

CONTRACT N40085-12-B-0091

NAVFAC SPECIFICATION
NO. 05-12-0091

HVAC/DHW IMPROVEMENTS, VARIOUS FACILITIES, HADNOT POINT

AT THE

MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

DESIGN BY:

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A/E Contract: N40085-08-D-8419

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Date: August 21, 2012

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05120091

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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 removal, replacement and/or new HVAC and domestic hot water system installation at multiple existing facilities, including new ductwork, heat pumps, ventilating, water heaters and controls 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 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 14 00

WORK RESTRICTIONS

01/07

PART 1 GENERAL

1.1 SPECIAL SCHEDULING REQUIREMENTS

- a. The new boilers shall be ready for operation as approved by Contracting Officer before demolition work is started on the steam lines at each building which would interfere with normal operation.
- b. Each building will remain in operation during the entire construction period. The Contractor shall conduct his operations so as to cause the least possible interference with normal operations of the activity.
- c. Permission to interrupt any Station roads, railroads, and/or utility service shall be requested in writing a minimum of 15 calendar days prior to the desired date of interruption.

1.2 CONTRACTOR ACCESS AND USE OF PREMISES

1.2.1 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.

1.2.2 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.

1.2.3 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.

1.2.4 Occupied and Existing Buildings

The Contractor shall be working in an existing building and/or around existing buildings which are occupied.

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.

1.2.5 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, compressed air, 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.

1.3 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 (LANTNAVFACENCOM 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.kröll.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, BACnet Direct Digital Control Systems for HVAC; Section 23 05 92 Testing/Adjusting/Balancing:Small Heating/Ventilating/Cooling Systems shall be accomplished directly by a first tier subcontractor.

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 schedule shall identify as a minimum:

- a. Construction time for all major systems and components;
- b. Manpower requirements for each activity;
- c. Major submittals and submittal processing time; and
- d. 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 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-0091, 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-0091."

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: 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".

1.8 FORWARDING SUBMITTALS

1.8.1 Samples and Submittalsr

Except as otherwise noted, submit samples and submittals to:

Wiley|Wilson
 6606 W.Broad Street, Suite 500
 Richmond, VA 23230

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).

1.8.2 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

HVAC/DHW Improvements, Various Facilities Hadnot Point

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	1.14.4													
			Violations														
			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

HVAC/DHW Improvements, Various Facilities Hadnot Point

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
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		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 57 19	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 1.4.2 1.2 1.4.3 1.4.4 2.1													
		01 78 00	SD-10 Operation and Maintenance Data Equipment/product warranty list SD-11 Closeout Submittals As-built drawings GIS Deliverables Record of materials Maximo requirements Complete Submittal Package Equipment/product warranty tag	1.4.1 1.2.1 1.3 1.3.3 1.3.4 1.5 1.4.2													
		02 41 00.10	SD-01 Preconstruction Submittals														

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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	
																		(a)
		02 41 00.10	Existing Conditions	1.10														
			SD-07 Certificates															
			Demolition Plan	1.2.1														
			Notification	1.7														
		08 51 13	SD-02 Shop Drawings															
			Windows	2.1														
			SD-03 Product Data															
			Windows	2.1														
			Hardware	2.2.7.1														
			Fasteners	2.2.3														
			Window performance	1.10														
			Thermal-Barrier Windows	2.4														
			SD-04 Samples															
			Finish Sample	1.4.2.1														
			SD-05 Design Data															
			Structural calculations for deflection	2.1														
			SD-06 Test Reports															
			Minimum condensation resistance factor	1.4.4														
			Standard Airblast Test	1.10.2.3														
		08 81 00	SD-02 Shop Drawings															
			Installation	3.2.2														
			SD-03 Product Data															
			Insulating Glass	1.6.1														
			Glazing Accessories	1.3														

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																		(a)
		08 81 00	SD-04 Samples															
			Insulating Glass	1.6.1														
			SD-07 Certificates															
			Insulating Glass	1.6.1														
		09 15 00	SD-07 Certificates															
			Gypsum Plaster	2.1														
			Gypsum Wallboard	2.1														
			Screws	2.1														
		09 22 00	SD-03 Product Data															
			Metal framing	2.1														
		09 29 00	SD-03 Product Data															
			Gypsum Board	2.1.1														
			Accessories	2.1.5														
			Adhesives	2.1.4														
			Joint Treatment Materials	2.1.2														
			SD-07 Certificates															
			Asbestos Free Materials	2.1														
			Material Safety Data Sheets	2.1														
		09 51 00	SD-03 Product Data															
			Acoustical Units	2.1														
			SD-04 Samples															
			Acoustical Units	2.1														
			SD-07 Certificates															
			Sealant	2.6														
			Adhesive	2.4														
		23 05 92	SD-06 Test Reports															

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		23 05 92	Certified TAB Report	1.4.1													
		23 07 00	SD-03 Product Data														
			Piping insulation	2.1													
			Piping insulation finishes	2.1.3													
			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 23.13	SD-02 Shop Drawings														
			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	1.3.1.5													
			Ladder diagrams														
			Component wiring diagrams	1.3.1.6													
			Terminal strip diagrams	1.3.1.7													
			BACnet communication	1.3.1.8													
			architecture schematic														
			SD-03 Product Data														
			Direct Digital Controllers	2.1.3													
			BACnet Gateways	2.1.3.13													
			Sensors and Input Hardware	2.2													

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																		(a)
		23 09 23.13	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	1.5.8														
			SD-07 Certificates															
			Contractor's Qualifications	1.5.6														
			SD-10 Operation and Maintenance Data															
			BACnet Direct Digital Control Systems	1.3														
			Controls System Operators Manuals	3.4														
			VFD Service Manuals	1.5.8														
			SD-11 Closeout Submittals															
			Training documentation	3.5.1														
		23 73 33	SD-03 Product Data															
			Split-system heat pumps	2.1.1														
			Packaged terminal heat pumps	2.1.2														
			Cabinet unit heaters	2.1.3														
			Unit heaters	2.1.4														
			Direct Vent Gas-Fired Central Furnaces	2.1.7														
			Exhaust fans	2.1.6														
			Exhaust fans	2.1.9														

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		23 73 33	Dampers	2.3.3													
			Diffusers, registers, and grilles	2.3.4													
			Outside air intake louvers	2.3.5													
			Flexible round ducts	2.3.9													
			Pipe and fittings	2.4													
			SD-08 Manufacturer's Instructions														
			Installation manual	1.3.3													
			SD-10 Operation and Maintenance														
			Data														
			Split-system heat pumps	2.1.1													
			Packaged terminal heat pumps	2.1.2													
			Unit heaters	2.1.4													
			Exhaust fans	2.1.6													
			Exhaust fans	2.1.9													
			SD-11 Closeout Submittals														
			Air filter inventory	1.3.4													
		26 20 00	SD-02 Shop Drawings														
			Panelboards	2.9													
			Wireways	2.20													
			SD-03 Product Data														
			Receptacles	2.8													
			Circuit breakers	2.9.2													
			Circuit breakers	2.10.2													
			Switches	2.7													
			Enclosed circuit breakers	2.11													
			Motor controllers	2.14													

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		26 20 00	Manual motor starters	2.15													
			SD-06 Test Reports														
			600-volt wiring test	3.2.2													
			Grounding system test	3.2.4													
			Ground-fault receptacle test	3.2.3													
			SD-07 Certificates														
			Fuses	2.12													
			SD-10 Operation and Maintenance														
			Data														
			Electrical Systems	1.5.1													
		26 29 23	SD-02 Shop Drawings														
			Schematic diagrams	1.5.1													
			Installation drawings	1.5.3													
			SD-03 Product Data														
			Variable frequency drives	2.1													
			Wires and cables	2.3													
			Equipment schedule	1.5.4													
			SD-06 Test Reports														
			VFD Test	3.2.1													
			Performance Verification Tests	3.2.2													
			Endurance Test	3.2.3													
			SD-08 Manufacturer's Instructions														
			Installation instructions	1.5.5													
			SD-09 Manufacturer's Field														
			Reports														
			VFD Factory Test Plan	2.5.1													

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		26 29 23	Factory test results	1.5.6													
			SD-10 Operation and Maintenance Data														
			Variable frequency drives	2.1													
		26 51 00	SD-03 Product Data														
			Fluorescent lighting fixtures	2.1													
			Fluorescent electronic ballasts	1.5.1													
			Fluorescent lamps	2.1.3													
			High-intensity-discharge (HID) lighting fixtures	2.2													
			HID ballasts	2.2.1													
			High-pressure sodium (HPS) lamps	2.2.2													
			Metal-halide lamps	2.2.3													
			Lighting contactor	2.5													
			Time switch	2.6													
			Power hook fixture hangers	2.8													
			Emergency lighting equipment	2.10													
			Occupancy sensors	2.12													
			SD-06 Test Reports														
			Operating test	3.2													
			SD-10 Operation and Maintenance Data														
			Lighting Control System	1.5.3													

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 (2002) Potable 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 SSHO, 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 SSHO 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

01/07

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. The designations "AOK" and "LOK" are for administrative purposes and should not be used when ordering publications.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)
30 West University Drive
Arlington Heights, IL 60004
Ph: 847-394-0150
Fax: 847-253-0088

AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)
4301 North Fairfax Dr., Suite 425
ATTN: Pubs Dept.
Arlington, VA 22203
Ph: 703-524-8800
Fax: 703-528-3816
E-mail: ari@ari.org
Internet: <http://www.ari.org>
AOK 5/01
LOK 2/01

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)
1827 Walden Ofc. Sq.
Suite 104
Schaumburg, IL 60173-4268
Ph: 847-303-5664
Fax: 847-303-5774
Internet: <http://www.aamanet.org>
AOK 5/01
LOK 2/01

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

Note --- Documents beginning with the letter "S" can be ordered from:

Acoustical Society of America
Standards and Publications Fulfillment Center
P. O. Box 1020
Sewickley, PA 15143-9998
Ph: 412-741-1979
Fax: 412-741-0609
Internet: <http://asa.aip.org>
General e-mail: asa@aip.org
Publications e-mail: asapubs@abdintl.com
AOK 5/01
LOK 6/00

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)
American Society of Safety Engineers
Customer Service
1800 E Oakton St
Des Plaines, IL 60018
Phone: 847-699-2929
Email: customerservice@asse.org

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959
Ph: 610-832-9585
Fax: 610-832-9555
Internet: <http://www.astm.org>
AOK 5/01
LOK 3/01

ASTM INTERNATIONAL (ASTM)
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959
Ph: 610-832-9585
Fax: 610-832-9555
Internet: <http://www.astm.org>
AOK 5/01
LOK 3/01

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
Internet: <http://www.ashrae.org>
AOK 5/01
LOK 3/01

ASME INTERNATIONAL (ASME)
Three Park Avenue
New York, NY 10016-5990
Ph: 212-591-7722
Fax: 212-591-7674
Internet: <http://www.asme.org>
AOK 5/01
LOK 6/00

ASSOCIATED AIR BALANCE COUNCIL (AABC)
1518 K St., NW, Suite 503
Washington, DC 20005
Ph: 202-737-0202
Fax: 202-638-4833
Internet: <http://www.aabchq.com>
E-mail: aabchq@aol.com
AOK 5/01
LOK 6/00

GAS APPLIANCE MANUFACTURERS ASSOCIATION (GAMA)

2107 Wilson Blvd
No. 600
Arlington, VA 22201
Ph: 703-525-7060
Fax: 703 525-0718
Internet: www.gamanet.org

GLASS ASSOCIATION OF NORTH AMERICA (GANA)
2945 SW Wanamaker Drive, Suite A
Topeka, KS 66614-5321
Ph: 785-271-0208
Fax: 785-271-0166
Internet: <http://www.glasswebsite.com/GANA>
AOK 5/01
LOK 6/00

GYPSUM ASSOCIATION (GA)
810 First St. NE, Suite 510
Washington, DC 20002
Ph: 202-289-5440
Fax: 202-289-3707
Internet: <http://www.gypsum.org>
AOK 5/01
LOK 6/00

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA)
120 Wall St., 17th Floor
New York, NY 10005-4001
Ph: 212-248-5000
Fax: 212-248-5017
Internet: <http://www.iesna.org>
AOK 5/01
LOK 6/00

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
445 Hoes Ln, P. O. Box 1331
Piscataway, NJ 08855-1331
Ph: 732-981-0060 OR 800-701-4333

Fax: 732-981-9667
Internet: <http://www.ieee.org>
E-mail: customer.services@ieee.org
AOK 5/01
LOK 6/00

INSULATING GLASS MANUFACTURERS ALLIANCE (IGMA)

55-2319 St. Laurent Blvd.
Ottawa, Ontario, Canada K1G 4J8
Ph: 613-233-1929
Internet: info@igmaonline.org

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

1, rue de Varembe'
Case Postale 56
CH-1211 Geneve 20
Ph: 41-22-749-0111
Fax: 41-22-733-3430
Internet: <http://www.iso.ch>
e-mail: central@iso.ch
AOK 5/01
LOK 6/00

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS
INDUSTRY (MSS)

127 Park St., NE
Vienna, VA 22180-4602
Ph: 703-281-6613
Fax: 703-281-6671
Internet: <http://www.mss-hq.com>
e-mail: info@mss-hq.com
AOK 5/01
LOK 6/00

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

8 S. Michigan Ave, Suite 1000
Chicago, IL 60603
Ph: 312-782-4951
Fax: 312-332-0405
Internet: <http://www.naamm.org>
e-mail: naamm@gss.net
AOK 5/01
LOK 6/00

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

1300 N. 17th St., Suite 1847
Rosslyn, VA 22209
Ph: 703-841-3200
Fax: 703-841-3300
Internet: <http://www.nema.org/>
AOK 5/01
LOK 6/00

NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)

8575 Grovemont Circle
Gaithersburg, MD 20877-4121
Ph: 301-977-3698

Fax: 301-977-9589
Internet: <http://www.nebb.org>
AOK 5/01
LOK 6/00

NATIONAL FENESTRATION RATING COUNCIL (NFRC)
1300 Spring Street, Suite 500
Silver Spring, MD 20910
Ph: 301-589-6372
Fax: 303-588-6342
Internet: <http://www.nfrc.org>
E-Mail: nfrcusa@aol.com or info@nfrc.com
AOK 5/01
LOK 6/00

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
1 Batterymarch Park
P.O. Box 9101
Quincy, MA 02269-9101
Ph: 617-770-3000
Fax: 617-770-0700
Internet: <http://www.nfpa.org>
AOK 5/01
LOK 8/00

SHEET METAL & AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION
(SMACNA)
4201 Lafayette Center Dr.,
Chantilly, VA 20151-1209
Ph: 703-803-2980
Fax: 703-803-3732
Internet: <http://www.smacna.org>
e-mail: info@smacna.org
AOK 5/01
LOK 6/00

UNDERWRITERS LABORATORIES (UL)
333 Pfingsten Rd.
Northbrook, IL 60062-2096
Ph: 847-272-8800
Fax: 847-272-8129
Internet: <http://www.ul.com/>
e-mail: northbrook@us.ul.com
AOK 5/01
LOK 6/00

U.S. ARMY CORPS OF ENGINEERS (USACE)
Order CRD-C DOCUMENTS from:
U.S. Army Engineer Waterways Experiment Station
ATTN: Technical Report Distribution Section, Services
Branch, TIC
3909 Halls Ferry Rd.
Vicksburg, MS 39180-6199
Ph: 601-634-2664
Fax: 601-634-2388
Internet: <http://www.wes.army.mil/SL/MTC/handbook/handbook.htm>

Order Other Documents from:
USACE Publications Depot

Attn: CEIM-SP-D
2803 52nd Avenue
Hyattsville, MD 20781-1102
Ph: 301-394-0081
Fax: 301-394-0084
Internet: <http://www.usace.army.mil/publications>
or <http://www.hnd.usace.army.mil/techinfo/index.htm>
AOK 5/01
LOK 6/00

U.S. DEFENSE LOGISTICS AGENCY (DLA)
Andrew T. McNamara Building
8725 John J. Kingman Road
Fort Belvoir, VA 22060
Internet: <http://www.dla.mil>
AOK 8/01

U.S. DEPARTMENT OF DEFENSE (DOD)
Order DOD Documents from:
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Ph: 703-605-6000
FAX: 703-605-6900
Internet: <http://www.ntis.gov>

Order Military Specifications, Standards and Related Publications
from:
Department of Defense Single Stock Point for (DODSSP)
Defense Automation and Production Service (DAPS)
Bldg 4D
700 Robbins AV
Philadelphia, PA 19111-5094
Ph: 215-697-2179
Fax: 215-697-1462
Internet: <http://www.dodssp.daps.mil>
AOK 5/01
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U.S. GENERAL SERVICES ADMINISTRATION (GSA)
Order from:
General Services Administration
Federal Supply Service Bureau
470 E L'Enfant Plaza, S.W., Suite 8100
Washington, DC 20407
Ph: 202-619-8925
Fx: 202-619-8978
Internet: <http://www.fss.gsa.gov/pub/fed-specs.cfm>
AOK 5/01
LOK 6/00

U.S. GREEN BUILDING COUNCIL (USGBC)

U.S. Green Building Council
2101 L Street, NW
Suite 500
Washington, DC 20037
1-800-795-1747

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
700 Pennsylvania Avenue, N.W.
Washington, D.C. 20408
Phone: 800-234-8861
Internet: <http://www.nara.gov>

Order documents from:
Superintendent of Documents
U.S. Government Printing Office
732 North Capitol Street, NW
Washington, DC 20401
Mailstop: SDE
Ph: 202-512-1530
Fax: 202-512-1262
Internet: <http://www.gpo.gov>
E-mail: gpoaccess@gpo.gov
AOK 5/01

-- 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.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (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	(2000a) Agencies Engaged in the Testing and Inspection of Materials Used on 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 15 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 super intendent, 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 78 00, "Closeout Procedures", 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



WAS A JOB SAFETY MEETING HELD THIS DATE? YES NO
if YES attach copy of the meeting minutes
 WERE THERE ANY LOST TIME ACCIDENTS THIS DATE? YES NO
if YES attach copy of completed OSHA report
 WAS CRANE/MANLIFT/TRENCHING/SCAFFOLD/HV ELECTRICAL/HIGH WORK DONE? YES NO
if YES attach statement or checklist showing inspection performed
 WAS HAZARDOUS MATERIAL/WASTE RELEASED INTO THE ENVIRONMENT? YES NO
if YES attach description of incident and proposed action

TOTAL WORK HOURS ON JOB SITE THIS DATE	
CUMULATIVE TOTAL OF WORK HOURS FROM PREVIOUS REPORT	
TOTAL WORK HOURS FROM START OF CONSTRUCTION	
<input type="checkbox"/> 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 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 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. DEPARTMENT OF DEFENSE (DOD)

MIL-S-16165	(Rev E) Shielding Harnesses, Shielding Items and Shielding Enclosures for Use in the Reduction of Interference from Engine Electrical Systems
MIL-STD-461	(2007; Rev F) Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment
MIL-STD-462	(Rev D; Notice 4) Electromagnetic Interference Characteristics

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 ENVIRONMENTAL PROTECTION REGULATORY REQUIREMENTS

Provide and maintain, during the life of the contract, environmental protection as defined in this Section. Plan for and provide environmental protective measures to control pollution that develops during normal construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Comply with Federal, State, and local regulations pertaining to the environment, including but not limited to water, air, solid waste, and noise pollution.

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. Conform to the state permitting requirements of the Clean Water Act.

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.

3.1.2 Water Resources

3.1.2.1 Oily Wastes

Prevent oily or other hazardous substances from entering the ground, drainage areas, or local bodies of water. Surround all temporary fuel oil or petroleum storage tanks with a temporary earth berm of sufficient size and strength to contain the contents of the tanks in the event of leakage or spillage.

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 NOISE

Make the maximum use of low-noise emission products, as certified by the EPA. Blasting or use of explosives will not be permitted without written permission from the Contracting Officer, and then only during designated times.

3.4 RESTRICTIONS ON EQUIPMENT

3.4.1 Electromagnetic Interference Suppression

- a. Electric motors must comply with MIL-STD-461 relative to radiated and conducted electromagnetic interference. A test for electromagnetic interference will not be required for motors that are identical physically and electrically to those that have previously met the requirements of MIL-STD-461. An electromagnetic interference suppression test will not be required

for electric motors without commutation or sliprings having no more than one starting contact and operated at 3,600 revolutions per minute or less.

- b. Equipment used by the Contractor shall comply with MIL-S-16165 for internal combustion engines and MIL-STD-461 for other devices capable of producing radiated or conducted interference.
- c. Conduct tests for electromagnetic interference on electric motors and Contractor's construction equipment in accordance with MIL-STD-461 and MIL-STD-462. Test location shall be reasonably free from radiated and conducted interference. Furnish testing equipment, instruments, and personnel for making the tests; a test location; and other necessary facilities.

3.4.2 Radio Transmitter Restrictions

Conform to the restrictions and procedures for the use of radio transmitting equipment, as directed. Do not use transmitters without prior approval.

3.5 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.

3.5.1 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.

3.5.2 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.
<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.
Solid Waste	Separate each category of solid waste to enhance recycling.

<u>CATEGORY</u>	<u>CONSTRUCTION DEBRIS DISPOSAL - BASE SANITARY LANDFILL EXAMPLE/GENERAL INFORMATION FOR DEPOSIT IN THE LANDFILL</u>
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.
3.5.3 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

3.6 CONTROL AND DISPOSAL OF HAZARDOUS WASTE

3.6.1 Hazardous Waste Generation

Handle generated hazardous waste in accordance with 40 CFR 262.

3.6.2 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 transporter 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.

3.6.3 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.

3.6.4 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.

3.6.5 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.

3.6.6 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.

3.6.7 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.

3.6.8 Ozone Depleting Substances (ODS)

Remove ODS as specified in Section 02 41 00.10, "Selective Demolition."

3.7 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.

3.8 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

Page 1 of 3

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 --

**CAMP LEJEUNE SANITARY LANDFILL
CONTRACTOR'S INFORMATION SHEET
No Personal Property/Off Base Trash Accepted
(Revised May 2012)**

General Trash

The following items may be mixed together and brought to the landfill in the same load:

Non-recyclable Paper, Plastics, and Basic Garbage
Roofing Shingles (Non-Asbestos)
Insulation (Non-Asbestos)
Glass (other than bottles)
Sheet Rock (Wall Board)
Particle Board/Composition Board/OSB (re-manufactured wood products used in construction and furniture in lieu of plywood)
Laminated/Formica covered wood products (counter tops, etc)
Hollow core interior doors
Floor tile (Non-Asbestos)
Porcelain & Ceramic products (toilets, sinks etc)
Fiber glass
PVC pipe (cut in 10' or less lengths)
Ceiling tile

Wood Products:

The following wood products must be removed from the Base:

Scrap lumber (painted and unpainted)
Embark and packing boxes, pallets, ammunition crates, trees, limbs and shrubs. Salt treated wood, creosote treated wood.

Other Products:

Leaves, pine straw, grass and shrub clippings.

Wood Furniture units (must have a 1348 with Base Property and DRMO Stamps downgrading it to SCAP or be specified in the Contract)

ALL material shall be weighed through the Base Landfill scales before being removed from the Base and net tonnage & material type must be reported to the Landfill Office.

Lead Base Painted Wood Products must be delivered to the landfill cut in less than eight foot lengths, wrapped in 6 mil plastic and sealed. Not accepted after 1400 Mon-Thur.

Asbestos (all types)

Accepted by Appointment Only Asbestos must be double wrapped in 6 mil plastic, sealed with duct tape and labeled prior to delivery. Must be delivered before 1000 Mon-Thur.

Call Landfill Manager for appointment @ 451-5011 or 451-2946.

Please provide manifest at time of delivery.

Soil

NON-CONTAMINATED soil accepted

Concrete Products

Concrete, block, brick, concrete culverts, and mortar products must be removed from the Base.

Small loads of broken up brick & block may be accepted at the discretion of the Landfill Manager.

Recyclable Products

The following Recyclable Products Must be separated and dropped off at a recycling drop-off point or the Recycling Center: Plastic Containers, Cardboard, Glass bottles, Aluminum cans & foil, White paper, Shredded paper, Vinyl siding, Steel cans (clean), Newspaper, Toner/ink cartridges.

Landfill Hours of Operation:

Mon – Thur: 0730 - 1530

Fri: 0730 - 1200

**CAMP LEJEUNE SANITARY LANDFILL
CONTRACTOR'S INFORMATION SHEET
No Personal Property/Off Base Trash Accepted
(Revised May 2012)**

The following items CANNOT be accepted at the landfill:

Hazardous waste	(Contact EMD)
Liquid waste	(Contact EMD)
Metal any type	(Contact DRMO) (see Base Order 5090.17)
Paint & Paint cans	(Contact EMD)
Appliances (white gear)	(Contact EMD)
Electronics	(Contact Recycling Ctr)
Computer equipment	(Contact DRMO)
Batteries any type	(Contact EMD)
Comm wire	(Contact EMD)
Barbed wire	(Contact EMD)
Concertina wire	(Contact EMD)
Contaminated soil	(Contact EMD)
Tires	(Contact EMD)
55 Gal Drums	(Contact EMD) Oil
Filters	(Contact EMD)
Petroleum containers	(Contact EMD)
Regulated Medical waste	(Contact Navel Hospital)
PCBs or PCB containers	(Contact EMD)
Oyster Shells	(Take to Off Base collection point) (Outside T.O.P. Gate)
Items Requiring Demilitarization	(Return to generating unit for demil)
Construction and Demolition debris	(unless specifically stated in the contract)

Other Info

All furniture must be accompanied by a 1348 REJECTED by Base Property Office
AND downgraded to Scrap by DRMO.

All other Base or USMC property must be accompanied by a 1348 downgraded to
Scrap by DRMO.

Anything related to Ordinance, Ammunition or Dangerous items, including containers,
tubes, and packing, must be accompanied by the ADEA Certifications and copies of the
Certifier and Verifier's Appointment letters.

