	10	0.100
8	12	0.120
10	14	0.120

- a. Plastic PVC pipe conduit: ASTM D1784, Class 12454-B compound extruded seamless PVC plastic pipe.
- b. Plastic RTR pipe conduit: ASTM D2996, filament-wound, fiberglass RTR plastic pipe, without liner.

- c. Plastic RTR factory lay-up conduit: Conduit shall be machine-applied continuous rovings of fiberglass strands saturated with isophthalic polyester or epoxy resin filament wound in helical pattern directly to the outer surface of the pipe insulation. In lieu of minimum conduit size for each size of carrier pipe, provide minimum of **one inch** thick insulation for **2 inch** carrier pipe and provide minimum of **1.5 inch** thick insulation for **3 inch** and larger carrier pipe.

2.1.3 Factory-Applied End Seals

Provide watertight end seal, or factory lay-up type end seal between carrier pipe and conduit. Provide sufficient surface bonding area between carrier pipe and conduit to ensure permanent watertight end seal suitable for use with temperature limits of carrier pipe.

2.1.4 Factory-Prefabricated Carrier Piping

Pipe, fittings, flanges, and couplings shall be marked with manufacturer's name, product identification, and publication to which items conform. Carrier piping shall be as specified in this section. Buried carrier pipe connections between straight sections of pipe beyond **5 feet** exterior of buildings may be manufacturer's standard O-ring connections designed to absorb pipe expansion and contraction at working pressure of **125 psig** with no leakage. Connections at elbows and tees shall be other than O-ring connections.

2.2 CARRIER PIPING

2.2.1 Copper Tubing

Provide copper tubing for hot domestic water piping, recirculating hot domestic water piping, chilled water piping, chilled-hot water piping, and hot water piping.

- a. Copper tubing: Provide **ASTM B88**, Type L or M copper tubing for buried factory-prefabricated preinsulated piping and for aboveground piping. Provide **ASME B16.18** or **ASME B16.22** solder joint fittings, unions, and flanges; provide adapters as required.
- b. Solder for copper tubing: Provide **ASTM B32**, 95-5 tin-antimony solder or provide Plumbing Code approved lead-free solder.
- c. Flanged connections: Provide **ASME B16.24**, Class 150, solder joint flat face flanged connections.
- d. O-ring connections: Provide between straight sections of pipe beyond **5 feet** of exterior of buildings.

2.2.2 Steel Piping

Provide steel piping for chilled water piping, chilled-hot water piping, and hot water piping.

- a. Steel pipe: Provide **ASTM A53/A53M**, Type E (electric-resistance welded, Grade A or B), **ASTM A53/A53M**, Type S (seamless, Grade A or B), or **ASTM A106/A106M** (seamless, Grade A or B). Provide Weight Class STD (Standard) or Schedule No. 40 black steel pipe for welding end connections. Provide Weight Class XS (Extra Strong) or Schedule No. 80

black steel pipe for threaded end connections.

- b. Steel pipe fittings: Provide ASME B16.9 buttwelding fittings of the same material and weight as the piping in which fittings are installed. Provide ASME B16.11 socket welding fittings.
- c. Steel pipe flanges: Provide ASME B16.5, Class 150 flanges.
- d. O-ring connections: Provide between straight sections of pipe beyond 5 feet of exterior of buildings.

2.2.3 Plastic Reinforced Thermosetting Resin (RTR) Piping

Provide plastic RTR piping for hot domestic water piping, recirculating hot domestic water piping, chilled water piping, chilled-hot water piping, and hot water piping.

- a. Plastic carrier pipe, fittings, and adhesive: Provide plastic carrier piping conforming to the Federal Agency Approved Brochure. Pipe, fittings, and adhesive shall be supplied by same manufacturer. Pipe, fittings, flanges, and couplings shall have end connections of the adhesive bell and spigot type. Threaded piping, including pipe, fittings, flanges, and couplings, will not be permitted.
- b. Flanged connections: Provide flat face flanged connections between plastic piping and metal piping. Plastic flanges shall be suitable for connecting to ASME Class 150 flanges.
- c. Plastic RTR piping sizes: When piping sizes other than 2, 3, 4, 6, and 8 inches are indicated, provide next larger piping size. The connecting system piping shall be of the same size or increased to meet next size of RTR piping.

2.2.4 Plastic PVC Piping

Provide plastic PVC piping only for chilled water piping.

- a. Plastic PVC carrier pipe, fittings, and cement: ASTM D1785 pipe, ASTM D2466 socket type fittings, and ASTM D2564 solvent cement shall be supplied by the same manufacturer. Pipe, fittings, flanges, and couplings shall have solvent cement socket end connections, except piping beyond 5 feet outside of buildings shall have O-ring connections. Plastic PVC piping shall be suitable for working pressure of 125 psig at 75 degrees F.
- b. Flanged connections: Provide flat face flanged connections between plastic piping and metal piping. Plastic flanges shall be suitable for connecting to ASME Class 150 flanges.
- c. O-ring connections: Provide between straight sections of pipe beyond 5 feet of exterior of buildings.

2.3 FLANGED CONNECTIONS

Provide ASME Class 150 flat face flanged connections.

- a. Gaskets: ASTM D1330, except Shore A durometer hardness shall be 55 to 65, 0.125 inch thick ethylene propylene. Provide one piece factory cut full-face gaskets.

- b. Bolts: **ASTM A193/A193M**, Grade B7. Extend minimum of two full threads beyond nut with bolts tightened to required torque.
- c. Nuts: **ASTM A194/A194M**, Grade 7, with Teflon coated threads.
- d. Washers: Provide galvanized steel flat circular washers under bolt heads and nuts.
- e. Electrically isolating (insulating) gaskets for connections between metal flanges: Provide **ASTM D229** electrical insulating material of 1000 ohms minimum resistance. Provide one piece factory cut insulating gaskets between flanges. Provide silicon-coated fiberglass insulating sleeves between bolts and holes in flanges; bolts may have reduced shanks of diameter not less than diameter at root of threads. Provide **0.125 inch** thick high-strength insulating washers next to flanges and provide stainless steel flat circular steel washers over insulating washers and under bolt heads and nuts. Provide bolts **0.5 inch** longer than standard length to compensate for thicker insulating gaskets and washers under bolt heads and nuts.

2.4 BURIED WARNING AND IDENTIFICATION TAPE

Provide detectable aluminum foil plastic backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried piping. Tape shall be detectable by an electronic detection instrument. Provide tape in rolls, **3 inches** minimum width, color coded for the utility involved with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning and identification shall read "CAUTION BURIED PREINSULATED WATER PIPING BELOW" or similar wording. Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material.

2.5 CONCRETE THRUST BLOCKS

Provide concrete thrust blocks. Concrete shall be of **4000 psi** minimum 28 day compressive strength, air-entrained admixture (**3.6 ounces per cubic yard**) with water-reducing admixture (**22 ounces per cubic yard**).

2.6 PIPE SLEEVES

Provide where piping passes entirely through walls and floors. Provide sleeves of sufficient length to pass through entire thickness of walls and floors. Provide **one inch** minimum clearance between exterior of piping or pipe insulation, and interior of sleeve or core-drilled hole. Firmly pack space with mineral wool insulation. Seal space at both ends of sleeve or core-drilled hole with plastic waterproof cement which will dry to a firm but pliable mass, or provide mechanically adjustable segmented elastomeric seal. In fire walls and fire floors, seal both ends of sleeves or core-drilled holes with UL listed fill, void, or cavity material.

- a. Sleeves in masonry and concrete walls and floors: Provide hot-dip galvanized steel, ductile-iron, or cast-iron sleeves. Core drilling of masonry and concrete may be provided in lieu of sleeves when cavities in the core-drilled hole are grouted smooth.
- b. Sleeves in other than masonry and Concrete walls and floors: Provide **26 gage** galvanized steel sheet.

2.7 ESCUTCHEON PLATES

Provide split hinge type metal plates for piping entering walls and floors in exposed spaces. Provide polished stainless steel plates or chromium-plated finish on copper alloy plates in finished spaces. Provide paint finish on metal plates in unfinished spaces.

PART 3 EXECUTION

3.1 INSTALLATION

Installation of exterior buried factory-prefabricated preinsulated water piping systems shall be in accordance with manufacturer's installation manual. Welding of steel piping including qualification of welders shall be in accordance with **ASME B31.1**, metallic arc process. Deviations shall not be permitted unless authorized in writing by Contracting Officer. Install piping straight and true to bear evenly on sand bedding material. Installation and field assembly of plastic RTR piping shall be in accordance with the Federal Agency Approved Brochure.

- a. Cleaning of piping: Keep interior and ends of new piping and existing piping affected by the Contractor's operations, cleaned of water and foreign matter during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of pipe and fittings to prevent entry of water and foreign matter. Inspect piping before placing into position.
- b. Demolition: Remove materials so as not to damage materials which are to remain. Replace existing work damaged by the Contractor's operations with new work of the same construction.

3.2 FIELD JOINTS

- a. Carrier piping joints without concrete anchor: Pressure test and approve piping joints. Provide joints with polyurethane or polyisocyanate insulation of same type and thickness as insulation on carrier piping. Provide waterproof shrink sleeves to cover insulation and overlap not less than **6 inches** of each end of conduit section.
- b. Carrier piping joints with concrete anchor: Pressure test and approve piping joints. Provide each elbow and tee with concrete anchors (thrust blocks). Provide waterproof end seals between carrier piping and conduit adjacent to each carrier pipe fitting. Encase carrier pipe fitting and at least **2 inches** of each end of conduit with a minimum of **6 inches** of concrete.

3.3 BURIED FACTORY-PREFABRICATED PREINSULATED PIPE INSTALLATION

- a. Assembly and alignment: Assemble carrier pipe and fittings according to manufacturer's installation manual; assemble plastic RTR piping in accordance with the Federal Agency Approved Brochure. Maintain proper alignment during assembly of joints.
- b. Bedding: Accurately grade trench bedding with a minimum of **6 inches** of manufactured or natural sand. Backfill sand to a minimum of **6 inches** above and below conduit. Lay bedding to firmly support conduit along entire length.

- c. Concrete thrust blocks: Encase each elbow and tee of carrier pipe in thrust block with minimum of 3 square feet of thrust-bearing surface cast against undisturbed soil, minimum pipe-to-bearing surface single dimension of 10 inches perpendicular to bearing surface, and minimum volume of 9 cubic feet, except as indicated otherwise. Disturbed soil under and around thrust blocks shall be compacted.

3.4 FIELD QUALITY CONTROL

Before final acceptance of work, test each system to demonstrate compliance with contract requirements. Thoroughly flush and clean piping before placing in operation. Flush piping at minimum velocity of 8 fps. Correct defects in the work and repeat tests until work is in compliance with contract requirements. Furnish potable water, electricity, instruments, connecting devices, and personnel for tests.

- a. Field tests of carrier piping: Do not cover carrier piping joints with insulation or concrete anchors (thrust blocks), until carrier piping joints pass field tests.
- b. Hydrostatic pressure test: Test piping system at 200 psig for minimum holding period of 2 hours during which time pressure shall not drop more than 4 psi; test plastic RTR piping in accordance with Federal Agency Approved Brochure. Pressure drop greater than 4 psicorrected for temperature variation constitutes failure. Valve off piping system and disconnect method of piping system pressurization before starting the 2 hour pressure holding period. During hydrostatic pressure test, examine piping system for leaks. Repair leaking joints, replace damaged and porous pipe and fittings with new materials, and repeat tests.
- c. Thrust blocks: If O-ring connections are used, provide temporary thrust blocks prior to hydrostatic pressure testing of piping system. Place bedding and backfill around center portion of piping system, leaving thrust blocks and field joints clear for observation. After successful completion of hydrostatic pressure test, cast concrete thrust blocks.
- d. Field inspections: Prior to initial operation, inspect piping system for compliance with drawings, specifications, and manufacturer's submittals.

3.5 DISINFECTION

Disinfect new hot domestic water piping under Section 22 00 00 PLUMBING, GENERAL PURPOSE.

-- End of Section --

SECTION 33 82 00

TELECOMMUNICATIONS OUTSIDE PLANT (OSP)

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

- ASTM B 1 (2001; R 2007) Standard Specification for Hard-Drawn Copper Wire
- ASTM B 8 (2011) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
- ASTM D 709 (2001; R 2007) Laminated Thermosetting Materials

ELECTRONIC INDUSTRIES ALLIANCE (EIA)

- EIA TIA/EIA-455-204 (2000) FOTP-204 Measurement of Bandwidth on Multimode Fiber
- EIA TIA/EIA-455-46A (1990) FOTP-46 Spectral Attenuation Measurement for Long-Length, Graded-Index Optical Fibers
- EIA TIA/EIA-455-61A (2000) FOTP-61 Measurement of Fiber or Cable Attenuation Using an OTDR
- EIA TIA/EIA-455-B (1998) Test Procedures for Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices, and other Fiber Optic Components (ANSI)
- EIA TIA/EIA-472D000-A (1993) Fiber Optic Communications Cable for Outside Plant Use
- EIA TIA/EIA-492CAAA (1998; R 2002) Class IVA Dispersion-Unshifted Single-Mode Optical Fibers
- EIA TIA/EIA-526-14A ((1998) OFSTP-14A Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant (ANSI/TIA/EIA-526-14A)
- EIA TIA/EIA-526-7 (1998) OFSTP-7 Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant (ANSI/TIA/EIA-526-7)

EIA TIA/EIA-568-B.1 (2001; Addendum 2001) Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements (ANSI/TIA/EIA-568-B.1)

EIA TIA/EIA-568-B.2 (2001) Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted Pair Cabling Components (ANSI/TIA/EIA-568-B.2)

EIA TIA/EIA-568-B.3 (2000; Addendum 2002) Optical Fiber Cabling Components Standard (ANSI/TIA/EIA-568-B.3)

EIA TIA/EIA-569-A (1998; Addenda 2000, 2001) Commercial Building Standards for Telecommunications Pathways and Spaces (ANSI/TIA/EIA-569-A)

EIA TIA/EIA-590-A (1997) Standard for Physical Location and Protection of Below Ground Fiber Optic Cable Plant

EIA TIA/EIA-598-B (2001) Optical Fiber Cable Color Coding

EIA TIA/EIA-606-A (2002) Administration Standard for the Telecommunications Infrastructure (ANSI/TIA/EIA-606)

EIA TIA/EIA-758 (1999; Addendum 1999) Customer-Owned Outside Plant Telecommunications Cabling Standard (ANSI/TIA/EIA-758)

TIA J-STD-607-A (2002) Commercial Building Grounding (Earthen) and Bonding Requirements for Telecommunications

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2 (2012) National Electrical Safety Code

IEEE Std 100 (2000) The Authoritative Dictionary of IEEE Standards Terms

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)

ICEA S-87-640 (1999) Fiber Optic Outside Plant Communications Cable

ICEA S-98-688 (1997) Broadband Twisted Pair, Telecommunications Cable Aircore, Polyolefin Insulated Copper Conductors

ICEA S-99-689 (1997) Broadband Twisted Pair Telecommunications Cable Filled, Polyolefin Insulated Copper Conductors

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA C62.61 (1993) Gas Tube Surge Arresters on Wire Line Telephone Circuits

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2011; Errata 2 2012) National Electrical Code

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 6 (2000) Commercial Blast Cleaning

U.S. DEPARTMENT OF AGRICULTURE (USDA)

RUS 1755.200 Standard for Splicing Copper and Fiber Optic Cables

RUS 1755.390 Specification for Filled Telephone Cables

RUS Bul 1751F-643 (1996) Design of Aerial Plant

RUS Bul 1751F-815 (1979) Electrical Protection of Outside Plant

RUS Bul 1753F-201 (1997) Acceptance Tests of Telecommunications Plant (PC-4)

RUS Bul 345-83 (1979; Rev Oct 1982) Gas Tube Surge Arrestors (PE-80)

UNDERWRITERS LABORATORIES (UL)

UL 497 (2001; Reprint Apr 2009) Protectors for Paired Conductor Communication Circuits

UL 83 (2008) Thermoplastic-Insulated Wires and Cables

1.2 RELATED REQUIREMENTS

Section 27 10 00, "Building Telecommunications Cabling System" apply to this section with additions and modifications specified herein.

