NAVFAC
Naval Facilities Engineering Command
NAVFAC MID ATLANTIC

WORK ORDER NO. 859348

MILCON P-725 - PUMP STATION UPGRADES

At the

MCAS New River
Jacksonville, North Carolina

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A/E Contract N0085-06-D-8009

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SECTION 00 01 15

LIST OF DRAWINGS
01/07

PART 1 GENERAL

1.1 SUMMARY

This section lists the drawings for the project pursuant to contract clause "DFARS 252.236-7001, Contract Drawings, Maps and Specifications."

1.2 CONTRACT DRAWINGS

Contract drawings are as follows:

DRAWING NO.	REVISION NO.	NAVFAC DWG NO.	TITLE
G-001	---	12556435	Title Sheet, Index of Drawings
G-002	---	12556436	General Notes
C-001	---	12556437	Civil Notes, Legend & Abbreviations
C-101	---	12556438	Drainage Plan & Detail
S-001	---	12556439	Structural Notes, Legend & Abbreviations
S-401	---	12556440	Pump Station Pad Plan
S-402	---	12556441	Pipe Cross-Over Plan
S-501	---	12556442	Miscellaneous Details
M-001	---	12556443	Mechanical Notes, Legend & Abbreviations
MD401	---	12556444	Pump Pad Demolition
M-402	---	12556445	Pump Station Plan
M-403	---	12556446	Sections
M-501	---	12556447	Details & Pipe Supports
M-601	---	12556448	Flow Diagram, Schedule & Sequence of Construction
MD901	---	12556449	Photographs
E-001	---	12556450	Electrical Notes, Legend & Abbreviations
E-401	---	12556451	Pump Pad Power, Lighting & Grounding Plans
E-501	---	12556452	Details
E-601	---	12556453	Schedules & One-Line Diagram
E-602	---	12556454	Pump Pad Classification & Details

1.3 SUPPLEMENTARY DRAWINGS

These supplementary drawings may not be a part of the contract but are included with the drawings for information.

-- End of Document --

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SECTION 01 11 00

SUMMARY OF WORK
01/08

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Upon receipt of Government Furnished Equipment, the Contractor shall submit records in accordance with paragraph entitled, "Government Furnished Property," of this section.

Submit the following items to the Contracting Officer:

Utility Outage Requests
Utility Connection Requests
Excavation Permits
Welding Permits

1.2 WORK COVERED BY CONTRACT DOCUMENTS

1.2.1 Project Description

The work includes upgrades to the existing pump station and incidental related work.

1.2.2 Location

The work shall be located at the New River Marine Corps Air Station, Jacksonville, North Carolina, approximately as indicated. The exact location will be shown by the Contracting Officer.

1.3 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.

1.4 ON-SITE PERMITS

1.4.1 Utility Outage Requests and Utility Connection Requests

Notify the Contracting Officer at least 72 hours prior to starting excavation work. Contractor is responsible for marking and verifying all utilities not marked.

The Contractor shall 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 transversed by piping, ducts, and other work to be installed.

Work shall be scheduled to hold outages to a minimum.

Utility outages and connections required during the prosecution of work that affect existing systems shall be arranged for at the convenience of the Government and shall be scheduled outside the regular working hours or on weekends.

Contractor shall not be entitled to additional payment for utility outages and connections required to be performed outside the regular work hours.

Requests for utility outages and connections shall be made in writing to the Contracting Officer at least 30 calendar days in advance of the time required. Each request shall state the system involved, area involved, approximate duration of outage, and the nature of work involved.

1.4.2 Borrow, Excavation, Welding, and Burning Permits

ACTIVITY	SUBMISSION DATE
Excavation Permits	3 calendar days prior to work
Welding Permits	1 calendar day prior to work

Permits shall be posted at a conspicuous location in the construction area.

Burning of trash or rubbish is not permitted.

1.5 LOCATION OF UNDERGROUND FACILITIES

Obtain digging permits prior to start of excavation by contacting the Contracting Officer 15 calendar days in advance. Scan the construction site with electromagnetic or sonic equipment, and mark the surface of the ground, pier deck or paved surface where existing underground utilities are discovered. Verify the elevations of existing piping, utilities,and any type of underground obstruction not indicated to be specified or removed but indicated or discovered udring scanning in locations to be traversed by piping, ducts, and other work to be conducted or installed.

1.5.1 Notification Prior to Excavation

Notify the Contracting Officer at least 48 hours prior to starting excavation work.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 14 00

WORK RESTRICTIONS
07/07

PART 1 GENERAL

1.1 CONTRACTOR ACCESS AND USE OF PREMISES

1.1.1 Activity Regulations

Ensure that Contractor personnel employed on the Activity become familiar with and obey Activity regulations including safety, fire, traffic and security regulations. Keep within the limits of the work and avenues of ingress and egress. To minimize traffic congestion, delivery of materials shall be outside of peak traffic hours (6:30 to 8:00 a.m. and 3:30 to 5:00 p.m.) unless otherwise approved by the Contracting Officer. Wear hard hats in designated areas. Do not enter any restricted areas unless required to do so and until cleared for such entry. The Contractor's equipment shall be conspicuously marked for identification.

1.1.1.1 Subcontractors and Personnel Contacts

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.

1.1.1.2 Identification Badges

Identification badges, if required, will be furnished without charge. Application for and use of badges will be as directed. Furnish a completed EMPLOYMENT ELIGIBILITY VERIFICATION (DHS FORM I-9) form for all personnel requesting badges. This form is available at http://www.uscis.gov/files/form/I-9_IFR_02-02-09.pdf. Immediately report instances of lost or stolen badges to the Contracting Officer.

1.1.1.3 No Smoking Policy

Smoking is prohibited within and outside of all buildings on installations under the cognizance of NAVFAC except in designated smoking areas. This applies to existing buildings, buildings under construction and buildings under renovation. Discarding tobacco materials other than into designated tobacco receptacles is considered littering and is subject to fines. The Contracting Officer will identify designated smoking areas.

1.1.2 Working Hours

Regular working hours shall consist of an 8 1/2 hour period , between 7 a.m. and 3:30 p.m., Monday through Friday, and 7 a.m. to 11 p.m. on Saturday, excluding Government holidays.

1.1.3 Work Outside Regular Hours

Work outside regular working hours requires Contracting Officer approval. Make application 15 calendar days prior to such work to allow arrangements to be made by the Government for inspecting the work in progress, giving the specific dates, hours, location, type of work to be performed, contract

number and project title. Based on the justification provided, the Contracting Officer may approve work outside regular hours. During periods of darkness, the different parts of the work shall be lighted in a manner approved by the Contracting Officer. Make utility cutovers after normal working hours or on Saturdays, Sundays, and Government holidays unless directed otherwise.

1.1.4 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, and compressed air shall be considered utility cutovers pursuant to the paragraph entitled "Work Outside Regular Hours."

d. Operation of Station Utilities: The Contractor shall not operate nor disturb the setting of control devices in the station utilities system, including water, sewer, electrical, and steam services. The Government will operate the control devices as required for normal conduct of the work. The Contractor shall notify the Contracting Officer giving reasonable advance notice when such operation is required.

1.2 SECURITY REQUIREMENTS

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

1.2.1 Business Access Security Requirements

1.2.1.1 Business Access Definition

Contractor/subcontractor employees requiring installation access to MCB, Camp Lejeune or MCAS New River, NC, 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.

1.2.1.2 Installation Security Access Requirements

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

1.2.1.3 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:

a. Identification Card Center, 59 Molly Pitcher Road for badge (910-451-2727).

MCAS New River, NC. Report as follows:

a. S-4 (Facilities Office), Bldg AS-211 (1st Deck) for registration on contractor's list (910-449-6310).

b. Pass and Identification Office, Bldg AS-211 (1st Deck) for badge and vehicle decal (910-449-5427/5428).

1.2.1.4 Proof of Employee Citizenship or Legal Alien Status

Acceptable documents include birth certificate, Immigration and Naturalization Service (INS) forms and passports.

1.2.1.5 Proof of Criminal Records Check

Proof of a criminal records check from the country or state where the employee resided for the previous two years (or length of legal residence for foreign nationals in the U.S. for less than two years). Criminal records checks may be obtained from, but is not limited to the following sources: Country Courthouse, Defense Security Service (www.dss.mil) and/or Infolink Screening Services, Inc. (www.infolinkscreening.com). Infolink Screening Services is listed as another possible source to obtain a criminal background check. The Government does not endorse nor is it affiliated with Infolink Screening Services. Criminal records check shall be conducted annual prior to renewal of badge for reevaluation.

1.2.1.6 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).

1.2.2 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.

1.2.3 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.

1.2.4 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 for vehicle decal (910-451-1158):

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.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

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SECTION 01 20 00.00 20

PRICE AND PAYMENT PROCEDURES
08/09

PART 1 GENERAL

1.1 REFERENCES

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

U.S. ARMY CORPS OF ENGINEERS (USACE)

EP-1110-1-8	(2005) Construction Equipment Ownership and Operating Expense Schedule, Vol 1-12

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Schedule of prices; G

1.3 SCHEDULE OF PRICES

1.3.1 Data Required

This contract requires the use of a cost-loaded Network Analysis Schedule. The information required for the Schedule of Prices will be entered as an integral part of the Network Analysis Schedule (NAS). Provide a detailed breakdown of the contract price, giving quantities for each of the various kinds of work, unit prices, and extended prices.

1.3.2 Schedule Instructions

Payments will not be made until the Schedule of Prices has been submitted to and accepted 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. Work out 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.

1.4 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 EP-1110-1-8.

1.5 CONTRACTOR'S INVOICE

1.5.1 Content of Invoice

Request for payment in accordance with the terms of the contract shall include the following: If NFAS Clause 5252.232-9301 is present in the contract, documents shall be provided as attachments in Wide Area Workflow (WAWF). The maximum size limit of each attachment is less than 2 megabytes, but there are no limits to the number of attachments. If a document cannot be attached to WAWF due to system or size restrictions it shall be provided as instructed by the Contracting Officer.

a. Contractor's Invoice on NAVFAC Form 7300/30, which shall show, in summary form, the basis for arriving at the amount of the invoice.

b. Contractor's Monthly Estimate for Voucher (LANTNAVFACENGCOM Form 4-4330/110 (New 7/84)), with subcontractor and supplier payment certification.

c. Affidavit to accompany invoice (LANTDIV NORVA Form 4-4235/4 (Rev. 5/81)).

d. Updated copy of submittal register.

e. Updated copy of progress schedule. Furnish as specified in "FAR 52.236-15, Schedules for Construction Contracts."

f. Network mathematical analysis.

g. Include Contractor's Final Release Form. Final invoice shall be accompanied by the Final Release Form. If the Contractor is incorporated, the release shall contain the corporate seal. An officer of the corporation shall sign the release and the corporate secretary shall certify the release.

   For final invoices being submitted via WAWF, the original Contractor's Final Release Form must be provided directly to the respective Contracting Officer prior to submission of the final invoice.

   Once receipt of the original Final Release Form has been confirmed by the Contracting Officer, the Contractor shall then its submit final invoice and attach a copy of the Final Release Form in WAWF.

1.5.2 Quantities of Monthly Invoices and Supporting Forms

Forms will be furnished by the Contracting Officer. Requests for payment shall be processed in accordance with FAR 52.232-5, Payments Under Fixed-Price Construction Contracts.

Monthly invoices and supporting forms for work performed through the anniversary award date of the contract shall be submitted to the Contracting Officer within 5 calendar days of the date of invoice For example, contract award date is the 7th of the month, the date of each monthly invoice shall be the 7th and the invoice shall be submitted by the 12th of the month.

Forms shall be submitted electronically via WAWF if NFAS clause 5252.232-9301 is specified in the contract. Otherwise, the forms shall be submitted in accordance with contract invoicing instructions

a. Contractor's invoice

b. Contractor's monthly estimate for voucher shall be required on jobs where there is a schedule of prices

c. Affidavit

d. Updated submittal register

e. Network mathematical analysis

f. Contractor Safety Self Evaluation Checklist

g. Final release (for Final Payment only)

1.6 PAYMENTS TO THE CONTRACTOR

Payments will be made on submission of itemized requests by the Contractor which comply with the requirements of this section, and will be subject to reduction for overpayments or increase for underpayments made on previous payments to 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 reductions and/or suspensions permitted under the FAR and agency regulations including the following in accordance with "FAR 32.503-6:

a. Reasonable deductions due to defects in material or workmanship;

b. Claims which the Government may have against the Contractor under or in connection with this contract;

c. Unless otherwise adjusted, repayment to the Government upon demand for overpayments made to the Contractor; and

d. Failure to provide up to date record drawings not current as stated in Contract Clause "FAC 5252.236-9310, Record Drawings."

1.6.2 Payment for Materials Offsite

No payments will be made to the Contractor for materials stored off the construction site.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

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SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS
08/08

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

List of contact personnel; G

View location map; G

Progress and completion pictures; G

1.2 VIEW LOCATION MAP

Submit to the Contracting Officer, prior to or with the first digital photograph submittals, a sketch or drawing indicating the required photographic locations. Update as required if the locations are moved.

1.3 PROGRESS AND COMPLETION PICTURES

Photographically document site conditions prior to start of construction operations. Provide monthly, and within one month of the completion of work, digital photographs, 1600x1200x24 bit true color minimum resolution in JPEG file format showing the sequence and progress of work. Take a minimum of 20 digital photographs each week throughout the entire project from a minimum of ten views from points located by the Contracting Officer. Submit a view location sketch indicating points of view. Submit with the monthly invoice two sets of digital photographs each set on a separate CD-R, cumulative of all photos to date. Indicate photographs demonstrating environmental procedures. Photographs for each month shall be in a separate monthly directory and each file shall be named to indicate its location on the view location sketch. The view location sketch shall also be provided on the CD as digital file. All file names shall include a date designator. Cross reference submittals in the appropriate daily report. Photographs shall be provided for unrestricted use by the Government.

1.4 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 for bodily injury, $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 law.

1.5 CONTRACTOR PERSONNEL REQUIREMENTS

1.5.1 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.

1.5.2 Identification Badges

Identification badges, if required, will be furnished without charge. Immediately report instances of lost or stolen badges to the Contracting Officer.

1.5.3 Subcontractor Special Requirements

1.5.3.1 Asbestos Containing Material

All contract requirements of Section 02 82 16.00 20, "Engineering Control of Asbestos Containing Materials" assigned to the Private Qualified Person (PQP) shall be accomplished directly by a first tier subcontractor.

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 (QC) representative is required on the contract, then that individual shall also have fluent English communication skills.

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 prices, shop drawings, and other submittals, scheduling programming, and prosecution of the work. Major subcontractors who will engage in the work shall also attend.

1.8 PARTNERING

LEVEL B PARTNERING: To most effectively accomplish this contract, the Government requires the formation of a cohesive partnership with the Contractor and its subcontractors. Key personnel, including the client who will occupy the facility, the designer-of-record, principal individuals from NAVFAC (Echelon III and/or IV) and from the activity contracting office, the project sponsor, and representative(s) of the facility owner will be invited to participate in the partnering process. Key members of the prime and subcontractors teams, including senior management, must participate.

The partnership will draw on the strength of each organization in an effort to achieve a quality project done right the first time, within budget, on schedule, and without any safety mishaps. The initial session will be one-day and the follow-on session(s), held at a minimum of once every three months or as agreed to by the partners, will be half-day. The partnering sessions shall be held at locations agreed to by the partners. A Government in-house facilitator (a trained facilitator from NAVFAC Atlantic, NAVFAC Pacific, a Facilities Engineering Command (FEC), another ROICC office or another Government agency) will facilitate the partnering sessions. The contractor shall pay all costs associated with the partnering effort including meeting room and other incidental items. Before the partnering session, the contractor shall coordinate with the facilitator requirements for incidental items (audio-visual equipment, two easels, flipchart paper, colored markers, note paper, pens/pencils, colored flash cards, etc.) and have these items available at the partnering session. The contractor will copy documents for distribution to all attendees. The participants shall bear their own costs for meals, lodging and transportation associated with partnering.

1.9 AVAILABILITY OF CADD DRAWING FILES

After award and upon request, the electronic "Computer-Aided Drafting and Design (CADD)" drawing files will only be made available to the Contractor for use in preparation of construction data related to the referenced contract subject to the following terms and conditions.

Data contained on these electronic files shall not be used for any purpose other than as a convenience in the preparation of construction data for the referenced project. Any other use or reuse shall be at the sole risk of the Contractor and without liability or legal exposure to the Government. The Contractor shall make no claim and waives to the fullest extent permitted by law, any claim or cause of action of any nature against the Government, its agents or sub consultants that may arise out of or in connection with the use of these electronic files. The Contractor shall, to the fullest extent permitted by law, indemnify and hold the Government harmless against all damages, liabilities or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from the use of these electronic files.

These electronic CADD drawing files are not construction documents. Differences may exist between the CADD files and the corresponding construction documents. The Government makes no representation regarding the accuracy or completeness of the electronic CADD files, nor does it make representation to the compatibility of these files with the Contractors hardware or software. In the event that a conflict arises between the signed and sealed construction documents prepared by the Government and the furnished CADD files, the signed and sealed construction documents shall govern. The Contractor is responsible for determining if any conflict exists. Use of these CADD files does not relieve the Contractor of duty to fully comply with the contract documents, including and without limitation, the need to check, confirm and coordinate the work of all contractors for the project.

If the Contractor uses, duplicates and/or modifies these electronic CADD files for use in producing construction data related to this contract, all previous indicia of ownership (seals, logos, signatures, initials and dates) shall be removed.

1.10 ELECTRONIC MAIL (E-MAIL) ADDRESS

The Contractor shall establish and maintain electronic mail (e-mail) capability along with the capability to open various electronic attachments in Microsoft, Adobe Acrobat, and other similar formats. Within 10 days after contract award, the Contractor shall provide the Contracting Officer a single (only one) e-mail address for electronic communications from the Contracting Officer related to this contract including, but not limited to contract documents, invoice information, request for proposals, and other correspondence. The Contracting Officer may also use email to notify the Contractor of base access conditions when emergency conditions warrant, such as hurricanes, terrorist threats, etc. Multiple email address will not allowed.

It is the Contractor's responsibility to make timely distribution of all Contracting Officer initiated e-mail with its own organization including field office(s). The Contractor shall promptly notify the Contracting Officer, in writing, of any changes to this email address.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 32 16.00 20

CONSTRUCTION PROGRESS DOCUMENTATION
04/06

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Construction schedule; G

1.2 CONSTRUCTION SCHEDULE

Prior to the start of work, prepare and submit to the Contracting Officer for acceptance a construction schedule in the form of 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.

1.3 NETWORK ANALYSIS SCHEDULE (NAS)

The Contractor shall use the critical path method (CPM) to schedule and control construction activities. The Network shall have a minimum of construction activities. The scheduling software that will be utilized by the Government on this project is SureTrak by Primavera Systems, Inc. Notwithstanding any other provision in the contract, schedules submitted for this project must be prepared using either Primavera P3 or Primavera SureTrak (files saved in Concentric P3 format). Submission of data from another software system where data conversion techniques or software is used to import into Primavera's scheduling software is not acceptable and will be cause for rejection of the submitted schedule. The schedule shall identify as a minimum:

a. Construction time for all major systems and components;

b. Each activity shall be assigned its appropriate Responsibility Code;

c. Each activity shall be assigned its appropriate Phase Code;

d. Major submittals and submittal processing time; and

e. Major equipment lead time.

1.3.1 CPM Submittals and Procedures

Submit all network analysis and updates in hard copy and on electronic media that is acceptable to the Contracting Officer. The project schedule will also be posted in the format specified as an Adobe PDF file with no relationship lines displayed in the graphic. The network analysis system

shall be kept current, with changes made to reflect the actual progress and status of the construction.

1.4 UPDATED SCHEDULES

Update the construction schedule and equipment delivery schedule at monthly intervals or when the 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
02/09

PART 1 GENERAL

The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections.

Units of weights and measures used on all submittals are to be the same as those used in the contract drawings.

Each submittal is to be complete and in sufficient detail to allow ready determination of compliance with contract requirements.

Contractor's Quality Control (CQC) System Manager and the Designer of Record, if applicable, to check and approve all items prior to submittal and stamp, sign, and date indicating action taken. Proposed deviations from the contract requirements are to be clearly identified. Include within submittals items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals.

Submittals requiring Government approval are to be scheduled and made prior to the acquisition of the material or equipment covered thereby. Picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations samples remaining upon completion of the work.

1.1 DEFINITIONS

1.1.1 Submittal Descriptions (SD)

Submittals requirements are specified in the technical sections. Submittals are identified by Submittal Description (SD) numbers and titles as follows:

SD-01 Preconstruction Submittals

Submittals which are required prior to a notice to proceed commencing work on site. Submittals required prior to the start of the next major phase of the construction on a multi-phase contract. Schedules or tabular list of data or tabular list including location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work, submitted prior to contract notice to proceed or next major phase of construction.

Certificates of insurance
Surety bonds
List of proposed subcontractors
List of proposed products
Construction Progress Schedule
Network Analysis Schedule (NAS)
Submittal register

Schedule of prices
Health and safety plan
Work plan
Quality control(QC) 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, systems or equipment for some portion of the work.

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

SD-04 Samples

Fabricated or unfabricated 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

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

Design submittals, design substantiation submittals and extensions of design submittals.

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 logs and checklists.

Final acceptance test and operational test procedure.

SD-07 Certificates

Statements printed on the manufacturer's letterhead and 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 manufacturer, 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.

Text of posted operating instructions.

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 at the job site, in the vicinity of the job site, or on a sample taken from the job site, on a portion of the work, during or after installation, to confirm compliance with manufacturer's standards or instructions. The documentation must be signed by an authorized official of a testing laboratory or agency and must state the test results; and indicate whether the material, product, or system has passed or failed the test.

Factory test reports.

SD-10 Operation and Maintenance Data

Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel, including manufacturer's help and product line documentation necessary to maintain and install equipment. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance

and repair of the item.

This data is intended to be incorporated in an operations and maintenance manual or control system.

SD-11 Closeout Submittals

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

Special requirements necessary to properly close out a construction contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract.

1.1.2 Approving Authority

Office or designated person authorized to approve submittal.

1.1.3 Work

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

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor QC approval. Submit the following in accordance with this section.

SD-01 Preconstruction Submittals

Submittal register; G

1.3 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.4 FORWARDING SUBMITTALS REQUIRING GOVERNMENT APPROVAL

1.4.1 Submittals Required from the Contractor

As soon as practicable after award of contract, and before procurement of fabrication, forward to the Architect-Engineer, submittals required in the technical sections of this specification, including shop drawings, product data and samples. One copy of the transmittal form for all submittals shall be forwarded to the Resident Officer in Charge of Construction.

The Architect-Engineer for this project will review and approve for the Contracting Officer those submittals reserved for Contracting Officer approval to verify submittals comply with the contract requirements.

1.4.1.1 O&M Data

The Architect-Engineer for this project will review and approve for the Contracting Officer O&M Data to verify the submittals comply with the contract requirements; submit data specified for a given item within 30

calendar days after the item is delivered to the contract site.

a. In the event the Contractor fails to deliver O&M Data within the time limits specified, the Contracting Officer may withhold from progress payments 50 percent of the price of the item with which such O&M Data are applicable.

1.4.1.2 Submittals Reserved for NAVFAC Atlantic Approval

As an exception to the standard submittal procedure specified above, submit the following to the Code OPNCCI, Marine Corps North Carolina IPT, 9742 Maryland Avenue, Norfolk, 23511-3095, include shop drawings, product data and samples. One copy of the transmittal form for all submittals shall be forwarded to the Officer in Charge of Construction. Marine Corps North Carolina IPT will review and approve for the Contracting Officer those submittals reserved for Contracting Officer approval to verify submittals comply with the contract requirements.

1.5 PREPARATION

1.5.1 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. On the transmittal form identify Contractor, indicate date of submittal, and include information prescribed by transmittal form and required in paragraph entitled "Identifying Submittals."

1.5.2 Identifying Submittals

When submittals are provided by a Subcontractor, the Prime Contractor is to prepare, review and stamp with Contractor's approval all specified submittals prior to submitting for Government approval.

Identify submittals, except sample installations and sample panels, 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. Date of the drawings and revisions.

d. Name, address, and telephone number of subcontractor, supplier, manufacturer and any other subcontractor associated with the submittal.

e. Section number of the specification section by which submittal is required.

f. Submittal description (SD) number of each component of submittal.

g. When a resubmission, add alphabetic suffix on submittal description, for example, submittal 18 would become 18A, to indicate resubmission.

h. Product identification and location in project.

1.5.3 Format for SD-02 Shop Drawings

a. Shop drawings are not to be less than 8 1/2 by 11 inches nor more than 30 by 42 inches, except for full size patterns or templates. Prepare drawings to accurate size, with scale indicated, unless other form is required. Drawings are to be suitable for reproduction and be of a quality to produce clear, distinct lines and letters with dark lines on a white background.

b. Present A4 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. Number drawings in a logical sequence. Each drawing is to bear the number of the submittal in a uniform location adjacent to the title block. Place the Government contract number in the margin, immediately below the title block, for each drawing.

e. Dimension drawings, except diagrams and schematic drawings; prepare drawings demonstrating interface with other trades to scale. Use the same unit of measure for shop drawings as indicated on the contract drawings. Identify materials and products for work shown.

1.5.4 Format of SD-03 Product Data and SD-08 Manufacturer's Instructions

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, with information and format as required for submission of SD-07 Certificates.

e. Include the manufacturer's name, trade name, place of manufacture, and catalog model or number on product data. Also include applicable federal, military, industry and technical society publication references. Should manufacturer's data require supplemental information for clarification, submit as specified for SD-07 Certificates.

f. 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), ASTM International (ASTM), National Electrical Manufacturer's 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. 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. State on the certificate 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.

g. Collect required data submittals for each specific material, product, unit of work, or system into a single submittal and marked for choices, options, and portions applicable to the submittal. Mark each copy of the product data identically. Partial submittals will not be accepted for expedition of construction effort.

h. Submit manufacturer's instructions prior to installation.

1.5.5 Format of SD-04 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 A4 8 1/2 by 11 inches.

(3) Sample of Materials Exceeding A4 8 1/2 by 11 inches: Cut down to A4 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. Where samples are specified for selection of color, finish, pattern, or texture, submit the full set of available choices for the material or product specified. Sizes and quantities of samples are to represent their respective standard unit.

(7) Sample Panel: 4 by 4 feet.

(8) Sample Installation: 100 square feet.

b. Samples Showing Range of Variation: Where variations in color, finish, pattern, or texture are unavoidable due to nature of the materials, submit sets of samples of not less than three units showing extremes and middle of range. Mark each unit to describe its relation to the range of the variation.

c. Reusable Samples: Incorporate returned samples into work only if so specified or indicated. Incorporated samples are to 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.

1.5.6 Format of SD-05 Design Data and SD-07 Certificates

Provide design data and certificates on 8 1/2 by 11 inches paper. Provide a bound volume for submittals containing numerous pages.

1.5.7 Format of SD-06 Test Reports and SD-09 Manufacturer's Field Reports

a. Provide reports on 8 1/2 by 11 inches paper in a complete bound volume.

b. Indicate by prominent notation, each report in the submittal. Indicate specification number and paragraph number to which it pertains.

1.5.8 Format of SD-01 Preconstruction Submittals and SD-11 Closeout 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. Provide all dimensions in administrative submittals in metric. Where data are included in preprinted material with English units only, submit metric dimensions on separate sheet.

1.6 QUANTITY OF SUBMITTALS

1.6.1 Number of Copies of SD-02 Shop Drawings

Submit six copies of submittals of shop drawings requiring review and approval only by QC organization and seven copies of shop drawings requiring review and approval by Contracting Officer.

1.6.2 Number of Copies of SD-03 Product Data and SD-08 Manufacturer's Instructions

Submit in compliance with quantity requirements specified for shop drawings.

1.6.3 Number of Samples SD-04 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 or provide one sample installation where directed. Include components listed in technical section or as directed.

c. Submit one sample installation, where directed.

d. Submit one sample of non-solid materials.

1.6.4 Number of Copies SD-05 Design Data and SD-07 Certificates

Submit in compliance with quantity requirements specified for shop drawings.

1.6.5 Number of Copies SD-06 Test Reports and SD-09 Manufacturer's Field Reports

Submit in compliance with quantity and quality requirements specified for shop drawings other than field test results that will be submitted with QC reports.

1.6.6 Number of Copies of SD-10 Operation and Maintenance Data

Submit three copies of O&M Data to the Contracting Officer for review and approval.

1.6.7 Number of Copies of SD-01 Preconstruction Submittals and SD-11 Closeout Submittals

Unless otherwise specified, submit two sets of administrative submittals.

1.7 VARIATIONS / SUBSTITUTION REQUESTS

Variations from contract requirements require Government approval pursuant to contract Clause FAR 52.236-21 and will be considered where advantageous to Government.

1.7.1 Considering Variations

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

Specifically point out variations from contract requirements in transmittal letters. Failure to point out deviations may result in the Government requiring rejection and removal of such work at no additional cost to the Government.

1.7.2 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 savings. In addition to documentation required for variation, include the submittals required for the item. Clearly mark the proposed variation in all documentation.

1.7.3 Warranting That Variations 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.

1.7.4 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.

1.8 SUBMITTAL REGISTER

Prepare and maintain submittal register, as the work progresses. 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. A submittal register showing items of equipment and materials for which submittals are required by the specifications is provided as an attachment. This list may not be all inclusive and additional submittals may be required. Maintain a submittal register for the project in accordance with Section 01 45 02 NAVFAC QUALITY CONTROL.

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

Column (d): Lists each submittal description (SD No. and type, e.g. SD-02 Shop 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.

1.8.1 Use of Submittal Register

Submit submittal register. Submit with QC plan and project schedule. Verify that all submittals required for project are listed and add missing submittals. Coordinate and complete the following fields on the register submitted with the QC plan and the project schedule:

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.

1.8.2 Contractor Use of Submittal Register

Update the following fields with each submittal throughout contract.

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.

1.8.3 Approving Authority Use of Submittal Register

Update the following fields.

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

Column (l) List date of submittal receipt.

Column (m) through (p)List Date related to review actions.

Column (q) List date returned to Contractor.

1.8.4 Contractor Action Code and Action Code

Entries for columns (j) and (o), are to be used are as follows (others may be prescribed by Transmittal Form):

NR - Not Received

AN - Approved as noted

A - Approved

RR - Disapproved, Revise, and Resubmit

1.8.5 Copies Delivered to the Government

Deliver one copy of submittal register updated by Contractor to Government with each invoice request.

1.9 SCHEDULING

Schedule and submit concurrently submittals covering component items forming a system or items that are interrelated. Include certifications to be submitted with the pertinent drawings at the same time. No delay damages or time extensions will be allowed for time lost in late submittals.

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 resubmittal of requirements.

b. Submittals called for by the contract documents will be listed on the register. If a submittal is called for but does not pertain to the contract work, the Contractor is to include the submittal in the register and annotate it "N/A" with a brief explanation. Approval by the Contracting Officer does not relieve the Contractor of supplying submittals required by the contract documents but which have been omitted from the register or marked "N/A".

c. Re-submit register and annotate monthly by the Contractor with actual submission and approval dates. When all items on the

register have been fully approved, no further re-submittal is required.

d. Carefully control procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

e. 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.

f. Period of review for each resubmittal is the same as for initial submittal.

1.9.1 Reviewing, Certifying, Approving Authority

The QC organization is responsible for reviewing and certifying that submittals are in compliance with contract requirements. Approving authority on submittals is QC Manager unless otherwise specified for specific submittal. At each "Submittal" paragraph in individual specification sections, a notation "G," following a submittal item, indicates Contracting Officer is approving authority for that submittal item.

1.9.2 Constraints

a. Conform to provisions of this section, unless explicitly stated otherwise for submittals listed or specified in this contract.

b. Submit complete submittals for each definable feature of work. Submit at the same time components of definable feature interrelated as a system.

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.

1.9.3 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 P-725, Work Order No. 859348 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)

(2) When approving authority is QC Manager, QC Manager will use the following approval statement when returning submittals to Contractor as "Approved" or "Approved as Noted."

"I hereby certify that the (material) (equipment) (article) shown and marked in this submittal and proposed to be incorporated with Contract P-725, Work Order No. 859348 is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is approved for use.

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

Approved by QC Manager _____, Date _____"
(Signature)

g. Sign certifying statement or approval statement. The QC organization member designated in the approved QC plan is the person signing certifying statements. The use of original ink for signatures is required. 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.

1.10 DISAPPROVED SUBMITTALS

Contractor shall make corrections required by the Contracting Officer. If the Contractor considers any correction or notation on the returned submittals to constitute a change to the contract drawings or specifications; notice as required under the clause entitled, "Changes" is to be given to the Contracting Officer. Contractor is responsible for the dimensions and design of connection details and construction of work. Failure to point out deviations may result in the Government requiring rejection and removal of such work at the Contractor's expense.

If changes are necessary to submittals, the Contractor shall make such revisions and submission of the submittals in accordance with the procedures above. No item of work requiring a submittal change is to be accomplished until the changed submittals are approved.

1.11 APPROVED SUBMITTALS

The Contracting Officer's approval or acceptance of submittals is not be construed as a complete check, and indicates only that the general method of construction, materials, detailing and other information are satisfactory design, general method of construction, materials, detailing and other information appear to meet the Solicitation and Accepted Proposal. Approval or acceptance will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Contractor Quality Control (CQC) requirements of this contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work. After submittals have been approved or accepted by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.12 APPROVED SAMPLES

Approval of a sample is only for the characteristics or use named in such approval and is not be construed to change or modify any contract requirements. Before submitting samples, the Contractor to assure that the materials or equipment will be available in quantities required in the project. No change or substitution will be permitted after a sample has been approved.

Match the approved samples for Materials and equipment incorporated in the work. If requested, approved samples, including those which may be damaged in testing, will be returned to the Contractor, at his expense, upon completion of the contract. Samples not approved will also be returned to the Contractor at its expense, if so requested.

Failure of any materials to pass the specified tests will be sufficient cause for refusal to consider, under this contract, any further samples of the same brand or make of that material. Government reserves the right to disapproved any material or equipment which previously has proved unsatisfactory in service.

Samples of various materials or equipment delivered on the site or in place may be taken by the Contracting Officer for testing. Samples failing to meet contract requirements will automatically void previous approvals. Contractor to replace such materials or equipment to meet contract requirements.

Approval of the Contractor's samples by the Contracting Officer does not relieve the Contractor of his responsibilities under the contract.

1.13 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.No payment for materials incorporated in the work will be made if all required Designer of Record or required Government approvals have not been obtained. No payment will be made for any materials incorporated into the work for any conformance review submittals or information only submittals found to contain errors or deviations from the Solicitation or Accepted Proposal.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

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SECTION 01 35 26

GOVERNMENTAL SAFETY REQUIREMENTS
08/09

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.32	(2004) Fall Protection
ASSE/SAFE A10.34	(2001; R 2005) Protection of the Public on or Adjacent to Construction Sites
ASSE/SAFE Z359.1	(2007) Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components

ASME INTERNATIONAL (ASME)

ASME B30.22	(2005) Articulating Boom Cranes
ASME B30.3	(2009) Construction Tower Cranes
ASME B30.5	(2007) Mobile and Locomotive Cranes
ASME B30.8	(2004) Floating Cranes and Floating Derricks

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

NASA NPG 8621.1	(2004a) NASA Mishap Reporting, Investigating and Record Keeping Policy
NASA NPG 8715.3	(2004) NASA Safety Manual
NASA NSS 1740.12	(1993) NASA Safety Standard For Explosives, Propellants and Pyrotechnics

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10	(2007; Errata 2007; AMD 1 2007) Standard for Portable Fire Extinguishers
NFPA 241	(2009) Standard for Safeguarding Construction,Alteration, and Demolition Operations
NFPA 51B	(2009) Standard for Fire Prevention During Welding, Cutting, and Other Hot Work
NFPA 70	(2008; AMD 1 2008) National Electrical

	Code - 2008 Edition
NFPA 70E	(2009; Errata 2009) Standard for Electrical Safety in the Workplace

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2008) 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 1915	Confined and Enclosed Spaces and Other Dangerous Atmospheres in Shipyard Employment
29 CFR 1926	Safety and Health Regulations for Construction
29 CFR 1926.500	Fall Protection

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Government acceptance is required for submittals with a "G, A" designation.

SD-01 Preconstruction Submittals

Accident Prevention Plan (APP); G, A

Activity Hazard Analysis (AHA); G, A

Crane Critical Lift Plan; G, A

Proof of qualification for Crane Operators; G, A

SD-06 Test Reports

Reports

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

Accident Reports

Crane Reports

SD-07 Certificates

Confined Space Entry Permit

Hot work permit

Contractor Safety Self-Evaluation Checklist; G, A

Certificate of Compliance (Crane)
Submit one copy of each permit/certificate attached to each Daily Quality Control Report.

1.3 DEFINITIONS

a. 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.

b. High Visibility Accident. Any mishap which may generate publicity and/or high visibility.

c. 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 through provided by a physician or registered personnel.

d. Operating Envelope. The area surrounding any crane. Inside this "envelope" is the crane, the operator, riggers and crane walkers, rigging gear between the hook and the load, the load and the crane's supporting structure (ground, rail, etc.).

e. Qualified Person for Fall Protection. A person with a recognized degree or professional certificate, and with 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.

f. 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 (any time lost after day of injury/illness onset);

(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.

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

h. 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/or 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.) Any mishap meeting the criteria described above shall be documented in both the Contractor Significant Incident Report (CSIR) and using the NAVFAC prescribed Navy Crane Center (NCC) form submitted within five days both as provided by the Contracting Officer.

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. Additionally, 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. 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, comply with the most recent addition of USACE EM 385-1-1, and the following federal, state, and local, 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 govern.

1.6 SITE QUALIFICATIONS, DUTIES AND MEETINGS

1.6.1 Personnel Qualifications

1.6.1.1 Site Safety and Health Officer (SSHO)

The contractor shall provide a Safety oversight team that includes a minimum of one (1) Competent Person at each project site to function as the Safety and Health Officer (SSHO). The SSHO shall be at the work site at all times, unless specified differently in the contract, to perform safety and occupational health management, surveillance, inspections, and safety enforcement for the Contractor, and their training, experience, and qualifications shall be as required by EM 385-1-1 paragraph 01.A.17 and all

associated sub-paragraphs. A Competent Personal shall be provided for all of the hazards identified in the Contractor's Safety and Health Program in accordance with the accepted Accident Prevention Plan, and shall be on-site at all times when the work that presents the hazards associated with their professional expertise is being performed. The credentials of the Competent Persons(s) shall be approved by the Contracting Officer in consultation with the Safety Office.

The Contractor Quality Control (QC) person cannot be the SSHO on this project, even though the QC has safety inspection responsibilities as part of the QC duties.

1.6.1.2 Competent Person for Confined Space Entry

Provide a competent person for confined space meeting the definition and requirements of EM 385-1-1.

1.6.1.3 Crane Operators

Meet the crane operators requirements in USACE EM 385-1-1, Section 16 and Appendix I. In addition, for mobile cranes with Original Equipment Manufacturer (OEM) rated capacitates of 50,000 pounds or greater, designate crane operators as qualified by a source that qualifies crane operators (i.e., union, a government agency, or and organization that tests and qualifies crane operators). Provide proof of current qualification.

1.6.2 Personnel Duties

1.6.2.1 Site Safety and Health Officer (SSHO)

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. Attach safety inspection logs to the Contractors' daily quality control 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. Post a list of unresolved safety and health deficiencies on the safety bulletin board.

g. Ensure sub-contractor compliance with safety and health requirements.

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

h. Maintain a list of hazardous chemicals on site and their material

safety data sheets.

1.6.2.2 Associate Safety Professional (ASP)

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 at all times 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 ASP is appointed as the SSHO all duties of that position shall also be performed.

1.6.3 Meetings

1.6.3.1 Preconstruction Conference

a. 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).

b. 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, establish a schedule for the preparation, submittal, review, and acceptance of AHAs to preclude project delays.

c. 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. Do not begin work until there is an accepted APP.

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

1.6.3.2 Safety Meetings

Conduct and document meetings as required by EM 385-1-1. Attach minutes showing contract title, signatures of attendees and a list of topics discussed to the Contractors' daily quality control report.

1.7 ACCIDENT PREVENTION PLAN (APP)

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 Accident Prevention Plan" and show compliance with NASA NPG 8715.3. Specific requirements for some of the APP elements are described below. The APP shall be job-specific and 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. Include any portions of the Contractor's overall safety and health program referenced in the APP 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, the Contractor Quality control Manager, 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.

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, SSHO and quality control manager. Should any severe hazard exposure, i.e. imminent danger, become evident, stop work in the area, secure the area, and develop a plan to remove the exposure and control the hazard. Notify the Contracting Officer within 24 hours of discovery. Eliminate/remove the hazard. In the interim, take all necessary action to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public (as defined by ASSE/SAFE A10.34,) and the environment.

Copies of the accepted plan will be maintained at the Contracting Officer's office and at the job site.
Continuously reviewed and amended the APP, as necessary, throughout the life of the contract. Incorporate unusual or high-hazard activities not identified in the original APP as they are discovered.

1.7.1 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. Specify the duties of each position.

b. Qualifications of competent and of qualified persons. As a minimum, designate and submit qualifications of competent persons 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 and/or enclosed space entry plan in accordance with USACE EM 385-1-1, applicable OSHA standards 29 CFR 1910, 29 CFR 1915, and 29 CFR 1926, OSHA Directive 2.100, 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. Crane Critical Lift Plan. Prepare and sign weight handling critical lift plans for lifts over 75 percent of the 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 non-routine rigging or operation, sensitive equipment, or unusual safety risks. Submit 15 calendar days prior to on-site work and include the requirements of USACE EM 385-1-1, paragraph 16.H. and the following:

(1) For lifts of personnel, demonstrate compliance with the requirements of 29 CFR 1926.550(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.

e. Fall Protection and Prevention (FP&P) Program Documentation. The program documentation shall be site specific and address all fall hazards in the work place and during different phases of construction. Address how to protect and prevent workers from falling to lower levels when they are exposed to fall hazards above 6 feet. A qualified person for fall protection shall prepare and sign the program documentation. 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. Keep and maintain the accepted Fall Protection and Prevention Program documentationat the job site for the duration of the project. Include the Fall Protection and Prevention Program documentation in the Accident Prevention Plan (APP).

g. Lead Compliance Plan. The safety and health aspects of lead work, prepared in accordance with Section 02 83 13.00 20 LEAD IN CONSTRUCTION.

h. Asbestos Hazard Abatement Plan. The safety and health aspects of asbestos work, prepared in accordance with Section 02 82 16.00 20 ASBESTOS ABATEMENT 02 82 16.00 20 ENGINEERING CONTROL OF ASBESTOS CONTAINING MATERIALS.

i. Excavation Plan. The safety and health aspects prepared in accordance with Section 31 23 00.00 20 EARTHWORK.

1.8 ACTIVITY HAZARD ANALYSIS (AHA)

The Activity Hazard Analysis (AHA) format shall be in accordance with USACE EM 385-1-1, Section 1. Submit the AHA for review at least 15 calendar days prior to the start of each phase. Format subsequent AHAs as amendments to the APP. 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.

Develop the activity hazard analyses 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.

1.9 DISPLAY OF SAFETY INFORMATION

Within 1 calendar day after commencement of work, erect a safety bulletin board at the job site. Where size, duration, or logistics of project do not facilitate a bulletin board, an alternative method, acceptable to the Contracting Officer, that is accessible and includes all mandatory information for employee and visitor review, shall be deemed as meeting the requirement for a bulletin board. Include and maintain information on safety bulletin board as required by EM 385-1-1, section 01.A.06. Additional items required to be posted include:

a. Confined space entry permit.

b. Hot work permit.

1.10 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.

1.11 EMERGENCY MEDICAL TREATMENT

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

1.12 REPORTS

1.12.1 Accident Reports

a. Conduct an accident investigation for recordable injuries and illnesses, as defined in 1.3.h and property damage accidents resulting in at least $2,000 in damages, to establish the root cause(s) of the accident, complete the Navy Contractor Significant Incident Report (CSIR) fromUSACE Accident Report Form 3394 and provide the report to the Contracting Officer within 5 calendar day(s) of the accident. The Contracting Officer will provide copies of any required or special

forms.

b. Conduct an accident investigation for any weight handling equipment accident (including rigging gear accidents) 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. Do not proceed with crane operations 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.

1.12.2 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 in accordance with NASA NPG 8621.1. Within notification 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.

1.12.3 Crane Reports

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

1.12.4 Certificate of Compliance

Provide a Certificate of Compliance for each crane entering an activity under this contract (see Contracting Officer for a blank certificate). State within the certificate 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 comply with 29 CFR 1926 and USACE EM 385-1-1 Section 16 and Appendix I. Certify on the Certificate of Compliance that the crane operator(s) is qualified and trained in the operation of the crane to be used. 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). Post certifications on the crane.

1.13 HOT WORK

Submit and obtain a written permit prior to performing "Hot Work" (welding, cutting, etc.) or operating other flame-producing/spark producing devices, from the Fire Division. A permit is required from the Explosives Safety Office for work in and around where explosives are processed, stored, or handled. 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.

When starting work in the facility, require personnel to familiarize themselves with the location of the nearest fire alarm boxes and place in memory the emergency Fire Division phone number. ANY FIRE, NO MATTER HOW SMALL, SHALL BE REPORTED TO THE RESPONSIBLE FIRE DIVISION IMMEDIATELY.

Obtain services from a NFPA Certified Marine Chemist 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.

1.14 FACILITY OCCUPANCY CLOSURE

Streets, walks, and other facilities occupied and used by the Government shall not be closed or obstructed without written permission from the Contracting Officer.

1.15 SEVERE STORM PLAN

In the event of a severe storm warning, the Contractor must:

a. Secure outside equipment and materials and place materials that could be damaged in protected areas.

b. Check surrounding area, including roof, for loose material, equipment, debris, and other objects that could be blown away or against existing facilities.

c. Ensure that temporary erosion controls are adequate.

1.16 CONFINED SPACE ENTRY REQUIREMENTS.

Contractors entering and working in confined spaces performing shipyard industry work are required to follow the requirements of OSHA 29 CFR Part 1915 Subpart B. Contractors entering and working in confined spaces performing general industry work are required to follow the requirements of OSHA 29 CFR Part 1926.

Navy personnel entering and working in confined spaces performing naval maritime facility work are required to follow the requirements of NAVSEA S6470-AA-SAF-101 Rev. 03. Navy personnel entering and working in confined spaces performing non-maritime facility work are required to follow the requirements of OPNAVINST 5100.23G Chapter 27.

PART 2 PRODUCTS

Not used.

2.1 CONFINED SPACE SIGNAGE

Provide permanent signs integral to or securely attached to access covers for new permit-required confined spaces. Signs wording: "DANGER--PERMIT-REQUIRED CONFINED SPACE - DO NOT ENTER -" in bold letters a minimum of one inch in height and constructed to be clearly legible with all paint removed. The signal word "DANGER" shall be red and readable from 5 feet.

2.2 FALL PROTECTION ANCHORAGE

Leave in place fall protection anchorage, conforming to ASSE/SAFE Z359.1, installed under the supervision of a qualified person in fall protection, 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

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 prevails.

3.1.1 Hazardous Material Use

Each hazardous material must receive approval from the Contracting Office or their designated representative 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.

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-isocynates, 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. The Radiation Safety Officer (RSO) must be notified prior to excepted items of radioactive material and devices being brought on base.

3.1.3 Unforeseen Hazardous Material

The design should have identified materials such as PCB, lead paint, and friable and non-friable asbestos and other OSHA regulated chemicals (i.e. 29 CFR Part 1910.1000). 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, 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 CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

Contractor shall ensure that each employee is familiar with and complies with these procedures and USACE EM 385-1-1, Section 12, Control of Hazardous Energy.

Contracting Officer will, at the Contractor's request, apply lockout/tagout tags and take other actions that, because of experience and knowledge, are known to be necessary to make the particular equipment safe to work on for government owned and operated systems.

No person, regardless of position or authority, shall operate any switch, valve, or equipment that has an official lockout/tagout tag attached to it, nor shall such tag be removed except as provided in this section. No person shall work on any energized equipment including, but not limited to activities such as erecting, installing, constructing, repairing, adjusting, inspecting, un-jamming, setting up, trouble shooting, testing, cleaning, dismantling, servicing and maintaining machines equipment of processes until an evaluation has been conducted identifying the energy source and the procedures which will be taken to ensure the safety of personnel.

When work is to be performed on electrical circuits, only qualified personnel shall perform work on electrical circuits.

A supervisor who is required to enter an area protected by a lockout/tagout tag will be considered a member of the protected group provided he notifies the holder of the tag stub each time he enters and departs from the protected area.

Identification markings on building light and power distribution circuits shall not be relied on for established safe work conditions.

Before clearance will be given on any equipment other than electrical (generally referred to as mechanical apparatus), the apparatus, valves, or systems shall be secured in a passive condition with the appropriate vents, pins, and locks.

Pressurized or vacuum systems shall be vented to relieve differential pressure completely.

Vent valves shall be tagged open during the course of the work.

Where dangerous gas or fluid systems are involved, or in areas where the environment may be oxygen deficient, system or areas shall be purged, ventilated, or otherwise made safe prior to entry.

3.3.1 Tag Placement

Lockout/tagout tags shall be completed in accordance with the regulations printed on the back thereof and attached to any device which, if operated, could cause an unsafe condition to exist.

If more than one group is to work on any circuit or equipment, the employee in charge of each group shall have a separate set of lockout/tagout tags completed and properly attached.

When it is required that certain equipment be tagged, the Government will review the characteristics of the various systems involved that affect the safety of the operations and the work to be done; take the necessary actions, including voltage and pressure checks, grounding, and venting, to make the system and equipment safe to work on; and apply such lockout/tagout tags to those switches, valves, vents, or other mechanical devices needed to preserve the safety provided. This operation is referred to as "Providing Safety Clearance."

3.3.2 Tag Removal

When any individual or group has completed its part of the work and is clear of the circuits or equipment, the supervisor, project leader, or individual for whom the equipment was tagged shall turn in his signed lockout/tagout tag stub to the Contracting Officer. That group's or individual's lockout/tagout tags on equipment may then be removed on authorization by the Contracting Officer.

3.4 FALL HAZARD PROTECTION AND PREVENTION PROGRAM

Establish a fall protection and prevention program, for the protection of all employees exposed to fall hazards. Within the program 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 evacuation procedures.

3.4.1 Training

Institute a fall protection training program. As part of the Fall Hazard Protection and Prevention Program, provide training for each employee who might be exposed to fall hazards. Provide training by a competent person for fall protection in accordance with USACE EM 385-1-1, Section 21.B.

3.4.2 Fall Protection Equipment and Systems

Enforce use of the fall protection equipment and systems designated for each specific work activity in the Fall Protection and Prevention Plan and/or AHA at all times when an employee is exposed to a fall hazard. Protect employees from fall hazards as specified in EM 385-1-1, Section 21. 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 21.N through 21.N.04. 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 are 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, USACE EM 385-1-1 and ASSE/SAFE A10.32.

3.4.2.1 Personal Fall Arrest Equipment

Personal fall arrest equipment, systems, subsystems, and components shall meet ASSE/SAFE Z359.1. Only a full-body harness with a shock-absorbing lanyard or self-retracting lanyard is an acceptable personal fall arrest body support 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 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.

3.4.3 Fall Protection for Roofing Work

Implement fall protection controls based on the type of roof being constructed and work being performed. Evaluate the roof area to be accessed for its structural integrity including weight-bearing capabilities for the projected loading.

a. Low Sloped Roofs:

(1) For work within 6 feet of an edge, on low-slope roofs, Protect personnel 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 6 feet from an edge, erect and install warning lines in accordance with 29 CFR 1926.500 and USACE EM 385-1-1.

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

3.4.4 Existing Anchorage

Certified (or re-certified) by a qualified person for fall protection existing anchorages, to be used for attachment of personal fall arrest equipment in accordance with ASSE/SAFE Z359.1. Exiting horizontal lifeline anchorages must be certified (or re-certified) by a registered professional engineer with experience in designing horizontal lifeline systems.

3.4.5 Horizontal Lifelines

Design, install, certify and use under the supervision of a qualified person horizontal lifelines for fall protection as part of a complete fall arrest system which maintains a safety factor of 2 (29 CFR 1926.500).

3.4.6 Guardrails and Safety Nets

Design, install and use guardrails and safety nets in accordance with EM 385-1-1 and 29 CFR 1926 Subpart M.

3.4.7 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. Prepare a Rescue and Evacuation Plan 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. Include the Rescue and Evacuation Plan within 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).

3.5 SCAFFOLDING

Provide employees 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 scaffold platforms greater than 20 feet maximum in height by use of a scaffold stair system. Do not use vertical ladders commonly provided by scaffold system manufacturers for accessing scaffold platforms greater than 20 feet maximum in height. The use of an adequate gate is required. 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. Give special care 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. Place work platforms 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.

3.6 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. Equip cranes and derricks as specified in EM 385-1-1, section 16.

b. 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. Comply with the crane manufacturer's specifications and limitations for erection and operation of cranes and hoists used in support of the work. Perform erection under the supervision of a designated person (as defined in ASME B30.5). Perform all testing in accordance with the manufacturer's recommended procedures.

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

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

g. Do not crane suspended personnel work platforms (baskets) unless the Contractor proves that using any other access to the work location would provide a greater hazard to the workers or is impossible. Do not lift personnel with a line hoist or friction crane.

h. Inspect, maintain, and recharge portable fire extinguishers as specified in NFPA 10, Standard for Portable Fire Extinguishers.

i. All employees must keep clear of loads about to be lifted and of suspended loads.

j. Use cribbing when performing lifts on outriggers.

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

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

m. 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.

n. 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.

o. Certify that all crane operators have been trained in proper use of all safety devices (e.g. anti-two block devices).

p. Take steps to ensure that wind speed does not contribute to loss of control of the load during lifting operations. Prior to conducting lifting operations set a maximum wind speed at which a crane can be safely operated based on the equipment being used, the load being lifted, experience of operators and riggers, and hazards on the work site. This maximum wind speed determination shall be included as part

of the activity hazard analysis plan for that operation.

3.6.3 Equipment and Mechanized Equipment

a. Proof of qualifications for operator 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. Incorporate such additional safety precautions or requirements into the AHAs.

3.6.4 USE OF EXPLOSIVES

Explosives shall not be used or brought to the project site without prior written approval from the Contracting Officer. Such approval shall not relieve the Contractor of responsibility for injury to persons or for damage to property due to blasting operations.

Storage of explosives, when permitted on Government property, shall be only where directed and in approved storage facilities. These facilities shall be kept locked at all times except for inspection, delivery, and withdrawal of explosives.

Explosive work shall be performed in accordance with NASA NSS 1740.12. This document is available at:

http://www.hq.nasa.gov/office/codeq/doctree/871912.htm

3.7 EXCAVATIONS

Perform soil classification by a competent person in accordance with 29 CFR 1926.

3.7.1 Utility Locations

Prior to digging, the appropriate digging permit must be obtained. All underground utilities in the work area must be positively identified by a private utility locating service 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 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 expose the utility by hand digging every 100 feet if parallel within 5 feet of the excavation.

3.7.3 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 must have the registered professional engineer stamp, specifications, and tabulated data. Extreme care must be used when excavating near direct burial electric underground cables.

3.7.4 Trenching Machinery

Operate trenching machines with digging chain drives only when the spotters/laborers are in plain view of the operator. Provide operator and spotters/laborers 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. Keep documentation of the training on file at the project site.

3.8 UTILITIES WITHIN CONCRETE SLABS

Utilities located within concrete slabs or pier structures, bridges, and the like, are extremely difficult to identify due to the reinforcing steel used in the construction of these structures. Whenever contract work involves concrete chipping, saw cutting, or core drilling, the existing utility location must be coordinated with station utility departments in addition to a private locating service. 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.

3.9 ELECTRICAL

3.9.1 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 will 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 also be required, depending on the specific job and as delineated in the Contractor's AHA.

3.9.2 Portable Extension Cords

Size portable extension cords in accordance with manufacturer ratings for the tool to be powered and protected from damage. Immediately removed from

service all damaged extension cords. Portable extension cords shall meet the requirements of NFPA 70E and OSHA electrical standards.

3.10 WORK IN CONFINED SPACES

Comply with the requirements in Section 34 of USACE EM 385-1-1, OSHA 29 CFR 1910.146 and OSHA 29 CFR 1926.21(b)(6). 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 34 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. Sewer wet wells require continuous atmosphere monitoring with audible alarm for toxic gas detection.

-- 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

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SECTION 01 45 02

NAVFAC QUALITY CONTROL
11/08

PART 1 GENERAL

1.1 REFERENCES

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

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

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

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 008	(2007) IAQ Guidance for Occupied Buildings Under Construction

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2008) Safety and Health Requirements Manual

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED Reference Guide	(2005) LEED-NC Reference Guide for New Construction

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES

SD-01 Preconstruction Submittals

Construction Quality Control (QC) Plan; G

Submit a Construction QC Plan prior to start of construction.

Indoor Air Quality (IAQ) Management Plan; G

Basis of Design

SD-07 Certificates

SD-10 Operation and Maintenance Data

Training Plan

For each training session submit dates, start and finish times, and locations; outline of the information to be presented; names and qualifications of the presenters; and list of texts and other materials required to support training.

SD-11 Closeout Submittals

Training Outline; G

Training Video Recording; G

Validation of Training Completion;G1.3 INFORMATION FOR THE CONTRACTING OFFICER

Prior to commencing work on construction, the Contractor can obtain a single copy set of the current report forms from the Contracting Officer. The report forms will consist of the Contractor Production Report, Contractor Production Report (Continuation Sheet), Contractor Quality Control (CQC) Report, (CQC) Report (Continuation Sheet), Preparatory Phase Checklist, Initial Phase Checklist, Rework Items List, and Testing Plan and Log.

Deliver the following to the Contracting Officer during Construction:

a. CQC Report: Mail or hand-carry the original (wet signatures) and one copy by 10:00 AM the next working day after each day that work is performed and for every seven consecutive calendar days of no-work.

b. Contractor Production Report: Submit the report electronically by 10:00 AM the next working day after each day that work is performed and for every seven consecutive calendar days of no-work.

c. Preparatory Phase Checklist: Submit the report electronically in the same manner as the CQC Report for each Preparatory Phase held.

d. Initial Phase Checklist: Submit the report electronically in the same manner as the CQC Report for each Initial Phase held.

e. QC Specialist Reports: Submit the report electronically by 10:00 AM the next working day after each day that work is performed.

f. Field Test Reports: Within two working days after the test is performed, submit the report as an electronic attachment to the CQC Report.

g. Monthly Summary Report of Tests: Submit the report as an electronic attachment to the CQC Report at the end of each month.

h. Testing Plan and Log: Submit the report as an electronic attachment to the CQC Report, at the end of each month. A copy of the final Testing Plan and Log shall be provided to the OMSI preparer for inclusion into the OMSI documentation.

i. Rework Items List: Submit lists containing new entries daily, in

the same manner as the CQC Report.

j. CQC Meeting Minutes: Within two working days after the meeting is held, submit the report as an electronic attachment to the CQC Report.

k. 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. This QC program is a key element in meeting the objectives of NAVFAC Commissioning. The QC program consists of a QC Organization, QC Plan, QC Plan Meeting(s), a Coordination and Mutual Understanding Meeting, QC meetings, three phases of control, submittal review and approval, testing, completion inspections, and 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 must cover on-site and off-site work and be keyed to the work sequence. No construction work or testing may be performed unless the QC Manager is on the work site. The QC Manager must report to an officer of the firm and not be subordinate to the Project Superintendent or the Project Manager. The QC Manager, Project Superintendent and Project Manager must work together effectively. Although the QC Manager is the primary individual responsible for quality control, all individuals will be held responsible for the quality of work on the job.

1.4.1 Commissioning

Commissioning (Cx) is a systematic process of ensuring that all building systems meet the requirements and perform interactively according to the Contract. The QC Program is a key to this process by coordinating, verifying and documenting measures to achieve the following objectives:

a. Verify and document that the applicable equipment and systems are installed in accordance with the design intent as expressed through the Contract and according to the manufacturer's recommendations and industry accepted minimum standards.

b. Verify and document that equipment and systems receive complete operational checkout by the installing contractors.

c. Verify and document proper performance of equipment and systems.

d. Verify that Operation and Maintenance (O&M) documentation is complete.

e. Verify and document that the Government's operating personnel are adequately trained.