Phone Numbers:

Landfill Clerk	451-2946
Landfill Manager	451-4998
Landfill Fax	451-9935
EMD	451-5837
EOD	451-0558
DRMO	451-8598

Marine Corps Base (MCB) Camp Lejeune Contractor Environmental Guide



August 2008

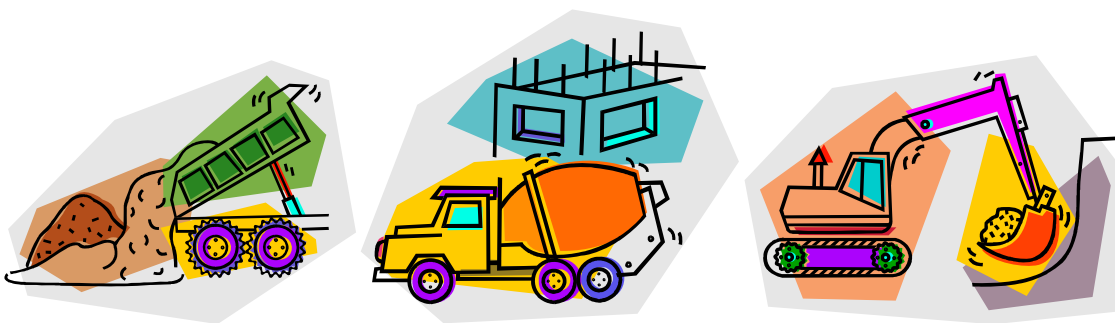


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Attachment 3-1 Spill Reporting Form

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

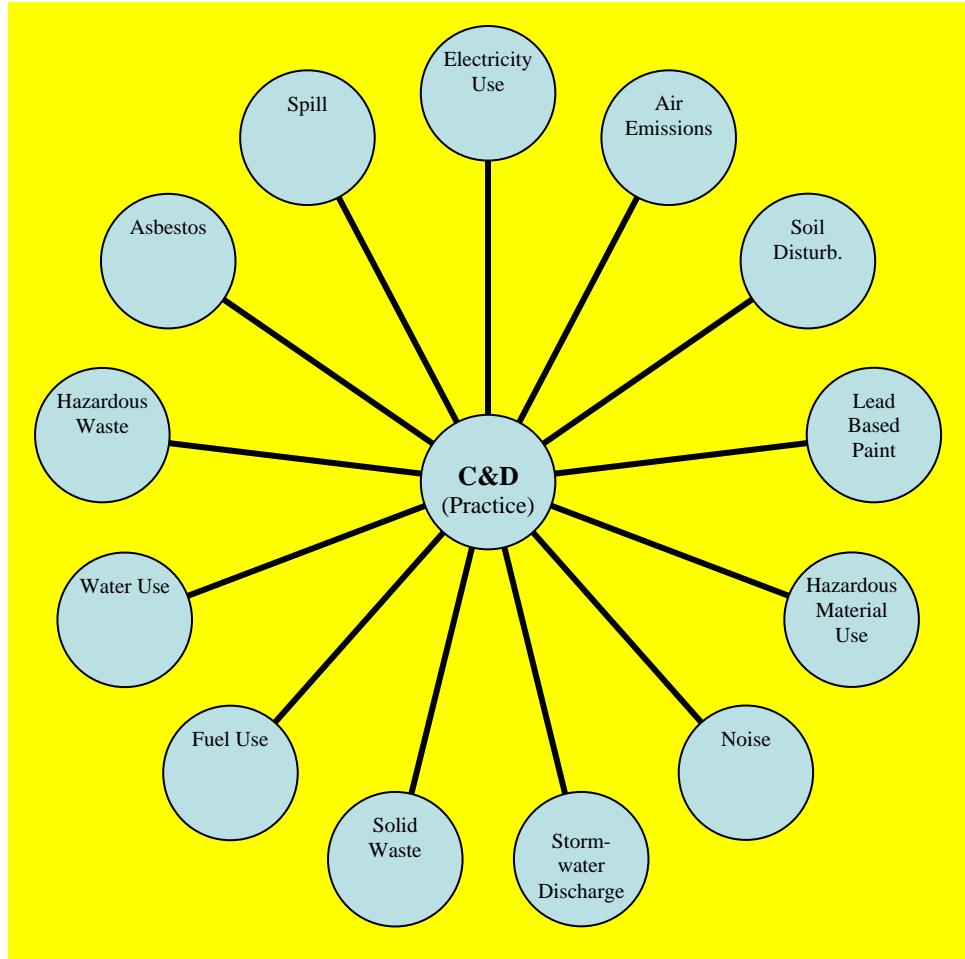
Contractors must be aware of, and adhere to, all regulations and requirements concerning EMS, including the following:

- **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
	Applicable To All Practices Conducted Aboard MCB Camp Lejeune			Applicable To All Practices Conducted Aboard MCB Camp Lejeune				Applicable To All Practices Conducted Aboard MCB Camp Lejeune				
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	●													
	Applicable To All Practices Conducted Aboard MCB Camp Lejeune													

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.

- Development that drains to an Outstanding Resource Water (ORW)
- Development within one mile of and draining to a High Quality Water (HQW)

A State Stormwater Management Permit is required for all activities that will disturb one acre or more of land.

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.

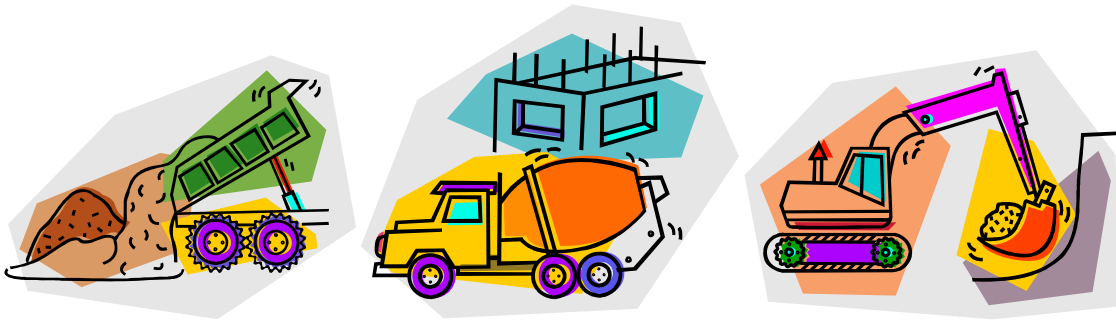
Temporary roads, parking areas, and similar temporarily used areas should be graded to conform to surrounding contours.

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 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

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 XXXXXXX
- (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 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-0091."

1.6 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 02 41 00.10.10

SELECTIVE 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.

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.6 (2006) Safety Requirements for Demolition Operations

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 (2006) MILSTRIP - Military Standard Requisitioning and Issue Procedures

MIL-STD-129 (2007; Rev P; Change 4 2007) Military Marking for Shipment and Storage

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

40 CFR 61 National Emission Standards for Hazardous Air Pollutants

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 removal procedures for approval before work is started. Include in the plan procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a disconnection schedule of utility services, a detailed description of methods and equipment to be used for each operation and of the sequence of operations. [Identify components and materials to be](#)

salvaged for reuse or recycling with reference to paragraph Existing Facilities to be Removed. Append tracking forms for all removed materials indicating type, quantities, condition, destination, and end use. 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 buildings on airfield pavements. The work includes demolition,, salvage of identified items and materials, 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. 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 Utility Service

Maintain existing utilities indicated to stay in service and protect

against damage during demolition and deconstruction operations. Prior to start of work, the Government will disconnect and seal utilities serving each area of alteration or removal upon written request from the Contractor.

1.3.4 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 AVAILABILITY OF WORK AREAS

Areas in which the work is to be accomplished will be coordinated between the Contractor and Contracting Officer.

1.6 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

1.7 QUALITY ASSURANCE

Submit 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, 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.

1.7.1 Dust and Debris Control

Prevent the spread of dust and debris to occupied portions of the building 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.

1.8 PROTECTION

1.8.1 Traffic Control Signs

a. Where pedestrian and driversafety is endangered in the area of removal work, use traffic barricades with flashing lights. Notify the Contracting Officer prior to beginning such work.

1.8.2 Protection of Personnel

Before, during and after the demolition work continuously evaluate the condition of 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.

1.9 RELOCATIONS

Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Repair or replace items to be relocated which are damaged by the Contractor with new undamaged items as approved by the Contracting Officer.

1.10 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. Submit survey results.

PART 2 PRODUCTS

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

Inspect and evaluate existing work 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 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.

3.1.2 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.

3.1.3 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)."

3.1.4 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. Salvage each item of equipment and fixtures as a whole unit; listed, indexed, tagged, and stored. Salvage each unit with its normal operating auxiliary equipment. Transport salvaged equipment and fixtures, including motors and machines, to a designated on station storage area as directed by the Contracting Officer. Do not remove equipment until approved. Do not offer low-efficiency equipment for reuse; provide to recycling service for disassembly and recycling of parts.

3.1.4.1 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.

3.1.4.2 Ducts

Classify removed duct work as scrap metal.

3.1.4.3 Fixtures, Motors and Machines

Remove and salvage fixtures, motors and machines associated with plumbing, heating, air conditioning, refrigeration, and other mechanical system installations. Salvage, box and store auxiliary units and accessories with the main motor and machines. Tag salvaged items for identification, storage, and protection from damage.

3.1.5 Electrical Equipment and Fixtures

Salvage motors, motor controllers, and operating and control equipment that are attached to the driven equipment. Salvage wiring systems and components. Box loose items and tag for identification. Disconnect primary, secondary, control, communication, and signal circuits at the point of attachment to their distribution system.

3.1.5.1 Fixtures

Remove and salvage electrical fixtures. Salvage unprotected glassware from the fixture and salvage separately. Salvage incandescent, mercury-vapor, and fluorescent lamps and fluorescent ballasts manufactured prior to 1978, boxed and tagged for identification, and protected from breakage.

3.1.5.2 Conduit and Miscellaneous Items

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.

3.2 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 listed in the Demolition Plan to be reused or relocated to prevent damage, and reinstall as the work progresses.

3.2.3 Salvaged Materials and Equipment

Remove materials and equipment that are listed in the Demolition Plan and specified to be removed by the Contractor and that are to remain the property of the Government, and deliver to a storage site, as directed within 5 miles of the work site.

- a. Salvage items and material to the maximum extent possible. Coordinate with the Contracting Officer.
- b. Store all materials salvaged for the Contractor as approved by the Contracting Officer and remove from Government property before completion of the contract. On site sales of salvaged material is prohibited.
- c. Remove salvaged items to remain the property of the Government in a manner to prevent damage, and packed or crated to protect the items from damage while in storage or during shipment. Items damaged during removal or storage must be repaired or replaced to match existing items. Properly identify the contents of containers.
- d. Remove and capture all Class I ODS refrigerants in accordance with the Clean Air Act Amendment of 1990.

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 in the Waste Management Plan. Storage of removed materials on the project site is prohibited.

3.4.2 Removal to Spoil Areas on Government Property

Transport noncombustible materials removed from demolition and deconstruction structures to designated spoil areas on Government property.

3.4.3 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 08 51 13

ALUMINUM WINDOWS

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 ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

- AAMA 1503** (2009) Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections
- AAMA 2603** (2002) Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels
- AAMA/WDMA/CSA 101/I.S.2/A440** (2008; Update 1 2008; Update 2 2008; Update 3 2009) North American Fenestration Standard/Specification for Windows, Doors, and Skylights

ASTM INTERNATIONAL (ASTM)

- ASTM E1300** (2009a) Determining Load Resistance of Glass in Buildings
- ASTM F1642** (2004; R 2010) Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings
- ASTM F2248** (2009) Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

- NFRC 200** (2010) Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

1.2 CERTIFICATION

Each prime window unit must bear the AAMA Label warranting that the product complies with **AAMA/WDMA/CSA 101/I.S.2/A440**. Certified test reports attesting that the prime window units meet the requirements of **AAMA/WDMA/CSA 101/I.S.2/A440**, including test size, will be acceptable in

lieu of product labeling.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Windows

SD-03 Product Data

Windows

Hardware

Fasteners

Window performance

Thermal-Barrier Windows

SD-04 Samples

Finish Sample

SD-05 Design Data

Structural calculations for deflection

SD-06 Test Reports

Minimum condensation resistance factor

Standard Airblast Test

For Minimum Antiterrorism windows, in lieu of a Design Analysis, results of airblast testing, whether by arena test or shocktube, shall be included in a test report, providing information in accordance with ASTM F1642, as prepared by the independent testing agency performing the test. The test results shall demonstrate the ability of each window proposed for use to withstand the airblast loading parameters and achieve the hazard level rating specified in paragraph "Standard Airblast Test Method".

1.4 QUALITY ASSURANCE

1.4.1 Shop Drawing Requirements

Provide drawings that indicate elevations of windows, full-size sections, thickness and gages of metal, fastenings, proposed method of anchoring, size and spacing of anchors, details of construction, method of glazing, details of operating hardware, mullion details, method and materials for weatherstripping, method of attaching screens, installation details, and other related items.

1.4.2 Sample Requirements

1.4.2.1 Finish Sample Requirements

Submit color chart of standard factory color coatings when factory-finish color coating is to be provided.

1.4.3 Design Data Requirements

Submit calculations to substantiate compliance with deflection requirements and Minimum Antiterrorism Performance criteria. A registered Professional Engineer must provide calculations.

Submit design analysis with calculations showing that the design of each different size and type of aluminum window unit and its anchorage to the structure meets the requirements of paragraph "Minimum Antiterrorism Performance Criteria". Calculations verifying the structural performance of each window proposed for use, under the given loads, must be prepared and signed by a registered professional engineer. Reflect the window components and anchorage devices to the structure, as determined by the design analysis, in the shop drawings.

1.4.4 Test Report Requirements

Submit test reports for each type of window attesting that identical windows have been tested and meet the requirements specified herein for conformance to [AAMA/WDMA/CSA 101/I.S.2/A440](#) including test size, and [minimum condensation resistance factor](#) (CRF), and, for Minimum Antiterrorism windows, in lieu of a Design Analysis, results of a Standard Airblast Test.

1.5 DELIVERY AND STORAGE

Deliver windows to project site in an undamaged condition. Use care in handling and hoisting windows during transportation and at the jobsite. Store windows and components out of contact with the ground, under a weathertight covering, so as to prevent bending, warping, or otherwise damaging the windows. Repair damaged windows to an "as new" condition as approved. If windows can not be repaired, provide a new unit.

1.6 PROTECTION

Protect finished surfaces during shipping and handling using the manufacturer's standard method. Do not apply coatings or lacquers to surfaces to which calking and glazing compounds must adhere.

1.7 FIELD MEASUREMENTS

Take field measurements prior to preparation of the drawings and fabrication.

1.8 PERFORMANCE REQUIREMENTS

1.8.1 Wind Loading Design Pressure

Design window components, including mullions, hardware, and anchors, to withstand a wind-loading design pressure of at least 35 [pounds per square foot](#) (psf).

1.8.2 Tests

Test windows proposed for use in accordance with [AAMA/WDMA/CSA 101/I.S.2/A440](#) for the particular type and quality window specified.

Perform tests by a nationally recognized independent testing laboratory equipped and capable of performing the required tests. Submit the results of the tests as certified laboratory reports required herein.

Minimum design load for a uniform-load structural test must be 50 psf.

1.9 DRAWINGS

Submit the Fabrication Drawings for aluminum window units showing complete window assembly including hardware, weatherstripping, and subframe assembly details.

1.10 WINDOW PERFORMANCE

Aluminum windows must meet the following performance requirements. Perform testing requirements by an independent testing laboratory or agency.

1.10.1 Structural Performance

Structural test pressures on window units must be for positive load (inward) and negative load (outward). After testing, there will be no glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanisms or any other damage which could cause window to be inoperable. There must be no permanent deformation of any main frame, sash or ventilator member in excess of the requirements established by [AAMA/WDMA/CSA 101/I.S.2/A440](#) for the window types and classification specified in this section.

1.10.2 Minimum Antiterrorism Performance

Windows shall meet the minimum antiterrorism performance as specified in the paragraphs below. Conformance to the performance requirements shall be validated by one of the following methods.

1.10.2.1 Computational Design Analysis Method

Window frames, mullions, and sashes shall be designed to the criteria listed herein. Computational design analysis shall include calculations verifying the structural performance of each window proposed for use, under the given static equivalent loads.

Aluminum window framing members shall restrict deflections of the edges of glazing they support to $L/60$ under two times (2X) the glazing resistance per the requirements of [ASTM F2248](#) and [ASTM E1300](#). Glazing resistance shall be greater than equivalent 3-second duration loading of 35 pounds per square foot (psf) for type of window (per Window Schedule indicated on the drawings). L denotes the length of the glazing supported edge. (L is to be based on edge length of glazing in frame and not on the distance between anchors that fasten frame to the structure.)

The glazing frame bite for the window frames shall be in accordance with [ASTM F2248](#).

Window frames shall be anchored to the supporting structure with anchors designed to resist two times (2X) the glazing resistance in accordance with [ASTM F2248](#) and [ASTM E1300](#).

1.10.2.2 Alternate Dynamic Design Analysis Method

As an alternative to the static equivalent load design approach described above, window framing members, anchors, and glazing may be designed using a dynamic analysis to prove the window system will provide performance equivalent to or better than a very low hazard rating in accordance with [ASTM F1642](#) associated with the applicable low level of protection for the project.

1.10.2.3 Standard Airblast Test Method

As an alternative to either of the Computational Design Analysis Methods, each Minimum Antiterrorism window type shall be tested for evaluation of hazards generated from airblast loading in accordance with [ASTM F1642](#) by an independent testing agency regularly engaged in blast testing. For proposed window systems that are of the same type as the tested system but of different size, the test results may be accepted provided the proposed window size is within the range from 25 percent smaller to 10 percent larger in area, than the tested window. Proposed windows of a size outside this range shall require testing to evaluate their hazard rating. Testing may be by shocktube or arena test. The test shall be performed on the entire proposed window system, which shall include, but not be limited to, the glazing, its framing system, operating devices, and all anchorage devices. Anchorage of the window frame or subframe shall replicate the method of installation to be used for the project. The minimum airblast loading parameters for the test shall be as follows: Peak positive pressure of 40 kPa and positive phase impulse of 285 kPa-msec. The hazard rating for the proposed window systems, as determined by the rating criteria of [ASTM F1642](#), shall not exceed the "Very Low Hazard" rating (i.e. the "No Break", "No Hazard", "Minimal Hazard" and "Very Low Hazard" ratings are acceptable. "Low Hazard" and "High Hazard" ratings are unacceptable). Results of window systems previously tested by test protocols other than [ASTM F1642](#) may be accepted provided the required loading, hazard level rating, and size limitations stated herein are met.

1.10.3 Air Infiltration

Air infiltration must not exceed the amount established by [AAMA/WDMA/CSA 101/I.S.2/A440](#) for each window type.

1.10.4 Water Penetration

Water penetration must not exceed the amount established by [AAMA/WDMA/CSA 101/I.S.2/A440](#) for each window type.

1.10.5 Thermal Performance

Non-residential aluminum windows (including frames and glass) shall be certified by the National Fenestration Rating Council with a whole-window Solar Heat Gain Coefficient (SHGC) maximum of 0.25 determined according to [NFRC 200](#) procedures and a U-factor maximum of 0.65 $\text{Btu/hr-ft}^2\text{-F}$ in accordance with ASHRAE 90.1.

1.11 QUALIFICATION

Window manufacturer must specialize in designing and manufacturing the type of aluminum windows specified in this section, and have a minimum of 3 years of documented successful experience. Manufacturer must have the facilities capable of meeting contract requirements, single-source responsibility and warranty.

1.12 WARRANTY

Provide Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period.

PART 2 PRODUCTS

2.1 WINDOWS

Provide prime windows that comply with [AAMA/WDMA/CSA 101/I.S.2/A440](#) and the requirements specified herein. In addition to compliance with [AAMA/WDMA/CSA 101/I.S.2/A440](#), window framing members for each individual light of glass must not deflect to the extent that deflection perpendicular to the glass light exceeds L/175 of the glass edge length when subjected to uniform loads at specified design pressures. Provide [Structural calculations for deflection](#) to substantiate compliance with deflection requirements. Provide windows of types, performance classes, performance grades, combinations, and sizes indicated or specified. Design windows to accommodate hardware, glass, weatherstripping, screens, and accessories to be furnished. Each window must be a complete factory assembled unit with or without glass installed. Dimensions shown are minimum. Provide windows with insulating glass and thermal break necessary to achieve a minimum Condensation Resistance Factor (CRF) of 79 when tested in accordance with [AAMA 1503](#).

2.1.1 Awning Windows (AP)

Type AP-CW30 (Optional Performance Grade). Conceal operating mechanism within the frame members or enclose within a metal casing not less than [0.0625 inch](#) thick sheet aluminum.

2.1.2 Fixed Windows (F)

Type F-CW30 (Optional Performance Grade).

2.1.3 Glass and Glazing

Materials are specified in Section [08 81 00 GLAZING](#).

2.1.4 Weatherstripping

[AAMA/WDMA/CSA 101/I.S.2/A440](#).

2.2 FABRICATION

Fabrication of window units must comply with [AAMA/WDMA/CSA 101/I.S.2/A440](#).

2.2.1 Provisions for Glazing

Design windows and rabbets suitable for glass thickness shown or specified. For minimum antiterrorism windows, attach glazing to its supporting frame

using structural silicone sealant or adhesive glazing tape in accordance with ASTM F2248. Design sash for inside and outside double glazing and for securing glass with metal beads, glazing clips, glazing channels, or glazing compound.

2.2.2 Weatherstripping

Provide for ventilating sections of all windows to ensure a weather-tight seal meeting the infiltration requirements specified in AAMA/WDMA/CSA 101/I.S.2/A440. Provide easily replaceable factory-applied weatherstripping. Use molded vinyl, molded or molded-expanded neoprene or molded or expanded Ethylene Propylene Diene Terpolymer (EPDM) compression-type weatherstripping for compression contact surfaces. Use treated woven pile or wool, or polypropylene or nylon pile bonded to nylon fabric and metal or plastic backing strip weatherstripping for sliding surfaces. Do not use neoprene or polyvinylchloride weatherstripping where they will be exposed to direct sunlight.

2.2.3 Fasteners

Fabricated from 100 percent re-melted steel. Use fasteners as standard with the window manufacturer for windows, trim, and accessories. Self-tapping sheet-metal screws are not acceptable for material more than 1/16 inch thick.

2.2.4 Drips and Weep Holes

Provide continuous drips over heads of top ventilators. Where fixed windows adjoin ventilators, drips must be continuous across tops of fixed windows. Provide drips and weep holes as required to return water to the outside.

2.2.5 Combination Windows

Windows used in combination must be the same class and grade and will be factory assembled. Where factory assembly of individual windows into larger units is limited by transportation considerations, prefabricate, match mark, transport, and field assemble.

2.2.6 Mullions and Transom Bars

Provide mullions between multiple window units to resist two times (2X) glazing resistance in accordance with ASTM F2248 and ASTM E1300. Provide mullions with a thermal break. Secure mullions and transom bars to adjoining construction and window units in such a manner as to permit expansion and contraction and to form a weathertight joint. Provide mullion covers on the interior and exterior to completely close exposed joints and recesses between window units and to present a neat appearance.

2.2.7 Accessories

Provide windows complete with necessary hardware, fastenings, clips, fins, anchors, glazing beads, and other appurtenances necessary for complete installation and proper operation.

2.2.7.1 Hardware

AAMA/WDMA/CSA 101/I.S.2/A440. The item, type, and functional characteristics must be the manufacturer's standard for the particular

window type. Provide hardware of suitable design and of sufficient strength to perform the function for which it is used. Equip all operating ventilators with a lock or latching device which can be secured from the inside.

2.2.7.2 Fasteners

Provide concealed anchors of the type recommended by the window manufacturer for the specific type of construction. Anchors and fasteners must be compatible with the window and the adjoining construction. Provide a minimum of three anchors for each jamb located approximately 6 inches from each end and at midpoint.

2.2.7.3 Window Anchors

Anchoring devices for installing windows must be made of aluminum, cadmium-plated steel, stainless steel, or zinc-plated steel conforming to AAMA/WDMA/CSA 101/I.S.2/A440.

2.2.8 Finishes

Exposed aluminum surfaces must be factory finished with an organic coating. Color must match existing or as selected. a

2.2.8.1 Organic Coating

Clean and prime exposed aluminum surfaces. Provide a baked enamel finish in accordance with AAMA 2603 with total dry film thickness not less than 0.8 mil.

2.2.9 Screens

AAMA/WDMA/CSA 101/I.S.2/A440. Provide one insect screen for each operable exterior sash or ventilator. Design screens to be rewirable, easily removable from inside the building, and to permit easy access to operating hardware.

2.3 SPECIAL OPERATORS

For windows having operating hardware or locking or latching devices located more than 6 feet above the floor, provide suitably designed operators or locking or latching devices necessary for convenient and proper window operation.

2.4 THERMAL-BARRIER WINDOWS

Provide thermal-barrier windows, complete with accessories and fittings, where indicated.

Specify material and construction except as follows:

- a. Aluminum alloy must be 6063-T6.
- b. Frame construction, including operable sash, must be factory-assembled and factory-sealed inner and outer aluminum completely separated from metal-to-metal contact. Join assembly by a continuous, concealed, low conductance divider housed in an interlocking extrusion of the inner frame. Metal fasteners, straps, or anchors will not bridge the connection between the inner and outer frame.

- c. Operating hardware for each sash must consist of spring-loaded nylon cushion blocks and pin locks designed to lock in predetermined locations.
- d. Sash must be completely separated from metal-to-metal contact by means of woven-pile weatherstripping, plastic, or elastomeric separation members.
- e. Operating and storm sash will be factory-glazed with the type of glass indicated and of the quality specified in Section 08 81 00 GLAZING.

2.5 MULLIONS

Provide mullions between multiple-window units to match existing.

Mullions and mullion covers must be the profile indicated, reinforced as required for the specified wind loading, and securely anchored to the adjoining construction. Mullion extrusion will include serrations or pockets to receive weatherstripping, sealant, or tape at the point of contact with each window flange.

Mullion assembly must include aluminum window clamps or brackets screwed or bolted to the mullion and the mullion cover.

Mullion cover must be screw-fastened to the mullion unless otherwise indicated.

Mullion reinforcing members shall be fabricated of the materials specified in AAMA/WDMA/CSA 101/I.S.2/A440 and meet the specified design loading.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Method of Installation

Install in accordance with the window manufacturer's printed instructions and details. Build in windows as the work progresses or install without forcing into prepared window openings. Set windows at proper elevation, location, and reveal; plumb, square, level, and in alignment; and brace, strut, and stay properly to prevent distortion and misalignment. Protect ventilators and operating parts against accumulation of dirt and building materials by keeping ventilators tightly closed and locked to frame. Bed screws or bolts in sill members, joints at mullions, contacts of windows with sills, built-in fins, and subframes in mastic sealant of a type recommended by the window manufacturer. Install and caulk windows in a manner that will prevent entrance of water and wind. Fasten insect screens securely in place.

3.1.2 Dissimilar Materials

Where aluminum surfaces are in contact with, or fastened to masonry, concrete, wood, or dissimilar metals, except stainless steel or zinc, protect the aluminum surface from dissimilar materials as recommended in the Appendix to AAMA/WDMA/CSA 101/I.S.2/A440. Do not coat surfaces in contact with sealants after installation with any type of protective material.

3.1.3 Anchors and Fastenings

Make provision for securing units to each other, to masonry, and to other adjoining construction. Windows installed in masonry walls must have head and jamb members designed to recess into masonry wall not less than 7/16 inch.

3.1.4 Adjustments After Installation

After installation of windows and completion of glazing and field painting, adjust all ventilators and hardware to operate smoothly and to provide weathertight sealing when ventilators are closed and locked. Lubricate hardware and operating parts as necessary. Verify that products are properly installed, connected, and adjusted.

3.2 CLEANING

Clean interior and exterior surfaces of window units of mortar, plaster, paint spattering spots, and other foreign matter to present a neat appearance, to prevent fouling of weathering surfaces and weather-stripping, and to prevent interference with the operation of hardware. Replace all stained, discolored, or abraded windows that cannot be restored to their original condition with new windows.

3.3 WASTE MANAGEMENT

Separate corrugated cardboard and protective materials in accordance with the Waste Management Plan and place in designated areas for reuse or recycling. Place materials defined as hazardous or toxic waste in designated containers. Close and seal tightly all partly used sealant containers and store protected in well ventilated fire-safe area at moderate temperature. Place used sealant tubes and containers in areas designated for hazardous materials.

-- 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 (2010e1) Standard Specification for Flat Glass

ASTM C1172 (2009e1) Standard Specification for Laminated Architectural Flat Glass

ASTM C509 (2006; R 2011) Elastomeric Cellular Preformed Gasket and Sealing Material

ASTM C864 (2005; R 2011) Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers

ASTM C920 (2011) Standard Specification for Elastomeric Joint Sealants

ASTM D2287 (2011) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds

ASTM D395 (2003; R 2008) Standard Test Methods for Rubber Property - Compression Set

ASTM E1300 (2009a) Determining Load Resistance of Glass in Buildings

GLASS ASSOCIATION OF NORTH AMERICA (GANA)

GANA Glazing Manual (2004) Glazing Manual

GANA Sealant Manual (2008) Sealant 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

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, mullion details, 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-04 Samples

Insulating Glass

Two 8 by 10 inch samples of each of the following: insulating glass units.

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.

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 E1300.

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 Clear Glass

Type I, Class 1 (clear), Quality q3 (

2.1.2 Annealed Glass

Annealed glass shall be Type I transparent flat type, Class 1 - clear, Quality q3 - glazing select, .70 percent light transmittance, .43 percent shading coefficient, conforming to ASTM C1036.

2.1.3 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 0.030 inch thick, clear polyvinyl butyral interlayer. The total thickness shall be nominally 1/4 inch. Color shall be clear. The total thickness shall be nominally 1/4 inch.