1.3 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in this specification shall be as defined in EIA TIA/EIA-568-B.1, EIA TIA/EIA-568-B.2, EIA TIA/EIA-568-B.3, EIA TIA/EIA-569-A, EIA TIA/EIA-606-A, and IEEE Std 100 and herein.

1.3.1 Campus Distributor (CD)

A distributor from which the campus backbone cabling emanates. International expression for main cross-connect - (MC).

1.3.2 Entrance Facility (EF)

An entrance to the building for both private and public network service cables (including antennae) including the entrance point at the building wall and continuing to the entrance room or space.

1.3.3 Entrance Room (ER)

A centralized space for telecommunications equipment that serves the occupants of a building. Equipment housed therein is considered distinct from a telecommunications room because of the nature of its complexity.

1.3.4 Building Distributor (BD)

A distributor in which the building backbone cables terminate and at which connections to the campus backbone cables may be made. International expression for intermediate cross-connect - (IC).

1.3.5 Pathway

A physical infrastructure utilized for the placement and routing of telecommunications cable.

1.4 SYSTEM DESCRIPTION

The telecommunications outside plant consists of cable, conduit, manholes, poles, etc. required to provide signal paths from the closest point of presence to the new facility, including free standing frames or backboards, interconnecting hardware, terminating cables, lightning and surge protection modules at the entrance facility. The work consists of providing, testing and making operational cabling, interconnecting hardware and lightning and surge protection necessary to form a complete outside plant telecommunications system for continuous use. The telecommunications contractor must coordinate with Base Telephone concerning layout and configuration of the EF telecommunications and OSP. The telecommunications contractor may be required to coordinate work effort for access to the EF telecommunications and OSP with Base Telephone.

1.5 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 "Submittal Procedures":

- a. Submittals shall include the manufacturer's name, trade name, place of manufacture, and catalog model or number. Submittals shall also include applicable federal, military, industry, and technical society publication references. Should manufacturer's data require supplemental information for clarification, the supplemental information shall be submitted as specified in paragraph "Regulatory Requirements" and as required for certificates in Section 01 33 00 "Submittal Procedures".
- b. Commercial off-the-shelf manuals shall be provided for operation, installation, configuration, and maintenance of products provided as a part of the telecommunications outside plant (OSP). Submit operations and maintenance data in accordance with Section 01 78 23, "Operation and Maintenance Data" and as specified herein not later than 2months prior to the date of beneficial occupancy. In addition to requirements of Data package 5, include the

requirements of paragraphs "Telecommunications Outside Plant Shop Drawings" and "Telecommunications Entrance Facility Drawings".

SD-02 Shop Drawings

Telecommunications Outside Plant

Telecommunications Entrance Facility Drawings

SD-03 Product Data

Wire and cable

Cable splices, and connectors

Closures

Building protector assemblies

Protector modules

Cross-connect terminal cabinets

Spare Parts

SD-06 Test Reports

Pre-installation tests

Acceptance tests

Outside Plant Test Plan

SD-07 Certificates

Telecommunications Contractor Qualifications

Key Personnel Qualifications

Minimum Manufacturer's Qualifications

SD-08 Manufacturer's Instructions

Building protector assembly installation

Fiber Optic Splices

Submit instructions prior to installation.

SD-09 Manufacturer's Field Reports

Factory Reel Test Data

SD-10 Operation and Maintenance Data

Telecommunications outside plant (OSP), Data Package 5

SD-11 Closeout Submittals

Record Documentation

In addition to other requirements, provide in accordance with paragraph "Record Documentation".

1.6 QUALITY ASSURANCE

1.6.1 Shop Drawings

Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices. Submittals shall include the nameplate data, size, and capacity. Submittals shall also include applicable federal, military, industry, and technical society publication references.

1.6.1.1 Telecommunications Outside Plant Shop Drawings

Provide Outside Plant Design in accordance with [EIA TIA/EIA-758](#), [RUS Bul 1751F-643](#) for underground duct system design and for direct buried system design. Provide T0 shop drawings that show the physical and logical connections from the perspective of an entire campus, such as actual building locations, exterior pathways and campus backbone cabling on plan view drawings, major system nodes, and related connections on the logical system drawings in accordance with [EIA TIA/EIA-606-A](#). Drawings shall include wiring and schematic diagrams for fiber optic and copper cabling and splices, copper conductor gauge and pair count, fiber pair count and type, pathway duct and innerduct arrangement, associated construction materials, and any details required to demonstrate that cable system has been coordinated and will properly support the switching and transmission system identified in specification and drawings. Provide Registered Communications Distribution Designer (RCDD) approved drawings of the telecommunications outside plant. Update existing telecommunication Outside Plant T0 drawings to include information modified, deleted or added as a result of this installation in accordance with [EIA TIA/EIA-606-A](#). The [telecommunications outside plant \(OSP\)](#) shop drawings shall be included in the operation and maintenance manuals.

1.6.1.2 Telecommunications Entrance Facility Drawings

Provide T3 drawings for EF Telecommunications in accordance with [EIA TIA/EIA-606-A](#) that include telecommunications entrance facility plan views, pathway layout, mechanical/electrical layout, and cabinet, rack, backboard, and wall elevations. Drawings shall show layout of applicable equipment including building protector assembly, incoming cable connector blocks, patch panels and equipment spaces, and cabinet/racks. Drawings shall include a complete list of equipment and material, equipment rack details, proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearance for maintenance and operation. Drawings may also be an enlargement of a congested area of T1 or T2 drawings. Provide T3 drawings for EF Telecommunications as specified in the paragraph "Telecommunication Space Drawings" of Section 27 10 00, "Building Telecommunications Cabling Systems". The telecommunications entrance facility shop drawings shall be included in the operation and maintenance manuals.

1.6.2 Telecommunications Qualifications

Work under this section shall be performed by and the equipment shall be provided by the approved telecommunications contractor and key personnel. Qualifications shall be provided for: the telecommunications system contractor, the telecommunications system installer, the supervisor (if different from the installer), and the cable splicing and terminating personnel. A minimum of 30 days prior to installation, submit documentation of the experience of the telecommunications contractor and of the key personnel.

1.6.2.1 Telecommunications Contractor Qualifications

The telecommunications contractor shall be a firm which is regularly and professionally engaged in the business of the applications, installation, and testing of the specified telecommunications systems and equipment. The telecommunications contractor shall demonstrate experience in providing successful telecommunications systems that include outside plant and broadband cabling within the past 3 years. Submit documentation for a minimum of three and a maximum of five successful telecommunication system installations for the telecommunications contractor. Each of the key personnel shall demonstrate experience in providing successful telecommunications systems in accordance with EIA TIA/EIA-758 within the past 3 years.

1.6.2.2 Key Personnel Qualifications

Provide key personnel who are regularly and professionally engaged in the business of the application, installation and testing of the specified telecommunications systems and equipment. There may be one key person or more key persons proposed for this solicitation depending upon how many of the key roles each has successfully provided. Each of the key personnel shall demonstrate experience in providing successful telecommunications systems within the past 3 years.

Cable splicing and terminating personnel assigned to the installation of this system or any of its components shall have training in the proper techniques and have a minimum of 3 years experience in splicing and terminating the specified cables. Modular splices shall be performed by factory certified personnel or under direct supervision of factory trained personnel for products used.

Supervisors and installers assigned to the installation of this system or any of its components shall have factory or factory approved certification from each equipment manufacturer indicating that they are qualified to install and test the provided products.

Submit documentation for a minimum of three and a maximum of five successful telecommunication system installations for each of the key personnel. Documentation for each key person shall include at least two successful system installations provided that are equivalent in system size and in construction complexity to the telecommunications system proposed for this solicitation. Include specific experience in installing and testing telecommunications outside plant systems, including broadband cabling, and provide the names and locations of at least two project installations successfully completed using optical fiber and copper telecommunications cabling systems. All of the existing telecommunications system installations offered by the key persons as successful experience

shall have been in successful full-time service for at least 18 months prior to the issuance date for this solicitation. Provide the name and role of the key person, the title, location, and completed installation date of the referenced project, the referenced project owner point of contact information including name, organization, title, and telephone number, and generally, the referenced project description including system size and construction complexity.

Indicate that all key persons are currently employed by the telecommunications contractor, or have a commitment to the telecommunications contractor to work on this project. All key persons shall be employed by the telecommunications contractor at the date of issuance of this solicitation, or if not, have a commitment to the telecommunications contractor to work on this project by the date that the bid was due to the Contracting Officer.

Note that only the key personnel approved by the Contracting Officer in the successful proposal shall do work on this solicitation's telecommunications system. Key personnel shall function in the same roles in this contract, as they functioned in the offered successful experience. Any substitution for the telecommunications contractor's key personnel requires approval from the Contracting Officer.

1.6.2.3 Minimum Manufacturer Qualifications

Cabling, equipment and hardware manufacturers shall have a minimum of 3 years experience in the manufacturing, assembly, and factory testing of components which comply with, [EIA TIA/EIA-568-B.1](#), [EIA TIA/EIA-568-B.2](#) and [EIA TIA/EIA-568-B.3](#). In addition, cabling manufacturers shall have a minimum of 3 years experience in the manufacturing and factory testing of cabling which comply with [ICEA S-87-640](#), [ICEA S-98-688](#), and [ICEA S-99-689](#).

1.6.3 Outside Plant Test Plan

Prepare and provide a complete and detailed test plan for field tests of the outside plant including a complete list of test equipment for the copper conductor and optical fiber cables, components, and accessories for approval by the Contracting Officer. Include a cut-over plan with procedures and schedules for relocation of facility station numbers without interrupting service to any active location. Submit the plan at least 30 days prior to tests for Contracting Officer approval. Provide outside plant testing and performance measurement criteria in accordance with [EIA TIA/EIA-568-B.1](#) and [RUS Bul 1753F-201](#). Include procedures for certification, validation, and testing that includes fiber optic link performance criteria.

1.6.4 Standard Products

Provide materials and equipment that are standard products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship and shall be the manufacturer's latest standard design that has been in satisfactory commercial or industrial use for at least 2 years prior to bid opening. The 2 year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturer's catalogs, or brochures during the 2 year period. Products supplied shall be specifically designed and manufactured for use with outside plant telecommunications systems. Where two or more items of the same class of equipment are required, these items

shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.6.4.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturer's factory or laboratory tests, is provided.

1.6.4.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

1.6.5 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.6.5.1 Independent Testing Organization Certificate

In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

1.7 DELIVERY, STORAGE, AND HANDLING

Ship cable on reels in 5000 foot lengths for 25, 50, or 100 pair configuraton and 1250 feet length for larger cables. Radius of the reel drum shall not be smaller than the minimum bend radius of the cable. Wind cable on the reel so that unwinding can be done without kinking the cable. Two meters of cable at both ends of the cable shall be accessible for testing. Attach permanent label on each reel showing length, cable identification number, cable size, cable type, and date of manufacture. Provide water resistant label and the indelible writing on the labels. Apply end seals to each end of the cables to prevent moisture from entering the cable. Reels with cable shall be suitable for outside storage conditions when temperature ranges from minus 40 degrees C to plus 65 degrees C, with relative humidity from 0 to 100 percent. Equipment, other than cable, delivered and placed in storage shall be stored with protection from weather, humidity and temperature variation, dirt and dust, or other contaminants in accordance with manufacturer's requirements.

1.8 MAINTENANCE

1.8.1 Record Documentation

Provide the activity responsible for telecommunications system maintenance and administration a single complete and accurate set of record

documentation for the entire telecommunications system with respect to this project.

Provide record documentation as specified in Section 27 10 00, "Building Telecommunications Cabling Systems".

Provide T5 drawings including documentation on cables and termination hardware in accordance with EIA TIA/EIA-606-A. T5 drawings shall include schedules to show information for cut-over and cable plant management, patch panel layouts, cross-connect information and connecting terminal layout as a minimum. T5 drawings shall be provided in both hard copy format and on electronic media using Windows based computer cable management software. A licensed copy of the cable management software including documentation shall be provided. Update existing record documentation to reflect campus distribution T0 drawings and T3 drawing schedule information modified, deleted or added as a result of this installation. Provide the following T5 drawing documentation as a minimum:

- a. Cables - A record of installed cable shall be provided in accordance with EIA TIA/EIA-606-A. The cable records shall include only the required data fields on the hard copy and the required data fields for each cable and complete end-to-end circuit report for each complete circuit from the assigned outlet to the entry facility in accordance with EIA TIA/EIA-606-A. Include manufacture date of cable with submittal.
- b. Termination Hardware - Provide a record of installed patch panels, cross-connect points, campus distributor and terminating block arrangements and type in accordance with EIA TIA/EIA-606-A. Documentation shall include the required data fields in accordance with EIA TIA/EIA-606-A.

1.8.2 Spare Parts

In addition to the requirements of Section 01 78 23, "Operation and Maintenance Data", provide a complete list of parts and supplies, with current unit prices and source of supply, and a list of spare parts recommended for stocking. Spare parts shall be provided no later than the start of field testing.

1.9 WARRANTY

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Products supplied shall be specifically designed and manufactured for use with outside plant telecommunications systems.

2.2 TELECOMMUNICATIONS ENTRANCE FACILITY

2.2.1 Building Protector Assemblies

Building protector assembly shall be self-contained and have

interconnecting hardware for connection to exterior cabling at full capacity. Provide manufacturers instructions for [building protector assembly installation](#). Provide copper cable interconnecting hardware as specified in Section [27 10 00](#), "Building Telecommunications Cabling System".

2.2.2 Protector Modules

Provide in accordance with [UL 497](#) 3-electrode gas tube or solid state type 5 pin rated for the application. Provide gas tube protection modules in accordance with [RUS Bul 345-83](#) and shall be heavy duty, 400 volt where A is the maximum single impulse discharge current, B is the impulse life and C is the AC discharge current in accordance with [NEMA C62.61](#). The gas modules shall shunt high voltage to ground, fail short, and be equipped with an external spark gap and heat coils in accordance with [UL 497](#). Provide the number of surge protection modules equal to the number of pairs of exterior cable of the building protector assembly.

2.2.3 Fiber Optic Terminations

Provide fiber optic cable terminations as specified in Section [27 10 00](#), "Building Telecommunications Cabling System".

2.3 CONDUIT

Provide 4" Schedule 40 PVC buried a minimum of 24" below grade

2.4 PLASTIC INSULATING TAPE

UL 510.

2.5 WIRE AND CABLE

2.5.1 Copper Conductor Cable

Solid copper conductors, covered with an extruded solid insulating compound. Insulated conductors shall be twisted into pairs which are then stranded or oscillated to form a cylindrical core. For special high frequency applications, the cable core shall be separated into compartments. Cable shall be completed by the application of a suitable core wrapping material, a corrugated copper or plastic coated aluminum shield, and an overall extruded jacket. Telecommunications contractor shall verify distances between splice points prior to ordering cable in specific cut lengths. Gauge of conductor shall determine the range of numbers of pairs specified; 19 gauge (6 to 400 pairs), 22 gauge (6 to 1200 pairs), 24 gauge (6 to 2100 pairs), and 26 gauge (6 to 3000 pairs). Copper conductors shall conform to the following: All copper conductor cable from 6 to 1800 pair shall be PE-39 type. Provide pair count as shown on plans.

2.5.1.1 Underground

Provide filled cable meeting the requirements of [ICEA S-99-689](#) and [RUS 1755.390](#).

2.5.2 Fiber Optic Cable

Provide single-mode, 8/125-um, 0.10 aperture 1310 nm fiber optic cable in accordance with [EIA TIA/EIA-492CAAA](#), [EIA TIA/EIA-472D000-A](#), and [ICEA S-87-640](#) including any special requirements made necessary by a

specialized design. Provide 12 optical fibers as indicated. Fiber optic cable shall be specifically designed for outside use with loose buffer construction. Provide fiber optic color code in accordance with [EIA TIA/EIA-598-B](#)

2.5.2.1 Strength Members

Provide central, and non-metallic strength members with sufficient tensile strength for installation and residual rated loads to meet the applicable performance requirements in accordance with [ICEA S-87-640](#). The strength member is included to serve as a cable core foundation to reduce strain on the fibers, and shall not serve as a pulling strength member.