1.4.2 Acceptance of the Construction Quality Control (QC) Plan

Acceptance 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, including removal of personnel, 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 the submitted qualifications. All QC organization personnel are

subject to acceptance by the Contracting Officer. The Contracting Officer may require the removal of any individual for non-compliance with quality requirements specified in the Contract.

1.4.3 Preliminary Construction Work Authorized Prior to Acceptance

The only construction work that is authorized to proceed prior to the acceptance of the QC Plan is mobilization of storage and office trailers, temporary utilities, and surveying.

1.4.4 Notification of Changes

Notify the Contracting Officer, in writing, of any proposed changes in the QC Plan or changes to the QC organization personnel, a minimum of 10 work days prior to a proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

1.5 QC ORGANIZATION

1.5.1 QC Manager

1.5.1.1 Duties

Provide a QC Manager at the work site to implement and manage the QC program. In addition to implementing and managing the QC program, the QC Manager may perform the duties of Project Superintendent. The only duties and responsibilities of the QC Manager are to manage and implement the QC program on this Contract. The QC Manager is required to attend the partnering meetings, QC Plan Meetings, Coordination and Mutual Understanding Meeting, conduct the QC meetings, perform the three phases of control except for those phases of control designated to be performed by QC Specialists, perform submittal review and approval, ensure testing is performed and provide 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, testing laboratory personnel and any other inspection and testing personnel required by this Contract. The QC Manager is the manager of all QC activities.

1.5.1.2 Qualifications

An individual with a minimum of 10 years combined experience in the following positions: Project Superintendent, QC Manager, Project Manager, Project Engineer or Construction Manager on similar size and type construction contracts which included the major trades that are part of this Contract. The individual must have at least two years experience as a QC Manager. The individual must be familiar with the requirements of EM 385-1-1, and have experience in the areas of hazard identification, safety compliance, and sustainability.

1.5.2 Construction Quality Management Training

In addition to the above experience and education requirements, the QC Manager must have completed the course entitled "Construction Quality Management (CQM) for Contractors." If the QC Manager does not have a current certification, they must obtain the CQM for Contractors course certification within 90 days of award. This course is periodically offered by the Naval Facilities Engineering Command and the Army Corps of Engineers. Contact the Contracting Officer for information on the next

scheduled class.

1.5.3 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 must be the same as for the QC Manager.

1.5.4 QC Specialists Duties and Qualifications

Provide a separate QC Specialist at the work site for each of the areas of responsibilities, specified in Part 3, Execution, of the technical sections, who shall assist and report to the QC Manager and who may perform production related duties but must be allowed sufficient time to perform their assigned quality control duties. QC Specialists are required to attend the QC meetings and be physically present at the construction site to perform the three phases of control and prepare documentation for each definable feature of work in their area of responsibility at the frequency specified below.

Qualification/Experience in Area of Responsibility	Area of Responsibility	Frequency
Coating Inspector - SSPC QP5, Level III	Surface preparation, testing, application, inspection, repair	Full time during coating work
Coating Manufacturers' Representative - Five Years	Coating application	Pre-application
Commissioning/Flushing Specialist - 10 Years	Coordination of major system components and controls, system tuning, flushing, commissioning, start-up, and acceptance testing	Full time during commissioning as needed during construction
Control Valve Manufacturers' Representative - Five Years	Control valve installation and start-up	Full time during start-up; as needed during construction

1.6 QUALITY CONTROL (QC) PLAN

1.6.1 Construction Quality Control (QC) Plan

1.6.1.1 Requirements

Provide, for acceptance by the Contracting Officer, a Construction QC Plan submitted in a three-ring binder that includes a table of contents, with major sections identified with tabs, with pages numbered sequentially, and that documents the proposed methods and responsibilities for accomplishing commissioning activities during the construction of the project:

a. QC ORGANIZATION: A chart showing the QC organizational structure.

b. NAMES AND QUALIFICATIONS: Names and qualifications, in resume format, for each person in the QC organization. Include the CQM for Contractors course certifications for the QC Manager and Alternate QC Manager as required by the paragraphs entitled "Construction Quality Management Training" and "Alternate QC Manager Duties and Qualifications".

c. DUTIES, RESPONSIBILITY AND AUTHORITY OF QC PERSONNEL: Duties, responsibilities, and authorities of each person in the QC organization.

d. OUTSIDE ORGANIZATIONS: 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.

e. APPOINTMENT LETTERS: Letters signed by an officer of the firm appointing the QC Manager and Alternate QC Manager and stating that they are responsible for implementing and managing the QC program as described in this Contract. Include in this letter the responsibility of the QC Manager and Alternate QC Manager to implement and manage the three phases of control, and their authority to stop work which is not in compliance with the Contract. Letters of direction are to be issued by the QC Manager to all other QC Specialists outlining their duties, authorities, and responsibilities. Include copies of the letters in the QC Plan.

f. SUBMITTAL PROCEDURES AND INITIAL SUBMITTAL REGISTER: Procedures for reviewing, approving, and managing submittals. Provide the name(s) of the person(s) in the QC organization authorized to review and certify submittals prior to approval. Provide the initial submittal of the Submittal Register as specified in Section 01 33 00 SUBMITTAL PROCEDURES.

g. TESTING LABORATORY INFORMATION: Testing laboratory information required by the paragraphs entitled "Accreditation Requirements", as applicable.

h. TESTING PLAN AND LOG: 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. Use Government forms to log and track tests.

i. PROCEDURES TO COMPLETE REWORK ITEMS: Procedures to identify, record, track, and complete rework items. Use Government forms to record and track rework items.

j. DOCUMENTATION PROCEDURES: Use Government form.

k. LIST OF DEFINABLE FEATURES: A Definable Feature of Work (DFOW) is a task that is separate and distinct from other tasks and has control requirements and work crews unique to that task. A DFOW is identified by different trades or disciplines and is an item or activity on the construction schedule. Include in the list of DFOWs, but not be limited to, all critical path activities on the NAS. Include all activities for which this specification requires QC Specialists or specialty inspection personnel. Provide

separate DFOWs in the Network Analysis Schedule for each design development stage and submittal package.

l. PROCEDURES FOR PERFORMING THE THREE PHASES OF CONTROL: Identify procedures used to ensure the three phases of control to manage the quality on this project. For each DFOW, a Preparatory and Initial phase checklist will be filled out during the Preparatory and Initial phase meetings. Conduct the Preparatory and Initial Phases and meetings with a view towards obtaining quality construction by planning ahead and identifying potential problems for each DFOW.

m. PERSONNEL MATRIX: A personnel matrix showing for each section of the specification who will review and approve submittals, who will perform and document the three phases of control, and who will perform and document the testing.

n. PROCEDURES FOR COMPLETION INSPECTION: Procedures for identifying and documenting the completion inspection process. Include in these procedures the responsible party for punch out inspection, pre-final inspection, and final acceptance inspection.

o. TRAINING PROCEDURES AND TRAINING LOG: Procedures for coordinating and documenting the training of personnel required by the Contract. Include a sample record of training for reporting what systems were included in the training, who provided the training, when and where the training was performed and who attended the training.

p. ORGANIZATION AND PERSONNEL CERTIFICATIONS LOG: Procedures for coordinating, tracking and documenting all certifications on subcontractors, testing laboratories, suppliers, personnel, etc. QC Manager will ensure that certifications are current, appropriate for the work being performed, and will not lapse during any period of the contract that the work is being performed.

1.7 QC PLAN MEETINGS

At the descrection of the E
FEAD/ROICC and prior to submission of the QC Plan, the QC Manager will 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 and to agree on the Contractor's list of DFOWs.

1.8 COORDINATION AND MUTUAL UNDERSTANDING MEETING

After submission of the QC Plan, and prior to the start of construction, the QC Manager will meet with the Contracting Officer to present the QC program required by this Contract. When a new QC Manager is appointed, the coordination and mutual understanding meeting shall be repeated.

1.8.1 Purpose

The purpose of this meeting is to develop a mutual understanding of the QC details, including documentation, administration for on-site and off-site work, design intent, Cx, environmental requirements and procedures, coordination of activities to be performed, and the coordination of the Contractor's management, production, and QC personnel. At the meeting, the

Contractor will be required to explain in detail how three phases of control will be implemented for each DFOW, as well as how each DFOW will be affected by each management plan or requirement as listed below:

a. Waste Management Plan.

b. IAQ Management Plan.

c. Procedures for noise and acoustics management.

d. Environmental Protection Plan.

e. Environmental regulatory requirements.

f. Cx Plan.

1.8.2 Coordination of Activities

Coordinate activities included in various sections to assure efficient and orderly installation of each component. Coordinate operations included under different sections that are dependent on each other for proper installation and operation. Schedule construction operations with consideration for indoor air quality as specified in the IAQ Management Plan. Coordinate prefunctional tests and startup testing with Cx.

1.8.3 Attendees

As a minimum, the Contractor's personnel required to attend include an officer of the firm, the Project Manager, Project Superintendent, QC Manager, Alternate QC Manager, QC Specialists, CA, Environmental Manager, and subcontractor representatives. Each subcontractor who will be assigned QC responsibilities shall have a principal of the firm at the meeting. Minutes of the meeting will be prepared by the QC Manager and signed by the Contractor and the Contracting Officer. Provide a copy of the signed minutes to all attendees and shall be included in the QC Plan.

1.9 QC MEETINGS

After the start of construction, conduct QC meetings once every two weeks by the QC Manager at the work site with the Project Superintendent, QC Specialists, the CA, and the foremen who are performing the work of the DFOWs. The QC Manager is to prepare the minutes of the meeting and provide a copy to the Contracting Officer within two working days after the meeting. The Contracting Officer may attend these meetings. As a minimum, accomplish the following at each meeting:

a. Review the minutes of the previous meeting.

b. Review the schedule and the status of work and rework.

c. Review the status of submittals.

d. Review the work to be accomplished in the next two weeks and documentation required.

e. Resolve QC and production problems (RFI, etc.).

f. Address items that may require revising the QC Plan.

g. Review Accident Prevention Plan (APP).

h. Review environmental requirements and procedures.

i. Review Waste Management Plan.

j. Review IAQ Management Plan.

k. Review Environmental Management Plan.

l. Review the status of training completion.

m. Review Cx Plan and progress.

1.10 DESIGN REVIEW AND DOCUMENTATION

1.10.1 Basis of Design

Review the basis of design received from the Contracting Officer.

1.10.2 Contract Document Review

Review the Contract documents to verify that Cx is adequately specified, and that each commissioned system is likely to meet the design intent relative to functionality, energy performance, water performance, maintainability, sustainability, system cost, indoor environmental quality, and local environmental impacts.

1.11 THREE PHASES OF CONTROL

Adequately cover both on-site and off-site work with the Three Phases of Control and include the following for each DFOW.

1.11.1 Preparatory Phase

Notify the Contracting Officer at least two work days in advance of each preparatory phase meeting. The meeting will be conducted by the QC Manager and attended by the QC Specialists, the Project Superintendent, the CA, and the foreman responsible for the DFOW. When the DFOW will be accomplished by a subcontractor, that subcontractor's foreman shall attend the preparatory phase meeting. Document the results of the preparatory phase actions in the Preparatory Phase Checklist. Perform the following prior to beginning work on each DFOW:

a. Review each paragraph of the applicable specification sections.

b. Review the Contract drawings.

c. Verify that field measurements are as indicated on construction and/or shop drawings before confirming product orders, in order to minimize waste due to excessive materials.

d. 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.

e. Review the testing plan and ensure that provisions have been made to provide the required QC testing.

f. Examine the work area to ensure that the required preliminary work has been completed.

g. Coordinate the schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

h. Arrange for the return of shipping/packaging materials, such as wood pallets, where economically feasible.

i. 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.

j. Discuss specific controls used and construction methods, construction tolerances, workmanship standards, and the approach that will be used to provide quality construction by planning ahead and identifying potential problems for each DFOW.

k. Review the APP and appropriate Activity Hazard Analysis (AHA) to ensure that applicable safety requirements are met, and that required Material Safety Data Sheets (MSDS) are submitted.

l. Review the Cx Plan and ensure all preliminary work items have been completed and documented.

1.11.2 Initial Phase

Notify the Contracting Officer at least two work days in advance of each initial phase. When construction crews are ready to start work on a DFOW, conduct the initial phase with the QC Specialists, the Project Superintendent, and the foreman responsible for that DFOW. Observe the initial segment of the DFOW to ensure that the work complies with Contract requirements. Document the results of the initial phase in the Initial Phase Checklist. 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 DFOW:

a. Establish the quality of workmanship required.

b. Resolve conflicts.

c. Ensure that testing is performed by the approved laboratory.

d. Check work procedures for compliance with the APP and the appropriate AHA to ensure that applicable safety requirements are met.

e. Review the Cx Plan and ensure all preparatory work items have been completed and documented.

1.11.3 Follow-Up Phase

Perform the following for on-going work daily, or more frequently as necessary, until the completion of each DFOW and document in the daily CQC 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 the approved laboratory.

d. Ensure that rework items are being corrected.

e. Assure manufacturers representatives have performed necessary inspections if required and perform safety inspections.

f. Review the Cx Plan and ensure all work items, testing, and documentation has been completed.

1.11.4 Additional Preparatory and Initial Phases

Conduct additional preparatory and initial phases on the same DFOW if the quality of on-going work is unacceptable, if there are changes in the applicable QC organization, if there are changes in the on-site production supervision or work crew, if work on a DFOW is resumed after substantial period of inactivity, or if other problems develop.

1.11.5 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.

1.12 SUBMITTAL REVIEW AND APPROVAL

Procedures for submission, review and approval of submittals are described in Section 01 33 00 SUBMITTAL PROCEDURES.

1.13 TESTING

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

1.13.1 Accreditation Requirements

Construction materials testing laboratories must be accredited by a laboratory accreditation authority and will be required to submit a copy of the Certificate of Accreditation and Scope of Accreditation. The laboratory's scope of accreditation must include the appropriate ASTM standards (E 329, C 1077, D 3666, D 3740, A 880, E 543) listed in the technical sections of the specifications. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA. The policy applies to the specific laboratory performing the actual testing, not just the Corporate Office.

1.13.2 Laboratory Accreditation Authorities

Laboratory Accreditation Authorities include the National Voluntary Laboratory Accreditation Program (NVLAP) administered by the National Institute of Standards and Technology at http://ts.nist.gov/ts/htdocs/210/214/214.htm , the American Association of State Highway and Transportation Officials (AASHTO) program at http://www.transportation.org/aashto/home.nsf/frontpage , International Accreditation Services, Inc. (IAS) at http://www.iasonline.org, U. S. Army Corps of Engineers Materials Testing Center (MTC)at http://www.wes.army.mil/SL/MTC/, the American Association for Laboratory Accreditation (A2LA) program at http://www.a2la.org/, the Washington

Association of Building Officials (WABO) at http://www.wabo.org/ (Approval authority for WABO is limited to projects within Washington State), and the Washington Area Council of Engineering Laboratories (WACEL) at http://www.wacel.org/labaccred.html (Approval authority by WACEL is limited to projects within Facilities Engineering Command (FEC) Washington geographical area).

1.13.3 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.

1.13.4 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. If the item fails to conform, notify the Contracting Officer immediately. 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 must 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, per the paragraph entitled "INFORMATION FOR THE CONTRACTING OFFICER".

1.13.5 Test Reports and Monthly Summary Report of Tests

Furnish the signed reports, certifications, and a summary report of field tests at the end of each month to the Contracting Officer. Attach a copy of the summary report to the last daily Contractor Quality Control Report of each month. Provide a copy of the signed test reports and certifications to the OMSI preparer for inclusion into the OMSI documentation.

1.14 QC CERTIFICATIONS

1.14.1 CQC Report Certification

Contain the following statement within the CQC Report: "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."

1.14.2 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, coordinated and attesting that the work for which payment is requested, including stored material, is in compliance with Contract requirements.

1.14.3 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." Provide a copy of this final QC Certification for completion to the OMSI preparer for inclusion into the OMSI documentation.

1.15 COMPLETION INSPECTIONS

1.15.1 Punch-Out Inspection

Near the completion of all work or any increment thereof, established by a completion time stated in the Contract Clause entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the QC Manager and the CA must conduct an inspection of the work and develop a "punch list" of items which do not conform to the approved drawings, specifications and Contract. Include in the punch list any remaining items on the "Rework Items List", which were not corrected prior to the Punch-Out Inspection. Include within the punch list the estimated date by which the deficiencies will be corrected. Provide a copy of the punch list to the Contracting Officer. The QC Manager, or staff, must make follow-on inspections to ascertain that all deficiencies have been corrected. Once this is accomplished, notify the Government that the facility is ready for the Government "Pre-Final Inspection".

1.15.2 Pre-Final Inspection

The Government and QCM will perform this inspection to verify that the facility is complete and ready to be occupied. A Government "Pre-Final Punch List" will be documented by the CQM as a result of this inspection. The QC Manager will ensure that all items on this list are corrected prior to notifying the Government that a "Final" inspection with the Client can be scheduled. Any items noted on the "Pre-Final" inspection must be corrected in a timely manner and be accomplished before the contract completion date for the work,or any particular increment thereof, if the project is divided into increments by separate completion dates.

1.15.3 Final Acceptance Inspection

Notify the Contracting Officer at least 14 calendar days prior to the date a final acceptance inspection can be held. State within the notice that all items previously identified on the pre-final punch list will be corrected and acceptable, along with any other unfinished Contract work, by the date of the final acceptance inspection. The Contractor must be represented by the QC Manager, the Project Superintendent, the CA, and others deemed necessary. Attendees for the Government will include the Contracting Officer, other FEAD/ROICC personnel, and personnel representing the Client. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the Contract Clause entitled "Inspection of Construction."

1.16 TRAINING

Prior to acceptance of the facility by the Contracting Officer for beneficial occupancy, the Contractor must provide a comprehensive project-specific Government personnel training (up to eight hours in length) program for the systems and equipment of the facility specified in the technical specifications of this Contract. The trainees must include the Contracting Officer, facilities managers and maintenance staff. The Contractor is responsible for coordinating, scheduling, and ensuring that training is completed. Instructors shall be well-versed in the particular

systems that they are presenting. Provide instruction time on site at a location approved by the Contracting Officer.

1.16.1 Training Plan

Submit a written training plan to the Contracting Officer and CA for review and approval prior to training. Coordinated and scheduled the training with the Contracting Officer and CA. Include within the plan the following elements:

a. Equipment included in training.

b. Intended audience.

c. Location of training.

d. Objectives.

e. Subjects covered including description.

f. Duration of training on each subject.

g. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.).

h. Instructor and instructor qualifications for each subject.

1.16.2 Content

Stress and enhance the importance of system interactions, troubleshooting, and long-term preventative maintenance and operation. The core of this training will be based on manufacturer's recommendations and the operation and maintenance information provided as a part of this Contract. A review of environmentally-related aspects of the Operation and Maintenance Manuals shall be included. Include the following for each commissioned system:

a. Design intent.

b. Use of O&M Manuals.

c. Review of control drawings and schematics.

d. Start-up, normal operation, shutdown, unoccupied operation, seasonal changeover, manual operation, controls set-up and programming, troubleshooting, and alarms.

e. Interactions with other systems.

f. Adjustments and optimizing methods for energy conservation.

g. Relevant health and safety issues.

h. Special maintenance and replacement sources.

i. Tenant interaction issues.

j. Discussion of how the feature or system is environmentally responsive.

1.16.3 Training Outline

The CA is responsible for overseeing and approving the content and adequacy of the training. The CA must interview the Government facilities manager and Contracting Officer to determine the special needs and areas where training will be most valuable. The Contracting Officer and CA must decide how rigorous the training should be for each piece of equipment. The CA is to communicate the results to the Contractor, who will provide each trainee in the course a written course outline, listing the major and minor topics to be discussed by the instructor on each day of the course.

1.16.4 Video Recording

Provide to the Contracting Officer two copies of the training course in DVD video recording format, and add one copy to the O&M manual data. Capture within the recording, in video and audio, all instructors' training presentations including question and answer periods with the trainees. Videotaping of the training sessions shall be provided by the Contractor.

1.16.5 Unresolved Questions From Trainees

If, at the end of the training course, there are questions from trainees that remain unresolved, the instructor will send the answers, in writing, to the Contracting Officer for transmittal to the trainees, and the training video should be modified to include the appropriate clarifications.

1.16.6 Validation of Training Completion

Develop criteria for determining that the training was satisfactorily completed, including attending some of the training, and upon fulfillment of the criteria, validate training completion. The CA will then recommend approval of the training to the Contracting Officer using a standard form and the CA and Contracting Officer will sign the approval form. Provide completed and signed validation of training forms as provided in the QC Plan for all training sessions accomplished. Provide two copies of the signed training validation forms to the Contracting Officer and one copy to the OMSI preparer for inclusion into the OMSI documentation.

1.17 DOCUMENTATION

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

1.17.1 Construction Documentation

Reports are required for each day that work is performed and the Contractor Quality Control Report prepared for the same day. Maintain current and complete records of on-site and off-site QC program operations and activities. The forms identified under the paragraph "INFORMATION FOR THE CONTRACTING OFFICER" will be used. Reports are required for each day work is performed. Account for each calendar day throughout the life of the Contract. Every space on the forms must be filled in. Use N/A if nothing can be reported in one of the spaces. The Project Superintendent and the QC Manager must prepare and sign the Contractor Production and CQC Reports, respectively. The reporting of work must be identified by terminology consistent with the construction schedule. In the "remarks" sections of the reports, enter 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, quality control problem areas, deviations from the QC Plan, construction deficiencies encountered, meetings held. For each entry in the report(s), identify the Schedule Activity No. that is associated with the entered remark.

1.17.2 Quality Control Validation

Establish and maintain the following in a series of three ring binders. Binders shall be divided and tabbed as shown below. These binders must be readily available to the Contracting Officer during all business hours.

a. All completed Preparatory and Initial Phase Checklists, arranged by specification section.

b. All milestone inspections, arranged by Activity Number.

c. An up-to-date copy of the Testing Plan and Log with supporting field test reports, arranged by specification section.

d. Copies of all contract modifications, arranged in numerical order. Also include documentation that modified work was accomplished.

e. An up-to-date copy of the Rework Items List.

f. Maintain up-to-date copies of all punch lists issued by the QC staff to the Contractor and Sub-Contractors and all punch lists issued by the Government.

g. Commissioning documentation including Cx checklists, schedules, tests, and reports.

1.17.3 Reports from the QC Specialist(s)

Reports are required for each day that work is performed in their area of responsibility. QC Specialist reports shall include the same documentation requirements as the CQC Report for their area of responsibility. QC Specialist reports are to be prepared, signed and dated by the QC Specialists and shall be attached to the CQC Report prepared for the same day.

1.17.4 Testing Plan and Log

As tests are performed, the QC Manager will record on the "Testing Plan and Log" the date the test was performed and the date the test results were forwarded to the Contracting Officer. Attach a copy of the updated "Testing Plan and Log" to the last daily CQC Report of each month, per the paragraph "INFORMATION FOR THE CONTRACTING OFFICER". Provide a copy of the final "Testing Plan and Log" to the OMSI preparer for inclusion into the OMSI documentation.

1.17.5 Rework Items List

The QC Manager must 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, the date the item will be corrected by, 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. The Contractor is responsible for including those items identified by the Contracting Officer.

1.17.6 As-Built Drawings

The QC Manager is required to ensure the as-built drawings, required by Section 01 78 00 CLOSEOUT SUBMITTALS are kept current on a daily basis and marked to show deviations which have been made from the Contract drawings. Ensure each deviation has been identified with the appropriate modifying documentation (e.g. PC No., Modification No., Request for Information No., etc.). The QC Manager or QC Specialist assigned to an area of responsibility must initial each revision. Upon completion of work, the QC Manager will furnish a certificate attesting to the accuracy of the as-built drawings prior to submission to the Contracting Officer.

1.18 NOTIFICATION ON NON-COMPLIANCE

The Contracting Officer will notify the Contractor of any detected non-compliance with the Contract. Take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders will be made the subject of claim for extension of time for excess costs or damages by the Contractor.

1.19 CONSTRUCTION INDOOR AIR QUALITY (IAQ) MANAGEMENT PLAN

Submit an IAQ Management Plan within 15 days after notice to proceed and not less than 10 days before the preconstruction meeting. Revise and resubmit Plan as required by the Contracting Officer. Make copies of the final plan available to all workers on site. Include provisions in the Plan to meet the requirements specified below and to ensure safe, healthy air for construction workers and building occupants.

1.19.1 Requirements During Construction

1.19.1.1 Control Measures

Meet or exceed the requirements of SMACNA 008, Chapter 3, to help minimize contamination of the building from construction activities. The five requirements of this manual which must be adhered to are described below:

a. Source control: Use low emitting paints and other finishes, sealants, adhesives, and other materials as specified. When available, cleaning products shall have a low VOC content and be non-toxic to minimize building contamination. Utilize cleaning techniques that minimize dust generation. Cycle equipment off when not needed. Prohibit idling motor vehicles where emissions could be drawn into building. Designate receiving/storage areas for incoming material that minimize IAQ impacts.

b. Pathway interruption: When pollutants are generated use strategies such as 100 percent outside air ventilation or erection of physical barriers between work and non-work areas to prevent contamination.

c. Housekeeping: Clean frequently to remove construction dust and

debris. Promptly clean up spills. Remove accumulated water and keep work areas dry to discourage the growth of mold and bacteria. Take extra measures when hazardous materials are involved.

f. Scheduling: Control the sequence of construction to minimize the absorption of VOCs by other building materials.

1.19.1.2 Moisture Contamination

a. Remove accumulated water and keep work dry.

b. Use dehumidification to remove moist, humid air from a work area.

c. Do not use combustion heaters or generators inside the building.

d. Protect porous materials from exposure to moisture.

e. Remove and replace items which remain damp for more than a few hours.

1.19.2 Requirements after Construction

After construction ends and prior to occupancy, conduct a building flush-out or test the indoor air contaminant levels. Flush-out must be a minimum two-weeks with MERV-13 filtration media as determined by ASHRAE 52.2 at 100 percent outside air, or in accordance with LEED Reference Guide. Air contamination testing must be consistent with EPA's current Compendium of Methods for the Determination of Air Pollutants in Indoor Air, and with the LEED Reference Guide. After building flush-out or testing and prior to occupancy, replace filtration media. Filtration media must have a MERV of 13 as determined by ASHRAE 52.2.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 PREPARATION

Designate receiving/storage areas for incoming material to be delivered according to installation schedule and to be placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. Store and handle materials in a manner as to prevent loss from weather and other damage. Keep materials, products, and accessories covered and off the ground, and store in a dry, secure area. Prevent contact with material that may cause corrosion, discoloration, or staining. Protect all materials and installations from damage by the activities of other trades.

-- End of Section --

CAPITAL IMPROVEMENTS

ENGINEERING & CONSTRUCTION Bulletin

Issue No. 2008-03 **25 September 2008** **Type: Policy**

Subject: **Acceptance Testing of Critical Systems**

Reference: (a) ECB 2007-01 Proper use of Military Construction Funds, 13 October 2006

Enclosure: (1) Roles and Responsibilities (R&R) Matrices

Cancelled: NAVFAC Instruction 12271.1: NAVFAC Total Building Commissioning Policy, dated 23 October 2003

1. Purpose.

To focus NAVFAC's technical oversight of acceptance testing during construction on five critical areas (electrical, fire and life safety, mechanical, roofing, and underwater structures) to ensure the constructed facility performs as intended and meets the needs of the supported commands; to define the use of Post Construction Award Services (PCAS) funding as it applies to the Capital Improvements Business Line (CIBL) in-house acceptance testing and technical support efforts.

2. Background.

NAVFAC has identified five critical areas that have consistently caused problems in facilities delivered to its supported commands. These areas are electrical, fire and life safety, mechanical, roofing systems, and underwater structures. These five critical areas were identified as requiring ongoing, thorough construction technical oversight in support of acceptance testing. A NAVFAC Team of technical experts determined how to apply responsible oversight to these five critical areas using one-half of PCAS funds. Each Team compiled all systems / sub-systems and developed R&R matrices (enclosure (1)). Each matrix identifies responsibilities of each of the contributors to the quality and functionality of the completed project, including the contractor, Facilities Engineering Command's (FEC) Integrated Product Team (IPT) and Facilities Engineering and Acquisition Division (FEAD) technical staff. The matrices served as the basis for determining the level of effort (man hours) to perform the technical support for acceptance testing. The following table shows the format in the R&R matrices. Each heading is provided with a description of each column's intent:

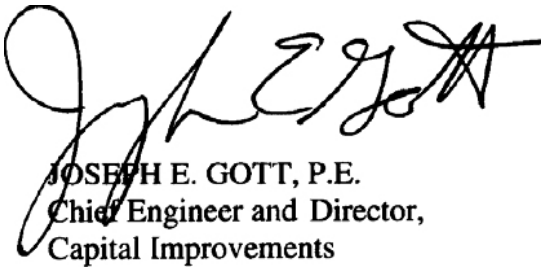
System	Sub-System	Phase	Element	Ktr QC-DOR (Project Req'ts)	FEAD (SIOH)	FEC (PCAS)
Major system grouping	Specific system	Phase of the project where it will occur	The item or task to be accomplished	What actions, if any, need to be taken by the appropriate party? (Indicates funding method)		

The contractor is still responsible for delivering a high quality and properly functioning facility via the Contractor Quality Control (CQC) program and commissioning process (including documentation and training).

3. Policy and Implementation.

The following will apply to the performance of acceptance testing for the five critical areas:

a. This applies to Military Construction (MILCON) and all Special Projects with costs over $750,000 for design-build and design-bid-build contracts.
b. The Project Manager (PM) shall manage, in coordination with the Construction Manager (CM), the project PCAS funds. The PM shall ensure that PCAS funding is used in accordance with reference (a).
c. The average funds available to support the CIBL acceptance testing in-house effort will be one-half the total PCAS funds.
d. Enclosure (1) defines the roles and responsibilities of the contractor, FEC's IPT and FEAD technical staff.
e. While the FEAD will be responsible for managing the overall construction project, the FEC's IPT will be responsible for the technical support for the acceptance testing effort associated with the five critical areas. Technical support from the FEAD can be leveraged as capabilities and resources allow, and must be coordinated between the FEC IPT and FEAD. The support for the five critical areas will be provided by engineers that have been trained and are experienced in that area.
f. The CM will manage the day-to-day coordination with the contractor and coordinate the necessary reach back to the FEC IPT for technical support for acceptance testing.
g. PCAS must be budgeted and included in the project costs. The PCAS costs must be shown in the budget estimate summary sheets (BESS) on the DD 1391.
h. The Public Works Business Line (PWBL) has agreed to designate representatives who are responsible for facility maintenance and sustainment to perform the following:
    i. Participate in the submittal review process by providing comments on submittals for the critical areas.
    ii. Be present for the final inspections and tests.
    iii. Be present for all system training.
    iv. Provide feedback and lessons learned to the FEC CI4.
i. It is recommended that the designated representatives, who are responsible for maintenance and sustainment visit the site during construction to become familiar with the building systems.
j. The efforts in paragraph 3.h above will not be funded using PCAS or supervision, inspection and overhead (SIOH).



JOSEPH E. GOTT, P.E.
Chief Engineer and Director,
Capital Improvements

Note: This ECB has been coordinated with Headquarters, U.S. Marine Corps (Code LFF).

ELECTRICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	EE QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
All Systems	**Submittals & Plans**	Pre-Construction	Qualifications of Installer, Shop Drawings, Data Sheets, and Calculations (as applicable)	A	C	S
			QC Plan		A	S
			Performance Verification Plan		A	S
	Certificates & Reports	Construction	Functional Acceptance Test Procedure	A	C	S
			Preliminary Test Reports	A	RA	S
			Final Acceptance Test Reports	A	C	S
Power Generators	**Single Operation Generator Sets**	Test Preparation	Perform fuel oil piping tests	V	C	-
			Perform acceptance checks and tests	V	W	C
			Perform preliminary operations	V	W	C
		Final Test	Test all engine protective shutdown devices	V	—	W
			Test all pre-shutdown alarm devices	V	—	W
			Test crank cycle/terminate relay	V	—	W
			Test automatic and manual operations in all possible scenarios involving loss of utility, return of utility, manual starting, and emergency stop	V	—	W
			Perform load test	V	—	W
	Automatic Transfer Switches	Test Preparation	Perform acceptance checks and tests	V	W	C
		Final Test	Simulate loss of normal power	—	—	W
			Simulate return of normal power	V	—	W
			Simulate loss of emergency power	V	—	W
			Simulate all forms of single-phase conditions	V	—	W
			Verify operation of normal power voltage-sensing relays	V	—	W
			Verify engine start sequence	V	—	W
			Verify time delay upon transfer	V	—	W
			Verify operation of alternate power voltage-sensing relays	V	—	W
			Verify automatic transfer operation	V	—	W
			Verify interlocks and limit switch operation	V	—	W
			Verify time delay and retransfer upon normal power restoration	V	—	W
400-Hertz Solid State Frequency Converter	**All**	Test Preparation	Perform acceptance checks and tests	V	W	C
			Verify equipment nameplate information with specifications and approved shop drawings	V	W	—
			Inspect physical and mechanical condition	V	W	—
			Verify correct equipment grounding	V	W	—
			Perform resistance measurements through all bolted connections	V	W	—
			Perform preliminary operations	V	W	C
		Final Test	Test all control devices	V	—	W
			Test all protective shutdown devices	V	—	W
			Perform load test	V	—	W
			Perform transient tests	V	—	W
			Perform harmonic distortion tests	V	—	W
			Perform automatic line drop compensation test	V	—	W

KEY = A - Approve, R - Review, W - Witness, RA - Receipt Acknowledge, S - Surveilance Review, V- Verification and Testing, C - Copy, QA - Quality Assurance

ELECTRICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	EE QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Uninterruptible Power Supply (UPS)	**All**	Test Preparation	Verify ventilation equipment in UPS and battery rooms are operational	V	W	—
			Verify battery cells are filled with electrolyte	V	W	—
			Verify polarity of DC connections and phase rotation of AC connections	V	W	—
			Verify AC power to all equipment	V	W	—
			Verify remote monitors and control wiring	V	W	—
			Verify UPS system and battery system is properly grounded	V	W	—
			Verify operation of emergency shower and eye wash	V	W	—
			Verify control connections between UPS and emergency engine generator signal contacts	V	W	—
			Verify control connections between UPS module and UPS maintenance bypass cabinet	V	W	—
			Perform acceptance checks and tests	V	W	C
		Final Test	Perform load tests	V	—	W
			Perform full-load burn in test	V	—	W
			Perform battery discharge test	V	—	W
			Perform battery performance test	V	—	W
			Perform UPS in conjunction with emergency generator service (if applicable)	V	—	W
Lighting	**Interior Lighting**	Final Test	Verify electronic dimming ballasts operatation over full range of dimming capability without any visually detectable flicker	V	W	—
			Verify occupancy sensors operation	V	W	—
			Verify lighting controls operation	V	W	—
			Verify lighting output levels	V	W	—
	Exterior Lighting	Final Test	Verify photocell aiming and operation	V	W	—
			Verify lighting controls operation	V	W	—
			Verify lighting output levels	V	W	—
Transformers	**Single-Phase Pad-Mounted Transformers**	Factory Routine Tests	Perform resistance measurements, polarity, ratio, no-load losses and excitation current, load losses and impedance voltage, dielectric, leak (liquid-filled), and disolved gas analysis (liquid-filled) tests	—	—	W
		Field Tests	Perform acceptance checks and tests	V	W	C
	Three-Phase Pad-Mounted Transformers	Factory Routine Tests	Perform resistance measurements, polarity, ratio, no-load losses and excitation current, load losses and impedance voltage, dielectric, leak (liquid-filled), and disolved gas analysis (liquid-filled) tests	—	—	W
		Field Tests	Perform acceptance checks and tests	V	W	C
	Secondary Unit Substations	Factory Routine Tests	Perform resistance measurements, polarity, ratio, no-load losses and excitation current, load losses and impedance voltage, and dielectric tests	—	—	W
		Field Tests	Perform acceptance checks and tests	V	W	C
	Primary Unit Substations	Factory Routine Tests	Perform resistance measurements, polarity, ratio, no-load losses and excitation current, load losses and impedance voltage, dielectric, leak (liquid-filled), and disolved gas analysis (liquid-filled) tests	—	—	W
		Field Tests	Perform acceptance checks and tests	V	W	C

KEY = A - Approve, R - Review, W - Witness, RA - Receipt Acknowledge, S - Surveilance Review, V- Verification and Testing, C - Copy, QA - Quality Assurance

ELECTRICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	EE QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Switchgear/ Switchboards	**Metal-Clad Switchgear / Switchboards and Busway**	Factory Production Tests	60 Hz dielectric, mechanical operation, electrical operation and control wiring, and ground fault sensing equipment tests	—	—	W
		Test Preparation	Perform acceptance checks and tests	V	W	C
Cable	**Medium-Voltage Cable, Terminations, and Splices**	Test Preparation	Perform acceptance checks and tests	V	W	—
		Field Tests	Perform shield continuity and very low frequency (VLF) tests	V	W	—
SF6 Switch - Padmount	**Medium Voltage Pad-mounted Switches**	Factory Production Tests	60 Hz dielectric, mechanical operation, electrical operation and control wiring, and ground fault sensing equipment tests	—	—	W
		Test Preparation	Perform acceptance checks and tests	V	W	C
Airfield Lighting	**Airfield Lighting Circuits**	Field Tests	Airfield lighting circuits low voltage continuity and high voltage insulation resistance tests	V	W	—
		Field Tests	Airfield lighting circuit operating test	V	W	—
	Counterpoise	Field Tests	Counterpoise system test	V	W	—
	Constant	Field Tests	Perform open circuit protector and load tests	V	W	—
	All	Field Tests	Perform airfield lighting system operation test	V	W	—
Cathodic Protection	**Cathodic Protection by Galvanic Anodes**	Field Tests	Perform non-destructive testing of anodes	V	W	—
			Perform destructive testing of anodes	V	W	—
			Perform base potential tests, insulation joint testing, electrical continuity testing, pipe casing testing, anode-to-soil potential tests, anode output tests, protected potential measurement tests, and interference testing.	V	W	—
			Perform field operation tests.	V	—	W
	Cathodic Protection by Impressed Current	Field Tests	Perform non-destructive testing of anodes	V	W	—
			Perform destructive testing of anodes	V	W	—
			Perform base potential tests, permanent reference electrode calibration, insulation joint testing, electrical continuity testing, rectifier system testing, pipe casing testing, protected potential measurement tests, and interference testing.	V	W	—
			Perform field operation tests.	V	—	W

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FIRE PROTECTION ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	FP QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
All Systems	**Required Submittals**		QC Plan	—	A	S
			Performance Verification Plan	—	A	S
		Test Prep & Preliminary Certifications	Field Visit/Construction Surveillance Reports	—	S	QA
		Final Test Reports &	Final Acceptance Test Reports	A	S	QA or A
			Final Life Safety/Fire Protection Certification	—	S	A
Sprinkler Systems	**Wet Pipe Sprinkler Systems**	Test Preparation	Process/review system submittal (Qualifications of Installer, Shop Drawings, Data Sheets & Calcs)	A	C	S
			Process/review Preliminary Test Reports & Certifications	—	RA	S
			Witness hydrostatic test.	A	C	—
			Witness flush test.	V	W	—
			Visually inspect system for adherence to plan, completeness, and adequacy of installation.	A	QA	QA
			Visually inspect pipe pentrations	A	QA	QA
			Visually inspect sprinklers for location and that they are not painted / taped.	A	QA	QA
			Visually inspect seismic bracing	A	C	QA
			Operate control valves {Other than main service entrance riser}	A	C	QA
			Visually inspect check valve installation	A	C	QA
			Visually inspect test/drain discharge locations	A	C	QA
			Witness backflow preventer forward-flow test (NFPA 13, §16.2.5).	V	W	W
			Inspect/test alarm valve assembly and water service entrance(pipe sleeves, thrust rods, etc.), including valves, flow switch & tamper switches)	V	C	W
			Inspect/test flow control valve assembly	V	C	W
	Additional requirements for Dry Pipe, Preaction - Deluge		Process system submittal (Qualifications of Installer, Shop Drawings, Data Sheets & Calcs)	A	C	S
			Preliminary Test Reports & Certifications	—	RA	S
			Witness hydrostatic test.	A	C	—
			Witness flush test.	V	W	—
		Final Test	Verify Low-point drains are provided	V	—	QA
			Visually inspect air supply and piping	A	S	QA
			Witness backflow preventer test.	V	W	W
			Test high-low pressure air switch operation	V	—	W
			Inspect/Test deluge or dry valve riser assembly (including control valves, alarm switch & tamper switches), and functional operation	A	S	W
			Inspect/test detection and releasing system	See Fire Alarm System		

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FIRE PROTECTION ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	FP QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Water Distribution	**Fire hydrants, distribution piping, & control valves**	Final Test	Process system submittal (Qualifications of Installer, Shop Drawings, Data Sheets & Calcs)	A	C	—
			Preliminary Test Reports & Certifications	—	RA	S
			Visually inspect all thrust blocks.	A	QA	—
			Witness hydrostatic test.	A	C	—
			Witness flush testing of hydrant	A	C	QA
			Operate all control/isolation valves (each)	V	S	QA
			Operate fire hydrants and check for proper drainage (each)	V	S	QA
	Water storage	Construction	Preliminary Test Reports & Certifications	—	RA	S
			Verify suction piping w/in tank is installed in accordance with design	A	C	S
Pumps for Fire Protection (Water & Foam)	**Pumps & Controllers**		Process system submittal (Qualifications of Installer, Shop Drawings, Data Sheets & Calcs)	A	C	S
			Preliminary Test Reports & Certifications	—	RA	S
		Test Preparation	Visually inspect system for adherence to plan, completeness, and adequacy of installation.	A	QA	QA
		Test Preparation	Witness pump controller functional tests (including automatic transfer switch operation & battery transfer as applicable).	A	QA	W
			Witness flow test to generate performance curve (pressure vs discharge, rpms, amps, shaft alignment)	V	QA	W
		Final Test	Witness automatic and manual starts & stops	V	QA	W
			Verify that controller supervisory signals are received by the fire alarm control panel	V	C	W

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FIRE PROTECTION ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	FP QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Fire Alarm Systems	**Evacuation / Notification Detection & Releasing Systems.**	Test Preparation & Final Test	Process system submittal (Qualifications of Installer, Shop Drawings, Data Sheets & Calcs)	A	C	S
			Preliminary Test Reports & Certifications	—	RA	S
			Visually inspect system for adherence to plan, completeness, and adequacy of installation. (30,000 SQ. FT.)	A	QA	QA
			Test initiating devices for proper operation. (Activate 15% of smoke or heat detectors with no failures {30,000 sq. ft)/(625 sq. ft/ detector)(0.15)=7}	A	QA	QA
			Test initiating circuits for shorts, ground faults, and general operation	A	C	QA
			Test signaling circuits for shorts, ground faults, and general operation	A	C	QA
			Verify audible and visual devices operate properly and audible devices can be heard throughout the facility	A	C	QA
			Test peripheral devices (door hold opens, etc)	A	C	QA
			Witness functional test of the main control panel	V	C	W
			Test interface with other systems (i.e., preaction, gaseous, etc.)	V	C	W
			Test that correct signals are being sent to the base receiving station	V	C	W
			Test recall for elevators - See "Others - Elevators" {Bldg 2 stories or more}	V	S	W
			Test AHU shut down - See "Others - HVAC"	V	S	W
			Test power shut down - See "Others - {Elevators} Electrical"	V	C	W
	Control Panels used for Releasing Service		Process system submittal (Qualifications of Installer, Shop Drawings, Data Sheets & Calcs)	A	C	S
			Preliminary Test Reports & Certifications	—	RA	S
			Test releasing circuits for shorts, ground faults, and general operation	V	C	W
			Test power shut down - See "Others - Electrical"	V	S	QA
			Test automatic closing of dampers/doors	V	S	W
	Base-Wide Fire Reporting System		Process system submittal (Qualifications of Installer, Shop Drawings, Data Sheets & Calcs)	A	C	S
			Preliminary Test Reports & Certifications	—	RA	S
			Test transmitting devices to ensure the signals are received at the main console **{per bldg}**	V	C	W
			Test the main console for redundancy requirements	V	S	W

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FIRE PROTECTION ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	FP QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Miscelaneous Extinguishing Systems	**Gaseous Systems**	Final Test	Process system submittal (Qualifications of Installer, Shop Drawings, Data Sheets & Calcs)	A	C	S
			Preliminary Test Reports & Certifications	—	RA	S
			Visually inspect system for adherence to plan, completeness, and adequacy of installation.	A	S	QA
			Verify correct nozzles were installed	A	S	W
			Witness room pressurization test	V	S	W
			Witness full functional test to verify cylinder head functions properly and all control/interface functions operate accordingly.	V	S	W
			Inspect/test detection and releasing system	See Fire Alarm System		
	Wet Chemical & Dry Chemical Systems	Test Prep	Process system submittal (Qualifications of Installer, Shop Drawings, Data Sheets & Calcs)	A	C	S
			Preliminary Test Reports & Certifications	—	RA	S
			Verify piping and nozzles are installed in accordance with manufacturer's listing requirements	A	S	W
		Final Test	Witness discharge test - ensure nozzles are bagged if discharging water in a wet chemical system	V	S	W
			Verify alarm and supervisory signals are sent to the FACP	V	S	W
			Verify power and gas are disconnect when system activates (if applicable)	V	S	W
			Verify exhaust system either continues to run or shuts down depending on listing (if applicable)	V	S	W
	Foam Systems (All types)	Test Preparation	Process system submittal (Qualifications of Installer, Shop Drawings, Data Sheets & Calcs)	A	C	S
			Preliminary Test Reports & Certifications	—	RA	S
			Review test plan	—	C	QA
			Review the contractor's test plan for environmental and other compliance	—	S	QA
			Inspect/test detection and releasing system	See Fire Alarm System		
			Visually inspect system for adherence to plan, completeness, and adequacy of installation. Conduct functional test of entire system. Submit report.	A	QA	QA
			Verify correct foam generators / discharge devices are installed and properly piped	A	—	QA
			Verify correct size pipe and installed properly	A	—	QA
			Verify riser assembly (deluge valve) is installed properly	A	—	QA
		Final Test	Verify strainer has proper mesh	V	QA	W
		Final Test	Conduct performance test to ensure proper setting and operation of foam control valves and discharge devices. *(multiply by the number of risers)*	V	QA	W
			Conduct functional test of each generator, ratio controller, or proportioner. *(multiply by the number of risers)*	—	QA	W

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FIRE PROTECTION ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	FP QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Passive	Fire / Smoke Barriers IBC Inspections (Section 109)	Preliminary and Final Inspections	Process system submittal (Qualifications of Installer, Shop Drawings, Data Sheets & Calcs)	A	C	S
			Preliminary Test Reports & Certifications	—	RA	S
			Inspect Lath & gypsum board installation	A	QA	QA
			Inspect fire-rated / smoke wall and/or floor penetrations	A	S	QA
			Inspect wall/ceiling/roof joint	A	S	QA
			Inspect/test fire & smoke damper installation and performance	A	S	QA
			Inspect fire doors and frames	A	QA	QA
Life Safety Features	Exit Signs and Emergency Lighting	Preliminary	Verify installed locations of exit signs.	A	S	QA
			Verify installed locations of emergency lighting	A	S	QA
		Final Test	Check performance of emergency lighting systems and battery back-up.	A	S	QA
	Emergency Generators		Check to ensure all life safety features on the emergency generator are provide with power in the required amount of time	A	S	QA
Other Systems	Elevators	Test	Verify elevator re-call to primary floor	A	S	QA
			Verify elevator re-call to alternate floor	A	S	QA
			Test power disconnect upon water flow	V	S	QA
			Verify signal in elevator cab activates	V	S	QA
	Smoke Control / Exhaust Systems	Preliminary Test	Verify smoke exhaust / smoke control system activates via appropriate initiating devices (IBC §1704)	A	S	QA
			Verify location of duct detectors and for proper installation	A	S	QA
		Final Test	Perform operational test to show smoke exhaust / smoke control system functions as designed	V	S	QA
			Special Inspections for smoke control (IBC §1704) (See NFPA 92A & 92B, Chap. 8.)	A	W	W
			Perform operational test to verify detector functions properly and shuts down the correct AHU	V	S	QA
	Electrical	Pre-Test	Verify each detector associated with the electrical equipment disconnects power	A	S	QA
		Final Test	Test power disconnect for associated electronic equipment	V	S	QA

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MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Energy Supply Systems	**Fuel Oil - ALL**	Field Visit	**Complete System -** Verify contractor provided complete fuel oil system to the facility, including applications and permits	A	QA	—
			Piping - Verify fuel oil piping meets requirements of International Mechanical Code.	A	QA	—
			Testing - Verify oil system testing meets requirements of NFPA 31.	V	W	—
	Fuel Oil - Exterior	Submittal Process	**Piping -** Verify fuel piping is either ASTM A 53 Type E (electric-resistance welded, Grade A or B) black steel; or ASTM A 53 Type S (seamless, Grade A or B) black steel; or API SPEC 5L, seamless, submerged-arc weld or gas metal-arc weld, Grade B, black ste	A	RA	—
			Fuel Pumps - Verify fuel pumps comply with NEMA MG 1, NFPA 70, and are designed for use with hydrocarbon fuels.	A	RA	—
			Fuel Pumps - Verify fuel pumps have a working pressure of 1896 kilopascals (275 psig) at 38 degrees C (100 degrees F).	A	RA	—
			Fuel Meters - Verify fuel meters are continuous duty, positive displacement type, with electronic thermal compensation capability, suitable for outdoor installation.	A	RA	—
			Fuel Meters - Verify fuel meters are designed for use with hydrocarbon fuels and have a working pressure of 1896 kilopascals (275 psig) at 38 degrees C (100 degrees F).	A	RA	—
		Submittal Process/ Field Visit	**Storage Tanks -** Verify aboveground liquid fuel storage tanks are concrete encased or double wall in accordance with UL 142 and UL 2085 with secondary containment and leak monitoring of a capacity to meet the system requirements. Verify overfill/spill con	A	RA/ QA	S
			Dispensing Tanks - Verify Liquid fuel dispensing tanks are concrete encased or double wall in accordance with UL 142 and UL 2085 with secondary containment and leak monitoring of a capacity to meet the system requirements. Verify overfill/spill containme	A	RA/ QA	S
	Fuel Oil - Interior	Submittal Process	**Pumps -** Verify pumps that are not part of the burner assembly are positive dispacement type	A	RA	—
		Field Visit	**Oil Filter -** Verify an oil filter is provided prior to oil entering appliance or pump.	A	QA	QA
		Field Visit	**Drip Legs -** Verify drip legs are provided and properly installed prior to oil entering appliance or pump.	A	QA	—
		Submittal Process	**Storage Tanks -** Verify all storage tanks meet NFPA 31 requirements.	A	RA	—
	Natural Gas - ALL	Field Visit	**Complete System -** Verify contractor provided complete natural gas system to the facility, including applications and permits	A	QA	—
		Field Visit	**Testing -** Verify system was tested at 1.5 times maximum working pressure, but not less than 350 kPa (50 PSI) per NFPA 54	V	W	—

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MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Energy Supply Systems (continued)	**Natural Gas - Exterior (Contractor installed piping)**	Field Visit	**Piping -** Verify exterior gas piping meets requirements of local natural gas utility	A	QA	—
		Submittal Process	**Piping -** Verify piping meets requirements of ASME B31.8, Gas Transmission and Distribution Piping Systems	A	RA	—
		Submittal Process	**Piping -** Verify the natural gas piping is either ASTM A 53, Type E (electric-resistance welded, Grade A or B) black steel piping or ASTM A 53 Type S (seamless, Grade A or B) black steel piping or ASTM D 2513, Grade PE2406 or PE3408 polyethylene piping an	A	RA	—
		Field Visit	**Meter and Pressure Regulator -** Verify meter and pressure regulator are provided in accordance with local utility requirements.	A	QA	—
		Field Visit	**Piping Identification -** Verify polyethylene plastic tape manufactured specifically for warning and identifying buried utility lines are provided for non-metallic undergound piping systems	A	QA	—
	Natural Gas - Interior	Submittal Process	**Piping -** Verify interior gas piping meets requirements of NFPA 54, National Fuel Gas Code	A	RA	—
	Propane - ALL	Field Visit	**Complete System -** Verify contractor provided complete propane system to the facility, including appropriate applications and permits.	A	QA	—
	Propane - Exterior	Submittal Process	**Piping -** If piping is not provided by propane supplier, verify the propane piping is either ASTM A 53, Type E (electric-resistance welded, Grade A or B) black steel piping or ASTM A 53 Type S (seamless, Grade A or B) black steel piping or ASTM D 2513, Gr	A	RA	—
		Submittal Process	**Fittings -** Confirm Polyethylene fittings meet ASTM D 2683 for socket fittings or ASTM D 2513 for molded butt-fusion fittings	A	RA	—
		Field Visit	**Tank -** Verify propane tank capacity conforms to tank capacity submitted in shop drawings.	A	QA	—
		Submittal Process	**Tank -** If tank is not provided by propane supplier, verify propane tank material and installation comply with NFPA 58.	A	RA	—
		Submittal Process	**Tank -** If tank is not provided by propane supplier, verify propane tank is ASME labeled.	A	QA	—
		Field Visit	**Piping Identiication -** Verify polyethylene plastic tape manufactured specifically for warning and identifying buried utility lines are provided for non-metallic undergound piping systems	A	QA	—

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Energy Supply Systems (continued)	**Propane - Interior**	Field Visit	Verify the propane installation meets the requirements specified in NFPA 58.	A	QA	—
		Submittal Process	**Piping -** Verify standard pipe dimension ratio is not more than 11.5	A	RA	—
	Steam - Exterior Underground	Submittal Process	Confirm the submission of a Certificate of Satisfactory Operation certifying that at least 3 systems installed by the piping system manufacturer within the previous 10 years have and are operating satisfactorily for not less than 5 years.	A	RA	S
		Submittal Process	Confirm the submission of a written certification by the piping system manufacturer that the distribution system installer is technically qualified and experienced in the installation of the system.	A	RA	S
		Submittal Process/ Field Visit	Verify underground steam and condensate piping in separate conduits is direct buried, factory pre-fabricated, pre-insulated, and consist of a steel service pipe with polyurethane insulation and a high-density polyethylene (HDPE) jacket.	A	RA/ QA	—
		Submittal Process/ Field Visit	Confirm piping system fittings and components are factory fabricated and no field insulated fittings are provided.	A	RA/ QA	—
		Field Visit	Verify asbestos cement or plastic conduit piping is not provided.	A	QA	—
		Field Visit	**Piping Insulation -** Verify the piping system insulation thickness is in accordance with contract requirements.	A	QA	—
		Submittal Process	**Isolation Valves -** Verify ASME class 150 isolation valves are provided in manholes for system supply and return lines at take-offs for service to each building .	A	QA	—
		Submittal Process/ Field Visit	**Expansion Loops -** Verify expansion loops are utilized to compensate for piping expansion.	A	RA/ QA	S
		Submittal Process/ Field Visit	**Expansion Anchors -** Verify piping expansion anchors are located outside manholes.	A	RA/ QA	—
		Field Visit	**Manholes -** Verify system manholes are constructed of reinforced, 206.8 bar (3000 psi) concrete. Verify manhole floor and sides are watertight and were made in one monolithic pour. Verify manhole top extends a minimum of 300 mm (6 inches) above grade. V	A	QA	—
		Submittal Process	Verify a sump pit and a vertical sump pump designed for an operating temperature design of 93 degrees C (195 degrees F) minimum are provided in each system manhole.	A	RA	—
		Submittal Process	**Sump Pump - Float Control -** Verify a 2-pole float control is provided for each manhole sump pump.	A	RA	—
		Submittal Process/ Field Visit	**Valves -** For system valves located outside of manholes, verify a cast-iron or ductile-iron valve box and cover of a suitable size are provided. Verify the box cover has the word(s) describing the utility cast on the cover.	A	RA/ QA	—

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Energy Supply Systems (continued)	**Steam - Exterior Aboveground**	Submittal Process	**Piping -** Verify steam piping is either ASTM A 53 Type E (electric-resistance welded, Grade A or B) black steel pipe or ASTM A 53 Type S (seamless, Grade A or B) black steel pipe or, for pipe sizes through 250 mm (9 inches), ASTM A 106 (Grade A or B) black	A	RA	—
		Submittal Process	**Piping -** Verify condensate piping is either ASTM A 53 Type E (electric-resistance welded, Grade A or B) black steel, Weight Class XS (Extra Strong); or ASTM A 53 Type S (seamless, Grade A or B) black steel, Weight Class XS (Extra Strong); or ASTM A 106, G	A	RA	—
		Field Visit	**Piping Insulation -** Verify piping insulation is either fibrous glass, calcium silicate, or cellular glass as indicated in submitted shop drawings. Verify pipe insulation matches existing or surrounding insulation if applicable.	A	QA	—
		Field Visit	**Piping Insulation -** Verify the piping system insulation thickness is in accordance with contract requirements.	A	QA	—
		Field Visit	**Insulation -** Verify insulation is covered with an with aluminum jacket painted to conform with the Base Architectural Plan.	A	QA	—
		Submittal Process/ Field Visit	Verify the use of either MSS SP-58 or MSS SP-69 adjustable supports with insulation protection saddles. Verify roller supports utilize stainless steel axles.	A	RA/ QA	—
		Field Visit	**Support Poles -** Verify support poles are installed with guy wires and necessary hardware.	A	QA	—
		Submittal Process/ Field Visit	**Pipe Expansion -** Verify pipe expansion is compensated by utilizing either expansion loops, guided sliexpansion joints, or flexible ball type expansion joints.	A	RA/ QA	S
	Steam - Interior	Submittal Process	**Steam piping** - Verify is ASTM A106 or A53, Grade B, Schedule 40, black steel, electric-resistance welded or seamless	A	RA	—
		Submittal Process/ Field Visit	**Steam piping** - Verify insulated with mineral fiber or cellular glass insulation with all-purpose jacket	A	RA/ QA	—
		Submittal Process	**Condensate return piping** - Verify is ASTM A106 or ASTM A53, Grade B, Schedule 80, black steel, electric-resistance welded or seamless	A	RA	—
		Submittal Process/ Field Visit	**Condensate return piping** - Verify insulated with mineral fiber or cellular glass insulation with all-purpose jacket	A	RA/ QA	—
		Submittal Process	**Steel pipe fittings** - For piping 50 mm (2 inch) and smaller, verify is ANSI/ASME B16.3 malleable iron screwed fittings or ASME B16.11 socket welding (Class 3000) or ASME B16.11 threaded type (Class 2000)	A	RA	—
		Submittal Process	**Steel pipe fittings** - For piping 63 mm (2-1/2 inch) and larger, verify is ANSI/ASME B16.9 butt-welding fittings or ANSI/ASME B16.5 flanged type	A	RA	—
		Field Visit	**Steam pressure reducing station -** Verify provided for each building	A	QA	—

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
nergy Supply Systems (continued)		Submittal Process/ Field Visit	**Steam traps** - Verify steam traps and accessories are in accordance with UFC 3-400-10N	A	RA/ QA	—
		Field Visit	Verify all valves, traps, and PRV's are accessible for service & maintenance	A	QA	—
	Hot Water - Exterior Underground	Submittal Process/ Field Visit	**Piping -** Verify underground hot water supply & return piping in separate conduits is direct buried, factory pre-fabricated, pre-insulated, and consist of a steel service pipe with polyurethane insulation and a high-density polyethylene (HDPE) jacket.	A	RA/ QA	—
		Submittal Process/ Field Visit	Confirm piping system fittings and components are factory fabricated and no field insulated fittings are provided.	A	RA/ QA	—
		Field Visit	Verify asbestos cement or plastic conduit piping is not provided.	A	QA	—
		Submittal Process	The UHDS representative shall be certified in writing by the UHDS manufacturer to be technically qualified and experienced in the installation of the system. Provide a Certificate of Satisfactory Operation certifying that at least 3 systems installed by	A	QA	S
		Field Visit	**Piping Insulation -** Verify the piping system insulation thickness is in accordance with contract requirements.	A	QA	—
		Submittal Process/ Field Visit	**Isolation Valves -** Verify ASME class 150 isolation valves are provided in manholes for system supply and return lines at take-offs for service to each building .	A	RA/ QA	—
		Submittal Process/ Field Visit	**Expansion Loops -** Verify expansion loops are utilized to compensate for piping expansion.	A	RA/ QA	S
		Submittal Process/ Field Visit	**Manholes -** Verify system manholes are constructed of reinforced, 206.8 bar (3000 psi) concrete. Verify manhole floor and sides are watertight and were made in one monolithic pour. Verify manhole top extends a minimum of 300 mm (6 inches) above grade. V	A	RA/ QA	—
		Submittal Process	Verify a sump pit and a vertical sump pump designed for an operating temperature design of 93 degrees C (195 degrees F) minimum are provided in each system manhole.	A	RA	—
		Submittal Process	**Sump Pump - Float Control -** Verify a 2-pole float control is provided for each manhole sump pump.	A	RA	—
		Submittal Process/ Field Visit	**Valves -** For system valves located outside of manholes, verify a cast-iron or ductile-iron valve box and cover of a suitable size are provided. Verify the box cover has the word(s) describing the utility cast on the cover.	A	RA/ QA	—