2.2 INSULATING GLASS UNITS

Two panes of glass separated by a dehydrated 1/2 inch airspace, filled with argon and hermetically sealed. Non-residential glazed systems (including frames and glass) shall be certified by the National

Fenestration Rating Council. Glazing shall meet or exceed a luminous efficacy of 1.0. Dimensional tolerances shall be as specified in [IGMA TR-1200](#). Spacer shall be black, roll-formed, thermally broken aluminum 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.

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, filled with argon gas and hermetically sealed.

Insulated glass units shall have a Solar Heat Gain Coefficient (SHGC) maximum of .37 and a U-factor maximum of .25 W per square m by K Btu per square foot by hr by degree F. The total overall thickness of glazing is a nominal 1 inch thick.

Dimensional tolerances shall be as specified in [IGMA TR-1200](#). Spacer shall be black, roll-formed, thermally broken aluminum, 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 laminated light shall be [ASTM C1172](#), clear annealed flat glass Type I, Class I, Quality q3 The outer light shall be [ASTM C1036](#), Type I, Class 1 (transparent), Quality q3, inch thick Style I (uncoated), Type I, Class 2 (heat absorbing low E) 1.4 inch thick.

2.2.2 Low Emissivity Insulating Glass

Interior and exterior glass panes for Low-E insulating units shall be Type I annealed flat glass, Class 1-clear Quality q3 - glazing select, conforming to [ASTM C1036](#). Glass performance shall be U value maximum of .25 Btu/hr-ft²-F, Solar Heat Gain Coefficient (SHGC) maximum of .37.

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 Putty and Glazing Compound

Glazing compound shall be as recommended by manufacturer for face-glazing metal sash. Putty shall be linseed oil type. Putty and glazing compounds shall not be used with insulating glass or laminated glass.

2.3.2 Glazing Compound

Use for face glazing metal sash. Do not use with insulating glass units or laminated glass.

2.3.3 Sealants

Provide elastomeric sealants.

2.3.3.1 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.

2.3.4 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.

2.3.5 Preformed Channels

Neoprene, vinyl, or rubber, as recommended by the glass manufacturer for the particular condition. Channels shall be chemically compatible with plastic sheet.

2.3.6 Sealing Tapes

Preformed, semisolid, PVC-based material of proper size and compressibility for the particular condition, complying with ASTM D2287. 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.

2.3.7 Setting Blocks and Edge Blocks

Closed-cell neoprene setting blocks shall be dense extruded type conforming to ASTM C509 and ASTM D395, 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.

2.3.8 Glazing Gaskets

Glazing gaskets shall be extruded with continuous integral locking projection designed to engage into metal glass holding members to provide a watertight seal during dynamic loading, building movements and thermal movements. Glazing gaskets for a single glazed opening shall be continuous one-piece units with factory-fabricated injection-molded corners free of flashing and burrs. Glazing gaskets shall be in lengths or units recommended by manufacturer to ensure against pull-back at corners. Glazing gasket profiles shall be as indicated on drawings.

2.3.8.1 Fixed Glazing Gaskets

Fixed glazing gaskets shall be closed-cell (sponge) smooth extruded compression gaskets of cured elastomeric virgin neoprene compounds conforming to [ASTM C509](#), Type 2, Option 1.

2.3.8.2 Wedge Glazing Gaskets

Wedge glazing gaskets shall be high-quality extrusions of cured elastomeric virgin neoprene compounds, ozone resistant, conforming to [ASTM C864](#), Option 1, Shore A durometer between 65 and 75.

2.3.8.3 Aluminum Framing Glazing Gaskets

Glazing gaskets for aluminum framing shall be permanent, elastic, non-shrinking, non-migrating, watertight and weathertight.

2.3.9 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. Aluminum windows, may be glazed in conformance with one of the glazing methods described in the standards under which they are produced, except that face puttying with no bedding will not be permitted. 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 Sheet Glass

Cut and set with the visible lines or waves horizontal.

3.2.2 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 15 00

PLASTER AND STUCCO REPAIR

01/07

PART 1 GENERAL

1.1 APPLICABLE PUBLICATIONS

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 SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 28	(1996e1) Gypsum Plasters
ASTM C 36/C 36M	(1999) Gypsum Wallboard
ASTM C 840	(1999) Application and Finishing of Gypsum Board
ASTM C 926	(1998a) Application of Portland Cement-Based Plaster
ASTM C 932	(1980; R 1998a) Surface Applied Bonding Agents for Exterior Plastering
ASTM C 1002	(2000) Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases

1.2 SUBMITTALS

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

SD-07 Certificates

Gypsum Plaster

Gypsum Wallboard

Screws

Submit manufacturers certificate of conformance attesting that the materials meet the requirements specified.

1.3 ENVIRONMENTAL CONDITIONS

1.3.1 Gypsum Plaster

Maintain an ambient temperature of not less than 55 degrees F continuously in the areas to be plastered. Maintain this temperature for not less than one week prior to the application of plaster, while performing plastering, while the plaster is drying, and after the plaster is dry until normal occupancy heating conditions are established. Distribute heat in all

areas. Provide regulated ventilation to prevent "sweatouts" or "dry-outs." When the building is exposed to hot dry winds or day-to-night temperature differentials of 20 degrees F or more, cover openings that are not glazed. Provide permanent ventilation for spaces enclosed by suspended ceilings.

PART 2 PRODUCTS

2.1 MATERIALS

Provide materials conforming to the respective specifications and the requirements specified herein.

2.1.1 Gypsum Plaster

ASTM C 28, ready mixed plaster shall be used.

2.1.4 Gypsum Wallboard

ASTM C 36/C 36M.

2.1.5 Screws

ASTM C 1002, Type "G", Type "S" or Type "W" steel drill screws. Use specially designed steel screws as recommended by the gypsum board manufacturer for the screw application of gypsum board or to steel or wood framing.

2.2 PROPORTIONING AND MIXING

Except where specified otherwise, materials are specified on a volume basis and shall be measured in approved containers, which will insure that the specified proportions will be controlled and accurately maintained during the progress of the work. Measuring materials with shovels "shovel count" will not be permitted. Ready-mix plaster shall be prepared for use by the addition of water only.

2.3 READY-MIXED PLASTER

Mix in accordance with the manufacturer's printed instructions.

PART 3 EXECUTION

3.1 PREPARATION OF SURFACES

Clean surfaces to be free of all projections, dust, loose particles, grease, bond breakers, gouges, holes, and other foreign matter. Do not apply to surfaces that have been painted or previously plastered or stuccoed. Before plaster work is started, wet underlying surfaces thoroughly with a fine fog spray of clean water to produce a uniformly moist condition. Check metal grounds, corner beads, screeds, and other accessories carefully for alignment before the work is started. Do not apply plaster or stucco to surfaces containing frost.

3.2 APPLICATION

3.2.1 GYPSUM BOARD

ASTM C 840, System VIII.

3.2.2 PLASTER

Shall be applied to yield a finished surface which is smooth and true to the line of existing undisturbed surface.

-- End of Section --

SECTION 09 22 00

SUPPORTS FOR PLASTER AND GYPSUM BOARD

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.

ASTM INTERNATIONAL (ASTM)

ASTM A463/A463M	(2010) Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process
ASTM A653/A653M	(2011) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM C645	(2011a) Nonstructural Steel Framing Members
ASTM C754	(2011) Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
ASTM C841	(2003; R 2008e1) Installation of Interior Lathing and Furring
ASTM C847	(2010a) Standard Specification for Metal Lath

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM EMLA 920	(2009) Guide Specifications for Metal Lathing and Furring
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1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Metal framing

Submit for the erection of metal framing, and furring,. Indicate materials, sizes, thicknesses, and fastenings.

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the job site and store in ventilated dry locations.

Storage area shall permit easy access for inspection and handling. If materials are stored outdoors, stack materials off the ground, supported on a level platform, and fully protected from the weather. Handle materials carefully to prevent damage. Remove damaged items and provide new items.

PART 2 PRODUCTS

2.1 MATERIALS

Provide steel materials for metal framing with galvanized coating ASTM A653/A653M, G-60; aluminum coating ASTM A463/A463M, T1-25; or a 55-percent aluminum-zinc coating. Provide support systems and attachments per UFC 3-310-04, "Seismic Design for Buildings" in seismic zones.

2.1.1 Materials for Attachment of Lath

2.1.1.1 Suspended and Furred Ceiling Systems and Wall Furring

ASTM C841, and ASTM C847.

2.1.1.2 Non-loadbearing Wall Framing

NAAMM EMLA 920.

2.1.2 Materials for Attachment of Gypsum Wallboard

2.1.2.1 Suspended and Furred Ceiling Systems

ASTM C645.

2.1.2.2 Nonload-Bearing Wall Framing and Furring

ASTM C645, but not thinner than 0.0359 inch thickness.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Systems for Attachment of Lath

3.1.1.1 Suspended and Furred Ceiling Systems and Wall Furring

ASTM C841, except as indicated otherwise.

3.1.1.2 Non-loadbearing Wall Framing

NAAMM EMLA 920, except provide framing members 16 inches o.c. unless indicated otherwise.

3.1.2 Systems for Attachment of Gypsum Wallboard

3.1.2.1 Suspended and Furred Ceiling Systems

ASTM C754, except provide framing members 16 inches o.c. unless indicated otherwise.

3.1.2.2 Non-loadbearing Wall Framing and Furring

ASTM C754, except as indicated otherwise.

3.2 ERECTION TOLERANCES

Provide framing members which will be covered by finish materials such as wallboard, plaster, or ceramic tile set in a mortar setting bed, within the following limits:

- a. Layout of walls and partitions: 1/4 inch from intended position;
- b. Plates and runners: 1/4 inch in 8 feet from a straight line;
- c. Studs: 1/4 inch in 8 feet out of plumb, not cumulative; and
- d. Face of framing members: 1/4 inch in 8 feet from a true plane.

-- 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.

ASTM INTERNATIONAL (ASTM)

- ASTM C1002 (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 C1047 (2010a) Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base
- ASTM C1396/C1396M (2011) Standard Specification for Gypsum Board
- ASTM C475/C475M (2002; R 2007) Joint Compound and Joint Tape for Finishing Gypsum Board
- ASTM C514 (2004; R 2009e1) Standard Specification for Nails for the Application of Gypsum Board
- ASTM C557 (2003; R 2009e1) Adhesives for Fastening Gypsum Wallboard to Wood Framing
- ASTM C840 (2011) Application and Finishing of Gypsum Board
- ASTM C954 (2011) 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

GYPSUM ASSOCIATION (GA)

- GA 214 (2010) Recommended Levels of Gypsum Board Finish
- GA 216 (2010) Application and Finishing of Gypsum Panel Products

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC

(2009) Leadership in Energy and
Environmental Design(tm) New Construction
Rating System

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL
PROCEDURES:

SD-03 Product Data

Gypsum Board
Accessories

Submit for each type of gypsum board units.

Adhesives; (LEED NC)
Joint Treatment Materials

Submit manufacturer's product data, indicating VOC content.

SD-07 Certificates

Asbestos Free Materials

Certify that gypsum board types, and joint treating materials do
not contain asbestos.

Material Safety Data Sheets

SD-10 Operation and Maintenance Data

Manufacturer maintenance instructions

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 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 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, and joint treatment materials, or the bonding of adhesives.

1.4.2 Exposure to Weather

Protect gypsum board 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.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to specifications, standards and requirements specified. Provide gypsum board types, 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 C1396/C1396M. Gypsum board may contain post-consumer or post-industrial recycled content.

2.1.1.1 Regular

48 inch wide, 5/8 inch thick, tapered edges.

2.1.1.2 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, tapered edges.

2.1.2 Joint Treatment Materials

ASTM C475/C475M.

2.1.2.1 Embedding Compound

Specifically formulated and manufactured for use in embedding tape at gypsum board joints and compatible with tape, substrate and fasteners.

2.1.2.2 Finishing or Topping Compound

Specifically formulated and manufactured for use as a finishing compound.

2.1.2.3 All-Purpose Compound

Specifically formulated and manufactured to serve as both a taping and a finishing compound and compatible with tape, substrate and fasteners.

2.1.2.4 Joint Tape

Use cross-laminated, tapered edge, reinforced paper, or fiber glass mesh tape recommended by the manufacturer.

2.1.3 Fasteners

2.1.3.1 Nails

ASTM C514.

2.1.3.2 Screws

ASTM C1002, 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 C954 steel drill screws for fastening gypsum board to steel framing members 0.033 to 0.112 inch thick.

2.1.4 Adhesives

Do not use adhesive containing benzene, carbon tetrachloride, or trichloroethylene. Adhesive must meet the requirements of LEED low emitting materials credit.

2.1.4.1 Adhesive for Fastening Gypsum Board to Metal Framing

Type recommended by gypsum board manufacturer.

2.1.4.2 Adhesive for Fastening Gypsum Board to Wood Framing

ASTM C557.

2.1.5 Accessories

ASTM C1047. 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.

2.1.6 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 units. Verify that all blocking, headers and supports are in place . Do not proceed with work until framing and furring are acceptable for application

of gypsum board units.

3.1.2 Gypsum Board and Framing

Verify that surfaces of gypsum board and framing to be bonded with an adhesive are free of dust, dirt, grease, and any other foreign matter. Do not proceed with work until surfaces are acceptable for application of gypsum board with adhesive.

3.2 APPLICATION OF GYPSUM BOARD

Apply gypsum board to framing and furring members in accordance with [ASTM C840](#) 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. Treat edges of cutouts for plumbing pipes, screwheads, and joints with water-resistant compound as recommended by the gypsum board manufacturer. [Install 5/8 inch gypsum ceiling board over framing at 16 inches on center.](#) Provide type of gypsum board for use in each system specified herein as indicated.

3.2.1 Application of Single-Ply Gypsum Board to Wood Framing

Apply in accordance with [ASTM C840](#), System I or [GA 216](#).

3.2.2 Application of Gypsum Board to Steel Framing and Furring

Apply in accordance with [ASTM C840](#), System VIII or [GA 216](#).

3.2.3 Control Joints

Install expansion and contraction joints in ceilings and walls in accordance with [ASTM C840](#), 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 FINISHING OF GYPSUM BOARD

Tape and finish gypsum board in accordance with [ASTM C840](#), [GA 214](#) and [GA 216](#). Finish above suspended acoustical tile ceilings to Level 2 in accordance with [GA 214](#). Finish walls and ceilings without critical lighting to receive flat paints, light textures, or wall coverings to Level 4 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. Protect workers, building occupants, and HVAC systems from gypsum dust.

3.4 SEALING

Seal openings around pipes, fixtures, and other items projecting through gypsum board units. Apply material with exposed surface flush with gypsum board units.

3.5 PATCHING

Patch surface defects in gypsum board to a smooth, uniform appearance, ready to receive finishes.

3.6 SHAFTWALL FRAMING

Install the shaftwall system in accordance with the system manufacturer's published instructions. Coordinate bucks, anchors, blocking and other items placed in or behind shaftwall framing with electrical and mechanical work. Patch or replace fireproofing materials which are damaged or removed during shaftwall construction.

-- 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 A1008/A1008M	(2011) 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 A489	(2004e1) Standard Specification for Carbon Steel Lifting Eyes
ASTM A641/A641M	(2009a) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM A653/A653M	(2011) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B633	(2011) Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
ASTM C423	(2009a) Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
ASTM C635/C635M	(2007) Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings
ASTM C636/C636M	(2008) Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
ASTM C920	(2011) Standard Specification for Elastomeric Joint Sealants
ASTM E1264	(2008e1) Acoustical Ceiling Products
ASTM E1414/E1414M	(2011a) Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum

ASTM E1477	(1998a; R 2008) Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers
ASTM E580/E580M	(2011b) Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Moderate Seismic Restraint
ASTM E795	(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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1.2 SYSTEM DESCRIPTION

1.2.1 Ceiling Attenuation Class and Test

Provide a ceiling system with an attenuation class (CAC) of 35 for all ceilings when determined in accordance with ASTM E1414/E1414M. 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 C423 Test Method.

1.2.3 Light Reflectance

Determine light reflectance factor in accordance with ASTM E1477 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.

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

SD-07 Certificates for low VOC

Sealant

Adhesive

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 or concrete 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 standard performance guarantees or warranties that extend beyond a one year period. Include an agreement to repair or replace acoustical panels that fail within the warranty period in the standard performance guarantee or warranty. Failures include, but are not limited to, sagging and warping of panels; rusting and manufacturers defects of grid system.

1.8 EXTRA MATERIALS

Furnish spare tiles, from the same lot as those installed, of each color at the rate of 5 tiles for each 1000 tiles installed.

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 E1264, Class A, and the following requirements:

2.1.1 Units for Exposed-Grid System A

- a. Type: III (non-asbestos mineral fiber with painted finish).
- b. Flame Spread: Class A, 25 or less
- c. Pattern: C, E.
- d. Minimum NRC: 0.55 in all rooms and areas when tested on mounting Type E-400 of ASTM E795.
- e. Minimum Light Reflectance Coefficient: LR-1, 0.75 or greater .
- f. Nominal size: 24 by 48 inch. or 24 x 24 inch, as indicated.
- g. Edge detail: Square or Reveal, to match existing..
- h. Finish: Factory-applied standard finish.
- i. Minimum CAC: 35.

2.1.2 Acoustical Units

Acoustical units shall match existing units edge detail, color, pattern and finish.

2.2 SUSPENSION SYSTEM

Provide standard exposed-grid standard width flange as shown on drawings suspension system conforming to ASTM C635/C635M 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 standard mitered corners. 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 E580/E580M. Suspension systems shall match existing grid systems.

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 A641/A641M, Class 1, 0.11 inch in diameter.

2.3.2 Straps

Provide straps of 1 by 3/16 inch galvanized steel conforming to ASTM A653/A653M, with a light commercial zinc coating or ASTM A1008/A1008M with an electrodeposited zinc coating conforming to ASTM B633, Type RS.

2.3.3 Eyebolts

Provide eyebolts of weldless, forged-carbon-steel, with a straight-shank in accordance with ASTM A489. Eyebolt size must be a minimum 1/4 inch, zinc coated.

2.4 ADHESIVE

Use low VOC adhesive as recommended by tile manufacturer.

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.

2.6 SEALANT

Conform sealant to **ASTM C920**, nonstaining, Type S, Grade NS, Class 12.5, low VOC.

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 C636/C636M** 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.

3.1.5 Adhesive Application

Wipe back of tile to remove accumulated dust. Daub acoustical units on back side with four equal daubs of adhesive. Apply daubs near corners of tiles. Ensure that contact area of each daub is at least 2 inch diameter in final position. Press units into place, aligning joints and abutting units tight and uniform without differences in joint widths.

3.2 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.

-- 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.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (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 (2012) Motors and Generators

NEMA MG 10 (2001; R 2007) 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 of 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 20 00, "Interior Distribution System." 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 20 00, "Interior Distribution System."

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, 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: _____

- | | |
|--|---|
| <input type="checkbox"/> AC, Computer Room | <input type="checkbox"/> Heat Pump, Indoor Unit |
| <input type="checkbox"/> AC, Package | <input type="checkbox"/> Heat Pump, Outdoor Unit |
| <input type="checkbox"/> AC, Package Terminal | <input type="checkbox"/> Heat Pump, Package |
| <input type="checkbox"/> Assembly, Trap line | <input type="checkbox"/> Heat Pump, Package Terminal |
| <input type="checkbox"/> Backflow Preventer | <input type="checkbox"/> Pump, Circulating, Chilled Water |
| <input type="checkbox"/> Boiler | <input type="checkbox"/> Pump, Circulating, Domestic Water |
| <input type="checkbox"/> Chiller, Air Cooled Recip | <input type="checkbox"/> Pump, Circulating, Dual Temp Water |
| <input type="checkbox"/> Chiller, Air Cooled Screw | <input type="checkbox"/> Pump, Circulating, Heating Water |
| <input type="checkbox"/> Chiller, Air Cooled Scroll | <input type="checkbox"/> Pump, Condensate |
| <input type="checkbox"/> Chiller, Water Cooled Recip | <input type="checkbox"/> Pump, Sump |
| <input type="checkbox"/> Chiller, Water Cooled Screw | <input type="checkbox"/> Regulator, Temperature |
| <input type="checkbox"/> Compressor, Control Air | <input type="checkbox"/> Tank, Hot Water Storage |
| <input type="checkbox"/> Compressor, Industrial Air | <input type="checkbox"/> Tower, Cooling |
| <input type="checkbox"/> Dryer, Refrigerated Air | <input type="checkbox"/> Unit, Air Handling |
| <input type="checkbox"/> Exchanger, Heat | <input type="checkbox"/> Unit, AC Condensing |
| <input type="checkbox"/> Evaporator, Freezer | <input type="checkbox"/> Unit, Freezer Condensing |
| <input type="checkbox"/> Evaporator, Refrigerator | <input type="checkbox"/> Unit, Refrigerator Condensing |
| <input type="checkbox"/> Fan, Exhaust | <input type="checkbox"/> Unit, Fan Coil |
| <input type="checkbox"/> Generator | <input type="checkbox"/> Unit, TAB (Attach Room No. List) |
| <input type="checkbox"/> Heater, Space | <input type="checkbox"/> Unit, VAV (Attach Room No. List) |
| <input type="checkbox"/> Heater, Unit | <input type="checkbox"/> Valve, Pressure Reducing |
| <input type="checkbox"/> Heat Pump, Geo-Thermal | <input type="checkbox"/> Valve, Steam Pilot |
| | <input type="checkbox"/> 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 & 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.

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) DX cooling coils - reports entering/leaving, wet/dry bulb temperatures.
 - (e) Unit heaters.
 - (f) Condensing units/compressors/condensers - report rated/actual compressor amperages/voltages. Also, report condenser entering air temperature, both design and actual.
 - (2) Water Systems
 - (a) All pumps.
 - (b) All flow control balancing valves, circuit setters, flow orifices, venturis - report size, flow, measured pressure drop, setting, manufacturer, model.

(c) Unit heaters, convectors, fan coil units, fin tube radiation.

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.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 167	(1999) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM B 209	(1996) 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 534	(1994) Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
ASTM C 547	(1995) Mineral Fiber Preformed Pipe Insulation
ASTM C 553	(1992) Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
ASTM C 591	(1994) Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
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 (2000a) 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 Flexible Unicellular Insulation

2.1.1.1 Recommended Adhesive

ASTM C 534. Provide adhesive as recommended by insulation manufacturer or conforming with MIL-A-24179, Type II, Class 1.

2.1.1.2 Polyolefin thermoplastic

Polyolefin thermoplastic meets ASTM C 534, except density.

2.1.1.3 Adhesive For Finishing Flexible Unicellular Insulation

MIL-A-3316, Class 1, Grade A.

2.1.1.4 Glass Cloth For Finishing Flexible Unicellular Insulation

MIL-C-20079, Type I, Class 1, 3, or 5.

2.1.2 Mineral Fiber

ASTM C 547, Class I.

2.1.3 Piping Insulation Finishes

2.1.3.1 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.

2.1.3.2 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.

2.1.3.3 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. 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 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.

2.3 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 Bands for Metal Jackets

3/8-inch minimum width; 0.26 gage stainless steel or 0.24 gage aluminum.

2.5.3 Anchor Pins

Provide anchor pins and speed washers recommended by insulation manufacturer.

2.5.4 Wire

Soft annealed stainless steel, 0.047-inch nominal diameter.

2.5.5 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 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 inerts and sheet metal sleeves. Insulate flanges, unions, valves, and fittings in accordance with manufacturer's published instructions. Tape all butt joints with adhesive backed insulation tape. On elastomeric insulation (Rubatex, Armorflex) located outside provide weather covering 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.

3.2.2 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.

3.2.3 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.

3.2.4 Piping Exposed to Weather

3.2.4.1 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.

3.3 DUCTS (HVAC) INSULATION

3.3.1 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.

3.3.2 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.

3.3.3 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 PAINTING AND IDENTIFICATION

Paint as specified. Piping identification shall be as specified in other sections.

3.5 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>			
Temperature & Refrigerant Suction Pipe	Flexible Unicellular	3/4 (1.5)	3/4 (1.5)	1.5 (2.0)	1.5 (2.0)			Yes
Domestic Cold Water,	Flexible Unicellular	3/4	1	1	1			Yes
Domestic Hot Water	Flexible Unicellular	1	1	1.5	1.5			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.

=====
 -- 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 B31.1 (2007; Addenda a 2008; Addenda b 2009)
Power Piping

ASTM INTERNATIONAL (ASTM)

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 10-1; TIA 10-2; TIA 10-3; TIA 10-4) National Fire Alarm and Signaling Code
- NFPA 90A** (2012) Standard for the Installation of Air Conditioning and Ventilating Systems

SHEET METAL & 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; R 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. Remove existing and provide new BACnet DDC systems including associated equipment and accessories.
- 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

SD-07 Certificates

Contractor's Qualifications

SD-10 Operation and Maintenance Data

Comply with requirements for data packages 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". 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 .
- 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.

2.1.1.4 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.

2.1.1.5 DDC Software

2.1.1.5.1 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 room temperature sensors with timed override button, setpoint adjustment lever, digital temperature display. 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 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 Air Quality Sensors

Provide power supply for each sensor.

2.2.5 Input Switches

2.2.5.1 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.

2.3 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 Output Switches

2.3.2.1 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. Circuits operating at more than 100 volts shall be in accordance with Section [26 20 00](#), INTERIOR DISTRIBUTION SYSTEM. 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.

Provide photoelectric type detectors. Detectors shall detect both visible and invisible particles of combustion, and shall not be susceptible to undesired operation by changes to relative humidity. Provide each detector with an approved duct housing mounted exterior to the duct, and an integral perforated sampling tube extending across the width of the duct. The detector housing shall have indicator lamps that light when the detector is powered and when the detector is activated. Each detector shall have an integral test port and test switch. Connect new detectors to the building's existing fire alarm control panel. Provide control and power modules required for the operation of the detectors in their own new control unit or integral with the existing fire alarm panel. A ground fault, break, or open condition in the electrical circuitry to any detector or its control or power unit shall cause activation of a trouble signal at the building fire alarm panel. Electrical supervision of wiring used exclusively for air-handling unit shutdown is not required, provided a break in the wiring would cause shutdown of the associated unit. Equipment and devices shall be compatible and operable in all respects with, and shall in no way impair the reliability or operational functions of, the existing fire alarm system. Provide descriptive zone labels at the existing fire alarm panel indicating which new air-handling unit detectors they serve and their location. Label zones modified in order to accomplish the work.

Provide photoelectric type detectors. Detectors shall detect both visible and invisible particles of combustion, and shall not be susceptible to undesired operation by changes to relative humidity. Provide each detector with an approved duct housing mounted exterior to the duct, and an integral perforated sampling tube extending across the width of the duct. The detector housing shall have indicator lamps that light when the detector is powered and when the detector is activated. Each detector shall have an integral test port and test switch. Provide a 115 VAC power supply unit integral with the detector's duct housing. Provide power to the detector from the location indicated. Provide the detectors with a remote alarm indicator device at the location indicated. Activation of a detector shall cause immediate shutdown of the associated air-handling unit and the closing of its dampers and shall activate the remote alarm indicator.

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 54 inches above the floor to meet ADA requirements.

3.1.10.2 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 Damper Actuators

Where possible, mount actuators outside the air stream in accessible areas.

3.1.12 Thermometers and Gages

Mount devices to allow reading while standing on the floor or ground, as applicable.

3.1.13 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.

3.1.14 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. 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 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.

3.5.1 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.