2.5.2.2 Shielding or Other Metallic Covering

Provide bare aluminum or coated aluminum, single tape covering or shield in accordance with [ICEA S-87-640](#).

2.5.2.3 Performance Requirements

Provide fiber optic cable with optical and mechanical performance requirements in accordance with [ICEA S-87-640](#).

2.5.3 Grounding and Bonding Conductors

Provide grounding and bonding conductors in accordance with [RUS 1755.200](#), [TIA J-STD-607-A](#), [IEEE C2](#), and [NFPA 70](#). Solid bare copper wire meeting the requirements of [ASTM B 1](#) for sizes number 8 AWG and smaller and stranded bare copper wire meeting the requirements of [ASTM B 8](#), for sizes number 6 AWG and larger. Insulated conductors shall have 600-volt, Type TW insulation meeting the requirements of [UL 83](#).

2.6 CABLE TAGS IN MANHOLES, HANDHOLES, AND VAULTS

Provide tags for each telecommunications cable or wire located in manholes, handholes, and vaults. Cable tags shall be stainless steel or polyethylene and labeled in accordance with [EIA TIA/EIA-606-A](#). Handwritten labeling is unacceptable.

2.6.1 Stainless Steel

Provide stainless steel, cable tags 41.25 mm (1 5/8 inches) in diameter 1.58 mm (1/16 inch) thick minimum, and circular in shape. Tags shall be die stamped with numbers, letters, and symbols not less than 6.35 mm (0.25 inch) high and approximately 0.38 mm (0.015 inch) deep in normal block style.

2.6.2 Polyethylene Cable Tags

Provide tags of polyethylene that have an average tensile strength of 22.4 MPa (3250 pounds per square inch); and that are two millimeter (0.08 inch) thick minimum, non-corrosive non-conductive; resistive to acids, alkalis, organic solvents, and salt water; and distortion resistant to 77 degrees C (170 degrees F). Provide 1.3 mm (0.05 inch) minimum thick black polyethylene tag holder. Provide a one-piece nylon, self-locking tie at each end of the cable tag. Ties shall have a minimum loop tensile strength of 778.75 N (175 pounds). The cable tags shall have black block letters, numbers, and symbols 25 mm (one inch) high on a yellow background. Letters, numbers, and symbols shall not fall off or change positions

regardless of cable tag orientation.

2.7 BURIED WARNING AND IDENTIFICATION TAPE

Provide fiber optic media marking and protection in accordance with [EIA TIA/EIA-590-A](#). Provide metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 inches minimum width, orange color for Telephone and Communications, with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED TELEPHONE LINE BELOW" or similar wording. Provide permanent color and printing, unaffected by moisture or soil. Tape shall be a minimum thickness of 0.004 inch and a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be detectable by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.8 GROUNDING BRAID

Provide grounding braid that provides low electrical impedance connections for dependable shield bonding in accordance with [RUS 1755.200](#). Braid shall be made from flat tin-plated copper.

2.9 MANUFACTURER'S NAMEPLATE

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

2.10 FIELD FABRICATED NAMEPLATES

Provide laminated plastic nameplates in accordance with [ASTM D 709](#) for each patch panel, protector assembly, rack, cabinet and other equipment or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, 3 mm (0.125 inch) thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be 25 by 65 mm (one by 2.5 inches). Lettering shall be a minimum of 6.35 mm (0.25 inch) high, and of normal block style.

2.11 TESTS, INSPECTIONS, AND VERIFICATIONS

2.11.1 [Factory Reel Test Data](#)

Test 100 percent OTDR test of FO media at the factory in accordance with [EIA TIA/EIA-568-B.1](#) and [EIA TIA/EIA-568-B.3](#). Use [EIA TIA/EIA-526-7](#) for single mode optic fiber and [EIA TIA/EIA-526-14A](#) Method B for multi mode optic fiber measurements. Calibrate OTDR to show anomalies of 0.2 dB minimum. Enhanced performance filled OSP copper cables, referred to as Broadband Outside Plant (BBOSP), shall meet the requirements of [ICEA S-99-689](#). Enhanced performance air core OSP copper cables shall meet the requirements of [ICEA S-98-688](#). Submit test reports, including manufacture date for each cable reel and receive approval before delivery of cable to the project site.

PART 3 EXECUTION

3.1 INSTALLATION

Install all system components and appurtenances in accordance with manufacturer's instructions [IEEE C2](#), [NFPA 70](#), and as indicated. Provide all necessary interconnections, services, and adjustments required for a complete and operable telecommunications system.

3.1.1 Contractor Damage

Promptly repair indicated utility lines or systems damaged during site preparation and construction. Damages to lines or systems not indicated, which are caused by Contractor operations, shall be treated as "Changes" under the terms of the Contract Clauses. When Contractor is advised in writing of the location of a non-indicated line or system, such notice shall provide that portion of the line or system with "indicated" status in determining liability for damages. In every event, immediately notify the Contracting Officer of damage.

3.1.2 Cable Inspection and Repair

Handle cable and wire provided in the construction of this project with care. Inspect cable reels for cuts, nicks or other damage. Damaged cable shall be replaced or repaired to the satisfaction of the Contracting Officer. Reel wraps shall remain intact on the reel until the cable is ready for placement.

3.1.3 Underground Duct

Provide underground duct and connections to existing manholes, handholes, as Shown on plans. Ducts shall have a continuous slope downward toward underground structures and away from buildings, laid with a minimum slope of [3 inches per 100 feet](#). Depending on the contour of the finished grade, the high-point may be at a terminal, a manhole, a handhole, or between manholes or handholes. Short-radius manufactured 90-degree duct bends may be used only for pole or equipment risers, unless specifically indicated as acceptable. The minimum manufactured bend radius shall be [18 inches](#) for ducts of less than [3 inch](#) diameter, and [36 inches](#) for ducts [3 inches](#) or greater in diameter. Otherwise, long sweep bends having a minimum radius of [25 feet](#) shall be used for a change of direction of more than 5 degrees, either horizontally or vertically. Both curved and straight sections may be used to form long sweep bends, but the maximum curve used shall be 30 degrees and manufactured bends shall be used. Ducts shall be provided with end bells whenever duct lines terminate in structures. Draw a flexible testing mandrel approximately [12 inches](#) long with a diameter less than the inside diameter of the conduit through the conduit. After which, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel; then immediately install conduit plugs. Separate multiple conduits by a minimum distance of [2 1/2 inches](#), except that light and power conduits shall be separated from control, signal, and telephone conduits by a minimum distance of [12 inches](#). Provide not less than [3 inches](#) clearance from the conduit to each side of the trench. Grade bottom of trench smooth; where rock, soft spots, or sharp-edged materials are encountered, excavate the bottom for an additional [3 inches](#), fill and tamp level with original bottom with sand or earth free from particles, that would be retained on a [1/4 inch](#) sieve. The first [6 inch](#) layer of backfill cover shall be sand compacted as previously specified. The rest of the excavation shall be backfilled and compacted in [3 to 6 inch](#) layers. Provide

color, type and depth of warning tape as specified. Under roads, paved areas, and railroad tracks, install conduits in concrete encasement of rectangular cross-section providing a minimum of 3 inch concrete cover around ducts. Concrete encasement shall extend at least 5 feet beyond the edges of paved areas and roads

3.1.4 Reconditioning of Surfaces

Provide reconditioning of surfaces to match existing.

3.1.5 Penetrations

Caulk and seal cable access penetrations in walls, ceilings and other parts of the building. Seal openings around electrical penetrations through fire resistance-rated wall, partitions, floors, or ceilings.

3.1.6 Cable Pulling

Test duct lines with a mandrel and swab out to remove foreign material before the pulling of cables. Avoid damage to cables in setting up pulling apparatus or in placing tools or hardware. Do not step on cables when entering or leaving the manhole. Do not place cables in ducts other than those shown without prior written approval of the Contracting Officer or Base Telephone Officer. Roll cable reels in the direction indicated by the arrows painted on the reel flanges. Set up cable reels on the same side of the manhole as the conduit section in which the cable is to be placed. Level the reel and bring into proper alignment with the conduit section so that the cable pays off from the top of the reel in a long smooth bend into the duct without twisting. Under no circumstances shall the cable be paid off from the bottom of a reel. Check the equipment set up prior to beginning the cable pulling to avoid an interruption once pulling has started. Use a cable feeder guide of suitable dimensions between cable reel and face of duct to protect cable and guide cable into the duct as it is paid off the reel. As cable is paid off the reel, lubricate and inspect cable for sheath defects. When defects are noticed, stop pulling operations and notify the Contracting Officer to determine required corrective action. Cable pulling shall also be stopped when reel binds or does not pay off freely. Rectify cause of binding before resuming pulling operations. Provide cable lubricants recommended by the cable manufacturer. Avoid bends in cables of small radii and twists that might cause damage. Do not bend cable and wire in a radius less than 10 times the outside diameter of the cable or wire.

3.1.6.1 Cable Tensions

Obtain from the cable manufacturer and provide to the Contracting Officer, the maximum allowable pulling tension. This tension shall not be exceeded.

3.1.6.2 Pulling Eyes

Equip cables 32 mm (1.25 inches) in diameter and larger with cable manufacturer's factory installed pulling-in eyes. Provide cables with diameter smaller than 32 mm (1.25 inches) with heat shrinkable type end caps or seals on cable ends when using cable pulling grips. Rings to prevent grip from slipping shall not be beaten into the cable sheath. Use a swivel of 19 mm (3/4 inch) links between pulling-in eyes or grips and pulling strand.

3.1.6.3 Installation of Cables in Manholes, Handholes, and Vaults

Provide minimum of 15 feet slack tail on the cables for Base Telephone Group to splice. Identify each cable with corrosion-resistant embossed metal tags.

3.1.7 Surge Protection

All cables and conductors, except fiber optic cable, which serve as communication lines through off-premise lines, shall have surge protection installed at each end which meets the requirements of [RUS Bul 1751F-815](#).

3.1.8 Grounding

Provide grounding and bonding in accordance with [RUS 1755.200](#), [TIA J-STD-607-A](#), [IEEE C2](#), and [NFPA 70](#). Ground exposed non-current carrying metallic parts of telephone equipment, cable sheaths, cable splices, and terminals.

3.1.8.1 Telecommunications Main Ground Bar (TMGB)

The TMGB is the hub of the basic telecommunications grounding system providing a common point of connection for ground from outside cable, CD, and equipment. Establish a TMGB for connection point for cable stub shields to connector blocks and CD protector assemblies. The TMGB will at a minimum be 4 inches by 10 inches by 1/4 inch.

3.1.8.2 Incoming Cable Shields

Shields shall not be bonded across the splice to the cable stubs. Ground shields of incoming cables in the EF Telecommunications to the TMGB.

3.1.8.3 Campus Distributor Grounding

- a. Protection assemblies: Mount CD protector assemblies directly on the telecommunications backboard. Connect assemblies mounted on each vertical frame with number 6 AWG copper conductor to provide a low resistance path to TMGB.
- b. TMGB connection: Connect TMGB to TGB with copper conductor with a total resistance of less than 0.01 ohms.

3.1.9 Cut-Over

All necessary transfers and cut-overs shall be accomplished by the telecommunications contractor.

3.2 LABELING

3.2.1 Labels

Provide labeling for new cabling and termination hardware located within the facility in accordance with [EIA TIA/EIA-606-A](#). Handwritten labeling is unacceptable. Stenciled lettering for cable and termination hardware shall be provided using either thermal ink transfer process or laser printer.

3.2.2 Cable Tag Installation

Install cable tags for each telecommunications cable or wire located in

manholes, handholes, and vaults including each splice. Tag only new wire and cable provided by this contract. Tag new wire and cable provided under this contract and existing wire and cable which are indicated to have splices and terminations provided by this contract. The labeling of telecommunications cable tag identifiers shall be in accordance with EIA TIA/EIA-606-A. Tag legend shall be as indicated. Do not provide handwritten letters. Install cable tags so that they are clearly visible without disturbing any cabling or wiring in the manholes, handholes, and vaults.

3.2.3 Termination Hardware

Label patch panels, distribution panels, connector blocks and protection modules using color coded labels with identifiers in accordance with EIA TIA/EIA-606-A.

3.3 FIELD APPLIED PAINTING

Provide ferrous metallic enclosure finishes in accordance with the following procedures. Ensure that surfaces are dry and clean when the coating is applied. Coat joints and crevices. Prior to assembly, paint surfaces which will be concealed or inaccessible after assembly. Apply primer and finish coat in accordance with the manufacturer's recommendations.

3.3.1 Cleaning

Clean surfaces in accordance with SSPC SP 6.

3.3.2 Priming

Prime with a two component polyamide epoxy primer which has a bisphenol-A base, a minimum of 60 percent solids by volume, and an ability to build up a minimum dry film thickness on a vertical surface of 0.127 mm (5.0 mils). Apply in two coats to a total dry film thickness of 0.127 to 0.2 mm (5 to 8 mils).

3.3.3 Finish Coat

Finish with a two component urethane consisting of saturated polyester polyol resin mixed with aliphatic isocyanate which has a minimum of 50 percent solids by volume. Apply to a minimum dry film thickness of 0.05 to 0.076 mm (2 to 3 mils). Color shall be the manufacturer's standard.

3.4 FIELD FABRICATED NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

3.5 FIELD QUALITY CONTROL

Provide the Contracting Officer 10 working days notice prior to each test. Provide labor, equipment, and incidentals required for testing. Correct defective material and workmanship disclosed as the results of the tests. Furnish a signed copy of the test results to the Contracting Officer within 3 working days after the tests for each segment of construction are completed. Perform testing as construction progresses and do not wait until all construction is complete before starting field tests.

3.5.1 Pre-Installation Tests

Perform the following tests on cable at the job site before it is removed from the cable reel. For cables with factory installed pulling eyes, these tests shall be performed at the factory and certified test results shall accompany the cable.

3.5.1.1 Cable Capacitance

Perform capacitance tests on at least 10 percent of the pairs within a cable to determine if cable capacitance is within the limits specified.

3.5.1.2 Loop Resistance

Perform DC-loop resistance on at least 10 percent of the pairs within a cable to determine if DC-loop resistance is within the manufacturer's calculated resistance.

3.5.1.3 Pre-Installation Test Results

Provide results of pre-installation tests to the Contracting Officer at least 5 working days before installation is to start. Results shall indicate reel number of the cable, manufacturer, size of cable, pairs tested, and recorded readings. When pre-installation tests indicate that cable does not meet specifications, remove cable from the job site.

3.5.2 Acceptance Tests

Perform acceptance testing in accordance with [RUS Bul 1753F-201](#) and as further specified in this section. Provide personnel, equipment, instrumentation, and supplies necessary to perform required testing. Notification of any planned testing shall be given to the Contracting Officer at least 14 days prior to any test unless specified otherwise. Testing shall not proceed until after the Contractor has received written Contracting Officer's approval of the test plans as specified. Test plans shall define the tests required to ensure that the system meets technical, operational, and performance specifications. The test plans shall define milestones for the tests, equipment, personnel, facilities, and supplies required. The test plans shall identify the capabilities and functions to be tested. Provide test reports in booklet form showing all field tests performed, upon completion and testing of the installed system. Measurements shall be tabulated on a pair by pair or strand by strand basis.

3.5.2.1 Copper Conductor Cable

Perform the following acceptance tests in accordance with [EIA TIA/EIA-758](#):

- a. Wire map (pin to pin continuity)
- b. Continuity to remote end
- c. Crossed pairs
- d. Reversed pairs
- e. Split pairs
- f. Shorts between two or more conductors

- g. Grounded pairs.

3.5.2.2 Fiber Optic Cable

Test fiber optic cable in accordance with [EIA TIA/EIA-455-B](#) and as further specified in this section. Two optical tests shall be performed on all optical fibers: Optical Time Domain Reflectometry (OTDR) Test, and Attenuation Test. In addition, a Bandwidth Test shall be performed on all multimode optical fibers. These tests shall be performed on the completed end-to-end spans which include the near-end pre-connectorized single fiber cable assembly, outside plant as specified, and the far-end pre-connectorized single fiber cable assembly.