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Ei	**Hot Water - Exterior Aboveground**	Submittal Process	**Piping -** Verify hot water piping is either ASTM A 53 Type E (electric-resistance welded, Grade A or B) black steel, Weight Class XS (Extra Strong); or ASTM A 53 Type S (seamless, Grade A or B) black steel, Weight Class XS (Extra Strong); or ASTM A 106, Gr	A	RA	—
		Field Visit	**Piping Insulation -** Verify piping insulation is either fibrous glass, calcium silicate, or cellular glass as indicated in submitted shop drawings.	A	QA	—
		Field Visit	**Piping Insulation -** Verify the piping system insulation thickness is in accordance with contract requirements.	A	QA	—
		Field Visit	**Insulation -** Verify insulation is covered with an with aluminum jacket painted to conform with the Base Architectural Plan.	A	QA	—
		Submittal Process/ Field Visit	**Pipe Expansion -** Verify pipe expansion is compensated by utilizing either expansion loops, guided slip expansion joints, or flexible ball type expansion joints.	A	RA/ QA	S
		Submittal Process/ Field Visit	Verify the use of either MSS SP-58 or MSS SP-69 adjustable supports with insulation protection saddles. Verify roller supports utilize stainless steel axles.	A	RA/ QA	—
		Field Visit	**Support Poles -** Verify support poles are installed with guy wires and necessary hardware.	A	QA	—
	Hot Water - Interior	Submittal Process	**Piping** - Verify hot water piping is electric resistance, welded or seamless, schedule 40, black steel pipe conforming to ASTM A53. Piping 100mm (4 inch) and smaller may be ASTM B 88 Type K or L copper.	A	RA	—
		Submittal Process	**Steel fittings** - **For piping 50mm (2 inch) and smaller**, verify provided ANSI/ASME B16.3 malleable iron screwed fittings **OR** ASME B16.11 socket welding (Class 3000) fittings OR ASME B16.11 threaded type (Class 2000)	A	RA	—
		Submittal Process	**Steel fittings** - **For piping 63 mm (2-1/2 inch) and larger**, verify provided ANSI/ASME B16.9 butt-welding fittings **OR** ANSI/ASME B16.5 flanged type	A	RA	—
		Submittal Process	**Copper fittings -** Verify ANSI B16.18 cast bronze solder joint type or ASME/ANSI B16.22 wrought copper solder joint type	A	RA	—

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Energy Supply Systems (continued)		Submittal Process/ Field Visit	**Insulation -** Verify hot water piping insulated with mineral fiber insulation with factory-applied all-purpose jacket	A	RA/ QA	—
		Field Visit	**Isolation valves** - Verify equipment provided with isolation valves for service and repairs	A	QA	—
		Submittal Process/ Field Visit	**Valves -** Verify appropriately sized	A	RA/ QA	—
		Submittal Process/ Field Visit	**Balancing valves -** Verify provided and appropriately sized to balance water flow	A	RA/ QA	QA
		Field Visit	**Appurtenances -** Verify provided (such as air separators, expansion tanks, suction diffusers, strainers, etc)	A	QA	—
		Field Visit	**Test ports -** Verify provided in piping at inlet and outlet of all major system components including boilers, pumps, etc)	A	QA	QA
		Field Visit	Verify all valves and test ports are accessible for service and maintenance	A	QA	—
	Chilled Water & Condenser Water - Exterior Underground	Submittal Process	Verify system provided is direct buried, factory-prefabricated, pre-insulated, chilled water piping systems. Verify all fittings and accessories are designed and factory-fabricated to prevent moisture from entering into the system by manufacturer.	A	RA	S
		Field Visit	Verify backfill and overall installation meets the requirements of the piping system manufacturer.	A	QA	—
		Field Visit	**Isolation Valves -** Verify supply and return line isolation valves are provided at take-offs for service to each building in valve boxes.	A	QA	—
		Submittal Process/ Field Visit	Verify expansion loops are provided to compensate for piping expansion. Verify anchors are provided outside manholes.	A	RA/ QA	S
	Chilled Water & Condenser Water - Exterior Aboveground	Submittal Process	**Piping -** Verify chilled and condenser water piping are either electric resistance welded or seamless Schedule 40 black steel pipe conforming to ASTM A 53 or, for piping 100 mm (4 inch) and smaller, ASTM B 88 Type K or L copper.	A	RA	—
		Submittal Process	If steel piping is used, verify for piping 50 mm (2 inch) and smaller, ANSI/ASME B16.3 malleable iron screwed fittings or ASME B16.11 socket welding (Class 3000) or threaded type (Class 2000) fittings are provided. For piping 63 mm (2-1/2 inch) and large	A	RA	—
		Submittal Process	If copper piping is used, verify ANSI B16.18 cast bronze solder joint fittings or ASME/ANSI B16.22 wrought copper solder joint fittings are provided.	A	RA	—
		Submittal Process/ Field Visit	**Piping Insulation -** Verify piping insulation is either Mineral fiber, Urethane, cellular glass, Faced Phenolic Foam, or Flexible Cellular pipe insulation as indicated in submitted shop drawings.	A	RA/ QA	—

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Energy Supply Systems (continued)		Field Visit	**Piping Insulation -** Verify the piping system insulation thickness is in accordance with contract requirements.	A	QA	—
		Field Visit	**Piping Insulation -** Verify piping insulation is covered with an aluminum jacket.	A	QA	—
		Submittal Process/ Field Visit	Verify the use of either MSS SP-58 or MSS SP-69 adjustable supports with insulation protection saddles. Verify roller supports utilize stainless steel axles.	A	RA/ QA	—
		Field Visit	**Support Poles -** Verify support poles are installed with guy wires and necessary hardware.	A	QA	—
		Submittal Process/ Field Visit	**Pipe Expansion -** Verify pipe expansion is compensated by utilizing either expansion loops, guided slip expansion joints, or flexible ball type expansion joints.	A	RA/ QA	S
	Chilled Water & Condenser Water - Interior	Submittal Process	**Aboveground chilled & condenser water piping -** Verify aboveground chilled water piping is electric resistance welded or seamless schedule 40 black steel pipe conforming to ASTM A 53. Piping 100mm (4 inch) and smaller may be ASTM B 88 Type K or L copper.	A	RA	—
		Submittal Process	**Steel pipe fittings - For piping 50mm (2 inch) and smaller -** Verify provided ANSI/ASME B16.3 malleable iron screwed fittings or ASME B16.11 socket welding (Class 3000) or threaded type (Class 2000).	A	RA	—
		Submittal Process	**Steel pipe fittings - For piping 63mm (2-1/2 inch) and larger -** Verify provided ASME/ANSI B16.9 butt-welding fittings or ASME/ANSI B16.5 flanged type.	A	RA	—
		Submittal Process	**Steel pipe fittings -** Grooved joint pipe coupling systems of appropriate pressure rating are acceptable in lieu of welded or screwed fittings	A	RA	—
		Submittal Process	**Copper fittings -** Verify provided ANSI B16.18 cast bronze solder joint type or ASME/ANSI B16.22 wrought copper solder joint type	A	RA	—
		Field Visit	**Isolation valves -** Verify isolation valves provided on supply and return lines at take-offs for service to each building	A	QA	—
		Field Visit	**Isolation valves -** Verify isolation valves located in valve boxes	A	QA	—
		Submittal Process/ Field Visit	**Insulation -** Verify above-ground chilled water piping insulated with cellular glass insulation. Flexible unicellular insulation may be used on small piping runouts.	A	RA/ QA	—
		Submittal Process/ Field Visit	**Insulation -** Verify above-ground condenser water piping insulated with mineral fiber insulation	A	RA/ QA	—
		Submittal Process/ Field Visit	**Insulation -** Verify all-purpose jacket with vapor retarder provided for above-ground chilled water and condenser piping	A	RA/ QA	—
inued)		Submittal Process/ Field Visit	**Valves -** Verify appropriately sized	A	RA/ QA	—

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Energy Supply Systems (conti		Submittal Process/ Field Visit	**Balancing valves -** Verify provided and appropriately sized to balance water flow	A	RA/ QA	QA
		Submittal Process/ Field Visit	**Relief valves -** Verify provided and appropriately sized	A	RA/ QA	—
		Field Visit	**Test ports -** Verify test ports provided inpiping at inlet and outlet of all major system components including chillers, pumps, etc	A	QA	QA
		Field Visit	Verify all valves and test ports are accessible for service and maintenance	A	QA	—
	AHU's - ALL	Field Visit	**DDC Sensors -** Confirm location of DDC sensors (temp, SP, Freeze, High pressure SP, AFM), if required	A	QA	QA
		Field Visit	**Smoke Detectors -** Confirm location of smoke detectors (if over 2000 cfm)	A	QA	QA
		Field Visit	**Testing - Filters -** Confirm filters are clean prior to testing	A	QA	QA
		Field Visit	**Filters -** Confirm filters are installed	—	—	—
		Field Visit	**Belts -** Confirm belt tightness and alignment	A	QA	QA
		Field Visit	**Coils -** Confirm all coils are clean	A	QA	QA
		Field Visit	**Vibration Isolators -** Confirm vibration isolators installed according to contract docs and unit secured	A	QA	QA
		Field Visit	**Damper -** Confirm damper operation and assembly tightness	A	QA	QA
		Field Visit	**Motor -** Confirm motor size (HP), voltage, amperage, and rpm	A	QA	QA
		Submittal Process	**Fans -** Verify provided have AMCA 210 certified fans with AMCA seal	A	QA	—
		Field Visit	**Fans -** Confirm fan rpm and rotation direction	A	QA	QA
		Field Visit	**OA Intake Plenum -** Confirm OA intake plenum configuration provides for drainage	A	QA	QA
		Field Visit	**AFM -** Confirm air flow monitoring station location in conformance with manufacturer requirements	A	QA	QA
		Field Visit	**Size -** Confirm unit matches schedule req	A	QA	QA
		Submittal Process/ Field Visit	**Fan bearings -** Verify fan bearings were greased (if req) and have min average life of 200,000 hours at design operating conditions	A	RA/ QA	—
		Field Visit	**Birdscreens -** Verify birdscreens provided for outdoor inlets and outlets	A	QA	QA
		Field Visit	Verify all filter and access doors are accessible for service and maintenance	A	QA	—
		Field Visit	Verify provided are modular construction, double wall AHU's with min of 25mm (1 inch) casing insulation	A	QA	—
		Submittal Process	Verify provided have ARI 430 certified fans and ARI certified coils	A	RA	—

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Equipment & Components (continued)		Submittal Process/ Field Visit	**Drain pan -** Verify provided has stainless steel, positive draining condensate drain pan	A	RA/ QA	—
		Submittal Process	**For 100% OA units -** Verify capability provided for cooling, heating, dehumidification, and reheat	A	RA	—
		Submittal Process/ Field Visit	**Ultraviolet disinfection system -** Verify central station ahu's provided with an ultraviolet c-band (UVC) disinfection system for mold, bacteria, and odor control in each air handler that has a chilled water or DX cooling coil	A	RA/ QA	—
		Submittal Process/ Field Visit	**Ultraviolet disinfection system -** Verify irradiation emitters and fixtures installed in sufficient quantity and in such an arrangement so as to provide an equal distribution of UVC energy on the coil and in the drain pan	A	RA/ QA	—
		Submittal Process/ Field Visit	**Ultraviolet disinfection system -** Verify the UVC energy produced has the lowest possible reflected and shadowed losses (To maintain energy efficiency)	A	RA/ QA	—
		Submittal Process/ Field Visit	**Ultraviolet disinfection system -** For energy efficiency, verify power supplies are of the high efficiency electronic type and matched to the emitter	A	RA/ QA	—
		Submittal Process/ Field Visit	**Ultraviolet disinfection system -** For intensity, verify the minimal UVC energy striking the leading edge (if nstalled upstream) or trailing edge (if installed downstream) of all the coil fins is not less than 820 uW/cm2 at the closest point and through pl	A	RA/ QA	—
		Submittal Process/ Field Visit	**Ultraviolet disinfection system -** Verify equal amounts strike the drain pan, either directly or indirectly through reflection	A	RA/ QA	—
		Submittal Process/ Field Visit	**Ultraviolet disinfection system -** For installation, verify emitters and fixtures are installed at right angles to the conforming lines of the coil fins, such that through incident angle reflection, UVC energy bathes all surfaces of the coil and drain pan	A	RA/ QA	—
		Submittal Process/ Field Visit	**Ultraviolet disinfection system -** Verify one complete set of spare bulbs supplied	A	RA/ QA	—
	AHU's - Split System	Submittal Process	Verify provided is factory assembled, packaged AHU rated in accordance with ARI 210/240 or ARI 340/360	A	RA	—
		Field Visit	Verify matching components provided are from the same manufacturer	A	QA	—
	AHU's - Rooftop	Submittal Process/ Field Visit	Verify provided is factory packaged unit in accordance with ARI 430 and suitable for outdoor installation	A	RA/ QA	—
		Field Visit	**Roof Curb -** Verify provided with manufacturer's roof curb	A	QA	—

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
nent & Components (continued)	**Roof Curbs**	Field Visit	**Mounting Surface -** Confirm fan or unit mounting surface is parallel to the horizon, not the roof deck if sloped	A	QA	—
		Field Visit	**Waterproofing -** Confirm curb has been flashed properly and seal to the roofing material (no leaks) (waterproofing)	A	QA	—
		Field Visit	**Lightning Rods -** Confirm lightning rods have been attached to units and run to ground	A	QA	—
		Field Visit	**Insulation -** Confirm roof curb is insulated	A	QA	—
		Field Visit	**Size -** Confirm curb is the same size or smaller as the unit being placed on it (tight fit)	A	QA	—
	Fans - ALL	Submittal Process/ Field Visit	Verify fans are AMCA 210 certified with AMCA seal	A	RA/ QA	—
		Submittal Process	**Fan bearings -** Verify fan bearings have min average life of 200,000 hours at design operating conditions	A	RA	—
		Field Visit	**Rotation -** Confirm rotation and alignment	A	QA	QA
		Field Visit	**Belts -** Confirm belt tightness (if provided)	A	QA	QA
		Field Visit	**Motor -** Confirm HP, voltage, amperage	A	QA	QA
		Field Visit	**Size -** Confirm size matches schedule req	A	QA	QA
		Field Visit	Verify fans are accessible for service and maintenance	A	QA	
		Field Visit	**Birdscreens -** Verify bird screens provided for outdoor inlets and outlets	A	QA	QA
		Field Visit	**DDC -** Verify fans provided with means for verifying operation via DDC system	A	QA	QA
	Exhaust Fans (Roof)	Field Visit	**Roof Curb -** Confirm lag bolted to roof curb	A	QA	QA
		Field Visit	**Dome Top -** Confirm dome top is secured	A	QA	QA
		Field Visit	**Type -** Verify centrifugal fans provided	A	QA	
	In-line Fans	Field Visit	**Vibration Isolators -** Confirm hangers & isolation devices	A	QA	QA
		Field Visit	**Flex Connection -** Confirm flexible connection to ductwork	A	QA	QA
		Field Visit	**Speed Controller -** Confirm speed controller installation (if provided)	A	QA	QA
		Field Visit	**Access Panel -** Confirm access panel located properly	A	QA	QA
		Field Visit	**Type -** Verify centrifugal fans provided	A	QA	—
	Wall Fans	Field Visit	**Type -** Verify wall fans provided are propeller fans with fan guards	A	QA	—
		Field Visit	**Type -** Verify wall fans provided are centrifugal fans with backdraft dampers and wall bracket	A	QA	—
	Bathroom Fan	Submittal Process/ Field Visit	Verify provided are UL 507 and UL-Listed, Home Ventilating Institute (HVI) certified, and with AMCA seal for ceiling installation	A	RA/ QA	—

KEY = A - Approve, R - Review, W - Witness, RA - Receipt Acknowledge, S - Surveilance Review, V- Verification and Testing, C - Copy, QA - Quality Assurance

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Equipm	**Range Hoods**	Submittal Process/ Field Visit	Verify provided are UL 507 and UL-Listed, with AMCA seal	A	RA/ QA	—
		Submittal Process/ Field Visit	**Light -** Verify provided with light over stove	A	RA/ QA	—
		Submittal Process	Verify min fan capacity is 160 cfm with max sound level of 5.6 sones	A	RA	—
	Louvers & Hoods - ALL	Submittal Process	**Louver rating** - Verify louvers bear AMCA ratings seal for air performance and water penetration in accordance with AMCA 500 and AMCA 511	A	RA	—
		Submittal Process/ Field Visit	**Construction** - Verify hoods and louvers constructed of anodized aluminum alloy or stainless steel	A	RA/ QA	
		Submittal Process/ Field Visit	**Birdscreens** - Verify provided for louvers and hoods	A	RA/ QA	QA
	Intake Hood (Roof)	Submittal Process/ Field Visit	**Type -** Confirm type as specified	A	RA/ QA	QA
		Field Visit	Confirm top is secured	A	QA	QA
		Submittal Process/ Field Visit	**Size -** Confirm size matches schedule req (free area)	A	RA/ QA	QA
	OA Intake Louvers (Wall)	Submittal Process/ Field Visit	**Type -** Confirm type as specified	A	RA/ QA	QA
		Submittal Process/ Field Visit	**Size -** Confirm size matches schedule req (free area)	A	RA/ QA	QA
		Submittal Process/ Field Visit	Confirm waterproof (when req) and velocity when water carry-over occurs	A	RA/ QA	QA
		Field Visit	**Intake Plenum -** Confirm intake plenum is sloped back to louver or drain has been provided	A	QA	QA
		Field Visit	**Damper -** Confirm opposed blade damper with actuator has been provided	A	QA	QA
		Field Visit	**AFM -** Confirm air flow monitoring type louver has been provided, if req	A	QA	QA

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Equipment & Components (continued)	**Ductwork**	Field Visit	**Construction -** Except as specified herein, verify ductwork constructed, braced, reinforced, installed, supported, and sealed per SMACNA standards	A	QA	QA
		Field Visit	Verify all dampers are accessible for service and maintenance	A	QA	—
		Field Visit	Confirm general construction conforms to contract documents	A	QA	QA
		Field Visit	Confirm correct pressure rating of ductwork has been conformed to SMACNA	A	QA	QA
		Field Visit	Confirm ductwork has been sealed in accordance with specified seal class	A	QA	QA
		Field Visit	**VAV inlet -** Confirm minimum straight duct is 6 duct diameters and same size as VAV terminal inlet	A	QA	QA
		Field Visit	Confirm DALT allowables are met	A	QA	QA
		Submittal Process/ Field Visit	**Access Doors -** Confirm access doors have been provided before every elbow with turning vanes	A	RA/ QA	QA
		Submittal Process/ Field Visit	**Access Doors -** Confirm access doors provided at appropriate locations	A	RA/ QA	QA
		Field Visit	**Flexible duct** - Verify insulated flexible duct used only to adapt to minor offsets for connections to air distribution devices	A	QA	QA
		Submittal Process	**Flexible duct** - Verify is UL 181 listed and per SMACNA DCS with minimum R value of 4	A	RA	—
		Field Visit	**Flexible duct** - Verify maximum length is 2 meters (6 feet)	A	QA	QA
		Field Visit	**Flexible Duct -** Confirm, where flexible ductwork is specified, that the length of flex ductwork is provided to the max req length or less and is supported properly with no abrupt turns (ie: as straight as possible)	A	QA	QA
		Field Visit	**Flexible connectors** - Verify provided between fans and ducts	A	QA	QA
		Submittal Process/ Field Visit	**Damper -** Confirm balancing damper at branch take-off's, not at diffuser neck	A	RA/ QA	QA
		Submittal Process/ Field Visit	**Damper -** Confirm balancing damper construction conforms to the specified seal class	A	RA/ QA	QA
		Submittal Process/ Field Visit	**Damper -** Confirm discharge damper installed on VAV terminal discharge, if req	A	RA/ QA	QA
		Field Visit	**Damper -** Confirm control damper type and location along with actuator type	A	QA	QA
		Submittal Process	**Dampers** - Verify conforms to SMACNA DCS	A	RA	—
		Submittal Process	**Fire dampers** - Verify are rated per UL 555	A	RA	—
		Submittal Process	**Fire dampers** - Verify are dynamic type rated for closure against a moving airstream	A	RA	—

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
ent & Components (continued)		Submittal Process/ Field Visit	**Fire dampers** - Verify do not intrude into air stream when in open position	A	RA/ QA	—
		Submittal Process	**Smoke dampers** - Verify are rated per UL 555S	A	RA	—
		Submittal Process/ Field Visit	**Elbows** - Confirm correct elbow type (ie: double wall turning vane, 1.5 radius curved, etc)	A	RA/ QA	QA
		Field Visit	**Bracing** - Confirm proper bracing of high pressure ductwork in accordance with SMACNA	A	QA	QA
		Field Visit	**Filters** - Confirm access to filter rack for ease of filter change out in duct mounted assemblies	A	QA	QA
		Submittal Process/ Field Visit	**Insulation** - Confirm ductwork insulated properly (ext batt, hard, int lined, double wall insulated, etc)	A	RA/ QA	QA
		Field Visit	**Insulation** - Inspect vapor barrier of insulation	A	QA	—
		Field Visit	**Hangers** - Confirm proper duct hangers have been utilized in accordance with spec req	A	QA	QA
		Field Visit	**Vibration Isolators** - Confirm the use of vibration isolation material at unit connection to ductwork free of holes (no leakage)	A	QA	QA
		Submittal Process	**Sound attenuators** - Verify fabricated sound attenuators reduces the rated sound pressure level of the fan down to at least 65 decibels in the 250 Hz (third octave band) center frequency by using a reference sound source calibrated in decibels of sound pow	A	RA	—
		Submittal Process/ Field Visit	**Sound attenuators** - Verify pressure drop does not exceed 157 Pa (0.63 inch of water)	A	RA/ QA	QA
	VAV Boxes - ALL	Submittal Process	Verify units are pressure-independent type and rated per ARI 880	A	QA	—
		Field Visit	**Primary air valve** - Verify not allowed to fully shut-off	A	QA	QA
		Field Visit	**Heating coil** - Verify each box provided with heating coil unless not required by space reheat or heating	A	QA	—
		Field Visit	Verify all VAV box control panels are accessible	A	QA	
		Field Visit	**Electronic controls** - Verify are provided	A	QA	QA
	VAV Terminal Box (Fan-Powered)	Submittal Process	**Type** - Verify units are pressure-independent, fan powered, rated per ARI 880, and UL listed	A	QA	—
		Field Visit	**Filters** - Confirm filter installed and clean	A	QA	QA
		Field Visit	Confirm ductwork on primary inlet is installed with 6 straight duct diameters the same size as the inlet	A	QA	QA
		Submittal Process/ Field Visit	**Dampers** - Confirm discharge damper has been provided and/or coordinated with sheet metal contractor	A	QA	QA
		Field Visit	Confirm fan size & primary inlet sized in accordance with contract documents	A	QA	—
		Field Visit	**Primary Air Valve** - Confirm max/min setting of primary air valve	A	QA	QA
		Field Visit	**Primary air valve** - Verify not allowed to fully shut-off	A	QA	QA

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Equipme		Field Visit	**Size** - Confirm size matches schedule req	A	QA	QA
		Field Visit	**Motor** - Confirm HP, voltage, and amperage of fan motor	A	QA	QA
		Field Visit	**Heating coil** - Verify each box provided with heating coil, if required	A	QA	—
		Field Visit	**Reheat Coils** - Confirm reheat coil size, if req	A	QA	—
		Field Visit	**Reheat Coils** - Confirm reheat coil is piped properly	A	QA	QA
		Field Visit	**Sensors** - Confirm discharge temp sensor provided, if req	A	QA	QA
		Field Visit	Confirm hangers have provisions for vibration isolation	A	QA	QA
		Field Visit	**Electronic controls** - Verify provided with speed controller, discharge volume control damper(s), and return/recirculation air frame and filter	A	QA	QA
		Submittal Process	**Insulation** - Verify in accordance with ASHRAE 90.1	A	RA	—
	VAV Terminal Box (Shut Off)	Field Visit	Confirm ductwork on primary inlet is installed with 6 straight duct diameters the same size as the inlet	A	QA	QA
		Field Visit	**Primary Air Valve** - Confirm max and min setting of primary air valve	A	QA	QA
		Field Visit	**Reheat Coils** - Confirm reheat coil size, if req	A	QA	
		Field Visit	**Reheat Coils** - Confirm reheat coil in piping properly	A	QA	QA
		Field Visit	**Sensors** - Confirm discharge temp sensor provided, if req	A	QA	QA
		Field Visit	Confirm hangers have provisions for vibration isolation	A	QA	QA
		Field Visit	**Size** - Confirm box size matches schedule req	A	QA	QA
	DX VAV Units	Submittal Process	**Finish** - If indicated in ESR Section D30, verify anti-corrosion coating provided is immersion applied, baked phenolic, or other approved coating. Field applied coatings not acceptable.	A	QA	—
		Submittal Process/ Field Visit	**Direct expansion equipment** - Verify is specifically designed and manufactured for VAV applications	A	RA/ QA	—
		Submittal Process/ Field Visit	**Equipment** - Verify from the same manufacturer (central air handling units, VAV boxes/ zone dampers, and zone controls)	A	RA/ QA	—
		Field Visit	**Evaporator coils** - Verify airflow through evaporator coils is not modulated	A	QA	—
		Field Visit	**Zone control damper units** - Verify duct mounted zone control damper units provided with integral control box designed for use with DX VAV packaged systems	A	QA	—
		Submittal Process/ Field Visit	**Air diffusers** - Verify self-modulating air diffusers are not used	A	RA/ QA	—
	Condensing Units	Submittal Process/ Field Visit	**Finish** - If indicated in ESR Section D30, verify anti-corrosion coating provided is immersion applied, baked phenolic, or other approved coating. Field applied coatings not acceptable.	A	RA/ QA	—
d)		Submittal Process	**Air conditioner** - Verify air-cooled, split system air conditioner provided with ducted air distribution	A	QA	—

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Equipment & Components (continued)		Submittal Process	**Construction and rating** - Verify units are factory assembled, designed, tested, and rated in accordance with ARI 210/ 240 or ARI 340/ 360	A	QA	—
		Submittal Process/ Field Visit	**Clearance** - Verify manufacturer's minimum recommended clearance around condensing units is provided	A	RA/ QA	QA
		Field Visit	**Refrigerant piping size** - Verify is per manufacturer's recommendations	A	QA	—
	Heat Pumps - Ground Source	Submittal Process/ Field Visit	**Finish** - If indicated in ESR Section D30, verify anti-corrosion coating provided is immersion applied, baked phenolic, or other approved coating. Field applied coatings not acceptable.	A	RA/ QA	—
		Submittal Process	**Construction and rating** - Verify units are factory assembled, designed, tested, and rated in accordance with ARI 330	A	QA	—
		Submittal Process	**Heat exchanger** - Verify connected to heat exchanger by closed loop ground source vertical well field	A	RA	—
		Submittal Process/ Field Visit	**Well field** - Verify design and installation of each well field comply with IGSHPA and ASHRAE standards	A	RA/ QA	—
	Heat Pumps - Water Source	Submittal Process/ Field Visit	**Finish** - If indicated in ESR Section D30, verify anti-corrosion coating provided is immersion applied, baked phenolic, or other approved coating. Field applied coatings not acceptable.	A	RA/ QA	—
		Submittal Process	**Construction and rating** - Verify units are factory assembled, designed, tested, and rated in accordance with ARI 210/ 240 or ARI 340/ 360	A	QA	—
	Heat Pumps - Air to Air	Submittal Process/ Field Visit	**Finish** - If indicated in ESR Section D30, verify anti-corrosion coating provided is immersion applied, baked phenolic, or other approved coating. Field applied coatings not acceptable.	A	RA/ QA	—
		Submittal Process	**Heat pumps** - Verify air-cooled, split system heat pumps provided with ducted air distribution	A	RA/ QA	—
		Submittal Process	**Construction and rating** - Verify units are factory assembled, designed, tested, and rated in accordance with ARI 210/ 240 or ARI 340/ 360	A	QA	QA
		Field Visit	**Clearance** - Verify manufacturer's minimum recommended clearance around condensing units is provided	A	QA	—
		Field Visit	**Refrigerant piping size** - Verify is per manufacturer's recommendations	A	QA	QA
		Field Visit	**Insulation** - Verify provided for refrigerant piping suction lines and condensate drain	A	QA	—
	Condensate Return Units	Submittal Process/ Field Visit	Verify has floor-mounted receiver and duplex pump unit	A	RA/ QA	—

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Equipment & Components (continued)	**Equipment Thermal Insulation**	Submittal Process/ Field Visit	**Insulation** - Verify insulation provided for hot and chilled water pumps and equipment as suitable for the temperature and service fit as closely as possible to equipment. May be rigid block, semi-rigid board, or flexible unicellular insulation.	A	RA/ QA	QA
			Vapor retarder - Verify provided for chilled water applications	A	QA	—
	Auxilliary Equipment	Submittal Process/ Field Visit	**Steam-to-hot-water converter** - Verify provided as required for application	A	RA/ QA	—
		Submittal Process	**Heat exchangers** - Verify factory assembled u-tube units provided constructed in accordance with ASME BPVC for steam or hot water. For hot water, plate type heat exchangers may be provided.	A	RA	—
	Furnaces	Submittal Process/ Field Visit	**Construction** - Confirm provided furnace is UL-listed, factory assembled, self-contained, and forced circulation	A	RA/ QA	QA
		Submittal Process/ Field Visit	**Electronic ignition system** - Verify provided	A	RA/ QA	—
		Submittal Process/ Field Visit	**Gas furnace rating** - Confirm unit is design certified by AGA and GAMA efficiency rating certified for gas furnaces.	A	RA/ QA	—
		Submittal Process/ Field Visit	**Oil furnace rating** - Confirm unit meets requirements for NFPA 31 for oil furnaces.	A	RA/ QA	—
		Submittal Process/ Field Visit	**Cooling coil** - Verify provided, if necessary	A	RA/ QA	—
	Unit Ventilators	Submittal Process/ Field Visit	Verify unit is a factory assembled unit ventilator capable of up to 100% OA ventilation and UL-Listed	A	RA/ QA	—
	Unit Heaters	Submittal Process/ Field Visit	See D302004 for gas fired unit heaters	A	RA/ QA	—
	Unit Heaters-Steam	Submittal Process/ Field Visit	Verify provided is UL-Listed and factory assembled	A	RA/ QA	—
	Unit Heaters - Hot Water	Submittal Process/ Field Visit	Verify provided is UL-Listed and factory assembled	A	RA/ QA	—
	Unit Heaters - Cabinet	Submittal Process/ Field Visit	Verify provided is UL-Listed and factory assembled	A	RA/ QA	—

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
	Fuel-Fired Unit Heaters - Gas	Submittal Process/ Field Visit	Verify meets requirements for ANSI Z83.8 and AGA label	A	RA/ QA	—
		Submittal Process/ Field Visit	**Discharge louver** - Verify each heater equipped with individually adjustable package discharge louver	A	RA/ QA	QA
		Submittal Process/ Field Visit	**Thermostat** - Verify provided	A	RA/ QA	QA
	Fuel-Fired Unit Heaters - Infrared	Submittal Process/ Field Visit	Verify meets requirements for ANSI Z83.8 and AGA label	A	RA/ QA	—
	Unit Heaters - Electric	Submittal Process/ Field Visit	Verify provided are factory assembled, UL-1025	A	RA/ QA	—
	Heaters - Baseboard	Submittal Process/ Field Visit	Verify provided are factory assembled, UL-1042	A	RA/ QA	—
	Heaters - Wall	Submittal Process/ Field Visit	Verify provided are factory assembled, UL-1025, cabinet heaters	A	RA/ QA	—
	Heaters - Infrared	Submittal Process/ Field Visit	Verify provided are factory assembled, UL-Listed and labeled heaters	A	RA/ QA	—
	Fin Tube Radiators & Convectors	Submittal Process	Verify fin tube radiators and convectors provided with copper tubes and aluminum fins	A	RA	—
		Submittal Process	**Control Valves -** Verify control valves provided are normally open, spring return	A	RA/ QA	QA
	Duct Heater	Submittal Process/ Field Visit	Verify provided is factory assembled, UL-Listed heater	A	RA/ QA	—
		Field Visit	Verify adequate duct length is provided per manufacturer's recommendations upstream & downstream	A	QA	—
		Submittal Process/ Field Visit	Verify control cabinet and heating coil provided	A	RA/ QA	—
	Pumps - ALL	Submittal Process/ Field Visit	Verify provided are centrifugal circulating pumps with motor, motor starter, and motor enclosure conforming to the appropriate NEMA standards	A	RA/ QA	—
		Field Visit	**Insulation -** Verify pumps used for hot service and chilled water service are insulated	A	QA	QA

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Equipment & Components (continued)	**Pumps - Base-mounted**	Field Visit	Confirm size and nameplate data matches schedule req	A	QA	QA
		Field Visit	Verify voltage service matches nameplate	A	QA	QA
		Field Visit	Verify provided are single-stage end suction pumps suitable for chilled, condenser, and hot water heating systems	A	QA	QA
		Field Visit	**Isolation Base -** Confirm isolation base is provided where req	A	QA	QA
		Field Visit	**Insulation -** Confirm insulation enclosure is provided where req	A	QA	QA
		Field Visit	Confirm pressure taps, gages, and shutoffs have been provided in the specified locations	A	QA	QA
		Field Visit	**Balancing Valves -** Confirm the balancing valves have been provided in accordance with manufacturers recommendations and/or in accordance with the appropriate contract document detail	A	QA	QA
		Field Visit	**Balancing Valves -** Confirm balancing valves provided with proper clearances	A	QA	QA
		Field Visit	**Rotation -** Verify rotation direction is correct	A	QA	QA
		Field Visit	**Suction diffusers -** Verify suction diffusers provided on base-mounted pumps	A	QA	QA
	Pumps - In-line	Field Visit	**Location -** Confirm location is correct(ie: in accordance with the contract documents)	A	QA	QA
		Field Visit	Verify constructed of manufacturer's standard materials suitable for chilled, condenser, and hot water heating systems	A	QA	QA
		Field Visit	Confirm voltage provided is correct	A	QA	QA
		Field Visit	**Valve Arrangement -** Confirm valve arrangement around the pump is correct	A	QA	QA
		Field Visit	**Balancing Valve -** Confirm balancing valve has been provided in accordance with the contract documents, if req	A	QA	QA
		Field Visit	**Balancing Valve -** Confirm balancing valves provided with proper clearances	A	QA	QA
	Diffusers, Registers, & Grilles	Field Visit	Confirm location, size, and type have been provided in accordance with the contract documents	A	QA	QA
		Field Visit	**Dampers -** Confirm branch balancing dampers have been provided and dampers, if any, provided with the air device are in the wide open position	A	QA	QA
		Field Visit	**Finish** - Verify are factory-finished	A	QA	—
		Field Visit	**Exterior and exposed edges** - Verify are rolled, or otherwise stiffened and rounded	A	QA	—
	Pipe Sleeves	Field Visit	Verify pipe sleeves provided at each wall and floor penetration	A	QA	—
		Field Visit	Verify sleeves are of a material suitable to protect the carrier pipe (2 pipe sizes larger) and sealed with an appropriate flexible material	A	QA	—

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Equipment & Components (continued)		Submittal Process/ Field Visit	**Fire Stopping -** In fire rated walls, verify fire stopping provided inaccordance with IBC	A	RA/ QA	—
	Piping Identification	Field Visit	Verify piping provided with identification labels or stencil names or code letters for piping systems in clearly visible letters and symbols	A	QA	—
		Field Visit	Verify arrow-shaped markings provided to indicate direction of flow	A	QA	QA
	Piping - Condensate Drain	Submittal Process/ Field Visit	Verify condensate drain piping provided is ASTM B 88, Type M or L, hard drawn copper	A	RA/ QA	—
	Piping	Field Visit	**Flushing -** Confirm/ witness pipe flushing (make sure water is clear prior to putting final chemicals into water system)	V	W	—
		Field Visit	**Strainers -** Confirm start-up strainer has been removed from **all** strainers (hang at location)	A	QA	—
		Field Visit	**Air Vents -** Confirm air vents are at specified locations and are auto type, if req	A	QA	QA
		Submittal Process/ Field Visit	**Pressure Relief Valves -** Confirm pressure relief valves are sized properly and installed where specified	A	RA/ QA	QA
		Field Visit	Confirm make-up water pressure setting is sufficient for facility (adjust if req for pressure req at highest point	A	QA	QA
		Field Visit	**Expansion Tanks -** Where diaphragm expansion tanks are provided, confirm tank pressure is set in accordance with nameplate	A	QA	QA
		Field Visit	Confirm valve arrangements for each unit coil are as specified on the contract documents	A	QA	QA
		Field Visit	Confirm all valve clearance req's, manufacturer, and/or contract have been adhered to	A	QA	QA
		Field Visit	**Layout -** Confirm piping layout conforms to the contract documents (physically walk all pipe runs to make sure there are no cross connections)	A	QA	QA
		Field Visit	Confirm traps have been provided on condensate lines per the contract documents	A	QA	
		Field Visit	Confirm slope of condensate lines meets spec req	A	QA	
		Field Visit	**Supports -** Confirm piping supported properly (ie: hangers, saddles, seismic (if req))	A	QA	QA
		Field Visit	**Insulation -** Confirm pipe insulated with specified insulation and vapor barrier is intact	A	QA	QA
		Submittal Process/ Field Visit	**Fittings -** Confirm dialectric fittings have been provided where piping of dissimilar metals connect	A	RA/ QA	—
		Field Visit	Confirm condensate piping from equip has been run to floor drains, if req	A	QA	QA
		Field Visit	**Identification -** Confirm piping is marked properly with water type and direction of flow	A	QA	QA
		Field Visit	Confirm provisions have been made in the piping arrangement at each coil for isolation of flow and ease of coil removal	A	QA	QA

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Components (continued)		Field Visit	Confirm steam piping relief valve has been piped to the exterior of the building in a safe location to personnel	A	QA	QA
		Field Visit	Confirm hazard warning and/or hot surface signage is in place at steam piping, equip. (This also applies to hot water systems)	A	QA	—
		Field Visit	**Flow Meters -** Confirm location of flow meters meets factory req for straight, unobstructed inlet and outlet piping	A	QA	QA
	Chillers	Field Visit	**Leaving Water Temp -** Confirm the leaving chilled water temp is below temp specified for terminal equip to compensate for pump heat gain (approx 1.8F/1.0C) (chiller leaving should **never** be same as temp req at terminal unit)	A	QA	QA
		Submittal Process/ Field Visit	Confirm piping/valve arrangement matches contract documents and balancing valve and flow monitoring device have been provided in accordance with manufacturers req and/or detail	A	RA/ QA	QA
		Submittal Process/ Field Visit	**Decoupler -** Confirm decoupler leg is tied into chilled return piping before entering chilled water return header (for multiple chillers)	A	RA/ QA	QA
		Field Visit	Confirm piping arrangement has allotment for access to the cooling and condensing bundles	A	QA	QA
		Field Visit	**Flow Switch -** Confirm flow switch has been provided to protect the chiller from low or lack of flow	A	QA	QA
		Submittal Process/ Field Visit	Confirm BACNET compatable (if req in contract docs) and that the connection has been made to the DDC control system	A	RA/ QA	QA
	Chiller Systems - Closed Circuit Coolers	Submittal Process	**Construction and rating** - Confirm provided is factory assembled conforming to NFPA 214	A	RA	—
		Submittal Process	**Fire hazard rating** - Verify fire hazard rating for plastic impregnated materials does not exceed 25	A	RA	—
		Submittal Process	**Certification** - Verify Cooling Technology Institute 201 certification of tower capability and performance is provided	A	RA	—
		Submittal Process	**Cooler performance** - Verify meets or exceeds that listed in ASHRAE 90.1	A	RA	—
		Submittal Process/ Field Visit	**Hardware** - Verify stainless steel hardware provided	A	RA/ QA	—
		Submittal Process	**Vibration cutout switch** - Verify interlocked with fan motor	A	RA	—
		Submittal Process	**Fan motors** - Verify 2-speed or adjustable frequency drive fan motors provided	A	RA	—
		Field Visit	**Safety** - Verify OSHA safety requirements for stairs and handrails are met	A	QA	—

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Equipment &	**Chiller Systems - Water Cooled Chillers**	Submittal Process	**Construction and rating** - Verify self-contained chiller provided meeting requirements of ARI 550/590-98	A	RA	—
		Field Visit	**Control panel** - Verify provided with manufacturer's standard controls and protection circuits	A	QA	—
		Submittal Process/ Field Visit	**DDC system** - If DDC system required in project, verify control interface provided for remote monitoring of chiller's operating parameters, functions, and alarms from DDC control system central workstation	A	RA/ QA	QA
		Submittal Process	**Automatic capacity-reduction system** - Verify provided for stable operation from 100 to 10 percent of full load capacity	A	RA	—
	Chiller Systems - Air Cooled	Submittal Process	**Construction and rating** - Verify provided air-cooled chillers are type indicated in Project Program and meet requirements of ARI 550/590-98	A	RA	—
		Submittal Process	**Control panel** - Verify provided with manufacturer's standard controls and protection circuits	A	RA	—
		Submittal Process/ Field Visit	**DDC System** - If DDC system required in project, verify control interface provided for remote monitoring of chiller's operating parameters, functions, and alarms from DDC control system central workstation	A	RA/ QA	QA
		Submittal Process	**Reciprocating chillers** - Verify minimum of four stages of unloading provided at 25% per stage minimum	A	RA	—
		Submittal Process	**Reciprocating chillers** - Verify provided with hot gas bypass	A	RA	—
		Submittal Process	**Head pressure control** - Verify provided for cold temperature operation	A	RA	—
		Submittal Process/ Field Visit	**Freeze protection** - Verify provided for chiller and piping	A	RA/ QA	QA
		Submittal Process/ Field Visit	**Condenser coils** - Verify provided are copper tube with aluminum fins unless specified otherwise	A	RA/ QA	QA
		Submittal Process/ Field Visit	**Condenser coils** - If condenser coil coatings indicated in ESR Section D30, verify provided with copper tube/ copper fin construction or immersion applied, baked phenolic, or other approved coating. Field applied coatings not acceptable.	A	RA/ QA	QA
		Submittal Process/ Field Visit	**Condenser coils** - Verify condenser coils provided with manufacturer's optional louvered covers or hail guards for protection against vandalism, debris, or hail	A	RA/ QA	—
	Cooling Tower	Field Visit	Confirm tower size HP, voltage per contract docs	A	QA	QA
		Submittal Process/ Field Visit	Confirm tower constructed in accordance with specs (ie: galvanized, stainless steel, fiber-glass)	A	RA/ QA	QA
		Submittal Process/ Field Visit	**Sump** - Confirm height of cooling tower sump is above intake of condenser water pumps (min of 3 to 4 feet)	A	RA/ QA	QA

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Equipment & Components (continued)		Submittal Process/ Field Visit	Confirm return line to tower has trap leg below well unless the by-pass is piped directly to cooling tower well	A	RA/ QA	QA
		Field Visit	**Overflow -** Confirm tower well overflow is low enough to prevent the well from overflowing	A	QA	QA
		Field Visit	**Make-up Float -** Confirm tower well make-up float setting shuts of prior to water level reaching the top of the overflow	A	QA	QA
		Field Visit	**Fan Rotation -** Confirm tower fan rotation is correct	A	QA	QA
		Field Visit	**Well Heater -** Confirm tower well heater is installed, if req	A	QA	QA
		Field Visit	**Shut-off Valve -** Confirm tower shut-off valve has been installed in proper location, if req	A	QA	QA
		Field Visit	**Fan Discharge -** Confirm tower fan discharge is unobstructed from above	A	QA	QA
		Field Visit	**Heat Trace -** Confirm tower piping above grade is heat traced, if req	A	QA	QA
		Submittal Process	**Construction and rating** - Confirm provided is factory assembled conforming to NFPA 214	A	RA	—
		Submittal Process	**Fire hazard rating** - Confirm fire hazard rating for plastic impregnated materials does not exceed 25	A	RA	—
		Submittal Process	**Certification** - Verify Cooling Technology Institute 201 certification of tower capability and performance is provided	A	RA	—
		Submittal Process	**Cooling tower performance** - Verify meets or exceeds that listed in ASHRAE 90.1	A	RA	—
		Submittal Process/ Field Visit	**Construction** - Verify construction is as indicated in ESR Section D30 with fill material of PVC formed sheets	A	RA/ QA	—
		Submittal Process/ Field Visit	**Hardware** - Verify stainless steel hardware provided	A	RA/ QA	—
		Submittal Process	**Vibration cutout switch** - Verify interlocked with fan motor	A	QA	—
		Submittal Process	**Fan motors** - Verify 2-speed or adjustable frequency drive fan motors provided	A	QA	—
		Submittal Process/ Field Visit	**Work platforms** - Verify provided at all locations in tower that require periodic maintenance	A	RA/ QA	
		Submittal Process/ Field Visit	**Isolation valves** - For multi-cell installations, verify isolation valves provided on inlets and outlets of each cell	A	RA/ QA	—
	Fan Coil Units	Field Visit	Confirm size and location in accordance with contract docs	A	QA	QA
		Field Visit	**Filter Access -** Confirm filter accessibility	A	QA	QA
		Field Visit	Confirm vibration isolation provided for on hangers and at ductwork connection	A	QA	QA
		Field Visit	Confirm installation of auxilliary drain pan (if req) along with respective condensate drain piping	A	QA	QA

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Equipment & Components (continued)		Field Visit	Confirm valves arranged properly including the straight pipe diameters req before and after the balancing valve	A	QA	QA
		Submittal Process/ Field Visit	**Speed Controller -** Confirm speed controller has been provided, if req in contract docs	A	RA/ QA	QA
		Field Visit	**Fan Access -** Confirm fan access is accessible by maintenance staff	A	QA	QA
		Field Visit	Confirm unit tagging has been provided	A	QA	—
		Field Visit	Confirm operational	A	QA	—
		Submittal Process/ Field Visit	**Sensors -** Confirm leaving air temp sensor has been provided	A	RA/ QA	QA
		Submittal Process	Verify provided are UL-Listed, factory assembled and tested fan coils, ARI 440, and ARI certified	A	QA	—
	Thru Wall Classroom Terminal Units	Field Visit	Confirm size and location in accordance with contract docs	A	QA	QA
		Field Visit	Confirm operational	A	QA	—
		Field Visit	Confirm piping arrangement meets contract docs req's	A	QA	QA
	Packaged Thru Wall Units	Submittal Process	Verify provided is factory assembled air conditioner or heat pump and rated in accordance with ARI 310 or ARI 380 and ARI certified	A	RA	—
		Submittal Process	Verify provided unit includes heat and operates under the standard unit controls (Not sure if worded correctly, D305006 1.4)	A	RA	—
		Submittal Process	**Wall Sleeve -** Verify unit designed to allow ease of maintenance by use of a wall sleeve	A	RA	QA
		Submittal Process/ Field Visit	**Condensate Removal -** Verify provided unit includes internal condensate removal (condensate shall not be externally drained)	A	RA/ QA	QA
	Room Air Conditioners	Submittal Process	Verify provided is factory assembled air conditioner or heat pump and rated in accordance with AHAM RAC-1	A	RA	—
		Submittal Process/ Field Visit	Verify auxiliary electric heat included and operates under the standard unit controls	A	RA/ QA	QA
		Submittal Process	Verify provided unit is AHAM certified or listed in AHAM DCRAC	A	RA	—
	Computer Room Units	Field Visit	Confirm size and location	A	QA	QA
		Field Visit	Confirm all features have been provided	A	QA	QA
		Field Visit	Confirm water connection to humidifier	A	QA	QA
		Field Visit	**Fan Rotation -** Confirm fan rotation	A	QA	QA
		Submittal Process	If computer room unit req'd, verify DOR utilized UFGS Spec section 23 81 23.00 20 (Computer Room Air Conditioning Units) for the project spec and submitted the edited spec section as part of the design submittal for the project	A	RA	—
	Boilers	Field Visit	Confirm size and location	A	QA	—
		Field Visit	**Stack -** Confirm stack material and arrangement meet contract doc req's	A	QA	QA

KEY = A - Approve, R - Review, W - Witness, RA - Receipt Acknowledge, S - Surveilance Review, V- Verification and Testing, C - Copy, QA - Quality Assurance

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
		Field Visit	**Stack -** Confirm stack above roof does not touch roof curb and guy wires have been provided	A	QA	QA
		Field Visit	**Stack -** Confirm stack type is per contract docs and the height above the parapet and/or building meets code req's	A	QA	QA
		Field Visit	Confirm fuel train meets contract docs and code req's with no leaks	A	QA	QA
		Submittal Process/ Field Visit	**Make-up Air -** Confirm adequate make-up air for the boiler(s) has been provided under positive pressure to the room	A	RA/ QA	QA
		Field Visit	**Relief Valve -** Confirm relief valve setting and operation	A	QA	—
		Field Visit	**DDC -** Confirm boilers have been interfaced with the DDC system	A	QA	QA
		Field Visit	Confirm pump/piping arrangement meets contract docs including circulation pump, if req	A	QA	QA
		Submittal Process/ Field Visit	Confirm boiler sequencing panel has been provided by the boiler manufacturer, if req in the contract docs	A	RA/ QA	QA
	Boilers - Hot Water	Submittal Process	**Load capacity** - Verify boiler type provided meets building load capacity as indicated in ESR Section D30, if required	A	RA	—
		Submittal Process/ Field Visit	**Construction and rating** - Verify boiler designed, tested, and installed per ASME CSD-1 (Controls and Safety Devices) and ASME BPVC (Boiler and Pressure Vessel Code)	A	RA/ QA	—
		Submittal Process/ Field Visit	**Construction** - Verify boiler meets requirements of UL 795, ANSI Z83.3, and ASME CSD	A	RA/ QA	—
		Submittal Process/ Field Visit	**Burners** - Confirm provided are make, model, and type certified and approved by manufacturer of provided boiler	A	RA/ QA	—
		Submittal Process/ Field Visit	Verify burner controls and flame safety equipment conform to either ASME CSD-1 or NFPA 58 as dictated by input	A	RA/ QA	—
		Submittal Process/ Field Visit	**Boiler controls** - Verify are mounted on a single control panel mounted on the burner or separate from the burner (includes operating switches, indicating lights, gages, alarms, motor starters, fuses, and circuit elements of the control system). If separa	A	RA/ QA	—
		Submittal Process/ Field Visit	**Trim** - Verify boiler trim complies with ASME BPVC SEC IV, ASME CSD-1, and additional appurtenances as specified herein	A	RA/ QA	—
		Submittal Process/ Field Visit	**Pressure gages** - Confirm provided have scale equivalent to 1.5 times the outlet water pressure on supply water piping and return water piping	A	RA/ QA	—
		Submittal Process/ Field Visit	**Thermometers - Piping** - Confirm provided have scale equivalent to 1.5 times the outlet water temperature on supply water piping and return water piping	A	RA/ QA	—
		Field Visit	**Drain valve** - Verify provided and piped to floor drain	A	QA	—

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Equipment & Components (continued)		Submittal Process/ Field Visit	**Air vent valve** - Verify provided with screwed connection, stainless steel disk, and stainless steel seats to vent entrapped air	A	RA/ QA	—
		Submittal Process	**Boiler stack** - Verify provided boiler stack insulated in accordance with manufacturer's recommendations and conform to NFPA 211, or pre-manufactured multi-wall stacks provided complying with NFPA 54 or NFPA 58 and UL-listed	A	RA	—
		Submittal Process/ Field Visit	**Thermometer - Flue gas** - Verify provided and mounted in flue gas outlet	A	RA/ QA	—
		Field Visit	**Cleaning** - Verify boiler(s) cleaned in accordance with ASME Boiler and Pressure Vessel Code and manufacturer's recommendations prior to startup	A	QA	—
		Field Visit	**Testing** - Verify services are furnished of an engineer or technician approved by the boiler manufacturer for installation, startup, and operational and safety testing	V	W	W
		Field Visit	**Testing** - Verify boiler demonstrates proper operability of combustion control, flame safeguard control, and safety interlocks	V	W	W
	Boilers - Steam		**Confirm meets same requirements specified for hot water boilers except as follows:**			
		Submittal Process/ Field Visit	**Pressure gage** - Confirm provided have scale equivalent to 1.5 times the outlet water pressure on boiler feedwater supply piping and condensate return water piping	A	RA/ QA	—
		Submittal Process/ Field Visit	**Pressure gage** - Confirm provided boiler steam pressure gage has scale equivalent to 1.5 times the boiler rated working pressure	A	RA/ QA	—
		Submittal Process/ Field Visit	**Thermometers - Piping** - Confirm provided have scale equivalent to 1.5 times the outlet water temperature on boiler feedwater piping and return water piping	A	RA/ QA	—
	Insulation - Condensate Drain	Field Visit	**Insulation** - Verify condensate drain piping insulated with flexible cellular insulation	A	QA	—
	Insulation	Field Visit	Verify all ductwork provided with external thermal insulation	A	QA	—

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Equipment & Components (continued)		Field Visit	Verify all ductwork in concelaed spaces insulated with blanket flexible mineral fiber	A	QA	—
		Field Visit	Verify ductwork in mechanical Rooms and exposed locations insulated with rigid mineral fiber insulation	A	QA	—
		Field Visit	Verify insulation provided with factory applied all-purpose jacket with integral vapor retarder	A	QA	—
		Field Visit	In exposed locations, verify jacket provided with white surface suitable for painting	A	QA	—
		Submittal Process/ Field Visit	Verify flame spread/smoke developed rating for all insulation does not exceed 25/ 50	A	RA/ QA	—
		Submittal Process	Verify minimum insulation thickness does not violate minimum required by ASHRAE 90.1	A	RA	—
		Field Visit	Verify the backs of all supply air diffusers insulated with blanket flexible mineral fiber insulation	A	QA	QA
	VFDs	Submittal Process/ Field Visit	Verify are factory-assembled VFD drive control systems for variable speed control	A	RA/ QA	QA
		Submittal Process/ Field Visit	Verify all AHU and pump VFD's are from same manufacturer	A	RA/ QA	QA
		Submittal Process/ Field Visit	Verify each VFD provided includes motor starter, motor disconnects, and controls as required for a complete system	A	RA/ QA	QA
		Submittal Process/ Field Visit	Verify VFD units provided are UL-Listed and comply with the National Electric Code	A	RA/ QA	—
		Submittal Process/ Field Visit	Verify the following accessories were provided: Disconnect switch, Control circuit transformer with primary and secondary fuses, Manual bypass, System hand-off-auto switch with provisions for remote start/stop of the system, System initialized light, Run	A	RA/ QA	QA
	Air Separators	Submittal Process/ Field Visit	**For hot and chilled water** - Verify provided are ASME rated air separators with tangential inlet and outlet connections and automatic air vent	A	RA/ QA	—
	Solids Separators	Submittal Process/ Field Visit	Verify provided are centrifugal solids separators with automatic drain in open systems.	A	RA/ QA	—
	Expansion Tanks	Submittal Process/ Field Visit	For hot and chilled water - Verify provided are ASME rated expansion tanks with polypropylene or butyl diaphragm or compression tanks as indicated in UFC 3-400-10N.	A	RA/ QA	—
	Make-Up Water Station	Field Visit	Verify station consists of a water pressure-reducing valve, filter, and relief valve in the make-up water line to the chilled and hot water systems to maintain the operating pressure	A	QA	—
		Field Visit	Verify a 20mm (3/4 inch) globe valve by-pass provided around the pressure reducing station	A	QA	—
		Field Visit	Verify a reduced pressure backflow preventer provided upstream of the by-pass	A	QA	—

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System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
ent & Components (continued)	**Glycol Make-Up Station**	Submittal Process/ Field Visit	If required, verify a glycol make-up system provided to maintain system proper operating mixture	A	RA/ QA	—
	Chemical Treatment	Submittal Process/ Field Visit	If required, verify chilled and hot water systems provided with automatic chemical treatment system for the control of pH, scale formation, and corrosion inhibition	A	RA/ QA	—
		Field Visit	Verify shot-type feeders provided for manual chemical feed	A	QA	—
		Submittal Process	Verify feeders rated for use with pressures up to 900 kPa (130 PSI) (gage)	A	RA	—
		Submittal Process/ Field Visit	Verify condenser water systems provided with automatic chemical treatment systems that monitor conductivity, pH, etc, and provide for water metering and bleed-off	A	RA/ QA	—
		Submittal Process/ Field Visit	Verify chemicals provided are in accordance with EPA and equipment manufacturer's recommendations	A	RA/ QA	—
	System Flushing	Field Visit	Verify hydronic systems flushed thoroughly prior to system startup	A	QA	—
	Heat Tape	Submittal Process/ Field Visit	Verify heat tape provided is UL-Listed, and self-regulating	A	RA/ QA	—
		Submittal Process/ Field Visit	Verify heat tape provided on piping subject to freezing	A	RA/ QA	QA
	Terminal & package Units	Submittal Process/ Field Visit	Where required in ESR Section D30, verify anti-corrosion coating provided on the casing and both the condenser and evaporater coils to protect against salt air damage	A	RA/ QA	—
		Submittal Process/ Field Visit	Verify anti-corrosion coating is immersion applied, baked phenolic or other approved coating (Field applied coatings are not acceptable)	A	RA/ QA	—
	Seismic Design	Submittal Process	Verify provided inaccordance with UFC 3-400-10N, Mechanical Engineering	A	RA	—
	Energy Recovery Wheel (Enthalpy Wheel)	Field Visit	Verify provided is a total energy (enthalpy) type energy recovery wheel (heat wheel)	A	QA	—
		Submittal Process/ Field Visit	**Media -** Verify media is aluminum or a lightweight polymer coated with a corrosion resistance finish (Etched or oxidized surfaces are not acceptable)	A	RA/ QA	—
		Submittal Process/ Field Visit	Verify heat transfer surfaces are coated with a non-migrating (permanently bonded) absorbent specifically developed for the selective transfer of water vapor	A	RA/ QA	—
		Submittal Process	Verify equal sensible and latent recovery efficiencies are documented through a certification program conducted per ASHRAE 84 and ARI 1060	A	RA	—

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Equipme		Submittal Process/ Field Visit	Verify energy recovery wheel provided with insulating housing of double wall construction, rotor seals specifically designed to limit cross-contamination, and a rotation detector	A	RA/ QA	—
		Field Visit	Verify the rotation detector alarms the HVAC control system if rotation stops	A	QA	—
		Field Visit	**Filter Access -** Verify filter sections are readily accessible for maintenance	A	QA	QA
	Heat Pipes	Submittal Process	Verify provided are factory fabricated, assembled and tested heat pipes with counter-flow arrangement	A	RA	—
		Submittal Process	Verify are provided with hermitically sealed, seamless aluminum tube cores with extended surfaces	A	RA	—
		Submittal Process	Verify heat exchanger frame constructed of not less than 16-gage galvanized steel and fitted with intermediate tube supports and flange connections	A	RA	—
		Submittal Process	Verify tube end covers and a partition of galvanized steel provided to separate exhaust and supply air streams without cross-contamination	A	RA	—
		Submittal Process	**Refrigerant -** Verify refrigerant used as the working fluid (Type I refrigerants are not allowed)	A	RA	—
	Exterior Piping Manholes	Submittal Process/ Field Visit	**Manholes -** Verify system manholes are constructed of reinforced, 206.8 bar (3000 psi) concrete. Verify manhole floor and sides are watertight and were made in one monolithic pour. Verify manhole top extends a minimum of 300 mm (6 inches) above grade. V	A	RA/ QA	—
		Submittal Process	Verify a sump pit and a vertical sump pump designed for an operating temperature design of 93 degrees C (195 degrees F) minimum are provided in each system manhole.	A	RA	—
		Submittal Process	**Sump Pump - Float Control -** Verify a 2-pole float control is provided for each manhole sump pump.	A	RA	—
	Exterior Piping Cathodic Protection	Field Visit	If underground steel piping is installed, verify a cathodic protection system is provided.	A	QA	—
		Submittal Process	If a cathodic protection system is provided, verify the system was designed by a National Association of Corrosion Engineers (NACE) certified Cathodic Protection Engineer and they supervised, inspected and tested the installation and performance of the ca	A	QA	QA
		Field Visit	Verify the test stations were post mounted and placed at the manhole or nearby building and test stations were provided at each end of each cathodically protected section.	A	QA	—
	DDC		Verify one of the following provided as directed in ESR Section D30			
		Submittal Process	A) Verify Direct Digital Controls (DDC) provided to comply with UFGS Section 23 09 54.00 20, Direct Digital Control Systems	A	RA	—