3.5.2 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

3.5.3 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 --

EQUIPMENT NAMES

DESCRIPTION	EQUIPMENT NAME
air handler 1, air handling unit 1	AH1
Building	BLDG
Boiler 1	BLR1
Chiller 1	CHR1
Condenser 1	COND1
Cooling tower 1	CT1
Cooling tower 1 fan	CT1F
Cooling tower 1 pump	CT1P
condenser water	CW
condenser water pump 1	CWP1
exhaust fan 1	EF1
Evaporator 1	EVAP1
heat exchanger 1	HEX1
high pressure steam	HPS
low pressure steam	LPS
make up air fan 1	MAF1
medium pressure steam	MPS
primary chilled water	PCHW
primary chilled water pump 1	PCHWP1
primary hot water	PHW
primary hot water pump 1	PHWP1
return fan 1	RF1
secondary chilled water	SCHW
secondary chilled water pump 1	SCHWP1
secondary hot water	SHW
secondary hot water pump 1	SHWP1
System	SYS
terminal air blender 1, fan powered	TAB1
tertiary chilled water	TCHW
tertiary chilled water pump 1	TCHWP1
tertiary hot water	THW
tertiary hot water pump 1	THWP1
variable air volume box 1	VAV1
occupied zone 1 thru 999	ZN1
Common zone	ZNT

OBJECT NAMES

Point Name	Description	BACnet Command
ACHWS-SP	Actual CHW Temperature Setpoint	Read/Write
ACLG-SP	Actual Cooling Setpoint	Read/Write
ADA-SP	Actual Discharge Setpoint	Read/Write
AHTG-SP	Actual Heating Sepoint	Read/Write
AHWS-SP	Actual HW Supply Temperature Setpoint	Read/Write
ASA-SP	Actual Supply Air Setpoint	Read/Write
ASTATIC-SP	Actual Static Pressure Setpoint	Read/Write
AUTOCAL-C	Autocalibrate Command	Read/Write
AUTOCAL-STATE	Autocalibration Status	Read
AVEMA-T	Average Mixed Air Temperature	Read
AVEZN-T	Average Zone Temperature	Read
AZN-SP	Actual Zone Setpoint	Read/Write
BLDG-P	Building Static Pressure	Read
BLR1-A	Boiler 1 Alarm	Read
BLR1-EN	Boiler 1 Enable	Read/Write
BLR1EW-T	Boiler 1 Entering Water Temperature	Read
BLR1-FS	Boiler 1 Flow Switch	Read
BLR1LW-T	Boiler 1 Leaving Water Temperature	Read
BLR1-S	Boiler 1 Status	Read
BLR1SP-O	Boiler 1 Setpoint Output	Read/Write
BLR2-A	Boiler 2 Alarm	Read
BLR2EW-T	Boiler 2 Entering Water Temperature	Read
BLR2-FS	Boiler 2 Flow Switch	Read
BLR2LW-T	Boiler 2 Leaving Water Temperature	Read
BLR2-S	Boiler 2 Status	Read
BLR3-A	Boiler 3 Alarm	Read
BLR3EW-T	Boiler 3 Entering Water Temperature	Read
BLR3-FS	Boiler 3 Flow Switch	Read
BLR3LW-T	Boiler 3 Leaving Water Temperature	Read
BLR3-S	Boiler 3 Status	Read
BLR4-A	Boiler 4 Alarm	Read
BLR4EW-T	Boiler 4 Entering Water Temperature	Read
BLR4-FS	Boiler 4 Flow Switch	Read
BLR4LW-T	Boiler 4 Leaving Water Temperature	Read
BLR4-S	Boiler 4 Status	Read
BLR-SP	Boiler Setpoint	Read/Write
BLR-SP-O	Boiler Setpoint Output	Read/Write
BOX-LOAD	Box Terminal Load	Read
BOXMODE	Box Mode	Read
BP1-C	Boiler Pump 1 Command	Read/Write
BP1-S	Boiler Pump 1 Status	Read
BYPDMP-O	Bypass Damper Output	Read/Write
CC-T	Cooling Coil Temperature	Read
CD-P	Cold Deck Pressure	Read
CSDS-A	Cold Deck Smoke Detector Alarm	Read
CD-T	Cold Deck Temperature	Read
CH1-A	Chiller 1 Alarm	Read
CH1-C	Chiller 1 Command	Read/Write
CH1CHWE-T	Chiller 1 CHW Entering Temperatrue	Read
CH1CHWL-T	Chiller 1 CHW Leaving Temperature	Read
CH1CL-O	Chiller 1 Current Limit Output	Read

OBJECT NAMES

CH1CWE-T	Chiller 1 CW Entering Temperature	Read
CH1CWL-T	Chiller 1 CW Leaving Temperature	Read
CH1-E	Chiller 1 Enable	Read/Write
CH1-S	Chiller 1 Status	Read
CH1SP-O	Chiller 1 Setpoint Output	Read/Write
CH1-UNL	Chiller 1 Unloader	Read
CH2-A	Chiller 2 Alarm	Read
CH2-C	Chiller 2 Command	Read
CH2-S	Chiller 2 Status	Read
CH2-UNL	Chiller 2 Unloader	Read
CH-C	Chiller Command	Read
CH-E	Chiller Enable	Read/Write
CHNGOVER-DIFF	Changeover Differential	Read
CHNGOVER-DLY	Changeover Delay	Read
CH-S	Chiller Status	Read
CH-SP	Chiller Setpoint	Read/Write
CHW-DP	Chilled Water Differential Pressure	Read
CHWDP-SP	Chilled Water Differential Pressure Setpoint	Read/Write
CHWDT-SP	CHW Differential Temperature Setpoint	Read
CHWGPM-F	Chilled Water GPM Flow	Read
CHWGPM-SP	Chilled Water GPM Setpoint	Read/Write
CHWP-C	Chilled Water Pump Command	Read/Write
CHWP-S	Chilled Water Pump Status	Read
CHWR-T	Chilled Water Return Temperature	Read
CHWS-SP	Chilled Water Supply Temperature Setpoint	Read/Write
CHWS-T	Chilled Water Supply Temperature	Read
CHWV-O	Chilled Water Valve Output	Read/Write
CLG1-C	Cooling Stage 1 Comand	Read/Write
CLGDA-SP	Cooling Discharge Air Temperature Setpoint	Read
CLG-O	Cooling Valve Output	Read/Write
CLG-O	Cooling Output	Read/Write
CLGOCC-SP	Occupied Cooling Setpoint	Read/Write
CLGUNOCC-SP	Unoccupied Cooling Setpoint	Read/Write
CMP1-A	Commpressor 1 Alarm	Read
CMP1-C	Commpressor 1 Command	Read/Write
CMP1EVAP-P	Commpressor 1 Evaporation Pressure	Read
CMP2-A	Commpressor 2 Alarm	Read
CMP2-C	Commpressor 2 Command	Read/Write
CMP2EVAP-P	Commpressor 2 Evaporation Pressure	Read
COMMON-SP	Common Setpoint	Read/Write
COND-T	Condensate Temperature	Read
CT1-C	Cooling Tower 1 Command	Read/Write
CTIISOV-C	Cooling Tower 1 Isolation Valve Command	Read/Write
CT1-S	Cooling Tower 1 Status	Read
CTV-O	Cooling Tower Valve Output	Read/Write
CWP1-C	Condenser Water Pump 1 Command	Read/Write
CWP1-S	Condenser Water Pump 1 Status	Read
CWR-T	Condenser Water Return Temperature	Read
CW-SP	Condenser Water Setpoint	Read/Write
CWS-T	Condenser Water Supply Temperature	Read
DA1-P	Discharge Air Static Pressure 1	Read
DADEHUM-SP	Discharge Air Dehumidification Setpoint	Read/Write

OBJECT NAMES

DA-F	Discharge Air Flow	Read
DA-H	Discharge Air Humidity	Read
DAMPER-O	Damper Output	Read/Write
DA-P	Discharge Air Static Pressure	Read
DAPHI-A	Discharge Air High Duct Pressure	Read
DAP-SP	Duct Static Pressure Setpoint	Read/Write
DA-SD	Discharge Air Smoke Detector	Read
DA-SP	Discharge Air Setpoint	Read/Write
DA-SP-HL	Discharge Air Setpoint High Limit	Read/Write
DA-SP-LL	Discharge Air Setpoint Low Limit	Read/Write
DA-STATIC-SP	Discharge Air Static Pressure Setpoint	Read/Write
DA-T	Discharge Air Temperature	Read
DATCLGUNOCC-SP	Unoccupied Cooling Setpoint	Read/Write
DATHTGUNOCC-SP	Unoccupied Heating Setpoint	Read/Write
DA-VP	Discharge Air Velocity Pressure	Read
DCPL-F	Decouple Loop Flow	Read
DCPL-S	Decouple Loop Direction	Read
DCPL-T	Decouple Loop Temperature	Read
DEHUM-SP	Dehumidification Setpoint	Read/Write
DPR-C	Damper Command	Read/Write
DPR-O	Damper Output	Read/Write
DTC-T	Dual Temp Coil Temperature	Read
DTP-C	Dual Temp Pump Command	Read/Write
DTP-S	Dual Temp Pump Status	Read
DTR-T	Dual Temp Return Temperature	Read
DTS-T	Dual Temp Supply Temperature	Read
DTV-O	Dual Temp Valve Output	Read/Write
EAFILTER_S	Exhaust Air Filter Status	Read
ECON-C	Economizer Command	Read/Write
ECON-S	Economizer Status	Read
EF1-C	Exhaust Fan 1 Command	Read/Write
EF1-S	Exhaust Fan 1 Status	Read
EF2-C	Exhaust Fan 2 Command	Read/Write
EF2-S	Exhaust Fan 2 Status	Read
EF3-C	Exhaust Fan 3 Command	Read/Write
EF3-S	Exhaust Fan 3 Status	Read
EF4-C	Exhaust Fan 4 Command	Read/Write
EF4-S	Exhaust Fan 4 Status	Read
EF-C	Exhaust Fan Command	Read/Write
EF-S	Exhaust Fan Status	Read
EFFCLG-SP	Effective Cooling Setpoint	Read/Write
EFFHTG-SP	Effective Heating Setpoint	Read/Write
EF-S	Exhaust Fan Status	Read
EMER-RST	Emergency Reset Switch	Read/Write
ERU-E	Energy Recovery Unit Enable	Read/Write
E-STOP	Emergency Stop Switch	Read/Write
FAN-C	Fan Command	Read/Write
FA-SD	Fire Alarm Shutdown	Read/Write
FFILTER-A	Final Filter Alarm	Read
FFILTER-DP	Final Filter Differential Pressure	Read
FILTER-S	Filter Status	Read
FLOERR	Average Flow Error	Read

OBJECT NAMES

FLOWPID-C	Flow PID Command	Read/Write
FLOW-S	Flow Switch Status	Read
FLOW-SP	Flow Setpoint	Read/Write
FSD1-S	Fire Smoke Damper 1 Status	Read
FSD2-S	Fire Smoke Damper 2 Status	Read
FSD3-S	Fire Smoke Damper 3 Status	Read
FSD-S	Fire Smoke Damper Status	Read
GAS-MTR	Gas Meter Accumulator	Read
HD-P	Hot Deck Pressure	Read
HDS-D-A	Hot Deck Smoke Detector Alarm	Read
HD-T	Hot Deck Temperature	Read
HIDAP-A	High Discharge Air pressure Alarm	Read
HRW-C	Heat Recovery Wheel Command	Read/Write
HRW-S	Heat Recovery Wheel Status	Read
HT-A	High Temperature Alarm	Read
HTG1-C	Heating Stage 1 Command	Read/Write
HTG2-C	Heating Stage 2 Command	Read/Write
HTGCLG-S	AHU Heating/Cooling Status	Read
HTGDA-SP	Heating Discharge Air Temperature Setpoint	Read/Write
HTG-O	Heating Output	Read/Write
HUMSEN-A	Humidity Sensor Failure	Read
HUM-SP	Humidifier Setpoint	Read/Write
HUMV-O	Humidifier Valve Output	Read/Write
HWB-T	Heating Water Bridge Temperature	Read
HW-DP	Hot Water Differential Pressure	Read
HW-DTS-HL	Hot Water Dual Temp Supply High Limit	Read/Write
HW-DTS-LL	Hot Water Dual Temp Supply Low Limit	Read/Write
HW-OA-HL	Hot Water Outdoor Air Reset High Limit	Read/Write
HW-OA-LL	Hot Water Outdoor Air Reset Low Limit	Read/Write
HWP-C	Hot Water Pump Command	Read/Write
HWP-O	Hot Water Valve Output	Read/Write
HWP-S	Hot Water Pump Status	Read
HWP-S	Hot Water Pump Status	Read
HWR-T	Hot Water Return Temperature	Read
HWS-BTU-h	Hot Water System BTU/h	Read
HWS-HI	Hot Water Supply High (Reset)	Read/Write
HWS-kW-h	Hot Water System kW/h	Read
HWS-LO	Hot Water Supply Low (Reset)	Read/Write
HW-SP-HL	Hot Water Setpoint High Limit	Read/Write
HW-SP-LL	Hot Water Setpoint Low Limit	Read/Write
HWS-SP	Hot Water Supply Setpoint	Read/Write
HWS-T	Hot Water Supply Temperature	Read
HWS-W-h	Hot Water System Watt per Hour	Read
HX-EN	Heat Exchanger Enable	Read/Write
HXMV-O	Heat Exchanger Mixing Valve Output	Read/Write
HXV-O	Heat Exchanger Valve Output	Read/Write
IV-O	Inlet Vane Output	Read/Write
LIFT-STA_AIR-A	Lift Station Air Pressure Alarm	Read
LIFT-STA_LEVEL-A	Lift Station Level Alarm	Read
LIFT-STA_P1-A	Lift Station Pump 1 Alarm	Read
LIFT-STA_P1-S	Lift Station Pump 1 Status	Read
LIFT-STA_POWER-A	Lift Station Power Alarm	Read

OBJECT NAMES

LOWVOLTA	Low Voltage Alarm	Read
LL-A	low Limit Alarm	Read
LT-A	Low Temperature Alarm	Read
MAD-O	Mixed Air Damper Output	Read
MANUALOVERRIDE	Manual Override	Read
MA-P	Mixed Air Static Pressure	Read
MA-STATIC-SP	Mixed Air Static Pressure Setpoint	Read/Write
MA-T	Mixed Air Temperature	Read
MINOAD-SP	Minimum Outdoor Air Damper Setpoint	Read/Write
MIX-O	Mixing Valve Output	Read/Write
MOAD-O	Minimum Outdoor Air Damper Output	Read/Write
MOTOROVRD	Motor Overload	Read
MR-T	Mechanical Room Temperature	Read
OA-CFM	Outdoor Air Cubic Feet per Minute	Read
OACFM-SP	Outdoor Air Cubic Feet per Minute Setpoint	Read/Write
OACHNGOVER-SP	Outdoor Air Changeover Setpoint	Read/Write
OACLG-LL	Outdoor Air Cooling Low Limit	Read
OAD-C	Outdoor Air Damper Command	Read/Write
OAD-O	Outdoor Air Damper Output	Read/Write
OAD-S	Outdoor Air Damper Status	Read
OA-F	Outdoor Air Flow	Read
OAFILTER-S	Outdoor Air Filter Status	Read
OAF-SP	Outdoor Air Flow Setpoint	Read/Write
OA-H	Outdoor Air Humidity	Read
OA-MIN	Outdoor Air Minimum Cubic Feet per Minute	Read/Write
OA-P	Outdoor Air Static Pressure	Read
OA-Q	Outdoor Air Quality	Read
OA-SP-HL	Outdoor Air Setpoint High Limit	Read/Write
OA-SP-LL	Outdoor Air Setpoint Low Limit	Read/Write
OA-T	Outdoor Air Temperature	Read
OAT-HI	Outdoor Air Temperature High (Reset)	Read/Write
OA-T-LL	Outdoor Air Temperature Low Limit	Read/Write
OA-T-LL-S	Outdoor Air Temperature Low Limit Status (Enabled)	Read/Write
OAT-LO	Outdoor Air Temperature Low (Reset)	Read/Write
OA-VP	Outdoor Air Velocity Pressure	Read
OCC-C	Occupied Command	Read/Write
OCCCLGBIAS	Occupied Cooling Bias	Read
OCCHTGBIAS	Occupied Heating Bias	Read
OCCHTG-SP	Occupied Heating Setpoint	Read/Write
OCC-OVERRIDE	Occupancy Override	Read/Write
OCC-S	Occupancy Status	Read
OCC-SCHEDULE	Occupancy Schedule	Read
OCLG-SP	Occupied Cooling Setpoint	Read/Write
OHTG-SP	Occupied Heating Setpoint	Read/Write
OVER-TMR	Override Timer	Read
PCHWP1-C	Primary Chilled Water Pump 1 Command	Read/Write
PFILTER-A	Pre-filter Alarm	Read
PFILTER-DP	Pre-filter Differential Pressure	Read
PH-O	Preheat Valve Output	Read/Write
PH-SP	Preheat Setpoint	Read/Write
PH-T	Preheat Temperature	Read
PHWP1-C	Primary Hot Water Pump 1 Command	Read/Write

OBJECT NAMES

PHWP1-S	Primary Hot Water Pump 1 Status	Read
PHWP2-S	Primary Hot Water Pump 2 Status	Read
PHWP3-S	Primary Hot Water Pump 3 Status	Read
PHWP4-S	Primary Hot Water Pump 4 Status	Read
PHWP-C	Primary Hot Water Pump Command	Read/Write
PHWP-S	Primary Hot Water Pump Status	Read
PHWR-T	Primary Hot Water Return Temperature	Read
PHWS-T	Primary Hot Water Supply Temperature	Read
Power Fail	Power Failure	Read
RAD-O	Return Air Damper Output	Read/Write
RA-F	Return Airflow Rate	Read
RA-H	Return Air Humidity	Read
RA-P	Return Air Static Pressure	Read
RAPHI-A	Relief Air High Duct Pressure	Read
RAPLO-A	Return Air Low Duct Pressure	Read
RASD-A	Return Air Smoke Detector Alarm	Read
RA-T	Return Air Temperature	Read
RAT-HI-A	High Temperature Alarm	Read
RAT-LO-A	Low Temperature Alarm	Read
RA-VP	Return Air Velocity Pressure	Read
RF-C	Return Fan Command	Read/Write
RF-O	Return Fan Output	Read/Write
RF-S	Return Fan Status	Read
RH-O	Reheat Output	Read/Write
RTU1-C	Rooftop Unit 1 Command	Read/Write
RTU1-S	Rooftop Unit 1 Status	Read
RTU2-C	Rooftop Unit 2 Command	Read/Write
RTU2-S	Rooftop Unit 2 Status	Read
RTU3-C	Rooftop Unit 3 Command	Read/Write
RTU3-S	Rooftop Unit 3 Status	Read
SA-F	Supply Airflow Rate	Read
SAFLOW-SP	Supply Flow Setpoint	Read/Write
SA-P	Supply Air Static Pressure	Read
SASD-A	Supply Air Smoke Detector	Read
SA-T	Supply Air Temperature	Read
SCHW-F	Secondary Chilled Water Flow	Read
SCHWP1-C	Secondary Chilled Water Pump 1 Command	Read/Write
SCHWP1-O	Secondary Chilled Water Pump 1 Output	Read/Write
SCHWP1-S	Secondary Chilled Water Pump 1 Status	Read
SCHWP1-S	Secondary Hot Water Pump 1 Status	Read
SCHWR-T	Secondary CHW Return Temperature	Read
SCHWS-T	Secondary CHW Supply Temperature	Read
SCLG-SP	Standby Cooling Setpoint	Read/Write
SDES-S	Supply Air Damper End Switch Status	Read
SDWN-C	Shutdown Command	Read/Write
SF-A	Supply Fan Alarm	Read
SF-C	Supply Fan Command	Read/Write
SF-FAULT	Supply Fan Fault Cycle	Read
SF-HZ	Supply Fan Output Frequency	Read
SF-KWH	Supply Fan Kilowatt Hours	Read
SF-O	Supply Fan Output	Read/Write
SF-RPM	Supply Fan Motor Speed	Read

OBJECT NAMES

SF-S	Supply Fan Status	Read
SHTG-SP	Standby Heating Setpoint	Read/Write
SHUTDOWN	Shutdown	Read/Write
SHUTDOWN-S	Shutdown Status	Read
SHW-F	Secondary Hot Water Flow	Read
SHWP1-C	Secondary Hot Water Pump 1 Command	Read/Write
SHWP1-O	Secondary Hot Water Pump 1 Output	Read/Write
SHWP1-S	Secondary Hot Water Pump 1 Status	Read
SHWP2-C	Secondary Hot Water Pump 2 Command	Read/Write
SHWP2-O	Secondary Hot Water Pump 2 Output	Read/Write
SHWP2-S	Secondary Hot Water Pump 2 Status	Read
SHWP-ROT	Secondary Hot Water Pump Rotate	Read/Write
SHWR-T	Secondary Hot Water Return Temperature	Read
SHWS-T	Secondary Hot Water Supply Temperature	Read
SMKNEG-A	Smoke Negative Alarm	Read
SMKPOS-A	Smoke Positive Alarm	Read

OBJECT GROUPING

AHU		
SYSTEM-E	System Enable	R/W
OCC-C	Occupied Command	R/W
DA-T	Discharge Air Temperature	R
ADA-SP	Actual Discharge Air Setpoint	R/W
RA-T	Return Air Temperature	R
SF-C	Supply Fan Command	R/W
SF-S	Supply Fan Status	R
SF-O	Supply Fan Output	R/W
SF-HZ	Supply Fan Output Frequency	R
SF-RPM	Supply Fan Motor Speed	R
SF-KWH	Supply Fan Kilowatt Hours	R
SF-FAULT	Supply Fan Fault Code	R
DA-P	Discharge Air Static Pressure	R
ASTATIC-SP	Actual Static Pressure Setpoint	R/W
DTV-O	Dual Temperature Valve Output	R/W
SUMDA-SP	Summer Discharge Air Setpoint	R/W
SUMRA-SP-HL	Summer Return Air Setpoint High Limit	
SUMSTATIC-SP-HL	Summer Static Setpoint High Limit	
SUMRA-SP-LL	Summer Return Air Setpoint Low Limit	
SUMSTATIC-SP-LL	Summer Static Setpoint Low Limit	
WINSTATIC-SP	Winter Static Pressure Setpoint	
WINRA-SP-HL	Winter Return Air Setpoint High Limit	
WINDA-SP-LL	Winter Discharge Air Setpoint Low Limit	
WINRA-SP-LL	Winter Return Air Setpoint Low Limit	
WINDA-SP-HL	Winter Discharge Air Setpoint High Limit	
LL-A	Low Limit Alarm	
HIDAP-A	High Discharge Air Pressure Alarm	
SUMWIN-C	Summer/Winter Command	
OA-T	Outdoor Air Temperature	

AHU-VAV	
SYSTEM-E	System Enable
SYSTEM-M	System Mode
OCC-C	Occupied Command
DPR-O	Damper Output
SA-F	Supply Air Flow
FLOW-SP	Flow Setpoint

OBJECT GROUPING

VAV

SYSTEM-E	System Enable
SYSTEM-M	System Mode
OCC-C	Occupied Command
ZN-T	Zone Temperature
WC-ADJ	Warm/Cool Adjust
SF-C	Supply Fan Command
ACLG-SP	Actual Cooling Setpoint
OCLG-SP	Occupied Cooling Setpoint
AHTG-SP	Actual Heating Setpoint
OHTG-SP	Occupied Heating Setpoint
SA-F	Supply Air Flow
FLOW-SP	Flow Setpoint
DPR-O	Supply Air Damper Output
SUMWIN-C	Summer/Winter Command
FLOWPID-C	Flow PID Command

ERU

SYSTEM-E	System Enable
OCC-C	Occupied Command
DA-T	Discharge Air Temperature
ADA-SP	Actual Discharge Air Setpoint
ERU-E	Energy Recovery Unit Enable
SF-S	Supply Fan Status
EF-S	Exhaust Fan Status
WHEEL-S	Wheel Status
DTV-O	Dual Temperature Valve Output
SUMDA-SP	Summer Discharge Air Setpoint
WINDA-SP	Winter Discharge Air Setpoint
OACLG-LL	Outdoor Air Cooling Low Limit
LL-A	Low Limit Alarm
OAFILTER-S	Outdoor Air Filter Status
EAFILTER-S	Exhaust Air Filter Status
SUMWIN-C	Summer/Winter Command
OA-T	Outdoor Air Temperature

OBJECT GROUPING

DTWS

SYSTEM-E	System Enable
OA-T	Outdoor Air Temperature
SUM-SW	Summer Switch
WIN-SW	Winter Switch
SUMWIN-S	Summer/Winter Status
DTS-T	Dual Temp Supply Temperature
DTR-T	Dual Temp Return Temperature
DTP-C	Dual Temperature Pump Command
DTP-S	Dual Temperature Pump Status
CH-E	Chiller Enable
CHWP-C	Chiller Water Pump Command
CHWP-S	Chilled Water Pump Status
HWP-C	Hot Water Pump Command
HWP-S	Hot Water Pump Status
HWS-T	Hot Water Supply Temperature
STMVLV-O	Steam Valve Output
AHWS-SP	Actual HW Supply Temperature Setpoint
OA-SP-LL	Outdoor Air Setpoint Low Limit
HW-SP-HL	Hot Water Setpoint High Limit
OA-SP-HL	Outdoor Air Setpoint High Limit
HW-SP-LL	Hot Water Setpoint Low Limit
CHNGOVER-DLY	Change Over Delay

ENERGY MANAGEMENT POINTS

EMTR	Electric Meter
GMTR	Gas Meter

AREA NAMES

Lejeune Memorial Park
Knox Trailer Park
Camp Geiger
Camp Johnson
Tarawa Terrace
Naval Hospital Midway Park
MCASNR (Marine Corps Air Station New River)
Training Area B
Training Area C
Piney Green Gate
Berkeley Manor
Paradise Point
Training Area R
Training Area D
Watkins Village
Piney Green
Camp Devil Dog
Training Area M
Training Area K
Wallace Creek North
Wallace Creek South
Training Area Q
Training Area F
Hospital Point
Hadnot Point
Cogdels Creek
MOUT
Frence Creek
Triangle Outpost Gate
Ammo Supply Point
G-10 Impact Area
Training Area L
K-2 Impact Area
Greater Sandy Run
Rifle Range
Training Area J
Amphibian Base
Courthouse Bay
Training Area H
Training Area G
N1/BT-3 Impact Area
AIWW
Training Area E-1
Training Area I
Onslow Beach
Mile Hammock Bay
Training Area E
Rawls Parcel-Greater Sandy Run

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 (1999) 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 Z21.64 (1990; Addenda 1992) Direct Vent Central Furnaces

AIR-CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

ARI DCAACP Directory of Certified Applied Air Conditioning Products

ARI UD Directory of Certified Unitary Air Conditioning Equipment

ARI 210/240 (1994) Unitary Air-Conditioning and Air-Source Heat Pump Equipment

ARI 310/380 (1993) Packaged Terminal Air-Conditioners and Heat Pumps

ARI 340/360 (2000) Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment

ARI 710 (1995) Liquid-Line Driers

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 52.2 (2007; Addenda B 2008; Errata 2009, Errata 2010; INT 2010; Errata 2011) Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size

ASME INTERNATIONAL (ASME)

ASME B16.3	(1998) Malleable Iron Threaded Fittings
ASME B16.5	(2009) Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard
ASME B16.9	(2001) Factory-Made Wrought Steel Buttwelding Fittings
ASME B16.11	(2001) Forged Fittings, Socket-Welding and Threaded
ASME/ANSI B16.22	(1995) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.23	(1992) 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	(2007; Addenda a 2008; Addenda b 2009) Power Piping
ASME/ANSI B31.5	(2001) Refrigeration Piping and Heat Transfer Components

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53/A 53M	(1999b) 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	(2002; Rev. A) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B 280	(1999e1) Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
ASTM B 306	(1999) Copper Drainage Tube (DWV)

GAS APPLIANCE MANUFACTURERS ASSOCIATION (GAMA)

GAMA CDCER (1994) Consumer's Directory of Certified Efficiency Ratings for Residential Heating and Water Heating Equipment

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58 (1993) Pipe Hangers and Supports - Materials, Design and Manufacture

MSS SP-69 (1996) Pipe Hangers and Supports - Selection and Application

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 & 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 (1999) 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

Split-system heat pumps

Packaged terminal heat pumps
Cabinet unit heaters
Unit heaters
Direct Vent Gas-Fired Central Furnaces
Exhaust fans
Dampers
Diffusers, registers, and grilles
Outside air intake louvers
Flexible round ducts
Pipe and fittings

SD-08 Manufacturer's Instructions

Installation manual

SD-10 Operation and Maintenance Data

Split-system heat pumps, Data Package 3
Packaged terminal heat pumps, Data Package 2
Unit heaters, Data Package 2
Exhaust fans, Data Package 2

SD-11 Closeout Submittals

Air filter inventory

1.3.1 Temperature Control Systems

Drawings shall include point-to-point electrical wiring diagrams.