- a. OTDR Test: The OTDR test shall be used to determine the adequacy of the cable installations by showing any irregularities, such as discontinuities, micro-bendings or improper splices for the cable span under test. Hard copy fiber signature records shall be obtained from the OTDR for each fiber in each span and shall be included in the test results. The OTDR test shall be measured in both directions. A reference length of fiber, 1000 feet minimum, used as the delay line shall be placed before the new end connector and after the far end patch panel connectors for inspection of connector signature. Conduct OTDR test and provide calculation or interpretation of results in accordance with [EIA TIA/EIA-526-7](#) for single-mode fiber and [EIA TIA/EIA-526-14A](#) for multimode fiber. Splice losses shall not exceed 0.3 db.
- b. Attenuation Test: End-to-end attenuation measurements shall be made on all fibers, in both directions, using a 850 and 1300 for 62.5 multi-mode fiber and 1310 and 1550 for single mode nanometer light source at one end and the optical power meter on the other end to verify that the cable system attenuation requirements are met in accordance with [EIA TIA/EIA-455-46A](#) for multimode and [EIA TIA/EIA-526-7](#) for single-mode fiber optic cables. The measurement method shall be in accordance with [EIA TIA/EIA-455-61A](#). Attenuation losses shall not exceed 0.5 db/km at 1310 nm and 1550 nm for single-mode fiber. Attenuation losses shall not exceed 5.0 db/km at 850 nm and 1.5 db/km at 1300 nm for multimode fiber.
- c. Bandwidth Test: The end-to-end bandwidth of all multimode fiber span links shall be measured by the frequency domain method. The bandwidth shall be measured in both directions on all fibers. The bandwidth measurements shall be in accordance with [EIA TIA/EIA-455-204](#).

-- End of Section --



Industrial Hygiene

Comprehensive Asbestos Survey

Maune Belangia Faulkenberry Architects, PA
MCAS New River - Bldg. AS302
Building AS-302
Camp Lejeune, NC <<SiteZip>>

Prepared By:

The EI Group, Inc. - Corporate Headquarters
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July 19, 2012

**COMPREHENSIVE
ASBESTOS SURVEY**

Conducted At:

**MCAS New River - Bldg. AS302
Building AS-302
Camp Lejeune, NC**

EI Project # IHMO120097.00

Prepared For:

Maune Belangia Faulkenberry Architects, PA
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July 19, 2012

Mr. Rohit Bali

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NC Asbestos Inspector Accreditation No. 12143



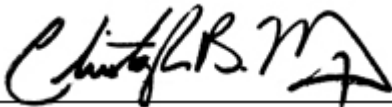
Asbestos Management Planner

SC Asbestos Management Planner Accreditation

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1.0 INTRODUCTION

A Comprehensive Asbestos Survey was conducted at MCAS New River - Bldg. AS302 located at Building AS-302, Camp Lejeune, NC. This survey was authorized by Bill Faulkenberry, Partner. The purpose of this assessment was to identify potential asbestos-containing materials (ACMs) located at the facility. A material is defined by the Environmental Protection Agency (EPA) to be asbestos containing if greater or equal to one percent ($\geq 1\%$) asbestos is detected in the sample.

Mr. Rohit Bali (NC Asbestos Inspector Accreditation No. 12143) of The EI Group, Inc. (EI) conducted the survey on July 10, 2012. Building components generally known to contain asbestos were identified and, where appropriate, sampled for transport to the laboratory. Suspect materials are typically grouped into two categories: friable (able to be crushed or pulverized by hand pressure) and non-friable. Additionally, those materials, which are typically non-friable in their normal usage, such as floor tile, may be considered potentially friable. This potential exists because materials may be subjected to mechanical abrasion activities (e.g. floor sanding and renovations) causing them to become friable. Such suspect materials and their typical application are identified in the EPA document entitled "Guidance for Controlling Asbestos-Containing Materials in Buildings, 1985 Edition."

Legislation has been promulgated by the Department of Labor - Occupational Safety and Health Administration (OSHA) regarding inspection of buildings for ACMs. According to regulations (29 CFR 1910.1001, 29 CFR 1926.1101), a material is presumed to contain asbestos, unless it has been demonstrated to be non-asbestos-containing through the performance of an asbestos survey. This survey, which includes sampling of suspect ACM, must be conducted in accordance with the Asbestos Hazard Emergency Response Act (40 CFR 763 AHERA) guidelines. A material may be considered non-asbestos-containing only if analytical results from the survey determine the presence of asbestos to be less than or equal to one percent ($\leq 1\%$) asbestos in the sampled material. These regulations apply to all buildings constructed prior to 1980.

Please note that while this survey is intended to be a comprehensive asbestos survey, it was not a destructive survey, as the facilities and equipment being surveyed were in use. Therefore, samples were collected in unobtrusive areas, and an effort was made to avoid damaging those building materials being sampled. In general, exterior building components including roofing materials were not sampled. However, suspect interior and exterior window caulking and door caulking was sampled. Fire doors and fire door casings were assumed to contain asbestos although they were not sampled. The quantities and locations of suspect asbestos containing fire doors/casings are included along with all other asbestos containing materials. Vibration dampers on interior heating, ventilation, and air conditioning (HVAC) units were assumed to contain asbestos and were not sampled to avoid impairing their function. Potential ACMs that were concealed inside walls and in other inaccessible areas may not have been identified nor sampled.

2.0 SCOPE OF SERVICES

A. Asbestos identification and quantification

1. Following thorough review of facility records, EI's EPA accredited and state licensed asbestos professionals collected samples of suspected asbestos containing material by 40 CFR 763.85 "AHERA" methodology from the facility. If a sample within a homogenous area or grouping was identified as asbestos containing (i.e. any detectable asbestos), the remaining samples within the same area or grouping were assumed to contain asbestos. Samples were analyzed by using the Positive Stop method. The Positive Stop method involves instructing the lab not to process any additional samples of a particular Asbestos-Containing material once a positive result is identified.
2. A minimum of two (2) samples were taken of each suspect material per the AHERA guidelines. Only patch areas may have less than two (2) samples taken.
 - a. AHERA guidelines require three (3) samples of surfacing materials such as plaster or spray-on fire proofing for areas measuring less than 1000 sq. ft.; five (5) samples for areas of suspect surfacing material measuring from 1001 sq. ft. to 5000 sq. ft.; and for areas measuring greater than 5000 sq. ft., a minimum of seven (7) samples are to be taken and analyzed to prove a material does not contain asbestos
 - b. Thermal System Insulation (TSI) includes pipe insulation, boiler insulation, tank insulation, any insulation and other insulation needed for heating/cooling processes. The AHERA guidelines require three (3) samples be taken and analyzed of each type, or size (homogenous areas) of TSI.
 - c. Miscellaneous materials are the third classification of ACM. These materials include vinyl composite tile and mastic, vinyl floor covering and mastic, wall board/joint compound, cementitious siding (transite), covebase and mastic, window caulking, roofing, ceiling tiles and other similar materials. EI sampled two (2) locations of each of these suspect materials. Fiberglass insulation was visually inspected and was not considered a suspect ACM. Therefore, bulk samples of fiberglass insulation were not collected or analyzed.
3. Samples were analyzed by polarized light microscopy by *EMSL*, a National Voluntary Laboratory Accredited Program (NVLAP) accredited and licensed laboratory. All samples were analyzed by using the Positive Stop method.
4. This report includes an identification of sampling locations and asbestos-containing material locations by homogeneous/area grouping.

3.0 METHODOLOGY

3.1 Sampling and Assessment Techniques

During the building inspection, each area of the facility was inspected and sampled according to homogeneous area. A material or area is considered homogeneous if it is consistent in size, texture, color, and application. All samples were taken in a randomly distributed manner, in areas of easy access, and in a quantity in accordance with EPA regulations. A total of sixty two (62) bulk samples were obtained for analysis from the facility. Photos are also provided for all homogeneous materials that have been sampled as well as damaged materials.

Table 1 provides a summary of the asbestos containing materials identified at the facility and presents each positive sample identification and location, a description of each homogeneous material (HGA) and area, the type and percent of asbestos present, and the quantity, friability, and physical condition of ACMs. A comprehensive list of each HGA is also provided in Appendix D of this report. Photos of each HGA and damaged HGA are in Appendix E and F respectively.

Table 5 provides a summary of all non-asbestos containing materials identified at the site. Suspect asbestos-containing material sample locations are shown in Figure 1. Asbestos-containing material locations are illustrated in Figure 2. The attached appendices include copies of field and laboratory data sheets, Chain of Custody documentation, and Inspector Licenses and Accreditations.

3.2 Laboratory Analysis

Each sample was individually sealed in plastic and submitted to EMSL, in Kenersville, NC under chain of custody for analysis. EMSL is accredited by the National Institute of Standards and Technology (NIST) for polarized light microscopy (PLM) analysis of asbestos in bulk materials and by the National Voluntary Laboratory Accreditation Program (NVLAP) at the time of the survey. Samples were analyzed by stereoscopic microscopy and PLM with dispersion staining techniques (EPA Interim Method for Determination of Asbestos in Bulk Materials, EPA-600/M4-82-020).

The EPA adopted the National Emission Standards for Hazardous Air Pollutants (NESHAP) policy on the analysis of multi-layered asbestos samples (40 CFR Part 61). This policy requires laboratories to prepare, analyze, and report, separately, each layer of a multi-layered sample. Any layer containing equal to or more than one percent ($\geq 1\%$) asbestos is declared a regulated ACM. An exception is made for joint compound, which may be composited with the accompanying drywall which is part of a wallboard system.

4.0 FINDINGS OF SURVEY

Table 1 - Asbestos Containing Materials

HGA No	Material Description	Location	Material Type	Material Status	Comment
02	Floor Tile - Brown – NCID*	42-56, 77, NCID	Miscellaneous	ACM	Lab Comment: Mastic
03	Floor Tile - Tan - Hallway 1*	1, 11, 12, 13, 14, 15, 16, 17, 18, 19, 2, 20, 27, 28, 29, 3, 30, 33, 34, 36, 37, 38, 4, 40, 41, 5, 59, 6, 60, 61, 62, 64, 65, 66, 67, 68, 69, 7, 70, 71, 72, 74, 75, 8, 9	Miscellaneous	ACM	Lab Comment: Mastic

Key: * - less than 1% ACM, Material Location: Room number 1-001=First Floor-Room Number 001
Material Type: TSI=Thermal System Insulation; Misc=Miscellaneous; Surf=Surfacing
Total Quantity: SF=Square Feet, LF=Linear Feet, Ea=Each

5.0 RESPONSE ACTIONS/RECOMMENDATIONS

When asbestos-containing materials are found in a building, there are five typical options available to the building owner. These options, which are commonly referred to as “response actions,” include:

1. **Removal/Abatement** - following all federal and state removal guidelines/regulations;
2. **Enclosure** - construction of an airtight barrier installed between the friable asbestos and the building environment;
3. **Encapsulation** - the application of a sprayed-on liquid, which surrounds or embeds the asbestos fibers in an adhesive matrix to prevent fiber release;
4. **Repair** - returning damaged asbestos-containing materials (ACMs) to an undamaged condition; and
5. The development of an **Operations & Maintenance Plan**. An O&M Plan details a program of training, cleaning, work practices, and periodic surveillance to maintain friable and/or non-friable ACMs in good condition, to ensure cleanup of asbestos fibers previously released, and to prevent further fiber release by minimizing and controlling ACM disturbance.

The following tables present those materials which meet the criteria for one of the recommended response actions described above.

Table 2: includes those Asbestos Containing Materials that are significantly damaged or damaged with a high potential for disturbance. These materials are recommended for abatement.

Table 3: includes those Asbestos Containing Materials that are damaged with a low to moderate potential for disturbance. These materials are recommended for repair and/or replacement.

Table 4: includes those Asbestos Containing Materials that are in good condition with a low to moderate potential for disturbance. These materials are recommended for inclusion in an Operations & Maintenance Plan (O&M).

Table 5: includes a comprehensive list of building materials sample at the site which were determined not to contain asbestos. These materials are non-ACM and do not require a response action. The field assessment, laboratory data and Chain of Custody documentation, and Inspector Licenses and Accreditations are in Appendix G, H and I respectively.

Table 2 – Asbestos Containing Material Recommended for **Removal / Abatement**

EI recommends that fair (damaged) or poor (significantly damaged) ACMs be abated immediately based upon the extent of damage that has occurred as they may pose a significant threat of asbestos exposure to human health and the environment if left unmanaged.

*Criteria for Removal / Abatement Recommendation: All Asbestos Containing Materials that are poor (significantly damaged) materials with a **low to high potential for disturbance** or fair (damaged) materials with a **high potential for disturbance**.*

No materials matched these criteria.

Table 3 – Asbestos Containing Materials which meet the Criteria for Repair

EI recommends that fair (damaged) ACMs, either friable or non-friable, be repaired and/or replaced based upon the extent of damage that has occurred. In the interim, some damaged materials can temporarily be managed under an O&M Plan until arrangements can be made to either remove or repair those materials.

*Criteria for Repair Recommendation: Asbestos Containing Materials that are fair (damaged) materials and have a **low to moderate potential for disturbance.***

No materials matched these criteria.

Table 4 – Asbestos Containing Material Recommended for Operations and Maintenance

EI recommends that ACMs in good condition be managed under an O&M Plan. All of these materials had less than 1% *Chrysotile* asbestos containing material. If ACMs will be disturbed by renovation/demolition activities, a licensed asbestos abatement contractor should remove them in accordance with current local, state, and federal regulations. Table 4 details those materials which may be included and managed in an O&M Plan.

Additionally, if the building is to be renovated or demolished, the owner must then adhere to local, state, and federal regulations regarding the disposal of asbestos-containing waste generated during renovation/demolition activities (National Emission Standards for Hazardous Air Pollutants, Section 40 CFR Part 61.150). According to Occupational Safety and Health Administration (OSHA) Construction Industry Standard (29 CFR 1926.1101), employees whose duties require contact with ACMs must be informed of the presence and location of these materials and instructed in the proper procedures for working with ACMs in order to prevent personnel exposure and property contamination.

Criteria for Operations and Maintenance Recommendation: Asbestos Containing Materials that are in good condition.