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Equipment & Components (continued)		Submittal Process	A) Verify DOR utilized UFGS Spec Section 23 09 54.00 20, Direct Digital Control Systems, for the project spec, and submitted the edited spec section as part of the design submittal for the project	A	RA	—
		Submittal Process/ Field Visit	B) Verify a partial DDC system provided that communicates with the existing DDC system	A	RA/ QA	—
		Submittal Process	B) Notwithstanding any other provisions of this contract, no other product will be acceptable other than that indicated in ESR Section D30	A	RA	—
		Submittal Process/ Field Visit	B) Verify the system has stand alone digital controllers, a communication network, and a workstation computer with control software (Pneumatic controllers and components are not acceptable)	A	RA/ QA	—
		Submittal Process	B) Verify all 120-volt wiring complies with NFPA 70	A	RA	—
		Submittal Process/ Field Visit	B) Verify all 24-volt wiring complies with the IMC and terminal device manufacturer's recommendations	A	RA/ QA	—
	DDC - Equipment Controllers	Submittal Process/ Field Visit	Verify DDC hardware are UL-916 rated	A	RA/ QA	—
		Submittal Process/ Field Visit	Verify controllers used in a distributed control manner	A	RA/ QA	QA
		Submittal Process/ Field Visit	Verify controllers are stand alone with an internal clock and modem	A	RA/ QA	QA
		Submittal Process	Verify the total number of I/O hardware points do not exceed 48 in any controller	A	RA	QA
		Submittal Process	Verify sufficient memory provided for each controller to support required control, communication, trends, alarms, and messages	A	RA	QA
		Submittal Process/ Field Visit	Verify communications ports provided for controller to controller, on-site interface, remote workstation interface, and telecommunications interface	A	RA/ QA	QA
	DDC - Electronic Controls	Submittal Process/ Field Visit	If required, verify programmable thermostats provided with built in keypads for scheduling of day and night temps with two setback periods per day	A	RA/ QA	QA
		Submittal Process/ Field Visit	Verify independent summer and winter programs provided	A	RA/ QA	QA
		Submittal Process/ Field Visit	Verify thermostats have temporary and manual override of schedule and battery backup	A	RA/ QA	QA
	All Submittals	Submittal Process	All equipment and controls hardware reviewed by A/E	A	RA	RA
	DALTS - Submittals	Submittal Process	TAB contractor qualifications & certification	RA	RA	A
		Submittal Process	DALT test equip with certification	RA	RA	A

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MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
		Submittal Proces	DALT test plan	RA	RA	A
		Submittal Proces	DALT tests report including plan drawing of duct to be tested and square foot calc for each section	RA	RA	A
	DALTS - Testing	Submittal Process	Ductwork to be DALT'd	RA	RA	A
		Field Visit	Testing	V	W	W
		Submittal Proces	Pre-final DALT report	RA	C	A
		Submittal Proces	Certified final DALT report	RA	C	A
	DALTS - Acceptance Testing	Field Visit	Quality assurance - Contracting officer DALT field checks	V	W	W
		Field Visit	Additional field checks	V	W	W
	TABS - Submittals	Submittal Process	TAB contractors qualifications & certification	RA	RA	A
		Submittal Process	Pre-TAB engineering report	RA	RA	A
		Submittal Process	*Discussion on TAB procedure	RA	RA	A
		Submittal Process	*Pre-requisite checklist	RA	RA	A
		Submittal Process	*Design review report	RA	RA	A
		Submittal Process	*Preliminary TAB test report	RA	RA	A
		Submittal Process	Certified TAB test report (Season 1)	RA	RA	A
		Submittal Process	Certified TAB test report (Season 2 (coil data))	RA	RA	A
	TABS - Pre-Test Checklist		**1) Variable Air Volume Series Boxes**			
			a) General			
		Field Visit	Louvers installed	V	W	—
		Field Visit	Manual dampers open and locked	V	W	—
		Field Visit	Automatic dampers set properly	V	W	—
		Field Visit	Housing construction leakage	V	W	—
		Field Visit	Access doors per plans & specs.	V	W	—
		Field Visit	Condensate drain piping & pan	V	W	—
		Field Visit	Free from dirt & debris	V	W	—
		Field Visit	Nameplate data clearly visible	V	W	—
			b) Filters			
		Field Visit	Type / size / number correct	V	W	—
		Field Visit	Clean	V	W	—
		Field Visit	Blank-off plates installed	V	W	—
		Field Visit	Frame leakage at a minimum	V	W	—
			c) Coils (Hydronic – Water / Steam)			
		Field Visit	Size & rows	V	W	—
		Field Visit	Fin spacing & condition	V	W	—
		Field Visit	Obstructions and/or debris	V	W	—
		Field Visit	Correct air flow direction	V	W	—
		Field Visit	Correct piping connections / flow	V	W	—

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
		Field Visit	Valves open & set	V	W	—
		Field Visit	Vents / traps installed correctly	V	W	—
		Field Visit	Provisions for TAB measurements	V	W	—
			d) Coils (Electric)			
		Field Visit	Size & construction	V	W	—
		Field Visit	Airflow direction	V	W	—
		Field Visit	Duct connections	V	W	—
		Field Visit	Safety switches	V	W	—
		Field Visit	Obstructions	V	W	—
		Field Visit	Free from debris	V	W	—
		Field Visit	Contractors & disconnect switches	V	W	—
		Field Visit	Electrical service & connections	V	W	—
		Field Visit	Nameplate data clearly visible	V	W	—
			e) Fans			
		Field Visit	Rotation	V	W	—
		Field Visit	Wheel clearance & balance	V	W	—
		Field Visit	Bearing & motor lubrication	V	W	—
		Field Visit	Drive alignment	V	W	—
		Field Visit	Belt tension	V	W	—
		Field Visit	Drive set screws tight	V	W	—
		Field Visit	Belt guards in place	V	W	—
		Field Visit	Flex duct connector alignment	V	W	—
		Field Visit	Proper unit / duct alignment	V	W	—
		Field Visit	Starters & disconnect switches	V	W	—
		Field Visit	Electrical service & connections	V	W	—
		Field Visit	Nameplate data clearly visible	V	W	—
			f) Vibration isolation			
		Field Visit	Springs & compression	V	W	—
		Field Visit	Base level & free	V	W	—
			2) DUCT SYSTEMS			
			a) General			
		Field Visit	Manual damper positioned & locked	V	W	—
		Field Visit	Damper adjustments accessible	V	W	—
		Field Visit	Access doors closed & tight	V	W	—
		Field Visit	Fire dampers open & accessible	V	W	—
		Field Visit	Terminal units open & set	V	W	—
		Field Visit	Registers/diffusers wide open & set	V	W	—
		Field Visit	Turning vanes in square elbows	V	W	—
		Field Visit	Provisions made for TAB tests	V	W	—
		Field Visit	System installed per plans & specs.	V	W	—
		Field Visit	All ductwork sealed as required	V	W	—
			b) Architectural			
		Field Visit	Windows installed & closed	V	W	—
		Field Visit	Doors closed as required	V	W	—
		Field Visit	Ceiling plenums installed/sealed	V	W	—
		Field Visit	Access doors closed & tight	V	W	—
		Field Visit	Air shafts/openings as required	V	W	—
			3) PUMPS			
			a) Motors			
		Field Visit	Rotation	V	W	—

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
System Acceptance (continued)		Field Visit	Lubrication	V	W	—
		Field Visit	Alignment	V	W	—
		Field Visit	Set screws tight	V	W	—
		Field Visit	Guards in place	V	W	—
		Field Visit	Tank level and controls	V	W	—
		Field Visit	Starters & disconnects	V	W	—
		Field Visit	Electrical service & connections	V	W	—
			b) Piping			
		Field Visit	Correct flow	V	W	—
		Field Visit	Correct connections	V	W	—
		Field Visit	Leakage	V	W	—
		Field Visit	Valves positioned & set	V	W	—
		Field Visit	Strainers clean	V	W	—
		Field Visit	Air Vented	V	W	—
		Field Visit	Flexible connectors installed	V	W	—
		Field Visit	Provisions made for TAB tests	V	W	—
		Field Visit	System water clean	V	W	—
			c) Bases			
		Field Visit	Vibration isolation	V	W	—
		Field Visit	Grouting (if required)	V	W	—
		Field Visit	Leveling	V	W	—
			4) HYDRONIC EQUIPMENT			
			a) Boilers			
		Field Visit	Operating controls & devices	V	W	—
		Field Visit	Safety controls & devices	V	W	—
		Field Visit	Lubrication of fans & pumps	V	W	—
		Field Visit	Draft controls & devices	V	W	—
		Field Visit	Piping controls & devices	V	W	—
		Field Visit	Valves set & open	V	W	—
		Field Visit	Water make-up provisions	V	W	—
		Field Visit	Blowdown provisions	V	W	—
		Field Visit	Electrical connections	V	W	—
		Field Visit	Nameplate data clearly visible	V	W	—
			b) Heat Exchangers			
		Field Visit	Correct flow & connections	V	W	—
		Field Visit	Valves open or set	V	W	—
		Field Visit	Air vents or steam traps	V	W	—
		Field Visit	Leakage	V	W	—
		Field Visit	Provisions made for TAB tests	V	W	—
		Field Visit	Nameplate data clearly visible	V	W	—
			c) Cooling Towers/Evaporative Condensers			
		Field Visit	Correct flow & connections	V	W	—
		Field Visit	Valves open or set	V	W	—
		Field Visit	Leakage	V	W	—
		Field Visit	Provisions made for TAB tests	V	W	—
		Field Visit	Sump water level	V	W	—
		Field Visit	Spray nozzles	V	W	—
		Field Visit	Fan/Pump rotation	V	W	—
		Field Visit	Motor/Fan lubrication	V	W	—
		Field Visit	Drives & alignment	V	W	—

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MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
System Acceptance (continued)		Field Visit	Guards in place	V	W	—
		Field Visit	Starters & disconnects	V	W	—
		Field Visit	Electrical connections	V	W	—
		Field Visit	Nameplate data clearly visible	V	W	—
			5) REFRIGERANT EQUIPMENT			
		Field Visit	Crankcase heaters energized	V	W	—
		Field Visit	Operating controls & devices	V	W	—
		Field Visit	Safety controls & devices	V	W	—
		Field Visit	Valves open	V	W	—
		Field Visit	Piping connections & flow	V	W	—
		Field Visit	Flexible connectors	V	W	—
		Field Visit	Oil level & lubrication	V	W	—
		Field Visit	Alignment & drives	V	W	—
		Field Visit	Guards in place	V	W	—
		Field Visit	Vibration isolation	V	W	—
		Field Visit	Starters/Contactors/Disconnects	V	W	—
		Field Visit	Electrical connections	V	W	—
		Field Visit	Nameplate data clearly visible	V	W	—
			6) HYDRONIC PIPING SYSTEM			
		Field Visit	Leak tested	V	W	—
		Field Visit	Fluid levels & make-up	V	W	—
		Field Visit	Relief or safety valves	V	W	—
		Field Visit	Expansion tanks & air vents	V	W	—
		Field Visit	Steam traps & connections	V	W	—
		Field Visit	Strainers clean	V	W	—
		Field Visit	Valves open & set	V	W	—
		Field Visit	Provisions made for TAB tests	V	W	—
		Field Visit	Systems installed per plans & specs.	V	W	—
			7) CONTROLS & CONTROL SYSTEMS			
		Field Visit	Data centers	V	W	—
		Field Visit	Outdoor/return Air/reset	V	W	—
		Field Visit	Economizer set & tested	V	W	—
		Field Visit	AHU Static pressure set	V	W	—
		Field Visit	Room controls calibrated	V	W	—
		Field Visit	VAV box regulators set to design	V	W	—
		Field Visit	VAV box P.E. switches set	V	W	—
		Field Visit	Proper end-of-line static pressure	V	W	—
		Field Visit	VAV box reheats tested	V	W	—
			8) OTHER CHECKS			
		Submittal Process	Appropriate contractors notified of TABS	A	RA	S
		Submittal Process	Preliminary data complete	A	RA	S
		Submittal Process	Test report forms prepared	S	RA	A

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
	TABS - Testing	Field Visit	TAB field work	V	W	
		Submittal Process	Preliminary procedures	RA	C	A
		Field Visit	TAB air distrbution systems	V	W	—
		Field Visit	TAB water distribution systems	V	W	—
		Field Visit	Sound measurement work	V	W	—
		Field Visit	TAB work on performance tests without seasonal limitations	V	W	—
		Field Visit	TAB work on performance tests with seasonal limitations	V	W	—
		Field Visit	Marking settings	V	W	—
		Field Visit	Marking of test ports	V	W	—
	TABS - Acceptance Testing	Field Visit	Quality assurance - Contracting officer TAB field checks	V	W	W
		Field Visit	Additional field checks	V	W	W
	ACATS - Submittals	Submittal Process	Controls contractor qualifications	RA	RA	A
		Submittal Process	Manufacturers field report	RA	RA	A
		Submittal Process	Performance verification test plan (PVT)	RA	RA	A
		Submittal Process	Pre-PVT checklist	RA	RA	A
		Submittal Process	Final certified PVT report (with all mods incorporated in as-builts)	RA	RA	A
	ACATS - Pre-PVT Checklist	Field Visit	Prior to conducting the PVT, thoroughly inspect the installed work with the Contractor's QC representative and the mechanical contractor using the following checklist. Submit the checklist with items checked off once verified. Provide a detailed explana	V	W	—
		Field Visit	a. Verify all required mechanical installation work is successfully completed, and all HVAC equipment is working correctly (or will be by the time the PVT is conducted).	V	W	—
		Field Visit	b. Verify HVAC motors operate below full-load amperage ratings.	V	W	—
		Field Visit	c. Verify all required control system components, wiring, and accessories are installed.	V	W	—
		Field Visit	d. Verify the installed control system architecture matches approved drawings.	V	W	—
		Field Visit	e. Verify all control circuits operate at the proper voltage and are free from grounds or faults.	V	W	—
		Field Visit	f. Verify all required surge protection is installed and functions correctly.	V	W	—
		Field Visit	g. Verify the A/C Power Table specified in "CONTROLS SYSTEM OPERATORS MANUALS" is accurate.	V	W	—

MECHANICAL ENGINEERING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	ME QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
System Acceptance (continued)		Field Visit	h. Verify all DDC network communications function properly, including uploading and downloading programming changes.	V	W	—
		Field Visit	i. Using the BACnet protocol analyzer (if provided or required in this specification), verify communications are error free.	V	W	—
		Field Visit	j. Verify each digital controller's programming is backed up.	V	W	—
		Field Visit	k. Verify all wiring, components, and panels are properly labeled.	V	W	—
		Field Visit	l. Verify all required points are programmed into devices.	V	W	—
		Field Visit	m. Verify all TAB work affecting controls is complete.	V	W	—
		Field Visit	n. Verify all valve and actuator zero and span adjustments are set properly.	V	W	—
		Field Visit	o. Verify all sensor readings are accurate and calibrated.	V	W	—
		Field Visit	p. Verify each control valve and actuator goes to normal position upon loss of power.	V	W	—
		Field Visit	q. Verify all control loops are tuned for smooth and stable operation. View trend data where applicable.	V	W	—
		Field Visit	r. Verify each controller works properly in stand-alone mode.	V	W	—
		Field Visit	s. Verify all safety controls and devices function properly, including interfaces with building fire alarm systems.	V	W	—
		Field Visit	t. Verify all electrical interlocks work properly.	V	W	—
		Field Visit	u. Verify all workstations, notebooks and maintenance personnel interface tools are delivered, all system and database software is installed, and graphic pages are created for each workstation and notebook. Notify the Government when phone lines or netw	V	W	—
		Field Visit	v. Verify the as-built (shop) control drawings are completed.	V	W	—
	ACATS - Testing	Field Visit	Field testing of components	V	W	—
		Field Visit	Field testing of programming	V	W	—
		Field Visit	Pre-performance verification testing	V	W	—
	ACATS - Acceptance Testing	Field Visit	Performance verification testing	V	W	W
		Field Visit	Performance verification re-resting	V	W	W

ROOFING ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	Roof QC / DOR (Ktr)	FEAD (SIOH)	FEC (PCAS)
Roofing	**Low Sloped Roofs**	Design Guidance	Post Award Kick Off Meeting		S	A
		Design Guidance	Verify Roof Design Assurance	A	R	S
		Submittal Process	Review Shop Drawings	A	S	S
		Submittal Process	Review Manufacturer's Product Data Sheets	A	S	S
		Submittal Process	Review Design Data (to include wind and fire resistance)	A	S	S
		Submittal Process	Review Test Reports	A	S	S
		Submittal Process	Review Certificates	A	S	S
		Submittal Process	Review Sample Roof Warranty	A	S	C
		Field Visit	Conduct Pre Roofing Conference	V	S	S
		Field Visit	Review Delivery, Storage, and Handling	A	S	S
		Field Visit	Verify Conditions for roof application	A	S	S
		Field Visit	Verify Preparation	A	S	S
		Field Visit	Verify Application	A	S	S
		Field Visit	Verify Protection of Applied Roofing	A	S	S
		Field Visit	Verify Field Quality Control	A	S	S
		Field Visit	Verify Operation Maintenance and Support Information (Roof Warranty and Information Card)	A	S	S
	Steep Sloped Roofs	Design Guidance	Post Award Kick Off Meeting		S	A
		Design Guidance	Verify Roof Design Assurance	A	R	S
		Submittal Process	Review Shop Drawings	A	S	S
		Submittal Process	Review Manufacturer's Product Data Sheets	A	S	S
		Submittal Process	Review Design Data (to include wind and fire resistance)	A	S	S
		Submittal Process	Review Test Reports	A	S	S
		Submittal Process	Review Certificates	A	S	S
		Submittal Process	Review Sample Roof Warranty	A	S	C
		Field Visit	Conduct Pre Roofing Conference	V	S	S
		Field Visit	Review Delivery, Storage, and Handling	A	S	S
		Field Visit	Verify Conditions for roof application	A	S	S
		Field Visit	Verify Preparation	A	S	S
		Field Visit	Verify Application	A	S	S
		Field Visit	Verify Protection of Applied Roofing	A	S	S
		Field Visit	Verify Field Quality Control	A	S	S
		Field Visit	Verify Operation Maintenance and Support Information (Roof Warranty and Information Card)	A	S	S

KEY = A - Approve, R - Review, W - Witness, RA - Receipt Acknowledge, S - Surveilance Review, V- Verification and Testing, C - Copy, QA - Quality Assurance

UNDERWATER STRUCTURES ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	UW QC / DOR (Ktr)	FEAD (SIOH)	FEC/NFESC (PCAS)
Waterfront Structure H10 (Uniformat II) - Substructure H1010	**Pile Foundations (H101001) Sheet Piles (H101001) Caissons (H101001) Cofferdams (H101001) Wraps and Encasements (H101001) Sheet Pile Bulheads (H101003) Gravity Walls (H101003) Block Walls (H101003) Seawalls (H101006) Boat Ramps (H101007) Cut-Off Walls (H101008) Wave Attenuation Walls (H101009) Fender Piles (H104001) Dolphins (H104004)**	Submittal Process	Shop Drawings	A	C	S
		Submittal Process	Manufacturer's Data Sheets	A	C	S
		Submittal Process	Pile driving records	A	C	S
		Submittal Process	Concrete testing: petrographic, chemical, service-life modeling	A	C	S
		Submittal Process	As-built drawings, 3D AUTOCAD format	A	C	S
		Field Visit	Validate in-water/underwater structure complies with RFP requirements, e.g., number, location, size, etc.	A	—	W
		Field Visit	Inspect in-water prestressed/precast concrete piles or sheetpiles for alignment, spalls, cracks, damages, defects, lifting hoops cut/area patched, exposed steel ties, penetrations, etc.	A	—	W
		Field Visit	Inspect in-water cast-in-place concrete drilled caissons for alignment, spalls, cracks, damages, defects, concrete quality (hardness), honeycombing, etc.	A	—	W
		Field Visit	Inspect in-water steel piles and/or p/c p/s concrete sheetpiles for alignment, damage/buckling, coating damage, penetrations, gaps, etc.	A	—	W
		Field Visit	Inspect underwater concrete placement for defects such as honeycombing, concrete quality (hardness)	A	—	W
		Field Visit	Inspect underwater slope protection for conformance with RFP requirements such as rock/boulder size, placement gap limits, angle, location (e.g., toe of slope protection), consistency, etc.	A	—	W
		Field Visit	Inspect underwater Cathodic Protection anodes and connections	A	—	W
		Field Visit	Inspect for underwater debris, existing or by construction.	A	—	W
		Field Visit	Validate in-water/underwater structure complies with RFP requirements, e.g., number, location, size, etc.	A	—	W
		Field Visit	Validate in-water/underwater structure complies with RFP requirements, e.g., number, location, size, etc.	A	—	W
		Field Visit	Validate in-water/underwater structure complies with RFP requirements, e.g., number, location, size, etc.	A	—	W

UNDERWATER STRUCTURES ROLES and RESPONSIBILITIES

System	Sub-Systems	Phase	Elements	UW QC / DOR (Ktr)	FEAD (SIOH)	FEC/NFESC (PCAS)
Underwater Cables	**All**	Submittal Process	Shop Drawings	A	C	S
		Submittal Process	Manufacturer's Data Sheets	A	C	S
		Field Visit	Validate in-water/underwater cable complies with RFP requirements, e.g., number, location, size, etc.	A	—	W
		Field Visit	Inspect underwater cable for defects/damages, kinks, missing anchors, coating damage, etc.	A	—	W
		Field Visit	Inspect for underwater debris, existing or by construction.	A	—	W
Underwater Utility Pipes and Conduits	**All**	Submittal Process	Shop Drawings	A	C	S
		Submittal Process	Manufacturer's Data Sheets	A	C	S
		Field Visit	Validate in-water/underwater component complies with RFP requirements, e.g., number, location, size, etc.	A	—	W
		Field Visit	Inspect underwater component for defects/damages, cracks, missing anchors, coating damage, etc.	A	—	W
		Field Visit	Inspect for underwater debris, existing or by construction.	A	—	W

DEFINITIONS

Approve	(A)	Professional or quality control endorsement of the submittal or installed system meets the contract requirements
Review	(R)	To confirm accuracy of the submittal and that it meets contract requirements
Witness	(W)	Observe demonstration of system performance for acceptance
Receipt **A**cknowledge	(RA)	Confirm receipt of submittal with no review necessary
Surveillance Review	(S)	A quality assurance review based on risk, complexity, and workload
Performance **V**erification and Acceptance Testing	(V)	A demonstration of satisfactory construction and system performance
Receive **C**opy of Correspondence	(C)	Receive a copy of the transmittal sheet and/or correspondence letter
Quality **A**ssurance Inspection	(QA)	Witnessing satisfactory performance without testing all devices or visual inspection of various parts of the system

SECTION 01 50 00

TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS
08/09

PART 1 GENERAL

1.1 SUMMARY

Requirements of this Section apply to, and are a component of, each section of the specifications.

1.2 REFERENCES

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

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C511	(2007) Standard for Reduced-Pressure Principle Backflow Prevention Assembly

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

FCCCHR List	(continuously updated) List of Approved Backflow Prevention Assemblies
FCCCHR Manual	(1988e9) Manual of Cross-Connection Control

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 241	(2009) Standard for Safeguarding Construction,Alteration, and Demolition Operations
NFPA 70	(2008; AMD 1 2008) National Electrical Code - 2008 Edition

U.S. FEDERAL AVIATION ADMINISTRATION (FAA)

FAA AC 70/7460-1	(Rev K) Obstruction Marking and Lighting

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

MUTCD	(2000) Manual of Uniform Traffic Control Devices

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submitted the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Traffic control plan; G

SD-03 Product Data

Backflow preventers; G

SD-06 Test Reports

Backflow Preventer Tests; G

SD-07 Certificates

Backflow Tester Certification; G

1.4 BACKFLOW PREVENTERS CERTIFICATE

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

1.4.1 Backflow Tester Certificate

Prior to testing, submit to the Contracting Officer certification issued by the State or local regulatory agency attesting that the backflow tester has successfully completed a certification course sponsored by the regulatory agency. Tester must not be affiliated with any company participating in any other phase of this Contract.

1.4.2 Backflow Prevention Training Certificate

Submit a certificate recognized by the State or local authority that states the Contractor has completed at least 10 hours of training in backflow preventer installations. The certificate must be current.

PART 2 PRODUCTS

2.1 TEMPORARY SIGNAGE

2.1.1 Bulletin Board

Immediately upon beginning of work, provide a weatherproof glass-covered bulletin board not less than 36 by 48 inches in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, and other information approved by the Contracting Officer. Locate the bulletin board at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer.

2.1.2 Project and Safety Signs

The requirements for the signs, their content, and location are as specified in Section 01 58 00 PROJECT IDENTIFICATION. Erect signs within 15 days after receipt of the notice to proceed. Correct the data required by the safety sign daily, with light colored metallic or non-metallic numerals.

2.2 TEMPORARY TRAFFIC CONTROL

2.2.1 Haul Roads

At contractors expense construct access and haul roads necessary for proper prosecution of the work under this contract. Construct with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic are be avoided. Provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control, although optional, must be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and hauling roads are subject to approval by the Contracting Officer. Lighting must be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations.

2.2.2 Barricades

Erect and maintain temporary barricades to limit public access to hazardous areas. Whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic barricades will be required. Securely place barricades clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

2.2.3 Fencing

2.2.4 Temporary Wiring

Provide temporary wiring in accordance with NFPA 241 and NFPA 70, Article 305-6(b), Assured Equipment Grounding Conductor Program. Include frequent inspection of all equipment and apparatus.

2.2.5 Backflow Preventers

Reduced pressure principle type conforming to the applicable requirements AWWA C511. Provide backflow preventers complete with [150 pound] flanged cast iron, mounted gate valve and strainer, 304 stainless steel or bronze, internal parts. The particular make, model/design, and size of backflow preventers to be installed must be included in the latest edition of the List of Approved Backflow Prevention Assemblies issued by the FCCCHR List and be accompanied by a Certificate of Full Approval from FCCCHR List. After installation conduct Backflow Preventer Tests and provide test reports verifing that the installation meets the FCCCHR Manual Standards.

PART 3 EXECUTION

3.1 EMPLOYEE PARKING

Contractor employees will park privately owned vehicles in an area designated by the Contracting Officer. This area will be within reasonable walking distance of the construction site. Contractor employee parking must not interfere with existing and established parking requirements of the government installation.

3.2 AVAILABILITY AND USE OF UTILITY SERVICES

3.2.1 Utilities at Special Locations

Reasonable amounts of utilities will be made available to the Contractor at the prevailing Government rates and may be obtained upon application to the Base Maintenance Officer, Bldg. 1202, Marine Corps Base, Camp Lejeune. A refundable security deposit to the Resident Officer in Charge of Construction shall be made prior to application for services. The Contractor shall be responsible for providing transformers, meter bases, electrical service poles and drops for electrical services, and backflow preventer devices on connections to domestic water lines. Final taps and tie-ins to the Government utility grid will be made by Base Maintenance who will also provide and seal a 120 or 208 volt, three-wire kWh meter. Tap-in cost, if any, shall be the responsibility of the Contractor. Tampering or movement of a sealed meter without notification to base maintenance is grounds for discontinuance of electrical service. The Contractor shall be responsible for providing larger meters required if not available from the Government. The Contractor shall be responsible for the cost of utility services required until the date of Government acceptance. Under no circumstances will taps to base fire hydrants be allowed for obtaining domestic water.

3.2.2 Obstruction Lighting of Cranes

Provide a minimum of 2 aviation red or high intensity white obstruction lights on temporary structures (including cranes) over 100 feet above ground level. Light construction and installation must comply with FAA AC 70/7460-1. Lights must be operational during periods of reduced visibility, darkness, and as directed by the Contracting Officer.

3.2.3 Fire Protection

Provide temporary fire protection equipment for the protection of personnel and property during construction. Remove debris and flammable materials daily to minimize potential hazards.

3.3 TRAFFIC PROVISIONS

3.3.1 Maintenance of Traffic

a. Conduct operations in a manner that will not close any thoroughfare or interfere in any way with traffic on railways or highways except with written permission of the Contracting Officer at least 15 calendar days prior to the proposed modification date, and provide a Traffic Control Plan detailing the proposed controls to traffic movement for approval. The plan must be in accordance with State and local regulations and the MUTCD, Part VI. Contractor may move oversized and slow-moving vehicles to the worksite provided requirements of the highway authority have been met.

b. Conduct work so as to minimize obstruction of traffic, and maintain traffic on at least half of the roadway width at all times. Obtain approval from the Contracting Officer prior to starting any activity that will obstruct traffic.

c. Provide, erect, and maintain, at contractors expense, lights, barriers, signals, passageways, detours, and other items, that may be required by

the Life Safety Signage, overhead protection authority having jurisdiction.

3.3.2 Protection of Traffic

Maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment the work, and the erection and maintenance of adequate warning, danger, and direction signs, will be as required by the State and local authorities having jurisdiction. Protect the traveling public from damage to person and property. Minimize the interference with public traffic on roads selected for hauling material to and from the site. Investigate the adequacy of existing roads and their allowable load limit. Contractor is responsible for the repair of any damage to roads caused by construction operations.

3.3.3 Rush Hour Restrictions

Do not interfere with the peak traffic flows preceding and during normal operations without notification to and approval by the Contracting Officer.

3.3.4 Dust Control

Dust control methods and procedures must be approved by the Contracting Officer. Treat dust abatement on access roads with applications of calcium chloride, water sprinklers, or similar methods or treatment.

3.4 CONTRACTOR'S TEMPORARY FACILITIES

3.4.1 Safety

Protect the integrity of any installed safety systems or personnel safety devices. If entrance into systems serving safety devices is required, the Contractor must obtain prior approval from the Contracting Officer. If it is temporarily necessary to remove or disable personnel safety devices in order to accomplish contract requirements, provide alternative means of protection prior to removing or disabling any permanently installed safety devices or equipment and obtain approval from the Contracting Officer.

3.4.2 Administrative Field Offices

Provide and maintain administrative field office facilities within the construction area at the designated site. Government office and warehouse facilities will not be available to the Contractor's personnel.

3.4.3 Storage Area

Construct a temporary 6 foot high chain link fence around trailers and materials. Include plastic strip inserts, colored brown, so that visibility through the fence is obstructed. Fence posts may be driven, in lieu of concrete bases, where soil conditions permit. Do not place or store Trailers, materials, or equipment outside the fenced area unless such trailers, materials, or equipment are assigned a separate and distinct storage area by the Contracting Officer away from the vicinity of the construction site but within the installation boundaries. Trailers, equipment, or materials must not be open to public view with the exception of those items which are in support of ongoing work on any given day. Do not stockpile materials outside the fence in preparation for the next day's

work. Park mobile equipment, such as tractors, wheeled lifting equipment, cranes, trucks, and like equipment within the fenced area at the end of each work day.

3.4.4 Appearance of Trailers

a. Trailers utilized by the Contractor for administrative or material storage purposes must present a clean and neat exterior appearance and be in a state of good repair. Trailers which, in the opinion of the Contracting Officer, require exterior painting or maintenance will not be allowed on installation property.

b. Paint using suitable paint and maintain the temporary facilities. Failure to do so will be sufficient reason to require their removal.

3.4.5 Security Provisions

Provide adequate outside security lighting at the Contractor's temporary facilities. The Contractor will be responsible for the security of its own equipment; in addition, the Contractor will notify the appropriate law enforcement agency requesting periodic security checks of the temporary project field office.

3.4.6 Storage Size and Location

The open site available for storage must be confined to the indicated operations area 1,000 feet. The storage area will be approximately 1,000 square feet.

3.4.7 Storage in Existing Buildings

The Contractor will be working around existing buildings; the storage of material square footwill not be allowed in the buildings. 8 foot

3.4.8 Weather Protection of Temporary Facilities and Stored Materials

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

3.4.8.1 Building and Site Storm Protection

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

3.4.8.2 Hurricane Condition of Readiness

Unless directed otherwise, comply with:

a. Condition FOUR (Sustained winds of 50 knots or greater expected within 72 hours): Normal daily jobsite cleanup and good housekeeping

practices. Collect and store in piles or containers scrap lumber, waste material, and rubbish for removal and disposal at the close of each work day. Maintain the construction site including storage areas, free of accumulation of debris. Stack form lumber in neat piles less than 4 feet high. Remove all debris, trash, or objects that could become missile hazards. Contact Contracting Officer for Condition of Readiness (COR) updates and completion of required actions.

b. Condition THREE (Sustained winds of 50 knots or greater expected within 48 hours): Maintain "Condition FOUR" requirements and commence securing operations necessary for "Condition ONE" which cannot be completed within 18 hours. Cease all routine activities which might interfere with securing operations. Commence securing and stow all gear and portable equipment. Make preparations for securing buildings. Review requirements pertaining to "Condition TWO" and continue action as necessary to attain "Condition THREE" readiness. Contact Contracting Officer for weather and COR updates and completion of required actions.

c. Condition TWO (Sustained winds of 50 knots or greater expected within 24 hours): Curtail or cease routine activities until securing operation is complete. Reinforce or remove form work and scaffolding. Secure machinery, tools, equipment, materials, or remove from the jobsite. Expend every effort to clear all missile hazards and loose equipment from general base areas. Contact Contracting Officer for weather and Condition of Readiness (COR) updates and completion of required actions.

d. Condition ONE. (Sustained winds of 50 knots or greater expected within 12 hours): Secure the jobsite, and leave Government premises.

3.5 TEMPORARY PROJECT SAFETY FENCING

As soon as practicable, but not later than 15 days after the date established for commencement of work, furnish and erect temporary project safety fencing at the work site. The safety fencing must be a high visibility orange colored, high density polyethylene grid or approved equal, a minimum of 42 inches high, supported and tightly secured to steel posts located on maximum 10 foot centers, constructed at the approved location. Maintain the safety fencing during the life of the contract and, upon completion and acceptance of the work, will become the property of the Contractor and be removed from the work site.

3.6 CLEANUP

Remove construction debris, waste materials, packaging material and the like from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways must be cleaned away. Store within the fenced area described above or at the supplemental storage area any materials resulting from demolition activities which are salvageable. Neatly stacked stored materials not in trailers, whether new or salvaged.

3.7 RESTORATION OF STORAGE AREA

Upon completion of the project remove the bulletinboard, signs, barricades, haulroads, and any other temporary products from the site. After removal of trailers, materials, and equipment from within the fenced area, remove the fence that will become the property of the Contractor. Restore to the original or better condition, areas used by the Contractor for the storage

of equipment or material, or other use. Gravel used to traverse grassed areas must be removed and the area restored to its original condition, including top soil and seeding as necessary.

-- End of Section --

SECTION 01 57 13.00 22

EROSION AND SEDIMENT CONTROL
07/06

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM A 185	(2002) Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM C 33	(2003) Concrete Aggregates
ASTM D 3787	(2001) Bursting Strength of Textiles - Constant-Rate-of-Traverse (CRT), Ball Burst Test
ASTM D 4355	(2002) Deterioration of Geotextiles from Exposure to Light, Moisture and Heat in a Xenon-Arc Type Apparatus
ASTM D 4533	(1991; R 1996) Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	(1991; R 1996) Grab Breaking Load and Elongation of Geotextiles
ASTM D 5141	(1996; R 1999) Determining Filtering Efficiency and Flow Rate of a Geotextile for Silt Fence Application Using Site-Specific Soil

1.2 DESCRIPTION OF WORK

The work includes the provision of temporary erosion control measures to prevent the pollution of air, water, and land within the project limits and in areas outside the project limits where work is accomplished in conjunction with the project.

1.3 [Enter Appropriate Subpart Title Here]PART 2 PRODUCTS

2.1 SEDIMENT FENCE

2.1.1 Sediment Fence

2.1.1.1 Posts

4 by 4 inch wood posts, minimum 3 inch diameter wood, or 1.33 pound per linear foot steel posts. Posts shall be minimum 5 feet long.

2.1.1.2 Wire Fabric

ASTM A 185, 6 by 6, minimum 12 1/2 gage.

2.1.1.3 Filter Fabric

A woven or nonwoven polypropylene, nylon, or polyester containing stabilizers and/or inhibitors to make the fabric resistant to deterioration from ultraviolet, and with the following properties:

a. Minimum grab strength (TF 25 #1/ASTM D 4632) 90 pounds

b. Elongation (TF 25 #1/ASTM D 4632) 15 percent (minimum) to 50 percent (maximum) (at 45 pounds grab)

c. Minimum U.V. Resistance (ASTM D 4355) 70 percent strength retained at 500 hours.

d. Minimum Filtering Efficiency (ASTM D 5141) 75 percent

e. Minimum Flow Rate (ASTM D 5141) .2 gallons/minute/square foot

2.2 CONSTRUCTION ENTRANCE

2.2.1 Standard Construction Entrance

2.2.1.1 Aggregate

ASTM C 33, Size No. 57.

2.2.1.2 Filter Fabric

A woven or nonwoven polypropylene, nylon, or polyester containing stabilizers and/or inhibitors to make the fabric resistant to deterioration from ultraviolet, and with the following properties:

a. Minimum grab tensile strength (TF 25 #1/ASTM D 4632) 180 pounds

b. Minimum Puncture (TF 25 #4/ASTM D 3787) 75 psi in the weakest direction

c. Apparent Opening Size 40-80 (U.S. Sieve Size)

d. Minimum Trapezoidal tear strength (TF 25 #2/ASTM D 4533) 50 pounds

2.3 TEMPORARY SEEDING

2.3.1 Temporary Seeding

2.3.1.1 Seed

Provide State certified seed of the latest season's crop. Seed shall be a mixture of Hybrid Fescue, Red Top and Bermuda.

2.3.1.2 Fertilizer

Fertilizer, with 10 percent nitrogen, 20 percent available phosphoric acid, and 10 percent potash.

2.3.1.3 Mulch

Hay or straw. Provide in an air dried condition for placement with commercial mulch blowing equipment.

PART 3 EXECUTION

3.1 CONSTRUCTION SEQUENCE SCHEDULE

Stabilize areas for construction access immediately with gravel. Provide sediment fences as grading progresses. Stabilize graded and disturbed areas immediately after grading. Permanent stabilization shall be provided immediately on areas that have been final graded. Temporary seeding and mulching shall be provided on disturbed areas as specified in the paragraph entitled "Temporary Seeding." **Remove temporary erosion control measures at the end of construction and provide permanent seeding.**

3.2 SEDIMENT FENCES

Install posts a maximum of 6 feet on center, and at an angle between 2 degrees and 20 degrees towards the potential silt load area. Secure filter fabric to the post using staples, tie wire, or hog rings. Imbed the filter fabric into the ground. Splice filter fabric at support pole using a 6 inch overlap and securely seal.

3.3 CONSTRUCTION ENTRANCE

Provide as indicated, a minimum of 6 inches thick, at points of vehicular ingress and egress on the construction site. Construction entrances shall be cleared and grubbed, and then excavated a minimum of 3 inches prior to placement of the filter fabric and aggregate. The aggregate shall be placed in a manner that will prevent damage and movement of the fabric. Place fabric in one piece, where possible. Overlap fabric joints a minimum of

3.4 TEMPORARY SEEDING

3.4.1 Time Restrictions

Within 48 hours after attaining the grading increment specified herein, provide seed, fertilizer, mulch and water on graded areas when any of the following conditions occur:

a. Grading operations stop for an anticipated duration of 30 days or more.

b. When it is impossible or impractical to bring an area to finish grade so that permanent seeding operations can be performed without serious disturbance from additional grading.

c. Grading operations for a specific area are completed and the seeding seasons specified for permanent seeding in Section 32 92 19, "Seeding" is more than 30 days away.

d. When an immediate cover is required to minimize erosion, or when erosion has occurred.

e. Provide on erosion control devices constructed using soil materials.

3.4.2 Seeding Requirements

3.4.2.1 Seeding Requirements

Loosen soil to a depth of 2-4 inches. Uniformly apply the seed, fertilizer, and mulch at the specified application rates. Do not seed or fertilize when the Contracting Officer determines conditions are unfavorable. Provide fertilizer at the rate of 1000 pounds per acre. Spread mulch at the rate of 1.5 tons per acre and anchor by crimping mulch with a disc. Provide water on a regular basis to promote turf growth. Areas which fail to establish vegetative cover adequate to prevent rill erosion shall be reseeded as soon as these areas are identified. Provide seed type and quantity (pounds per acre) as follows:

Feb 1 - Apr 15

SEED TYPE	Nov 16 - Jan 31	Oct 16 - Nov 15	Apr 16 - Oct 15
Hybrid Fescue	200	200	
Red Top	6	6	6
Bermuda	45 (unhulled)	45 (unhulled)	100 (hulled)

3.4.2.2 Permanent Seeding

Temporary seeding shall be removed, and permanent seeding shall be provided during the specified planting season as specified in Section 32 92 19, "Seeding".

3.5 MAINTENANCE AND INSPECTION

Inspect erosion control devices after each rainfall and daily during pro longed rainfall. Remove sediment deposits after each rainfall or when sediment reaches approximately one-half the barrier height. Immediately repair damaged erosion control devices and damaged areas around and underneath the devices. Maintain erosion control devices to assure continued performance of their intended function. Modify the erosion control plan as required to control problem areas noticed after each inspection. Modifications shall be approved by the Contracting Officer.

3.6 CLEAN UP

At the completion of the job, or when directed or approved by the Contracting Officer, temporary erosion control devices shall be removed. Erosion control devices and areas immediately adjacent to the device shall be filled (where applicable), shaped to drain and to blend into the surrounding contours, and provided with permanent seeding.

-- End of Section --

SECTION 01 57 19.00 20

TEMPORARY ENVIRONMENTAL CONTROLS
02/09

PART 1 GENERAL

1.1 REFERENCES

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

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

29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1910.120	Hazardous Waste Operations and Emergency Response
40 CFR 112	Oil Pollution Prevention
40 CFR 241	Guidelines for Disposal of Solid Waste
40 CFR 243	Guidelines for the Storage and Collection of Residential, Commercial, and Institutional Solid Waste
40 CFR 258	Subtitle D Landfill Requirements
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 266	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
40 CFR 268	Land Disposal Restrictions
40 CFR 270	EPA Administered Permit Programs: The Hazardous Waste Permit Program

40 CFR 271	Requirements for Authorization of State Hazardous Waste Programs
40 CFR 272	Approved State Hazardous Waste Management Programs
40 CFR 273	Standards For Universal Waste Management
40 CFR 279	Standards for the Management of Used Oil
40 CFR 280	Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (UST)
40 CFR 300	National Oil and Hazardous Substances Pollution Contingency Plan
40 CFR 355	Emergency Planning and Notification
40 CFR 372-SUBPART D	Specific Toxic Chemical Listings
40 CFR 82	Protection of Stratospheric Ozone
49 CFR 171	General Information, Regulations, and Definitions
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR 173	Shippers - General Requirements for Shipments and Packagings
49 CFR 178	Specifications for Packagings

1.2 DEFINITIONS

1.2.1 Sediment

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

1.2.2 Solid Waste

Garbage, refuse, debris, sludge, or other discharged material, including solid, liquid, semisolid, or contained gaseous materials resulting from domestic, industrial, commercial, mining, or agricultural operations. Types of solid waste typically generated at construction sites may include:

a. Green waste: The vegetative matter from landscaping, land clearing and grubbing, including, but not limited to, grass, bushes, scrubs, small trees and saplings, tree stumps and plant roots. Marketable trees, grasses and plants that are indicated to remain, be re-located, or be re-used are not included.

b. Surplus soil: Existing soil that is in excess of what is required for this work, including aggregates intended, but not used, for on-site mixing of concrete, mortars and paving. Contaminated soil

meeting the definition of hazardous material or hazardous waste is not included.

c. Debris: Non-hazardous solid material generated during the construction, demolition, or renovation of a structure which exceeds 2.5 inch particle size that is: a manufactured object; plant or animal matter; or natural geologic material (e.g. cobbles and boulders), broken or removed concrete, masonry, and rock asphalt paving; ceramics; roofing paper and shingles. Inert materials may be reinforced with or contain ferrous wire, rods, accessories and weldments. A mixture of debris and other material such as soil or sludge is also subject to regulation as debris if the mixture is comprised primarily of debris by volume, based on visual inspection..

d. Wood: Dimension and non-dimension lumber, plywood, chipboard, hardboard. Treated and/or painted wood that meets the definition of lead contaminated or lead based contaminated paint is not included.

e. Scrap metal: Scrap and excess ferrous and non-ferrous metals such as reinforcing steel, structural shapes, pipe and wire that are recovered or collected and disposed of as scrap. Scrap metal meeting the definition of hazardous material or hazardous waste is not included.

f. Paint cans: Metal cans that are empty of paints, solvents, thinners and adhesives. If permitted by the paint can label, a thin dry film may remain in the can.

g. Recyclables: Materials, equipment and assemblies such as doors, windows, door and window frames, plumbing fixtures, glazing and mirrors that are recovered and sold as recyclable. Metal meeting the definition of lead contaminated or lead based paint contaminated may not be included as recyclable if sold to a scrap metal company. Paint cans may not be included as recyclable if sold to a scrap metal company.

h. Hazardous Waste: By definition, to be a hazardous waste a material must first meet the definition of a solid waste. Hazardous waste and hazardous debris are special cases of solid waste. They have additional regulatory controls and must be handled separately. They are thus defined separately in this document.

Material not regulated as solid waste are: nuclear source or byproduct materials regulated under the Federal Atomic Energy Act of 1954 as amended; suspended or dissolved materials in domestic sewage effluent or irrigation return flows, or other regulated point source discharges; regulated air emissions; and fluids or wastes associated with natural gas or crude oil exploration or production.

1.2.3 Hazardous Debris

As defined in Solid Waste paragraph, debris that contains listed hazardous waste (either on the debris surface, or in its interstices, such as pore structure) per 40 CFR 261; or debris that exhibits a characteristic of hazardous waste per 40 CFR 261.

1.2.4 Chemical Wastes

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

1.2.5 Garbage

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

1.2.6 Hazardous Waste

Any discarded material, liquid, solid, or gas, which meets the definition of hazardous material or is designated hazardous waste by the Environmental Protection Agency or State Hazardous Control Authority as defined in 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265, 40 CFR 266, 40 CFR 268, 40 CFR 270, 40 CFR 271, 40 CFR 272, 40 CFR 273, 40 CFR 279, and 40 CFR 280.

1.2.7 Hazardous Materials

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

Hazardous material is any material that:

a. Is regulated as a hazardous material per 49 CFR 173, or

b. Requires a Material Safety Data Sheet (MSDS) per 29 CFR 1910.120, or

c. During end use, treatment, handling, packaging, storage, transpiration, or disposal meets or has components that meet or have potential to meet the definition of a hazardous waste as defined by 40 CFR 261 Subparts A, B, C, or D.

Designation of a material by this definition, when separately regulated or controlled by other instructions or directives, does not eliminate the need for adherence to that hazard-specific guidance which takes precedence over this instruction for "control" purposes. Such material include ammunition, weapons, explosive actuated devices, propellants, pyrotechnics, chemical and biological warfare materials, medical and pharmaceutical supplies, medical waste and infectious materials, bulk fuels, radioactive materials, and other materials such as asbestos, mercury, and polychlorinated biphenyls (PCBs). Nonetheless, the exposure may occur incident to manufacture, storage, use and demilitarization of these items.

1.2.8 Waste Hazardous Material (WHM)

Any waste material which because of its quantity, concentration, or physical, chemical, or infectious characteristics may pose a substantial hazard to human health or the environment and which has been so designated. Used oil not containing any hazardous waste, as defined above, falls under this definition.

1.2.9 Oily Waste

Those materials which are, or were, mixed with used oil and have become separated from that used oil. Oily wastes also means materials, including

wastewaters, centrifuge solids, filter residues or sludges, bottom sediments, tank bottoms, and sorbents which have come into contact with and have been contaminated by, used oil and may be appropriately tested and discarded in a manner which is in compliance with other State and local requirements.

This definition includes materials such as oily rags, "kitty litter" sorbent clay and organic sorbent material. These materials may be land filled provided that:

a. It is not prohibited in other State regulations or local ordinances

b. The amount generated is "de minimus" (a small amount)

c. It is the result of minor leaks or spills resulting from normal process operations

d. All free-flowing oil has been removed to the practical extent possible

Large quantities of this material, generated as a result of a major spill or in lieu of proper maintenance of the processing equipment, are a solid waste. As a solid waste, a hazardous waste determination must be performed prior to disposal. As this can be an expensive process, it is recommended that this type of waste be minimized through good housekeeping practices and employee education.

1.2.10 Regulated Waste

Those solid waste that have specific additional Federal, state, or local controls for handling, storage, or disposal.

1.2.11 Class I Ozone Depleting Substance (ODS)

Class I ODS is defined in Section 602(a) of The Clean Air Act and includes the following chemicals:

chlorofluorocarbon-11 (CFC-11)
chlorofluorocarbon-12 (CFC-12)
chlorofluorocarbon-13 (CFC-13)
chlorofluorocarbon-111 (CFC-111)
chlorofluorocarbon-112 (CFC-112)
chlorofluorocarbon-113 (CFC-113)
chlorofluorocarbon-114 (CFC-114)
chlorofluorocarbon-115 (CFC-115)
chlorofluorocarbon-211 (CFC-211)
chlorofluorocarbon-212 (CFC-212)
chlorofluorocarbon-213 (CFC-213)
chlorofluorocarbon-214 (CFC-214)
chlorofluorocarbon-215 (CFC-215)
chlorofluorocarbon-216 (CFC-216)
chlorofluorocarbon-217 (CFC-217)
chlorofluorocarbon-500 (CFC-500)
chlorofluorocarbon-502 (CFC-502)
chlorofluorocarbon-503 (CFC-503)
halon-1211
halon-1301
halon-2402

carbon tetrachloride
methyl bromide
methyl chloroform

Class II ODS is defined in Section 602(s) of The Clean Air Act and includes the following chemicals:

hydrochlorofluorocarbon-21 (HCFC-21)
hydrochlorofluorocarbon-22 (HCFC-22)
hydrochlorofluorocarbon-31 (HCFC-31)
hydrochlorofluorocarbon-121 (HCFC-121)
hydrochlorofluorocarbon-122 (HCFC-122)
hydrochlorofluorocarbon-123 (HCFC-123)
hydrochlorofluorocarbon-124 (HCFC-124)
hydrochlorofluorocarbon-131 (HCFC-131)
hydrochlorofluorocarbon-132 (HCFC-132)
hydrochlorofluorocarbon-133 (HCFC-133)
hydrochlorofluorocarbon-141 (HCFC-141)
hydrochlorofluorocarbon-142 (HCFC-142)
hydrochlorofluorocarbon-221 (HCFC-221)
hydrochlorofluorocarbon-222 (HCFC-222)
hydrochlorofluorocarbon-223 (HCFC-223)
hydrochlorofluorocarbon-224 (HCFC-224)
hydrochlorofluorocarbon-225 (HCFC-225)
hydrochlorofluorocarbon-226 (HCFC-226)
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hydrochlorofluorocarbon-242 (HCFC-242)
hydrochlorofluorocarbon-243 (HCFC-243)
hydrochlorofluorocarbon-244 (HCFC-244)
hydrochlorofluorocarbon-251 (HCFC-251)
hydrochlorofluorocarbon-252 (HCFC-252)
hydrochlorofluorocarbon-253 (HCFC-253)
hydrochlorofluorocarbon-261 (HCFC-261)
hydrochlorofluorocarbon-262 (HCFC-262)
hydrochlorofluorocarbon-271 (HCFC-271)

1.2.11.1 Universal Waste

The universal waste regulations streamline collection requirements for certain hazardous wastes in the following categories: batteries, pesticides, mercury-containing equipment (e.g., thermostats) and lamps (e.g., fluorescent bulbs). The rule is designed to reduce hazardous waste in the municipal solid waste (MSW) stream by making it easier for universal waste handlers to collect these items and send them for recycling or proper disposal. These regulations can be found at 40 CFR 273.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Preconstruction Survey; G

Solid Waste Management Plan and Permit; G

Regulatory Notifications; G

Environmental Management Plan; G

Dirt and Dust Control Plan

Contractor Hazardous Material Inventory Log; G

SD-06 Test Reports

Disposal Requirements

Contractor 40 CFR employee training records

Solid Waste Management Report; G

SD-11 Closeout Submittals

Some of the records listed below are also required as part of other submittals. For the "Records" submittal, maintain on-site a separate three-ring Environmental Records binder and submit at the completion of the project. Make separate parts to the binder corresponding to each of the applicable sub items listed below.

Waste Determination Documentation

Disposal Documentation for Hazardous and Regulated Waste

Contractor 40 CFR Employee Training Records

Solid Waste Management Permit

Solid Waste Management Report

Contractor Hazardous Material Inventory Log; G

Hazardous Waste/Debris Management

Regulatory Notifications

1.4 ENVIRONMENTAL PROTECTION REQUIREMENTS

Provide and maintain, during the life of the contract, environmental protection as defined. 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 water, air, solid waste, hazardous waste and substances, oily substances, and noise pollution.

The Contractor may be required to promptly conduct tests and procedures for the purpose of assessing whether construction operations are in compliance

with Applicable Environmental Laws. Analytical work shall be done by qualified laboratories; and where required by law, the laboratories shall be certified.

1.4.1 Environmental Compliance Assessment Training and Tracking System (ECATTS)

The QC Manager is responsible for environmental compliance on projects unless an Environmental Manager is named. The QC Manager (and alternative QC Manager) or Environmental Manager shall complete ECATTS training prior to starting respective portions of on-site work under this contract. If personnel changes occur for any of these positions after starting work, replacement personnel shall complete ECATTS training within 14 days of assignment to the project

Submit an ECATTS certificate of completion for personnel who have completed the required "Environmental Compliance Assessment Training and Tracking System (ECATTS)" training. This training is web-based and can be accessed from any computer with Internet access using the following instructions.

Register for NAVFAC Environmental Compliance Training and Tracking System, by logging on to http://navfac.ecatts.com/. Obtain the password for registration from the Contracting Officer.

This training has been structured to allow contractor personnel to receive credit under this contract and also to carry forward credit to future contracts. Contractors shall ensure that the QC Manager (and alternate QC Manager) or Environmental Manager review their training plans for new modules or updated training requirements prior to beginning work. Some training modules are tailored for specific State regulatory requirements; therefore, Contractors working in multiple states will be requires to re-take modules tailored to the state where the contract work is being performed.

ECATTS is available for use by all contractor and subcontractor personnel associated with this project. These other personnel are encouraged (but not required) to take the training and may do so at their discretion.

1.4.2 Conformance with the Environmental Management System

The Contractor shall perform work under this contract consistent with the policy and objectives identified in the installation's Environmental Management System (EMS). The Contractor shall perform work in a manner that conforms to objectives and targets, environmental programs and operational controls identified by the EMS. The Contractor will provide monitoring and measurement information as necessary to address environmental performance relative to environmental, energy, and transportation management goals. In the event an EMS nonconformance or environmental noncompliance associated with the contracted services, tasks, or actions occurs, the Contractor shall take corrective and/or preventative actions. In addition, the Contractor shall ensure that its employees are aware of their roles and responsibilities under the EMS and how these EMS roles and responsibilities affect work performed under the contract.

The Contractor is responsible for ensuring that their employees receive applicable environmental and occupational health and safety training, and keep up to date on regulatory required specific training for the type of work to be conducted onsite. All on-site Contractor personnel, and their subcontractor personnel, performing tasks that have the potential to cause a significant environmental impact shall be competent on the basis of

appropriate education, training or experience. Upon contract award, the Contracting Officer's Representative will notify the installation's EMS coordinator to arrange EMS training. Refer to Section 01 57 19.01 20, Supplemental Temporary Environmental Controls for additional site specific EMS requirements related to construction. The installation's EMS coordinator shall identify training needs associated with environmental aspects and the EMS, and arrange training or take other action to meet these needs. The Contractor shall provide training documentation to the Contracting Officer. The EMS coordinator shall retain associated records.

1.5 QUALITY ASSURANCE

1.5.1 Preconstruction Survey

Perform a Preconstruction Survey of the project site with the Contracting Officer, and take photographs showing existing environmental conditions in and adjacent to the site. Submit a report for the record.

1.5.2 Regulatory Notifications

The Contractor is responsible for all regulatory notification requirements in accordance with Federal, State and local regulations. In cases where the Navy must also provide public notification (such as stormwater permitting), the Contractor must coordinate with the Contracting Officer. The Contractor shall submit copies of all regulatory notifications to the Contracting Officer prior to commencement of work activities. Typically, regulatory notifications must be provided for the following (this listing is not all inclusive): demolition, renovation, NPDES defined site work, remediation of controlled substances (asbestos, hazardous waste, lead paint).

1.5.3 Environmental Brief

Attend an environmental brief to be included in the preconstruction meeting. Provide the following information: types, quantities, and use of hazardous materials that will be brought onto the activity; types and quantities of wastes/wastewater that may be generated during the contract. Discuss the results of the Preconstruction Survey at this time.

Prior to initiating any work on site, meet with the Contracting Officer and activity environmental staff to discuss the proposed Environmental Management Plan. Develop a mutual understanding relative to the details of environmental protection, including measures for protecting natural resources, required reports, required permits, permit requirements, and other measures to be taken.

1.5.4 Contractor 40 CFR Employee Training Records

Prepare and maintain employee training records throughout the term of the contract meeting applicable 40 CFR requirements. The Contractor will ensure every employee completes a program of classroom instruction or on-the-job training that teaches them to perform their duties in a way that ensures compliance with Federal, State and local regulatory requirements for RCRA Large Quantity Generator. The Contractor will provide a Position Description for each employee, by subcontractor, based on the Davis-Bacon Wage Rate designation or other equivalent method, evaluating the employee's association with hazardous and regulated wastes. This Position Description will include training requirements as defined in 40 CFR 265 for a Large Quantity Generator facility. Submit these training records to the

Contracting Officer at the conclusion of the project, unless otherwise directed.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 ENVIRONMENTAL MANAGEMENT PLAN

Prior to initiating any work on site, the Contractor will meet with the Contracting Officer to discuss the proposed Environmental Protection Plan and develop a mutual understanding relative to the details of environmental protection, including measures for protecting natural resources, required reports, and other measures to be taken. The Contractor's Environmental Plan shall incorporate construction related objectives and targets from the installation's Environmental Management System. The Environmental Management Plan will be submitted in the following format and shall include the elements specified below.

a. Description of the Environmental Management Plan

(1) General overview and purpose

(a). A brief description of each specific plan required by environmental permit or elsewhere in this contract.

(b). The duties and level of authority assigned to the person(s) on the job site that oversee environmental compliance.

(c). A copy of any standard or project specific operating procedures that will be used to effectively manage and protect the environment on the project site.

(d). Communication and training procedures that will be used to convey environmental management requirements to contractor employees and subcontractors.

(e). Emergency contact information contact information (office phone number, cell phone number, and e-mail address).

(2) General site information

b. Management of Natural Resources

(1) Land resources

(2) Tree protection

(3) Replacement of damaged landscape features

(4) Temporary construction

(5) Stream crossings

(6) Fish and wildlife resources

(7) Wetland areas

c. Protection of Historical and Archaeological Resources

(1) Objectives

(2) Methods

d. Storm Water Management and Control

(1) Ground cover

(2) Erodible soils

(3) Temporary measures

(a) Mechanical retardation and control of runoff

(b) Vegetation and mulch

(4) Effective selection, implementation and maintenance of Best Management Practices (BMPs).

e. Protection of the Environment from Waste Derived from Contractor Operations

(1) Control and disposal of solid and sanitary waste. If Section 01 74 19.05 20 is included in the contract, submit the plan required by that section as part of the Environmental Management Plan.