1.3.2 Equipment layout drawings

Submit drawings showing equipment layout including foot print, piping, conduit, control cabinets, door swings, and power disconnects.

1.3.3 Installation Manual

Provide for each item of equipment.

1.3.4 Air Filter Inventory

Submit an inventory of sizes and quantity of air filters required to be replaced. Inventory shall indicate location of each piece of equipment. Include sketches of drawings.

PART 2 PRODUCTS

2.1 EQUIPMENT

Dehydrate, purge, and charge refrigerant circuit with refrigerant and oil at factory. Factory oil and refrigerant charge shall be full amount required for operation, if within limits permitted by the Department of Transportation; otherwise, a holding charge shall be furnished. Field charging, where only a holding charge is shipped, shall be accomplished without breaking permanent refrigerant connections. Equipment using R-11, R-12, R-13, R-113, R-114, R-115, R-500, or R-502 as a refrigerant will not be permitted. Refrigerants shall have an Ozone Depletion Factor (ODF) of 0.05 or less. The ODF shall be in accordance with the "Montreal Protocol On Substances That Deplete The Ozone Layer," September 1987, sponsored by the United Nations Environment Program. Refrigerants that operate anywhere in the cycle below 20 psia will not be permitted. Efficiency of equipment shall meet the minimum's of Table 15701-1.

2.1.1 Split-System Heat Pumps

Provide units factory assembled, designed, tested, and rated in accordance with ARI 210/240 or ARI 340/360. Units shall be ARI certified or rated in ARI UD. Outside unit shall include compressor and condenser. Provide guards to protect condenser fins. Unit shall include blower fan, evaporator coil, filters, and controls. Provide additional heating section when indicated. Insulate interior of inside unit casing with manufacturer's standard insulation. Insulate interior of inside unit casing with manufacturer's standard insulation.

- a. Filter section: Provide UL listed throwaway 1 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.
- b. Safety controls: Provide low refrigerant pressure protection and pressure relief device. Provide compressor motor with thermal and overload protection, 5 minute anti-recycle timer, and start capacitor kit. Provide compressor with electrical crankcase heater and internal high pressure protection. The above safety controls are not required when scroll compressors are provided.
- c. Supplemental heater section: Provide UL listed electric resistance heaters including internal fusing integral with indoor unit; fan shall run until heater cools. Locate downstream of indoor coil. Provide controls to operate heater only when indoor thermostat is in heating mode and outdoor thermostat indicates outside temperature is below 35 degrees F or unit balance point, whichever is higher; and when unit is in defrost mode at any outside temperature.
- d. Space temperature controls: Provide controls including adjustable programmable thermostats with COOL-OFF-HEAT system switch and AUTO-ON fan switch. Thermostats shall be provided by unit manufacturer. Provide relays, transformers, contactors, and control wiring between thermostats and unit.
- e. Special corrosion protection: Provide condenser coils constructed of copper tubes and plate copper fins or copper tubes and plate

aluminum fins with phenolic coating factory applied to entire coil by immersion dipping and baking to 1.5 mil minimum dry film thickness. Rating of units shall be after application of phenolic coating.

2.1.1.2 Packaged Terminal Heat Pumps

Provide units factory assembled, designed, tested, and rated in accordance with ARI 310/380. Units shall be ARI certified or rated in ARI DCAACP. Units shall include refrigeration section, additional heating section (where indicated), separate outdoor weatherproof anodized aluminum louvers, forced ventilation, room cabinet, fans and motors, controls, wall sleeves, filters, dampers, grilles, subbases, leveling device, and power connections. Wall sleeves and installation shall be designed to exclude driving rain. Insulate interior of unit with manufacturer's standard insulation. Unit shall have slide-out chassis easily removed through room cabinet opening. Provide adjustable deflection inside air supply grille. Fan motors shall be permanent-split capacitor type. Provide wall mounted units minimum of 3-inches above floor unless floor mounted units are indicated.

- a. Filters: Provide permanent washable air filters or UL listed throwaway fiberglass filters, standard dust-holding capacity; removable through access door or panel.
- b. Safety controls: Provide compressor motors with thermal and overload protection, 5 minute anti-recycle timer, start capacitor kit, and crankcase heater. The above safety controls are not required when scroll compressors are provided.
- c. Supplemental heating section: Provide UL listed electric resistance heaters including internal fusing integral with unit; fan shall run until heater cools. Provide controls to operate heater only when indoor thermostat is in heating mode and outdoor thermostat indicates outside temperature is below 35 degrees F or unit balance point, whichever is higher; and when unit is in defrost mode at any outside temperature.
- d. Space temperature controls: Provide controls including adjustable COOLER-WARMER temperature control thermostats with COOL-OFF-HEAT system switch and HIGH-MEDIUM-LOW fan switch, and FAN ONLY switch.
- e. Special corrosion protection: Provide condenser coils constructed of copper tubes and plate copper fins or copper tubes and plate aluminum fins with phenolic coating factory applied to entire coil by immersion dipping and baking to 1.5 mil minimum dry film thickness. Rating of units shall be after application of phenolic coating.

2.1.1.3 Cabinet Unit Heaters

Provide units factory assembled, designed, and tested. Units shall include single heating hot water, centrifugal fans, three-speed split capacitor motors with integral thermal overload protection, and filters.

- a. Filters: Provide UL listed throwaway fiberglass filters, standard dust-holding capacity.

- b. Space temperature controls: Provide controls including adjustable room temperature control thermostats with VENT-OFF-HEAT system switch, HIGH-MEDIUM-LOW fan switch, and FAN ONLY switch. When system switch is in OFF position, de-energize automatic valve to stop water flow to coil. Thermostats shall be furnished by unit manufacturer and installed where indicated. Provide relays, transformers, contactors, and control wiring between thermostats, and unit.
- c. Horizontal units: Provide concealed, recessed, and cabinet units where indicated.

- (1) Concealed Units: Provide unit mounted filter box with track and hinged access doors with latches. Provide supply air discharge with one-inch duct collar. Provide return air plenum suitable for bottom or rear return air duct connection as indicated. Provide plenum with duct lining.

- (2) Recessed units: Provide adjustable recessing frame for flush ceiling mounting. Provide hinged bottom panel with latches for access to filters and fan motors. Provide discharge air outlet with one-inch duct collar. Provide bottom access panel with stamped return air grille or provide solid bottom access panel and rear return air inlet with one-inch duct collar as indicated.

- (3) Cabinet units: Provide hinged bottom panel with latches for access to filters and fan motors. Provide adjustable double deflection or stamped discharge grilles as indicated. Provide bottom or rear stamped return air grille as indicated.

- d. Vertical units: Provide recessed and cabinet units where indicated. Provide unit levelers, subbases, and removable front cover for access to filters and fan motors. Provide outside air intake boxes with automatic and weatherproof anodized aluminum louvers.

- (1) Recessed unit: Provide removable front cover for access to entire unit. Provide discharge air and return air grilles in front cover.

- (2) Cabinet unit: Provide removable front, side, and top panels. Provide adjustable double deflection or stamped discharge grille as indicated.

2.1.1.4 Unit Heaters

Provide factory-assembled, propeller or blower type fan unit heaters arranged for horizontal or vertical air discharge as indicated. Each unit shall include electric coil, fan, electric motor, housing, and air discharge vanes or diffusers. Horizontal discharge type units shall have adjustable deflectors for control of horizontal and vertical airflow.

Each unit shall be provided with threaded mounting holes for attaching threaded hanger rods. Fan motor shall be controlled by wall-mounted adjustable thermostat with higher end of scale range factory set at 75 degrees F. Controls shall be automatic of the on-off type. Provide fan selector switches to provide AUTOMATIC-ON-OFF positions.

2.1.5 Gas Fired Unit Heaters

Heater shall conform to requirements of ANSI Z83.8/CSA 2/6. Heat exchangers shall be stainless steel. Air discharge section shall be equipped with adjustable horizontal louvers. Fan shafts shall be either directly connected to the driving motor, or indirectly connected by multiple V-belt drive. Fans in one unit shall be of the same size. Heaters shall be power-vented type, suitable for sidewall vent discharge and single wall thickness vent piping. Heater shall have automatic ignition. Heaters shall employ metered combustion air with enclosed draft diverter (no open flue collar). Heaters shall be provided with a space thermostat which controls both unit's fan and burner.

2.1.6 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.

2.1.7 Direct Vent Gas-Fired Central Furnaces

Provide ANSI Z21.64 factory assembled, self-contained, forced circulation, natural gas-fired air heating, direct vent (condensing) central furnaces with direct vent sealed combustion system using 100 percent outdoor air, and designed to distribute air through ducts for space heating and cooling. Provide automatic hot surface ignition system. Unit shall be factory wired with both cooling and heating controls. Unit shall be design certified by American Gas Association, GAMA efficiency rating certified, and listed in GAMA CDCER for gas central furnaces. Minimum AFUE shall be 95 percent. Provide UL listed throwaway one-inch thick fiberglass filter in return air to each unit. Provide 20- to 30-volt digital heating and cooling space temperature control thermostat with manual changeover. Provide natural gas steel piping, PVC vent and combustion air piping, and PVC condensate drain piping sized as recommended by furnace manufacturer. Provide cooling (evaporator) coil units and cabinets suitable for use with furnace and as specified in paragraph entitled "Split-System Air-Conditioners."

2.1.8 Ceiling Hugger or Stem Type Fans

UL 507 and UL listed ceiling hugger or stem type fans for close-to-ceiling installation, minimum of four 52 inch diameter fan blades, 3 speed pull chain fan motor switch, reversing switch, and light kit adaptable. Provide special fan support including metal electrical ceiling outlet box designed to support the weight of the fan and light assembly, and to prevent fan wobbling and vibrating at all fan speeds. Secure fan support with minimum of 2 metal hex head screws for each connection. Provide white opal glass schoolhouse type globe light kit to match fan.

2.1.9 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.

2.1.10 Energy Recovery Ventilator

Unit shall include outdoor supply fan, exhaust air fan, recovery wheel,

2-inch thick outdoor air and exhaust air filters, and outdoor and exhaust shut off dampers.

2.1.10.1 Exhaust Discharge and Outside Air Intake

Exhaust discharge and outside air intake shall not be located on the same side on roof top units. Units shall be UL listed and bear the UL label. Energy transfer ratings shall be in accordance with ASHRAE Standard 84. Performance to be as scheduled on plans. Unit casing to be insulated with 1-inch 3# rigid board fiberglass with fire-resistant Foil-Scrim-Kraft facing. All components shall be easily accessible through removable access doors for both exhaust and supply compartments.

2.1.10.2 Energy Recovery Wheel

Energy recovery wheel shall be in cassette form mounted on slide out track and include a total energy recovery wheel for sensible and latent energy recovery, wheel drive motor with permanently sealed ball bearings and electrical disconnect. The total enthalpy wheel shall be constructed of a light weight polymer material in removable sections with a permanently bonded silica gel desiccant coating. The unit shall not require a condensation pan. Sensible only energy recovery devices are not acceptable.

2.1.10.3 Exterior Installations

Unit shall be of internal frame type construction of G90 galvanized steel. All panels exposed to the weather shall be a minimum of 20 gauge galvanized steel. Where top panels are joined there shall be a standing seam to insure positive weather protection. Provide weather hoods of the same finish as the unit. Supply weather hood shall be louvered to stop wind driven rain and incorporate a moisture eliminator and bird screen. Exhaust hood shall include an automatic back draft damper and bird screen.

2.2 ELECTRICAL

2.2.1 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.

2.2.2 Electrical Work

Provide control wiring under Section 23 09 23.13 "BACnet Direct Digital Control Systems for HVAC."

2.3 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. 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.

2.3.1 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.

2.3.2 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.

2.3.3 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. Provide automatic dampers under Section [23 09 23.13](#) "[BACnet](#)Direct Digital Control Systems."

2.3.4 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.

2.3.5 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.

2.3.6 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.

2.3.7 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.

2.3.8 Filter Boxes

Provide when filters are not provided integral with the air-conditioning units or air-handling units. Construct filter boxes of zinc-coated steel with track, hinged access doors with latches, seal gaskets between frame, and filters. Arrange filters to filter outside air intake and return air. Filter assemblies shall be removable from filter box and replaceable without use of tools. Replaceable filter rack shall be designed to accept 2 inch thick filters.

- a. Replaceable filters: Provide UL listed throwaway 1 inch thick fiberglass filters, standard dust-holding capacity, 350 fpm maximum face velocity.
- b. High efficiency filters: Provide UL Class 2, mean efficiency of 30 percent when tested in accordance with [ASHRAE 52.2](#). Filter assembly shall include holding frame and fastener assembly, filter cartridge, and mounting frame and retainer assembly. High efficiency filters shall be preceded by replaceable filter.

2.3.9 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 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.

2.4 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.

2.4.1 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. Cold drain piping from drain pans.

2.4.2 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.

2.4.3 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.

2.4.4 Steel Piping Systems

Provide steel piping for the following piping systems.

- a. Steam and condensate piping.
- b. Fuel oil vent, and fill piping.
- c. Gas piping.

2.4.4.1 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.

2.4.4.2 Steel Pipe Fittings

Provide ASME B16.3 or ASME B16.11 threaded fittings, and ASME/ANSI B16.39 threaded unions. Provide ASME B16.9 buttwelding fittings of the same material and weight as the piping in which fittings are installed; provide backing rings compatible with piping materials being buttwelded. Provide ASME B16.11 socket welding fittings.

2.4.4.3 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.

2.4.4.4 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.

2.4.5 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.

2.4.5.1 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.

2.5 PIPING ACCESSORIES

2.5.1 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.

2.5.2 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.

2.5.3 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.

2.5.3.1 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.

2.5.3.2 Sleeves not in Masonry and Concrete

Provide 26 gage galvanized steel sheet or PVC plastic pipe sleeves.

2.5.4 Refrigerant Drier

ARI 710. Provide in refrigerant liquid piping.

2.6 PROGRAMMABLE THERMOSTATS

Provide programmable microelectronic thermostats. The thermostats shall have the following attributes:

- a. Low voltage
- b. Battery backup to maintain programming in the event of power failure
- c. Automatic control of single stage heating and single stage cooling
- d. Minimum 4 temperature settings per day, minimum of separate weekday/weekend day schedule, or 7 day schedules per week
- e. Installation shall include initial programming
- f. Temporary temperature override
- g. Display clock
- h. Display shall prompt for program modifications, or functions of

buttons shall be self evident, or instructions shall be permanently mounted on inside of flip down keyboard cover. Thermostat shall be capable of being completely programmed without the use of separate instructions.

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 Heating Equipment

Install heaters with clearance to combustibles, complying with minimum distances as determined by CSA Directory, UL Gas and Oil and as directed on each heater approval and listing plate. Support heaters independently from the building structure, as indicated, but not relying on suspended ceiling systems for support.

3.1.2.1 Vents

Locate vent dampers, piping and structural penetration as indicated. Vent damper installation shall conform to ANSI Z21.66/CGA 6.14. Vent pipes, where not connected to a masonry chimney conforming to NFPA 211, shall extend through the roof or an outside wall and shall terminate, in compliance with NFPA 54. Vents passing through waterproof membrane shall compliance with NFPA 54. Vents passing through waterproof membranes shall be provided with the necessary flashings to obtain waterproof installations.

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

- 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 FIELD QUALITY CONTROL

Upon completion and before final acceptance of work, test each 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. Furnish steam, fuel, water, electricity, instruments, connecting devices, and personnel for tests. Flush and clean piping before placing in operation. Clean equipment, piping, strainers, ducts, and filters.

3.4.1 Refrigerant Piping

Perform following when field piping connections are provided.

- a. Pressure test: Test refrigerant piping using dry, oil-free nitrogen, and prove tight at 300 psig on the high side and 150 psig on the low side. Maintain pressure for 2 hours with no leakage or reduction in gage pressure

- b. Evacuation: Using high vacuum pump and certified micron gage, reduce absolute pressure on both sides of system simultaneously to 300 microns. After reaching this point charge system with proper refrigerant until pressure of zero psig is obtained. Repeat evacuation-charging procedure for two more cycles, totaling to three evacuation-charging cycles. On final evacuation, secure pump and maintain 300 microns for 2 hours before charging with required final refrigerant.

3.4.2 Air Ducts

Obtain approval before applying insulation.

3.4.3 Equipment

3.4.3.1 Field Testing

3.4.4 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."

3.4.5 Testing and Balancing

Balance airflow in accordance with SMACNA and flows indicated. Submit written certificate to report the following:

- a. Air-handling unit and condensing unit nameplate data, and actual voltage and ampere consumption.
- b. Supply and return terminal airflow, and equipment used to measure airflow.
- c. Air-handling unit in and out cfm and temperatures, rpm of fan if belt driven.
- d. Ambient outside air temperature, date, and person testing, balancing, and reporting.

3.4.6 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.

TABLE 15701-1
 EQUIPMENT MINIMUM EFFICIENCY REQUIREMENTS
 Equipment must meet each rating listed

<u>Equipment Type</u>	<u>Efficiency</u>	<u>Rating Condition</u>
Air to Air Unitary Heat Pump (Packaged and Split)		
<65 Mbtu/hr	12.0 SEER 7.7 HSPF	
65-135 Mbtu/hr	10.1 EER 10.4 IPLV 3.2 COP	
136-240 Mbut/hr	9.3 EER 9.5 IPLV 3.1 COP	
Package Terminal Heat Pump	10- (.16xCap/1000)*EER 12.2- (.2xCap/1000)*EER 2.9- (.026xCap/1000)*COP	ARI 310/380 @ 95 F Outdoor ARI 310/380 @ 82 F Outdoor ARI 310/380 @ 47 F Outdoor
*Capacity is cooling capacity in but/hr. Use 7,000 if cap is less than 7,000, use 15,000 if cap is greater than 15.000.		
Direct Vent Gas-Fired Central Furnaces		
<225,000 input	95%	
-- 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.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 709 (2000) 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 (1996) Dictionary of Electrical and Electronics Terms (IEEE)

IEEE C2 (2012) National Electrical Safety Code

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA C57.12.28 (1999) Pad-Mounted Equipment - Enclosure Integrity (Revision of ANSI C57.12.28-88)

NEMA ICS 6 (1993; R 2001) Industrial Control and Systems Enclosures

NEMA MG 1 (2012) Motors and Generators

NEMA MG 10 (2001; R 2007) 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 of 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 certain sections of Division 23, "Mechanical".

This section applies to all sections of Division 26, "Electrical," of this project specification unless specified otherwise in the individual sections.

1.3 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.

1.4 ELECTRICAL CHARACTERISTICS

Electrical characteristics for this project shall be 12.47 kV primary, three phase, four wire, 60 Hz, and 208 volts secondary, three phase, four wire. Final connections to the power distribution system at the building shall be made by the Contractor as directed by the Contracting Officer.

1.5 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.

1.5.1 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.

1.5.2 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.

1.5.3 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.

1.5.4 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.

1.5.4.1 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.

1.5.4.2 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.

1.5.5 Operation and Maintenance Manuals

Comply with the requirements of the technical sections.

1.5.5.1 Operating Instructions

Submit text of posted operating instructions for each system and principal item of equipment as specified in the technical sections.

1.6 QUALITY ASSURANCE

1.6.1 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.

1.6.2 Regulatory Requirements

Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of [NFPA 70](#).

1.6.3 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.

1.6.4 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.

1.6.5 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.

1.6.6 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.

1.6.7 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.

1.7 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.

1.8 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. Provide red laminated plastic label with white center core where indicated. 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.

1.9 WARNING SIGNS

Provide warning signs for the enclosures of electrical equipment including substations, pad-mounted transformers, pad-mounted switches, generators, and switchgear having a nominal rating exceeding 600 volts.

- a. When the enclosure integrity of such equipment is specified to be in accordance with **NEMA C57.12.28**, such as for pad-mounted transformers, provide self-adhesive warning signs on the outside of the high voltage compartment door(s). Sign shall be a decal and shall have nominal dimensions of **7 by 10 inches** with the legend "DANGER HIGH VOLTAGE" printed in two lines of nominal **2 inch** high letters. The word "DANGER" shall be in white letters on a red background and the words "HIGH VOLTAGE" shall be in black letters on a white background. Decal shall be Panduit No. PPS0710D72 or approved equal.

1.10 ELECTRICAL REQUIREMENTS

Electrical installations shall conform to **IEEE C2**, **NFPA 70**, and requirements specified herein.

1.10.1 Motors and Equipment

Provide electrical components of mechanical equipment, such as motors, motor starters, control or push-button stations, float or pressure switches, solenoid valves, and other devices functioning to control mechanical equipment, including 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, and the electrical power circuits shall be provided under Division 16.

Provide motors, controllers, integral disconnects, and contactors with their respective pieces of equipment. Motors, controllers, integral disconnects, and contactors shall conform to Section 26 20 00, "Interior Distribution System". Extended voltage range motors shall not be permitted. Control voltage for controllers and contactors shall not exceed 120 volts nominal. 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. Where fuse protection is specifically recommended by the equipment manufacturer, provide fused switches in lieu of non-fused switches indicated. As an exception to these requirements, provide disconnect switches, contactors, and controllers for existing motor-operated equipment under Section 26 20 00, "Interior Distribution System."

1.10.2 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, and motor control equipment forming part of motor control centers or switchgear assemblies, the conduit and wiring connecting such centers, assemblies, or other power sources to 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.

1.10.3 New Work

Provide electrical components of mechanical equipment, such as motors, motor starters, 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, and the electrical power circuits shall be provided under Division 16, except internal wiring for components of packaged 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.

1.10.4 Modifications to Existing Systems

Where existing mechanical systems and motor-operated equipment require

modifications, provide electrical components under Division 16.

1.10.5 High Efficiency Motors

1.10.5.1 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](#).

1.10.5.2 High Efficiency Polyphase Motors

Unless otherwise specified, polyphase motors shall be selected based on high 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 12-10 of [NEMA MG 1](#).

1.10.6 Three-Phase Motor Protection

Provide controllers for motors rated 1-hp and above 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.

1.11 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.

1.12 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."

1.13 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.

1.13.1 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.

1.13.1.1 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.

1.13.1.2 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).

1.13.1.3 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 and the additional requirements specified in the technical sections.

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 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

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"/>
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117 <input type="checkbox"/>	147 <input type="checkbox"/>		217 <input type="checkbox"/>	247 <input type="checkbox"/>		317 <input type="checkbox"/>	347 <input type="checkbox"/>	
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125 <input type="checkbox"/>	155 <input type="checkbox"/>		225 <input type="checkbox"/>	255 <input type="checkbox"/>		325 <input type="checkbox"/>	355 <input type="checkbox"/>	
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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 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)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 1 (2001) Hard-Drawn Copper Wire

ASTM B 8 (1999) Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

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) Low Voltage Cartridge Fuses

NEMA ICS 1 (2000; R 2005; R 2008) Standard for Industrial Control and Systems: General Requirements

NEMA ICS 2 (2000) Industrial Control and Systems Controllers, Contactors, and Overload Relays, Rated 600 Volts

NEMA ICS 4 (2000) Industrial Automation Control Products and Systems Section Terminal Blocks

NEMA ICS 6 (1993; R 2001) Industrial Control and Systems Enclosures

NEMA KS 1 (2001) Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)

NEMA MG 1 (2012) Motors and Generators

NEMA MG 10 (2001; R 2007) 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 of Selection and Use of Single Phase Motors
- NEMA RN 1 (1998) Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
- NEMA TC 14 (2002) Filament-Wound Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
- NEMA TC 2 (1998) Electrical Polyvinyl Chloride (PVC) Tubing and Conduit
- NEMA TC 3 (1999) PVC Fittings for Use with Rigid PVC Conduit and Tubing
- NEMA WD 1 (1999) General Color Requirements for Wiring Devices
- NEMA WD 6 (2002) Wiring Devices - Dimensional Specifications

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

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

UNDERWRITERS LABORATORIES (UL)

- UL 1 (2000) Flexible Metal Conduit
- UL 1242 (2000; R 2001, Bul. 2002) Intermediate Metal Conduit
- 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 44 (1999; R 2002, Bul. 2002) Thermoset-Insulated Wires and Cables

UL 467	(1993; R 2001) 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	(1995; R 1999, Bul. 2001) Enclosures for Electrical Equipment
UL 506	(2008; R 2010) Specialty Transformers
UL 508	(1999; R 2002, Bul. 2003) Industrial Control Equipment
UL 510	(1994; R 1998) Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
UL 514B	(1997; R 2002, Bul. 2002) Fittings for Cable and Conduit
UL 6	(2000; Bul. 2001, 2002) Rigid Metal Conduit- Steel
UL 651	(1995; R 2002) Schedule 40 and 80 Rigid PVC Conduit
UL 67	(1993; R 2002) Panelboards
UL 6A	(2000; Bul. 2002) Electrical Rigid Metal Conduit - Aluminum, Bronze, and Stainless Steel
UL 797	(2000; Bul. 2002) Electrical Metallic Tubing
UL 83	(1998; R 2001, Bul. 2002) Thermoplastic-Insulated Wires and Cables
UL 869A	(1998; Bul. 2002) Reference Standard for Service Equipment
UL 870	(1995; R 1999, Bul. 2002) Wireways, Auxiliary Gutters, and Associated Fittings
UL 943	(1993; R 2002, Bul. 2002) Ground-Fault Circuit-Interrupters
UL 984	(1996; Bul. 2001) Hermetic Refrigerant

Motor-Compressors

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

- Wireways

- Load centers for housing units

SD-03 Product Data

- Receptacles

- Circuit breakers

- Switches

- Enclosed circuit breakers

- Motor controllers

- Manual motor starters

- CATV outlets

- Grounding Block

SD-06 Test Reports

- 600-volt wiring test

- Grounding system test

- Ground-fault receptacle test

SD-07 Certificates

- Fuses

SD-09 Manufacturer's Field Reports

SD-10 Operation and Maintenance Data

- Electrical Systems, Data Package 5

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, and EPC-80 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

Die cast 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 CABINETS, JUNCTION BOXES, AND PULL BOXES

Volume greater than 100 cubic inches, UL 50, hot-dip, zinc-coated, if sheet steel.

2.4 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.

2.4.1 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.

2.4.1.1 Equipment Manufacturer Requirements

2.4.1.2 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.

2.4.2 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
- c. 120/240 volt, single phase: Black and red
- d. On three-phase, four-wire delta system, high leg shall be orange, as required by [NFPA 70](#).

2.4.3 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](#) conforming to [UL 44](#), 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.

2.4.4 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.

2.4.5 Metal-Clad Cable

[UL 1569](#); [NFPA 70](#), Type MC cable.

2.5 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.

2.6 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."

2.7 SWITCHES

2.7.1 Toggle Switches

NEMA WD 1, UL 20, single pole, double pole, three-way, and four-way, totally enclosed with bodies of thermoplastic and/or thermoset plastic and mounting strap with grounding screw. Handles shall be white 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.

2.7.2 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 3R, enclosure per NEMA ICS 6.

2.7.3 Breakers Used as Switches

For 120- and 277-Volt fluorescent fixtures, mark breakers "SWD" in accordance with UL 489.

2.8 RECEPTACLES

UL 498, hard use, heavy-duty, grounding-type. Ratings and configurations shall be as indicated. Bodies shall be of white as 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.

2.8.1 Switched Duplex Receptacles

Provide separate terminals for each ungrounded pole. Top receptacle shall be switched when installed.

2.8.2 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."

2.8.3 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.

2.8.4 Plugs

Provide heavy-duty, rubber-covered three-, four-, or five-wire cord of required size, install plugs thereon, and attach to equipment. Plugs shall be UL listed with receptacles, complete with grounding blades. Where equipment is not available, turn over plugs and cord assemblies to the Government.