HGA No	Material Description	Location	Potential For Disturbance	Condition	Friable	Quantity
03	Floor Tile - Tan - Hallway 1	1	Low	Good	No	112 SF
03	Floor Tile - Tan - Hallway 1	11	Low	Good	No	264 SF
03	Floor Tile - Tan - Hallway 1	12	Low	Good	No	224 SF
03	Floor Tile - Tan - Hallway 1	13	Low	Good	No	96 SF
03	Floor Tile - Tan - Hallway 1	14	Low	Good	No	120 SF
03	Floor Tile - Tan - Hallway 1	15	Low	Good	No	100 SF
03	Floor Tile - Tan - Hallway 1	16	Low	Good	No	420 SF
03	Floor Tile - Tan - Hallway 1	17	Low	Good	No	108 SF
03	Floor Tile - Tan - Hallway 1	18	Low	Good	No	48 SF
03	Floor Tile - Tan - Hallway 1	19	Low	Good	No	80 SF
03	Floor Tile - Tan - Hallway 1	2	Low	Good	No	112 SF
03	Floor Tile - Tan - Hallway 1	20	Low	Good	No	80 SF
03	Floor Tile - Tan - Hallway 1	27	Low	Good	No	110 SF
03	Floor Tile - Tan - Hallway 1	28	Low	Good	No	40 SF
03	Floor Tile - Tan - Hallway 1	29	Low	Good	No	120 SF
03	Floor Tile - Tan - Hallway 1	3	Low	Good	No	32 SF
03	Floor Tile - Tan - Hallway 1	30	Low	Good	No	66 SF
03	Floor Tile - Tan - Hallway 1	33	Low	Good	No	88 SF
03	Floor Tile - Tan - Hallway 1	34	Low	Good	No	120 SF

03	Floor Tile - Tan - Hallway 1	36	Low	Good	No	48 SF
03	Floor Tile - Tan - Hallway 1	37	Low	Good	No	48 SF
03	Floor Tile - Tan - Hallway 1	38	Low	Good	No	88 SF
03	Floor Tile - Tan - Hallway 1	4	Low	Good	No	24 SF
03	Floor Tile - Tan - Hallway 1	40	Low	Good	No	66 SF
03	Floor Tile - Tan - Hallway 1	41	Low	Good	No	132 SF
02	Floor Tile - Brown - NCID	42-56, 77	Low	Good	No	10176 SF
03	Floor Tile - Tan - Hallway 1	5	Low	Good	No	112 SF
03	Floor Tile - Tan - Hallway 1	59	Low	Good	No	130 SF
03	Floor Tile - Tan - Hallway 1	6	Low	Good	No	192 SF
03	Floor Tile - Tan - Hallway 1	60	Low	Good	No	130 SF
03	Floor Tile - Tan - Hallway 1	61	Low	Good	No	120 SF
03	Floor Tile - Tan - Hallway 1	62	Low	Good	No	160 SF
03	Floor Tile - Tan - Hallway 1	64	Low	Good	No	80 SF
03	Floor Tile - Tan - Hallway 1	65	Low	Good	No	256 SF
03	Floor Tile - Tan - Hallway 1	66	Low	Good	No	80 SF
03	Floor Tile - Tan - Hallway 1	67	Low	Good	No	160 SF
03	Floor Tile - Tan - Hallway 1	68	Low	Good	No	200 SF
03	Floor Tile - Tan - Hallway 1	69	Low	Good	No	200 SF
03	Floor Tile - Tan - Hallway 1	7	Low	Good	No	96 SF
03	Floor Tile - Tan - Hallway 1	70	Low	Good	No	100 SF
03	Floor Tile - Tan - Hallway 1	71	Low	Good	No	100 SF
03	Floor Tile - Tan - Hallway 1	72	Low	Good	No	200 SF
03	Floor Tile - Tan - Hallway 1	74	Low	Good	No	340 SF
03	Floor Tile - Tan - Hallway 1	75	Low	Good	No	340 SF
03	Floor Tile - Tan - Hallway 1	8	Low	Good	No	144 SF
03	Floor Tile - Tan - Hallway 1	9	Low	Good	No	120 SF
02	Floor Tile - Brown - NCID	NCID	Low	Good	No	2000 SF

APPENDICES

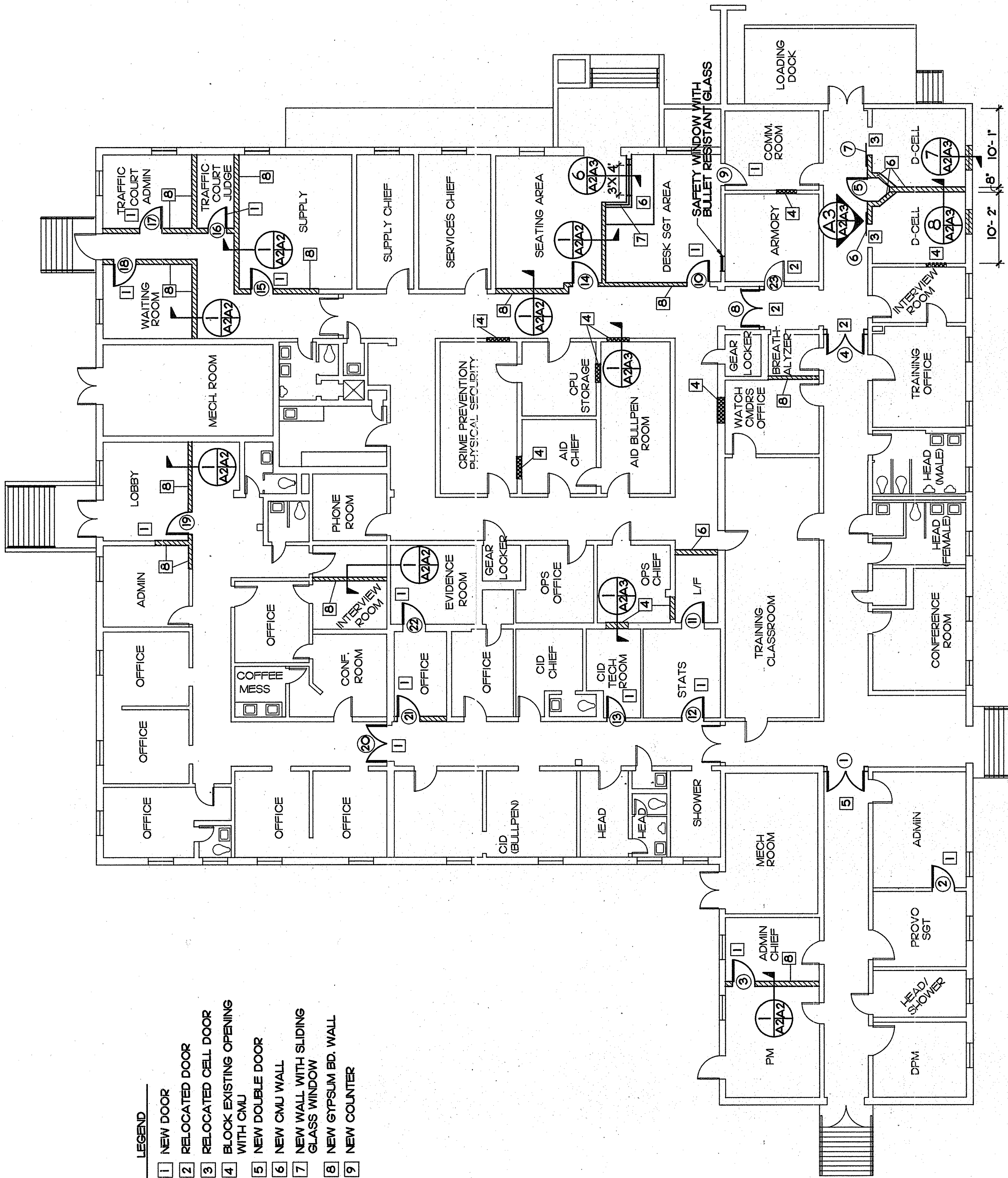
APPENDIX A

FIGURE 1

SUSPECT ASBESTOS-CONTAINING MATERIAL SAMPLE LOCATIONS

LEGEND

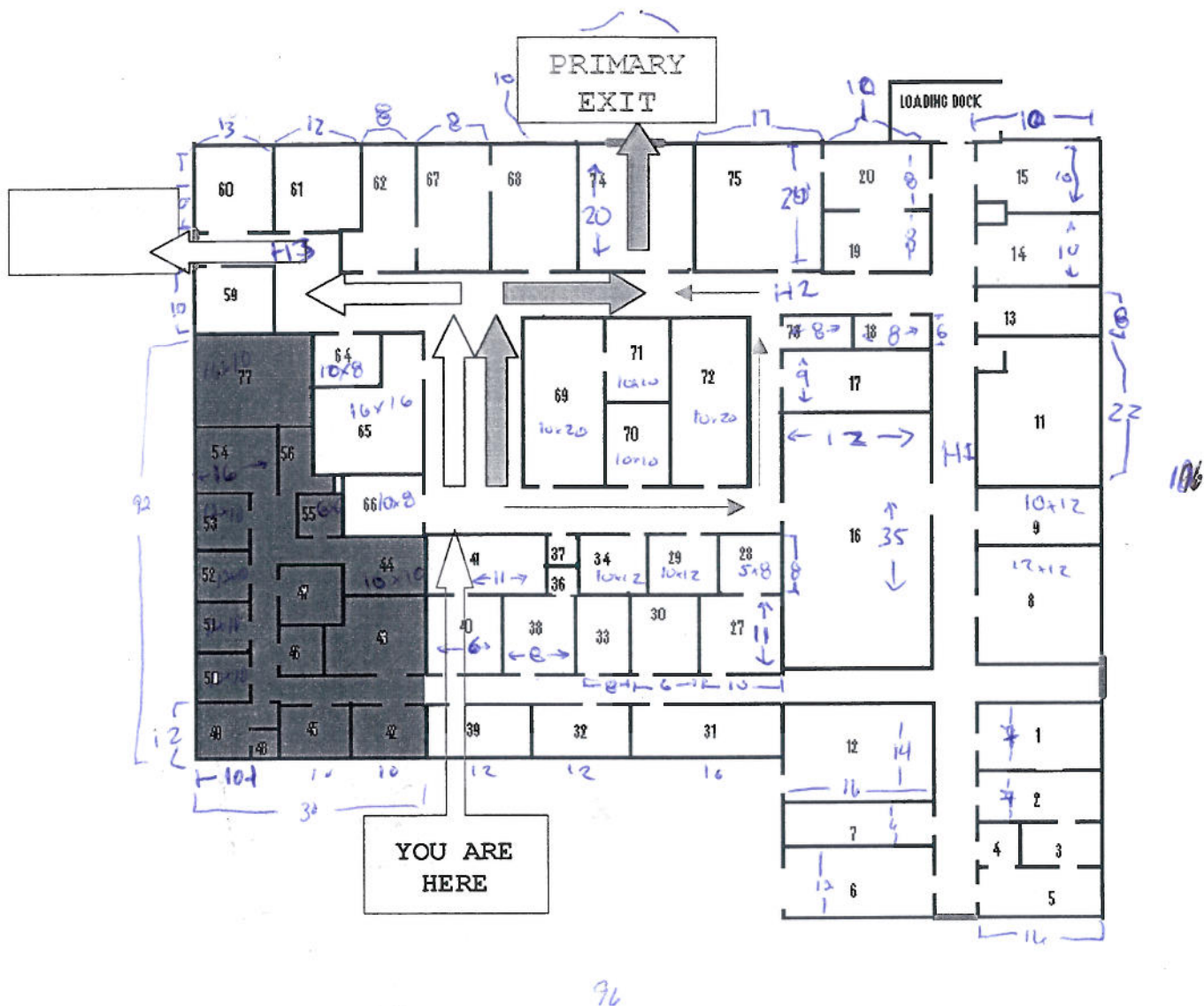
- 1 NEW DOOR
- 2 RELOCATED DOOR
- 3 RELOCATED CELL DOOR
- 4 BLOCK EXISTING OPENING WITH CMU
- 5 NEW DOUBLE DOOR
- 6 NEW CMU WALL
- 7 NEW WALL WITH SLIDING GLASS WINDOW
- 8 NEW GYPSUM BD. WALL
- 9 NEW COUNTER



APPENDIX B

FIGURE 2

ASBESTOS-CONTAINING MATERIAL LOCATIONS



- PRIMARY EXIT
- ALTERNATE EXIT

FIRE EVACUATION PLAN

APPENDIX C

TABLE 5 - NON-ASBESTOS-CONTAINING MATERIALS



Non Asbestos-Containing Materials

Project Number: IHMO120097.00

Site Name: MCAS New River - Bldg. AS302

HGA No	Material Description	Location	Type	Quantity
01	Floor Tile - Pink - Hallway 1	hallway	Miscellaneous	1600 SF
04	Wallboard and Joint Compound	1-9, 11-20, 59-62, 64-72, 74	Miscellaneous	3810 SF
05	Floor Tile - Grey Swirl	hallway 2	Miscellaneous	200 SF
06	Floor Tile - Brown	59	Miscellaneous	130 SF
07	Ceiling Tile	27-41, throughout	Miscellaneous	11509 SF
08	Carpet Mastic	1-9, 11-20, 27-41, 59-62, 64-72, 74	Miscellaneous	4790 SF
09	3" Covebase - Black	1-9, 11-20, 27-41, 59-62, 64-72, 74	Miscellaneous	514 LF
10	3" Covebase - Brown	34, 75	Miscellaneous	150 LF
11	3" Pipe Insulation - NCID	42-56, 77	TSI	200 LF
12	6" Pipe Insulation	42-56, 77	TSI	200 LF
13	Exterior Window Caulk	Exterior	Miscellaneous	300 LF
14	Roof-Asphalt Shingles	Exterior	Miscellaneous	10176 SF

APPENDIX D

LIST OF HOMOGENEOUS MATERIALS



Homogeneous Materials

Project Number: IHMO120097.00

Site Name: MCAS New River - Bldg. AS302

HGA No	Material Description	Material Type	Comment
01	Floor Tile - Pink - Hallway 1	Miscellaneous	None
02	Floor Tile - Brown - NCID	Miscellaneous	None
03	Floor Tile - Tan - Hallway 1	Miscellaneous	None
04	Wallboard and Joint Compound	Miscellaneous	None
05	Floor Tile - Grey Swirl	Miscellaneous	None
06	Floor Tile - Brown	Miscellaneous	None
07	Ceiling Tile	Miscellaneous	None
08	Carpet Mastic	Miscellaneous	None
09	3" Covebase - Black	Miscellaneous	Telephone Rm, Security Office
10	3" Covebase - Brown	Miscellaneous	None
11	3" Pipe Insulation - NCID	TSI	None
12	6" Pipe Insulation	TSI	None
13	Exterior Window Caulk	Miscellaneous	None
14	Roof-Asphalt Shingles	Miscellaneous	None

APPENDIX E

FIELD ASSESSMENT SHEET(S)



Field Assessment

Project Number: IHMO120097.00
 Site Name: MCAS New River - Bldg. AS302

Room	HGA No	Material Description	Friable	Condition	Potential For Disturbance	Quantity
1	03	Floor Tile - Tan - Hallway 1	No	Good	Low	112 SF
1-9	04	Wallboard and Joint Compound	No	Good	Low	1160 SF
1-9	08	Carpet Mastic	No	Good	Low	1160 SF
1-9	09	3" Covebase - Black	No	Good	Low	116 LF
11	03	Floor Tile - Tan - Hallway 1	No	Good	Low	264 SF
11-20	04	Wallboard and Joint Compound	No	Good	Low	1280 SF
11-20	08	Carpet Mastic	No	Good	Low	1280 SF
11-20	09	3" Covebase - Black	No	Good	Low	128 LF
12	03	Floor Tile - Tan - Hallway 1	No	Good	Low	224 SF
13	03	Floor Tile - Tan - Hallway 1	No	Good	Low	96 SF
14	03	Floor Tile - Tan - Hallway 1	No	Good	Low	120 SF
15	03	Floor Tile - Tan - Hallway 1	No	Good	Low	100 SF
16	03	Floor Tile - Tan - Hallway 1	No	Good	Low	420 SF
17	03	Floor Tile - Tan - Hallway 1	No	Good	Low	108 SF
18	03	Floor Tile - Tan - Hallway 1	No	Good	Low	48 SF
19	03	Floor Tile - Tan - Hallway 1	No	Good	Low	80 SF
2	03	Floor Tile - Tan - Hallway 1	No	Good	Low	112 SF
20	03	Floor Tile - Tan - Hallway 1	No	Good	Low	80 SF
27	03	Floor Tile - Tan - Hallway 1	No	Good	Low	110 SF
27-41	07	Ceiling Tile	No	Good	Low	1333 SF
27-41	08	Carpet Mastic	No	Good	Low	1333 SF
27-41	09	3" Covebase - Black	No	Good	Low	133 LF

28	03	Floor Tile - Tan - Hallway 1	No	Good	Low	40 SF
29	03	Floor Tile - Tan - Hallway 1	No	Good	Low	120 SF
3	03	Floor Tile - Tan - Hallway 1	No	Good	Low	32 SF
30	03	Floor Tile - Tan - Hallway 1	No	Good	Low	66 SF
33	03	Floor Tile - Tan - Hallway 1	No	Good	Low	88 SF
34	03	Floor Tile - Tan - Hallway 1	No	Good	Low	120 SF
34	10	3" Covebase - Brown	No	Good	Low	75 LF
36	03	Floor Tile - Tan - Hallway 1	No	Good	Low	48 SF
37	03	Floor Tile - Tan - Hallway 1	No	Good	Low	48 SF
38	03	Floor Tile - Tan - Hallway 1	No	Good	Low	88 SF
4	03	Floor Tile - Tan - Hallway 1	No	Good	Low	24 SF
40	03	Floor Tile - Tan - Hallway 1	No	Good	Low	66 SF
41	03	Floor Tile - Tan - Hallway 1	No	Good	Low	132 SF
42-56, 77	02	Floor Tile - Brown - NCID	No	Good	Low	10176 SF
42-56, 77	11	3" Pipe Insulation - NCID	No	Good	Low	200 LF
42-56, 77	12	6" Pipe Insulation	No	Good	Low	200 LF
5	03	Floor Tile - Tan - Hallway 1	No	Good	Low	112 SF
59	03	Floor Tile - Tan - Hallway 1	No	Good	Low	130 SF
59	06	Floor Tile - Brown	No	Good	Low	130 SF
59-62	04	Wallboard and Joint Compound	No	Good	Low	530 SF
59-62	08	Carpet Mastic	No	Good	Low	185 SF
59-62	09	3" Covebase - Black	No	Good	Low	53 LF
6	03	Floor Tile - Tan - Hallway 1	No	Good	Low	192 SF
60	03	Floor Tile - Tan - Hallway 1	No	Good	Low	130 SF
61	03	Floor Tile - Tan - Hallway 1	No	Good	Low	120 SF
62	03	Floor Tile - Tan - Hallway 1	No	Good	Low	160 SF
64	03	Floor Tile - Tan - Hallway 1	No	Good	Low	80 SF
64-72, 74	04	Wallboard and Joint Compound	No	Good	Low	840 SF
64-72, 74	08	Carpet Mastic	No	Good	Low	832 SF
64-72, 74	09	3" Covebase - Black	No	Good	Low	84 LF
65	03	Floor Tile - Tan - Hallway 1	No	Good	Low	256 SF
66	03	Floor Tile - Tan - Hallway 1	No	Good	Low	80 SF
67	03	Floor Tile - Tan - Hallway 1	No	Good	Low	160 SF
68	03	Floor Tile - Tan - Hallway 1	No	Good	Low	200 SF
69	03	Floor Tile - Tan - Hallway 1	No	Good	Low	200 SF
7	03	Floor Tile - Tan - Hallway 1	No	Good	Low	96 SF
70	03	Floor Tile - Tan - Hallway 1	No	Good	Low	100 SF
71	03	Floor Tile - Tan - Hallway 1	No	Good	Low	100 SF