(2) Control and disposal of hazardous waste (Hazardous Waste Management Section)

This item will consist of the management procedures for all hazardous waste to be generated. The elements of those procedures will coincide with the Activity Hazardous Waste Management Plan. A copy of the Activity Hazardous Waste Management Plan will be provided by the Contracting Officer. As a minimum, include the following:

(a) Procedures to be employed to ensure a written waste determination is made for appropriate wastes which are to be generated;

(b) Sampling/analysis plan;

(c) Methods of hazardous waste accumulation/storage (i.e., in tanks and/or containers);

(d) Management procedures for storage, labeling, transportation, and disposal of waste (treatment of waste is not allowed unless specifically noted);

(e) Management procedures and regulatory documentation ensuring disposal of hazardous waste complies with Land Disposal Restrictions (40 CFR 268);

(f) Management procedures for recyclable hazardous materials such as lead-acid batteries, used oil, and the like;

(g) Used oil management procedures in accordance with 40 CFR 279;

(h) Pollution prevention\hazardous waste minimization procedures;

(i) Plans for the disposal of hazardous waste by permitted facilities;

(j) Procedures to be employed to ensure all required employee training records are maintained.

f. Prevention of Releases to the Environment

(1) Procedures to prevent releases to the environment

(2) Notifications in the event of a release to the environment

g. Regulatory Notification and Permits

(1) List what notifications and permit applications must be made. Demonstrate that those permits have been obtained by including copies of all applicable, environmental permits..

3.1.1 Environmental Protection Plan Review

Within thirty days after the Contract award date, submit the proposed Environmental Management Plan for further discussion, review, and approval. Commencement of work will not begin until the environmental management plan has been approved.

3.1.2 Licenses and Permits

Obtain licenses and permits pursuant to the "Permits and Responsibilities" FAR Clause 52.236-7.

3.2 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. If the work is near streams, lakes, or other waterways, conform to the national permitting requirements of the Clean Water Act.

Do not disturb fish and wildlife. Do not alter water flows or otherwise significantly disturb the native habitat adjacent to the project and critical to the survival of fish and wildlife, except as indicated or specified.

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

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. 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 replacement.

The Contracting Officer's approval is required before any equipment will be permitted to ford live streams. In areas where frequent crossings are required, install temporary culverts or bridges. Obtain Contracting Officer's approval prior to installation. Remove temporary culverts or bridges upon completion of work, and repair the area to its original condition unless otherwise required by the Contracting Officer.

3.2.1 Erosion and Sediment Control Measures

3.2.1.1 Burnoff

Burnoff of the ground cover is not permitted.

3.2.1.2 Protection of Erodible Soils

Immediately finish the earthwork brought to a final grade, as indicated or specified. Immediately protect the side slopes and back slopes upon completion of rough grading. Plan and conduct earthwork to minimize the duration of exposure of unprotected soils.

3.2.1.3 Temporary Protection of Erodible Soils

Use the following methods to prevent erosion and control sedimentation:

a. Mechanical Retardation and Control of Runoff

(1) Mechanically retard and control the rate of runoff from the construction site. This includes construction of diversion ditches, benches, berms, and use of silt fences and straw bales to retard and divert runoff to protected drainage courses.

3.2.2 Stormwater Drainage and Construction Dewatering

There will be no discharge of excavation ground water to the sanitary sewer, storm drains, or to the river without prior specific authorization of the Environmental Division in writing. Discharge of hazardous substances will not be permitted under any circumstances.

Construction site runoff will be prevented from entering any storm drain or the river directly by the use of straw bales or other method suitable to the Environmental Division. Contractor will provide erosion protection of the surrounding soils.

Construction Dewatering shall not be discharged to the sanitary sewer. If the construction dewatering is noted or suspected of being contaminated, it may only be released to the storm drain system if the discharge is specifically permitted. Authorization for any contaminated groundwater release shall be obtained in advance from the base Environmental Officer. Discharge of hazardous substances will not be permitted under any circumstances.

3.3 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. Upon discovery, notify the Contracting Officer. 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.

3.4 SOLID WASTE MANAGEMENT PLAN and PERMIT

Provide to the contracting officer written notification of the quantity of solid waste/debris that is anticipated to be generated by construction. Include in the report the locations where various types of waste will be disposed or recycled. Include letters of acceptance or as applicable, submit one copy of a State and local Solid Waste Management Permit or license showing such agency's approval of the disposal plan before transporting wastes off Government property.

3.4.1 Solid Waste Management Report

Monthly, submit a solid waste disposal report to the Contracting Officer. For each waste, the report will state the classification (using the definitions provided in this section), amount, location, and name of the business receiving the solid waste.

The Contractor will include copies of the waste handling facilities' weight tickets, receipts, bills of sale, and other sales documentation. In lieu of sales documentation, the Contractor may submit a statement indicating the disposal location for the solid waste which is signed by an officer of the Contractor firm authorized to legally obligate or bind the firm. The sales documentation or Contractor certification will include the receiver's tax identification number and business, EPA or State registration number, along with the receiver's delivery and business addresses and telephone numbers. For each solid waste retained by the Contractor for his own use, the Contractor will submit on the solid waste disposal report the information previously described in this paragraph. Prices paid or received will not be reported to the Contracting Officer unless required by other provisions or specifications of this Contract or public law.

3.4.2 Control and Management of Solid Wastes

Pick up 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. Recycling is encouraged and can be coordinated with the Contracting Officer and the activity recycling coordinator. Remove all solid waste (including non-hazardous debris) from Government property and dispose off-site at an approved landfill. Solid waste disposal off-site must comply with most stringent local, State, and Federal requirements including 40 CFR 241, 40 CFR 243, and 40 CFR 258.

Manage spent hazardous material used in construction, including but not limited to, aerosol cans, waste paint, cleaning solvents, contaminated brushes, and used rags, as per environmental law.

3.4.2.1 Dumpsters

Equip dumpsters with a secure cover and paint the standard base color. Keep cover closed at all times, except when being loaded with trash and debris. Locate dumpsters behind the construction fence or out of the public view. Empty site dumpsters at least once a week. or as needed to keep the site free of debris and trash. If necessary, provide 55 gallon trash containers painted the darker base color to collect debris in the construction site area. Locate the trash containers behind the construction fence or out of the public view. Empty trash containers at least once a day. For large demolitions, large dumpsters without lids are acceptable but should not have debris higher than the sides before emptying.

3.5 WASTE DETERMINATION DOCUMENTATION

Complete a Waste Determination form (provided at the pre-construction conference) for all contractor derived wastes to be generated. Base the waste determination upon either a constituent listing from the manufacturer used in conjunction with consideration of the process by which the waste was generated, EPA approved analytical data, or laboratory analysis (Material Safety Data Sheets (MSDS) by themselves are not adequate). Attach all support documentation to the Waste Determination form. As a minimum, a Waste Determination form must be provided for the following wastes (this listing is not all inclusive): oil and latex based painting and caulking products, solvents, adhesives, aerosols, petroleum products, and all containers of the original materials.

3.6 CONTRACTOR HAZARDOUS MATERIAL INVENTORY LOG

Submit the "Contractor Hazardous Material Inventory Log"(found at: http://www.wbdg.org/ccb/NAVGRAPH/graphtoc.pdf), which provides information required by (EPCRA Sections 312 and 313) along with corresponding Material Safety Data Sheets (MSDS) to the Contracting Officer at the start and at the end of construction (30 days from final acceptance), and update no later than January 31 of each calendar year during the life of the contract. Documentation for any spills/releases, environmental reports or off-site transfers may be requested by the Contracting Officer.

3.6.1 Disposal Documentation for Hazardous and Regulated Waste

Manifest, pack, ship and dispose of hazardous or toxic waste and universal waste that is generated as a result of construction in accordance with the generating facilities generator status under the Recourse Conservation and Recovery Act. Contact the Contracting Officer for the facility RCRA identification number that is to be used on each manifest.

Submit a copy of the applicable EPA and or State permit(s), manifest(s), or license(s) for transportation, treatment, storage, and disposal of hazardous and regulated waste by permitted facilities. Hazardous or toxic waste manifest must be reviewed, signed, and approved by the Navy before the Contractor may ship waste. To obtain specific disposal instructions the Contractor must coordinate with the Activity environmental office. Refer to Section 01 57 19.01 20 for the Activity Point of Contact information.

3.7 POLLUTION PREVENTION/HAZARDOUS WASTE MINIMIZATION

Minimize the use of hazardous materials and the generation of hazardous waste. Include procedures for pollution prevention/ hazardous waste

minimization in the Hazardous Waste Management Section of the Environmental Management Plan. Consult with the activity Environmental Office for suggestions and to obtain a copy of the installation's pollution prevention/hazardous waste minimization plan for reference material when preparing this part of the plan. If no written plan exists, obtain information by contacting the Contracting Officer. Describe the types of the hazardous materials expected to be used in the construction when requesting information.

3.8 WHM/HW MATERIALS PROHIBITION

No waste hazardous material or hazardous waste shall be disposed of on government property. No hazardous material shall be brought onto government property that does not directly relate to requirements for the performance of this contract. The government is not responsible for disposal of Contractor's waste material brought on the job site and not required in the performance of this contract. The intent of this provision is to dispose of that waste identified as waste hazardous material/hazardous waste as defined herein that was generated as part of this contract and existed within the boundary of the Contract limits and not brought in from offsite by the Contractor. Incidental materials used to support the contract including, but not limited to aerosol cans, waste paint, cleaning solvents, contaminated brushes, rags, clothing, etc. are the responsibility of the Contractor. The list is illustrative rather than inclusive. The Contractor is not authorized to discharge any materials to sanitary sewer, storm drain, or to the river or conduct waste treatment or disposal on government property without written approval of the Contracting Officer.

3.9 HAZARDOUS MATERIAL MANAGEMENT

No hazardous material shall be brought onto government property that does not directly relate to requirements for the performance of this contract.

Include hazardous material control procedures in the Safety Plan. Address procedures and proper handling of hazardous materials, including the appropriate transportation requirements. Submit a MSDS and estimated quantities to be used for each hazardous material to the Contracting Officer prior to bringing the material on base. Typical materials requiring MSDS and quantity reporting include, but are not limited to, oil and latex based painting and caulking products, solvents, adhesives, aerosol, and petroleum products. At the end of the project, provide the Contracting Officer with the maximum quantity of each material that was present at the site at any one time, the dates the material was present, the amount of each material that was used during the project, and how the material was used. Ensure that hazardous materials are utilized in a manner that will minimize the amount of hazardous waste that is generated. Ensure that all containers of hazardous materials have NFPA labels or their equivalent. Keep copies of the MSDS for hazardous materials on site at all times and provide them to the Contracting Officer at the end of the project. Certify that all hazardous materials removed from the site are hazardous materials and do not meet the definition of hazardous waste per 40 CFR 261.

3.10 PETROLEUM PRODUCTS AND REFUELING

Conduct the fueling and lubricating of equipment and motor vehicles in a manner that protects against spills and evaporation. Manage all used oil generated on site in accordance with 40 CFR 279. Determine if any used oil

generated while on-site exhibits a characteristic of hazardous waste. Used oil containing 1000 parts per million of solvents will be considered a hazardous waste and disposed of at Contractor's expense. Used oil mixed with a hazardous waste will also be considered a hazardous waste.

3.10.1 Oily and Hazardous Substances

Prevent oil or hazardous substances from entering the ground, drainage areas, or navigable waters. In accordance with 40 CFR 112, surround all temporary fuel oil or petroleum storage tanks with a temporary berm or containment of sufficient size and strength to contain the contents of the tanks, plus 10 percent freeboard for precipitation. The berm will be impervious to oil for 72 hours and be constructed so that any discharge will not permeate, drain, infiltrate, or otherwise escape before cleanup occurs.

3.10.2 Inadvertent Discovery of Petroleum Contaminated Soil or Hazardous Wastes

If petroleum contaminated soil or suspected hazardous waste is found during construction that was not identified in the contract documents, the contractor shall immediately notify the contracting officer. The contractor shall not disturb this material until authorized by the contracting officer.

3.11 FUEL TANKS

Petroleum products and lubricants required to sustain up to 30 days of construction activity may be kept on site. Storage and refilling practices shall comply with 40 CFR Part 112. Secondary containment shall be provided and be no less than 110 percent of the tank volume plus five inches of free-board. If a secondary berm is used for containment then the berm shall be impervious to oil for 72 hours and be constructed so that any discharge will not permeate, drain, infiltrate, or otherwise escape before cleanup occurs. Drips pans are required and the tanks must be covered during inclement weather.

3.12 RELEASES/SPILLS OF OIL AND HAZARDOUS SUBSTANCES

Exercise due diligence to prevent, contain, and respond to spills of hazardous material, hazardous substances, hazardous waste, sewage, regulated gas, petroleum, lubrication oil, and other substances regulated by environmental law. Maintain spill cleanup equipment and materials at the work site. In the event of a spill, take prompt, effective action to stop, contain, curtail, or otherwise limit the amount, duration, and severity of the spill/release. In the event of any releases of oil and hazardous substances, chemicals, or gases; immediately (within 15 minutes) notify the Base or Activity Fire Department, the activity's Command Duty Officer, and the Contracting Officer. If the contractor's response is inadequate, the Navy may respond. If this should occur, the contractor will be required to reimburse the government for spill response assistance and analysis.

The Contractor is responsible for verbal and written notifications as required by the federal 40 CFR 355, State, local regulations and Navy Instructions. Spill response will be in accordance with 40 CFR 300 and applicable State and local regulations. Contain and clean up these spills without cost to the Government. If Government assistance is requested or required, the Contractor will reimburse the Government for such

assistance. Provide copies of the written notification and documentation that a verbal notification was made within 20 days.

Maintain spill cleanup equipment and materials at the work site. Clean up all hazardous and non-hazardous (WHM) waste spills. The Contractor shall reimburse the government for all material, equipment, and clothing generated during any spill cleanup. The Contractor shall reimburse the government for all costs incurred including sample analysis materials, equipment, and labor if the government must initiate its own spill cleanup procedures, for Contractor responsible spills, when:

a. The Contractor has not begun spill cleanup procedure within one hour of spill discovery/occurrence, or

b. If, in the government's judgment, the Contractor's spill cleanup is not adequately abating life threatening situation and/or is a threat to any body of water or environmentally sensitive areas.

3.13 CONTROL AND MANAGEMENT OF HAZARDOUS WASTES

3.13.1 Facility Hazardous Waste Generator Status

New River Marine Corps Air Station is designated as a Large Quantity Generator. All work conducted within the boundaries of this activity must meet the regulatory requirements of this generator designation. The Contractor will comply with all provisions of Federal, State and local regulatory requirements applicable to this generator status regarding training and storage, handling, and disposal of all construction derived wastes.

3.13.2 Hazardous Waste/Debris Management

Identify all construction activities which will generate hazardous waste/debris. Provide a documented waste determination for all resultant waste streams. Hazardous waste/debris will be identified, labeled, handled, stored, and disposed of in accordance with all Federal, State, and local regulations including 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265, 40 CFR 266, and 40 CFR 268.

Hazardous waste will also be managed in accordance with the approved Hazardous Waste Management Section of the Environmental Protection Plan. Store hazardous wastes in approved containers in accordance with 49 CFR 173 and 49 CFR 178. Hazardous waste generated within the confines of Government facilities will be identified as being generated by the Government.

Prior to removal of any hazardous waste from Government property, all hazardous waste manifests must be signed by activity personnel from the Station Environmental Office. No hazardous waste will be brought onto Government property. Provide to the Contracting Officer a copy of waste determination documentation for any solid waste streams that have any potential to be hazardous waste or contain any chemical constituents listed in 40 CFR 372-SUBPART D. For hazardous wastes spills, verbally notify the Contracting Officer immediately.

3.13.2.1 Regulated Waste Storage/Satellite Accumulation/90 Day Storage Areas

If the work requires the temporary storage/collection of regulated or

hazardous wastes, the Contractor will request the establishment of a Regulated Waste Storage Area, a Satellite Accumulation Area, or a 90 Day Storage Area at the point of generation. The Contractor must submit a request in writing to the Contracting Officer providing the following information:

Contract Number	_____	Contractor	_____
Haz/Waste or Regulated Waste POC	_____	Phone Number	_____
Type of Waste	_____	Source of Waste	_____
Emergency POC	_____	Phone Number	_____

Location of the Site: _____
(Attach Site Plan to the Request)

Attach a waste determination form. Allow ten working days for processing this request. The designated area where waste is being stored shall be barricaded and a sign identifying as follows:

"DANGER - UNAUTHORIZED PERSONNEL KEEP OUT"

3.13.3 Class I ODS Prohibition

Class I ODS as defined and identified herein will not be used in the performance of this contract, nor be provided as part of the equipment. This prohibition will be considered to prevail over any other provision, specification, drawing, or referenced documents. Regulations related to the protection of stratosphere ozone may be found in 40 CFR 82.

Heating and air conditioning technicians must be certified through an EPA-approved program. Copies of certifications shall be maintained at the employees' place of business and be carried as a wallet card by the technician, as provided by environmental law. Accidental venting of a refrigerant is a release and shall be reported to the Contracting Officer.

3.13.3.1 Universal Waste/e-Waste Management

Universal waste including but not limited to some mercury containing building products such florescent lamps, mercury vapor lamps, high pressure sodium lamps, CRTs, batteries, aerosol paint containers, electrical equipment containing PCBs, and consumed electronic devices, shall be managed in accordance with applicable environmental law and installation instructions.

3.14 DUST CONTROL

Keep dust down at all times, including during 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 unnecessarily shake bags of cement, concrete mortar, or plaster.

3.14.1 Dirt and Dust Control Plan

Submit truck and material haul routes along with a plan for controlling dirt, debris, and dust on base roadways. As a minimum, identify in the plan the subcontractor and equipment for cleaning along the haul route and measures to reduce dirt, dust, and debris from roadways.

3.15 ABRASIVE BLASTING

3.15.1 Blasting Operations

The use of silica sand is prohibited in sandblasting.

Provide tarpaulin drop cloths and windscreens to enclose abrasive blasting operations to confine and collect dust, abrasive, agent, paint chips, and other debris in accordance with the requirements specified. Perform work involving removal of hazardous material in accordance with 29 CFR 1910.

3.15.2 Disposal Requirements

Submit analytical results of the debris generated from abrasive blasting operations per paragraph entitled Laboratory Analysis of this section. Hazardous waste generated from blasting operations will be managed in accordance with paragraph entitled "Hazardous Waste\Debris Management" of this section and with the approved HWMP.

3.16 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 the designated times. Confine pile-driving operations to the period between 8 a.m. and 4 p.m., Monday through Friday, exclusive of holidays, unless otherwise specified.

3.17 REMOVAL FROM CAMP LEJEUNE, NC

Remove and dispose of rubbish and debris from Government property.

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 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 will require the Contractor at his own expense to remove, transport and relocate the debris to a State approved site. The Contract will also be required to pay all fines, penalties or fees related to the illegal disposal of construction debris.

d. Metals will not be accepted at the Base Sanitary Landfill. Materials which may be deposited in the landfill include:

CATEGORY	CONSTRUCTION DEBRIS DISPOSAL - BASE SANITARY LANDFILL EXAMPLE/GENERAL

	INFORMATION FOR DEPOSIT IN THE LANDFILL
Mixed Debris	The following materials may be placed in the landfill in a location designated by the landfill operator. These items may be mixed together. Sheetrock - plaster - glass (broken) Non asbestos insulation - (fiberglass and mineral wool will be bagged). Packing paper, styrofoam and pasteboard boxes. Non-asbestos roofing materials such as shingles built-up and shingle roofing. Painted wood such as doors, windows, siding and trim. Plastic/fiberglass such as pipe, electrical boxes, cover plates, etc. Ceramic and vinyl flooring or tile - ceiling tile.
Masonry and Concrete	Deliver concrete, block, brick, mortar to the landfill separate from any other items and place in a location designated by the landfill operator. Reinforcement wire and rebar will be removed flush with exposed surfaces.
Nonrecyclable Cardboard	Break down corrugated cardboard boxes and deliver to the Base Recycling Center located at Building 913. If Base personnel rejects the cardboard, take cardboard to the landfill.
Nonrecyclable Wall Pallets	Deliver usable pallets to the Base Recycling Center located at Building 913. If Base personnel rejects the pallets, take pallets to the landfill.
Treated Wood	Deliver treated wood, and such as piling and power poles, to the landfill separated from any other items and placed in locations as designated by the landfill operator.
Untreated/Unpainted Wood	Deliver lumber, trees, stumps, limbs, tops and shrubs to the landfill separated from any other items, and place in locations as designated by the landfill operator.
Organic Matter	Deliver leaves, pine straw, grass clippings to the landfill separated from any other items, and place in locations as designated by landfill operator. No bags or containers are allowed.

Fiberglass Tanks 550 gallons or less	Clean tanks before delivery to 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	Separate each category of construction debris at the construction site and deliver separately to the landfill.
Weigh each and every vehicle delivering debris	Place each category of construction debris in the landfill at the location designated by the landfill operator.
Asbestos	Refer to Section 13280.
Lead-Based Paint and Materials	Refer to Section 13282.
Metals	Metals will not be accepted at the landfill. Remove metals from each and every category before delivery to the landfill. (Example: Remove hardware from doors and windows.) Dispose of metal construction debris at Defense Reutilization Maintenance Office (DRMO) Building TC-861, Camp Geiger. Aluminum, brass, copper, lead, other metal, electrical wiring, cable cut in 3 foot3 foot or less sections).

-- End of Section --

SECTION 01 57 19.01 20

SUPPLEMENTAL TEMPORARY ENVIRONMENTAL CONTROLS
08/08

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

1.2 REGIONAL REQUIREMENTS

1.2.1 Mid-Atlantic and DC

1.2.1.1 North Carolina

a. MCB Camp Lejeune/MCAS New River

(1) Removal of Waste from Camp Lejeune/New River

Remove and dispose of rubbish and debris from Government property.

(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 my 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 will require the Contractor at his own expense to remove, transport and relocate the debris to a State approved site. The Contractor will also be required to pay any fines, penalties, or fees related to the illegal disposal of construction debris.

(d.) Metal will not be accepted at the Base Sanitary Landfill. Materials which may be deposited in the landfill include:

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

Mixed Debris	The following materials may be placed in the landfill in a location designated by the landfill operator. These items may be mixed together. Sheetrock - plaster - glass (broken) Non asbestos insulation - (fiberglass and mineral wool will be bagged). Packing paper, Styrofoam, and pasteboard boxes Non-asbestos roofing materials such as shingles built-up and shingle roofing. Painted wood such as doors, windows, siding, and trim. Plastic/fiberglass such as pipe, electrical boxes, cover plates, etc. Ceramic and vinyl flooring or tile - ceiling tile.
Masonry and Concrete	Deliver concrete, block, brick, mortar to the landfill separate from any other items, and place in a location designated by the landfill operator. Reinforcement wire and rebar will be removed flush with exposed surfaces.
Non-recyclable Cardboard	Breakdown corrugated cardboard boxes and deliver to the Base Recycling Center located at Building 913. If Base personnel rejects the cardboard, take cardboard to the landfill.
Non-recyclable Wall Pallets	Deliver usable pallets to the Base Recycling Center located at Building 913. If base personnel rejects the pallets, take pallets to the landfill.
Treated Wood	Deliver treated wood, and such as piling and power poles, to the landfill separated from any other items, and place in locations as designated by the landfill operator.
Untreated/Unpainted Wood	Deliver lumber, trees, stumps, limbs, tops, and shrubs to the landfill separated from any other items, and place in locations as designated by landfill operator.
Organic Matter	Deliver leaves, pine straw, and grass clippings to the landfill separated from any other items, and place in locations as designated by landfill operator. No bags or containers are allowed.
Fiberglass Tanks - 550 Gallons or less	Clean tanks before deliver to 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	Separate each category of construction debris at

Vehicle delivering debris	construction site and deliver separately to the landfill.
Weigh each and every Vehicle delivering debris	Place each category of construction debris in the landfill at the location designated by the landfill operator.
Asbestos	Refer to PART 4, PERFORMANCE TECHNICAL SPECIFICATIONS, F20, SELECTIVE BUILDING DEMOLITION.
Lead Based Paint and Materials	Refer to PART 4, PERFORMANCE TECHNICAL SPECIFICATIONS, F20, SELECTIVE BUILDING DEMOLITION.
Metals	Metals will not be accepted at the landfill. Remove metals from each and every category before delivery to the landfill. (Example: Remove hardware from doors and windows) Dispose of metal construction debris at Defense Reutilization Maintenance Office (DRMO) Building TC-861, Camp Geiger. Aluminum, brass, copper, lead, other metal, electrical wiring, cable (cut in 3 foot or less sections)

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

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SECTION 01 58 00

PROJECT IDENTIFICATION
08/08

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)

AWPA C1	(2003) All Timber Products - Preservative Treatment by Pressure Processes
AWPA C2	(2003) Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Preliminary Drawing Indicating Layout and Text Content; G

1.3 PROJECT SIGN

Prior to initiating any work on site, provide one project identification sign at the location designated. Construct the sign in accordance with project sign detail attached at the end of this section. Maintain sign throughout the life of the project. Upon completion of the project, remove the sign from the site.

1.3.1 Project Identification Signboard (Navy)

A project identification signboard shall be provided in accordance with the attached plates. Replace top most portion of sign with attached to add DLA logo. Provide preliminary drawing indicating layout and text content. The signboard shall be provided at a conspicuous location on the job site where directed by the Contracting Officer.

a. The field of the sign shall consist of a 4 by 8 foot sheet of grade B-B medium density overlaid exterior plywood.

b. Lumber shall be B or better Southern pine, pressure-preservative treated in accordance with AWPA C1 and AWPA C2. Nails shall be aluminum or galvanized steel.

c. The entire signboard and supports shall be given one coat of exterior alkyd primer and two coats of exterior alkyd enamel

paint. The lettering and sign work shall be performed by a skilled sign painter using paint known in the trade as bulletin colors. The colors, lettering sizes, and lettering styles shall be as indicated. Where preservative-treated lumber is required, utilize only cured pressure-treated wood which has had the chemicals leached from the surface of the wood prior to painting.

d. Use spray applied automotive quality high gloss acrylic white enamel paint as background for the NAVFAC logo. NAVFAC logo shall be an applied 2 millimeter film sticker/decal with either transparent or white background or paint the logo by stencil onto the sign. The weather resistant sticker/decal film shall be rated for a minimum of 2-year exterior vertical exposure. The self-adhering sticker shall be mounted to the sign with pressure sensitive, permanent acrylic adhesive. Shop cut sticker/decal to rectangular shape and provide pull-off backing sheet on adhesive side of design sticker for shipping.

e. Sign paint colors (manufacturer's numbers/types listed below for color identification only)

(1) Blue = To match dark blue color in the NAVFAC logo.

(2) White = To match Brilliant White color in the NAVFAC logo.

f. NAVFAC logo must retain proportions and design integrity. NAVFAC logos in electronic format may be obtained from the NAVFAC web portal via the follwoing link: https://portal.navfac.navy.mil/portal/page?_pageid=181,3465071&_dad=portal&_sche Use the following to choose color values for the paint to be used:

(1) Dark Blue = equivalent to CMYK values 100, 72, 0, 8 .

(2) Light Blue = equivalent to CMYK values 69, 34, 0, 0.

(3) Cyan = equivalent to CMYK values 100, 9, 0, 6.

(4) Yellow = equivalent to CMYK values 0.9,94, 0.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 62 35

RECYCLED / RECOVERED MATERIALS

07/06

PART 1 GENERAL

1.1 REFERENCES

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

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

40 CFR 247	Comprehensive Procurement Guideline for Products Containing Recovered Materials

1.2 OBJECTIVES

Government procurement policy is to acquire, in a cost effective manner, items containing the highest percentage of recycled and recovered materials practicable consistent with maintaining a satisfactory level of competition without adversely affecting performance requirements or exposing suppliers' employees to undue hazards from the recovered materials. The Environmental Protection Agency (EPA) has designated certain items which must contain a specified percent range of recovered or recycled materials. EPA designated products specified in this contract comply with the stated policy and with the EPA guidelines. The Contractor shall make all reasonable efforts to use recycled and recovered materials in providing the EPA designated products and in otherwise utilizing recycled and recovered materials in the execution of the work.

1.3 EPA DESIGNATED ITEMS INCORPORATED IN THE WORK

Various sections of the specifications contain requirements for materials that have been designated by EPA as being products which are or can be made with recovered or recycled materials. These items, when incorporated into the work under this contract, shall contain at least the specified percentage of recycled or recovered materials unless adequate justification (non-availability) for non-use is provided. When a designated item is specified as an option to a non-designated item, the designated item requirements apply only if the designated item is used in the work.

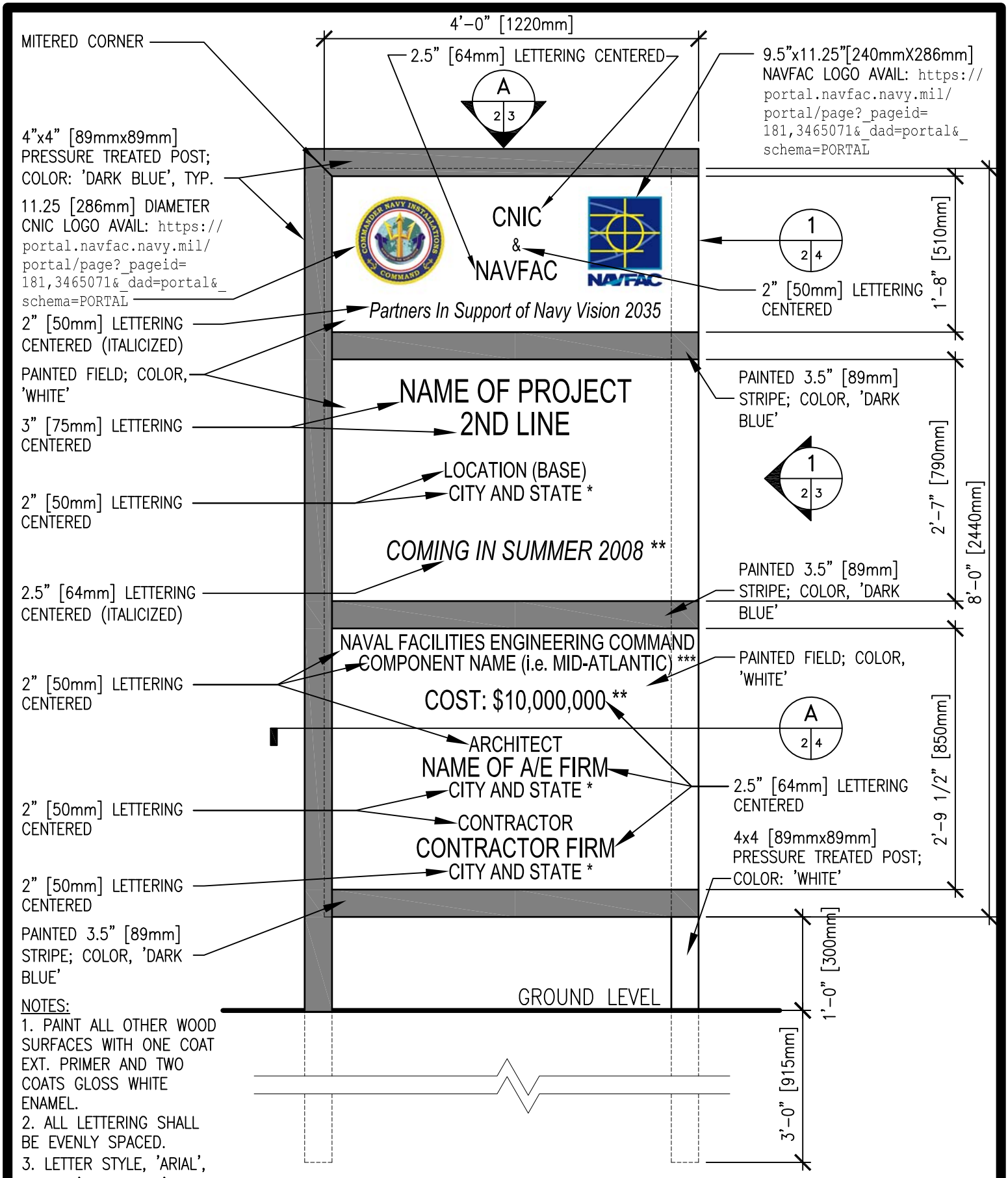
1.4 EPA PROPOSED ITEMS INCORPORATED IN THE WORK

Products other than those designated by EPA are still being researched and are being considered for future Comprehensive Procurement Guideline (CPG) designation. It is recommended that these items, when incorporated in the work under this contract, contain the highest practicable percentage of recycled or recovered materials, provided specified requirements are also met.

1.5 EPA LISTED ITEMS USED IN CONDUCT OF THE WORK BUT NOT INCORPORATED IN THE WORK

There are many products listed in 40 CFR 247 which have been designated or proposed by EPA to include recycled or recovered materials that may be used by the Contractor in performing the work but will not be incorporated into the work. These products include office products, temporary traffic control products, and pallets. It is recommended that these non-construction products, when used in the conduct of the work, contain the highest practicable percentage of recycled or recovered materials and that these products be recycled when no longer needed.

-- End of Section --



NOTES:
1. PAINT ALL OTHER WOOD SURFACES WITH ONE COAT EXT. PRIMER AND TWO COATS GLOSS WHITE ENAMEL.
2. ALL LETTERING SHALL BE EVENLY SPACED.
3. LETTER STYLE, 'ARIAL', COLOR 'DARK BLUE'. TYPICAL FOR ALL LETTERING.

*–ABBREVIATE STATE
**–CONFIRM USE WITH CONTRACTING OFFICER
***–VERIFY NAME WITH CONTRACTING OFFICER

PROJECT IDENTIFICATION SIGNBOARD

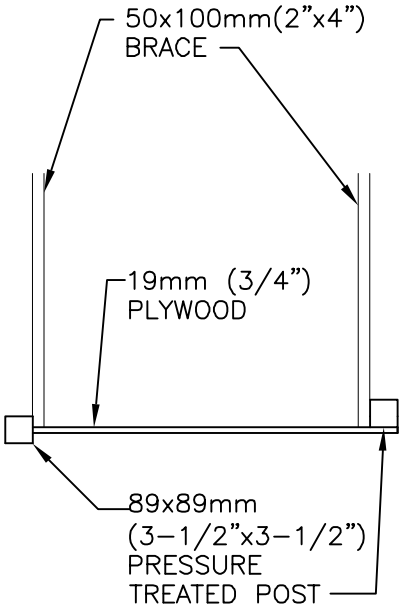
SCALE: 3/4" = 1'-0"

PLATE 1

REV DATE: 2008 03 18 rem

NOTE: POSTS AND BRACES SHALL BE PRESSURE TREATED. ALL FASTENINGS SHALL BE ZINC COATED.

INCLUDE OPTIONAL BRACING IN UNSTABLE SOIL OR HIGH WIND ENVIRONMENTS.



TOP VIEW

SCALE: 3"=1'–0"

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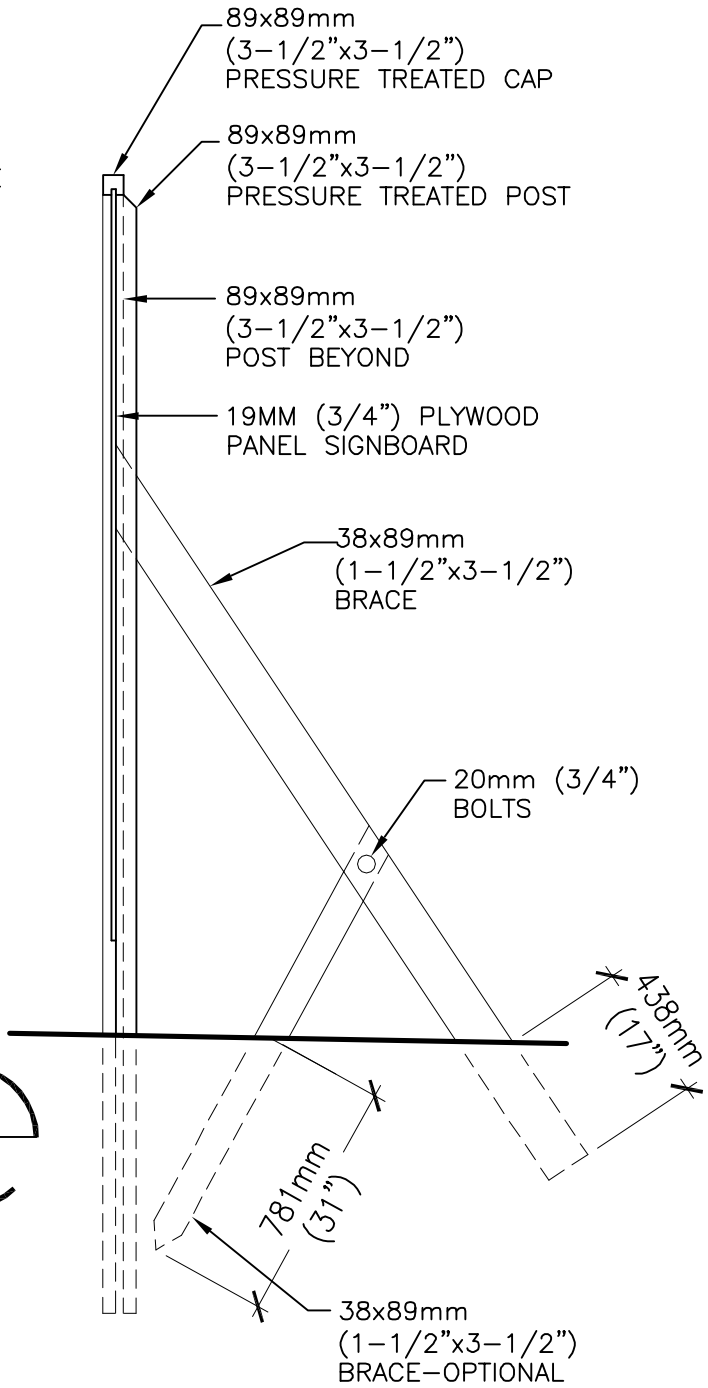
1, 2 | 3



SIDE VIEW

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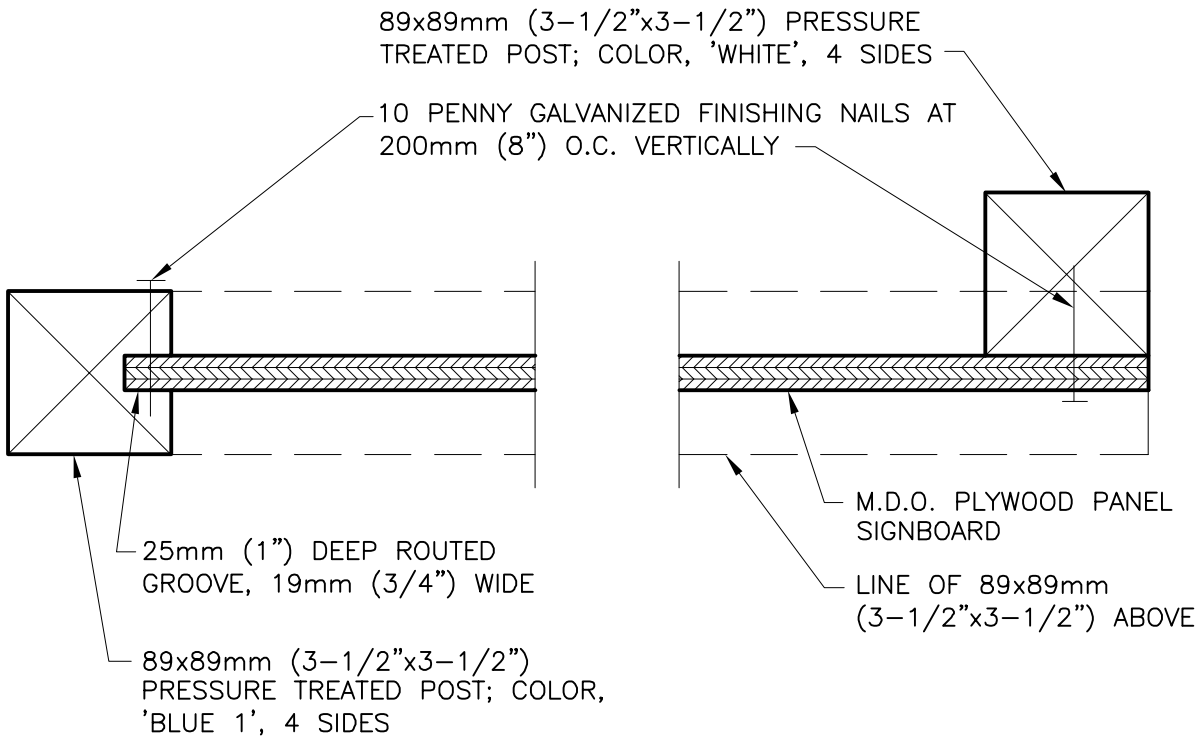
1, 2 | 3

PROJECT IDENTIFICATION SIGNBOARD SUPPORT DETAILS

SCALE: NONE



PLAN SECTION

SCALE: NONE

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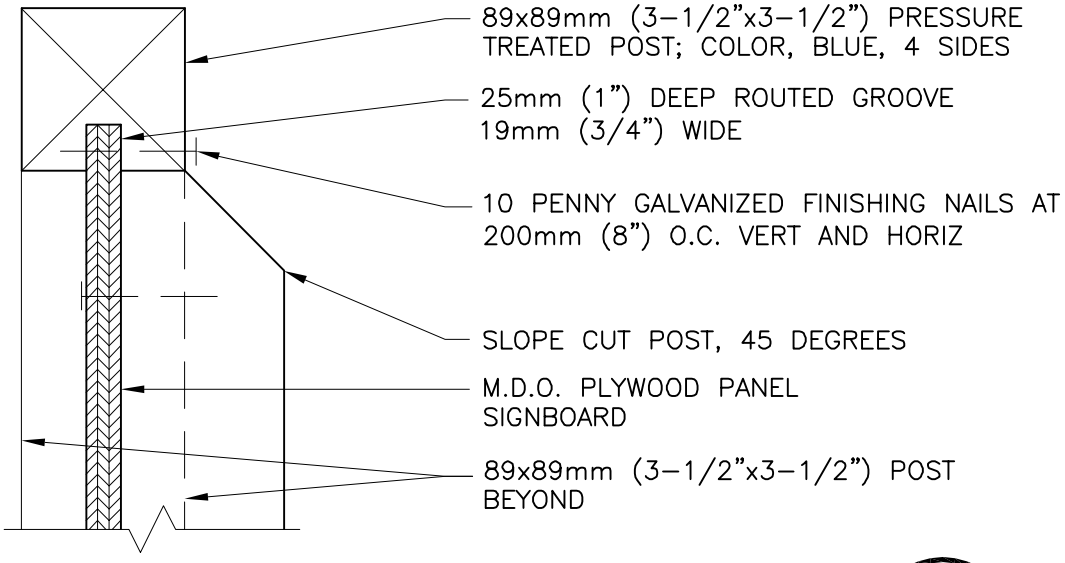

DETAIL @ END

SCALE: NONE

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PROJECT IDENTIFICATION SIGNBOARD SECTIONS

DEFENSE LOGISTICS AGENCY PROJECT
IN PARTNERSHIP WITH
NAVAL FACILITIES ENGINEERING COMMAND
AND THE UNITED STATES MARINE CORPS

Pump Station Upgrades


LOGISTICS
DEFENSE
AGENCY


NAVFAC
Naval Facilities Engineering Command
NAVFAC MID-ATLANTIC

SECTION 01 74 19

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT
01/07

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM E 1609	(2001) Development and Implementation of a Pollution Prevention Program

1.2 GOVERNMENT POLICY

Government policy is to apply sound environmental principles in the design, construction and use of facilities. As part of the implementation of that policy the Contractor shall: (1) practice efficient waste management when sizing, cutting, and installing products and materials and (2) use all reasonable means to divert construction and demolition waste from landfills and incinerators and to facilitate their recycling or reuse. A minimum of 50 percent by weight of total project solid waste shall be diverted from the landfill.

1.3 MANAGEMENT

Develop and implement a waste management program in accordance with ASTM E 1609 and as specified. Take a pro-active, responsible role in the management of construction and demolition waste and require all subcontractors, vendors, and suppliers to participate in the effort. Construction and demolition waste includes products of demolition or removal, excess or unusable construction materials, packaging materials for construction products, and other materials generated during the construction process but not incorporated into the work. In the management of waste consideration shall be given to the availability of viable markets, the condition of the material, the ability to provide the material in suitable condition and in a quantity acceptable to available markets, and time constraints imposed by internal project completion mandates. The Contractor is responsible for implementation of any special programs involving rebates or similar incentives related to recycling of waste. Revenues or other savings obtained for salvage, or recycling accrue to the Contractor. Appropriately permit firms and facilities used for recycling, reuse, and disposal for the intended use to the extent required by federal, state, and local regulations. Also, provide on-site instruction of appropriate separation, handling, recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section

01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Waste Management Plan; G

SD-11 Closeout Submittals

Records;

1.5 MEETINGS

Conduct Construction Waste Management meetings. After award of the Contract and prior to commencement of work, schedule and conduct a meeting with the Contracting Officer to discuss the proposed Waste Management Plan and to develop a mutual understanding relative to the details of waste management. The requirements for this meeting may be fulfilled during the coordination and mutual understanding meeting outlined in Section 01 45 02 NAVFAC QUALITY CONTROL. At a minimum, environmental and waste management goals and issues shall be discussed at the following additional meetings:

a. Pre-bid meeting.

b. Preconstruction meeting.

c. Regular QC meetings.

d. Work safety meetings.

1.6 WASTE MANAGEMENT PLAN

A waste management plan shall be submitted within 15 days after contract award and not less than 10 days before the preconstruction meeting. The plan shall demonstrate how the project waste diversion goal shall be met and shall include the following:

a. Name of individuals on the Contractor's staff responsible for waste prevention and management.

b. Actions that will be taken to reduce solid waste generation, including coordination with subcontractors to ensure awareness and participation.

c. Description of the regular meetings to be held to address waste management.

d. Description of the specific approaches to be used in recycling/reuse of the various materials generated, including the areas on site and equipment to be used for processing, sorting, and temporary storage of wastes.

e. Characterization, including estimated types and quantities, of the waste to be generated.

f. Name of landfill and/or incinerator to be used and the estimated costs for use, assuming that there would be no salvage or recycling on the project.

g. Identification of local and regional reuse programs, including

non-profit organizations such as schools, local housing agencies, and organizations that accept used materials such as materials exchange networks and Habitat for Humanity. Include the name, location, and phone number for each reuse facility to be used, and provide a copy of the permit or license for each facility.

h. List of specific waste materials that will be salvaged for resale, salvaged and reused on the current project, salvaged and stored for reuse on a future project, or recycled. Recycling facilities that will be used shall be identified by name, location, and phone number, including a copy of the permit or license for each facility.

i. Identification of materials that cannot be recycled/reused with an explanation or justification, to be approved by the Contracting Officer.

j. Description of the means by which any waste materials identified in item (h) above will be protected from contamination.

k. Description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site).

l. Anticipated net cost savings determined by subtracting Contractor program management costs and the cost of disposal from the revenue generated by sale of the materials and the incineration and/or landfill cost avoidance.

Revise and resubmit Plan as required by the Contracting Officer. Approval of Contractor's Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations or meeting project cumulative waste diversion requirement. Distribute copies of the Waste Management Plan to each subcontractor, the Quality Control Manager, and the Contracting Officer.

1.7 RECORDS

Records shall be maintained to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration. Quantities may be measured by weight or by volume, but must be consistent throughout. List each type of waste separately noting the disposal or diversion date. Identify the landfill, recycling center, waste processor, or other organization used to process or receive the solid waste. Provide explanations for any waste not recycled or reused. With each application for payment, submit updated documentation for solid waste disposal and diversion, and submit manifests, weight tickets, receipts, and invoices specifically identifying the project and waste material. The records shall be made available to the Contracting Officer during construction, and a copy of the records shall be delivered to the Contracting Officer upon completion of the construction.

1.8 COLLECTION

Separate, store, protect, and handle at the site identified recyclable and salvageable waste products in a manner that maximizes recyclability and salvagability of identified materials. Provide the necessary containers,

bins and storage areas to facilitate effective waste management and clearly and appropriately identify them. Provide materials for barriers and enclosures around recyclable material storage areas which are nonhazardous and recyclable or reusable. Locate out of the way of construction traffic. Provide adequate space for pick-up and delivery and convenience to subcontractors. Recycling and waste bin areas are to be kept neat and clean, and recyclable materials shall be handled to prevent contamination of materials from incompatible products and materials. Clean contaminated materials prior to placing in collection containers. Use cleaning materials that are nonhazardous and biodegradable. Handle hazardous waste and hazardous materials in accordance with applicable regulations. Separate materials by one of the following methods:

1.8.1 Source Separated Method.

Waste products and materials that are recyclable shall be separated from trash and sorted as described below into appropriately marked separate containers and then transported to the respective recycling facility for further processing. Deliver materials in accordance with recycling or reuse facility requirements (e.g., free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process). Separate materials into the following category types as appropriate to the project waste and to the available recycling and reuse programs in the project area:

a. Land clearing debris.

b. Asphalt.

c. Concrete and masonry.

d. Metal (e.g. banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized, stainless steel, aluminum, copper, zinc, lead brass, bronze).

(1) Ferrous.

(2) Non-ferrous.

e. Wood (nails and staples allowed).

f. Debris.

g. Glass (colored glass allowed).

h. Paper.

(1) Bond.

(2) Newsprint.

(3) Cardboard and paper packaging materials.

i. Plastic.

(1) Type 1: Polyethylene Terephthalate (PET, PETE).

(2) Type 2: High Density Polyethylene (HDPE).

(3) Type 3: Vinyl (Polyvinyl Chloride or PVC).

(4) Type 4: Low Density Polyethylene (LDPE).

(5) Type 5: Polypropylene (PP).

(6) Type 6: Polystyrene (PS).

(7) Type 7: Other. Use of this code indicates that the package in question is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination.

j. Gypsum.

k. Non-hazardous paint and paint cans.

l. Carpet.

m. Ceiling tiles.

n. Insulation.

o. Beverage containers.

1.8.2 Co-Mingled Method.

Waste products and recyclable materials shall be placed into a single container and then transported to a recycling facility where the recyclable materials are sorted and processed.

1.8.3 Other Methods.

Other methods proposed by the Contractor may be used when approved by the Contracting Officer.

1.9 DISPOSAL

Control accumulation of waste materials and trash. Recycle or dispose of collected materials off-site at intervals approved by the Contracting Officer and in compliance with waste management procedures. Except as otherwise specified in other sections of the specifications, disposal shall be in accordance with the following:

1.9.1 Reuse.

First consideration shall be given to salvage for reuse since little or no re-processing is necessary for this method, and less pollution is created when items are reused in their original form. Coordinate reuse with the Contracting Officer. Reuse materials as indicated on the drawings. Sale or donation of waste suitable for reuse shall be considered.

1.9.2 Recycle.

Waste materials not suitable for reuse, but having value as being recyclable, shall be made available for recycling. All fluorescent lamps, HID lamps, and mercury-containing thermostats removed from the site shall be recycled. Arrange for timely pickups from the site or deliveries to

recycling facilities in order to prevent contamination of recyclable materials.

1.9.3 Waste.

Materials with no practical use or economic benefit shall be disposed at a landfill or incinerator.

1.9.4 Return

Set aside and protect misdelivered and substandard products and materials and return to supplier for credit.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used. -- End of Section --

SECTION 01 78 00

CLOSEOUT SUBMITTALS
05/09

PART 1 GENERAL
1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM E 1971	(2005) Stewardship for the Cleaning of Commercial and Institutional Buildings

GREEN SEAL (GS)

GS-37	(2000; R 2005) Industrial and Institutional Cleaners

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

As-Built Record of Equipment and Materials

Two copies of the record listing the as-built materials and equipment incorporated into the construction of the project.

Warranty Tags

Two record copies of the warranty tags showing the layout and design.

Final Cleaning

Two copies of the listing of completed final clean-up items.

Spare Parts Data

Two copies of list that ndicates manufacturer's name, part number, nomenclature, and stock level recommended for maintenance and repair. List those items that may be standard to the normal maintenance of the system.

SD-08 Manufacturer's Instructions

Preventative Maintenance and Condition Monitoring (Predictive Testing) and Inspection schedules with instructions that state when systems should be retested.

Define within the schedule the anticipated length of each test, test apparatus, number of personnel identified by responsibility, and a testing validation procedure permitting the record operation capability requirements. On each test feature; e.g., gpm, rpm, psi, provide a signoff blank for the Contractor and Contracting Officer. Within a remarks column of the testing validation procedure include references to operating limits of time, pressure, temperature, volume, voltage, current, acceleration, velocity, alignment, calibration, adjustments, cleaning, or special system notes. Delineate procedures for preventative maintenance, condition monitoring (predictive testing) and inspection, adjustment, lubrication and cleaning necessary to prevent failure.

SD-10 Operation and Maintenance Data

Submit Operation and Maintenance Manuals in accordance with paragraph entitled, "Operation and Maintenance," of this section.

SD-11 Closeout Submittals

Record Drawings

Drawings showing final as-built conditions of the project. The final CADD record drawings must consist of one set of electronic CADD drawing files in the specified format, one set of mylar drawings, 2 sets of blue-line prints of the mylars, and one set of the approved working Record drawings.

Form DD1354; G

Checklist for Form DD1354; G

1.3 PROJECT RECORD DOCUMENTS

1.3.1 Record Drawings

This paragraph covers record drawings complete, as a requirement of the contract. The terms "drawings," "contract drawings," "drawing files," "working record drawings" and "final record drawings" refer to contract drawings which are revised to be used for final record drawings showning as-built conditions.

1.3.1.1 Government Furnished Materials

One set of electronic CADD files in the specified software and format revised to reflect all bid amendments will be provided by the Government at the preconstruction conference for projects requiring CADD file record drawings.

1.3.1.2 Working Record and Final Record Drawings

Revise 2 sets of paper drawings by red-line process to show the as-built conditions during the prosecution of the project. Kept these working as-built marked drawings current on a weekly basis and at least one set available on the jobsite at all times. Changes from the contract plans which are made in the work or additional information which might be

uncovered in the course of construction must be accurately and neatly recorded as they occur by means of details and notes. Prepare final record (as-built) drawings after the completion of each definable feature of work as listed in the Contractor Quality Control Plan (Foundations, Utilities, Structural Steel, etc., as appropriate for the project). The working as-built marked prints and final record (as-built) drawings will be jointly reviewed for accuracy and completeness by the Contracting Officer and the Contractor prior to submission of each monthly pay estimate. If the Contractor fails to maintain the working and final record drawings as specified herein, the Contracting Officer will deduct from the monthly progress payment an amount representing the estimated cost of maintaining the record drawings. This monthly deduction will continue until an agreement can be reached between the Contracting Officer and the Contractor regarding the accuracy and completeness of updated drawings. Show on the working and final record drawings , but not limited to, the following information:

a. The actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, show by offset dimensions to two permanently fixed surface features the end of each run including each change in direction on the record drawings. Locate valves, splice boxes and similar appurtenances by dimensioning along the utility run from a reference point. Also record the average depth below the surface of each run.

b. The location and dimensions of any changes within the building structure.

c. Correct grade, elevations, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made from contract plans.

d. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor; including but not limited to fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.

e. The topography, invert elevations and grades of drainage installed or affected as part of the project construction.

f. Changes or modifications which result from the final inspection.

g. Where contract drawings or specifications present options, show only the option selected for construction on the final as-built prints.

h. If borrow material for this project is from sources on Government property, or if Government property is used as a spoil area, furnish a contour map of the final borrow pit/spoil area elevations.

i. Systems designed or enhanced by the Contractor, such as HVAC controls, fire alarm, fire sprinkler, and irrigation systems.

j. Modifications (include within change order price the cost to change working and final record drawings to reflect modifications) and compliance with the following procedures.

(1) Follow directions in the modification for posting descriptive

changes.

(2) Place a Modification Delta at the location of each deletion.

(3) For new details or sections which are added to a drawing, place a Modification Delta by the detail or section title.

(4) For minor changes, place a Modification Delta by the area changed on the drawing (each location).

(5) For major changes to a drawing, place a Modification Delta by the title of the affected plan, section, or detail at each location.

(6) For changes to schedules or drawings, place a Modification Delta either by the schedule heading or by the change in the schedule.

(7) The Modification Delta size shall be 1/2 inch diameter unless the area where the circle is to be placed is crowded. Smaller size circle shall be used for crowded areas.

1.3.1.3 Drawing Preparation

Modify the record drawings as may be necessary to correctly show the features of the project as it has been constructed by bringing the contract set into agreement with approved working as-built prints, and adding such additional drawings as may be necessary. These working as-built marked prints must be neat, legible and accurate. These drawings are part of the permanent records of this project and must be returned to the Contracting Officer after approval by the Government. Any drawings damaged or lost by the Contractor must be satisfactorily replaced by the Contractor at no expense to the Government.

1.3.1.4 Computer Aided Design and Drafting (CADD) Drawings

Only employ personnel proficient in the preparation of CADD drawings to modify the contract drawings or prepare additional new drawings. Additions and corrections to the contract drawings must be equal in quality and detail to that of the originals. Line colors, line weights, lettering, layering conventions, and symbols must be the same as the original line colors, line weights, lettering, layering conventions, and symbols. If additional drawings are required, prepare them using the specified electronic file format applying the same graphic standards specified for original drawings. The title block and drawing border to be used for any new final record drawings must be identical to that used on the contract drawings. Accomplish additions and corrections to the contract drawings using CADD files. The Contractor will be furnished "as-designed" drawings in AutoCad format compatible with a Windows XP operating system. The electronic files will be supplied on compact disc, read-only memory (CD-ROM). Provide all program files and hardware necessary to prepare final record drawings. The Contracting Officer will review final record drawings for accuracy and return them to the Contractor for required corrections, changes, additions, and deletions.

a. Provide CADD "base" colors of red, green, and blue. Color code for changes as follows:

(1) Deletions (Red) - Over-strike deleted graphic items (lines),

lettering in notes and leaders.

(2) Additions (Green) - Added items, lettering in notes and leaders.

(3) Special (Blue) - Items requiring special information, coordination, or special detailing or detailing notes.

b. Rename the Contract Drawing files in a manner related to the contract number (i.e., 98-C-10.DGN) as instructed in the Pre-Construction conference. Use only those renamed files for the Marked-up changes. All changes shall be made on the layer/level as the original item.

c. When final revisions have been completed, show the wording "RECORD DRAWINGS / AS-BUILT CONDITIONS" followed by the name of the Contractor in letters at least 3/16 inch high on the cover sheet drawing. Mark all other contract drawings either "Record" drawing denoting no revisions on the sheet or "Revised Record" denoting one or more revisions. Date original contract drawings in the revision block.

d. Within 10 days after Government approval of all of the working record drawings for a phase of work, prepare the final CADD record drawings for that phase of work and submit two sets of blue-lined prints of these drawings for Government review and approval. The Government will promptly return one set of prints annotated with any necessary corrections. Within 7 days revise the CADD files accordingly at no additional cost and submit one set of final prints for the completed phase of work to the Government. Within 10 days of substantial completion of all phases of work, submit the final record drawing package for the entire project. Submit one set of electronic files on compact disc, read-only memory (CD-ROM), one set of mylars, two sets of blue-line prints and one set of the approved working record drawings. They must be complete in all details and identical in form and function to the contract drawing files supplied by the Government. Any transactions or adjustments necessary to accomplish this is the responsibility of the Contractor. The Government reserves the right to reject any drawing files it deems incompatible with the customer's CADD system. Paper prints, drawing files and storage media submitted will become the property of the Government upon final approval. Failure to submit final record drawing files and marked prints as specified will be cause for withholding any payment due the Contractor under this contract. Approval and acceptance of final record drawings must be accomplished before final payment is made to the Contractor.

1.3.1.5 Payment

No separate payment will be made for record drawings required under this contract, and all costs accrued in connection with such drawings are considered a subsidiary obligation of the Contractor.

1.3.2 As-Built Record of Equipment and Materials

Furnish one copy of preliminary record of equipment and materials used on the project 15 days prior to final inspection. This preliminary submittal will be reviewed and returned 2 days after final inspection with Government comments. Submit twosets of final record of equipment and materials 10 days after final inspection. Key the designations to the related area depicted on the contract drawings. List the following data:

RECORD OF DESIGNATED EQUIPMENT AND MATERIALS DATA

Description	Specification Section	Manufacturer and Catalog, Model, and Serial Number	Composition and Size	Where Used

1.3.3 Final Approved Shop Drawings

Furnish final approved project shop drawings 30 days after transfer of the completed facility.

1.3.4 Construction Contract Specifications

Furnish final record (as-built) construction contract specifications, including modifications thereto, 30 days after transfer of the completed facility.

1.3.5 Real Property Equipment

Furnish a list of installed equipment furnished under this contract. Include all information usually listed on manufacturer's name plate. In the "EQUIPMENT-IN-PLACE LIST" include, as applicable, the following for each piece of equipment installed: description of item, location (by room number), model number, serial number, capacity, name and address of manufacturer, name and address of equipment supplier, condition, spare parts list, manufacturer's catalog, and warranty. Furnish a draft list at time of transfer. Furnish the final list 30 days after transfer of the completed facility.