2.9 PANELBOARDS

UL 67 and UL 50 having a short-circuit current rating of 10,000 amperes symmetrical minimum. Panelboards for use as service disconnecting means shall additionally conform to UL 869A. Panelboards shall be circuit breaker-equipped. 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. Main breaker shall be "separately" mounted "above" branch breakers. 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.

2.9.1 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.

2.9.2 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.

2.9.2.1 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.

2.9.2.2 Circuit Breaker With GFCI

UL 943 and NFPA 70. Provide with "push-to-test" button, visible indication of tripped condition, and ability to detect and trip on current imbalance of 6 milliamperes or greater per requirements of UL 943 for Class A GFCI devices, for personnel protection, and 20 milliamperes or greater per requirements of UL 943 for Class B GFCI per equipment protection.

2.9.2.3 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.

2.10 LOAD CENTERS

2.10.1 RLC 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 groundable 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 with interrupting capacity of 10,000 minimum amperes rms symmetrical. Breaker terminals shall be UL listed as suitable for the type of conductor provided.

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 two adjacent breaker poles are connected to alternate phases in sequence.

2.10.2.2 Circuit Breaker With GFCI

UL 943 and NFPA 70. Provide with "push-to-test" button, visible indication of tripped condition, and ability to detect and trip on current imbalance of 6 milliamperes or greater per requirements of UL 943 for Class A GFCI devices.

2.11 ENCLOSED CIRCUIT BREAKERS

UL 489. Individual molded case circuit breakers with voltage and continuous current ratings, number of poles, overload trip setting, and short circuit current interrupting rating as indicated. Enclosure type as indicated.

2.12 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 or other circuit protective devices shall be

coordinated for proper operation. Submit coordination data for approval. Fuses shall have voltage rating not less than circuit voltage.

2.12.1 Cartridge Fuses, Current Limiting Type (Class R)

[UL 198E](#), Class RK-5. Associated fuseholders shall be Class R only.

2.12.2 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.

2.12.3 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.

2.13 MOTORS

[NEMA MG 1](#) ; hermetic-type sealed motor compressors shall also comply with [UL 984](#). Provide the size in terms of HP, or kVA, or full-load current, or a combination of these characteristics, and other characteristics, of each motor as indicated or specified. Determine specific motor characteristics to ensure provision of correctly sized starters and overload heaters. Motors for operation on 208-volt, 3-phase circuits shall have terminal voltage rating of 200 volts, and those for operation on 480-volt, 3-phase circuits shall have terminal voltage rating of 460 volts. Motors shall be designed to operate at full capacity with voltage variation of plus or minus 10 percent of motor voltage rating.

2.13.1 High Efficiency Single-Phase Motors

Single-phase fractional-horsepower alternating-current motors shall be high efficiency types corresponding to the applications listed in [NEMA MG 11](#).

2.13.2 High Efficiency Polyphase Motors

Polyphase motors shall be selected based on high 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 12-10 of [NEMA MG 1](#).

2.13.3 Motor Sizes

Provide size for duty to be performed, not exceeding the full-load nameplate current rating when driven equipment is operated at specified capacity under most severe conditions likely to be encountered. When motor size provided differs from size indicated or specified, make adjustments to wiring, disconnect devices, and branch circuit protection to accommodate equipment actually provided.

2.14 MOTOR CONTROLLERS

[UL 508](#), [NEMA ICS 1](#), and [NEMA ICS 2](#). Controllers shall have thermal overload protection in each phase and shall have one spare normally open and one spare normally closed auxiliary contact. Magnetic-type motor controllers shall have undervoltage protection when used with momentary-contact pushbutton stations or switches and shall have

undervoltage release when used with maintained-contact pushbutton stations or switches. When used with pressure, float, or similar automatic-type or maintained-contact switch, controller shall have hand/off/automatic selector switch. Connections to selector switch shall be such that only normal automatic regulatory control devices are bypassed when switch is in "hand" position. Safety control devices, such as low and high pressure cutouts, high temperature cutouts, and motor overload protective devices, shall be connected in motor control circuit in "hand" and "automatic" positions. Control circuit connections to hand/off/automatic selector switch or to more than one automatic regulatory control device shall be made in accordance with indicated or manufacturer's approved wiring diagram. Selector switch shall have means for locking in any position. For each motor not in sight of controller or where controller disconnecting means is not in sight of motor location and driven machinery location, controller disconnecting means shall be capable of being locked in open position. As an alternative, provide a manually operated, lockable, nonfused switch which disconnects motor from supply source within sight of motor. Overload protective devices shall provide adequate protection to motor windings; be thermal inverse-time-limit type; and include manual reset-type pushbutton on outside of motor controller case. Cover of combination motor controller and manual switch or circuit breaker shall be interlocked with operating handle of switch or circuit breaker so that cover cannot be opened unless handle of switch or circuit breaker is in "off" position. Minimum short circuit withstand rating of combination motor controller shall be 10,000 rms symmetrical amperes..

2.14.1 Control Circuits

Control circuits shall have maximum voltage of 120 volts derived from control transformer in same enclosure. Transformers shall conform to [UL 506](#), as applicable. Transformers, other than transformers in bridge circuits, shall have primaries wound for voltage available and secondaries wound for correct control circuit voltage. Size transformers so that 80 percent of rated capacity equals connected load. Provide disconnect switch on primary side. One secondary lead shall be fused; other shall be grounded.

2.14.2 Enclosures for Motor Controllers

[NEMA ICS 6](#).

2.14.3 Multiple-Speed Motor Controllers and Reversible Motor Controllers

Across-the-line-type, electrically and mechanically interlocked. Multiple-speed controllers shall have compelling relays and shall be multiple-button, station-type with pilot lights for each speed.

2.14.4 Pushbutton Stations

Provide with "start/stop" momentary contacts having one normally open and one normally closed set of contacts, and red lights to indicate when motor is running. Stations shall be heavy duty, oil-tight design.

2.14.5 Pilot and Indicating Lights

Provide LED cluster lamps.

2.14.6 Terminal Blocks

[NEMA ICS 4](#).

2.15 MANUAL MOTOR STARTERS (MOTOR RATED SWITCHES)

Single Double pole designed for surface mounting with overload protection .

2.16 TELEPHONE SYSTEM

2.16.1 Outlet Boxes for Telephone System

Standard type, as specified herein, 2 by 1/2 in. Mount flush in finished walls at height indicated. Outlet boxes for wall-mounted telephones shall be 2 by 4 by 2 1/8 in deep; mounted at height 60 in above finished floor. Outlet boxes for handicapped telephone station shall be 2 by 4 by 2 1/8 in deep and mounted at height 48 in above finished floor.

2.16.2 Cover Plates

Modular telephone type with same finish specified for receptacle and switch cover plates.

2.16.3 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.

2.17 GROUNDING AND BONDING EQUIPMENT

UL 467. Ground rods shall be copper-clad steel, with minimum diameter of 3/4 in and minimum length of 10 ft.

2.18 NAMEPLATES

Provide as specified in Section 26 00 00, "Basic Electrical Materials and Methods."

2.19 FIRESTOPPING MATERIALS

Provide firestopping around electrical penetrations.

2.20 WIREWAYS

UL 870. Material shall be steel galvanized 16 gage for heights and depths up to 6 by 6 in, and 14 gage for heights and depths up to 12 by 12 in. Provide in length required for the application with screw- cover NEMA 3R enclosure per NEMA ICS 6.

PART 3 EXECUTION

3.1 INSTALLATION

Electrical installations shall conform to requirements of NFPA 70 and to requirements specified herein.

3.1.1 Service Entrance Identification

3.1.1.1 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.

3.1.2 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. Shared neutral, or multi-wire branch circuits, are not permitted with arc-fault circuit interrupters. 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.

3.1.2.1 Restrictions Applicable to Aluminum Conduit

Do not install underground or encase in concrete or masonry. Do not use brass or bronze fittings.

3.1.2.2 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.

3.1.2.3 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.

3.1.2.4 Restrictions Applicable to Flexible Conduit

Use only as specified in paragraph entitled "Flexible Connections."

3.1.2.5 Underground Conduit Other Than Service Entrance

Plastic-coated rigid steel; plastic-coated steel IMC; PVC, Type EPC-40; or fiberglass. Convert nonmetallic conduit, other than PVC Schedule 40 or 80, to plastic-coated rigid, or IMC, steel conduit before rising through floor slab. Plastic coating shall extend minimum 6 in above floor.

3.1.2.6 Conduit in Floor Slabs

3.1.2.7 Metal Clad Cable

Install in accordance with NFPA 70, Type MC cable.

3.1.3 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. Run conduits in crawl space under floor slab as if exposed.

3.1.3.1 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.

3.1.3.2 Conduit Through Floor Slabs

Where conduits rise through floor slabs, curved portion of bends shall not be visible above finished slab.

3.1.3.3 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 watertight 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.

3.1.3.4 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.

3.1.3.5 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.

3.1.3.6 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.

3.1.3.7 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.

3.1.3.8 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.

3.1.3.9 Flexible Connections

Provide flexible steel conduit between 3 and 6 ft in length for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for motors. 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.

3.1.4 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, when surface mounted on interior walls exposed up to 7 ft above floors and walkways, and when specifically indicated. Boxes in other locations shall be sheet steel, except that aluminum boxes may be used with aluminum conduit. 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.

3.1.4.1 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.

3.1.4.2 Pull Boxes

Construct of at least minimum size required by **NFPA 70** of code-gauge aluminum or galvanized sheet steel, 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 Mounting Heights

Mount panelboards, enclosed circuit breakers, motor controller 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, and other devices. Measure mounting heights of wiring devices and outlets to center of device or outlet.

3.1.6 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.

3.1.7 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.

3.1.8 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.

3.1.9 Electrical Penetrations

Seal openings around electrical penetrations through fire resistance-rated walls, partitions, floors, or ceilings.

3.1.10 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. Where ground fault protection is employed, ensure that connection of ground and neutral does not interfere with correct operation of fault protection.

3.1.10.1 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 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.

3.1.12 Repair of Existing Work

Repair of existing work, demolition, and modification of existing electrical distribution systems shall be performed as follows:

3.1.12.1 Workmanship

Lay out work in advance. Exercise care where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, or other surfaces is necessary for proper installation, support, or anchorage of conduit, raceways, or other electrical work. Repair damage to buildings, piping, and equipment using skilled craftsmen of trades involved.

3.1.12.2 Existing Concealed Wiring to be Removed

Existing concealed wiring to be removed shall be disconnected from its source. Remove conductors; cut conduit flush with floor, underside of floor, and through walls; and seal openings.

3.1.12.3 Continuation of Service

Maintain continuity of existing circuits of equipment to remain. Existing circuits of equipment shall remain energized. Circuits which are to remain but were disturbed during demolition shall have circuits wiring and power restored back to original condition.

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 tests.

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 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.

3.2.4 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.

3.2.5 Watthour Metera. Electrical tests

- (1) Determine accuracy of meter.
- (2) Calibrate watthour meters to one-half percent.
- (3) Verify that correct multiplier has been placed on face of meter, where applicable.

-- End of Section --

SECTION 26 29 23

VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS

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.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

- IEEE 519 (1992; R 1993; Errata 2004) Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
- 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

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- NEMA 250 (2008) Enclosures for Electrical Equipment (1000 Volts Maximum)
- NEMA ICS 1 (2000; R 2005; R 2008) Standard for Industrial Control and Systems: General Requirements
- NEMA ICS 3.1 (2009) Guide for the Application, Handling, Storage, Installation and Maintenance of Medium-Voltage AC Contactors, Controllers and Control Centers
- NEMA ICS 6 (1993; R 2001) Industrial Control and Systems Enclosures
- NEMA ICS 7 (2006) Adjustable-Speed Drives

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

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

U.S. DEPARTMENT OF DEFENSE (DOD)

- MIL-STD-461 (2007; Rev F) Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment

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

47 CFR 15 Radio Frequency Devices

UNDERWRITERS LABORATORIES (UL)

UL 489 (2009; Reprint Jun 2011) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures

UL 508C (2002; Reprint Nov 2010) Power Conversion Equipment

1.2 RELATED REQUIREMENTS

Section 26 00 00 BASIC ELECTRICAL MATERIALS AND METHODS, and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM apply to this section with additions and modifications specified herein.

1.3 SYSTEM DESCRIPTION

1.3.1 Performance Requirements

1.3.1.1 Electromagnetic Interference Suppression

Computing devices, as defined by 47 CFR 15, MIL-STD-461 rules and regulations, shall be certified to comply with the requirements for class A computing devices and labeled as set forth in part 15.

1.3.1.2 Electromechanical and Electrical Components

Electrical and electromechanical components of the Variable Frequency Drive (VFD) shall not cause electromagnetic interference to adjacent electrical or electromechanical equipment while in operation.

1.3.2 Electrical Requirements

1.3.2.1 Power Line Surge Protection

IEEE C62.41.1 and IEEE C62.41.2, IEEE 519 Control panel shall have surge protection, included within the panel to protect the unit from damaging transient voltage surges. Surge arrestor shall be mounted near the incoming power source and properly wired to all three phases and ground. Fuses shall not be used for surge protection.

1.3.2.2 Sensor and Control Wiring Surge Protection

I/O functions as specified shall be protected against surges induced on control and sensor wiring installed outdoors and as shown. The inputs and outputs shall be tested in both normal mode and common mode using the following two waveforms:

- 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.

1.4 SUBMITTALS

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

SD-02 Shop Drawings

Schematic diagrams

Installation drawings

Submit drawings for government approval prior to equipment construction or integration. Modifications to original drawings made during installation shall be immediately recorded for inclusion into the as-built drawings.

SD-03 Product Data

Variable frequency drives

Wires and cables

Equipment schedule

Include data indicating compatibility with motors being driven.

SD-06 Test Reports

VFD Test

Performance Verification Tests

Endurance Test

SD-08 Manufacturer's Instructions

Installation instructions

SD-09 Manufacturer's Field Reports

VFD Factory Test Plan

Factory test results

SD-10 Operation and Maintenance Data

Variable frequency drives, Data Package 4

Provide service and maintenance information including preventive maintenance, assembly, and disassembly procedures. Include electrical drawings from electrical general sections. Submit additional information necessary to provide complete operation, repair, and maintenance information, detailed to the smallest replaceable unit. Include copies of as-built submittals. Provide routine preventative maintenance instructions, and equipment required. Provide instructions on how to modify program settings, and modify the control program. Provide instructions on drive adjustment, trouble-shooting, and configuration. Provide instructions on process tuning and system calibration.

1.5 QUALITY ASSURANCE

1.5.1 Schematic Diagrams

Show circuits and device elements for each replaceable module. Schematic diagrams of printed circuit boards are permitted to group functional assemblies as devices, provided that sufficient information is provided for government maintenance personnel to verify proper operation of the functional assemblies.

1.5.2 Interconnecting Diagrams

Show interconnections between equipment assemblies, and external interfaces, including power and signal conductors. Include for enclosures and external devices.

1.5.3 Installation Drawings

Show floor plan of each site, with V.F.D.'s and motors indicated. Indicate ventilation requirements, adequate clearances, and cable routes.

1.5.4 Equipment Schedule

Provide schedule of equipment supplied. Schedule shall provide a cross reference between manufacturer data and identifiers indicated in shop drawings. Schedule shall include the total quantity of each item of equipment supplied. For complete assemblies, such as VFD's, provide the serial numbers of each assembly, and a sub-schedule of components within the assembly. Provide recommended spare parts listing for each assembly or component.

1.5.5 Installation instructions

Provide installation instructions issued by the manufacturer of the equipment, including notes and recommendations, prior to shipment to the site. Provide operation instructions prior to acceptance testing.

1.5.6 Factory Test Results

Document test results and submit to government within 7 working days after completion of test.

1.6 DELIVERY AND STORAGE

Equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

1.7 WARRANTY

The complete system shall be warranted by the manufacturer for a period of one year, or the contracted period of any extended warrantee agreed upon by the contractor and the Government, after successful completion of the acceptance test. Any component failing to perform its function as specified and documented shall be repaired or replaced by the contractor at no additional cost to the Government. Items repaired or replaced shall be warranted for an additional period of at least one year from the date that it becomes functional again, as specified in the FAR CLAUSE 52.246-21.

1.8 MAINTENANCE

1.8.1 Spare Parts

Manufacturers provide spare parts in accordance with recommended spare parts list.

1.8.2 Maintenance Support

During the warranty period, the Contractor shall provide on-site, on-call maintenance services by Contractor's personnel on the following basis: The service shall be on a per-call basis with 36 hour response. Contractor shall support the maintenance of all hardware and software of the system. Various personnel of different expertise shall be sent on-site depending on the nature of the maintenance service required. Costs shall include travel, local transportation, living expenses, and labor rates of the service personnel while responding to the service request. The provisions of this Section are not in lieu of, nor relieve the Contractor of, warranty responsibilities covered in this specification. Should the result of the service request be the uncovering of a system defect covered under the warranty provisions, all costs for the call, including the labor necessary to identify the defect, shall be borne by the Contractor.

PART 2 PRODUCTS

2.1 VARIABLE FREQUENCY DRIVES (VFD)

Provide frequency drive to control the speed of induction motor(s). The VFD shall include the following minimum functions, features and ratings.

- a. Input circuit breaker per **UL 489** with a minimum of 20,000 amps symmetrical interrupting capacity and door interlocked external operator.
- b. A converter stage per **UL 508C** shall change fixed voltage, fixed frequency, ac line power to a fixed dc voltage. The converter shall utilize a full wave bridge design incorporating diode rectifiers. Silicon Controlled Rectifiers (SCR) are not acceptable. The converter shall be insensitive to three phase rotation of the ac line and shall not cause displacement power factor of less than .95 lagging under any speed and load condition.
- c. An inverter stage shall change fixed dc voltage to variable frequency, variable voltage, ac for application to a standard NEMA design B squirrel cage motor. The inverter shall be switched in a manner to produce a sine coded pulse width modulated (PWM) output waveform.
- d. The VFD shall be capable of supplying 120 percent of rated full load current for one minute at maximum ambient temperature.
- e. The VFD shall be designed to operate from a 208 volt, plus or minus 10 percent, three phase, 60 Hz supply, and control motors with a corresponding voltage rating.
- f. Acceleration and deceleration time shall be independently adjustable from one second to 60 seconds.
- g. Adjustable full-time current limiting shall limit the current to a

- preset value which shall not exceed 120 percent of the controller rated current. The current limiting action shall maintain the V/Hz ratio constant so that variable torque can be maintained. Short time starting override shall allow starting current to reach 175 percent of controller rated current to maximum starting torque.
- h. The controllers shall be capable of producing an output frequency over the range of 3 Hz to 60 Hz (20 to one speed range), without low speed cogging. Over frequency protection shall be included such that a failure in the controller electronic circuitry shall not cause frequency to exceed 110 percent of the maximum controller output frequency selected.
 - i. Minimum and maximum output frequency shall be adjustable over the following ranges: 1) Minimum frequency 3 Hz to 50 percent of maximum selected frequency; 2) Maximum frequency 40 Hz to 60 Hz.
 - j. The controller efficiency at any speed shall not be less than 96 percent.
 - k. The controllers shall be capable of being restarted into a motor coasting in the forward direction without tripping.
 - l. Protection of power semiconductor components shall be accomplished without the use of fast acting semiconductor output fuses. Subjecting the controllers to any of the following conditions shall not result in component failure or the need for fuse replacement:
 - 1. Short circuit at controller output
 - 2. Ground fault at controller output
 - 3. Open circuit at controller output
 - 4. Input undervoltage
 - 5. Input overvoltage
 - 6. Loss of input phase
 - 7. AC line switching transients
 - 8. Instantaneous overload
 - 9. Sustained overload exceeding 115 percent of controller rated current
 - 10. Over temperature
 - 11. Phase reversal
 - m. Solid state motor overload protection shall be included such that current exceeding an adjustable threshold shall activate a 60 second timing circuit. Should current remain above the threshold continuously for the timing period, the controller will automatically shut down.
 - n. A slip compensation circuit shall be included which will sense changing motor load conditions and adjust output frequency to provide speed regulation of NEMA B motors to within plus or minus 0.5 percent of

maximum speed without the necessity of a tachometer generator.

- o. The VFD shall be factory set for manual restart after the first protective circuit trip for malfunction (overcurrent, undervoltage, overvoltage or overtemperature) or an interruption of power. The VFD shall be capable of being set for automatic restart after a selected time delay. If the drive faults again within a specified time period (adjustable 0-60 seconds), a manual restart will be required.
- p. The VFD shall include external fault reset capability. All the necessary logic to accept an external fault reset contact shall be included.
- q. Provide critical speed lockout circuitry to prevent operating at frequencies with critical harmonics that cause resonant vibrations. The VFD shall have a minimum of three user selectable bandwidths.
- r. Provide the following operator control and monitoring devices mounted on the front panel of the VFD:
 - 1. Manual speed potentiometer.
 - 2. Hand-Off-Auto (HOA) switch.
 - 3. Power on light.
 - 4. Drive run power light.
 - 5. Local display.
- s. Provide properly sized NEMA rated by-pass and isolation contactors to enable operation of motor in the event of VFD failure. Mechanical and electrical interlocks shall be installed between the by-pass and isolation contactors. Provide a selector switch and transfer delay timer.

2.2 ENCLOSURES

Provide equipment enclosures conforming to NEMA 250, NEMA ICS 7, NEMA ICS 6.

2.3 WIRES AND CABLES

All wires and cables shall conform to NEMA 250, NEMA ICS 7, NFPA 70.

2.4 NAMEPLATES

Nameplates external to NEMA enclosures shall conform with the requirements of Section 26 00 00 BASIC ELECTRICAL MATERIALS AND METHODS. Nameplates internal to enclosures shall be manufacturer's standard, with the exception that they must be permanent.

2.5 SOURCE QUALITY CONTROL

2.5.1 VFD Factory Test Plan

To ensure quality, each VFD shall be subject to a series of in-plant quality control inspections before approval for shipment from the manufacturer's facilities. Provide test plans and test reports.

PART 3 EXECUTION

3.1 INSTALLATION

Per **NEMA ICS 3.1**, install equipment in accordance with the approved manufacturer's printed installation drawings, instructions, wiring diagrams, and as indicated on project drawings and the approved shop drawings. A field representative of the drive manufacturer shall supervise the installation of all equipment, and wiring.

3.2 FIELD QUALITY CONTROL

Specified products shall be tested as a system for conformance to specification requirements prior to scheduling the acceptance tests. Contractor shall conduct performance verification tests in the presence of Government representative, observing and documenting complete compliance of the system to the specifications. Contractor shall submit a signed copy of the test results, certifying proper system operation before scheduling tests.

3.2.1 VFD Test

A proposed test plan shall be submitted to the contracting officer at least 28 calendar days prior to proposed testing for approval. The tests shall conform to **NEMA ICS 1**, **NEMA ICS 7**, and all manufacturer's safety regulations. The Government reserves the right to witness all tests and review any documentation. The contractor shall inform the Government at least 14 working days prior to the dates of testing. Contractor shall provide video tapes, if available, of all training provided to the Government for subsequent use in training new personnel. All training aids, texts, and expendable support material for a self-sufficient presentation shall be provided, the amount of which to be determined by the contracting officer.

3.2.2 Performance Verification Tests

"Performance Verification Test" plan shall provide the step by step procedure required to establish formal verification of the performance of the VFD. Compliance with the specification requirements shall be verified by inspections, review of critical data, demonstrations, and tests. The Government reserves the right to witness all tests, review data, and request other such additional inspections and repeat tests as necessary to ensure that the system and provided services conform to the stated requirements. The contractor shall inform the Government 14 calendar days prior to the date the test is to be conducted.

3.2.3 Endurance Test

Immediately upon completion of the performance verification test, the endurance test shall commence. The system shall be operated at varying rates for not less than 192 consecutive hours, at an average effectiveness level of .9998, to demonstrate proper functioning of the complete PCS. Continue the test on a day-to-day basis until performance standard is met. During the endurance test, the contractor shall not be allowed in the building. The system shall respond as designed.

3.3 DEMONSTRATION

3.3.1 Training

Coordinate training requirements with the Contracting Officer.

3.3.1.1 Instructions to Government Personnel

Provide the services of competent instructors who will give full instruction to designated personnel in operation, maintenance, calibration, configuration, and programming of the complete control system. Orient the training specifically to the system installed. Instructors shall be thoroughly familiar with the subject matter they are to teach. The Government personnel designated to attend the training will have a high school education or equivalent. The number of training days of instruction furnished shall be as specified. A training day is defined as eight hours of instruction, including two 15-minute breaks and excluding lunch time; Monday through Friday. Provide a training manual for each student at each training phase which describes in detail the material included in each training program. Provide one additional copy for archiving. Provide equipment and materials required for classroom training. Provide a list of additional related courses, and offers, noting any courses recommended. List each training course individually by name, including duration, approximate cost per person, and location of course. Unused copies of training manuals shall be turned over to the Government at the end of last training session.

3.3.1.2 Operating Personnel Training Program

Provide one 2 hour training session at the site at a time and place mutually agreeable between the Contractor and the Government. Provide session to train 4 operation personnel in the functional operations of the system and the procedures that personnel will follow in system operation. This training shall include:

- a. System overview
- b. General theory of operation
- c. System operation
- d. Alarm formats
- e. Failure recovery procedures
- f. Troubleshooting

3.3.1.3 Engineering/Maintenance Personnel Training

Accomplish the training program as specified. Training shall be conducted on site at a location designated by the Government. Provide a one day training session to train 4 engineering personnel in the functional operations of the system. This training shall include:

- a. System overview
- b. General theory of operation
- c. System operation

- d. System configuration
- e. Alarm formats
- f. Failure recovery procedures
- g. Troubleshooting and repair
- h. Maintenance and calibration
- i. System programming and configuration

-- 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.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM A 580/A 580M (1998) Stainless Steel Wire
- ASTM A 641/A 641M (1998) Zinc-Coated (Galvanized) Carbon Steel Wire
- ASTM A 653/A 653M (2002; Rev. A) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- ASTM A 1008/A 1008M (2002) Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
- 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)
- IEEE C136.10 (1996) Roadway Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacle Physical and Electrical Interchangeability and Testing

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- NEMA C78.42 (2001) Electric Lamps - High-Pressure Sodium Lamps
- NEMA C78.81 (2001) Electric Lamps - Double-capped Fluorescent Lamps
- NEMA C78.901 (2001) Electric Lamps - Single Base

Fluorescent Lamps

NEMA C78.1375	(1996) Electric Lamps - 400-Watt, M59 Single-Ended Metal-Halide Lamps
NEMA C78.1376	(1996) Electric Lamps - 1000-Watt, M47 Single-Ended Metal-Halide Lamps
NEMA C78.1377	(1996) Electric Lamps - 175-Watt, M57 Single-Ended Metal-Halide Lamps
NEMA C78.1378	(1996) Electric Lamps - 250-Watt, M58 Single-Ended Metal-Halide Lamps
NEMA C78.1381	(1998) Electric Lamps - 70-Watt, M85 Double-Ended Metal-Halide Lamps
NEMA C78.1382	(1996) Electric Lamps - 100-Watt, M90 Single-Ended Metal-Halide Lamps
NEMA C78.1384	(1997) Electric Lamps - 150-Watt M102 Single-Ended Metal-Halide Lamps
NEMA C82.1	(1997) Electric Lamp Ballast - Line Frequency Fluorescent Lamp Ballast
NEMA C82.2	(2002) Fluorescent Lamp Ballasts - Methods of Measurement
NEMA C82.4	(2002) Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type)
NEMA C82.11	(2002) High-Frequency Fluorescent Lamp Ballasts
NEMA ICS 2	(2000) Industrial Control and Systems Controllers, Contactors, and Overload Relays, Rated 600 Volts
NEMA ICS 6	(1993; R 2001) Industrial Control and Systems Enclosures
NEMA LL 1	(1997; R 2002) Procedures for Linear Fluorescent Lamp Sample Preparation and the TCLP

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
NFPA 101	(2012; Amendment 1 2012) Life Safety Code

UNDERWRITERS LABORATORIES (UL)

UL 773	(1995; R 2002, Bul. 2002) Plug-In, Locking Type Photocontrols for Use with Area Lighting
UL 773A	(1995; R 1999) Nonindustrial Photoelectric Switches for Lighting Control
UL 924	(1995; R 2001, Bul. 2001 and 2002) Emergency Lighting and Power Equipment
UL 935	(2001; Bul. 2001) Fluorescent-Lamp Ballasts
UL 1029	(1994; R 2001) High-Intensity-Discharge Lamp Ballasts
UL 1598	(2000; Bul. 2001 and 2002) 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

High-intensity-discharge (HID) lighting fixtures

HID ballasts

High-pressure sodium (HPS) lamps

Metal-halide lamps

Lighting contactor

Time switch

Power hook fixture hangers

Emergency lighting equipment

Occupancy sensors

SD-06 Test Reports

Operating test

Submit test results as stated in paragraph entitled "Field Quality Control."