72	03	Floor Tile - Tan - Hallway 1	No	Good	Low	200 SF
74	03	Floor Tile - Tan - Hallway 1	No	Good	Low	340 SF
75	03	Floor Tile - Tan - Hallway 1	No	Good	Low	340 SF
75	10	3" Covebase - Brown	No	Good	Low	75 LF
8	03	Floor Tile - Tan - Hallway 1	No	Good	Low	144 SF
9	03	Floor Tile - Tan - Hallway 1	No	Good	Low	120 SF
Exterior	13	Exterior Window Caulk	No	Good	Low	300 LF
Exterior	14	Roof-Asphalt Shingles	No	Good	Low	10176 SF
hallway	01	Floor Tile - Pink - Hallway 1	No	Good	Low	100 SF
hallway	01	Floor Tile - Pink - Hallway 1	No	Good	Low	1500 SF
hallway 2	05	Floor Tile - Grey Swirl	No	Good	Low	200 SF
NCID	02	Floor Tile - Brown - NCID	No	Good	Low	2000 SF
throughout	07	Ceiling Tile	No	Good	Low	10176 SF

APPENDIX F

LABORATORY ANALYTICAL REPORTS



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Received: 07/12/12 8:30 AM
Analysis Date: 7/12/2012
Collected:

Project: **IHMO120097.00**

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
AS302-01-Floor Tile 291203477-0001	FT - Pink - Hallway 1	Pink Fibrous Heterogeneous	2%	Cellulose	98% Non-fibrous (other) None Detected
AS302-01-Mastic 291203477-0001A	FT - Pink - Hallway 1	Tan Fibrous Heterogeneous	5%	Cellulose	95% Non-fibrous (other) None Detected
AS302-02-Floor Tile 291203477-0002	FT - Pink - Hallway 2	Beige Fibrous Heterogeneous	5%	Cellulose	95% Non-fibrous (other) None Detected
AS302-02-Mastic 291203477-0002A	FT - Pink - Hallway 2	Tan Fibrous Heterogeneous	5%	Cellulose	95% Non-fibrous (other) None Detected
AS302-03-Floor Tile 291203477-0003	FT - Pink - Hallway 1	Gray Non-Fibrous Heterogeneous			100% Non-fibrous (other) None Detected
AS302-03-Mastic 291203477-0003A	FT - Pink - Hallway 1	Tan Fibrous Heterogeneous	2%	Cellulose	98% Non-fibrous (other) None Detected
AS302-04-Floor Tile 291203477-0004	FT - Brown - NCID	Beige Fibrous Heterogeneous	5%	Cellulose	95% Non-fibrous (other) None Detected
AS302-04-Mastic 291203477-0004A	FT - Brown - NCID	Tan Fibrous Heterogeneous	5% 2%	Cellulose Wollastonite	93% Non-fibrous (other) <1% Chrysotile

Analyst(s)

Billy Barnes (15)

Essie Spencer (47)

Essie Spencer, Laboratory Manager
or other approved signatory

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Initial report from 07/12/2012 15:37:31



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Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
AS302-05-Floor Tile 291203477-0005	FT - Brown - NCID	Tan Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
AS302-05-Mastic 291203477-0005A	FT - Brown - NCID	Tan/Black Fibrous Heterogeneous	3% Cellulose 2% Wollastonite	95% Non-fibrous (other)	<1% Chrysotile
AS302-06-Floor Tile 291203477-0006	FT - Brown - NCID	Gray Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
AS302-06-Mastic 291203477-0006A	FT - Brown - NCID	Tan Fibrous Heterogeneous	<1% Cellulose	100% Non-fibrous (other)	None Detected
AS302-07-Floor Tile 291203477-0007	FT - Tan - Hallway 1	Beige Fibrous Heterogeneous	2% Cellulose	98% Non-fibrous (other)	None Detected
AS302-07-Mastic 291203477-0007A	FT - Tan - Hallway 1	Tan/Black Fibrous Heterogeneous	2% Cellulose	98% Non-fibrous (other)	<1% Chrysotile
AS302-08-Floor Tile 291203477-0008	FT - Tan - Hallway 2	White/Beige Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (other)	None Detected
AS302-08-Mastic 291203477-0008A	FT - Tan - Hallway 2	Tan Fibrous Heterogeneous	2% Cellulose	98% Non-fibrous (other)	<1% Chrysotile

Analyst(s)
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Essie Spencer (47)


Essie Spencer, Laboratory Manager
or other approved signatory

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Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
AS302-09-Floor Tile 291203477-0009	FT - Tan - Hallway 3	Tan Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
AS302-09-Mastic 291203477-0009A	FT - Tan - Hallway 3	Tan Fibrous Heterogeneous	2% Cellulose	98% Non-fibrous (other)	None Detected
AS302-10 291203477-0010	Wallboard & Joint Compound	Brown/White Fibrous Heterogeneous	25% Cellulose 5% Glass	70% Non-fibrous (other)	None Detected
This is a composite result of wallboard, jt. compound, and tape.					
AS302-11 291203477-0011	Wallboard & Joint Compound	Brown/Tan/White Fibrous Heterogeneous	25% Cellulose 3% Glass 2% Wollastonite	70% Non-fibrous (other)	None Detected
AS302-12 291203477-0012	Wallboard & Joint Compound	White Fibrous Heterogeneous	20% Cellulose 2% Glass	78% Non-fibrous (other)	None Detected
This is a composite result of wallboard, jt. compound, and tape.					
AS302-13 291203477-0013	Wallboard & Joint Compound	Brown/Tan/White Fibrous Heterogeneous	15% Cellulose 10% Glass <1% Wollastonite	75% Non-fibrous (other)	None Detected
This is a composite result of wallboard, jt. compound, and tape.					
AS302-14 291203477-0014	Wallboard & Joint Compound	Brown/White Fibrous Heterogeneous	10% Cellulose <1% Wollastonite	90% Non-fibrous (other)	None Detected
This is a composite result of wallboard, jt. compound, and tape.					

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Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
AS302-15 291203477-0015	FT - Grey Swirl - Rm 66	Gray/White Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
AS302-16 291203477-0016	FT - Grey Swirl - Rm 15	Gray/White Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
AS302-17 291203477-0017	FT - Grey Swirl - Rm 8	Gray Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected
AS302-18-Floor Tile 291203477-0018	FT - Brown	Brown/Beige Fibrous Heterogeneous	5% Cellulose	95% Non-fibrous (other)	None Detected
AS302-18-Mastic 291203477-0018A	FT - Brown	Brown/Black Fibrous Heterogeneous	5% Cellulose	95% Non-fibrous (other)	None Detected
AS302-19-Floor Tile 291203477-0019	FT - Brown	Gray/Beige Fibrous Heterogeneous	2% Cellulose	98% Non-fibrous (other)	None Detected
AS302-19-Mastic 291203477-0019A	FT - Brown	Tan/Black Fibrous Heterogeneous	5% Cellulose	95% Non-fibrous (other)	None Detected
AS302-20-Floor Tile 291203477-0020	FT - Brown	Brown Non-Fibrous Heterogeneous		100% Non-fibrous (other)	None Detected

Analyst(s)
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Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
AS302-20-Mastic 291203477-0020A	FT - Brown	Tan Fibrous Heterogeneous	<1%	Cellulose	100% Non-fibrous (other) None Detected
AS302-21 291203477-0021	Ceiling Tile	White/Beige Fibrous Heterogeneous	40%	Cellulose 20% Min. Wool	20% Non-fibrous (other) 20% Perlite None Detected
AS302-22 291203477-0022	Ceiling Tile	Gray/White Fibrous Heterogeneous	40%	Cellulose 20% Min. Wool	20% Non-fibrous (other) 20% Perlite None Detected
AS302-23 291203477-0023	Ceiling Tile	White/Beige Fibrous Heterogeneous	40%	Cellulose 20% Min. Wool	20% Non-fibrous (other) 20% Perlite None Detected
AS302-24 291203477-0024	Ceiling Tile	Brown/Black Fibrous Heterogeneous	5%	Cellulose	95% Non-fibrous (other) None Detected
AS302-25 291203477-0025	Ceiling Tile	Brown Fibrous Heterogeneous	3%	Cellulose	97% Non-fibrous (other) None Detected
AS302-26 291203477-0026	Ceiling Tile	Yellow Fibrous Heterogeneous	3%	Cellulose	97% Non-fibrous (other) None Detected
AS302-27-Cove Base 291203477-0027	Yellow Carpet Mastic	Black Non-Fibrous Homogeneous			100% Non-fibrous (other) None Detected

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Project: **IHMO120097.00**

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Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
AS302-27-Mastic 291203477-0027A	Yellow Carpet Mastic	Tan/White Fibrous Heterogeneous	5% Cellulose	95% Non-fibrous (other)	None Detected
AS302-28-Cove Base 291203477-0028	Yellow Carpet Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
AS302-28-Mastic 291203477-0028A	Yellow Carpet Mastic	Tan/White Fibrous Heterogeneous	10% Cellulose	90% Non-fibrous (other)	None Detected
AS302-29-Cove Base 291203477-0029	Yellow Carpet Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
AS302-29-Mastic 291203477-0029A	Yellow Carpet Mastic	Tan Fibrous Heterogeneous	2% Cellulose	98% Non-fibrous (other)	None Detected
AS302-30-Cove Base 291203477-0030	3" Black Cove Base	Brown Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
AS302-30-Mastic 291203477-0030A	3" Black Cove Base	White/Beige Fibrous Heterogeneous	15% Cellulose	85% Non-fibrous (other)	None Detected

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Essie Spencer, Laboratory Manager
or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. Morrisville, NC NVLAP Lab Code 200671-0, VA 3333 000278, WVA LT000296

Initial report from 07/12/2012 15:37:31



EMSL Analytical, Inc.

2500 Gateway Centre Blvd., Suite 600, Morrisville, NC 27560

Phone/Fax: (919) 465-3900 / (919) 465-3950

<http://www.emsl.com>

raleighlab@emsl.com

EMSL Order: 291203477

CustomerID: ENVI67

CustomerPO:

ProjectID:

Attn: **Rohit Bali**
The EI Group, Inc.
2101 Gateway Centre Blvd, Suite 200
Morrisville, NC 27560

Phone: (919) 657-7500
Fax: (919) 657-7551
Received: 07/12/12 8:30 AM
Analysis Date: 7/12/2012
Collected:

Project: **IHMO120097.00**

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
AS302-31-Cove Base 291203477-0031	3" Black Cove Base	Brown Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
AS302-31-Mastic 291203477-0031A	3" Black Cove Base	Tan/White Fibrous Heterogeneous	15% Cellulose	85% Non-fibrous (other)	None Detected
AS302-32-Cove Base 291203477-0032	3" Black Cove Base	Brown Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
AS302-32-Mastic 291203477-0032A	3" Black Cove Base	Tan/White Fibrous Heterogeneous	15% Cellulose	85% Non-fibrous (other)	None Detected
AS302-33 291203477-0033	3" Pipe Insulation	White/Black Fibrous Heterogeneous	25% Glass 10% Cellulose	65% Non-fibrous (other)	None Detected
AS302-34 291203477-0034	3" Pipe Insulation	White/Black Fibrous Heterogeneous	25% Glass 10% Cellulose	65% Non-fibrous (other)	None Detected
AS302-35 291203477-0035	3" Pipe Insulation	White/Black Fibrous Heterogeneous	20% Cellulose 20% Glass	60% Non-fibrous (other)	None Detected
AS302-36 291203477-0036	6" Pipe Insulation	White/Black Fibrous Heterogeneous	25% Glass	75% Non-fibrous (other)	None Detected

Analyst(s)

Billy Barnes (15)
Essie Spencer (47)

Essie Spencer, Laboratory Manager
or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. Morrisville, NC NVLAP Lab Code 200671-0, VA 3333 000278, WVA LT000296

Initial report from 07/12/2012 15:37:31



EMSL Analytical, Inc.

2500 Gateway Centre Blvd., Suite 600, Morrisville, NC 27560
Phone/Fax: (919) 465-3900 / (919) 465-3950
<http://www.emsl.com> raleighlab@emsl.com

EMSL Order: 291203477
CustomerID: ENVI67
CustomerPO:
ProjectID:

Attn: **Rohit Bali**
The EI Group, Inc.
2101 Gateway Centre Blvd, Suite 200
Morrisville, NC 27560


Phone: (919) 657-7500
Fax: (919) 657-7551
Received: 07/12/12 8:30 AM
Analysis Date: 7/12/2012
Collected:

Project: **IHMO120097.00**

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
AS302-37 291203477-0037	6" Pipe Insulation	White/Black Fibrous Heterogeneous	25% Glass	75% Non-fibrous (other)	None Detected
AS302-38 291203477-0038	6" Pipe Insulation	White Fibrous Heterogeneous	25% Glass	75% Non-fibrous (other)	None Detected
AS302-39 291203477-0039	Exterior Window Caulk	Tan/White Fibrous Heterogeneous	3% Cellulose	97% Non-fibrous (other)	None Detected
AS302-40 291203477-0040	Exterior Window Caulk	Tan/White Fibrous Heterogeneous	3% Cellulose	97% Non-fibrous (other)	None Detected
AS302-41 291203477-0041	Exterior Window Caulk	Tan/White Fibrous Heterogeneous	2% Cellulose	98% Non-fibrous (other)	None Detected
AS302-42 291203477-0042	Roof - Asphalt Shingles	Brown/Black Fibrous Heterogeneous	25% Cellulose 10% Glass	65% Non-fibrous (other)	None Detected
AS302-43 291203477-0043	Roof - Asphalt Shingles	Black Fibrous Heterogeneous	20% Cellulose 10% Glass	70% Non-fibrous (other)	None Detected
AS302-44 291203477-0044	Roof - Asphalt Shingles	Black Fibrous Heterogeneous	8% Glass	92% Non-fibrous (other)	None Detected

Analyst(s)
Billy Barnes (15)
Essie Spencer (47)


Essie Spencer, Laboratory Manager
or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. Morrisville, NC NVLAP Lab Code 200671-0, VA 3333 000278, WVA LT000296

Initial report from 07/12/2012 15:37:31

The EI Group, Inc.
IHMO120097.00
7/12/2012 8:30
PLM

TAT: 24 Hour
Bulk

Order ID: 291203477
No Samples: 44
Due: 07/13 8:30 AM
Fax: 919-657-7551

Morrisville, NC 27560
PHONE: 919-465-3900
FAX: 919-465-3950

Company: The EI Group		EMSL-Bill to: <input checked="" type="checkbox"/> Same <input type="checkbox"/> Different If Bill to is Different note instructions in Comments**
Street: 2101 Gateway Centre Blvd Suite 200		Third Party Billing requires written authorization from third party
City/State/Zip: Morrisville, NC 27560		
Report To (Name): Allison Allen <i>Robert Bali</i>	Fax: 919-657-7551	
Telephone: 919-657-7500	Email Address: aallen@ei1.com	
Project Name/Number: IHMO120097.00		
Please Provide Results: Email	Purchase Order:	State Samples Taken: NC

Turnaround Time (TAT) Options* - Please Check

3 Hour
 6 Hour
 24 Hour
 48 Hour
 72 Hour
 96 Hour
 1 Week
 2 Week

*For TEM Air 3 hours/6 hours, please call ahead to schedule. *There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.