1.4 SPARE PARTS DATA

Indicate manufacturer's name, part number, nomenclature, and stock level required for maintenance and repair. List those items that may be standard to the normal maintenance of the system.

Supply two items of each part for spare parts inventory. Provision of spare parts does not relieve the Contractor of responsibilities listed under the contract guarantee provisions.

1.5 PREVENTATIVE MAINTENANCE

Submit Preventative Maintenance and Condition Monitoring (Predictive Testing) and Inspection schedules with instructions that state when systems should be retested.

Define the anticipated length of each test, test apparatus, number of personnel identified by responsibility, and a testing validation procedure permitting the record operation capability requirements within the schedule. Provide a signoff blank for the Contractor and Contracting Officer for each test feature; e.g., gpm, rpm, psi. Include a remarks column for the testing validation procedure referencing operating limits of time, pressure, temperature, volume, voltage, current, acceleration, velocity, alignment, calibration, adjustments, cleaning, or special system notes. Delineate procedures for preventative maintenance, inspection, adjustment, lubrication and cleaning necessary to minimize corrective maintenance and repair.

Repair requirements must inform operators how to check out, troubleshoot, repair, and replace components of the system. Include electrical and mechanical schematics and diagrams and diagnostic techniques necessary to enable operation and troubleshooting of the system after acceptance.

1.6 WARRANTY MANAGEMENT

1.6.1 Warranty Tags

At the time of installation, tag each warranted item with a durable, oil and water resistant tag approved by the Contracting Officer. Attached each tag with a copper wire and spray with a silicone waterproof coating. The date of acceptance and the QC signature must remain blank until the project is accepted for beneficial occupancy. Show the following information on the tag.

a. Type of product/material_____.

b. Model number_____.

c. Serial number_____.

d. Contract number_____.

e. Warranty period_____from_____to_____.

f. Inspector's signature_____.

g. Construction Contractor_____.

Address_____.

Telephone number_____.

h. Warranty contact_____.

Address_____.

Telephone number_____.

i. Warranty response time priority code_____.

j. WARNING - PROJECT PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE DURING THE WARRANTY PERIOD.

1.7 OPERATION AND MAINTENANCE MANUALS

Operation and Maintenance Manuals must be consistent with the manufacturer's standard brochures, schematics, printed instructions, general operating procedures, and safety precautions. Bind information in manual format and grouped by technical sections. Test data must be legible and of good quality. Light-sensitive reproduction techniques are acceptable provided finished pages are clear, legible, and not subject to fading. Pages for vendor data and manuals must have 0.3937-inch holes and be bound in 3-ring, loose-leaf binders. Organize data by separate index and tabbed sheets, in a loose-leaf binder. Binder must lie flat with printed sheets that are easy to read. Caution and warning indications must be clearly labeled.

Submit classroom and field instructions in the operation and maintenance of systems equipment where required by the technical provisions. These services must be directed by the Contractor, using the manufacturer's factory-trained personnel or qualified representatives. Contracting Officer will be given 7 calendar days written notice of scheduled instructional services. Instructional materials belonging to the manufacturer or vendor, such as lists, static exhibits, and visual aids, must be made available to the Contracting Officer.

Submit 6 copies of the project operation and maintenance manuals 30 calendar days prior to testing the system involved. Update and resubmit data for final approval no later than 30 calendar days prior to contract completion.

1.8 CLEANUP

Provide final cleaning in accordance with ASTM E 1971. Leave premises "broom clean." Comply with GS-37 for general purpose cleaning. Use only nonhazardous cleaning materials, including natural cleaning materials, in the final cleanup. Sweep paved areas and rake clean landscaped areas. Remove waste and surplus materials, rubbish and construction facilities from the site. Recycle, salvage, and return construction and demolition waste from project in accordance with the Waste Management Plan. Promptly and legally transport and dispose of any trash. Do not burn, bury, or otherwise dispose of trash on the project site.

1.9 REAL PROPERTY RECORD

Near the completion of Project, but a minimum of 60 days prior to final acceptance of the work, complete, update draft attached to this section, and submit an accounting of all installed property on Form DD1354 "Transfer and Acceptance of Military Real Property." Contact the Contracting Officer for any project specific information necessary to complete the DD Form 1354. For information purposes, a blank DD Form 1354 (fill-able) in ADOBE (PDF) may be obtained at the following web site:
http://www.dtic.mil/whs/directives/infomgt/forms/eforms/dd1354.pdf

Submit the completed Checklist for Form DD1354 of Government-Furnished and Contractor-Furnished/Contractor Installed items. Attach this list to the updated DD Form 1354. Instructions for completing the form and a blank checklist (fill-able) in ADOBE (PDF) may be obtained at the following web site:
http://www.wbdg.org/ccb/DOD/UFC/ufc_1_300_08.pdf

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA
07/06

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM E 1971	(2005) Stewardship for the Cleaning of Commercial and Institutional Buildings

1.2 SUBMISSION OF OPERATION AND MAINTENANCE DATA

Submit Operation and Maintenance (O&M) Data specifically applicable to this contract and a complete and concise depiction of the provided equipment, product, or system, stressing and enhancing the importance of system interactions, troubleshooting, and long-term preventative maintenance and operation. The subcontractors shall compile and prepare data and deliver to the Contractor prior to the training of Government personnel. The Contractor shall compile and prepare aggregate O&M data including clarifying and updating the original sequences of operation to as-built conditions. Organize and present information in sufficient detail to clearly explain O&M requirements at the system, equipment, component, and subassembly level. Include an index preceding each submittal. Submit in accordance with this section and Section 01 33 00 SUBMITTAL PROCEDURES.

1.2.1 Package Quality

Documents must be fully legible. Poor quality copies and material with hole punches obliterating the text or drawings will not be accepted.

1.2.2 Package Content

Data package content shall be as shown in the paragraph titled "Schedule of Operation and Maintenance Data Packages." Comply with the data package requirements specified in the individual technical sections, including the content of the packages and addressing each product, component, and system designated for data package submission.

1.2.3 Changes to Submittals

Manufacturer-originated changes or revisions to submitted data shall be furnished by the Contractor if a component of an item is so affected subsequent to acceptance of the O&M Data. Changes, additions, or revisions required by the Contracting Officer for final acceptance of submitted data, shall be submitted by the Contractor within 30 calendar days of the notification of this change requirement.

1.3 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES

1.3.1 Operating Instructions

Include specific instructions, procedures, and illustrations for the following phases of operation for the installed model and features of each system:

1.3.1.1 Safety Precautions

List personnel hazards and equipment or product safety precautions for all operating conditions.

1.3.1.2 Operator Prestart

Include procedures required to install, set up, and prepare each system for use.

1.3.1.3 Startup, Shutdown, and Post-Shutdown Procedures

Provide narrative description for Startup, Shutdown and Post-shutdown operating procedures including the control sequence for each procedure.

1.3.1.4 Normal Operations

Provide narrative description of Normal Operating Procedures. Include Control Diagrams with data to explain operation and control of systems and specific equipment.

1.3.1.5 Emergency Operations

Include Emergency Procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Include Emergency Shutdown Instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance and procedures for emergency operation of all utility systems including required valve positions, valve locations and zones or portions of systems controlled.

1.3.1.6 Operator Service Requirements

Include instructions for services to be performed by the operator such as lubrication, adjustment, inspection, and recording gage readings.

1.3.1.7 Environmental Conditions

Include a list of Environmental Conditions (temperature, humidity, and other relevant data) that are best suited for the operation of each product, component or system. Describe conditions under which the item equipment should not be allowed to run.

1.3.2 Preventive Maintenance

Include the following information for preventive and scheduled maintenance to minimize corrective maintenance and repair for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

1.3.2.1 Lubrication Data

Include preventative maintenance lubrication data, in addition to instructions for lubrication provided under paragraph titled "Operator Service Requirements":

a. A table showing recommended lubricants for specific temperature ranges and applications.

b. Charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities.

c. A Lubrication Schedule showing service interval frequency.

1.3.2.2 Preventive Maintenance Plan and Schedule

Include manufacturer's schedule for routine preventive maintenance, inspections, tests and adjustments required to ensure proper and economical operation and to minimize corrective maintenance. Provide manufacturer's projection of preventive maintenance work-hours on a daily, weekly, monthly, and annual basis including craft requirements by type of craft. For periodic calibrations, provide manufacturer's specified frequency and procedures for each separate operation.

1.3.2.3 Cleaning Recommendations

Provide environmentally preferable cleaning recommendations in accordance with ASTM E 1971.

1.3.3 Corrective Maintenance (Repair)

Include manufacturer's recommended procedures and instructions for correcting problems and making repairs for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

1.3.3.1 Troubleshooting Guides and Diagnostic Techniques

Include step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.

1.3.3.2 Wiring Diagrams and Control Diagrams

Wiring diagrams and control diagrams shall be point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams, number electrical and electronic wiring and pneumatic control tubing and the terminals for each type, identically to actual installation configuration and numbering.

1.3.3.3 Maintenance and Repair Procedures

Include instructions and a list of tools required to repair or restore the product or equipment to proper condition or operating standards.

1.3.3.4 Removal and Replacement Instructions

Include step-by-step procedures and a list required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Instructions shall include a combination of text and illustrations.

1.3.3.5 Spare Parts and Supply Lists

Include lists of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays. Special consideration is required for facilities at remote locations. List spare parts and supplies that have a long lead-time to obtain.

1.3.4 Corrective Maintenance Work-Hours

Include manufacturer's projection of corrective maintenance work-hours including requirements by type of craft. Corrective maintenance that requires completion or participation of the equipment manufacturer shall be identified and tabulated separately.

1.3.5 Appendices

Provide information required below and information not specified in the preceding paragraphs but pertinent to the maintenance or operation of the product or equipment. Include the following:

1.3.5.1 Product Submittal Data

Provide a copy of all SD-03 Product Data submittals required in the applicable technical sections.

1.3.5.2 Manufacturer's Instructions

Provide a copy of all SD-08 Manufacturer's Instructions submittals required in the applicable technical sections.

1.3.5.3 O&M Submittal Data

Provide a copy of all SD-10 Operation and Maintenance Data submittals required in the applicable technical sections.

1.3.5.4 Parts Identification

Provide identification and coverage for all parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing shall show the index, reference, or key number that will cross-reference the illustrated part to the listed part. Parts shown in the listings shall be grouped by components, assemblies, and subassemblies in accordance with the manufacturer's standard practice. Parts data may cover more than one model or series of equipment,

components, assemblies, subassemblies, attachments, or accessories, such as typically shown in a master parts catalog

1.3.5.5 Warranty Information

List and explain the various warranties and clearly identify the servicing and technical precautions prescribed by the manufacturers or contract documents in order to keep warranties in force. Include warranty information for primary components such as the compressor of air conditioning system.

1.3.5.6 Personnel Training Requirements

Provide information available from the manufacturers that is needed for use in training designated personnel to properly operate and maintain the equipment and systems.

1.3.5.7 Testing Equipment and Special Tool Information

Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components.

1.3.5.8 Testing and Performance Data

Include completed prefunctional checklists, functional performance test forms, and monitoring reports. Include recommended schedule for retesting and blank test forms.

1.3.5.9 Contractor Information

Provide a list that includes the name, address, and telephone number of the General Contractor and each Subcontractor who installed the product or equipment, or system. For each item, also provide the name address and telephone number of the manufacturer's representative and service organization that can provide replacements most convenient to the project site. Provide the name, address, and telephone number of the product, equipment, and system manufacturers.

1.4 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

Furnish the O&M data packages specified in individual technical sections. The required information for each O&M data package is as follows:

1.4.1 Data Package 1

a. Safety precautions

b. Cleaning recommendations

c. Maintenance and repair procedures

d. Warranty information

e. Contractor information

f. Spare parts and supply list

1.4.2 Data Package 2

a. Safety precautions

b. Normal operations

c. Environmental conditions

d. Lubrication data

e. Preventive maintenance plan and schedule

f. Cleaning recommendations

g. Maintenance and repair procedures

h. Removal and replacement instructions

i. Spare parts and supply list

j. Parts identification

k. Warranty information

l. Contractor information

1.4.3 Data Package 3

a. Safety precautions

b. Operator prestart

c. Startup, shutdown, and post-shutdown procedures

d. Normal operations

e. Emergency operations

f. Environmental conditions

g. Lubrication data

h. Preventive maintenance plan and schedule

i. Cleaning recommendations

j. Troubleshooting guides and diagnostic techniques

k. Wiring diagrams and control diagrams

l. Maintenance and repair procedures

m. Removal and replacement instructions

n. Spare parts and supply list

o. Product submittal data

p. O&M submittal data

q. Parts identification

r. Warranty information

s. Testing equipment and special tool information

t. Testing and performance data

u. Contractor information

1.4.4 Data Package 4

a. Safety precautions

b. Operator prestart

c. Startup, shutdown, and post-shutdown procedures

d. Normal operations

e. Emergency operations

f. Operator service requirements

g. Environmental conditions

h. Lubrication data

i. Preventive maintenance plan and schedule

j. Cleaning recommendations

k. Troubleshooting guides and diagnostic techniques

l. Wiring diagrams and control diagrams

m. Maintenance and repair procedures

n. Removal and replacement instructions

o. Spare parts and supply list

p. Corrective maintenance man-hours

q. Product submittal data

r. O&M submittal data

s. Parts identification

t. Warranty information

u. Personnel training requirements

v. Testing equipment and special tool information

w. Testing and performance data

x. Contractor information

1.4.5 Data Package 5

a. Safety precautions

b. Operator prestart

c. Start-up, shutdown, and post-shutdown procedures

d. Normal operations

e. Environmental conditions

f. Preventive maintenance plan and schedule

g. Troubleshooting guides and diagnostic techniques

h. Wiring and control diagrams

i. Maintenance and repair procedures

j. Removal and replacement instructions

k. Spare parts and supply list

l. Product submittal data

m. Manufacturer's instructions

n. O&M submittal data

o. Parts identification

p. Testing equipment and special tool information

q. Warranty information

r. Testing and performance data

s. Contractor information

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SPECIFICATIONS FOR DIGITAL DATA DELIVERABLES

These specifications for digital data are prepared by Marine Corps Base, Camp Lejeune's Geospatial Information and Services (GIS) Office. They are validated twice a year and updated as new technologies and software versions are implemented. The standards and guidance referenced in these specifications conform to the "Marine Corps Guidance for GIS, CADD, and Related Technologies" document dated 15 April 2003 or subsequent HQMC policy documents. Point of contact regarding the use of these specifications in scopes of work is Ms. Frances Railey, GIS Manager, Business and Logistics Support Department, (910) 451-9008/451-5876.

Instructions for the Project Manager:

The following paragraphs represent the FORMAT and documentation required for electronic files being delivered as part of a contracted effort. These paragraphs do not specify CONTENT or what the electronic files should contain. The content represented or specific data being collected should be specified separately in the Tasks section of the scope/statement of work (SOW). For example, the scope of work would contain a directive paragraph that tasks the Contractor with the actual work to be performed. This paragraph would include items such as:

What features are actually being collected,

What attributes are required,

Whether the deliverables should be provided in GIS or CADD format, or a combination thereof,

What form of data collection should be used; i.e. mapping grade or survey grade Global Positioning System (GPS),

When data is expected to be delivered during the course of the project, etc.

In all projects, the Project Manager should include the following paragraphs in the Deliverables section of your contract SOW -OR- as an Attachment and referenced in the SOW; i.e., "Data shall be provided in accordance with the attachment". All paragraphs are relevant unless designated in italics and with an –OR- statement, in which case the Project Manager would choose between the two options presented, or in some cases include both options when both GIS and CADD data deliverables are required for your project.

This cover sheet is a note to you, the Project Manager, and should not be included in the SOW. Questions about the use of these specifications or requests for assistance in developing SOWs that include data deliverables should be addressed to the GIS Manager as listed above. The GIS Office reviews SOWs that include geospatial data deliverables to: ensure clarity of scope relative to the data, minimize impact on existing applications as data changes may occur, and reduce duplication of data collection efforts at MCB, Camp Lejeune. Once a contract is awarded, you as the Project Manager referenced in the SOW shall coordinate project requirements for the Contractor with the GIS Manager as described below.

(cut and paste only the paragraphs on the following pages into your Scope/Statement of Work)

#. SPECIFICATIONS FOR DIGITAL DATA. Any maps, drawings, figures, sketches, geospatial data, spreadsheets, or text files prepared for this contract shall be provided in both hard copy and digital form. The hard copy deliverables are defined in another section of this SOW.

A. **Text, Spreadsheet, and Database Files**: The Marine Corps standard computing software is Microsoft Office 2003. Final Reports and other text documents shall be provided in Microsoft Word 2003 format **AND** Adobe Portable Document Format (PDF). Spreadsheet files shall be provided in Microsoft Excel format. Databases shall be provided in Microsoft Access format, unless specified otherwise, as approved by the Government. **Prior to database development, the contractor shall provide the Government with a Technical Approach Document** for approval, which describes the contractor's technical approach to designing and developing the database. All text, spreadsheet, and database files shall be delivered on a compact disk read-only memory (CD-ROM) or Digital Versatile Disc read-only memory (DVD-ROM).

B. **Maps, Drawings, and Sketches (Digital Geospatial Data):**

1. Geospatial Data Software Format: Geographic data **must** be provided in a form that does **not** require translation, preprocessing, or post processing before being loaded to the Camp Lejeune enterprise geodatabase. The Contractor shall validate any deviation from this specification in writing with the Government (GIS Manager via the Project Manager). Digital geographic maps and the related data sets shall be delivered in the following software format:

a. GIS: Personal geodatabase format (Access database file) using ArcGIS 9.1 (or higher, if a higher version is approved by the government at the time of this project). The personal geodatabase must be importable to an Oracle 10g multi-user geodatabase using ArcSDE 9.1. The delivered data layer(s) shall be provided with x,y domain precision of 1000.

-AND / OR-

b. CADD: The Government may approve the use of AutoCAD when it is determined that the format will not compromise the spatial accuracy or structure of the delivered data and that the data will easily integrate with the enterprise GIS system. All CADD data shall be provided in AutoCAD 2004 or later version as approved by the Government, and shall be in the same projection and use the same coordinate system, datum, and units as stated below in the paragraph titled Geospatial Data Projection. Drawing files shall be full files, uncompressed, unzipped, and georeferenced.

(NOTE: ARC/INFO, ArcGIS, and ArcSDE are geographic information system software produced by the Environmental Systems Research Institute (ESRI) of Redlands, California. AutoCAD is software produced by Autodesk,Inc. These software are used by Camp Lejeune's Geographic Information System.)

2. Geospatial Data Structure:

a. ***GIS Data Sets*** – *When developing/delivering a new feature class, the Contractor shall develop the initial structure consistent with the most current version of the Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE), also known as the National Committee for Information Technology Standards 353. The SDSFIE shall be followed for geospatial database table structure, nomenclature, attributes and symbology.* ***The Contractor shall then consult with the Government (GIS Manager via the Project Manager) concerning modifications or***

additions to the SDSFIE required by the specific business use to which the data will be applied. *Copies of the SDSFIE may be obtained from the Solutions and Technology for the Advancement and Refinement of SDSFIE (STARS) Team Internet homepage at https://www.sdsfie.org/ or by contacting:*

Marc Beckel
Deputy Program Manager, SDSFIE
Northrop Grumman IT, TASC
Marc.beckel@ngc.com

When delivering updates to existing feature classes, the Contractor shall obtain a copy of the subject data in a personal geodatabase to use as a template for all subsequent data collection processes. As Camp Lejeune has modified the SDSFIE structure for many feature classes to accommodate operational needs, the SDSFIE structure may not reflect the actual structure used in the geodatabase. If further modifications to structure are required as a result of this Scope, the Contractor will consult with the Government (GIS Manager) for direction and final approval.

-AND / OR-

b. CADD Drawings/Data *– The Contractor shall develop all CADD data in conformance with the latest version of the following standards and policies:*

- U. S. National CADD Standards (NCS)
- CADD/GIS Technology Center's AEC CADD Standards (https://tsc.wes.army.mil)
- NAVFACINST 4250.1, Electronic Bid Solicitation

3. **Geospatial Data Projection**: Geographic data (regardless of format) shall be provided in meters and **projected** into the Universal Transverse Mercator (UTM) coordinate system. The maps and data shall use UTM Zone 18N, the GRS 1980 spheroid and the North American Datum 1983. This projection requirement applies to all CADD drawings such as as-designed and as-built project plans, as well as GIS data layer deliverables. Each data set shall have a projection file if appropriate based on format. Map or drawing **scales** will be determined by the Project Manager, if applicable. Mapping **accuracy** for the agreed scales will conform to the American Society for Photogrammetry and Remote Sensing (ASPRS) "Accuracy Standards for Large-Scale Maps", "Interim Accuracy Standards for Large-Scale Maps", and "Geospatial Positioning Accuracy Standards". Copies of these standards can be obtained on the Internet at http://www.asprs.org, and/or at http://www.fgdc.gov, or by contacting:

American Society for Photogrammetry and Remote Sensing
5410 Grosvenor Lane, Suite 210
Bethesda, MD 20814-2160

4. **Geospatial Data Collection:**

a. ***Mapping grade Global Positioning System*** *(GPS) data collection (sub-foot, sub-meter, and sub-5 meter) shall be performed when specified in the statement of work and 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: http://www.cgia.state.nc.us/gicc Default horizontal accuracy for mapping grade GPS data collection efforts shall meet a sub-meter threshold unless otherwise specified to be survey grade, sub-foot or sub-5 meter in the statement of work. Only base stations included in the North Carolina Geodetic Survey Base Station Network shall be used for mapping grade GPS data collection. Spatial accuracy requirements are as follows:

- Sub foot: 95 % of all points are within ± 12 inches

-OR-

- Sub meter: 95% of points are within ± 1 Meter

*-OR_*

- Sub 5 meter: 95% of points are within ± 5 Meter

-AND / OR-

***b. Survey grade GPS** data collection shall be performed when specified in the statement of work. As survey processes are highly regulated by federal, state, and/or local technical and licensing requirements, they are in general beyond the scope of this document. However, survey grade GPS data collection shall at a minimum use the Geoid2003 CONUS epoch (or a more current epoch if available at the time of this project) and spatial accuracy requirements for survey grade are 95 % of GPS points are within ± 1 centimeter. Every effort shall be made to capture feature locations without using offsets unless obstructions are present. Any offsets used shall be annotated in the "user flag" field.*

NOTE: None of the GPS collection information is to be included in the table structure of the delivery, unless it is specifically part of the SDSFIE or established Camp Lejeune feature format.

5. **Media for Geospatial Data Deliverables**: Geographic data shall be delivered on a separate compact disk read-only memory (CD-ROM) –or-, digital versatile disk read-only memory (DVD-ROM), or other digital media such as external hard drives or flash drives if approved by the government. This media shall **contain only the value-added data sets** as designated in the Task sections of the statement of work. Do not include the Contractor's working files or original Camp Lejeune data sets that may have been used by the Contractor to develop the deliverables. "READ ME" files may be included on the geographic data media if such files provide explanation of the delivered data sets. However, these "READ ME" files should not be delivered in lieu of standard metadata.

6. **Geographic Data Documentation (METADATA)**: For each digital file delivered containing geographic information (regardless of format), **the Contractor shall provide documentation** consistent with the Federal Geographic Data Committee (FGDC) Content Standards for Digital Geospatial Metadata (CSDGM). Both 'Mandatory' and 'Mandatory as Applicable' fields shall be completed for each geographic data set. The documentation shall include, but not be limited to, the following:

- The name and description of the data set/data layer
- The source of the data and any related data quality information such as accuracy and time period of content
- 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.
- Type of data layer (point, line, polygon, etc.),
- Field names of all attribute data and a description of each field name
- Definition of all codes used in the data fields
- Ranges of numeric fields and the meaning of these numeric ranges
- The creation date of the map layer and the name of the person who created it
- A point of contact shall be provided to answer technical questions.

Metadata generation tools included in the ArcGIS suite of software(or equivalent technology) 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 or by contacting:

FGDC Secretariat
c/o U.S. Geological Survey
590 National Center
Reston, Virginia 22092
(703) 648-5514

NOTE: The metadata should be formatted from the Camp Lejeune database perspective, not the Contractor project perspective. Therefore such items as Point of Contact should be the Camp Lejeune POC currently associated with the data and NOT the Contractor's Project Manager. The Contractor shall use language and format consistent with existing Camp Lejeune metadata.

7. **Geographic Data Review**: The digital geographic maps, related data, and text documents shall be included for review in the draft and final contract submittals. The data will be analyzed for discrepancies in subject content, correct format in accordance with these specifications, and compatibility with the existing IGIR system. The Contractor shall incorporate review comments to data and text prior to approval of the final submittal. For each review of digital geospatial data deliverables, the Contractor shall provide a technical consultant to meet on-site at Camp Lejeune with the GIS Manager and functional area subject matter experts to visually review the data deliverables on a Windows 2000 compatible system unless otherwise approved by the government.

C. **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.

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SECTION 02 41 00

DEMOLITION
10/06

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.

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI Guideline K	(2005) Guideline for Containers for Recovered Non-Flammable Fluorocarbon Refrigerants

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

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

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2008) Safety and Health Requirements Manual

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

40 CFR 61	National Emission Standards for Hazardous Air Pollutants
40 CFR 82	Protection of Stratospheric Ozone

1.2 GENERAL REQUIREMENTS

Do not begin demolition until authorization is received from the Contracting Officer. Remove rubbish and debris from the station daily; do not allow accumulations inside or outside the buildings. 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 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-07 Certificates

Demolition Plan; G
Notifications; G
Proposed demolition, and removal procedures for approval before work is started.

SD-11 Closeout Submittals

Receipts

Receipts or bills of lading, as specified.

1.4 REGULATORY AND SAFETY REQUIREMENTS

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.

1.4.1 Notifications

1.4.1.1 General Requirements

Furnish timely notification of demolition projects to Federal, State, regional, and local authorities in accordance with 40 CFR 61, Subpart M. Notify the State's environmental protection agency and the Contracting Officer in writing 10 working days prior to the commencement of work in accordance with 40 CFR 61, Subpart M.

1.4.2 Receipts

Submit a shipping receipt or bill of lading for all containers of ozone depleting substance (ODS) shipped to the Defense Depot, Richmond, Virginia.

1.5 DUST AND DEBRIS CONTROL

Prevent the spread of dust and debris on airfield pavements 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. Sweep pavements as often as necessary to control the spread of debris that may result in foreign object damage potential to aircraft.

1.6 PROTECTION

1.6.1 Traffic Control Signs

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

1.6.2 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 or pavements to remain. Provide new supports and reinforcement for existing construction weakened by demolition, deconstruction, or removal work. Repairs, reinforcement, or structural replacement require approval by the Contracting Officer prior to performing such work.

1.6.3 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.

1.6.4 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.

1.6.5 Trees

Protect trees within the project site which might be damaged during demolition or deconstruction, and which are indicated to be left in place, by a 6 foot high fence. Erect and secure fence a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Replace any tree designated to remain that is damaged during the work under this contract with like-kind or as approved by the Contracting Officer.

1.6.6 Utility Service

Maintain existing utilities indicated to stay in service and protect against damage during demolition and deconstruction operations. Prior to start of work, utilities serving each area of alteration or removal will be shut off by the Government and disconnected and sealed by the Contractor.

1.6.7 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.

1.6.8 Protection of Personnel

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

1.7 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted

1.8 RELOCATIONS

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

1.9 REQUIRED DATA

Prepare a Demolition Plan. 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, and airfield lighting, 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. 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.

1.10 ENVIRONMENTAL PROTECTION

Comply with the Environmental Protection Agency requirements specified.

1.11 USE OF EXPLOSIVES

Use of explosives will not be permitted.

PART 2 PRODUCTS

2.1 FILL MATERIAL

Comply with excavating, backfilling, and compacting procedures for soils used as backfill material to fill excavations resulting frm demolition.

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

3.1.1 Structures

a. Remove existing structures indicated to be removed to top of foundation walls 1.0 feet below grade.

b. Demolish structures in a systematic manner from the top of the structure to the ground. Complete demolition work above each tier or

floor before the supporting members on the lower level are disturbed. Demolish concrete and masonry walls in small sections. Remove structural framing members and lower to ground by means of derricks, platforms hoists, or other suitable methods as approved by the Contracting Officer.

3.1.2 Utilities and Related Equipment

3.1.2.1 General Requirements

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the Contracting Officer. Do not interrupt existing utilities serving facilities occupied and used by the Government except when approved in writing and then only after temporary utility services have been approved and provided. Do not begin demolition or deconstruction work until all utility disconnections have been made. Shut off and cap utilities for future use, as indicated.

3.1.2.2 Disconnecting Existing Utilities

Remove existing utilities, as indicated, and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Contracting Officer. When utility lines are encountered that are not indicated on the drawings, the Contracting Officer shall be notified prior to further work in that area. Remove meters and related equipment and deliver to a location in accordance with instructions of the Contracting Officer.

3.1.3 Paving and Slabs

Remove sawcut concrete and asphaltic concrete paving and slabs to a depth of 200 inches below existing adjacent grade. Provide neat sawcuts at limits of pavement removal as indicated.

3.1.4 Concrete

Saw concrete along straight lines to a depth of a minimum 2 inch. Make each cut in walls perpendicular to the face and in alignment with the cut in the opposite face. Break out the remainder of the concrete provided that the broken area is concealed in the finished work, and the remaining concrete is sound. At locations where the broken face cannot be concealed, grind smooth or saw cut entirely through the concrete.

3.1.5 Miscellaneous Metal

Salvage shop-fabricated items such as access doors and frames, steel gratings, metal ladders, wire mesh partitions, metal railings, metal windows and similar items as whole units. Salvage light-gage and cold-formed metal framing, such as steel studs, steel trusses, metal gutters, roofing and siding, metal toilet partitions, toilet accessories and similar items. Scrap metal shall become the Contractor's property. Recycle scrap metal as part of demolition and deconstruction operations. Provide separate containers to collect scrap metal and transport to a scrap metal collection or recycling facility, in accordance with the Waste Management Plan.

3.1.6 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, 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.

3.1.7 Mechanical Equipment and Fixtures

Disconnect mechanical hardware at the nearest connection to existing services to remain, unless otherwise noted. Mechanical equipment and fixtures must be disconnected at fittings. Remove service valves attached to the unit. Do not remove equipment until approved.

3.1.7.1 Piping

Disconnect piping at unions, flanges and valves, and fittings as required to reduce the pipe into straight lengths for practical storage. Store salvaged piping according to size and type. If the piping that remains can become pressurized due to upstream valve failure, end caps, blind flanges, or other types of plugs or fittings with a pressure gage and bleed valve shall be attached to the open end of the pipe to ensure positive leak control. Carefully dismantle piping that previously contained gas, gasoline, oil, or other dangerous fluids, with precautions taken to prevent injury to persons and property. Store piping outdoors until all fumes and residues are removed. Box prefabricated supports, hangers, plates, valves, and specialty items according to size and type. Wrap sprinkler heads individually in plastic bags before boxing. Classify piping not designated for salvage, or not reusable, as scrap metal.

3.2 CONCURRENT EARTH-MOVING OPERATIONS

Do not begin excavation, filling, and other earth-moving operations that are sequential to demolition or deconstruction work in areas occupied by structures to be demolished or deconstructed until all demolition and deconstruction in the area has been completed and debris removed. Fill holes, open basements and other hazardous openings.

3.3 DISPOSITION OF MATERIAL

3.3.1 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.

3.3.2 Reuse of Materials and Equipment

Remove and store materials and equipment listed in the Demolition Plan indicated to be reused or relocated to prevent damage, and reinstall as the work progresses.

3.3.3 Disposal of Ozone Depleting Substance (ODS)

Class I and Class II ODS are defined in Section, 602(a) and (b), of The Clean Air Act. Prevent discharge of Class I and Class II ODS to the atmosphere. Place recovered ODS in cylinders meeting AHRI Guideline K suitable for the type ODS (filled to no more than 80 percent capacity) and provide appropriate labeling. Recovered ODS shall be removed from Government property and disposed of in accordance with 40 CFR 82. Products, equipment and appliances containing ODS in a sealed, self-contained system (e.g. residential refrigerators and window air conditioners) shall be disposed of in accordance with 40 CFR 82.

3.4 CLEANUP

Remove debris and rubbish from basement and similar excavations. Remove and transport the in a manner that prevents spillage on streets or adjacent areas. Apply local regulations regarding hauling and disposal.

3.5 DISPOSAL OF REMOVED MATERIALS

3.5.1 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. Storage of removed materials on the project site is prohibited.

3.5.2 Burning on Government Property

Burning of materials removed from demolished and deconstructed structures will not be permitted on Government property.

3.5.3 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.

-- End of Section --

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SECTION 02 61 13

EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL
04/06

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM D 5434	(2009) Field Logging of Subsurface Explorations of Soil and Rock

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2008) Safety and Health Requirements Manual

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

29 CFR 1926	Safety and Health Regulations for Construction
40 CFR 302	Designation, Reportable Quantities, and Notification

1.2 MEASUREMENT AND PAYMENT

1.2.1 Measurement

Measurement for excavation and on-site transportation shall be based on the actual number of cubic yards of contaminated material in-place prior to excavation. Determination of the volume of contaminated material excavated shall be based on cross-sectional volume determination reflecting the differential between the original elevations of the top of the contaminated material and the final elevations after removal of the contaminated material. Measurement for backfilling of excavated areas shall be based on in-place cubic yards of compacted fill. Measurement for construction of stockpile areas shall be based on the number of square yards of stockpile liner constructed.

1.2.2 Payment

1.2.2.1 Excavation and Transportation

Compensation for excavation and onsite transportation of contaminated material will be paid as a unit cost. This unit cost shall include any other items incidental to excavation and handling not defined as having a specific unit cost.

1.2.2.2 Backfilling

Compensation for backfill soil, transportation of backfill, backfill soil conditioning, backfilling, compaction, and geotechnical testing will be paid as a single unit cost.

1.2.2.3 Stockpiling

Compensation for construction of stockpile areas will be paid for as a unit cost. This unit cost shall include all aspects of grading, preparation, handling, placement, maintenance, removal, treatment, and disposal of stockpile cover materials and liner materials and all other items incidental to construction of stockpiles.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Surveys; G

Separate cross-sections of each area before and after excavation and after backfilling.

SD-03 Product Data

Work Plan; G

Work Plan within 30 calender days after notice to proceed. No work at the site, with the exception of site inspections and surveys, shall be performed until the Work Plan is approved. The Contractor shall allow 30 calender days in the schedule for the Government's review. No adjustment for time or money will be made if resubmittals of the Work Plan are required due to deficiencies in the plan. At a minimum, the Work Plan shall include:

a. Schedule of activities.

b. Method of excavation and equipment to be used.

c. Shoring or side-wall slopes proposed.

d. Dewatering plan.

e. Storage methods and locations for liquid and solid contaminated material.

f. Borrow sources and haul routes.

g. Decontamination procedures.

h. Spill contingency plan.

SD-06 Test Reports

Confirmation Sampling and Analysis; G
Sampling of Stored Material; G
Sampling Liquid; G
Test results.

1.4 SURVEYS

Surveys shall be performed immediately prior to and after excavation of contaminated material to determine the volume of contaminated material removed. Surveys shall also be performed immediately after backfill of each excavation. The Contractor shall provide cross-sections on [25] [_____] foot intervals and at break points for all excavated areas. Locations of confirmation samples shall also be surveyed and shown on the drawings. Surveys shall be performed in accordance with Section 01 57 19.00 20 TEMPORARY ENVIRONMENTAL CONTROLS.

1.5 REGULATORY REQUIREMENTS

1.5.1 Permits and Licenses

The Contractor shall obtain required federal, state, and local permits for excavation and storage of contaminated material. Permits shall be obtained at no additional cost to the Government.

1.6 DESCRIPTION OF WORK

The work shall consist of excavation and temporary storage of yards contaminated material. Approximate locations of contaminated material are shown on the drawings. Characterization data on the nature and extent of the contaminated material is attached at the end of this specification. Subsurface conditions are shown at the end of this specification. The Contractor shall submit a Work Plan as specified in the Submittals paragraph. The Contracting Officer shall be notified within 24 hours, and before excavation, if contaminated material is discovered that has not been previously identified or if other discrepancies between data provided and actual field conditions are discovered. Backfill material is not available onsite feet

1.7 SCHEDULING

The Contractor shall notify the Contracting Officer seven calender days prior to the start of excavation of contaminated material. The Contractor shall be responsible for contacting regulatory agencies in accordance with the applicable reporting requirements.

PART 2 PRODUCTS

PART 3 EXECUTION

3.1 EXISTING STRUCTURES AND UTILITIES

No excavation shall be performed until site utilities have been field located. The Contractor shall take the necessary precautions to ensure no damage occurs to existing structures and utilities. Damage to existing structures and utilities resulting from the Contractor's operations shall be repaired at no additional cost to the Government. Utilities encountered that were not previously shown or otherwise located shall not be disturbed without approval from the Contracting Officer.

3.2 CONTAMINATED MATERIAL REMOVAL

3.2.1 Excavation

Excavate contaminated soil only as necessary to construct facilities as indicated. Excavation shall be performed in a manner that will limit spills and the potential for contaminated material to be mixed with uncontaminated material. An excavation log describing visible signs of contamination encountered shall be maintained for each area of excavation. Excavation logs shall be prepared in accordance with ASTM D 5434.

3.2.2 Shoring

If workers must enter the excavation, it shall be evaluated, shored, sloped or braced as required by EM 385-1-1 and 29 CFR 1926 section 650.

3.2.3 Dewatering

Surface water shall be diverted to prevent entry into the excavation. Dewatering shall be limited to that necessary to assure adequate access, a safe excavation, prevent the spread of contamination, and to ensure that compaction requirements can be met.

3.3 CONFIRMATION SAMPLING AND ANALYSIS

The Contracting Officer shall be present to inspect the removal of contaminated material from each site. After all material suspected of being contaminated has been removed, the excavation shall be examined for evidence of contamination. If the excavation appears to be free of contamination, field analysis shall be used to determine the presence of contamination using a real time vapor monitoring instrument. Excavation of additional material shall be as directed by the Contracting Officer. After all suspected contaminated material is removed, confirmation samples shall be collected and analyzed for the following contaminants:

Chemical Parameter	Action Level
TPH	> 50 mg/kg
Total BTEX	> 10 mg/kg
Fails TCLP Test Tox Concentration	> 100 mg/kg

Samples shall be collected at a frequency of one per square yards from the bottom and each of the side walls or as directed by the Contracting Officer. A minimum of one sample shall be collected from the bottom and each side wall of the excavation. Based on test results, the Contractor shall propose any additional excavation which may be required to remove material which is contaminated above action levels. Additional excavation shall be subject to approval by the Contracting Officer. Locations of samples shall be marked in the field and documented on the as-built drawings.

3.4 CONTAMINATED MATERIAL STORAGE

Material shall be placed in temporary storage immediately after excavation. The following paragraphs describe acceptable methods of material storage. Storage units shall be in good condition and constructed of materials that are compatible with the material or liquid to be stored. If multiple storage units are required, each unit shall be clearly labeled with an

identification number and a written log shall be kept to track the source of contaminated material in each temporary storage unit.

3.4.1 Stockpiles

Stockpiles shall be constructed to isolate stored contaminated material from the environment. The maximum stockpile size shall be 30 cubic yards. Stockpiles shall be constructed to include:

a. A chemically resistant geomembrane liner free of holes and other damage. Non-reinforced geomembrane liners shall have a minimum thickness of [20] [_____] mils. Scrim reinforced geomembrane liners shall have a minimum weight of 40 lbs. per 1000 square feet. The ground surface on which the geomembrane is to be placed shall be free of rocks greater than 0.5 inches in diameter and any other object which could damage the membrane.

b. Geomembrane cover free of holes or other damage to prevent precipitation from entering the stockpile. Non-reinforced geomembrane covers shall have a minimum thickness of 10 mils. Scrim reinforced geomembrane covers shall have a minimum weight of 26 lbs. per 1000 square feet. The cover material shall be extended over the berms and anchored or ballasted to prevent it from being removed or damaged by wind.

c. Berms surrounding the stockpile, a minimum of 12 inches in height. Vehicle access points shall also be bermed.

d. The liner system shall be sloped to allow collection of leachate. Storage and removal of liquid which collects in the stockpile, in accordance with paragraph Liquid Storage.

3.4.2 Liquid Storage

Liquid collected from excavations and stockpiles shall be temporarily stored. Liquid storage containers shall be water-tight.

3.5 SAMPLING

3.5.1 Sampling of Stored Material

Samples of stored material shall be collected at a frequency of once per 25 cubic yards. Samples shall be tested for the following:

Chemical Parameter	Action Level
TPH	> 50 mg/kg
Total BTEX	>10 mg/kg
Fails TCLP Test	
Tox Concentration	>100 mg/kg

Stored material with contaminant levels that exceed the action levels shall be treated offsite. Analyses for contaminated material to be taken to an offsite treatment facility shall conform to local, state, and federal criteria as well as to the requirements of the treatment facility. Documentation of all analyses performed shall be furnished to the Contracting Officer. Additional sampling and analyses to the extent required by the approved offsite treatment, storage or disposal (TSD) facility shall be the responsibility of the Contractor and shall be

performed at no additional cost to the Government.

3.5.2 Sampling Liquid

Liquid collected from excavations and storage areas shall be sampled at a frequency of once for every [500] [_____] gallons of liquid collected. Samples shall be tested for the following:

Chemical Parameter	Action Level
Naphthalene Concentration	> 23.5 ug/L
TPH	>15 mg/L
pH	< 6.0 or > 9.0
BTEX	> 10 ppm

Liquid with contaminant levels that exceed action levels shall be treated offsite. Analyses for contaminated liquid to be taken to an offsite treatment facility shall conform to local, state, and federal criteria as well as to the requirements of the treatment facility. Documentation of all analyses performed shall be furnished to the Contracting Officer. Additional sampling and analysis to the extent required by the approved offsite treatment, storage or disposal (TSD) facility receiving the material shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government.

3.6 SPILLS

In the event of a spill or release of a hazardous substance (as designated in 40 CFR 302), pollutant, contaminant, or oil (as governed by the Oil Pollution Act (OPA), 33 U.S.C. 2701 et seq.), the Contractor shall notify the Contracting Officer immediately. If the spill exceeds the reporting threshold, the Contractor shall follow the pre-established procedures as described in the RCRA Contingency Plan for immediate reporting and containment. Immediate containment actions shall be taken to minimize the effect of any spill or leak. Cleanup shall be in accordance with applicable federal, state, and local regulations. As directed by the Contracting Officer, additional sampling and testing shall be performed to verify spills have been cleaned up. Spill cleanup and testing shall be done at no additional cost to the Government.

3.7 BACKFILLING

3.7.1 Confirmation Test Results

Excavations shall be backfilled immediately after all contaminated materials have been removed and confirmation test results have been approved. Backfill shall be placed and compacted to the lines and grades shown on the drawings.

3.8 DISPOSAL REQUIREMENTS

Offsite disposal of contaminated material shall be in accordance with Section 02 81 00 TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS.

-- End of Section --

SECTION 02 81 00

TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS
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 ations are referenced in the text by basic designation only.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA)

IATA DGR	(2004) Dangerous Goods Regulations

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

40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 266	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
40 CFR 268	Land Disposal Restrictions
40 CFR 270	EPA Administered Permit Programs: The Hazardous Waste Permit Program
40 CFR 279	Standards for the Management of Used Oil
40 CFR 300	National Oil and Hazardous Substances Pollution Contingency Plan
40 CFR 302	Designation, Reportable Quantities, and Notification
40 CFR 61	National Emission Standards for Hazardous Air Pollutants
40 CFR 761	Polychlorinated Biphenyls (PCBs)

	Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
49 CFR 107	Hazardous Materials Program Procedures
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR 173	Shippers - General Requirements for Shipments and Packagings
49 CFR 178	Specifications for Packagings

1.2 DEFINITIONS

1.2.1 Hazardous Material

A substance or material which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and which has been so designated pursuant to the Hazardous Materials Transportation Act, 49 U.S.C. Appendix Section 1801 et seq. The term includes materials designated as hazardous materials under the provisions of 49 CFR 172, Sections .101 and .102 and materials which meet the defining criteria for hazard classes and divisions in 49 CFR 173. EPA designated hazardous wastes are also hazardous materials.

1.2.2 Hazardous Waste

A waste which meets criteria established in RCRA or specified by the EPA in 40 CFR 261 or which has been designated as hazardous by a RCRA authorized state program.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

On-site Hazardous Waste Management; G

Prior to start of work, a plan detailing the manner in which hazardous wastes shall be managed. Written documentation of weekly hazardous waste inspections shall be submitted on a monthly basis.

Notices of Non-Compliance and Notices of Violation

Notices of non-compliance or notices of violation, as specified.

SD-06 Test Reports

Recordkeeping; G

Information necessary to file state annual or EPA biennial reports for all hazardous waste transported, treated, stored, or disposed of under this contract. The Contractor shall not forward these data directly to the regulatory agency but to the Contracting Officer at the specified time. The submittal shall contain all the information necessary for filing of the formal reports in the form and format required by the governing Federal or state regulatory agency. A cover letter shall accompany the data to include the contract number, Contractor name, and project location.

Spill Response

In the event of a spill or release of a hazardous substance (as designated in 40 CFR 302), or pollutant or contaminant, or oil (as governed by the Oil Pollution Act (OPA), 33 U.S.C. 2701 et seq.), the Contractor shall notify the Contracting Officer immediately. If the spill exceeds a reporting threshold, the Contractor shall follow the pre-established procedures for immediate reporting to the Contracting Officer.

Exception Reports; G

In the event that a manifest copy documenting receipt of hazardous waste at the treatment, storage, and disposal facility is not received within 35 days of shipment initiation, the Contractor shall prepare and submit an exception report to the Contracting Officer within 37 days of shipment initiation. In the event that a manifest copy documenting receipt of PCB waste at the designated facility is not received within 35 days of shipment initiation, the Contractor shall prepare and submit an exception report to the Contracting Officer within 37 days of shipment initiation.

Packaging Notifications

In accordance with 49 CFR 178.2(c), the Contractor shall acquire the appropriate notifications from the package manufacturers or any other persons certifying compliance with the packaging provisions and provide these to the Government.

SD-07 Certificates

Certification

Copies of the current certificates of registration required by 49 CFR 107, Subpart G issued to the Contractor and/or subContractors or written statements certifying exemption from these requirements.

Security Plan

Pre-transportation security plan, as specified.

Transportation and Disposal Coordinator; G

Transportation and Disposal Coordinator qualifications including proof of at least one year specialized experience in management and transportation of hazardous wastes; proof of current

Department of Transportation Hazardous Materials Training Certification; and, where applicable, proof of IATA DGR.

Training; G

Documentation that employees preparing or transporting hazardous materials have been trained, tested, and certified in accordance with 49 CFR 172, Subpart H, including general security awareness requirements and where applicable, site-specific security plan requirements.

EPA Off-Site Policy

A letter certifying that EPA considers the facilities to be used for all off-site disposal to be acceptable in accordance with the Off-Site policy in 40 CFR 300, Section 440. This certification shall be provided for wastes from Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 6901 et seq., sites as well as from Comprehensive Environmental Response Compensation and Liability Act (CERCLA), 42 U.S.C. 9601 et seq., responses. See Attachment A, sample certification, at the end of this section.

Certificates of Disposal

Certificates documenting the ultimate disposal, destruction or placement of hazardous wastes, polychlorinated biphenyls (PCBs), and/or asbestos within 180 days of initial shipment. Receipt of these certificates will be required for final payment.

Shipping Documents and Packagings Certification; G

All transportation related shipping documents to the Contracting Officer, including draft hazardous waste manifests, draft land disposal restriction notifications, draft asbestos waste shipment records, draft manifests for PCBs, draft bill of ladings for hazardous materials, lists of corresponding proposed labels, packages, marks, and placards to be used for shipment waste profiles supporting waste analysis documents, for review a minimum of 14 days prior to anticipated pickup. Packaging assurances shall be furnished prior to transporting hazardous material; "generator copies" of hazardous waste manifests land disposal restriction notifications asbestos waste shipment records "generator copies" of manifests used for initiating shipments of PCBs used oil invoices/shipment records bill of ladings supporting waste analysis documents shall be furnished when shipments are originated; and "receipt copies" of hazardous waste manifests, PCB manifests and asbestos waste shipment records at the designated disposal facility shall be furnished not later than 35 days after acceptance of the shipment.

Waste Minimization; G

Written certification that waste minimization efforts have been undertaken to reduce the volume and toxicity of waste to the degree economically practicable and that the method of treatment, storage, or disposal selected minimizes threats to human health and the environment.

1.4 QUALIFICATIONS

1.4.1 Transportation and Disposal Coordinator

The Contractor shall designate, by position and title, one person to act as the Transportation and Disposal Coordinator (TDC) for this contract. The TDC shall serve as the single point of contact for all environmental regulatory matters and shall have overall responsibility for total environmental compliance at the site including, but not limited to, accurate identification and classification of hazardous waste and hazardous materials; determination of proper shipping names; identification of marking, labeling, packaging and placarding requirements; completion of waste profiles, hazardous waste manifests, asbestos waste shipment records, PCB manifests, bill of ladings, exception and discrepancy reports; and all other environmental documentation. The TDC shall have, at a minimum, one year of specialized experience in the management and transportation of hazardous waste and have been Department of Transportation certified under 49 CFR 172, Subpart H.

1.4.2 Training

The Contractor's hazardous materials employees shall be trained, tested, and certified to safely and effectively carry out their assigned duties in accordance with Section 01 57 19.00 20 TEMPORARY ENVIRONMENTAL CONDITIONS. The Contractor's employees transporting hazardous materials or preparing hazardous materials for transportation, including samples, shall be trained, tested, and certified in accordance with 49 CFR 172, Subpart H, including security awareness and any applicable security plans. Where shipment of hazardous materials by air may be occurring, such as for sample shipments, the Contractor's hazardous material employees shall also be trained on IATA DGR. Contractor employees making determinations that shipments do not constitute DOT regulated hazardous materials shall also be trained, tested, and certified in accordance with 49 CFR 172, Subpart H.

1.4.3 Certification

The Contractor and/or subContractors transporting hazardous materials shall possess a current certificate of registration issued by the Research and Special Programs Administration (RSPA), U.S. Department of Transportation, when required by 49 CFR 107, Subpart G.

1.5 LAWS AND REGULATIONS REQUIREMENTS

Work shall meet or exceed the minimum requirements established by Federal, state, and local laws and regulations which are applicable. These requirements are amended frequently and the Contractor shall be responsible for complying with amendments as they become effective. In the event that compliance exceeds the scope of work or conflicts with specific requirements of the contract, the Contractor shall notify the Contracting Officer immediately.

PART 2 PRODUCTS

2.1 MATERIALS

The Contractor shall provide all of the materials required for the packaging, labeling, marking, placarding and transportation of hazardous wastes and hazardous materials in conformance with Department of Transportation standards. Details in this specification shall not be

construed as establishing the limits of the Contractor's responsibility.

2.1.1 Packagings

The Contractor shall provide bulk and non-bulk containers for packaging hazardous materials/wastes consistent with the authorizations referenced in the Hazardous Materials Table in 49 CFR 172, Section .101, Column 8. Bulk and non-bulk packaging shall meet the corresponding specifications in 49 CFR 173 referenced in the Hazardous Materials Table, 49 CFR 172, Section .101. Each packaging shall conform to the general packaging requirements of Subpart B of 49 CFR 173, to the requirements of 49 CFR 178 at the specified packing group performance level, to the requirements of special provisions of column 7 of the Hazardous Materials Table in 49 CFR 172, Section .101, and shall be compatible with the material to be packaged as required by 40 CFR 262. The Contractor shall also provide other packaging related materials such as materials used to cushion or fill voids in overpacked containers, etc. Sorbent materials shall not be capable of reacting dangerously with, being decomposed by, or being ignited by the hazardous materials being packaged. Additionally, sorbents used to treat free liquids to be disposed of in landfills shall be non-biodegradable as specified in 40 CFR 264, Section .314. In addition, packaging notifications will be provided to the Government in accordance with 49 CFR 172, Section .178.2(c) regarding type and dimensions of closures, including gaskets, needed to satisfy performance test requirements.

2.1.2 Markings

The Contractor shall provide markings for each hazardous material/waste package, freight container, and transport vehicle consistent with the requirements of 49 CFR 172, Subpart D and 40 CFR 262, Section .32 (for hazardous waste); 40 CFR 761, Section .45 (for PCBs); 40 CFR 61, Section .149(d) (for asbestos). Markings shall be capable of withstanding, without deterioration or substantial color change, a 180 day exposure to conditions reasonably expected to be encountered during container storage and transportation.

2.1.3 Labeling

The Contractor shall provide primary and subsidiary labels for hazardous materials/wastes consistent with the requirements in the Hazardous Materials Table in 49 CFR 172, Section .101, Column 6. Labels shall meet design specifications required by 49 CFR 172, Subpart E including size, shape, color, printing, and symbol requirements. Labels shall be durable and weather resistant and capable of withstanding, without deterioration or substantial color change, a 180 day exposure to conditions reasonably expected to be encountered during container storage and transportation.

2.1.4 Placards

For each off-site shipment of hazardous material/waste, the Contractor shall provide primary and subsidiary placards consistent with the requirements of 49 CFR 172, Subpart F. Placards shall be provided for each side and each end of bulk packaging, freight containers, transport vehicles, and rail cars requiring such placarding. Placards may be plastic, metal, or other material capable of withstanding, without deterioration, a 30 day exposure to open weather conditions and shall meet design requirements specified in 49 CFR 172, Subpart F.

2.1.5 Spill Response Materials

The Contractor shall provide spill response materials including, but not limited to, containers, adsorbent, shovels, and personal protective equipment. Spill response materials shall be available at all times in which hazardous materials/wastes are being handled or transported. Spill response materials shall be compatible with the type of material being handled.

2.2 EQUIPMENT AND TOOLS

The Contractor shall provide miscellaneous equipment and tools necessary to handle hazardous materials and hazardous wastes in a safe and environmentally sound manner.

PART 3 EXECUTION

3.1 ON-SITE HAZARDOUS WASTE MANAGEMENT

These paragraphs apply to Government owned waste only. Contractors are prohibited by 10 U.S.C. 2692 from storing Contractor owned waste on site for any length of time. The Contractor shall be responsible for ensuring compliance with all Federal, state, and local hazardous waste laws and regulations and shall verify those requirements when preparing reports, waste shipment records, hazardous waste manifests, or other documents. The Contractor shall identify hazardous wastes using criteria set forth in 40 CFR 261 or all applicable state and local laws, regulations, and ordinances. When accumulating hazardous waste on-site, the Contractor shall comply with generator requirements in 40 CFR 262 and any applicable state or local law or regulations. On-site accumulation times shall be restricted to applicable time frames referenced in 40 CFR 262, Section .34 and any applicable state or local law or regulation. Accumulation start dates shall commence when waste is first generated (i.e. containerized or otherwise collected for discard). The Contractor shall only use containers in good condition and compatible with the waste to be stored. The Contractor shall be responsible for ensuring containers are closed except when adding or removing waste. The Contractor shall be responsible for immediately marking all hazardous waste containers with the words "hazardous waste" and other information required by 40 CFR 262, Section .32 and any applicable state or local law or regulation as soon as the waste is containerized. An additional marking shall be placed on containers of "unknowns" designating the date sampled, and the suspected hazard. The Contractor shall be responsible for inspecting containers for signs of deterioration and shall be responsible for responding to any spills or leaks. The Contractor shall inspect all hazardous waste areas weekly and shall provide written documentation of the inspection. Inspection logs shall contain date and time of inspection, name of individual conducting the inspection, problems noted, and corrective actions taken.

3.1.1 Hazardous Waste Classification

The Contractor, in consultation with the Contracting Officer, shall identify all waste codes applicable to each hazardous waste stream based on requirements in 40 CFR 261 or any applicable state or local law or regulation. The Contractor shall also identify all applicable treatment standards in 40 CFR 268 and state land disposal restrictions and shall make a determination as to whether or not the waste meets or exceeds the standards. Waste profiles, analyses, classification and treatment standards information shall be submitted to Contracting Officer for review

and approval.

3.1.2 Management Plan

The Contractor shall prepare a plan detailing the manner in which hazardous wastes will be managed and describing the types and volumes of hazardous wastes anticipated to be managed as well as the management practices to be utilized. The plan shall identify the method to be used to ensure accurate piece counts and/or weights of shipments; shall identify waste minimization methods; shall propose facilities to be utilized for treatment, storage, and/or disposal; shall identify areas on-site where hazardous wastes are to be handled; shall identify whether transfer facilities are to be utilized; and if so, how the wastes will be tracked to ultimate disposal.

3.2 OFF-SITE HAZARDOUS WASTE MANAGEMENT

The Contractor shall use RCRA Subtitle C permitted facilities which meet the requirements of 40 CFR 264 or facilities operating under interim status which meet the requirements of 40 CFR 265. Off-site treatment, storage, and/or disposal facilities with significant RCRA violations or compliance problems (such as facilities known to be releasing hazardous constituents into ground water, surface water, soil, or air) shall not be used. The Contractor shall submit Notices of Non-Compliance and Notices of Violation by a Federal, state, or local regulatory agency issued to the Contractor in relation to any work performed under this contract. The Contractor shall immediately provide copies of such notices to the Contracting Officer. The Contractor shall also furnish all relevant documents regarding the incident and any information requested by the Contracting Officer, and shall coordinate its response to the notice with the Contracting Officer or his designated representative prior to submission to the notifying authority. The Contractor shall also furnish a copy to the Contracting Officer of all documents submitted to the regulatory authority, including the final reply to the notice, and all other materials, until the matter is resolved.

3.2.1 Treatment, Storage, and/or Disposal Facility and Transporter

The Contractor shall provide the Contracting Officer with EPA ID numbers, names, locations, and telephone numbers of TSD facilities and transporters. This information shall be contained in the Hazardous Waste Management Plan and shall be approved by the Contracting Officer prior to waste disposal.

3.2.2 Status of the Facility

Facilities receiving hazardous waste must be permitted in accordance with 40 CFR 270 or operating under interim status in accordance with 40 CFR 265 requirements, or must be permitted by a state authorized by the Environmental Protection Agency to administer the RCRA permit program. Additionally, prior to using a TSD Facility, the Contractor shall contact the EPA Regional Off-site Coordinator specified in 40 CFR 300, Section .440, to determine the facility's status, and document all information necessary to satisfy the requirements of the EPA Off-Site policy and furnish this information to the Contracting Officer.

3.2.3 Shipping Documents and Packagings Certification

Prior to shipment of any hazardous material off-site, the Contractor's TDC shall provide written certification to the Contracting Officer that

hazardous materials have been properly packaged, labeled, and marked in accordance with Department of Transportation and EPA requirements. The Contractor's TDC shall also provide written certification regarding waste minimization efforts documenting that efforts have been taken to reduce the volume and toxicity of waste to the degree economically practicable and that the method of treatment, storage, or disposal selected minimizes threats to human health and the environment.

3.2.4 Transportation

Prior to conducting hazardous materials activities, the Contractor responsible for pre-transportation activities shall either certify to the Government that a Security Plan is in place which meets the requirements of 49 CFR 172, Subpart I or in the event that the types or amounts of hazardous materials are excluded from the security planning requirements, a written statement to that effect detailing the basis for the exception. The Contractor shall use manifests for transporting hazardous wastes as required by 40 CFR 263 or any applicable state or local law or regulation. Transportation shall comply with all requirements in the Department of Transportation referenced regulations in the 49 CFR series. The Contractor shall prepare hazardous waste manifests for each shipment of hazardous waste shipped off-site. Manifests shall be completed using instructions in 40 CFR 262, Subpart B and any applicable state or local law or regulation. Manifests and waste profiles shall be submitted to Contracting Officer for review and approval. The Contractor shall prepare land disposal restriction notifications as required by 40 CFR 268 or any applicable state or local law or regulation for each shipment of hazardous waste. Notifications shall be submitted with the manifest to the Contracting Officer for review and approval.

3.2.5 Treatment and Disposal of Hazardous Wastes

The hazardous waste shall be transported to an approved hazardous waste treatment, storage, or disposal facility within 90 days of the accumulation start date on each container. The Contractor shall ship hazardous wastes only to facilities which are properly permitted to accept the hazardous waste or operating under interim status. The Contractor shall ensure wastes are treated to meet land disposal treatment standards in 40 CFR 268 prior to land disposal. The Contractor shall propose TSD facilities via submission of the Hazardous Waste Management Plan, subject to the approval of the Contracting Officer. The Contractor shall submit Certificates of Disposal as specified in the Submittals paragraph.