SD-10 Operation and Maintenance Data

Lighting Control System, Data Package 5

Submit operation and maintenance data specified herein, showing all control modules, control zones, occupancy sensors, light fixtures, and all interconnecting control wire, conduit, and associated hardware.

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.

1.5.3 Lighting Control System

Submit operation and maintenance manuals for lighting control systems that provide basic data relating to the design, operation, and maintenance of the lighting control system for the building. This shall include:

- a. Schematic diagram of the lighting control system.
- b. Manufacturers' operating and maintenance manuals on active lighting control equipment. Lighting control equipment shall include, if indicated: occupancy sensors, power packs, dimming ballasts, and light level sensors.

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 compact fluorescent fixtures shall be programmed start.
- i. 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.
- j. Ballast shall be capable of starting and maintaining operation at a minimum of 0 degrees F unless otherwise indicated.
- k. 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

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.

2.1.1.3 T-5 Long Twin Tube Lamp Ballast

- a. Total harmonic distortion (THD): Shall not be greater than 25 percent when operating one lamp, 15 percent when operating two lamps, and 20 percent when operating three lamps.
- b. Input wattage:
 - 1. 45 watts (maximum) when operating one F40 T-5 lamps
 - 2. 74 watts (maximum) when operating two F40 T-5 lamps

2.1.2 Electromagnetic Ballasts

2.1.2.1 Electromagnetic Energy-Saving Ballasts

[NEMA C82.1](#). Provide energy-saving fluorescent ballasts of the CBM certified full light output type . Ballasts shall have an average input wattage of 40 or less when operating one 32-watt F32T8 lamp 72 or less when operating two 32 watt F32T8 lamps tested in accordance with [NEMA C82.2](#) methods. Provide ballasts which are compatible with energy-saving lamps.

2.1.2.2 Electromagnetic Ballasts for Compact Fluorescent Lamps

Provide electromagnetic ballasts for compact fluorescent lamps.

2.1.2.3 Electromagnetic Low Temperature Ballasts

Provide fluorescent ballasts having a minimum starting temperature of **zero degrees F** for 800 milliampere, high output (HO) lamps in fixtures mounted outdoors, in unheated buildings, and as indicated.

2.1.3 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. Low mercury lamps shall have passed the EPA Toxicity Characteristic Leachate Procedure (TCLP) for mercury by using the lamp sample preparation procedure described in **NEMA LL 1**.
- b. T-8, U shaped fluorescent lamp, 31 watts maximum, 2600 initial lumens (minimum), 3500 K, 75 CRI (minimum), 20,000 hours average rated life, **1.625 inch** leg spacing.
- 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 9 watts, 600 initial lumens (minimum), and 13 watts, 825 initial lumens (minimum), as indicated.
 2. T-4, double twin tube, rated 13 watts, 900 initial lumens (minimum),

Average rated life is based on 3 hours operating per start.

2.1.4 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.

2.1.5 Open-Tube Fluorescent Fixtures

Provide with self-locking sockets, or lamp retainers (two per lamp). Provide a clear polycarbonate protective sleeve with end caps, over lamp, with 95 percent (minimum) light transmission. The sleeve shall be rated to withstand the thermal profile of the lamp and ballast.

2.1.6 Air Handling Fixtures

Fixtures used as air handling registers shall meet requirements of **NFPA 90A**.

2.2 HIGH-INTENSITY-DISCHARGE (HID) LIGHTING FIXTURES

UL 1598. Provide HID fixtures with tempered glass lenses when using metal-halide lamps.

2.2.1 HID Ballasts

UL 1029 and **NEMA C82.4** and shall be constant wattage autotransformer (CWA) or regulator, high power factor type. Provide single-lamp ballasts which shall have a minimum starting temperature of minus 30 degrees C. Ballasts

shall be:

- a. Designed to operate on the voltage system to which they are connected.
- b. Designed for installation in a normal ambient temperature of 40 degrees C.
- c. Constructed so that open circuit operation will not reduce the average life.

High-pressure sodium (HPS) ballasts shall have a solid-state igniter/starter with an average life in the pulsing mode of 3500 hours at the intended ambient temperature. Igniter case temperature shall not exceed 90 degrees C in any mode.

2.2.2 High-Pressure Sodium (HPS) Lamps

NEMA C78.42 wattage as indicated. 150 watt lamps, if required, shall be 55 volt type.

2.2.3 Metal-Halide Lamps

- a. 70 watt conforming to NEMA C78.1381
- b. 100 watt conforming to NEMA C78.1382
- c. 150 watt conforming to NEMA C78.1384
- d. 175 watt conforming to NEMA C78.1377
- e. 250 watt conforming to NEMA C78.1378
- f. 400 watt conforming to NEMA C78.1375
- g. 1000 watt conforming to NEMA C78.1376

2.3 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.

2.4 SUSPENDED FIXTURES

Provide hangers capable of supporting twice the combined weight of fixtures supported by hangers. Provide with swivel hangers to ensure a plumb installation. Hangers shall be cadmium-plated steel with a swivel-ball tapped for the conduit size indicated. Hangers shall be shock-absorbing type where indicated. Hangers shall allow fixtures to swing within an angle of 45 degrees. Brace pendants 4 feet or longer provided in shops or hangers to limit swinging. Single-unit suspended fluorescent fixtures shall have twin-stem hangers. Multiple-unit or continuous row fluorescent fixtures shall have a tubing or stem for wiring at one point and a tubing or rod suspension provided for each unit length of chassis, including one at each end. Rods shall be a minimum 0.18 inch diameter.

2.5 LIGHTING CONTACTOR

NEMA ICS 2, electrically held contactor. Contacts shall be rated 120

volts, 20 amperes, and 8 poles. Coils shall be rated 120 volts. Provide in NEMA 1 enclosure conforming to NEMA ICS 6. Contactor shall have silver alloy double-break contacts Provide contactor with hand-off-automatic selector switch.

2.6 TIME SWITCH

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 15 hours following power failure. Provide time switch with a manual on-off bypass switch. Housing for the time switch shall be surface-mounted, NEMA 1 enclosure conforming to NEMA ICS 6.

2.7 PHOTOCCELL SWITCH

UL 773 or UL 773A, hermetically sealed cadmium-sulfide or silicon diode type cell rated 110 volts ac, 60 Hz with single-throw contacts. Switch shall turn on at or below 3 footcandles and off at 2 to 10 footcandles. A time delay shall prevent accidental switching from transient light sources. Provide switch:

- a. Integral to the luminaire. rated 1000W minimum. Provide a directional lens in front of the cell to prevent fixed light sources from creating a turnoff condition.
- b. In a U.V. stabilized polycarbonate housing with swivel arm and adjustable window slide, rated 1800 VA, minimum.
- c. In a high-impact-resistant, noncorroding and nonconductive molded plastic housing with a locking-type receptacle conforming to IEEE C136.10, rated 1800 VA, minimum.
- d. In a cast weatherproof aluminum housing with adjustable window slide, rated 1800 VA, minimum.

2.8 POWER HOOK FIXTURE HANGERS

Provide UL listed assembly including through-wired power hook housing, interlocking plug and receptacle, power cord, and fixture support loop. Power hook housing shall be cast aluminum having two 3/4 inch threaded hubs. Support hook shall have safety screw. Fixture support loop shall be cast aluminum with provisions for accepting 3/4 inch threaded fixture stems. Power cord shall include 16 inches of 3 conductor No. 16 Type SO cord. Assembly shall be rated 120 volts or 277 volts, 15 amperes.

2.9 EXIT SIGNS

UL 924, NFPA 70, and NFPA 101. Exit signs shall be self-powered type.

2.9.1 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).

2.9.2 Remote-Powered Exit Signs

Provide remote ac/dc exit signs with provisions for wiring to external ac and dc power sources. Provide signs with a minimum of two ac lamps for normal illumination and a minimum of two dc lamps for emergency lighting.

2.10 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.

2.10.1 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. Equip units with brown-out sensitive circuit to activate battery when ac input falls to 75 percent of normal voltage . Provide integral self-testing module.

2.11 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.

2.12 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.

- a. Ultrasonic sensor shall be crystal controlled and shall not cause detection interference between adjacent sensors.
- b. Infrared sensors shall have a daylight filter. Sensor shall have a fresnel lens that is applicable for indicated usage.

c. Ultrasonic/Infrared Combination Sensor

Occupancy detection to turn lights on requires both ultrasonic and infrared sensor detection. Lights shall remain on if either the ultrasonic or infrared sensor detects movement. Infrared sensor shall have lens selected for indicated usage and daylight filter to prevent short wavelength infrared interference. Ultrasonic sensor frequency shall be crystal controlled.

2.13 SUPPORT HANGERS FOR LIGHTING FIXTURES IN SUSPENDED CEILING

2.13.1 Wires

ASTM A 641/A 641M, galvanized regular coating, soft temper, 0.1055 inches in diameter (12 gage).

2.13.2 Wires, for Humid Spaces

ASTM A 580/A 580M, composition 302 or 304, annealed stainless steel 0.1055 inches in diameter (12 gage).

2.13.3 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.

2.13.4 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 rods 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 rods 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 3/4 inch metal channels spanning, and secured to, the ceiling tees for centering and aligning the fixture. Provide wires or rods for lighting fixture support in this section.

3.1.3 Suspended Fixtures

Suspended fixtures shall be provided with 45 degree swivel hangers so that they hang plumb and shall be located with no obstructions within the 45 degree range in all directions. The stem, canopy and fixture shall be capable of 45 degree swing. Pendants, rods, or chains 4 feet or longer excluding fixture shall be braced to prevent swaying using three cables at 120 degree separation. Suspended fixtures in continuous rows shall have internal wireway systems for end to end wiring and shall be properly aligned to provide a straight and continuous row without bends, gaps, light leaks or filler pieces. Aligning splines shall be used on extruded aluminum fixtures to assure hairline joints. Steel fixtures shall be supported to prevent "oil-canning" effects. Fixture finishes shall be free of scratches, nicks, dents, and warps, and shall match the color and gloss specified. Pendants shall be finished to match fixtures. Aircraft cable shall be stainless steel. Canopies shall be finished to match the ceiling and shall be low profile unless otherwise shown. Maximum distance between suspension points shall be 10 feet or as recommended by the manufacturer, whichever is less.

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.

3.1.5 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.

3.1.6 Light Level Sensor

Locate light level sensor as indicated and in accordance with the manufacturer's recommendations. Adjust sensor for 50 footcandles or for the indicated light level at the typical work plane for that area.

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 Electronic Dimming Ballast

Test for full range of dimming capability. Observe for visually detectable flicker over full dimming range.

3.2.2 Occupancy Sensor

Test sensors for proper operation. Observe for light control over entire area being covered.

-- End of Section --



Mr. Christopher D. Hardwood
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Subject:

Limited Asbestos Survey – (CP12-0091)

Buildings:

13,114,127,214,216,219,317,400,419,501,516,526,1106,1107,1309,1310,1409
and1410

Marine Corps Base

Camp Lejeune, North Carolina

ENVIRONMENT

Date:

July 11, 2012

Dear Mr. Hardwood:

Contact:

Phillip Santiago

Crystal Coast Environmental, Inc. (CCEI) conducted a Limited Asbestos Survey (LAS) of asbestos-containing building materials (ACBMs) at the above-referenced buildings for Wiley Wilson. The survey was requested by Mr. Christopher Hardwood to identify the location and quantity of ACBMs within the mechanical rooms, steam pits and crawl spaces as part of a planned boiler modification project. The focus of the survey was to identify visible and accessible suspect ACBMs. Background information on the Site, a summary of the asbestos survey as well as the inspector's certification and license are provided below.

Phone:

910.938.7998

Email:

pasantiago@cceinc.biz

Our ref:

11-2781

BACKGROUND INFORMATION

These sites are located aboard MCB, Camp Lejeune, NC and are owned by **The US Government**. All buildings consists of a brick frame skeleton and brick and mortar exterior walls, glass windows and metal doors. Thermal System Insulation (TSI) was present in the form of fiberglass and mudded insulation within the steam pits. Spray-applied fireproofing was not observed on structural steel beams and columns.

ASBESTOS SURVEY

The survey was performed on July 6, 2012 by Mr. Robert Elbertson of CCEI. A copy of his North Carolina asbestos inspector license is provided in Attachment A. During the inspection, a total of 19 homogeneous applications (HAs) were identified and a total of 24 bulk samples were collected and submitted for laboratory analysis. The



Mr. Christopher D. Hardwood
July 11, 2012

results of the limited survey are presented in the Attachments to this report as follows:

- Attachment B – Homogeneous Application Table
- Attachment C - Types, Categories, Classes, and Condition Codes
- Attachment D – Laboratory Data Package and Chain of Custody
- Attachment E – Photographs of Homogeneous Applications

Consistent with scope of work, unless noted herein, destructive testing was not performed at the site in order to identify materials which may be hidden or obstructed. Examples of potentially hidden or obstructed areas include but are not limited to wall cavity interiors, pipe chases, spaces above fixed ceilings, grout/adhesive beneath ceramic tiles/marble tiles/granite, sub floors, and adhesives behind wall mounted mirrors, etc.

The methodology utilized to identify samples obtained during the survey is comprised of the CCEI job number, building number, homogeneous number and corresponding sample number: 000 – 1 – 01.

Visible suspected material were placed in clean Zip-Lock plastic baggies, marked for identification, cataloged, then logged onto a chain of custody, and then mailed, via FedEx, to Carolina Environmental, Inc (CEI) an approved laboratory participating in the National Volunteer Laboratory Accreditation Program (NVLAP) under Lab Code 101768-0.

Number of samples obtained from the project does not reflect any sample that may be subdivided by the laboratory for analysis.

CONCLUSIONS

As presented in the HAT in Attachment B, the results of the survey did identify ACBMs.

When reviewing the HAT, in general, materials confirmed as ACBMs are identified by the National Emission Standards for Hazardous Air Pollutants (NESHAP) categories (refer to the NESHAP column of the HAT):

- Friable RACM
- CAT 1 Non-friable RACM
- CAT 2 Non-friable RACM
- ACCM



In some cases, materials which may be ACBMs could not be sampled and are identified as "Suspect ACM, Not Sampled" in the HAT. Until determined otherwise, suspect and not sampled ACBMs should be treated as asbestos-containing.

Materials confirmed as non-ACBMs are identified by the NESHAP categories:

- Non-ACM, Sampled
- Non-Suspect ACM, Not Sampled

RECOMMENDATIONS

CCEI recommends that all suspect and confirmed ACBMs, if present, be managed in accordance with an O&M Program. In most cases, when an ACBM is in "Good" condition, we anticipate that the material can be managed under the Operations and Maintenance program in-place with abatement only being required when materials will be disturbed (i.e. renovation and some maintenance activities).

As defined by the Environmental Protection Agency (EPA) under the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulation 40 CFR 61, Subpart M and Occupational Safety and Health Administration (OSHA) regulation 29 CFR 1926.1101, it is recommended the following material located within the identified project be treated within the limits of the guidelines outlined in the following table:

Table 1

Material	HOA	Type	EPA Category	OSHA Class	Condition
Pipe Insulation	1	FRACM	Friable	I	Good
Floor Mastic	4,8,14,17	Misc	II	II	Good

See Attachment C - for a list of Types, Categories, Classes, and Condition Codes

For abatement purposes, unless otherwise tested, all like asbestos containing materials (ACMs) identified during any demolish or renovation should be considered ACMs throughout their individual site and handled accordingly.

All abatement projects involving over 160 square feet, 35 cubic feet, or 260 linear feet of ACM must be permitted by North Carolina Department of Environmental Health and Natural Resources (NCDEHNR), Health Hazards Control Unit (HHCU). Applications for permits shall be postmarked or received by NCDEHNR HHCU at least ten (10) working days prior to the scheduled removal start date.



Mr. Christopher D. Hardwood
July 11, 2012

Submission of the application is typically handled by the selected asbestos abatement contractor and a listing of state licensed asbestos abatement contractors, along with consulting firms, may be obtained from the NCDEHNR HHCU.

The primary Federal Regulations regarding identified ACM is EPA NESHAP Revision 40 CFR Part 61. Under this mandate, asbestos fibers must be controlled during removal. The HHCU, telephone 919-707-5983, is the North Carolina State agency responsible for the enforcement of the EPA NESHAP Regulations.

CLOSING

The asbestos survey described herein was conducted by the undersigned of CCEI. CCEI's investigation consisted solely of the activities described herein and is subject to the Limitations and Service Constraints in Attachment G. Prior to performing renovation or demolition activities, the existing data should be reviewed to confirm all building materials which may be impacted have been evaluated to determine if they are ACBMs and that the existing data is complete and complies with all laws and regulations. In some cases, additional testing, including destructive testing, may be required prior to demolition or renovation activities, especially with respect to potentially hidden, obstructed or non-sampled ACBMs. Contact the CCEI if you have any questions regarding this data and/or the need for additional sampling.

Thank you for your time and consideration. Please do not hesitate to call if you have questions regarding the results of this asbestos survey or require additional information.

Sincerely,
Crystal Coast Environment, Inc.

A handwritten signature in blue ink, reading "Robert L. Elbertson", with a horizontal line underneath.

Robert Elbertson
North Carolina Licensed Inspector

Attachments:

- A Certifications and Licenses
- B Asbestos Homogeneous Application Table
- C Types, Categories, Classes, and Condition Codes
- D Laboratory Data Package and Chain of Custody
- E Photographs
- F Limitations and Service Constraints

Homogeneous Application Table

HA No.	Material Type	Primary Color	Texture	Description	NESHAP Cat.	Building #	Rooms	Location	Condition	Amt.	Units	Status	Modified Date
1	T - Pipe Insulation - Straight Run (Corrugated Paper (Air-Cell), Mag Block,	White	Smooth	Thermal Pipe Insulation	Friable ACM	13	Crawl Space	Other	Good	25	LF	Undetermined	7/6/2012
2	T - Pipe Insulation - Straight Run (Corrugated Paper (Air-Cell), Mag Block,	White	Rough	Thermal Pipe Insulation	Non-ACM, Sampled	13	Crawl Space	Other	Good	N/A	N/A	Undetermined	7/6/2012
3	M - Floor Tile - 12" x 12"	Gray	Smooth	1' x 1' Vinyl Floor Tile	Non-ACM, Sampled	114	Mechanical Room	Other	Good	N/A	N/A	Undetermined	7/6/2012
4	M - Floor Tile - Mastic/Adhesive	Black	Rough	Mastic Associated with HA3	CAT 2 Non-friable ACM	114	Mechanical Room	Other	Good	150	SF	Undetermined	7/6/2012
5	T - Pipe Insulation - Straight Run (Corrugated Paper (Air-Cell), Mag Block,	White	Rough	Thermal Pipe Insulation	Non-ACM, Sampled	114	Mechanical Room	Other	Good	N/A	N/A	Undetermined	7/6/2012
6	T - Mastic Coating on Thermal Pipe Jacket Cover	Gray	Rough	Mastic Coating on Pipe Insulation	Non-ACM, Sampled	214	Mechanical Room	Other	Good	N/A	N/A	Undetermined	7/6/2012
7	M - Floor Tile - 12" x 12"	Gray	Smooth	1' x 1' Vinyl Floor Tile	Non-ACM, Sampled	216	Mechanical Room	Other	Good	N/A	N/A	Undetermined	7/6/2012
8	M - Floor Tile - Mastic/Adhesive	Black	Rough	Mastic Associated with HA7	CAT 2 Non-friable ACM	216	Mechanical Room	Other	Good	150	SF	Undetermined	7/6/2012
9	T - Pipe Insulation - Fittings, Elbows, Mudded Joint Packing	Black	Rough	Glass and Sulfur Insulation	Non-ACM, Sampled	216	Mechanical Room	Other	Good	N/A	N/A	Undetermined	7/6/2012
10	T - Mastic Coating on Thermal Pipe Jacket Cover	Gray	Rough	Mastic Coating on Pipe Insulation	Non-ACM, Sampled	400	Mechanical Room	Other	Good	N/A	N/A	Undetermined	7/6/2012
11	M - Caulking/Putties	Gray	Smooth	Caulking Located on Metal Pipe Wrap	Non-ACM, Sampled	419	Mechanical Room	Other	Good	N/A	N/A	Undetermined	7/6/2012
12	M - Caulking/Putties	Gray	Smooth	Caulking Located on Metal Pipe Wrap	Non-ACM, Sampled	501	Mechanical Room	Other	Good	N/A	N/A	Undetermined	7/6/2012
13	M - Floor Tile - 12" x 12"	Gray	Smooth	1' x 1' Vinyl Floor Tile	Non-ACM, Sampled	501	Mechanical Room	Other	Good	N/A	N/A	Undetermined	7/6/2012
14	M - Floor Tile - Mastic/Adhesive	Black	Rough	Mastic Associated with HA13	CAT 2 Non-friable ACM	501	Mechanical Room	Other	Good	150	SF	Undetermined	7/6/2012
15	T - Mastic Coating on Thermal Pipe Jacket Cover	Gray	Rough	Mastic Coating on Pipe Insulation	Non-ACM, Sampled	516	Mechanical Room	Other	Good	N/A	N/A	Undetermined	7/6/2012
16	M - Floor Tile - 12" x 12"	Gray	Smooth	1' x 1' Vinyl Floor Tile	Non-ACM, Sampled	526	Mechanical Room	Other	Good	N/A	N/A	Undetermined	7/6/2012
17	M - Floor Tile - Mastic/Adhesive	Black	Rough	Mastic Associated with HA15	CAT 2 Non-friable ACM	526	Mechanical Room	Other	Good	150	SF	Undetermined	7/6/2012
18	T - Mastic Coating on Thermal Pipe Jacket Cover	White	Smooth	Mastic Coating on Pipe Insulation	Non-ACM, Sampled	526	Mechanical Room	Other	Good	N/A	N/A	Undetermined	7/6/2012
19	T - Pipe Insulation - Fittings, Elbows, Mudded Joint Packing	Black	Rough	Glass and Sulfur Insulation	Non-ACM, Sampled	1410	Mechanical Room	Other	Good	N/A	N/A	Undetermined	7/6/2012

Results of Sample Analyses

HA No.	Material Type	ID	Location	Content	Type	Friable	Sample Date	Consultant	Method	Lab	Comments / Details
1	T - Pipe Insulation - Straight Run (Corrugated Paper (Air-Cell), Mag Block, etc)	0091-13-1-01	Mechanical Room	>10%	Chrysotile	Yes	7/6/2012	CCEI	PLM	Carolina Environmental	
2	T - Pipe Insulation - Straight Run (Corrugated Paper (Air-Cell), Mag Block, etc)	0091-13-2-02	Mechanical Room	>10%	Chrysotile	Yes	7/6/2012	CCEI	PLM	Carolina Environmental	
3	M - Floor Tile - 12" x 12"	0091-114-3-03	Mechanical Room	ND		No	7/6/2012	CCEI	PLM	Carolina Environmental	
4	M - Floor Tile - Mastic/Adhesive	0091-114-4-04	Mechanical Room	>1%-10%	Chrysotile	No	7/6/2012	CCEI	PLM	Carolina Environmental	
5	T - Pipe Insulation - Straight Run (Corrugated Paper (Air-Cell), Mag Block, etc)	0091-114-5-05	Steam Pit	ND		Yes	7/6/2012	CCEI	PLM	Carolina Environmental	
6	T - Mastic Coating on Thermal Pipe Jacket Cover	0091-214-6-06	Mechanical Room	ND		No	7/6/2012	CCEI	PLM	Carolina Environmental	
6	T - Mastic Coating on Thermal Pipe Jacket Cover	0091-214-6-07	Mechanical Room	ND		No	7/6/2012	CCEI	PLM	Carolina Environmental	
7	M - Floor Tile - 12" x 12"	0091-216-7-08	Mechanical Room	ND		No	7/6/2012	CCEI	PLM	Carolina Environmental	
8	M - Floor Tile - Mastic/Adhesive	0091-216-8-09	Mechanical Room	>1%-10%	Chrysotile	No	7/6/2012	CCEI	PLM	Carolina Environmental	
9	T - Pipe Insulation - Fittings, Elbows, Mudded Joint Packing	0091-216-9-10	Steam Pit	ND		No	7/6/2012	CCEI	PLM	Carolina Environmental	
10	T - Mastic Coating on Thermal Pipe Jacket Cover	0091-400-10-11	Mechanical Room	ND		No	7/6/2012	CCEI	PLM	Carolina Environmental	
10	T - Mastic Coating on Thermal Pipe Jacket Cover	0091-400-10-12	Mechanical Room	ND		No	7/6/2012	CCEI	PLM	Carolina Environmental	
11	M - Caulking/Putties	0091-419-11-13	Steam Pit	ND		No	7/6/2012	CCEI	PLM	Carolina Environmental	
11	M - Caulking/Putties	0091-419-11-14	Steam Pit	ND		No	7/6/2012	CCEI	PLM	Carolina Environmental	
12	M - Caulking/Putties	0091-501-12-15	Steam Pit	ND		No	7/6/2012	CCEI	PLM	Carolina Environmental	
13	M - Floor Tile - 12" x 12"	0091-501-13-16	Mechanical Room	ND		No	7/6/2012	CCEI	PLM	Carolina Environmental	
14	M - Floor Tile - Mastic/Adhesive	0091-501-14-17	Mechanical Room	>1%-10%	Chrysotile	No	7/6/2012	CCEI	PLM	Carolina Environmental	
15	T - Mastic Coating on Thermal Pipe Jacket Cover	0091-516-15-18	Mechanical Room	ND		No	7/6/2012	CCEI	PLM	Carolina Environmental	
15	T - Mastic Coating on Thermal Pipe Jacket Cover	0091-516-15-19	Mechanical Room	ND		No	7/6/2012	CCEI	PLM	Carolina Environmental	
16	M - Floor Tile - 12" x 12"	0091-526-16-20	Mechanical Room	ND		No	7/6/2012	CCEI	PLM	Carolina Environmental	
17	M - Floor Tile - Mastic/Adhesive	0091-526-17-21	Mechanical Room	>1%-10%	Chrysotile	No	7/6/2012	CCEI	PLM	Carolina Environmental	
18	T - Mastic Coating on Thermal Pipe Jacket Cover	0091-526-18-22	Mechanical Room	ND		No	7/6/2012	CCEI	PLM	Carolina Environmental	
19	T - Pipe Insulation - Fittings, Elbows, Mudded Joint Packing	0091-1410-19-23	Steam Pit	ND		No	7/6/2012	CCEI	PLM	Carolina Environmental	
19	T - Pipe Insulation - Fittings, Elbows, Mudded Joint Packing	0091-1410-19-24	Steam Pit	ND		No	7/6/2012	CCEI	PLM	Carolina Environmental	

Exhibit 1

Type, Category, Classification, and Condition Codes Of Asbestos Containing Material

Types of Asbestos Containing Material (ACM)	Thermal System Insulation (TSI)
	Surfacing
	Miscellaneous

EPA Category of ACM (40 CFR 61, Subpart M)	Friable
	Nonfriable Category I Asphalt Roofing Material Resilient Flooring & Mastic Packing Material Gaskets
	Nonfriable Category II Other Nonfirable Materials

OSHA Classification of ACM (29 CFR 1926.1101)	Class I Thermal System Insulation and Surfacing Material
	Class II Other Materials
	Class III Operational & Maintenance activity No bigger than one glovebag
	Class IV Janitorial – Contact with but does not disturb ACM

Condition Codes (40 CFR 763.88, Subpart E)	
1	Damaged or significantly damaged thermal system insulation ACM
2	Damaged friable surfacing ACM
3	Significantly damaged friable surfacing ACM
4	Damaged or significantly damaged friable miscellaneous ACM
5	Asbestos containing material building material (ACBM) with potential for damage
6	ACBM with potential for significant damage
7	Any remaining friable ACBM or friable suspected ACBM



ASBESTOS LABORATORY REPORT

Prepared for

Crystal Coast Environmental Inc.