PCM - Air <input type="checkbox"/> NIOSH 7400 <input type="checkbox"/> w/ OSHA 8hr. TWA PLM - Bulk (reporting limit) <input checked="" type="checkbox"/> PLM EPA 600/R-93/116 (<1%) <input type="checkbox"/> PLM EPA NOB (<1%) Point Count <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%) Point Count w/Gravimetric <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%) <input type="checkbox"/> NYS 198.1 (friable in NY) <input type="checkbox"/> NYS 198.6 NOB (non-friable-NY) <input type="checkbox"/> NIOSH 9002 (<1%)	TEM - Air <input type="checkbox"/> 4-4.5hr TAT (AHERA only) <input type="checkbox"/> AHERA 40 CFR, Part 763 <input type="checkbox"/> NIOSH 7402 <input type="checkbox"/> EPA Level II <input type="checkbox"/> ISO 10312 TEM - Bulk <input type="checkbox"/> TEM EPA NOB <input type="checkbox"/> NYS NOB 198.4 (non-friable-NY) <input type="checkbox"/> Chatfield SOP <input type="checkbox"/> TEM Mass Analysis-EPA 600 sec. 2.5 TEM - Water: EPA 100.2 Fibers >10µm <input type="checkbox"/> Waste <input type="checkbox"/> Drinking All Fiber Sizes <input type="checkbox"/> Waste <input type="checkbox"/> Drinking	TEM- Dust <input type="checkbox"/> Microvac - ASTM D 5755 <input type="checkbox"/> Wipe - ASTM D6480 <input type="checkbox"/> Carpet Sonication (EPA 600/J-93/167) Soil/Rock/Vermiculite <input type="checkbox"/> PLM CARB 435 - A (0.25% sensitivity) <input type="checkbox"/> PLM CARB 435 - B (0.1% sensitivity) <input type="checkbox"/> TEM CARB 435 - B (0.1% sensitivity) <input type="checkbox"/> TEM CARB 435 - C (0.01% sensitivity) <input type="checkbox"/> EPA Protocol (Semi-Quantitative) <input type="checkbox"/> EPA Protocol (Quantitative) Other: <input type="checkbox"/>
---	--	--

Check For Positive Stop - Clearly Identify Homogenous Group

Samplers Name: *Robert Bali* Samplers Signature: *Robert Bali*

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
	<i>sent via eLOC on 7-12-12</i>		

Client Sample # (s): *A5302-01* *- A5302-44* Total # of Samples: *44*

Relinquished (Client): *Robert Bali* Date: *7-12-12* Time: *8:30am*

Received (Lab): *[Signature]* Date: *7-12-12* Time: *8:50*

Comments/Special Instructions:

The El Group, Inc.
 2101 Gateway Centre Blvd.
 Suite 200
 Morrisville, NC
 Rohit Bali
 Project Number: IHMO120097.00

SAMPLE #	SAMPLE DESCRIPTION
AS302-01	FT- Pink - Hallway 1
AS302-02	FT- Pink - Hallway 2
AS302-03	FT- Pink - Hallway 1
AS302-04	FT-Brown - NCID
AS302-05	FT-Brown - NCID
AS302-06	FT-Brown - NCID
AS302-07	FT-Tan-Hallway 1
AS302-08	FT-Tan-Hallway 2
AS302-09	FT-Tan-Hallway 3
AS302-10	Wallboard and joint compound
AS302-11	Wallboard and joint compound
AS302-12	Wallboard and joint compound
AS302-13	Wallboard and joint compound
AS302-14	Wallboard and joint compound
AS302-15	FT-Grey Swirl-Rm 66
AS302-16	FT-Grey Swirl-Rm 15
AS302-17	FT-Grey Swirl-Rm 8
AS302-18	FT-Brown
AS302-19	FT-Brown
AS302-20	FT-Brown
AS302-21	Ceiling Tile
AS302-22	Ceiling Tile
AS302-23	Ceiling Tile
AS302-24	Yellow carpet mastic
AS302-25	Yellow carpet mastic
AS302-26	Yellow carpet mastic
AS302-27	3" black cove base
AS302-28	3" black cove base
AS302-29	3" black cove base
AS302-30	3" brown cove base
AS302-31	3" brown cove base
AS302-32	3" brown cove base
AS302-33	3 inch pipe insulation
AS302-34	3 inch pipe insulation
AS302-35	3 inch pipe insulation
AS302-36	6 inch pipe insulation
AS302-37	6 inch pipe insulation
AS302-38	6 inch pipe insulation
AS302-39	Exterior window caulk

The El Group, Inc.
 IHMO120097.00
 7/12/2012 8:30
 PLM

TAT: 24 Hour
 Bulk

Order ID: 291203477
 No Samples: 44
 Due: 07/13 8:30 AM
 Fax: 919-657-7551

See 7/12/12 8:30am

AS302-40	Exterior window caulk
AS302-41	Exterior window caulk
AS302-42	Roof-asphalt shingles
AS302-43	Roof-asphalt shingles
AS302-44	Roof-asphalt shingles

The El Group, Inc.
IHM0120097.00
7/12/2012 8:30
PLM

TAT: 24 Hour
Bulk

Order ID: 291203477
No Samples: 44
Due: 07/13 8:30 AM
Fax: 919-657-7551

Pl 7/12/12 8:30 a

APPENDIX G
LICENSES AND ACCREDITATIONS



North Carolina Department of Health and Human Services
 Division of Public Health · Epidemiology Section
 Occupational and Environmental Epidemiology Branch
 1912 Mail Service Center · Raleigh, North Carolina 27699-1912
 Tel 919-707-5950 · Fax 919-870-4808

Beverly Eaves Perdue, Governor
 Albert A. Delia, Acting Secretary

Laura Gerald, MD, MPH
 State Health Director

April 10, 2012

Rohit Bali
 9404 Leslieshire Dr
 Raleigh, NC 27615

Dear Mr. Bali:

Based upon the review of your accreditation application, the Health Hazards Control Unit (HHCU) has determined that you have fulfilled the requirements and are eligible for asbestos accreditation as a(n) INSPECTOR. Your assigned North Carolina accreditation number is 12143, which is reflected on your enclosed North Carolina Accreditation card. Please be sure to take this card with you to any asbestos work site where you are employed. The State requires that all persons conducting asbestos abatement or asbestos management activities be accredited and have their identification card on site.

Your North Carolina Inspector accreditation will expire on MARCH 31, 2013. It is NOT the policy of the HHCU to issue renewal notices. If you wish to continue working as a(n) Inspector after this expiration date, you must successfully complete the required training and submit a completed application to this office prior to March 31, 2013. If you should continue to perform asbestos management activities as a(n) Inspector without a valid North Carolina accreditation, you will be in violation of State regulations and may be cited for noncompliance.

Sincerely,

Marita E Cheek
 Accreditation/Certification Secretary
 Health Hazards Control Unit



Rohit Bali
 9404 Leslieshire Dr
 Raleigh, NC 27615

95791

North Carolina
 Asbestos Accreditation

EXPIRATION			
03-31-2013			
DOB	SEX	HT	WT
02-24-1969	M	6'0"	185
CLASS	#	EXP	
AIR MONITOR	80774	03-13	
DESIGNER	40431	03-13	
INSPECTOR	12143	03-13	
MGMT PLANNER	20906	03-13	



North Carolina Public Health
 Working for a healthier and safer North Carolina
 Everywhere. Everyday. Everybody.



XRF Lead-Based Paint Inspection Report

Conducted At:

MCAS New River
Building AS-302
MCB New River, NC

Prepared For:

Maune Belangia Faulkenberry Architects, PA
317-C Pollock Street
New Bern, NC 28560

EI Project Number: IHMO120097.00

July 30, 2012

XRF Lead-Based Paint Inspection Report

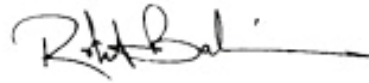
Conducted At:
MCAS New River
Building AS-302
MCAS New River, North Carolina

Prepared For:
Maune Belangia Faulkenberry Architects, PA
317-C Pollock Street
New Bern, NC 28560

EI Project Number:
IHMO120097.00

July 30, 2012

Rohit Bali
Project Manager
North Carolina Risk Assessor No. 120212



Christopher B. Murray, CIH
Senior Vice President – Operations



Prepared By:
The EI Group, Inc.
2101 Gateway Centre Boulevard, Suite 200
Morrisville, North Carolina 27560

Phone #: 919/657-7500
Fax #: 919/657-7551

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- 2.0 Surface-by-Surface Inspection Methodology
- 3.0 Description of Results
- 4.0 Recommendations/ Disclaimer

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APPENDIX B: Lead Based Paint Activity Summary

APPENDIX C: XRF Calibration Table

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APPENDIX E: Licenses and Certifications

1.0 EXECUTIVE SUMMARY

A XRF lead-based paint inspection of Building AS-302 was conducted on June 11, 2012 by Rohit Bali (NC Lead-Based Paint Risk Assessor Certification No.120212). The Base is located at MCAS New River at Camp Lejeune, North Carolina. The on-site property contact is Ms. Nichole Lawrence, Project Management, Office of Public Works Division.

Building AS-302 contains an administrative building with the police department. The building is a 1-story structure with a concrete and wood stud cavity wall envelope, a concrete floor system and a pitched asphalt shingle roof. The building was built in the 1940's and is approximately 9,604 square feet.

The buildings' structural integrity was intact. All of the paint condition was intact. The lead-based paint inspection determined that based on the levels defining lead-based paint hazards promulgated by EPA pursuant to section 403 of the Toxic Substances Control Act, 0 component readings out of the 58 component readings tested, excluding calibrations, were determined to test positive for lead-based paint. **Three of the XRF readings contained lead-based paint.**

A copy of the Executive Summary must be provided to new lessees (tenants) under Federal Law (24 CFR Part 35 and 40 CFR Part 745) before they become obligated under a lease or contract. The complete report must also be made available to new tenants. Landlords (lessors) are also required to distribute an educational pamphlet and include standard warning language in their leases or contracts to ensure that parents have the information they need to protect their children from lead-based paint hazards.

This executive summary has been prepared for the convenience of users of this report. This summary does not contain all the information presented in this report and, therefore, the entire report should be read to assure all pertinent information is transmitted.

2.0 SURFACE-BY-SURFACE INSPECTION METHODOLOGY

The lead-based paint inspection shall determine whether lead-based paint is present in the building and, if present, which components contain lead-based paint. This shall be accomplished through the determination of the concentration of lead in paint on a surface-by-surface basis both inside the building and on the exterior surfaces of the building using an XRF. Only accessible painted and/or varnished surfaces were tested using the direct read spectrum analyzer. The inspection shall be conducted following EPA's work practice standards for conducting lead-based paint activities (40 CFR 745.227), the U.S. Department of Housing and Urban Development (HUD) *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* (Guidelines) with the 1997 & 2000 revisions, and all state and local regulations except that a different visible color shall, by itself, result in a separate testing combination for a room equivalent. Samples are taken to represent component types; therefore it should be assumed that similar component types in the rest of that room or room equivalent also contain lead-based paint. If the standard for lead-based paint in the jurisdiction is different from the HUD/EPA standard, which is 1.0 mg/cm², the local jurisdiction's standard shall be used and the inspection report shall clearly indicate the standard. In addition, all requirements on XRF usage contained in the *Performance Characteristics Sheet* for the specific XRF being used shall be followed.

NITON Spectrum Analyzer Lead Detector

The sampling strategy adheres to the EPA Performance Characteristic Sheet for the particular XRF instrument used, as well as the manufacturers' modifications and recommendations. The XRF used for detection of lead-based paint is the NITON XLp-300A Spectrum Analyzer Lead Detector (Serial Number: U13730, Cd109 40mCi). It was manufactured by NITON Corporation, 900 Middlesex Turnpike, Building 8, Billerica, MA 01821.

Samples may be classified as POS (Positive), NEG (Negative), or INCOM/NULL (Incomplete). Positive results indicate lead in quantities greater than 1.0 mg/cm² and are considered lead-based paint. Negative results indicate lead in quantities less than 1.0 mg/cm² and are not considered lead-based paint. However, detectable lead in quantities less than 1.0 mg/cm² may lead to the development of lead dust hazards even though it is not a lead-based paint according to the HUD/EPA definition. Incomplete/Null results should be ignored as insufficient data was collected by the XRF during the sample time to determine if the sample is positive or negative (i.e. ~ instrument slipped or was removed prematurely, terminating the test).

When standing in any four-sided room facing side A, which coincides with the front of the structure, side B will be to the right, side C will be to the rear, and side D will be to the left (clockwise from side A).

Description of Paint Condition Hazard Rankings

The paint condition is placed into one of two categories using the risk assessor's professional judgement. These categories are: *intact* and *poor*. Type of deterioration may also be noted on surfaces in *poor* condition. Based on the approximate surface area of deteriorated paint, the risk assessor then assesses the paint condition as *intact* or *poor*.

Hazard ranking protocol was assessed following the HUD Guidelines for Evaluation and Control of Lead-Based Paint Hazards in Housing, dated June, 1995, and including the 1997 revisions to Chapter 5: Risk Assessment; Table 5-3, Categories of Paint Film Quality. This information is summarized below.

Type of Building Component ¹	Total Area of Deteriorated Paint on Each Component	
	Intact ¹	Poor ²
Exterior components with large surface area	Entire surface area is intact	Entire surface area is not intact
Interior components with large surface area	Entire surface area is intact	Entire surface area is not intact
Interior and exterior components with small surface areas	Entire surface area is intact	Entire surface area is not intact

Notes:

¹ indicates the building component in this table refers to each individual component or side of the building, not the combined surface area of similar components in a room.

² indicates surfaces in "poor" condition are considered to be lead-based paint hazards as defined by Title X and should be addressed through abatement or interim controls.

3.0 DESCRIPTION OF RESULTS

This is a report of an X-ray Fluorescence (XRF) inspection to determine if lead-based paint exists in the readily accessible areas of this complex and tested components. The presence or absence of lead-based paint applies only to tested surfaces on the date of the field visit. This survey was completed in accordance with HUD protocol.

According to HUD/EPA Guidelines, lead in greater quantities than 1.0 mg/cm² must be present to be considered lead-based paint (LBP). However, detectable lead in quantities less than 1.0 mg/cm² may contribute to the development of lead dust hazards even though it is not considered a lead-based paint hazard.

Surface-by-Surface Inspection

34	COLUMN	METAL	A	EXTERIOR	as302	Positive	3.2	1.5
35	STAIR RAIL	METAL	A	EXTERIOR	as302	Positive	15.7	12.3
40	Loading Dock	CONCRETE	A	EXTERIOR	as302	Positive	5.9	4.9

4.0 RECOMMENDATIONS/ DISCLAIMER

The following are possible options for treatment of identified hazards. Any or all of the options listed below will reduce or eliminate the hazard.

Lead-Based Paint

If paint condition is intact, no treatment is required at this time. However, ongoing monitoring and maintenance of painted surfaces containing lead-based paint must be performed on a routine basis as paint conditions may deteriorate creating a lead dust hazard. Painted surfaces should be inspected annually and repainted as needed before deterioration occurs. Prior to any scraping or sanding, appropriate measures should be taken to prevent the generation or spreading of paint chips or dust.

Although painted surfaces may contain lead in quantities less than 1.0 mg/cm^2 , ongoing monitoring and maintenance of painted surfaces must still be performed on a routine basis. These activities are necessary as lead quantities in paint less than 1.0 mg/cm^2 may constitute a lead dust hazard, even though the paint is not considered a lead-based paint.

The exterior can have paint film stabilization and repainted. The loading dock can have paint film stabilization or abatement.