3.3 HAZARDOUS MATERIALS MANAGEMENT

The Contractor, in consultation with the Contracting Officer, shall evaluate, prior to shipment of any material off-site, whether the material is regulated as a hazardous waste in addition to being regulated as a hazardous material; this shall be done for the purpose of determining proper shipping descriptions, marking requirements, etc., as described below.

3.3.1 Identification of Proper Shipping Names

The Contractor shall use 49 CFR 172, Section .101 to identify proper shipping names for each hazardous material (including hazardous wastes) to be shipped off-site. Proper shipping names shall be submitted to the Contracting Officer in the form of draft shipping documents for review and approval.

3.3.2 Packaging, Labeling, and Marking

The Contractor shall package, label, and mark hazardous materials/wastes using the specified materials and in accordance with the referenced authorizations. The Contractor shall mark each container of hazardous waste of 110 gallons or less with the following:

"HAZARDOUS WASTE - Federal Law Prohibits Improper Disposal.
If found, contact the nearest police or public safety authority or the U.S. Environmental Protection Agency.
Generator's name _____
Manifest Document Number _____".

3.3.3 Shipping Documents

The Contractor shall ensure that each shipment of hazardous material sent off-site is accompanied by properly completed shipping documents. This includes shipments of samples that may potentially meet the definition of a Department of Transportation regulated hazardous material.

3.3.3.1 PCB Waste Shipment Documents

The Contractor shall prepare hazardous waste manifests for each shipment of PCB waste shipped off-site. Manifests shall be completed using instructions in 40 CFR 761, Sections .207 and .208 and all other applicable requirements. Documents shall be submitted to Contracting Officer for review and approval.

3.3.3.2 Asbestos Waste Shipment Documents

The Contractor shall prepare waste shipment records as required by 40 CFR 61 for shipments of asbestos. Waste shipment records shall be submitted to the Contracting Officer for review and approval. Waste shipment records shall be signed by the Contractor.

3.3.3.3 Other Hazardous Material Shipment Documents

The Contractor shall prepare a bill of lading for each shipment of hazardous material which is not accompanied by a hazardous waste manifest or asbestos waste shipment record which fulfills the shipping paper requirements. The bill of lading shall satisfy the requirements of 49 CFR 172, Subpart C, and 40 CFR 279 if shipping used oil and any applicable state or local law or regulation, and shall be submitted to the Contracting Officer for review and approval. For laboratory samples and treatability study samples, the Contractor shall prepare bills of lading and other documentation as necessary to satisfy conditions of the sample exclusions in 40 CFR 261, Section .4(d) and (e) and any applicable state or local law or regulation. Bill of ladings requiring shipper's certifications shall be signed by the Contractor.

3.4 OBTAINING EPA ID NUMBERS

The Contractor shall complete EPA Form 8700-12, Notification of Hazardous Waste Activity, and submit to the Contracting Officer for review and approval. The Contractor shall allow a minimum of 30 days for processing the application and assigning the EPA ID number. Shipment shall be made not earlier than one week after receipt of the EPA ID number.

3.5 SPECIAL REQUIREMENTS FOR ASBESTOS WASTES

If work involves asbestos containing wastes, the Contractor shall manage these wastes in accordance with specification Section 02 82 16.00 20 ENGINERING CONTROL OF ASBESTOS CONTAINING MATERIALS.

3.6 WASTE MINIMIZATION

The Contractor shall minimize the generation of hazardous waste to the maximum extent practicable. The Contractor shall take all necessary precautions to avoid mixing clean and contaminated wastes. The Contractor shall identify and evaluate recycling and reclamation options as alternatives to land disposal. Requirements of 40 CFR 266 shall apply to: hazardous wastes recycled in a manner constituting disposal; hazardous waste burned for energy recovery; lead-acid battery recycling; and hazardous wastes with economically recoverable precious metals.

3.7 RECORDKEEPING

The Contractor shall be responsible for maintaining adequate records to support information provided to the Contracting Officer regarding exception reports, annual reports, and biennial reports. The Contractor shall be responsible for maintaining asbestos waste shipment records for a minimum of 3 years from the date of shipment or any longer period required by any applicable law or regulation or any other provision of this contract. The Contractor shall be responsible for maintaining bill of ladings for a minimum of 375 days from the date of shipment or any longer period required by any applicable law or regulation or any other provision of this contract.

3.8 SPILL RESPONSE

The Contractor shall respond to any spills of hazardous material or hazardous waste which are in the custody or care of the Contractor, pursuant to this contract. Any direction from the Contracting Officer concerning a spill or release shall not be considered a change under the contract. The Contractor shall comply with all applicable requirements of Federal, state, or local laws or regulations regarding any spill incident.

3.9 EMERGENCY CONTACTS

The Contractor shall be responsible for complying with the emergency contact provisions in 49 CFR 172, Section .604. Whenever the Contractor ships hazardous materials, the Contractor shall provide a 24 hr emergency response contact and phone number of a person knowledgeable about the hazardous materials being shipped and who has comprehensive emergency response and incident mitigation information for that material, or has immediate access to a person who possesses such knowledge and information. The phone must be monitored on a 24 hour basis at all times when the hazardous materials are in transportation, including during storage incidental to transportation. The Contractor shall ensure that information regarding this emergency contact and phone number are placed on all hazardous material shipping documents. The Contractor shall designate an emergency coordinator and post the following information at areas in which hazardous wastes are managed:

a. The name of the emergency coordinator.

b. Phone number through which the emergency coordinator can be contacted on a 24 hour basis.

c. The telephone number of the local fire department.

d. The location of fire extinguishers and spill control materials.

Attachment A
SAMPLE OFF-SITE POLICY CERTIFICATION MEMO

Project/Contract #:_____
Waste Stream:_____
Primary TSD Facility, EPA ID # and Location: _____
Alter. TSD Facility, EPA ID # and Location:_____

EPA Region	Contact
I	(617) 918-1752
II	(212) 637-4130
III	(214) 814-5267
IV	(404) 562-8591
V	(312) 353-8207
VI	(214) 665-2282
VII	(913) 551-7154
VIII	(303) 312-6419
IX	(415) 972-3304
X	(206) 553-2859

EPA representative contacted: _____
EPA representative phone number: _____
Date contacted: _____

Comment: _____
The above EPA representative was contacted on _____. As of that date the above sites were considered acceptable in accordance with the Off-Site Policy in 40 CFR 300.440.

Signature: _____ Date: _____
Phone number: _____

-- End of Section --

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SECTION 02 82 16.00 20

ENGINEERING CONTROL OF ASBESTOS CONTAINING MATERIALS
04/06

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z88.2	(1992) Respiratory Protection
ANSI Z9.2	(2001) Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems

ASTM INTERNATIONAL (ASTM)

ASTM C 732	(2006) Aging Effects of Artificial Weathering on Latex Sealants
ASTM D 1331	(1989; R 2001) Surface and Interfacial Tension of Solutions of Surface-Active Agents
ASTM D 2794	(1993; R 2004) Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D 522	(1993a; R 2008) Mandrel Bend Test of Attached Organic Coatings
ASTM E 119	(2007) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E 1368	(2005e1) Visual Inspection of Asbestos Abatement Projects
ASTM E 736	(2000; R 2006) Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
ASTM E 84	(2009a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E 96	(2005) Standard Test Methods for Water Vapor Transmission of Materials

STATE OF VIRGINIA ADMINISTRATIVE CODE (VAC)

16 VAC 25-20-30	Title 16, Agency 25, Chapter 20, Section

30: Notification and Permit Fee

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

29 CFR 1926.103	Respiratory Protection
29 CFR 1926.1101	Asbestos
29 CFR 1926.200	Accident Prevention Signs and Tags
29 CFR 1926.51	Sanitation
29 CFR 1926.59	Hazard Communication
40 CFR 61-SUBPART A	General Provisions
40 CFR 61-SUBPART M	National Emission Standard for Asbestos
40 CFR 763	Asbestos

U.S. NAVAL FACILITIES ENGINEERING COMMAND (NAVFAC)

ND OPNAVINST 5100.23	(Rev G) Navy Occupational Safety and Health (NAVOSH) Program Manual

UNDERWRITERS LABORATORIES (UL)

UL 586	(1996; Rev thru Aug 2004) Standard for High-Efficiency Particulate, Air Filter Units

1.2 DEFINITIONS

1.2.1 ACM

Asbestos Containing Materials.

1.2.2 Amended Water

Water containing a wetting agent or surfactant with a maximum surface tension of 29 dynes per centimeter when tested in accordance with ASTM D 1331.

1.2.3 Area Sampling

Sampling of asbestos fiber concentrations which approximates the concentrations of asbestos in the theoretical breathing zone but is not actually collected in the breathing zone of an employee.

1.2.4 Asbestos

The term asbestos includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, and actinolite asbestos and any of these minerals that has been chemically treated or altered. Materials are considered to contain asbestos if the asbestos content of the material is determined to be at least one percent.

1.2.5 Asbestos Control Area

That area where asbestos removal operations are performed which is isolated by physical boundaries which assist in the prevention of the uncontrolled release of asbestos dust, fibers, or debris.

1.2.6 Asbestos Fibers

Those fibers having an aspect ratio of at least 3:1 and longer than 5 micrometers as determined by National Institute for Occupational Safety and Health (NIOSH) Method 7400.

1.2.7 Asbestos Permissible Exposure Limit

0.1 fibers per cubic centimeter of air as an 8-hour time weighted average measured in the breathing zone as defined by 29 CFR 1926.1101 or other Federal legislation having legal jurisdiction for the protection of workers health.

1.2.8 Background

The ambient airborne asbestos concentration in an uncontaminated area as measured prior to any asbestos hazard abatement efforts. Background concentrations for other (contaminated) areas are measured in similar but asbestos free locations.

1.2.9 Contractor

The Contractor is that individual, or entity under contract to the Navy to perform the herein listed work.

1.2.10 Competent Person

A person meeting the requirements for competent person as specified in 29 CFR 1926.1101 including a person capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, and is specifically trained in a training course which meet the criteria of EPA's Model Accreditation Plan (40 CFR 763) for project designer or supervisor, or its equivalent. The competent person shall have a current Commonwealth of Virginia asbestos supervisors license.

1.2.11 Encapsulation

The abatement of an asbestos hazard through the appropriate use of chemical encapsulants.

1.2.12 Encapsulants

Specific materials in various forms used to chemically or physically entrap asbestos fibers in various configurations to prevent these fibers from becoming airborne. There are four types of encapsulants as follows which must comply with performance requirements as specified herein.

a. Removal Encapsulant (can be used as a wetting agent)

b. Bridging Encapsulant (used to provide a tough, durable surface coating to asbestos containing material)

c. Penetrating Encapsulant (used to penetrate the asbestos containing material encapsulating all asbestos fibers and preventing fiber release due to routine mechanical damage)

d. Lock-Down Encapsulant (used to seal off or "lock-down" minute asbestos fibers left on surfaces from which asbestos containing material has been removed).

1.2.13 Friable Asbestos Material

One percent asbestos containing material that can be crumbled, pulverized, or reduced to powder by hand pressure when dry.

1.2.14 Glovebag Technique

Those asbestos removal and control techniques put forth in 29 CFR 1926.1101 Appendix G.

1.2.15 HEPA Filter Equipment

High efficiency particulate air (HEPA) filtered vacuum and/or exhaust ventilation equipment with a filter system capable of collecting and retaining asbestos fibers. Filters shall retain 99.97 percent of particles 0.3 microns or larger as indicated in UL 586.

1.2.16 Navy Consultant (NC)

That qualified person employed directly by the Government to monitor, sample, inspect the work or in some other way advise the Contracting Officer. The NC is normally a private consultant, but can be an employee of the Government.

1.2.17 Negative Pressure Enclosure (NPE)

That engineering control technique described as a negative pressure enclosure in 29 CFR 1926.1101.

1.2.18 Nonfriable Asbestos Material

Material that contains asbestos in which the fibers have been immobilized by a bonding agent, coating, binder, or other material so that the asbestos is well bound and will not normally release asbestos fibers during any appropriate use, handling, storage or transportation. It is understood that asbestos fibers may be released under other conditions such as demolition, removal, or mishap.

1.2.19 Personal Sampling

Air sampling which is performed to determine asbestos fiber concentrations within the breathing zone of a specific employee, as performed in accordance with 29 CFR 1926.1101.

1.2.20 Private Qualified Person (PQP)

That qualified person hired by the Contractor to perform the herein listed tasks.

1.2.21 Qualified Person (QP)

A Registered Architect, Professional Engineer, Certified Industrial Hygienist, consultant or other qualified person who has successfully completed training and is therefore accredited under a legitimate State Model Accreditation Plan as described in 40 CFR 763 as a Building Inspector, Contractor/Supervisor Abatement Worker, and Asbestos Project Designer; and has successfully completed the National Institute of Occupational Safety and Health (NIOSH) 582 course "Sampling and Evaluating Airborne Asbestos Dust" or equivalent. The QP must be qualified to perform visual inspections as indicated in ASTM E 1368. The QP shall be appropriately licensed in the Commonwealth of Virginia as a Project Monitor.

1.2.22 TEM

Refers to Transmission Electron Microscopy.

1.2.23 Time Weighted Average (TWA)

The TWA is an 8-hour time weighted average airborne concentration of asbestos fibers.

1.2.24 Wetting Agent

A chemical added to water to reduce the water's surface tension thereby increasing the water's ability to soak into the material to which it is applied. An equivalent wetting agent must have a surface tension of at most 29 dynes per centimeter when tested in accordance with ASTM D 1331.

1.3 REPORTS

A hazardous material inspection report prepared by AH Environmental is included after this section.

1.4 REQUIREMENTS

1.4.1 Description of Work

The work covered by this section includes the handling and control of asbestos containing materials and describes some of the resultant procedures and equipment required to protect workers, the environment and occupants of the building or area, or both, from contact with airborne asbestos fibers. The work also includes the disposal of any asbestos containing materials generated by the work. More specific operational procedures shall be outlined in the Asbestos Hazard Abatement Plan called for elsewhere in this specification. The asbestos work includes the demolition and removal of asbestos containing gaskets (throughout the faciltiy) . Under normal conditions non-friable or chemically bound materials containing asbestos would not be considered hazardous; however, this material may release airborne asbestos fibers during demolition and removal and therefore must be handled in accordance with the removal and disposal procedures as specified herein. Provide wet removal methods and techniques as outlined in this specification. The Navy will evacuate the work area during the asbestos abatement work. All asbestos removal work shall be supervised by a competent person as specified herein.

1.4.2 Medical Requirements

Provide medical requirements including but not limited to medical

surveillance and medical record keeping as listed in 29 CFR 1926.1101.

1.4.2.1 Medical Examinations

Before exposure to airborne asbestos fibers, provide workers with a comprehensive medical examination as required by 29 CFR 1926.1101 or other pertinent State or local directives. This requirement must have been satisfied within the 12 months prior to the start of work on this contract. The same medical examination shall be given on an annual basis to employees engaged in an occupation involving asbestos and within 30 calendar days before or after the termination of employment in such occupation. Specifically identify x-ray films of asbestos workers to the consulting radiologist and mark medical record jackets with the word "ASBESTOS."

1.4.2.2 Medical Records

Maintain complete and accurate records of employees' medical examinations, medical records, and exposure data for a period of indefinite time after termination of employment and make records of the required medical examinations and exposure data available for inspection and copying to: The Assistant Secretary of Labor for Occupational Safety and Health (OSHA), or authorized representatives of them, and an employee's physician upon the request of the employee or former employee.

1.4.3 Employee Training

Submit certificates, prior to the start of work but after the main abatement submittal, signed by each employee indicating that the employee has received training in the proper handling of materials and wastes that contain asbestos in accordance with 40 CFR 763; understands the health implications and risks involved, including the illnesses possible from exposure to airborne asbestos fibers; understands the use and limits of the respiratory equipment to be used; and understands the results of monitoring of airborne quantities of asbestos as related to health and respiratory equipment as indicated in 29 CFR 1926.1101 on an initial and annual basis. Certificates shall be organized by individual worker, not grouped by type of certification. Train all personnel involved in the asbestos control work in accordance with United States Environmental Protection Agency (USEPA) Asbestos Hazard Emergency Response Act (AHERA) training criteria or State training criteria whichever is more stringent. The Contractor shall document the training by providing: dates of training, training entity, course outline, names of instructors, and qualifications of instructors upon request by the Contracting Officer. Furnish each employee with respirator training and fit testing administered by the PQP as required by 29 CFR 1926.1101. Fully cover engineering and other hazard control techniques and procedures. All asbestos workers shall have a current Commonwealth of Virginia asbestos worker's license.

1.4.4 Permits , Licenses, and Notifications

Obtain necessary permits and licenses in conjunction with asbestos removal, encapsulation, hauling, and disposition, and furnish notification of such actions required by Federal, State, regional, and local authorities prior to the start of work. Notify the Regional Office of the United States Environmental Protection Agency (USEPA) and the Contracting Officer in writing 20 working days prior to commencement of work in accordance with 40 CFR 61-SUBPART M and 16 VAC 25-20-30. Notify the Contracting Officer and other appropriate Government agencies in writing 20 working days prior

to the start of asbestos work as indicated in applicable laws, ordinances, criteria, rules, and regulations. Submit copies of all Notifications to the Contracting Officer.

1.4.5 Environment, Safety and Health Compliance

In addition to detailed requirements of this specification, comply with those applicable laws, ordinances, criteria, rules, and regulations of Federal, State, regional, and local authorities regarding handling, storing, transporting, and disposing of asbestos waste materials. Comply with the applicable requirements of the current issue of 29 CFR 1926.1101, 40 CFR 61-SUBPART A, 40 CFR 61-SUBPART M, and ND OPNAVINST 5100.23. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting the work. Where the requirements of this specification, applicable laws, rules, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirement as defined by the Government shall apply. The following laws, ordinances, criteria, rules and regulations regarding removal, handling, storing, transporting and disposing of asbestos materials apply:

a. All asbestos gasket and tile removals must be done using wet methods

b. Only qualified (appropriately trained/ licenced) personnel may remove ACM gasket material

c. No asbestos wastes shall be allowed to accumulate at the facility.

1.4.6 Respiratory Protection Program

Establish and implement a respirator program as required by ANSI Z88.2, 29 CFR 1926.1101, and 29 CFR 1926.103. Submit a written description of the program to the Contracting Officer. Submit a written program manual or operating procedure including methods of compliance with regulatory statutes.

1.4.6.1 Respirator Program Records

Submit records of the respirator program as required by ANSI Z88.2, 29 CFR 1926.103, and 29 CFR 1926.1101.

1.4.7 Asbestos Hazard Control Supervisor

The Contractor shall be represented on site by a supervisor, trained using the model Contractor accreditation plan as indicated in the Federal statutes for all portions of the herein listed work.

1.4.8 Hazard Communication

Adhere to all parts of 29 CFR 1926.59 and provide the Contracting Officer with a copy of the Material Safety Data Sheets (MSDS) for all materials brought to the site.

1.4.9 Asbestos Hazard Abatement Plan

Submit a detailed plan of the safety precautions such as lockout, tagout, tryout, fall protection, and confined space entry procedures and equipment and work procedures to be used in the removal of materials containing asbestos. The plan, not to be combined with other hazard abatement plans, shall be prepared, signed, and sealed by the PQP. Provide a Table of

Contents for each abatement submittal, which shall follow the sequence of requirements in the contract. Such plan shall include but not be limited to the precise personal protective equipment to be used including, but not limited to, respiratory protection, type of whole-body protection , the location of asbestos control areas including clean and dirty areas, buffer zones, showers, storage areas, change rooms, removal method, interface of trades involved in the construction, sequencing of asbestos related work, disposal plan, type of wetting agent and asbestos sealer to be used, locations of local exhaust equipment, planned air monitoring strategies, and a detailed description of the method to be employed in order to control environmental pollution. The plan shall also include (both fire and medical emergency) response plans. The Asbestos Hazard Abatement Plan must be approved in writing prior to starting any asbestos work. The Contractor, Asbestos Hazard Control Supervisor, and PQP shall meet with the Contracting Officer prior to beginning work, to discuss in detail the Asbestos Hazard Abatement Plan, including work procedures and safety precautions. Once approved by the Contracting Officer, the plan will be enforced as if an addition to the specification. Any changes required in the specification as a result of the plan shall be identified specifically in the plan to allow for free discussion and approval by the Contracting Officer prior to starting work.

1.4.10 Testing Laboratory

Submit the name, address, and telephone number of each testing laboratory selected for the sampling, analysis, and reporting of airborne concentrations of asbestos fibers along with evidence that each laboratory selected holds the appropriate State license and/or permits and certification that each laboratory is American Industrial Hygiene Association (AIHA) accredited and that persons counting the samples have been judged proficient by current inclusion on the AIHA Asbestos Analysis Registry (AAR) and successful participation of the laboratory in the Proficiency Analytical Testing (PAT) Program. Where analysis to determine asbestos content in bulk materials or transmission electron microscopy is required, submit evidence that the laboratory is accredited by the National Institute of Science and Technology (NIST) under National Voluntary Laboratory Accreditation Program (NVLAP) for asbestos analysis. The testing laboratory firm shall be independent of the asbestos contractor and shall have no employee or employer relationship which could constitute a conflict of interest.

1.4.11 Landfill Approval

Submit written evidence that the landfill is for asbestos disposal by the U.S. Environmental Protection Agency, Region 3, Air Enforcement Section (38W12), and local regulatory agencies. Within 3 working days after delivery, submit detailed delivery tickets, prepared, signed, and dated by an agent of the landfill, certifying the amount of asbestos materials delivered to the landfill. Submit a copy of the waste shipment records within 1 day of the shipment leaving the project site.

1.4.12 Medical Certification

Provide a written certification for each worker and supervisor, signed by a licensed physician indicating that the worker and supervisor has met or exceeded all of the medical prerequisites listed herein and in 29 CFR 1926.1101 and 29 CFR 1926.103 as prescribed by law. Submit certificates prior to the start of work but after the main abatement submittal.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Local exhaust equipment; G

Vacuums; G

Respirators; G

Pressure differential automatic recording instrument; G

Amended water; G

Glovebags; G

Material Safety Data Sheets (MSDS) for all materials proposed for transport to the project site; G

Encapsulants; G

SD-06 Test Reports

Air sampling results; G

Pressure differential recordings for local exhaust system; G

Asbestos disposal quantity report; G

Clearance sampling; G

SD-07 Certificates

Asbestos hazard abatement plan; G

Testing laboratory; G

Private qualified person documentation; G

Contractor's license; G

Competent person documentation; G

Worker's license; G

Landfill approval; G

Employee training; G

Medical certification requirements; G

Waste shipment records and if applicable exemption report; G

Respiratory Protection Program; G

Delivery tickets; G

Vacuums; G

Water filtration equipment; G

Ventilation systems; G

Other equipment used to contain airborne asbestos fibers; G

Chemical encapsulants sealers; G

Notifications

Show compliance with ANSI Z9.2 by providing manufacturers' certifications.

SD-11 Closeout Submittals

Notifications; G

Rental equipment; G

Respirator program records; G

Permits and licenses; G

1.6 QUALITY ASSURANCE

1.6.1 Private Qualified Person Documentation

Submit the name, address, and telephone number of the Private Qualified Person (PQP) selected to prepare the Asbestos Hazard Abatement Plan, direct monitoring and training, and documented evidence that the PQP has successfully completed training in and is accredited and where required is certified as, a Building Inspector, Contractor/Supervisor Abatement Worker, and Asbestos Project Designer as described by 40 CFR 763 and has successfully completed the National Institute of Occupational Safety and Health (NIOSH) 582 course "Sampling and Evaluating Airborne Asbestos Dust" or equivalent. The PQP shall be appropriately licensed in the Commonwealth of Virginia as a Project Monitor. The PQP and the asbestos contractor shall not have an employee/employer relationship or financial relationship which could constitute a conflict of interest. The PQP shall be a first tier subcontractor.

1.6.2 Competent Person Documentation

Submit training certification and a current Commonwealth of Virginia Asbestos Contractor's and Supervisor's License.

1.6.3 Worker's License

Submit documentation that requires all workers have a current Commonwealth of Virginia Asbestos Workers License.

1.6.4 Contractor's License

Contractor shall have current Virginia asbestos contractor's license. Submit a copy of the asbestos contractor's license issued by the Commonwealth of Virginia.

1.6.5 Air Sampling Results

Complete fiber counting and provide results to the PQP and NC for review within 24 hours of the "time off" of the sample pump. Notify the Contracting Officer immediately of any airborne levels of asbestos fibers in excess of the acceptable limits. Submit sampling results to the Contracting Officer and the affected Contractor employees where required by law within 3 working days, signed by the testing laboratory employee performing air sampling, the employee that analyzed the sample, and the PQP and NC. Notify the Contractor and the Contracting Officer immediately of any variance in the pressure differential which could cause adjacent unsealed areas to have asbestos fiber concentrations in excess of 0.01 fibers per cubic centimeter or background whichever is higher. In no circumstance shall levels exceed 0.1 fibers per cubic centimeter.

1.6.6 Pressure Differential Recordings for Local Exhaust System

Provide a local exhaust system that creates a negative pressure of at least 0.02 inches of water relative to the pressure external to the enclosure and operate it continuously, 24 hours a day, until the temporary enclosure of the asbestos control area is removed. Submit pressure differential recordings for each work day to the PQP and NC for review and to the Contracting Officer within 24 hours from the end of each work day.

1.7 EQUIPMENT

1.7.1 Rental Equipment

Provide a copy of the written notification to the rental company concerning the intended use of the equipment and the possibility of asbestos contamination of the equipment.

PART 2 PRODUCTS

2.1 ENCAPSULANTS

Shall conform to current USEPA requirements, shall contain no toxic or hazardous substances as defined in 29 CFR 1926.59, and shall conform to the following performance requirements.

2.1.1 Removal Encapsulants

Requirement	Test Standard
Flame Spread - 25, Smoke Emission - 50	ASTM E 84
Life Expectancy - 20 years	ASTM C 732 Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E 96

2.1.2 Bridging Encapsulant

Requirement	Test Standard
Flame Spread - 25, Smoke Emission - 50	ASTM E 84
Life Expectancy - 20 years	ASTM C 732 Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E 96
Fire Resistance - Negligible affect on fire resistance rating over 3 hour test (Classified by UL for use over fibrous and cementitious sprayed fireproofing)	ASTM E 119
Impact Resistance - Minimum 43 in/lb Gardner Impact Test	ASTM D 2794
Flexibility - no rupture or cracking	ASTM D 522 Mandrel Bend Test

2.1.3 Penetrating Encapsulant

Requirement	Test Standard
Flame Spread - 25, Smoke Emission - 50	ASTM E 84
Life Expectancy - 20 years	ASTM C 732 Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E 96
Cohesion/Adhesion Test - 50 pounds of force/foot	ASTM E 736
Fire Resistance - Negligible affect on fire resistance rating over 3 hour test (Classified by UL for use over fibrous and cementitious sprayed fireproofing)	ASTM E 119
Impact Resistance - Minimum 43 in/lb Gardner Impact Test	ASTM D 2794
Flexibility - no rupture or cracking	ASTM D 522 Mandrel Bend Test

2.1.4 Lock-down Encapsulant

Requirement	Test Standard
Flame Spread: 25, Smoke Emission - 50	ASTM E 84
Life Expectancy: 20 years	ASTM C 732 Accelerated Aging Test
Permeability: Minimum 0.4 perms	ASTM E 96
Fire Resistance: Negligible affect on	ASTM E 119

Requirement	Test Standard
fire resistance rating over 3 hour test (Tested with fireproofing over encapsulant applied directly to steel member)	
Bond Strength: 100 pounds of force/foot (Tests compatibility with cementitious and fibrous fireproofing)	ASTM E 736

PART 3 EXECUTION

3.1 EQUIPMENT

At all times, provide the Contracting Officer or the Contracting Officer's Representative, with at least two complete sets of personal protective equipment as required for entry to and inspection of the asbestos control area. Provide equivalent training to the Contracting Officer or a designated representative as provided to Contractor employees in the use of the required personal protective equipment. Provide manufacturer's certificate of compliance for all equipment used to contain airborne asbestos fibers.

3.1.1 Respirators

Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.

3.1.1.1 Respirators for Handling Asbestos

Provide personnel engaged in pre-cleaning, cleanup, handling, removal of asbestos materials with respiratory protection as indicated in 29 CFR 1926.1101 and 29 CFR 1926.103.

3.1.2 Exterior Whole Body Protection

3.1.2.1 Outer Protective Clothing

Provide personnel exposed to asbestos with disposable "non-breathable," whole body outer protective clothing, head coverings, gloves, and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber gloves for comfort, but shall not be used alone. Make sleeves secure at the wrists, make foot coverings secure at the ankles, and make clothing secure at the neck by the use of tape.

3.1.2.2 Work Clothing

Provide cloth work clothes for wear under the outer protective clothing and foot coverings and either dispose of or properly decontaminate them as recommended by the PQP after each use.

3.1.2.3 Personal Decontamination Unit

Provide a temporary, negative pressure unit with a separate decontamination locker room and clean locker room with a shower that complies with 29 CFR 1926.51(f)(4)(ii) through (V) in between for personnel required to wear whole body protective clothing. Provide two separate lockers for each asbestos worker, one in each locker room. Keep street clothing and street

shoes in the clean locker. HEPA vacuum and remove asbestos contaminated disposable protective clothing while still wearing respirators at the boundary of the asbestos work area and seal in impermeable bags or containers for disposal. Do not wear work clothing between home and work. Locate showers between the decontamination locker room and the clean locker room and require that all employees shower before changing into street clothes. Collect used shower water and filter with approved water filtration equipment to remove asbestos contamination. Dispose of filters and residue as asbestos waste. Discharge clean water to the sanitary system. Dispose of asbestos contaminated work clothing as asbestos contaminated waste . Decontamination units shall be physically attached to the asbestos control area. Build both a personnel decontamination unit and an equipment decontamination unit onto and integral with each asbestos control area.

3.1.2.4 Eye Protection

Provide goggles to personnel engaged in asbestos abatement operations when the use of a full face respirator is not required.

3.1.3 Warning Signs and Labels

Provide bilingual warning signs printed in English and Spanish at all approaches to asbestos control areas. Locate signs at such a distance that personnel may read the sign and take the necessary protective steps required before entering the area. Provide labels and affix to all asbestos materials, scrap, waste, debris, and other products contaminated with asbestos.

3.1.3.1 Warning Sign

Provide vertical format conforming to 29 CFR 1926.200, and 29 CFR 1926.1101 minimum 20 by 14 inches displaying the following legend in the lower panel:

Legend	Notation
Danger	one inch Sans Serif Gothic or Block
Asbestos	one inch Sans Serif Gothic or Block
Cancer and Lung Disease Hazard	1/4 inch Sans Serif Gothic or Block
Authorized Personnel Only	1/4 inch Gothic
Respirators and Protective Clothing are Required in this Area	1/4 inch Gothic

Spacing between lines shall be at least equal to the height of the upper of any two lines.

3.1.3.2 Warning Labels

Provide labels conforming to 29 CFR 1926.1101 of sufficient size to be clearly legible, displaying the following legend:

DANGER

CONTAINS ASBESTOS FIBERS

AVOID CREATING DUST

CANCER AND LUNG DISEASE HAZARD

BREATHING ASBESTOS DUST MAY
CAUSE SERIOUS BODILY HARM

3.1.4 Local Exhaust System

Provide a local exhaust system in the asbestos control area in accordance with ANSI Z9.2 and 29 CFR 1926.1101 that will provide at least four air changes per hour inside of the negative pressure enclosure. Local exhaust equipment shall be operated 24 hours per day, until the asbestos control area is removed and shall be leak proof to the filter and equipped with HEPA filters. Maintain a minimum pressure differential in the control area of minus 0.02 inch of water column relative to adjacent, unsealed areas. Provide continuous 24-hour per day monitoring of the pressure differential with a pressure differential automatic recording instrument. In no case shall the building ventilation system be used as the local exhaust system for the asbestos control area. Filters on exhaust equipment shall conform to ANSI Z9.2 and UL 586. The local exhaust system shall terminate out of doors and remote from any public access or ventilation system intakes.

3.1.5 Tools

Vacuums shall be leak proof to the filter and equipped with HEPA filters. Filters on vacuums shall conform to ANSI Z9.2 and UL 586. Do not use power tools to remove asbestos containing materials unless the tool is equipped with effective, integral HEPA filtered exhaust ventilation systems. Remove all residual asbestos from reusable tools prior to storage or reuse.

3.1.6 Rental Equipment

If rental equipment is to be used, furnish written notification to the rental agency concerning the intended use of the equipment and the possibility of asbestos contamination of the equipment.

3.1.7 Glovebags

Submit written manufacturers information/evidence that glovebags will not break down under expected temperatures and conditions.

3.2 WORK PROCEDURE

Perform asbestos related work in accordance with 29 CFR 1926.1101, 40 CFR 61-SUBPART M, and as specified herein. Use wet removal procedures and intact removal techniques. Personnel shall wear and utilize protective clothing and equipment as specified herein. Eating, smoking, drinking, chewing gum, tobacco, or applying cosmetics shall not be permitted in the asbestos work or control areas. Personnel of other trades not engaged in the removal and demolition of asbestos containing material shall not be exposed at any time to airborne concentrations of asbestos unless all the personnel protection and training provisions of this specification are complied with by the trade personnel. Shut down the building heating,

ventilating, and air conditioning system, cap the openings to the system, prior to the commencement of asbestos work. Disconnect electrical service when wet removal is performed and provide temporary electrical service with verifiable ground fault circuit interrupter (GFCI) protection prior to the use of any water or encapsulant. If an asbestos fiber release or spill occurs outside of the asbestos control area, stop work immediately, correct the condition to the satisfaction of the Contracting Officer including clearance sampling, prior to resumption of work.

3.2.1 Protection of Existing Work to Remain

Perform work without damage or contamination of adjacent work. Where such work is damaged or contaminated as verified by the Contracting Officer using visual inspection or sample analysis, it shall be restored to its original condition or decontaminated by the Contractor at no expense to the Government as deemed appropriate by the Contracting Officer. This includes inadvertent spill of dirt, dust, or debris in which it is reasonable to conclude that asbestos may exist. When these spills occur, stop work immediately. Then clean up the spill. When satisfactory visual inspection and air sampling results are obtained from the NC work may proceed at the discretion of the Contracting Officer.

3.2.2 Furnishings

Furniture and equipment will remain in the building. Cover and seal furnishings with 6-mil plastic sheet or remove from the work area and store in a location on site approved by the Contracting Officer.

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3.2.3 Precleaning

Wet wipe and HEPA vacuum all surfaces potentially contaminated with asbestos prior to establishment of an enclosure.

3.2.4 Asbestos Control Area Requirements

3.2.4.1 Negative Pressure Enclosure

Block and seal openings in areas where the release of airborne asbestos fibers can be expected. Establish an asbestos negative pressure enclosure with the use of curtains, portable partitions, or other enclosures in order to prevent the escape of asbestos fibers from the contaminated asbestos work area. Negative pressure enclosure development shall include protective covering of uncontaminated walls, and ceilings with a continuous membrane of two layers of minimum 6-mil plastic sheet sealed with tape to prevent water or other damage. Provide two layers of 6-mil plastic sheet over floors and extend a minimum of 12 inches up walls. Seal all joints with tape. Provide local exhaust system in the asbestos control area. Openings will be allowed in enclosures of asbestos control areas for personnel and equipment entry and exit, the supply and exhaust of air for the local exhaust system and the removal of properly containerized asbestos containing materials. Replace local exhaust system filters as required to maintain the efficiency of the system.

3.2.4.2 Glovebag

The construction of a negative pressure enclosure is infeasible for the

removal of ACM gasket material located on piping systems throughout the facility. Use alternate techniques as indicated in 29 CFR 1926.1101. Establish designated limits for the asbestos regulated area with the use of rope or other continuous barriers, and maintain all other requirements for asbestos control areas. The PQP shall conduct personal samples of each worker engaged in asbestos handling (removal, disposal, transport and other associated work) throughout the duration of the project. If the quantity of airborne asbestos fibers monitored at the breathing zone of the workers at any time exceeds background or 0.01 fibers per cubic centimeter whichever is greater, stop work, evacuate personnel in adjacent areas or provide personnel with approved protective equipment at the discretion of the Contracting Officer. This sampling may be duplicated by the Government at the discretion of the Contracting Officer. If the air sampling results obtained by the Government differ from those obtained by the Contractor, the Government will determine which results predominate. If adjacent areas are contaminated as determined by the Contracting Officer, clean the contaminated areas, monitor, and visually inspect the area as specified herein.

3.2.5 Removal Procedures

Wet asbestos material with a fine spray of amended water during removal, cutting, or other handling so as to reduce the emission of airborne fibers. Remove material and immediately place in 6 mil plastic disposal bags. Remove asbestos containing material in a gradual manner, with continuous application of the amended water or wetting agent in such a manner that no asbestos material is disturbed prior to being adequately wetted. Where unusual circumstances prohibit the use of 6 mil plastic bags, submit an alternate proposal for containment of asbestos fibers to the Contracting Officer for approval. For example, in the case where both piping and insulation are to be removed, the Contractor may elect to wet the insulation, wrap the pipes and insulation in plastic and remove the pipe by sections. Asbestos containing material shall be containerized while wet. At no time shall asbestos material be allowed to accumulate or become dry. Lower and otherwise handle asbestos containing material as indicated in 40 CFR 61-SUBPART M.

3.2.6 Air Sampling

Sampling of airborne concentrations of asbestos fibers shall be performed in accordance with 29 CFR 1926.1101 and as specified herein. Sampling performed in accordance with 29 CFR 1926.1101 shall be performed by the PQP. Sampling performed for environmental and quality control reasons shall be performed by the . Unless otherwise specified, use NIOSH Method 7400 for sampling and analysis. Monitoring may be duplicated by the Government at the discretion of the Contracting Officer. If the air sampling results obtained by the Government differ from those results obtained by the Contractor, the Government will determine which results predominate.

3.2.6.1 Sampling Prior to Asbestos Work

Provide area air sampling and establish the baseline one day prior to the masking and sealing operations for Building CI58 and one ambient exterior air sample per month for exterior ACM gasket removals. Establish the background by performing area sampling in similar but uncontaminated sites in the building.

3.2.6.2 Sampling During Asbestos Work

The PQP shall provide personal and area sampling as indicated in 29 CFR 1926.1101 and governing environmental regulations. In addition, provided the same type of work is being performed, provide area sampling at least once every work shift close to the work inside the enclosure, outside the clean room entrance to the enclosure, and at the exhaust opening of the local exhaust system. If sampling outside the enclosure shows airborne levels have exceeded background or 0.01 fibers per cubic centimeter, whichever is greater, stop all work, correct the condition(s) causing the increase, and notify the Contracting Officer immediately. Where alternate methods are used, perform personal and area air sampling at locations and frequencies that will accurately characterize the evolving airborne asbestos levels.

3.2.6.3 Sampling After Final Clean-Up (Clearance Sampling)

Provide area sampling of asbestos fibers and establish an airborne asbestos concentration of less than 0.01 fibers per cubic centimeter after final clean-up but before removal of the enclosure or the asbestos work control area. After final cleanup and the asbestos control area is dry but prior to clearance sampling, the PQP shall perform a visual inspection in accordance with ASTM E 1368 to ensure that the asbestos control and work area is free of any accumulations of dirt, dust, or debris. Prepare a written report signed and dated by the PQP documenting that the asbestos control area is free of dust, dirt, and debris and all waste has been removed. Perform at least two (2) samples. The asbestos fiber counts from these samples shall be less than 0.01 fibers per cubic centimeter or be not greater than the background, whichever is greater. Should any of the final samples indicate a higher value, the Contractor shall take appropriate actions to re-clean the area and shall repeat the sampling and analysis at the Contractor's expense.

3.2.7 Lock-Down

Prior to removal of plastic barriers and after pre-clearance clean up of gross contamination, the PQP shall conduct a visual inspection of all areas affected by the removal in accordance with ASTM E 1368. Inspect for any visible fibers , and to ensure that encapsulants were applied evenly and appropriately. A post removal (lock-down) encapsulant shall then be spray applied to ceiling, walls, floors and other areas exposed in the removal area. The exposed area shall include but not be limited to plastic barriers, furnishings and articles to be discarded as well as dirty change room, air locks for bag removal and decontamination chambers.

3.2.8 Site Inspection

While performing asbestos engineering control work, the Contractor shall be subject to on-site inspection by the Contracting Officer who may be assisted by or represented by safety or industrial hygiene personnel. If the work is found to be in violation of this specification, the Contracting Officer or his representative will issue a stop work order to be in effect immediately and until the violation is resolved. All related costs including standby time required to resolve the violation shall be at the Contractor's expense.

3.3 CLEAN-UP AND DISPOSAL

3.3.1 Housekeeping

Essential parts of asbestos dust control are housekeeping and clean-up procedures. Maintain surfaces of the asbestos control area free of accumulations of asbestos fibers. Give meticulous attention to restricting the spread of dust and debris; keep waste from being distributed over the general area. Use HEPA filtered vacuum cleaners. DO NOT BLOW DOWN THE SPACE WITH COMPRESSED AIR. When asbestos removal is complete, all asbestos waste is removed from the work-site, and final clean-up is completed, the Contracting Officer will attest that the area is safe before the signs can be removed. After final clean-up and acceptable airborne concentrations are attained but before the HEPA unit is turned off and the enclosure removed, remove all pre-filters on the building HVAC system and provide new pre-filters. Dispose of filters as asbestos contaminated materials. Reestablish HVAC mechanical, and electrical systems in proper working order. The Contracting Officer will visually inspect all surfaces within the enclosure for residual material or accumulated dust or debris. The Contractor shall re-clean all areas showing dust or residual materials. If re-cleaning is required, air sample and establish an acceptable asbestos airborne concentration after re-cleaning. The Contracting Officer must agree that the area is safe in writing before unrestricted entry will be permitted. The Government shall have the option to perform monitoring to determine if the areas are safe before entry is permitted.

3.3.2 Title to Materials

All waste materials, except as specified otherwise, shall become the property of the Contractor and shall be disposed of as specified in applicable local, State, and Federal regulations and herein.

3.3.3 Disposal of Asbestos

3.3.3.1 Procedure for Disposal

Collect asbestos waste, asbestos contaminated water, scrap, debris, bags, containers, equipment, and asbestos contaminated clothing which may produce airborne concentrations of asbestos fibers and place in sealed fiber-proof, waterproof, non-returnable containers (e.g. double plastic bags 6 mils thick, cartons, drums or cans). Wastes within the containers must be adequately wet in accordance with 40 CFR 61-SUBPART M. Affix a warning and Department of Transportation (DOT) label to each container including the bags or use at least 6 mils thick bags with the approved warnings and DOT labeling preprinted on the bag. The name of the waste generator and the location at which the waste was generated shall be clearly indicated on the outside of each container. Prevent contamination of the transport vehicle (especially if the transport vehicle is a rented truck likely to be used in the future for non-asbestos purposes). These precautions include lining the vehicle cargo area with plastic sheeting (similar to work area enclosure) and thorough cleaning of the cargo area after transport and unloading of asbestos debris is complete. Dispose of waste asbestos material at an Environmental Protection Agency (EPA) or State-approved asbestos landfill off Government property. For temporary storage, store sealed impermeable bags in asbestos waste drums or skids. An area for interim storage of asbestos waste-containing drums or skids will be assigned by the Contracting Officer or his authorized representative. Procedure for hauling and disposal shall comply with 40 CFR 61-SUBPART M, State, regional, and local standards. Sealed plastic bags may be dumped

from drums into the burial site unless the bags have been broken or damaged. Damaged bags shall remain in the drum and the entire contaminated drum shall be buried. Uncontaminated drums may be recycled. Workers unloading the sealed drums shall wear appropriate respirators and personal protective equipment when handling asbestos materials at the disposal site.

3.3.3.2 Asbestos Disposal Quantity Report

Direct the PQP to record and report, to the Contracting Officer, the amount of asbestos containing material removed by square footage and total quantity of bags/containers and released for disposal. Deliver the report for the previous day at the beginning of each day shift with amounts of material removed during the previous day reported in linear meters or square meters linear feet or square feet as described initially in this specification and in cubic meters feet for the amount of asbestos containing material released for disposal.

-- End of Section --

SECTION 02 83 13.00 20

LEAD IN CONSTRUCTION
04/06

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z88.2	(1992) Respiratory Protection

STATE OF VIRGINIA ADMINISTRATIVE CODE (VAC)

16 VAC 25-35	Title 16, Agency 25, Chapter 35: Regulation Concerning Certified Lead Contractor's Notification, Lead Project Permits And Permit Fees
18 VAC 15-30	Title 18, Agency 15, Chapter 30: Virginia Lead-Based Paint Activities Regulations

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

29 CFR 1926.134	Respiratory Protection
29 CFR 1926.21	Safety Training and Education
29 CFR 1926.33	Access to Employee Exposure and Medical Records
29 CFR 1926.55	Gases, Vapors, Fumes, Dusts, and Mists
29 CFR 1926.59	Hazard Communication
29 CFR 1926.62	Lead
29 CFR 1926.65	Hazardous Waste Operations and Emergency Response
29 CFR 1926.1126	Chromium
29 CFR 1926.1127	Cadmium
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 263	Standards Applicable to Transporters of

	Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 268	Land Disposal Restrictions
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR 178	Specifications for Packagings

UNDERWRITERS LABORATORIES (UL)

UL 586	(1996; Rev thru Aug 2004) Standard for High-Efficiency Particulate, Air Filter Units

1.2 DEFINITIONS

1.2.1 Action Level

Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter and chromium/cadmium of 2.5 micrograms per cubic meter of air averaged over an 8 hour period.

1.2.2 Area Sampling

Sampling of lead concentrations within the lead control area and inside the physical boundaries which is representative of the airborne lead, cadmium, and/or chromium concentrations but is not collected in the breathing zone of personnel (approximately 5 to 6 feet above the floor).

1.2.3 Competent Person (CP)

As used in this section, refers to a person employed by the Contractor who is trained in the recognition and control of lead and other airborne metal hazards in accordance with current federal, State, and local regulations and has the authority to take prompt corrective actions to control the lead or other airborne metal hazard. A Certified Industrial Hygienist (CIH) certified by the American Board of Industrial Hygiene or a Certified Safety Professional (CSP) certified by the Board of Certified Safety Professionals is the best choice.

1.2.4 Contaminated Area

Refers to a controled area for removal of contaminated personal protective equipment (PPE).

1.2.5 Decontamination Area

That location that encompasses a clean storage location, and a contaminated

materials storage area. A shower facility is not anticipated to be required based on presumptive control of contamination hazards. However, a Decontamination Wash Area/facility must be kept at the ready for personnel who come into contact with painted materials and potential contamination. This Decontamination area shall have a method to wash/rinse contaminated tools/materials, and allow for washing of personnel hands and face with uncontaminated water. Soap and towels will also be provided as proper lead hygiene dictates.

1.2.6 High Efficiency Particulate Arrestor (HEPA) Filter Equipment

HEPA filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining lead, cadmium, or chromium-contaminated particulate. A high efficiency particulate filter demonstrates at least 99.97 percent efficiency against 0.3 micron or larger size particles.

1.2.7 Lead

Metallic lead, inorganic lead compounds, and organic lead soaps. Excludes other forms of organic lead compounds.

1.2.8 Lead Control Area

A system of control methods to prevent the spread of lead dust, paint chips or debris to adjacent areas that may include temporary containment, floor or ground cover protection, physical boundaries, and warning signs to prevent unauthorized entry of personnel. HEPA filtered local exhaust equipment may be used as engineering controls to further reduce personnel exposures or building/outdoor environmental contamination.

1.2.9 Lead Permissible Exposure Limit (PEL)

Fifty micrograms per cubic meter of air as an 8 hour time weighted average as determined by 29 CFR 1926.62. If an employee is exposed for more than eight hours in a work day, the PEL shall be determined by the following formula:

PEL (micrograms/cubic meter of air) = 400/No. hrs worked per day

1.2.10 Material Containing Lead/Paint with Lead (MCL/PWL)

Any material, including paint, which contains lead as determined by the testing laboratory using a valid test method. The requirements of this section does not apply if no detectable levels of lead are found using a quantitative method for analyzing paint or MCL using laboratory instruments with specified limits of detection (usually 0.01% by weight or 0.01 miligrams per cubic centimeters via XRF).

1.2.11 Personal Sampling

Sampling of airborne lead, cadmium, and chromium concentrations within the breathing zone of an employee to determine the 8 hour time weighted average concentration in accordance with 29 CFR 1926.62, 29 CFR 1926.1126, and 29 CFR 1926.1127. Samples shall be representative of the employees' work tasks. Breathing zone shall be considered an area within a hemisphere, forward of the shoulders, with a radius of and centered at the nose or mouth of an employee.

1.2.12 Physical Boundary

Area physically roped or partitioned off around lead, cadmium, and chromium control area to limit unauthorized entry of personnel.

1.Resource Conservation and Recovery Act metals including cadmium and chromium (as identified with lead on painted components.1.3 REPORTS

A hazardous material inspection report prepared by AH Environmental is included after Section 02 82 16.00 20, ENGINEERING CONTROL OF ASBESTOS CONTAINING MATERIALS.

1.4 DESCRIPTION

1.4.1 Description of Work

Construction activities impacting PWL or material containing lead, cadmium, or chromium which are covered by this specification include the demolition and/or removal of material containing lead in good to poor condition, located on piping systems. For the purpose of this specification, painted materials (PWL) will also refer to and include RCRA metals Cadmium and Chromium.

1.4.2 Coordination with Other Work

The contractor shall coordinate with work being performed in adjacent areas. Coordination procedures shall be explained in the Plan and shall describe how the Contractor will prevent lead exposure to other contractors and/or Government personnel performing work unrelated to lead activities.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Occupational and Environmental Assessment Data Report (if objective data is used to justify excluding the initial occupational exposure assessment); G

Lead Compliance Plan including CP approval (signature, date, and certification number); G

Competent Person qualifications; G

Training Certification of workers and supervisors; G

lead waste management plan; G

written evidence that TSD is approved for lead disposal; G

Certification of Medical Examinations; G

SD-06 Test Reports

sampling results; G

Occupational and Environmental Assessment Data Report; G

SD-07 Certificates

Testing laboratory qualifications; G

Third party consultant qualifications; G

SD-11 Closeout Submittals

Completed and signed hazardous waste manifest from treatment or disposal facility; G

Waste turn-in documents or weight tickets for non-hazardous wastes that are disposed of at sanitary or construction and demolition landfills; G

1.6 QUALITY ASSURANCE

1.6.1 Qualifications

1.6.1.1 Competent Person (CP)

Submit name, address, and telephone number of the CP selected to perform responsibilities specified in paragraph entitled "Competent Person (CP) Responsibilities." Provide documented construction project-related experience with implementation of OSHA's Lead in Construction standard (29 CFR 1926.62) and 29 CFR 1926.1126 Chromium and 29 CFR 1926.1127 Cadmium which shows ability to assess occupational and environmental exposure to lead, cadmium, or chromium experience with the use of respirators, personal protective equipment and other exposure reduction methods to protect employee health. Submit proper documentation that the CP is trained and certified in accordance with federal, State (18 VAC 15-30) and local laws. The competent person shall be a licensed lead-based paint abatement Supervisor/Project Designer in the Commonwealth of Virginia.

1.6.1.2 Training Certification

Submit a certificate for each worker and supervisor, signed and dated by the accredited training provider, stating that the employee has received the required lead training specified in 29 CFR 1926.62, 29 CFR 1926.1126, and 29 CFR 1926.1127(l)and is certified to perform or supervise deleading, lead removal or demolition activities .

1.6.1.3 Testing Laboratory

Submit the name, address, and telephone number of the testing laboratory selected to perform the air analysis, testing, and reporting of airborne concentrations of lead. Use a laboratory participating in the EPA National Lead Laboratory Accreditation Program (NLLAP) by being accredited by either the American Association for Laboratory Accreditation (A2LA) or the American Industrial Hygiene Association (AIHA) and that is successfully participating in the Environmental Lead Proficiency Analytical Testing (ELPAT) program to perform sample analysis. Laboratories selected to perform blood lead analysis shall be OSHA approved.

1.6.1.4 Third Party Consultant Qualifications

Submit the name, address and telephone number of the third party consultant selected to perform the wipe sampling for determining concentrations of lead in dust. Submit proper documentation that the consultant is trained and certified as an inspector technician or inspector/risk assessor by the USEPA authorized State (or local) certification and accreditation program.

1.6.2 Requirements

1.6.2.1 Competent Person (CP) Responsibilities

a. Verify training meets all federal, State, and local requirements.

b. Review and approve Lead Compliance Plan for conformance to the applicable referenced standards.

c. Continuously inspect PWL or MCL work for conformance with the approved plan.

d. Perform (or oversee performance of) air sampling. Recommend upgrades or downgrades (whichever is appropriate based on exposure) on the use of PPE (respirators included) and engineering controls.

e. Ensure work is performed in strict accordance with specifications at all times.

f. Control work to prevent hazardous exposure to human beings and to the environment at all times.

g. Supervise final cleaning of the lead control area, take clearance wipe samples if necessary; review clearance sample results and make recommendations for further cleaning.

h. Certify the conditions of the work as called for elsewhere in this specification.

1.6.2.2 Lead Compliance Plan

Submit a detailed job-specific plan of the work procedures to be used in the disturbance of PWL or MCL and paints containing RCRA metals (cadmium and chromium). The plan shall include a sketch showing the location, size, and details of lead control areas, critical barriers, physical boundaries, location and details of decontamination facilities, viewing ports, and mechanical ventilation system. Include a description of equipment and materials, work practices, controls and job responsibilities for each activity from which lead, cadmium, or chromium may beemitted. Include in the plan, eating, drinking, smoking, hygiene facilities and sanitary procedures, interface of trades, sequencing of lead related work, collected waste water and dust containing lead, cadmium, chromium and debris, air sampling, respirators, personal protective equipment, and a detailed description of the method of containment of the operation to ensure that lead, cadmium, or chromium is not released outside of the control area. Include site preparation, cleanup and clearance procedures. Include occupational and environmental sampling, training and strategy, sampling and analysis strategy and methodology, frequency of sampling, duration of sampling, and qualifications of sampling personnel in the air sampling portion of the plan. Include a description of arrangements made among contractors on multicontractor worksites to inform affected employees and

to clarify responsibilities to control exposures.

The plan shall be developed by a certified planner/project designer in the Commonwealth of Virginia.

1.6.2.3 Occupational and Environmental Assessment Data Report

If initial monitoring is necessary, submit occupational and environmental sampling results to the Contracting Officer within three working days of collection, signed by the testing laboratory employee performing the analysis, the employee that performed the sampling, and the CP.

In order to reduce the full implementation of 29 CFR 1926.62, 29 CFR 1926.1126, and 29 CFR 1926.1127the Contractor shall provide documentation. Submit a report that supports the determination to reduce full implementation of the requirements of 29 CFR 1926.62, 29 CFR 1926.1126, and 29 CFR 1926.1127 and supporting the Lead Compliance Plan.

a. The initial monitoring shall represent each job classification, or if working conditions are similar to previous jobs by the same employer, provide previously collected exposure data that can be used to estimate worker exposures per 29 CFR 1926.62, 29 CFR 1926.1126, and 29 CFR 1926.1127. The data shall represent the worker's regular daily exposure to lead for stated work.

b. Submit worker exposure data gathered during the task based trigger operations of 29 CFR 1926.62, 29 CFR 1926.1126, and 29 CFR 1926.1127 with a complete process description. This includes manual demolition, manual scraping, manual sanding, heat gun, power tool cleaning, rivet busting, cleanup of dry expendable abrasives, abrasive blast enclosure removal, abrasive blasting, welding, cutting and torch burning where lead containing coatings are present.

c. The initial assessment shall determine the requirement for further monitoring and the need to fully implement the control and protective requirements including the lead compliance plan per 29 CFR 1926.62, 29 CFR 1926.1126, and 29 CFR 1926.1127.

1.6.2.4 Medical Examinations

Initial medical surveillance as required by 29 CFR 1926.62 shall be made available to all employees exposed to lead at any time (1 day) above the action level. Full medical surveillance shall be made available to all employees on an annual basis who are or may be exposed to lead in excess of the action level for more than 30 days a year or as required by 29 CFR 1926.62. Adequate records shall show that employees meet the medical surveillance requirements of 29 CFR 1926.33, 29 CFR 1926.62 , 29 CFR 1926.134 29 CFR 1926.1126, and 29 CFR 1926.1127. Provide medical surveillance to all personnel exposed to lead, cadmium, or chromium as indicated in 29 CFR 1926.62, 29 CFR 1926.1126, and 29 CFR 1926.1127. Maintain complete and accurate medical records of employees for the duration of employment plus 30 years.

1.6.2.5 Training

Train each employee performing work that disturbs lead, who performs MCL/PWL disposal, and air sampling operations prior to the time of initial job assignment and annually thereafter, in accordance with 29 CFR 1926.21,

29 CFR 1926.62, , 29 CFR 1926.1126, and 29 CFR 1926.1127and State (18 VAC 15-30) and local regulations where appropriate.

1.6.2.6 Respiratory Protection Program

a. Provide each employee required to wear a respirator a respirator fit test at the time of initial fitting and at least annually thereafter as required by 29 CFR 1926.62, 29 CFR 1926.1126, and 29 CFR 1926.1127.

b. Establish and implement a respiratory protection program as required by ANSI Z88.2, 29 CFR 1926.134, 29 CFR 1926.62, and 29 CFR 1926.55.

1.6.2.7 Hazard Communication Program

Establish and implement a Hazard Communication Program as required by 29 CFR 1926.59.

1.6.2.8 Lead Waste Management

The Lead Waste Management Plan shall comply with applicable requirements of federal, State, and local hazardous waste regulations. and address:

a. Identification and classification of wastes associated with the work.

b. Estimated quantities of wastes to be generated and disposed of.

c. Names and qualifications of each contractor that will be transporting, storing, treating, and disposing of the wastes. Include the facility location and a 24-hour point of contact. Furnish two copies of State (in accordance with 16 VAC 25-35) hazardous waste permits .

d. Names and qualifications (experience and training) of personnel who will be working on-site with hazardous wastes.

e. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.

f. Spill prevention, containment, and cleanup contingency measures including a health and safety plan to be implemented in accordance with 29 CFR 1926.65.

g. Work plan and schedule for waste containment, removal and disposal. Proper containment of the waste includes using acceptable waste containers (e.g., 55-gallon drums) as well as proper marking/labeling of the containers. Wastes shall be cleaned up and containerized daily.

h. Include any process that may alter or treat waste rendering a hazardous waste non hazardous.

i. Unit cost for hazardous waste disposal according to this plan.

1.6.2.9 Environmental, Safety and Health Compliance

In addition to the detailed requirements of this specification, comply with laws, ordinances, rules, and regulations of federal, State, and local authorities regarding lead. Comply with the applicable requirements of the current issue of 29 CFR 1926.62, 29 CFR 1926.1126, and 29 CFR 1926.1127. Submit matters regarding interpretation of standards to the Contracting

Officer for resolution before starting work. Where specification requirements and the referenced documents vary, the most stringent requirement shall apply.

1.6.3 Pre-Construction Conference

Along with the CP, meet with the Contracting Officer to discuss in detail the Lead Waste Management Plan and the Lead Compliance Plan, including procedures and precautions for the work.

1.7 EQUIPMENT

1.7.1 Respirators

Furnish appropriate respirators approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services, for use in atmospheres containing lead dust, fume and mist. Respirators shall comply with the requirements of 29 CFR 1926.62.

1.7.2 Special Protective Clothing

Furnish personnel who will be exposed to lead-contaminated dust with proper disposable protective whole body clothing, head covering, gloves, eye, and foot coverings as required by 29 CFR 1926.62, 29 CFR 1926.1126, and 29 CFR 1926.1127. Furnish proper disposable plastic or rubber gloves to protect hands. Reduce the level of protection only after obtaining approval from the CP.

1.7.3 Rental Equipment Notification

If rental equipment is to be used during PWL or MCL handling and disposal, notify the rental agency in writing concerning the intended use of the equipment.

1.7.4 Vacuum Filters

UL 586 labeled HEPA filters.

1.7.5 Equipment for Government Personnel

Furnish the Contracting Officer with two complete sets of personal protective equipment (PPE) daily, as required herein, for entry into and inspection of the lead removal work within the lead controlled area. Personal protective equipment shall include disposable whole body covering, including appropriate foot, head, eye, and hand protection. PPE shall remain the property of the Contractor. The Government will provide respiratory protection for the Contracting Officer.