PROJECT: Hadnot Point, Camp Lejeune, NC; 12-2781.1

CEI LAB CODE: A12-6059

DATE REPORTED: 07/12/12

TOTAL SAMPLES ANALYZED: 24

SAMPLES >1% ASBESTOS: 6

TEL: 866-481-1412

www.ceilabs.com



Asbestos Report Summary

By: POLARIZING LIGHT MICROSCOPY

PROJECT: Hadnot Point, Camp Lejeune, NC; 12-2781.1

CEI LAB CODE: A12-6059

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

Client ID	Layer	Lab ID	Color	Sample Description	ASBESTOS %
0091-13-1-01		A1313731	White	Pipe Insulation	Chrysotile 40%
0091-13-2-02		A1313732	White	Pipe Insulation	Chrysotile 40%
0091-114-3-03		A1313733	Off-white	Floor Tile	None Detected
0091-114-4-04		A1313734	Black	Mastic	Chrysotile 3%
0091-114-5-05		A1313735	White	Pipe Insulation	None Detected
0091-214-6-06		A1313736	White	Mastic On Jacket Cover	None Detected
0091-214-6-07		A1313737	White	Mastic On Jacket Cover	None Detected
0091-216-7-05		A1313738	Off-white	Floor Tile	None Detected
0091-216-8-09		A1313739	Black	Mastic	Chrysotile 2%
0091-216-9-10		A1313740	White	Pipe Insulation	None Detected
0091-400-10-11		A1313741	White	Mastic On Jacket Cover	None Detected
0091-400-10-12		A1313742	White	Mastic On Jacket Cover	None Detected
0091-419-11-13		A1313743	Grey	Caulking/putties	None Detected
0091-419-11-14		A1313744	Grey	Caulking/putties	None Detected
0091-501-12-15		A1313745	Grey	Caulking/putties	None Detected
0091-501-13-16		A1313746	Off-white	Floor Tile	None Detected
0091-501-14-17		A1313747	Black	Mastic	Chrysotile 2%
0091-516-15-18		A1313748	White	Mastic On Jacket Cover	None Detected
0091-516-15-19		A1313749	White	Mastic On Jacket Cover	None Detected
0091-526-16-20		A1313750	Off-white	Floor Tile	None Detected
0091-516-17-21		A1313751	Black	Mastic	Chrysotile 3%
0091-526-18-22		A1313752	White	Mastic On Jacket Cover	None Detected
0091-1410-19-24		A1313753	Black	Pipe Insulation	None Detected
0091-1410-19-24		A1313754	Black	Pipe Insulation	None Detected



ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: Crystal Coast Environmental Inc.
410 New Bridge Street, Ste.
Jacksonville, NC 28540

CEI Lab Code: A12-6059

Date Received: 07-12-12

Date Reported: 07-12-12

Project: Hadnot Point, Camp Lejeune, NC; 12-2781.1

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS			ASBESTOS %	
			Fibrous	Non-Fibrous			
0091-13-1-01 A1313731	Pipe Insulation	Homogeneous White Fibrous Loose	10%	Cellulose	50%	Binder	40% Chrysotile
0091-13-2-02 A1313732	Pipe Insulation	Homogeneous White Fibrous Loose	10%	Cellulose	50%	Binder	40% Chrysotile
0091-114-3-03 A1313733	Floor Tile	Homogeneous Off-white Non-fibrous Bound			100%	Vinyl	None Detected
0091-114-4-04 A1313734	Mastic	Homogeneous Black Fibrous Bound			97%	Mastic	3% Chrysotile
0091-114-5-05 A1313735	Pipe Insulation	Homogeneous White Fibrous Loosely Bound	10%	Cellulose 10% Synthetic Fiber	80%	Binder	None Detected
0091-214-6-06 A1313736	Mastic On Jacket Cover	Heterogeneous White Fibrous Loosely Bound	40%	Cellulose 40% Fiberglass	20%	Metal Foil Mastic	None Detected
0091-214-6-07 A1313737	Mastic On Jacket Cover	Heterogeneous White Fibrous Loosely Bound	40%	Cellulose 40% Fiberglass	20%	Metal Foil Mastic	None Detected
0091-216-7-05 A1313738	Floor Tile	Homogeneous Off-white Non-fibrous Bound			100%	Vinyl	None Detected



ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: Crystal Coast Environmental Inc.
410 New Bridge Street, Ste.
Jacksonville, NC 28540

CEI Lab Code: A12-6059

Date Received: 07-12-12

Date Reported: 07-12-12

Project: Hadnot Point, Camp Lejeune, NC; 12-2781.1

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS			ASBESTOS %
			Fibrous		Non-Fibrous	
0091-216-8-09 A1313739	Mastic	Homogeneous Black Fibrous Bound	98%		Mastic	2% Chrysotile
0091-216-9-10 A1313740	Pipe Insulation	Heterogeneous White Fibrous Bound	40%	Cellulose	15% Metal Foil	None Detected
			40%	Fiberglass	5% Mastic	
0091-400-10-11 A1313741	Mastic On Jacket Cover	Heterogeneous White Fibrous Loosely Bound	40%	Cellulose	20% Metal Foil	None Detected
			40%	Fiberglass	<1% Mastic	
0091-400-10-12 A1313742	Mastic On Jacket Cover	Heterogeneous White Fibrous Loosely Bound	40%	Cellulose	15% Metal Foil	None Detected
			40%	Fiberglass	5% Mastic	
0091-419-11-13 A1313743	Caulking/putties	Homogeneous Grey Non-fibrous Bound			100% Caulk	None Detected
0091-419-11-14 A1313744	Caulking/putties	Homogeneous Grey Non-fibrous Bound			100% Caulk	None Detected
0091-501-12-15 A1313745	Caulking/putties	Homogeneous Grey Non-fibrous Bound			100% Caulk	None Detected
0091-501-13-16 A1313746	Floor Tile	Homogeneous Off-white Non-fibrous Bound			100% Vinyl	None Detected



ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: Crystal Coast Environmental Inc.
410 New Bridge Street, Ste.
Jacksonville, NC 28540

CEI Lab Code: A12-6059

Date Received: 07-12-12

Date Reported: 07-12-12

Project: Hadnot Point, Camp Lejeune, NC; 12-2781.1

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS			ASBESTOS %	
			Fibrous		Non-Fibrous		
0091-501-14-17 A1313747	Mastic	Homogeneous Black Fibrous Bound	98%		Mastic	2% Chrysotile	
0091-516-15-18 A1313748	Mastic On Jacket Cover	Heterogeneous White Fibrous Loosely Bound	40% 40%	Cellulose Fiberglass	15% 5%	Metal Foil Mastic	None Detected
0091-516-15-19 A1313749	Mastic On Jacket Cover	Heterogeneous White Fibrous Loosely Bound	40% 40%	Cellulose Fiberglass	20% <1%	Metal Foil Mastic	None Detected
0091-526-16-20 A1313750	Floor Tile	Homogeneous Off-white Non-fibrous Bound	100%		Vinyl	None Detected	
0091-516-17-21 A1313751	Mastic	Homogeneous Black Fibrous Bound	97%		Mastic	3% Chrysotile	
0091-526-18-22 A1313752	Mastic On Jacket Cover	Heterogeneous White Fibrous Loosely Bound	40% 40%	Cellulose Fiberglass	15% 5%	Metal Foil Mastic	None Detected
0091-1410-19-24 A1313753	Pipe Insulation	Homogeneous Black Non-fibrous Bound	100%		Foam	None Detected	
0091-1410-19-24 A1313754	Pipe Insulation	Homogeneous Black Non-fibrous Bound	100%		Foam	None Detected	



ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: Crystal Coast Environmental Inc.
410 New Bridge Street, Ste.
Jacksonville, NC 28540

CEI Lab Code: A12-6059

Date Received: 07-12-12

Date Reported: 07-12-12

Project: Hadnot Point, Camp Lejeune, NC; 12-2781.1

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID	Lab	Lab	NON-ASBESTOS COMPONENTS		ASBESTOS
Lab ID	Description	Attributes	Fibrous	Non-Fibrous	%



LEGEND: Non-Anth = Non-Asbestiform Anthophyllite
Non-Trem = Non-Asbestiform Tremolite
Calc Carb = Calcium Carbonate

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

The detection limit for the method is <1% by visual estimation and 0.25% by 400 point counts or 0.1% by 1,000 point counts.

Due to the limitations of the EPA 600 Method, nonfriable organically bound materials (NOBs) such as vinyl floor tiles can be difficult to analyze via polarizing light microscopy (PLM). EPA recommends that all NOBs analyzed by PLM, and found not to contain asbestos, be further analyzed by Transmission Electron Microscopy (TEM). Please note that PLM analysis of dust and soil samples for asbestos is not covered under NVLAP accreditation.

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ANALYST: *Lynn Burkholder*
Lynn Burkholder

APPROVED BY: *Tianbao Bai*
Tianbao Bai, Ph.D.
Laboratory Director





107 New Edition Court, Cary, NC 27511
 Tel: 866-481-1412; Fax: 919-481-1442

CHAIN OF CUSTODY

LAB USE ONLY:	
CEI Lab Code:	A12-6059 (24)
CEI Lab I.D. Range:	A1313731- A1313754

COMPANY CONTACT INFORMATION	
Company: Crystal Coast Environmental	Client #: 23935
Address: 410 New Bridge St, Suite 4B Jacksonville, NC 28540	Job Contact: Mistery S. Mitchell Email: crystalcoast@cceinc.biz / mmitchell@cceinc.biz Tel: (910) 938-7998
Project Name: Hadnot Point, Camp Lejeune, NC	Fax: (910) 938-3441
Project ID #: 12-2781.1	P.O. #:

ASBESTOS	METHOD	TURN AROUND TIME						
		4 HR*	8 HR*	12 HR*	1 DAY	2 DAY	3 DAY	5 DAY
PLM BULK	EPA 600	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PLM POINT COUNT (400)	EPA 600	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PLM POINT COUNT (1000)	EPA 600	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PLM GRAVIMETRIC	EPA 600	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PLM GRAV w POINT COUNT	EPA 600	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PCM AIR	NIOSH 7400	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TEM AIR	AHERA	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TEM AIR	EPA Level II	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TEM AIR	NIOSH 7402	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TEM BULK	CHATFIELD	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TEM DUST WIPE	ASTM D6480-05	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TEM DUST MICROVAC	ASTM D5755-03	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TEM QUALITATIVE	CEI LABS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OTHER:		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LEAD PAINT	METHOD	4 HR*	8 HR*	12 HR*	24 HR	2 DAY	3 DAY	5 DAY
LEAD PAINT	EPA SW846 7000B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LEAD WIPE	EPA SW846 7000B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LEAD SOIL	EPA SW846 7000B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LEAD AIR	NIOSH 7082	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OTHER:		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

REMARKS: 24 Bulk Samples		<input checked="" type="checkbox"/> Accept Samples	
24 Bulk Samples		<input type="checkbox"/> Reject Samples	
Relinquished By:	Date/Time	Received By:	Date/Time
<i>Rolo L. Edwards</i>	7/7/2012	<i>Kristy Pruitt</i>	7/11/2012 9:45 AM

*Call to confirm RUSH analysis. Samples will be disposed of 30 days after analysis

Results of Sample Analyses

12-2781

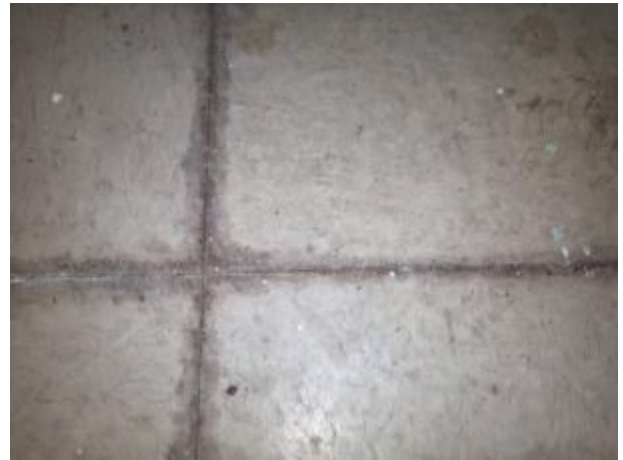
Ald. 6059

HA No.	Material Type	ID	Location
1	T - Pipe Insulation - Straight Run (Corrugated Paper (Air-Cell), Mag Block,	0091-13-1-01	Mechanical Room
2	- Pipe Insulation - Straight Run (Corrugated Paper (Air-Cell), Mag Block, etc	0091-13-2-02	Mechanical Room
3	M - Floor Tile - 12" x 12"	0091-114-3-03	Mechanical Room
4	M - Floor Tile - Mastic/Adhesive	0091-114-4-04	Mechanical Room
5	- Pipe Insulation - Straight Run (Corrugated Paper (Air-Cell), Mag Block, etc	0091-114-5-05	Steam Pit
6	T - Mastic Coating on Thermal Pipe Jacket Cover	0091-214-6-06	Mechanical Room
6	T - Mastic Coating on Thermal Pipe Jacket Cover	0091-214-6-07	Mechanical Room
7	M - Floor Tile - 12" x 12"	0091-216-7-08	Mechanical Room
8	M - Floor Tile - Mastic/Adhesive	0091-216-8-09	Mechanical Room
9	T - Pipe Insulation - Fittings, Elbows, Mudded Joint Packing	0091-216-9-10	Steam Pit
10	T - Mastic Coating on Thermal Pipe Jacket Cover	0091-400-10-11	Mechanical Room
10	T - Mastic Coating on Thermal Pipe Jacket Cover	0091-400-10-12	Mechanical Room
11	M - Caulking/Putties	0091-419-11-13	Steam Pit
11	M - Caulking/Putties	0091-419-11-14	Steam Pit
12	M - Caulking/Putties	0091-501-12-15	Steam Pit
13	M - Floor Tile - 12" x 12"	0091-501-13-16	Mechanical Room
14	M - Floor Tile - Mastic/Adhesive	0091-501-14-17	Mechanical Room
15	T - Mastic Coating on Thermal Pipe Jacket Cover	0091-516-15-18	Mechanical Room
15	T - Mastic Coating on Thermal Pipe Jacket Cover	0091-516-15-19	Mechanical Room
16	M - Floor Tile - 12" x 12"	0091-526-16-20	Mechanical Room
17	M - Floor Tile - Mastic/Adhesive	0091-526-17-21	Mechanical Room
18	T - Mastic Coating on Thermal Pipe Jacket Cover	0091-526-18-22	Mechanical Room
19	T - Pipe Insulation - Fittings, Elbows, Mudded Joint Packing	0091-1410-19-23	Steam Pit
19	T - Pipe Insulation - Fittings, Elbows, Mudded Joint Packing	0091-1410-19-24 X	Steam Pit

* 2 samples # 24
23 not submitted (KP)



HA-1 and 2: Thermal System Insulation



HA-3, 7, 13,16: 1' x 1' Vinyl Floor Tile



HA-4, 8, 14, 17: Mastic Associated with Floor Tile



HA-5: Pipe Insulation



HA-6, 10, 15 and 18: Mastic Coating on Thermal Pipe Jacket Cover



HA-9 Black Sulfur and Glass Insulation



HA-11 and 12: Caulking on thermal Pipe Wrap

LIMITATIONS AND SERVICE CONSTRAINTS Asbestos Related Services

All professional opinions presented in this report are based on information made available to us either by review of data provided by others or data gathered by Crystal Coast Environmental (CCE) personnel.

CCE affirms that data gathered and presented by CCE in this report was collected in an appropriate manner in accordance with generally accepted methods and practices. CCE cannot be responsible for decisions made by our client solely on the basis of economic factors.

Conditions described in this report are as found at the time of investigation, unless otherwise stated. CCE analyzed only the substances, conditions and locations described in the report at the time indicated. No inferences regarding other substances, conditions, location or time can be made unless specifically stated in this report.

No recommendations were provided for materials containing less than one-percent asbestos. Materials containing less than one percent asbestos do not meet either the generally accepted industry definition of asbestos-containing material (any material containing greater than one percent asbestos) or the EPA definition of friable ACM (any material friable bulk insulation material contain greater than one percent asbestos by weight as analyzed by Polarized Light Microscopy). CCE, however, makes no statement, implied or explicit, about the hazards of materials containing less than one percent asbestos.

This report is intended for the use listed in the section of this report described as the Introduction. The use of this report in any manner other than that listed in the Introduction requires the written consent of CCE. This report must be presented in its entirety.



Wiley Wilson

Limited Lead-Base

Paint Survey

Buildings: 13, 114, 127, 214,
216, 219, 317, 400, 419, 501,
516, 526, 1106, 1107, 1309,
1310, 1409, and 1410
MCB, Camp Lejeune, NC

July 11, 2012



Mr. Christopher D. Hardwood
Wiley Wilson
6606 West Broad Street, Suite 500
Richmond, Virginia 23230
chardwood@wileywilson.com

Subject:

Limited Lead-Based Paint (CP12-0091)
Buildings 13, 114, 127, 214, 216, 219, 317, 400, 419, 501, 516, 526, 1106, 1107,
1309, 1310, 1409, and 1410
MCB Camp Lejeune, North Carolina

Dear Mr. Hardwood:

Crystal Coast Environmental., Inc. (CCEI) conducted a limited lead-based paint determination of interior and exterior components that may be impacted during the renovation activities at the above-referenced buildings. The survey was conducted by Mr. Robert Elbertson on July 7, 2012. The survey consisted solely of the activities described in this letter report and is subject to the attached Limitations and Service Constraints provided in Attachment F.

METHODOLOGY

For OSHA due diligence purposes, CCEI investigated the building's interior and exterior in order to identify building components which are likely to be impacted by the construction activity and may be painted with suspected Lead Based Paint (LBP). The LBP inspection methodology followed guidelines for investigating dwellings as included in the US Department of Housing and Urban Development's *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* published in June 1995 (Chapter 7 updated in 1997). Generally, the inspection process includes visually inspecting the project for suspected LBP and testing these areas with an XRF Spectrum Analyzer.

The results of the limited lead-based paint survey are presented in the Appendices to this report as follows:

- Attachment B – XRF Lead Base Paint Results

Crystal Coast Environmental, Inc.
410 New Bridge Street
Suite 4-B
Jacksonville, NC 28540
Tel: 910.938.7998
Fax: 910.938.3441
www.cceinc.biz

ENVIRONMENTAL

Date: July 11, 2012

Contact:

Phillip Santiago

Phone:

910.938.7998

Email:

pasantiago@cceinc.biz

Our ref:

12-2783



Mr. Christopher D.
Hardwood
July 11, 2012

- Attachment C – XRF Performance Characteristics Sheet
- Attachment D – Photographs

FINDINGS

Based on the results of the investigation, the following painted components were identified as LBP:

CCEI recommends that any contractor who would disturb any lead-based paint be notified of the hazard and their requirement to comply with the OSHA Lead in Construction Standard (29 CFR 1926.62).

CCEI recommends that any work that could disturb a known or suspect lead containing surface be conducted in a way to minimize and control dust and that the contractor performs a thorough clean up.

Waste characterization sampling and analysis should be performed for each representative waste stream. Waste stream analyses should include the total threshold limit concentration (TTLIC), soluble threshold limit concentration (STLC), and toxicity characteristic leaching procedure (TCLP) analysis, as required.

Should you have any questions in regards to the aforementioned or if CCEI can be of further assistance, please feel free to contact CCEI at (910) 938-7998.

Sincerely,
Crystal Coast Environmental, Inc.

A handwritten signature in black ink that reads "Robert Elbertson". The signature is written in a cursive style and is positioned above a horizontal line.

Robert Elbertson

Lead Inspector

Attachments

- A Certifications and Licenses
- B XRF Lead Base Paint Results
- C XRF Performance Characteristics Sheet



Mr. Christopher D.
Hardwood
July 11, 2012

D Photographs
E Limitations and Service Constraints

No	Type	Act	Component	Substrate	Side	Condition	Color	Room	Results	PbL	Floor	Site
1	Shutter	1			Cal				Neg	0.04		
2	Paint	1			Cal				Pos	1.1		
3	Paint	1			Cal				Neg	0.9		
4	Paint	1	VALVE	METAL	B	INTACT	GRAY	STEAM PIT	Neg	0	FIRST	13
5	Paint	1	VALVE	METAL	B	INTACT	GRAY	STEAM PIT	Neg	0	FIRST	13
6	Paint	1	WALL	CONCRETE	B	INTACT	WHT	MECHANICAL	Neg	0.01	FIRST	114
7	Paint	1	WALL	CONCRETE	B	INTACT	WHT	MECHANICAL	Neg	0	FIRST	114
8	Paint	1			Cal				Pos	1		
9	Paint	1	WALL	CONCRETE	C	INTACT	WHT	MECHANICAL	Neg	0	FIRST	214
10	Paint	1	WALL	CONCRETE	C	INTACT	WHT	MECHANICAL	Neg	0	FIRST	214
11	Paint	1	WALL	CONCRETE	C	INTACT	WHT	MECHANICAL	Neg	0	FIRST	216
12	Paint	1	WALL	CONCRETE	C	INTACT	WHT	MECHANICAL	Neg	0.01	FIRST	216
13	Paint	1			Cal				Pos	1.2		
14	Paint	1	WALL	CONCRETE	D	INTACT	WHT	MECHANICAL	Neg	0	FIRST	400
15	Paint	1	WALL	CONCRETE	D	INTACT	WHT	MECHANICAL	Neg	0.01	FIRST	400
16	Paint	1	WALL	CONCRETE	B	INTACT	WHT	MECHANICAL	Neg	0	FIRST	501
17	Paint	1	WALL	CONCRETE	B	INTACT	WHT	MECHANICAL	Neg	0	FIRST	501
18	Paint	1			Cal				Pos	1		
19	Paint	1	PIPE CASING	METAL	C	INTACT	SILVER	STEAM PIT	Neg	0	FIRST	516
20	Paint	1	PIPE CASING	METAL	C	INTACT	SILVER	STEAM PIT	Neg	0.01	FIRST	516
21	Paint	1	WALL	CONCRETE	C	INTACT	WHT	MECHANICAL	Neg	0	FIRST	526
22	Paint	1	WALL	CONCRETE	C	INTACT	WHT	MECHANICAL	Neg	0	FIRST	526
23	Paint	1	PIPE CASING	METAL	C	INTACT	SILVER	STEAM PIT	Neg	0.01	FIRST	1106
24	Paint	1	PIPE CASING	METAL	C	INTACT	SILVER	STEAM PIT	Neg	0	FIRST	1106
25	Paint	1			Cal				Pos	1		
26	Paint	1	PIPE CASING	METAL	B	INTACT	SILVER	STEAM PIT	Neg	0	FIRST	1107
27	Paint	1	PIPE CASING	METAL	B	INTACT	SILVER	STEAM PIT	Neg	0	FIRST	1107
28	Paint	1	PIPE CASING	METAL	D	INTACT	SILVER	STEAM PIT	Neg	0.01	FIRST	1309
29	Paint	1	PIPE CASING	METAL	D	INTACT	SILVER	STEAM PIT	Neg	0	FIRST	1309
30	Paint	1	PIPE CASING	METAL	D	INTACT	SILVER	STEAM PIT	Neg	0.01	FIRST	1310
31	Paint	1	PIPE CASING	METAL	D	INTACT	SILVER	STEAM PIT	Neg	0	FIRST	1310
32	Paint	1			Cal				Pos	1.2		
33	Paint	1	PIPE CASING	METAL	B	INTACT	SILVER	STEAM PIT	Neg	0	FIRST	1409
34	Paint	1	PIPE CASING	METAL	B	INTACT	SILVER	STEAM PIT	Neg	0.01	FIRST	1409
35	Paint	1	PIPE CASING	METAL	D	INTACT	SILVER	STEAM PIT	Neg	0	FIRST	1410
36	Paint	1	PIPE CASING	METAL	D	INTACT	SILVER	STEAM PIT	Neg	0	FIRST	1410

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.

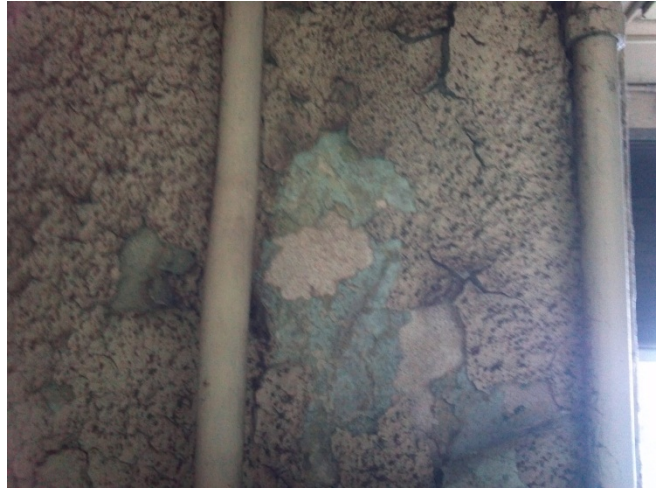
DOCUMENTATION:

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*.



Valve
(Photo 01)



White Paint
(Photo 02)



Silver Pipe Casing
(Photo 03)

Limitations and Service Constraints

The opinions, conclusions and recommendations presented in this report are limited to the information obtained during the performance of the specific scope of service identified in the report. To the extent that Crystal Coast Environmental, Inc. (CCEI) relied upon any information prepared by other parties not under direct contract to CCEI, no representation as to the accuracy or completeness of such information is made. This report is an instrument of professional service and the services described in the report were performed in accordance with generally accepted standards and level of skill and care ordinarily exercised by members of the profession working under similar conditions including comparable budgetary and schedule constraints. No warranty, guarantee or certification express or implied, is intended or given with respect to CCEI's services, opinions, conclusions or recommendations. This statement is in lieu of any other statement either expressed or implied.

CCEI's observations, the results of testing and CCEI's opinions, conclusions and recommendations apply solely to conditions existing at the specific times when and specific locations where CCEI's investigative work was performed. Observation and testing activities such as those conducted by CCEI are inherently limited and do not represent a conclusive or complete characterization. Conditions in other parts of the project site, building or area may vary from conditions at the specific locations where observations were made and where testing was performed by CCEI. Additionally, other building material hazards which were not identified by CCEI, may also be present in the indoor air, un-accessed areas and in walls, ceilings, cavities and floors. Therefore, the extent of CCEI's opinions, conclusions and recommendations are limited and 100% confidence in these opinions, conclusions and recommendations cannot reasonably be achieved. Nothing contained in this report shall relieve any other party of its responsibility to abide by contract documents and applicable laws, codes, regulations, or standards nor shall it be considered medical advice or consultation.

This report may document whether work conducted by CCEI or under CCEI's observation was done so in accordance with applicable regulatory standards. In the absence of standards such as is often the case for microbial assessment and abatement, this report may not be construed as providing clearance, approval, or authorization for use or re-occupancy of a given structure. Actual site conditions and quantities should be field verified and unless expressly stated.

This report is expressly for the sole and exclusive use of the party for whom this report was originally prepared for and for the particular purpose outlined in the report. Only the party for whom this report was originally prepared and/or other specifically named parties have the right to make use of and rely upon this report. Reuse of this report or any portion thereof for other than its intended purpose, or if modified, or if used by third parties, shall be at the user's sole risk.