Disclaimer

This inspection report is written for the use of MCAS New River and MCB Camp Lejeune, NC and Office of Public Works and their representatives. The EI Group, Inc. is not responsible nor will be held liable for any interpretations made, opinions formed, or conclusions drawn by any third party as a result of examining the lab results, inspection results, or this report. Any interpretations, opinions, and conclusions will be those made, formed, and drawn solely by that third party. This lead-based paint inspection was performed in accordance with generally accepted industry methods and practices. All work has been conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing in this field. All work has been performed in accordance with the recommended guidelines of the EPA and HUD and the State of North Carolina. The results obtained are representative of the conditions on the dates of sampling and no warranty, expressed or implied, is made. Future disturbance to painted surfaces could create additional lead-based paint hazards.

FIGURES

Floor Plans

APPENDIX A

XRF Field Data Sheets

XRF Lead-Based Paint Results

Site: MCAS New River Bldg, AS-302

Device: XLP-300A

Serial #U13730

Ranges (NEG<INC<POS)

Date: 7/11/12

Inspector: Hardy Faust

Index	COMPONENT	SUBSTRATE	SIDE	ROOM TYPE	SITE/ADDRESS	Results	PbC	PbC Error
1	CALIBRATE				as302	Positive	1	0.1
2	CALIBRATE				as302	Positive	1.1	0.1
3	CALIBRATE				as302	Positive	1.1	0.1
4	WALL	DRYWALL	A		as302	Negative	0	0.02
5	WALL	DRYWALL	B		as302	Null	0.05	0.72
6	WALL	DRYWALL	B		as302	Negative	0	0.02
7	WALL	DRYWALL	C		as302	Negative	0	0.02
8	WALL	DRYWALL	D		as302	Negative	0	0.02
9	WINDOW SILL	WOOD	B		as302	Negative	0	0.02
10	WINDOW	METAL	B		as302	Negative	0	0.02
11	MINIBLIND	MINIBLIND	B		as302	Negative	0	0.02
12	WALL	DRYWALL	C		as302	Negative	0	0.02
13	WALL	DRYWALL	D		as302	Negative	0	0.02
14	WALL	CINDER BLOCK	B		as302	Negative	0	0.02
15	DOOR	METAL	B		as302	Negative	0.01	0.06
16	DOOR CASING	METAL	B		as302	Negative	0	0.02
17	WALL	PANELING	D		as302	Negative	0.01	0.05
18	CHAIR RAIL	PANELING	D		as302	Negative	0	0.02
19	DOOR CASING	METAL	D		as302	Negative	0	0.02
20	DOOR	WOOD	D		as302	Negative	0	0.02
21	WALL	CINDER BLOCK	D		as302	Negative	0	0.02
22	COLUMN	METAL	D		as302	Negative	0.02	0.04
23	CEILING	CONCRETE	CEILING		as302	Negative	0	0.02
24	FLOOR	CONCRETE	FLOOR		as302	Negative	0	0.02
25	DOOR	METAL	A		as302	Negative	0	0.02
26	WALL	CERAMIC TILE	B		as302	Negative	0	0.05
27	WALL	DRYWALL	B		as302	Negative	0	0.02
28	FLOOR	CERAMIC TILE	FLOOR		as302	Negative	0.04	0.16
29	DOOR	METAL	D		as302	Negative	0	0.02
30	WALL	CINDER BLOCK	A	EXTERIOR	as302	Negative	0	0.02
31	FOUNDATION WALL	CONCRETE	A	EXTERIOR	as302	Negative	0	0.02
32	WINDOW SILL	CONCRETE	A	EXTERIOR	as302	Negative	0.05	0.16
33	COLUMN	METAL	A	EXTERIOR	as302	Negative	0.7	0.3
34	COLUMN	METAL	A	EXTERIOR	as302	Positive	3.2	1.5
35	STAIR RAIL	METAL	A	EXTERIOR	as302	Positive	15.7	12.3
36	WALL	BRICK	A	EXTERIOR	as302	Null	0	0.03
37	WALL	BRICK	A	EXTERIOR	as302	Null	0.01	0.03
38	WALL	BRICK	A	EXTERIOR	as302	Negative	0	0.02
39	bench	WOOD	A	EXTERIOR	as302	Negative	0	0.02
40	loading dock	CONCRETE	A	EXTERIOR	as302	Positive	5.9	4.9
41	loading dock	CONCRETE	A	EXTERIOR	as302	Negative	0.25	0.08
42	DOOR	METAL	C	EXTERIOR	as302	Negative	0	0.02
43	CEILING	CONCRETE	C	EXTERIOR	as302	Negative	0	0.02
44	CALIBRATE				as302	Positive	1.7	0.3
45	CALIBRATE				as302	Positive	1.8	0.3
46	CALIBRATE				as302	Positive	1.7	0.2
47	CALIBRATE				as302	Positive	1.7	0.2

APPENDIX B

Lead Based Paint Activity Summary Sheet

NC DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH
HEALTH HAZARDS CONTROL UNIT

LEAD-BASED PAINT ACTIVITY SUMMARY

Please type or print in ink.

I. TYPE OF ACTIVITY:

 X Inspection Risk Assessment Lead Hazard Screen

II. DATE ACTIVITY COMPLETED: July 11, 2012

III. ACTIVITY LOCATION:

Facility Name: MCAS New River

Address: Building AS-302

City: Camp Lejeune State: NC Zip Code: County: Onslow Year Built: 1940

Contact Person: Ms. Nichole Lawrence Contact Phone: 910/ 451-5950 ext. 3247

IV. ACTIVITY SUMMARY (attach additional pages as needed):

EI conducted a Lead-Based Paint Inspection at MCAS New River Bldg. AS-302 at Camp Lejeune, N.C. There were three positive readings for LBP.

V. CERTIFIED INSPECTOR OR RISK ASSESSOR

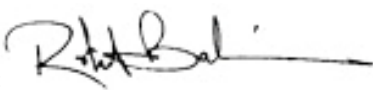
Name: Rohit Bali NC Lead Cert. No. 120212

Title: Project Manager

Certified Firm: The EI Group, Inc. NC Cert. No.: FPB-OO18

Address: 2101 Gateway Centre Blvd., Suite 200 State: NC Zip: 27560

Telephone: 919/657-7500

Signature: 

Date: July 30, 2012

**SUBMIT TO: NC DHHS - HEALTH HAZARDS CONTROL UNIT
1912 MAIL SERVICE CENTER
Raleigh, NC 27699-1912**

INSTRUCTIONS
FOR COMPLETION OF LEAD-BASED PAINT ACTIVITY SUMMARY

PURPOSE

A Lead-Based Paint Activity Summary shall be submitted to the North Carolina Lead-Based Paint Hazard Management Program by the certified inspector or risk assessor for each inspection, risk assessment, or lead hazard screen conducted within 45 days of the activity on a form provided or approved by the Program per 15A NCAC 19C .0807(b), Lead Hazard Management Program Rules.

PREPARATION

All information is to be filled out completely, typed or printed in ink. Pencil is not acceptable. Attachments are also to be typed or printed in ink.

INSTRUCTIONS

- I. Indicate the type of activity that was conducted.
- II. Enter the date the activity was completed.
- III. Enter complete information about the facility where the activity occurred, including facility name, address, city, state, zip code, county, the name of the facility contact, and the contact's telephone number, including area code.
- IV. Summarize the activities that were conducted at the site, including the results of the inspection, risk assessment, or lead hazard screen, and any recommendations resulting from the activity.
- V. Enter the name, NC Lead Certification Number, and title of the individual conducting the activity.

Enter the name of the NC Certified Firm, the NC Firm Certification Number, the firm's address, state, zip code, and telephone number, including area code.

Enter the original signature of the inspector or risk assessor who conducted the activity and the date the Lead-Based Paint Activity Summary was signed.

Completed Activity Summary with any attachments should be mailed to:

NC Department of Health and Human Services
Health Hazards Control Unit
1912 Mail Service Center
Raleigh, NC 27699-1912
(919) 733-0820

For Overnight/Express Mail:

NC Department of Health and Human Services
Health Hazards Control Unit
Parker-Lincoln Building, Room 2A-210
2728 Capital Boulevard
Raleigh, NC 27604

APPENDIX C

XRF Calibration Table

Calibration Check Test Results

Address/Unit No. MCAS New River Bldg. AS302

Device Xp-300A

Date 7.11.12 XRF Serial No. 113730

Contractor The EI Group, Inc.

Inspector Name ROBERT BALI Signature [Signature]

NIST SRM Used 1.0 mg/cm² Calibration Check Tolerance Used ± 0.02 mg/cm²

First Calibration Check

NIST SRM			First Average	Difference Between First Average and NIST SRM*
First Reading	Second Reading	Third Reading		
1.0	1.1	1.1	1.06	0.01

Second Calibration Check

NIST SRM			Second Average	Difference Between Second Average and NIST SRM*
First Reading	Second Reading	Third Reading		
1.7	1.8	1.7	1.73	0.03

Third Calibration Check (if required)

NIST SRM			Third Average	Difference Between Third Average and NIST SRM*
First Reading	Second Reading	Third Reading		

Fourth Calibration Check (if required)

NIST SRM			Fourth Average	Difference Between Fourth Average and NIST SRM*
First Reading	Second Reading	Third Reading		

* If the difference of the Calibration Check Average from the NIST SRM film value is greater than the specified Calibration Check Tolerance for this device, consult the manufacturer's recommendations to bring the instrument back into control. Retest all testing combinations tested since the last successful Calibration Check test.

APPENDIX D

XRF Performance Characteristics Sheets

Performance Characteristic Sheet

EFFECTIVE DATE: September 24, 2004

EDITION NO.: 1

MANUFACTURER AND MODEL:

Make: Niton LLC

Tested Model: XLp 300

Source: ^{109}Cd

Note: This PCS is also applicable to the equivalent model variations indicated below, for the Lead-in-Paint K+L variable reading time mode, in the XLi and XLp series:

XLi 300A, XLi 301A, XLi 302A and XLi 303A.

XLp 300A, XLp 301A, XLp 302A and XLp 303A.

XLi 700A, XLi 701A, XLi 702A and XLi 703A.

XLp 700A, XLp 701A, XLp 702A, and XLp 703A.

Note: The XLi and XLp versions refer to the shape of the handle part of the instrument. The differences in the model numbers reflect other modes available, in addition to Lead-in-Paint modes. The manufacturer states that specifications for these instruments are identical for the source, detector, and detector electronics relative to the Lead-in-Paint mode.

FIELD OPERATION GUIDANCE

OPERATING PARAMETERS:

Lead-in-Paint K+L variable reading time mode.

XRF CALIBRATION CHECK LIMITS:

0.8 to 1.2 mg/cm² (inclusive)

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm² in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm² film).

If readings are outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instruments into control before XRF testing proceeds.

SUBSTRATE CORRECTION:

For XRF results using Lead-in-Paint K+L variable reading time mode, substrate correction is not needed for:

Brick, Concrete, Drywall, Metal, Plaster, and Wood

INCONCLUSIVE RANGE OR THRESHOLD:

K+L MODE READING DESCRIPTION	SUBSTRATE	THRESHOLD (mg/cm ²)
Results not corrected for substrate bias on any substrate	Brick	1.0
	Concrete	1.0
	Drywall	1.0
	Metal	1.0
	Plaster	1.0
	Wood	1.0

BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* ("HUD Guidelines"). Performance parameters shown on this sheet are calculated from the EPA/HUD evaluation using archived building components. Testing was conducted in August 2004 on 133 testing combinations. The instruments that were used to perform the testing had new sources; one instrument's was installed in November 2003 with 40 mCi initial strength, and the other's was installed June 2004 with 40 mCi initial strength.

OPERATING PARAMETERS:

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

SUBSTRATE CORRECTION VALUE COMPUTATION:

Substrate correction is not needed for brick, concrete, drywall, metal, plaster or wood when using Lead-in-Paint K+L variable reading time mode, the normal operating mode for these instruments. If substrate correction is desired, refer to Chapter 7 of the HUD Guidelines for guidance on correcting XRF results for substrate bias.

EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing. Use the K+L variable time mode readings.

Conduct XRF retesting at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below.

Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. Do not correct the original or retest results for substrate bias. In single-family housing a result is defined as the average of three readings. In multifamily housing, a result is a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF results.

Compute the average of all ten re-test XRF results.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

For the Lead-in-Paint K+L variable reading time mode, the instrument continues to read until it is moved away from the testing surface, terminated by the user, or the instrument software indicates the reading is complete. The following table provides testing time information for this testing mode. The times have been adjusted for source decay, normalized to the initial source strengths as noted above. Source strength and type of substrate will affect actual testing times. At the time of testing, the instruments had source strengths of 26.6 and 36.6 mCi.

Testing Times Using K+L Reading Mode (Seconds)						
Substrate	All Data			Median for laboratory-measured lead levels (mg/cm ²)		
	25 th Percentile	Median	75 th Percentile	Pb < 0.25	0.25 ≤ Pb < 1.0	1.0 ≤ Pb
Wood Drywall	4	11	19	11	15	11
Metal	4	12	18	9	12	14
Brick Concrete Plaster	8	16	22	15	18	16

CLASSIFICATION RESULTS:

XRF results are classified as positive if they are greater than or equal to the threshold, and negative if they are less than the threshold.

DOCUMENTATION:

A document titled *Methodology for XRF Performance Characteristic Sheets* provides an explanation of the statistical methodology used to construct the data in the sheets, and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. For a copy of this document call the National Lead Information Center Clearinghouse at 1-800-424-LEAD.

This XRF Performance Characteristic Sheet was developed by the Midwest Research Institute (MRI) and QuanTech, Inc., under a contract between MRI and the XRF manufacturer. HUD has determined that the information provided here is acceptable when used as guidance in conjunction with Chapter 7, Lead-Based Paint Inspection, of HUD's *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*.

APPENDIX E

Licenses and Certifications



**North Carolina Department of Health and Human Services
Division of Public Health · Epidemiology Section
Occupational and Environmental Epidemiology Branch**
1912 Mail Service Center · Raleigh, North Carolina 27699-1912
Tel 919-707-5950 · Fax 919-870-4808

Beverly Eaves Perdue, Governor
Lanier M. Cansler, Secretary

Jeffrey P. Engel, M.D.
State Health Director

October 17, 2011

William Hardy Faust
13604 Heathwood Ct
Raleigh, NC 27615

Dear Mr. Faust:

You have successfully passed the North Carolina Lead Risk Assessor Certification examination. Based on these results, the Health Hazards Control Unit (HHCU) has determined that you have fulfilled the examination requirement and are eligible for lead certification as a(n) RISK ASSESSOR. Your assigned Risk Assessor certification number is 120235, which is reflected on your enclosed North Carolina Lead Certification card. The State requires that all persons conducting regulated lead-based paint activities be certified and have their identification card on-site.

A "Lead-Based Paint Activity Summary" shall be submitted to the HHCU by the certified inspector or risk assessor within 45 days of each inspection, risk assessment, or lead hazard screen conducted. The information shall be submitted on a form provided or approved by the Program, per 10A NCAC 41C .0807(b), Lead-Based Paint Hazard Management Program Rules.

Accredited refresher training must be completed at least every 24 months from the date of the last accredited training course **AND** within twelve months prior to applying for certification. The HHCU strongly recommends that individuals note the date of certification expiration and ensure all refresher training meets the above requirements.

Your North Carolina Risk Assessor certification will expire on OCTOBER 31, 2012. It is NOT the policy of the HHCU to issue renewal notices. If you wish to continue working as a(n) Risk Assessor after this expiration date, you must successfully complete the required training and submit a completed application to this office prior to October 31, 2012. If you should perform lead-based paint activities as a(n) Risk Assessor without a valid North Carolina certification, you will be in violation of State regulations and may be cited for noncompliance.

If you have any questions, please contact our office at (919) 707-5954.



**NORTH CAROLINA
LEAD CERTIFICATION**

William Hardy Faust
13604 Heathwood Ct
Raleigh, NC 27615

DOB	SEX	HT	WT
03-09-1985	M	5'8"	190

DISCIPLINE	#	LAST COURSE	EXPIRATION
RISK ASSESSOR	120235	RIS 09-16-2011	10-31-2012

Sincerely,

Marita E Cheek
Accreditation/Certification Secretary
Health Hazards Control Unit