1.8 PROJECT/SITE CONDITIONS

1.8.1 Protection of Existing Work to Remain

Perform work without damage or contamination of adjacent areas. Where existing work is damaged or contaminated, restore work to its original condition or better as determined by the Contracting Officer.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Protection

3.1.1.1 Notification

a. Notify the Contracting Officer 20 days prior to the start of any lead work.

3.1.1.2 Lead Control Area

a. Physical Boundary - Provide physical boundaries around the lead control area by roping off the area designated in the work plan or providing curtains, portable partitions or other enclosures to ensure that lead will not escape outside of the lead control area.

b. Warning Signs - Provide warning signs at approaches to lead control areas. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area. Signs shall comply with the requirements of 29 CFR 1926.62, 29 CFR 1926.1126, and 29 CFR 1926.1127.

3.1.1.3 Furnishings

Furniture and equipment will remain in the lead control area. Protect and cover furnishings or remove furnishings from the work area and store in a location approved by the Contracting Officer.

3.1.1.4 Heating, Ventilating and Air Conditioning (HVAC) Systems

Shut down, lock out, and isolate HVAC systems that supply, exhaust, or pass through the lead control areas. Seal intake and exhaust vents in the lead control area with 6 mil plastic sheet and tape. Seal seams in HVAC components that pass through the lead control area.

3.1.1.5 Decontamination Shower Facility

Provide clean and contaminated change rooms and shower facilities in accordance with this specification and 29 CFR 1926.62, 29 CFR 1926.1126, and 29 CFR 1926.1127.

3.1.1.6 Eye Wash Station

Where eyes may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes shall be provided within the work area.

3.1.1.7 Mechanical Ventilation System

a. To the extent feasible, use local exhaust ventilation or other collection systems, approved by the CP. Local exhaust ventilation

systems shall be evaluated and maintained in accordance with 29 CFR 1926.62, 29 CFR 1926.1126, and 29 CFR 1926.1127.

b. Vent local exhaust outside the building and away from building ventilation intakes or ensure system is connected to HEPA filters.

c. Use locally exhausted, power actuated tools or manual hand tools.

3.1.1.8 Personnel Protection

Personnel shall wear and use protective clothing and equipment as specified herein. Eating, smoking, or drinking or application of cosmetics is not permitted in the lead control area. No one will be permitted in the lead control area unless they have been appropriately trained and provided with protective equipment.

3.2 ERECTION

3.2.1 Lead Control Area Requirements

Establish a lead control area by completely establishing barriers and physical boundaries around the area or structure where PWL or MCL removal operations will be performed.

3.3 APPLICATION

3.3.1 Lead Work

Perform lead, cadmium, and chromium work in accordance with approved Lead Compliance Plan. Use procedures and equipment required to limit occupational exposure and environmental contamination with lead, cadmium, and chromium when the work is performed in accordance with 29 CFR 1926.62, 29 CFR 1926.1126, and 29 CFR 1926.1127 , and as specified herein. Dispose of all associated waste in compliance with federal, State, and local requirements.

3.3.2 Paint with Lead or Material Containing Lead Removal

Manual or power sanding or grinding of lead surfaces or materials is not permitted unless tools are equipped with HEPA attachments or wet methods. The dry sanding or grinding of surfaces that contain lead is prohibited. Provide methodology for removing lead in the Lead Compliance Plan. Select lead removal processes to minimize contamination of work areas outside the control area with lead-contaminated dust or other lead-contaminated debris or waste and to ensure that unprotected personnel are not exposed to hazardous concentrations of lead. Describe this removal process in the Lead Compliance Plan. Torch cutting of metals with lead, cadmium, or chromium coatings produces toxic levels of metal vapors and should only be conducted by personnel using the proper level of PPE and stringently controled work methods. Personnel exposure monitoring is required until a Goverment approved negative exposure assessment has been completed.

3.3.2.1 Paint with Lead or Material Containing Lead - Indoor Removal

Perform removal and thermal cutting in the lead/cadmium/chromium control areas using enclosures, barriers or containments and powered HEPA vacuum attached tools. Collect residue , wastes, and debris for disposal in accordance with federal, State, and local requirements.

3.3.2.2 Paint with Lead or Material Containing Lead - Outdoor Removal

Perform outdoor removal as indicated in federal, State, and local regulations and in the Lead Compliance Plan. The worksite preparation (barriers or containments) shall be job dependent and presented in the Lead Compliance Plan.

3.3.3 Personnel Exiting Procedures

Whenever personnel exit the lead-controlled area, they shall perform the following procedures and shall not leave the work place wearing any clothing or equipment worn in the control area:

a. Vacuum all clothing before entering the contaminated change room.

b. Remove protective clothing in the contaminated change room, and place them in an approved impermeable disposal bag.

c. Wash hands and face at the site, don appropriate disposable or uncontaminated reusable clothing, move to an appropriate decontamination zone and wash hands and face thoroughly..

d. Change to clean clothes prior to leaving the clean clothes storage area.

3.4 FIELD QUALITY CONTROL

3.4.1 Tests

3.4.1.1 Air and Wipe Sampling

Conduct sampling for lead, cadmium, and chromium in accordance with 29 CFR 1926.62, 29 CFR 1926.1126, and 29 CFR 1926.1127 and as specified herein. Air and wipe sampling shall be directed or performed by the CP.

a. The CP shall be on the job site directing the air and wipe sampling and inspecting the PWL or MCL removal work to ensure that the requirements of the contract have been satisfied during the entire PWL or MCL operation.

b. Collect personal air samples on employees who are anticipated to have the greatest risk of exposure as determined by the CP. In addition, collect air samples on at least twenty-five percent of the work crew or a minimum of two employees, whichever is greater, during each work shift.

c. Submit results of air samples, signed by the CP, within 48 hours after the air samples are taken.

d. Conduct area air sampling daily, on each shift in which lead-based or cadmium/chromium paint removal operations are performed, in areas immediately adjacent to the control area. Sufficient area monitoring shall be conducted to ensure unprotected personnel are not exposed at or above 30 micrograms per cubic meter of air for lead, or 2.5 micrograms per cubic meter of air for cadmium and chromium. If 30 micrograms per cubic meter of air lead, or 2.5 micrograms per cubic meter of air cadmium and chromium is reached or exceeded, stop work, correct the conditions(s) causing the increased levels. Notify the

Contracting Officer immediately. Determine if condition(s) require any further change in work methods. Removal work shall resume only after the CP and the Contracting Officer give approval.

3.4.1.2 Sampling After Removal

After the visual inspection, conduct soil sampling if bare soil is present during external removal operations and collect soil samples to determine the lead content of settled dust in micrograms per square meter foot of surface area and parts per million (ppm) or for soil.

3.4.1.3 Testing of Material Containing Lead Residue

Test residue and resulting wastesin accordance with 40 CFR 261 for hazardous waste.

3.5 CLEANING AND DISPOSAL

3.5.1 Cleanup

Maintain surfaces of the lead control area free of accumulations of dust and debris. Restrict the spread of dust and debris; keep waste from being distributed over the work area. Do not dry sweep or use pressurized air to clean up the area. At the end of each shift and when the lead operation has been completed, clean the controlled area of visible contamination by vacuuming with a HEPA filtered vacuum cleaner, wet mopping the area and wet wiping the area as indicated by the Lead Compliance Plan. Reclean areas showing dust or debris. After visible dust and debris is removed, wet wipe and HEPA vacuum all surfaces in the controlled area. If adjacent areas become contaminated at any time during the work, clean, visually inspect, and then wipe sample all contaminated areas. The CP shall then certify in writing that the area has been cleaned of lead contamination before clearance testing.

3.5.1.1 Clearance Certification

The CP shall certify in writing that air samples collected outside the lead control area during paint removal operations are less than 30 micrograms per cubic meter of air; the respiratory protection used for the employees was adequate; the work procedures were performed in accordance with 29 CFR 1926.62, 29 CFR 1926.1126, and 29 CFR 1926.1127; and that there were no visible accumulations of material and dust containing lead, cadmium, or chromium left in the work site. Do not remove the control area or roped off boundary and warning signs prior to the Contracting Officer's acknowledgement of receipt of the CP certification.

For exterior work, soil samples taken at the exterior of the work site shall be used to determine if soil lead levels had increased at a statistically significant level (significant at the 95 percent confidence limit) from the soil lead levels prior to the operation. If soil lead levels either show a statistically significant increase above soil lead levels prior to work or soil lead levels above any applicable federal or state standard for lead or RCRA metals in soil, the soil shall be remediated.

3.5.2 Disposal

a. All material, whether hazardous or non-hazardous shall be disposed in accordance with all laws and provisions and all federal, State or local regulations. Ensure all waste is properly characterized. The result of each waste characterization (TCLP for RCRA materials) will dictate disposal requirements.

b. Contractor is responsible for segregation of waste. Collect lead or RCRA metals-contaminated waste, scrap, debris, bags, containers, equipment, and lead or RCRA metals-contaminated clothing that may produce airborne concentrations of lead, cadmium, or chromium particles. Label the containers in accordance with 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127 and 40 CFR 261.

c. Dispose of lead, cadmium, or chromium-contaminated material classified as hazardous waste at an State approved hazardous waste treatment, storage, or disposal facility off Government property.

d. Store waste materials in U.S. Department of Transportation (49 CFR 178) approved 55 gallon drums. Properly label each drum to identify the type of waste (49 CFR 172) and the date the drum was filled. For hazardous waste, the collection drum requires marking/labeling in accordance with 40 CFR 262 during the accumulation/collection timeframe. The Contracting Officer or an authorized representative will assign an area for interim storage of waste-containing drums. Do not store hazardous waste drums in interim storage longer than 90 calendar days from the date affixed to each drum.

e. Handle, store, transport, and dispose lead or lead-contaminated waste in accordance with 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, and 40 CFR 265. Comply with land disposal restriction notification requirements as required by 40 CFR 268.

3.5.2.1 Disposal Documentation

Submit written evidence to demonstrate the hazardous waste treatment, storage, or disposal facility (TSD) is approved for lead disposal by the EPA, State or local regulatory agencies. Submit one copy of the completed hazardous waste manifest, signed and dated by the initial transporter in accordance with 40 CFR 262. Contractor shall provide a certificate that the waste was accepted by the disposal facility. Provide turn-in documents or weight tickets for non-hazardous waste disposal.

3.5.2.2 Payment for Hazardous Waste

Payment for disposal of hazardous and non-hazardous waste will not be made until a signed copy of the manifest from the treatment or disposal facility certifying the amount of lead-containing materials or non-hazardous waste delivered is returned and a copy is furnished to the Government.

-- End of Section --

SECTION 03 30 00

CAST-IN-PLACE CONCRETE
01/08

PART 1 GENERAL

1.1 REFERENCES

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

ACI INTERNATIONAL (ACI)

ACI/MCP-1	(2009) Manual of Concrete Practice Part 1: ACI 104-71R-97 to 223-98
ACI/MCP-2	(2009) Manual of Concrete Practice Part 2 - ACI 224R-01 to ACI 313R-97
ACI/MCP-3	(2009) Manual of Concrete Practice Part 3 - ACI 315-99 to ACI 343R-95
ACI/MCP-4	(2009) Manual of Concrete Practice Part 4 - ACI 345R-05 to 355.2R-04

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 182	(2005) Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats
AASHTO M 322M/M 322	(2007) Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4	(2004) Basic Hardboard

AMERICAN WELDING SOCIETY (AWS)

AWS D1.4/D1.4M	(2005; Errata 2005) Structural Welding Code - Reinforcing Steel

ASTM INTERNATIONAL (ASTM)

ASTM A 496/A 496M	(2007) Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement
ASTM A 53/A 53M	(2007) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 615/A 615M	(2009) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete

	Reinforcement
ASTM A 82/A 82M	(2007) Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
ASTM C 1017/C 1017M	(2007) Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C 1107/C 1107M	(2008) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C 1260	(2007) Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C 143/C 143M	(2008) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C 150	(2007) Standard Specification for Portland Cement
ASTM C 156	(2005) Standard Test Method for Water Retention by Concrete Curing Materials
ASTM C 171	(2007) Standard Specification for Sheet Materials for Curing Concrete
ASTM C 172	(2008) Standard Practice for Sampling Freshly Mixed Concrete
ASTM C 173/C 173M	(2009) Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C 192/C 192M	(2007) Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 231	(2009) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 233	(2007) Standard Test Method for Air-Entraining Admixtures for Concrete
ASTM C 260	(2006) Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C 295	(2008) Petrographic Examination of Aggregates for Concrete
ASTM C 309	(2007) Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 31/C 31M	(2009) Standard Practice for Making and Curing Concrete Test Specimens in the Field

ASTM C 311	(2007) Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland-Cement Concrete
ASTM C 33/C 33M	(2008) Standard Specification for Concrete Aggregates
ASTM C 39/C 39M	(2005e1e2) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C 42/C 42M	(2004) Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C 494/C 494M	(2008a) Standard Specification for Chemical Admixtures for Concrete
ASTM C 595	(2008a) Standard Specification for Blended Hydraulic Cements
ASTM C 618	(2008a) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C 881/C 881M	(2002) Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C 920	(2008) Standard Specification for Elastomeric Joint Sealants
ASTM C 932	(2006) Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering
ASTM C 94/C 94M	(2009) Standard Specification for Ready-Mixed Concrete
ASTM C 989	(2009) Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
ASTM D 1190	(1997) Standard Specification for Concrete Joint Sealer, Hot-Applied Elastic Type
ASTM D 1557	(2007) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
ASTM D 1752	(2004a; R 2008) Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion
ASTM D 2103	(2008) Standard Specification for Polyethylene Film and Sheeting
ASTM D 4397	(2009) Standard Specification for

	Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
ASTM D 5759	(1995; R 2005) Characterization of Coal Fly Ash and Clean Coal Combustion Fly Ash for Potential Uses
ASTM D 7116	(2005) Standard Specification for Joint Sealants, Hot Applied, Jet Fuel Resistant Types, for Portland Cement Concrete
ASTM E 329	(2008) Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
ASTM E 648	(2009a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

CRSI 10MSP	(2001; 27Ed) Manual of Standard Practice

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST PS 1	(2007) Construction and Industrial Plywood

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 572	(1974) Specifications for Polyvinylchloride Waterstops

U.S. DEPARTMENT OF COMMERCE (DOC)

PS1	(1995) Construction and Industrial Plywood (APA V995)

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS MMM-A-001993	(1978) Adhesive, Epoxy, Flexible, Filled (For Binding, Sealing, and Grouting)
FS SS-S-1614	(Rev A; Am 1) Sealants, Joint,Jet-Fuel-Resistant, Hot-Applied, for Portland Cement and Tar Concrete Pavements
FS UU-B-790	(Rev A) Building Paper, Vegetable Fiber: (Kraft, Waterproofed, Water Repellent and Fire Resistant)

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED	(2002; R 2005) Leadership in Energy and Environmental Design(tm) Green Building Rating System for New Construction (LEED-NC)

1.2 DEFINITIONS

a. "Cementitious material" as used herein must include all portland cement, pozzolan, fly ash, ground granulated blast-furnace slag, and silica fume.

b. "Exposed to public view" means situated so that it can be seen from eye level from a public location after completion of the building. A public location is accessible to persons not responsible for operation or maintenance of the building.

c. "Chemical admixtures" are materials in the form of powder or fluids that are added to the concrete to give it certain characteristics not obtainable with plain concrete mixes.

d. "Workability (or consistence)" is the ability of a fresh (plastic) concrete mix to fill the form/mould properly with the desired work (vibration) and without reducing the concrete's quality. Workability depends on water content, chemical admixtures, aggregate (shape and size distribution), cementitious content and age (level of hydration).

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fabrication Drawings for concrete formwork must be submitted by the Contractor in accordance with paragraph entitled, "Shop Drawings," of this section, to include the following:

Reinforcing steel; G

Reproductions of contract drawings are unacceptable.

SD-03 Product Data

Materials for curing concrete
Joint sealants
Joint filler
Cement; (LEED)Portland Cement
Ready-Mix Concrete
Water-Vapor Barrier Subgrade Cover
Bonding Materials
Floor Finish MaterialsConcrete Curing MaterialsReinforcement
Reinforcement Materials
Vapor barrieral Floor Hardener
Wood Formsing compound

SD-05 Design Data

Concrete mix design; G

Thirty days minimum prior to concrete placement, submit a mix design for each strength and type of concrete. Submit a complete list of materials including type; brand; source and amount of cement, fly ash, pozzolans, and admixtures; and applicable reference specifications. Provide mix proportion data using at least three different water-cement ratios for each type of mixture, which produce a range of strength encompassing those required for each class and type of concrete required. If source material changes, resubmit mix proportion data using revised source material. Provide only materials that have been proven by trial mix studies to meet the requirements of this specification, unless otherwise approved in writing by the Contracting Officer. Indicate clearly in the submittal where each mix design is used when more than one mix design is submitted. Submit additional data regarding concrete aggregates if the source of aggregate changes. Submit copies of the fly ash, and pozzolan test results, in addition. The approval of fly ash, and pozzolan test results must be within 6 months of submittal date. Obtain acknowledgement of receipt prior to concrete placement.

SD-06 Test Reports

Concrete mix design; G

Fly ash

Pozzolan

Aggregates

Compressive strength tests

Air Content

Slump

Air Entrainment

SD-08 Manufacturer's Instructions

Fly ash

Submit mill certificates for Steel Bar according to the paragraph entitled, "Fabrication," of this section.

Provide certificates for concrete that are in accordance with the paragraph entitled, "Classification and Quality of Concrete," of this section. Provide certificates that contain project name and number, date, name of Contractor, name of concrete testing service, source of concrete aggregates, material manufacturer, brand name of manufactured materials, material name, values as specified for each material, and test results.

SD-11 Closeout Submittals

1.4 MODIFICATION OF REFERENCES

Accomplish work in accordance with ACI publications except as modified

herein. Consider the advisory or recommended provisions to be mandatory. Interpret reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" to mean the Contracting Officer.

1.5 DELIVERY, STORAGE, AND HANDLING

Do not deliver concrete until vapor barrier, forms, reinforcement, embedded items, and chamfer strips are in place and ready for concrete placement. ACI/MCP-2 for job site storage of materials. Protect materials from contaminants such as grease, oil, and dirt. Ensure materials can be accurately identified after bundles are broken and tags removed. Do not store concrete curing compounds or sealers with materials that have a high capacity to adsorb volatile organic compound (VOC) emissions. Do not store concrete curing compounds or sealers in occupied spaces.

1.5.1 Reinforcement

Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground. Protect from contaminants such as grease, oil, and dirt. Ensure bar sizes can be accurately identified after bundles are broken and tags removed.

1.6 QUALITY ASSURANCE

1.6.1 Design Data

1.6.2 Drawings

1.6.2.1 Shop Drawings

Fabrication Drawings for Reinforcement Materials along with material types. Provide all design calculations in accordance with ACI/MCP-2 and ACI/MCP-3.

1.6.2.2 Reinforcing Steel

ACI/MCP-4. Indicate bending diagrams, assembly diagrams, splicing and laps of bars, shapes, dimensions, and details of bar reinforcing, accessories, and concrete cover. Do not scale dimensions from structural drawings to determine lengths of reinforcing bars.

1.6.3 Control Submittals

1.6.3.1 Curing Concrete Elements

Submit proposed materials and methods for curing concrete elements.

1.6.3.2 Form Removal Schedule

Submit schedule for form removal indicating element and minimum length of time for form removal.

1.6.3.3 Material Safety Data Sheets

Submit Material Safety Data Sheets (MSDS) for all materials that are regulated for hazardous health effects. Prominently post the MSDS at the construction site.

1.6.4 Test Reports

1.6.4.1 Concrete Mix Design

Submit copies of laboratory test reports showing that the mix has been successfully tested to produce concrete with the properties specified and that mix must be suitable for the job conditions. Include mill test and all other test for cement, aggregates, and admixtures in the laboratory test reports. Provide maximum nominal aggregate size, gradation analysis, percentage retained and passing sieve, and a graph of percentage retained verses sieve size. Submit test reports along with the concrete mix design. Obtain approval before concrete placement.

1.6.4.2 Fly Ash and Pozzolan

Submit test results in accordance with ASTM C 618 for fly ash and pozzolan. Submit test results performed within 6 months of submittal date. Submit manufacturer's policy statement on fly ash use in concrete.

1.6.4.3 Aggregates

ASTM C 1260 for potential alkali-silica reactions, ASTM C 295 for petrographic analysis.

1.6.5 Field Samples

1.7 QUALIFICATIONS FOR CONCRETE TESTING SERVICE

Perform concrete testing by an approved laboratory and inspection service experienced in sampling and testing concrete. Testing agency must meet the requirements of ASTM E 329.

1.8 CONCRETE SAMPLING AND TESTING

Testing by the Contractor must include sampling and testing concrete materials proposed for use in the work and testing the design mix for each class of concrete. Perform quality control testing during construction.

Sample and test concrete aggregate materials proposed for use in the work in accordance with ASTM C 33/C 33M.

Sample and test portland cement in accordance with ASTM C 150.

Sample and test air-entraining admixtures in accordance with ASTM C 233.

Testing must be performed by a Grade I Testing Technician.

PART 2 PRODUCTS

2.1 MATERIALS FOR FORMS

Provide wood, plywood, or steel.

2.1.1 Wood Forms

Provide lumber that is square edged or tongue-and-groove boards, free of raised grain, knotholes, or other surface defects. Provide plywood that complies with PS1, B-B concrete form panels or better or AHA A135.4, hardboard for smooth form lining.

2.1.1.1 Concrete Form Plywood (Standard Rough)

Provide plywood that conforms to NIST PS 1, B-B, concrete form, not less than 5/8-inch thick.

2.1.1.2 Overlaid Concrete Form Plywood (Standard Smooth)

Provide plywood that conforms to NIST PS 1, B-B, high density form overlay, not less than 5/8-inch thick.

2.1.2 Steel Forms

Provide steel form surfaces that do not contain irregularities, dents, or sags.

2.2 FORM TIES AND ACCESSORIES

The use of wire alone is prohibited. Provide form ties and accessories that do not reduce the effective cover of the reinforcement.

2.2.1 Polyvinylchloride Waterstops

COE CRD-C 572.

2.2.2 Dovetail Anchor Slot

Preformed metal slot approximately 1 by 1 inch of not less than 22 gage galvanized steel cast in concrete. Coordinate actual size and throat opening with dovetail anchors and provide with removable filler material.

2.3 CONCRETE

2.3.1 Contractor-Furnished Mix Design

ACI/MCP-1, ACI/MCP-2, and ACI/MCP-3 except as otherwise specified.

Location	f'c (Min. 28-Day Comp. Strength) (psi)	ASTM C 33/C 33M Maximum Nominal Aggregate (Size No.)	Range of Slump (inches)	[Maximum Water-Cement Ratio] (by weight)	[Air Entr.] (percent)
[All areas]	[_____]	[_____]	[_____]	[_____]	[_____]
[Concrete exposed to weather	[4000]	[57]	[_____]	[0.50]	[6]
Floor slabs	[_____]	[See Combined Aggregate Gradation]	[_____]	[_____]	[_(a)_]
All other areas	[_____]	[_____]	[_____]	[_____]	[_____]]

Maximum slump shown above may be increased 1 inchfor methods of consolidation other than vibration. Slump may be increased to 8 incheswhen superplasticizers are used.

Proportion concrete mixes for strength at 60 days.

2.3.1.1 Mix Proportions for Normal Weight Concrete

Trial design batches, mixture proportioning studies, and testing requirements for various classes and types of concrete specified are the responsibility of the Contractor. Base mixture proportions on compressive strength as determined by test specimens fabricated in accordance with ASTM C 192/C 192M and tested in accordance with ASTM C 39/C 39M. Samples of all materials used in mixture proportioning studies must be representative of those proposed for use in the project and must be accompanied by the manufacturer's or producer's test report indicating compliance with these specifications. Base trial mixtures having proportions, consistencies, and suitable for the work on methodology described in ACI/MCP-1. In the trial mixture, use at least three different water-cement ratios for each type of mixture, which must produce a range of strength encompassing those required for each class and type of concrete required on the project. The maximum water-cement ratio required must be based on equivalent water-cement ratio calculations as determined by the conversion from the weight ratio of water to cement plus pozzolan, and ground granulated blast-furnace slag by weight equivalency method. Design laboratory trial mixture for maximum permitted slump and air content. Each combination of material proposed for use must have separate trial mixture, except for accelerator or retarder use can be provided without separate trial mixture. Report the temperature of concrete in each trial batch. For each water-cement ratio, at least three test cylinders for each test age must be made and cured in accordance with ASTM C 192/C 192M and tested in accordance with ASTM C 39/C 39M for 7 and 28 days. From these results, plot a curve showing the relationship between water-cement ratio and strength for each set of trial mix studies. In addition, plot a curve showing the relationship between 7 and 28 day strengths.

2.3.1.2 Required Average Strength of Mix Design

The selected mixture must produce an average compressive strength exceeding the specified strength by the amount indicated in ACI/MCP-2. When a concrete production facility has a record of at least 15 consecutive tests, the standard deviation must be calculated and the required average compressive strength must be determined in accordance with ACI/MCP-2. When a concrete production facility does not have a suitable record of tests to establish a standard deviation, the required average strength must follow ACI/MCP-2 requirements.

2.3.2 Ready-Mix Concrete

Provide concrete that meets the requirements of ASTM C 94/C 94M.

Ready-mixed concrete manufacturer must provide duplicate delivery tickets with each load of concrete delivered. Provide delivery tickets with the following information in addition to that required by ASTM C 94/C 94M:

Type and brand cement

Cement content in 95-pound bags per cubic yard of concrete

Maximum size of aggregate

Amount and brand name of admixtures

Total water content expressed by water/cement ratio

2.3.3 Concrete Curing Materials

2.3.3.1 Absorptive Cover

Provide burlap cloth cover for curing concrete made from jute or kenaf, weighing 10 ounces plus or minus [5] percent per square yard when clean and dry, conforming to ASTM C 171, Class 3; or cover may be cotton mats as approved.

2.3.3.2 Moisture-Retaining Cover

Provide waterproof paper cover for curing concrete conforming to ASTM C 171, regular or white, or polyethylene sheeting conforming to ASTM C 171, or polyethylene-coated burlap consisting of a laminate of burlap and a white opaque polyethylene film permanently bonded to the burlap; burlap must conform to ASTM C 171, Class 3, and polyethylene film must conform to ASTM C 171. When tested for water retention in accordance with ASTM C 156, weight of water lost 72 hours after application of moisture retaining covering material must not exceed 0.039 gram per square centimeter of the mortar specimen surface.

2.3.3.3 Membrane-Forming Curing Compound

Provide liquid type compound conforming to ASTM C 309, Type 1, clear, Type 1D with fugitive dye for interior work and Type 2, white, pigmented for exterior work.

2.4 MATERIALS

2.4.1 Cement

ASTM C 150, Type I or II or ASTM C 595, Type IP(MS) or IS(MS) blended cement except as modified herein. Provide blended cement that consists of a mixture of ASTM C 150, Type II, cement and one of the following materials: ASTM C 618 pozzolan or fly ash, ASTM C 989 ground granulated blast-furnace slag. For portland cement manufactured in a kiln fueled by hazardous waste, maintain a record of source for each batch. For exposed concrete, use one manufacturer for each type of cement, ground slag, fly ash, and pozzolan.

2.4.1.1 Fly Ash and Pozzolan

ASTM C 618, Type N, F, or C, except that the maximum allowable loss on ignition must be 6 percent for Types N and F. Add with cement. Fly ash content must be a minimum of 15 percent by weight of cementitious material, provided the fly ash does not reduce the amount of cement in the concrete mix below the minimum requirements of local building codes. Where the use of fly ash cannot meet the minimum level, provide the maximum amount of fly ash permittable that meets the code requirements for cement content. Report the chemical analysis of the fly ash in accordance with ASTM C 311. Evaluate and classify fly ash in accordance with ASTM D 5759.

High contents of supplementary cementitious materials can have some detrimental effects on the concrete properties, such as slowing excessively the strength gain rate, and delaying and increasing the difficulty of finishing. The recommended maximum content (by weight of the total cementitious material) for these materials are:

1. For fly ash or natural pozzolan: 40 percent (25 percent in cold climates)

2.4.1.2 Portland Cement

Provide cement that conforms to ASTM C 150, Type I, IA, II, or IIA. Use one brand and type of cement for formed concrete having exposed-to-view finished surfaces.

2.4.2 Water

Minimize the amount of water in the mix. The amount of water must not exceed 45 percent by weight of cementitious materials (cement + pozzolans), and in general, improve workability by adjusting the grading rather than by adding water. Water must be fresh and clean; free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances deleterious to concrete.

2.4.3 Aggregates

ASTM C 33/C 33M, except as modified herein. Furnish aggregates for exposed concrete surfaces from one source. Provide aggregates that do not contain any substance which may be deleteriously reactive with the alkalies in the cement.

2.4.4 Nonshrink Grout

ASTM C 1107/C 1107M.

2.4.5 Admixtures

ASTM C 494/C 494M: Type A, water reducing; Type B, retarding; Type C, accelerating; Type D, water-reducing and retarding; and Type E, water-reducing and accelerating admixture. Do not use calcium chloride admixtures.

2.4.5.1 High Range Water Reducer (HRWR) (Superplasticizers)

ASTM C 494/C 494M and ASTM C 1017/C 1017M.

2.4.5.2 Pozzolan

Provide fly ash or other pozzolans used as admixtures that conform to ASTM C 618.

2.4.6 Vapor Barrier

ASTM D 4397 polyethylene sheeting, minimum [6] [10] mil thickness.

2.4.6.1 Water-Vapor Barrier Subgrade Cover

Provide cover that is water-resistant barrier paper, uncreped and reinforced, conforming to FS UU-B-790, Type I, Grade B, Style 4; or clear polyethylene sheeting, 6-mil, conforming to ASTM D 2103 and ASTM D 4397

2.4.7 Materials for Curing Concrete

Consider the use of water based or vegetable or soy based curing agents in

lieu of petroleum based products. Consider agents that are not toxic and emit low or no Volatile Organic Compounds (VOC). Consider the use of admixtures that offer high performance to increase durability of the finish product but also have low toxicity and are made from bio-based materials such as soy, and emit low levels of Volatile Organic Compounds (VOC).

2.4.7.1 Impervious Sheeting

ASTM C 171; waterproof paper, clear or white polyethylene sheeting, or polyethylene-coated burlap.

2.4.7.2 Pervious Sheeting

AASHTO M 182.

2.4.7.3 Liquid Membrane-Forming Compound

ASTM C 309, white-pigmented, Type 2, Class B.

2.4.8 Liquid Chemical Sealer-Hardener Compound

Provide magnesium fluorosilicate compound which when mixed with water seals and hardens the surface of the concrete. Do not use on exterior slabs exposed to freezing conditions. Provide compound that does not reduce the adhesion of resilient flooring, tile, paint, roofing, waterproofing, or other material applied to concrete.

2.4.9 Expansion/Contraction Joint Filler

2.4.9.1 Preformed Joint Filler Strips

Povide nonextruding and fuel resilient nonbituminous type filler strips conforming to ASTM D 1752, Type I or II.

2.4.10 Joint Sealants

2.4.10.1 Horizontal Surfaces, 3 Percent Slope, Maximum

ASTM D 1190 or ASTM C 920, Type M, Class 25, Use T. ASTM D 7116 for surfaces subjected to jet fuel.

2.4.10.2 Vertical Surfaces Greater Than 3 Percent Slope

ASTM C 920, Type M, Grade NS, Class 25, Use T. FS SS-S-1614.

2.4.10.3 Joint Sealant Compound

Provide hot-poured, elastic type compound conforming to ASTM D 1190.

2.4.11 Epoxy Bonding Compound

ASTM C 881/C 881M. Provide Type I for bonding hardened concrete to hardened concrete; Type II for bonding freshly mixed concrete to hardened concrete; and Type III as a binder in epoxy mortar or concrete, or for use in bonding skid-resistant materials to hardened concrete. Provide Grade 1 or 2 for horizontal surfaces and Grade 3 for vertical surfaces. Provide Class A if placement temperature is below 40 degrees F; Class B if placement temperature is between 40 and 60 degrees F; or Class C if placement temperature is above 60 degrees F.

2.5 REINFORCEMENT

2.5.1 Reinforcing Bars

ACI/MCP-2 unless otherwise specified. ASTM A 615/A 615M and AASHTO M 322M/M 322 with the bars marked A, S, W, Grade [40][60][75].

2.5.2 Mechanical Reinforcing Bar Connectors

ACI/MCP-2. Provide 125 percent minimum yield strength of the reinforcement bar.

2.5.3 Wire

ASTM A 82/A 82M or ASTM A 496/A 496M.

2.5.3.1 Steel Wire

Wire must conform to ASTM A 82/A 82M.

2.5.4 Reinforcing Bar Supports

Provide bar ties and supports of coated or non corrodible material.

2.5.5 Dowels for Load Transfer in Floors

Provide dowels for load transfer in floors of the type, design, weight, and dimensions indicated. Provide dowel bars that are plain-billet steel conforming to ASTM A 615/A 615M, Grade 40. Provide dowel pipe that is steel conforming to ASTM A 53/A 53M.

2.5.6 Supports for Reinforcement

Supports include bolsters, chairs, spacers, and other devices necessary for proper spacing, supporting, and fastening reinforcing bars and wire fabric in place.

Provide wire bar type supports conforming to ACI/MCP-3 and CRSI 10MSP.

Legs of supports in contact with formwork must be hot-dip galvanized, or plastic coated after fabrication, or stainless-steel bar supports.

2.6 BONDING MATERIALS

2.6.1 Concrete Bonding Agent

Provide aqueous-phase, film-forming, nonoxidizing, freeze and thaw-resistant compound agent suitable for brush or spray application conforming to ASTM C 932.

2.6.2 Epoxy-Resin Adhesive Binder

Provide two-component, epoxy-polysulfide polymer type binder with an amine-type curing-agent conforming to FS MMM-A-001993, Type I or ASTM C 881/C 881M.

2.7 Floor Finish Materials

2.7.1 Liquid Chemical Floor Hardener

Hardener must be a colorless aqueous solution containing a blend of magnesium fluorosilicate and zinc fluorosilicate combined with a wetting agent. Solution must contain not less than 1/2 pounds of fluorosilicates per gallon. An approved proprietary chemical hardener may be used provided hardener is delivered ready for use in manufacturer's original containers.

2.7.2 Abrasive Aggregate for Nonslip Aggregate Finish

Aggregate must be packaged, factory-graded fused aluminum oxide grits, or it may be crushed emery containing not less than 40-percent aluminum oxide and not less than 25-percent ferric oxide. Aggregate must be rust proof and nonglazing and must be unaffected by freezing, moisture, and cleaning materials.

Aggregate must be packaged, factory-graded, silicon carbide grits. Aggregate must be rust proof and must be unaffected by freezing, moisture, and cleaning materials.

Aggregate must be well-graded in size from particles retained on No. 30 sieve (0.0236 inch) to particles passing No. 8 sieve (0.0929 inch).

2.7.3 Dry Materials for Colored Wear-Resistant Finish

Provide materials that are packaged, dry, and a combination of materials formulated for producing colored and wear-resistant monolithic surface treatments; they must include portland cement, graded-quartz aggregate, coloring pigments, and dispersing agents. Provide coloring pigments that are finely ground, nonfacing mineral oxides prepared especially for the purpose and interground with the cement.

2.7.4 Aggregate for Heavy-Duty Wear-Resistant Finish

Provide aggregate that is traprock or emery, as follows:

Traprock must be packaged, crushed, natural, fine-to-medium-grained, igneous rock, such as diabase, basalt, or black granite. Traprock aggregate must be well-graded in size from particles retained on No. 4 sieve (0.187 inch) to particles passing 3/8-inch sieve.

Emery must be packaged, factory-graded, crushed, natural-emery ore, cubical or polyhedral in form, containing not less than 35-percent aluminum oxide and not less than 24-percent ferric oxide. Emery aggregate must be well graded in size from particles retained on No. 50 sieve (0.0118 inch) to particles passing No. 8 sieve (0.0929 inch).

Provide iron aggregate, as follows:

Iron must be packaged, ground and graded cubicle iron particles with dispersing agents, formulated to blend with portland cement for producing wear-resistant monolithic surface treatments. Provide aggregate that is free of nonferrous metals, oil, grease, soluble alkaline compounds, rust, and impurities and must be well-graded in size from particles retained on No. 50 sieve (0.0118 inch) to particles passing No. 8 sieve (0.0929 inch).

2.7.5 Aggregate for Heavy-Duty Floor Topping

Provide emery (or may be traprock or traprock-screenings) fine aggregates, as specified.

Provide emery that is packaged, factory-graded, crushed natural emery ore containing not less than 35-percent aluminum oxide and not less than 24-percent ferric oxide. Provide aggregate that is cubical or polyhedral in form and does not change its physical or chemical nature in the presence of moisture. Grade aggregate to a fineness modulus of 3.9 to 4.0, with 100 percent passing 3/8-inch sieve and not less than 95 percent retained on No. 100 sieve. Deliver emery in moisture-resistant bags.

Provide traprock that is packaged, crushed, natural, fine- to medium-grained igneous rock such as diabase, basalt, or black granite. Uniformly grade coarse aggregate with 100 percent passing 1/2-inch sieve, 30 to 50 percent passing 3/8-inch sieve, 0 to 15 percent passing No. 4 sieve, and 0 to 5 percent passing No. 8 sieve.

Provide fine aggregate using traprock that conforms to ASTM C 33/C 33M, except gradation. Grade fine aggregate within the following limits:

SIEVE	PERCENT PASSING
3/8 inch	100
No. 4	95 to 100
No. 8	65 to 80
No. 16	45 to 65
No. 30	25 to 45
No. 50	5 to 15
No. 100	0 to 5

Deliver traprock coarse aggregate and fine aggregate in moisture-resistant bags.

2.8 CLASSIFICATION AND QUALITY OF CONCRETE

2.8.1 Concrete Classes and Usage

Provide concrete classes, compressive strength, requirements for air entrainment, and usage as follows:

CONCRETE CLASS	MIN. 28-DAY COMPRESSIVE STRENGTH POUNDS PER SQ. IN.	REQUIREMENT FOR AIR ENTRAINMENT	USAGE
3A	3,000	Air-entrained	For foundation concrete work exposed to freezing and thawing or subjected to hydraulic pressure, such

CONCRETE CLASS	MIN. 28-DAY COMPRESSIVE STRENGTH POUNDS PER SQ. IN.	REQUIREMENT FOR AIR ENTRAINMENT	USAGE
			as foundation walls, grade beams, pits, tunnels. For exterior concrete slabs, such as steps, platforms, walks
3N	3,000	Nonair-entrained	For foundation concrete work not exposed to freezing and thawing or subjected to hydraulic pressure, such as footings, pile caps, foundation mats. For interior slabs on ground to be covered with resilient flooring
4A	4,000	Air-entrained	For structural concrete work exposed to freezing and thawing, unless otherwise indicated or specified, such as exterior columns and spandrels
4N	4,000	Nonair-entrained	For structural concrete work not exposed to freezing and thawing such as interior columns, beams, supported slabs and other structural members for interior slabs on ground subjected to foot traffic
2.5A	2,500	Air-entrained	For concrete not reinforced and not exposed to freezing and thawing
2.5N	2,500	Nonair-entrained	For concrete not reinforced and not exposed to freezing and thawing
5A	5,000	Air-entrained	For structural concrete work as indicated
5N	5,000	Nonair-entrained	For structural concrete work as indicated

2.8.2 Limits for Concrete Proportions

Provide limits for maximum water/cement ratio and minimum cement content for each concrete class as follows:

CONCRETE CLASS	MAX. WATER/CEMENT RATIO BY WEIGHT	MIN. CEMENT FOR 3- TO 4-INCH SLUMP, (NO. OF 94-POUND SACKS) PER CU. YD.
2.5A	0.58	4.75
2.5N	0.62	4.75
3A	0.50	5.25
3N	0.54	5.25
4A	0.46	6.0
4N	0.48	6.0
5A	0.41	6.5
5N	0.44	6.5

* Weight of water to weight of cement in pounds in one cubic yard of concrete

2.8.3 Maximum Size of Aggregate

Size of aggregate, designated by the sieve size on which maximum amount of retained coarse aggregate is 5 to 10 percent by weight, must be as follows:

MAXIMUM SIZE OF AGGREGATE	ASTM C 33/C 33M SIZE NUMBER	TYPE OF CONSTRUCTION
2 inches	357	Nonreinforced footings and other flat work having a depth of not less than 6 inches, and nonreinforced walls and other formed sections having a dimension between forms of not less than 10 inches
1-1/2 inches	467	Monolithic slabs on ground, concrete fill, and other flat-work having a depth of not less than 5 inches and a clear distance between reinforcing bars of not less than 2 inches
3/4 inch	67	Reinforced walls, columns, girders, beams, and other formed sections having a dimension between forms of not less than 6 inches and clear distance between reinforcing bars or reinforcing bar and

MAXIMUM SIZE OF AGGREGATE	ASTM C 33/C 33M SIZE NUMBER	TYPE OF CONSTRUCTION
		face of form of not less than 1 inch
3/4 inch	67	Monolithic concrete slabs and other flatwork having a depth of not less than 2-1/2 inches and a clear distance between reinforcing bars of not less than 1 inch
1/2 inch	7	Concrete joist construction, beams, reinforced walls, and other formed work having a clear distance between reinforcing bars and face of form of less than 1 inch
3/8 inch	8	Nonreinforced slabs and other flatwork having a depth of less than 2-1/2 inches

Maximum size of aggregate may be that required for most critical type of construction using that concrete class.

Specify gradation of aggregates for separate floor topping.

2.8.4 Slump

Provide slump for concrete at time and in location of placement as follows:

TYPE OF CONSTRUCTION	SLUMP
Footings, unreinforced walls	Not less than 1 inch nor more than 3 inches
Columns, beams, reinforced walls, monolithic slabs	Not less than 1 inch nor more than 4 inches
Ramps and other sloping surfaces	0 nor more than 3 inches

2.8.5 Total Air Content

Air content of exposed concrete and interior concrete must be in accordance with ASTM C 260 and/or as follows:

LIMITS CONCRETE EXPOSURE	REQUIREMENT FOR AIR ENTRAINMENT	MAXIMUM SIZE OF AGGREGATE	TOTAL AIR CONTENT BY VOLUME
Exposed to freezing and thawing or subjected to hydraulic pressure	Air-entrained	1-1/2 or 2 inches	4 to 6 percent
		3/4 inch	5 to 7 percent
		1/2 or 3/8 inch	6 to 8.5 percent

Provide concrete exposed to freezing and thawing or subjected to hydraulic pressure that is air-entrained by addition of approved air-entraining admixture to concrete mix.

PART 3 EXECUTION

3.1 EXAMINATION

Do not begin installation until substrates have been properly constructed; verify that substrates are plumb and true.

If substrate preparation is the responsibility of another installer, notify Architect/Engineer of unsatisfactory preparation before processing.

Check field dimensions before beginning installation. If dimensions vary too much from design dimensions for proper installation, notify Architect/Engineer and wait for instructions before beginning installation.

3.2 PREPARATION

Determine quantity of concrete needed and minimize the production of excess concrete. Designate locations or uses for potential excess concrete before the concrete is poured.

3.2.1 General

Surfaces against which concrete is to be placed must be free of debris, loose material, standing water, snow, ice, and other deleterious substances before start of concrete placing.

Remove standing water without washing over freshly deposited concrete. Divert flow of water through side drains provided for such purpose.

3.2.2 Subgrade Under Foundations and Footings

When subgrade material is semiporous and dry, sprinkle subgrade surface with water as required to eliminate suction at the time concrete is deposited. When subgrade material is porous, seal subgrade surface by covering surface with specified water barrier subgrade cover; this may also be used over semiporous, dry subgrade material instead of water sprinkling.

3.2.3 Subgrade Under Slabs on Ground

Before construction of slabs on ground, have underground work on pipes and conduits completed and approved.

Previously constructed subgrade or fill must be cleaned of foreign materials and inspected by the Contractor for adequate compaction and

surface tolerances as specified.

Actual density of top 12 inches of subgrade soil material-in-place must not be less than the following percentages of maximum density of same soil material compacted at optimum moisture content in accordance with ASTM D 1557.

SOIL MATERIAL	PERCENT MAXIMUM DENSITY
Drainage fill	100
Cohesionless soil material	100
Cohesive soil material	95

Finish surface of drainage fill under interior slabs on ground must not show deviation in excess of 1/4 inch when tested with a 10-foot straightedge parallel with and at right angles to building lines.

Finished surface of subgrade or fill under exterior slabs on ground must not be more than 0.02-foot above or 0.10-foot below elevation indicated.

Cover drainage fill surface under interior slabs on ground with specified water-vapor barrier subgrade cover immediately prior to placing reinforcement. Install subgrade cover to avoid puncture or tear. Patch punctures or tears over 12 inches with separate sheets lapped not less than 6 inches. Seal all punctures or tears less than 12 inches with pressure-sensitive vapor barrier tape not less than 2-inches wide. Seal lapped joints with vapor barrier adhesive or pressure-sensitive vapor barrier tape not less than 2-inches wide. Lay subgrade cover sheets with not less than a 6-inch lap at edges and ends and in direction in which concrete is to be placed.

Prepare subgrade or fill surface under exterior slabs on ground as specified for subgrade under foundations and footings.

3.2.4 Formwork

Complete and approve formwork. Remove debris and foreign material from interior of forms before start of concrete placing.

3.2.5 Edge Forms and Screed Strips for Slabs

Set edge forms or bulkheads and intermediate screed strips for slabs to obtain indicated elevations and contours in finished slab surface and must be strong enough to support vibrating bridge screeds or roller pipe screeds if nature of specified slab finish requires use of such equipment. Align concrete surface to elevation of screed strips by use of strike-off templates or approved compacting-type screeds.

3.2.6 Reinforcement and Other Embedded Items

Secure reinforcement, joint materials, and other embedded materials in position, inspected, and approved before start of concrete placing.

3.3 FORMS

ACI/MCP-2. Provide forms, shoring, and scaffolding for concrete placement. Set forms mortar-tight and true to line and grade. Chamfer

above grade exposed joints, edges, and external corners of concrete 0.75 inch unless otherwise indicated. Provide formwork with clean-out openings to permit inspection and removal of debris. Forms submerged in water must be watertight.

3.3.1 General

Construct forms to conform, within the tolerances specified, to shapes dimensions, lines, elevations, and positions of cast-in-place concrete members as indicated. Forms must be supported, braced, and maintained sufficiently rigid to prevent deformation under load.

3.3.2 Design and Construction of Formwork

Provide formwork design and construction that conforms to and ACI/MCP-2, Chapter 4.

Provide forms that are tight to prevent leakage of cement paste during concrete placing.

Support form facing materials by structural members spaced close to prevent deflection of form facing material. Fit forms placed in successive units for continuous surfaces to accurate alignment to ensure a smooth completed surface within the tolerances specified. Where necessary to maintain the tolerances specified, such as long spans where immediate supports are not possible, camber formwork for anticipated deflections in formwork due to weight and pressure of fresh concrete and to construction loads.

Chamfer exposed joints, edges, and external corners a minimum of 3/4 inch by moldings placed in corners of column, beam, and wall forms.

Provide shores and struts with a positive means of adjustment capable of taking up formwork settlement during concrete placing operations. Obtain adjustment with wedges or jacks or a combination thereof. When adequate foundations for shores and struts cannot be secured, provide trussed supports.

Provide temporary openings in wall forms, column forms, and at other points where necessary to permit inspection and to facilitate cleaning.

Provide forms that are readily removable without impact, shock, or damage to concrete.

3.3.3 Coating

Before concrete placement, coat the contact surfaces of forms with a nonstaining mineral oil, nonstaining form coating compound, or two coats of nitrocellulose lacquer. Do not use mineral oil on forms for surfaces to which adhesive, paint, or other finish material is to be applied.

3.3.4 Reshoring

Reshore concrete elements where forms are removed prior to the specified time period. Do not permit elements to deflect or accept loads during form stripping or reshoring. Forms on columns, walls, or other load-bearing members may be stripped after 2 days if loads are not applied to the members. After forms are removed, reshore slabs and beams over 10 feet in span and cantilevers over 4 feet for the remainder of the specified time period in accordance with paragraph entitled "Removal of Forms." Perform

reshoring operations to prevent subjecting concrete members to overloads, eccentric loading, or reverse bending. Provide reshoring elements with the same load-carrying capabilities as original shoring and spaced similar to original shoring. Firmly secure and brace reshoring elements to provide solid bearing and support.

3.3.5 Reuse

Reuse forms providing the structural integrity of concrete and the aesthetics of exposed concrete are not compromised.

3.3.6 Forms for Standard Rough Form Finish

Give rough form finish concrete formed surfaces that are to be concealed by other construction, unless otherwise specified.

Form facing material for standard rough form finish must be the specified concrete form plywood or other approved form facing material that produces concrete surfaces equivalent in smoothness and appearance to that produced by new concrete form plywood panels.

For concrete surfaces exposed only to the ground, undressed, square-edge, 1-inch nominal thickness lumber may be used. Provide horizontal joints that are level and vertical joints that are plumb.

3.3.7 Forms for Standard Smooth Form Finish

Give smooth form finish concrete formed surfaces that are to be exposed to view or that are to be covered with coating material applied directly to concrete or with covering material bonded to concrete, such as waterproofing, dampproofing, painting, or other similar coating system.

Form facing material for standard smooth finish must be the specified overlaid concrete form plywood or other approved form facing material that is nonreactive with concrete and that produce concrete surfaces equivalent in smoothness and appearance to that produced by new overlaid concrete form plywood panels.

Maximum deflection of form facing material between supports and maximum deflection of form supports such as studs and wales must not exceed 0.0025 times the span.

Provide arrangement of form facing sheets that are orderly and symmetrical, and sheets that are in sizes as large as practical.

Arrange panels to make a symmetrical pattern of joints. Horizontal and vertical joints must be solidly backed and butted tight to prevent leakage and fins.

3.3.8 Form Ties

Provide ties that are factory fabricated metal, adjustable in length, removable or snap-off type that do allow form deflection or do not spall concrete upon removal. Portion of form ties remaining within concrete after removal of exterior parts must be at least 1-1/2 inches back from concrete surface. Provide form ties that are free of devices that leave a hole larger than 7/8 inch or less than 1/2 inch in diameter in concrete surface. Form ties fabricated at the project site or wire ties of any type are not acceptable.

3.3.9 Tolerances for Form Construction

Construct formwork to ensure that after removal of forms and prior to patching and finishing of formed surfaces, provide concrete surfaces in accordance with tolerances specified in ACI/MCP-1 and ACI/MCP-2.

3.3.10 Removal of Forms and Supports

After placing concrete, forms must remain in place for the time periods specified in ACI/MCP-4. Do not remove forms and shores (except those used for slabs on grade and slip forms) until the client determines that the concrete has gained sufficient strength to support its weight and superimposed loads. Base such determination on compliance with one of the following:

a. The plans and specifications stipulate conditions for removal of forms and shores, and such conditions have been followed, or

b. The concrete has been properly tested with an appropriate ASTM standard test method designed to indicate the concrete compressive strength, and the test results indicate that the concrete has gained sufficient strength to support its weight and superimposed loads.

Prevent concrete damage during form removal. Clean all forms immediately after removal.

3.3.10.1 Special Requirements for Reduced Time Period

Forms may be removed earlier than specified if ASTM C 39/C 39M test results of field-cured samples from a representative portion of the structure indicate that the concrete has reached a minimum of 85 percent of the design strength.

3.4 WATERSTOP SPLICES

Fusion weld in the field.

3.5 FORMED SURFACES

3.5.1 Preparation of Form Surfaces

Coat contact surfaces of forms with form-coating compound before reinforcement is placed. Provide a commercial formulation form-coating compound that does not bond with, stain, nor adversely affect concrete surfaces and impair subsequent treatment of concrete surfaces that entails bonding or adhesion nor impede wetting of surfaces to be cured with water or curing compounds. Do not allow excess form-coating compound to stand in puddles in the forms nor to come in contact with concrete against which fresh concrete is placed. Make thinning of form-coating compound with thinning agent of the type, in the amount, and under the conditions recommended by form-coating compound manufacturer's printed or written directions.

3.5.2 Tolerances

ACI/MCP-4 and as indicated.

3.5.3 As-Cast Form

Provide form facing material producing a smooth, hard, uniform texture on the concrete. Arrange facing material in an orderly and symmetrical manner and keep seams to a practical minimum. Support forms as necessary to meet required tolerances. Do not use material with raised grain, torn surfaces, worn edges, patches, dents, or other defects which can impair the texture of the concrete surface.

3.6 PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS

ACI/MCP-2. Provide bars, wire fabric, wire ties, supports, and other devices necessary to install and secure reinforcement. Reinforcement must not have rust, scale, oil, grease, clay, or foreign substances that would reduce the bond. Rusting of reinforcement is a basis of rejection if the effective cross-sectional area or the nominal weight per unit length has been reduced. Remove loose rust prior to placing steel. Tack welding is prohibited.

3.6.1 General

Provide details of reinforcement that are in accordance with, and ACI/MCP-4 and as specified.

3.6.2 Vapor Barrier

Provide beneath the on-grade concrete floor slab. Use the greatest widths and lengths practicable to eliminate joints wherever possible. Lap joints a minimum of 12 inches. Remove torn, punctured, or damaged vapor barrier material and provide with new vapor barrier prior to placing concrete. Concrete placement must not damage vapor barrier material.

3.6.3 Reinforcement Supports

Place reinforcement and secure with galvanized or non corrodible chairs, spacers, or metal hangers. For supporting reinforcement on the ground, use concrete or other non corrodible material, having a compressive strength equal to or greater than the concrete being placed.

3.6.4 Cover

ACI/MCP-2 for minimum coverage, unless otherwise indicated.

3.6.5 Setting Miscellaneous Material

Place and secure anchors and bolts, pipe sleeves, conduits, and other such items in position before concrete placement. Plumb anchor bolts and check location and elevation. Temporarily fill voids in sleeves with readily removable material to prevent the entry of concrete.

3.6.6 Construction Joints

Locate joints to least impair strength. Continue reinforcement across joints unless otherwise indicated.

3.6.7 Expansion Joints and Contraction Joints

Provide expansion joint at edges of interior floor slabs on grade abutting vertical surfaces, and as indicated. Make expansion joints 1/2 inch wide

unless indicated otherwise. Fill expansion joints not exposed to weather with preformed joint filler material. Completely fill joints exposed to weather with joint filler material and joint sealant. Do not extend reinforcement or other embedded metal items bonded to the concrete through any expansion joint unless an expansion sleeve is used. Provide contraction joints, either formed or saw cut or cut with a jointing tool, to the indicated depth after the surface has been finished. Complete saw joints within 4 to 12 hours after concrete placement. Protect joints from intrusion of foreign matter.

3.6.8 Fabrication

Shop fabricate reinforcing bars to conform to shapes and dimensions indicated for reinforcement, and as follows:

Provide fabrication tolerances that are in accordance with ACI/MCP-1, ACI/MCP-2 and ACI/MCP-3.

Provide hooks and bends that are in accordance with and ACI/MCP-3.

Reinforcement must be bent cold to shapes as indicated. Bending must be done in the shop. Rebending of a reinforcing bar that has been bent incorrectly is not be permitted. Bending must be in accordance with standard approved practice and by approved machine methods.

Tolerance on nominally square-cut, reinforcing bar ends must be in accordance with ACI/MCP-3.

Deliver reinforcing bars bundled, tagged, and marked. Tags must be metal with bar size, length, mark, and other information pressed in by machine. Marks must correspond with those used on the placing drawings.

Do not use reinforcement that has any of the following defects:

a. Bar lengths, depths, and bends beyond specified fabrication tolerances

b. Bends or kinks not indicated on drawings or approved shop drawings

c. Bars with reduced cross-section due to rusting or other cause

Replace defective reinforcement with new reinforcement having required shape, form, and cross-section area.

3.6.9 Placing Reinforcement

Place reinforcement in accordance withACI/MCP-4.

For slabs on grade (over earth or over capillary water barrier) and for footing reinforcement, support bars or welded wire fabric on precast concrete blocks, spaced at intervals required by size of reinforcement, to keep reinforcement the minimum height specified above the underside of slab or footing.

For slabs other than on grade, supports for which any portion is less than 1 inch from concrete surfaces that are exposed to view or to be painted must be of precast concrete units, plastic-coated steel, or stainless steel protected bar supports. Precast concrete units must be wedge shaped, not larger than 3-1/2 by 3-1/2 inches, and of thickness equal to that indicated

for concrete protection of reinforcement. Provide precast units that have cast-in galvanized tie wire hooked for anchorage and blend with concrete surfaces after finishing is completed.

Contractor must cooperate with other trades in setting of anchor bolts, inserts, and other embedded items. Where conflicts occur between locating reinforcing and embedded items, the Contractor must notify the Contracting Officer so that conflicts may be reconciled before placing concrete. Anchors and embedded items must be positioned and supported with appropriate accessories.

Provide reinforcement that is supported and secured together to prevent displacement by construction loads or by placing of wet concrete, and as follows:

Provide supports for reinforcing bars that are sufficient in number and sufficiently heavy to carry the reinforcement they support, and in accordance with ACI/MCP-4 and CRSI 10MSP. Do not use supports to support runways for concrete conveying equipment and similar construction loads.

Equip supports on ground and similar surfaces with sand-plates.

Support welded wire fabric as required for reinforcing bars.

Secure reinforcements to supports by means of tie wire. Wire must be black, soft iron wire, not less than 16 gage.

With the exception of temperature reinforcement, tied to main steel approximately 24 inches on center, reinforcement must be accurately placed, securely tied at intersections with 18-gage annealed wire, and held in position during placing of concrete by spacers, chairs, or other approved supports. Point wire-tie ends away from the form. Unless otherwise indicated, numbers, type, and spacing of supports must conform to ACI/MCP-3.

Bending of reinforcing bars partially embedded in concrete is permitted only as specified inand ACI/MCP-4.

3.6.10 Spacing of Reinforcing Bars

Spacing must be as indicated. If not indicated, spacing must be in accordance with theACI/MCP-3.

Reinforcing bars may be relocated to avoid interference with other reinforcement, or with conduit, pipe, or other embedded items. If any reinforcing bar is moved a distance exceeding one bar diameter or specified placing tolerance, resulting rearrangement of reinforcement is subject to approval.

3.6.11 Concrete Protection for Reinforcement

Concrete protection must be in accordance with the ACI/MCP-4, ASTM E 648,and ACI/MCP-3.

3.6.12 Welding

Welding must be in accordance with AWS D1.4/D1.4M.

3.7 BATCHING, MEASURING, MIXING, AND TRANSPORTING CONCRETE

ASTM C 94/C 94M, and ACI/MCP-2, except as modified herein. Batching equipment must be such that the concrete ingredients are consistently measured within the following tolerances: 1 percent for cement and water, 2 percent for aggregate, and 3 percent for admixtures. Furnish mandatory batch ticket information for each load of ready mix concrete.

3.7.1 Measuring

Make measurements at intervals as specified in paragraphs entitled "Sampling" and "Testing."

3.7.2 Mixing

ASTM C 94/C 94M and ACI/MCP-2. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Reduce mixing time and place concrete within 60 minutes if the air temperature is greater than 84 degrees F except as follows: if set retarding admixture is used and slump requirements can be met, limit for placing concrete may remain at 90 minutes. Additional water may be added, provided that both the specified maximum slump and water-cement ratio are not exceeded. When additional water is added, an additional 30 revolutions of the mixer at mixing speed is required. Dissolve admixtures in the mixing water and mix in the drum to uniformly distribute the admixture throughout the batch.

3.7.3 Transporting

Transport concrete from the mixer to the forms as rapidly as practicable. Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use aluminum pipe or chutes. Remove concrete which has segregated in transporting and dispose of as directed.

3.8 PLACING CONCRETE

Place concrete as soon as practicable after the forms and the reinforcement have been inspected and approved. Do not place concrete when weather conditions prevent proper placement and consolidation; in uncovered areas during periods of precipitation; or in standing water. Prior to placing concrete, remove dirt, construction debris, water, snow, and ice from within the forms. Deposit concrete as close as practicable to the final position in the forms. Do not exceed a free vertical drop of 3 feet from the point of discharge. Place concrete in one continuous operation from one end of the structure towards the other. Position grade stakes on 10 foot centers maximum in each direction when pouring interior slabs and on 20 foot centers maximum for exterior slabs.

3.8.1 General Placing Requirements

Deposit concrete continuously or in layers of such thickness that no concrete is placed on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section. If a section cannot be placed continuously, provide construction joints as specified. Perform concrete placing at such a rate that concrete which is being integrated with fresh concrete is still plastic. Deposit concrete as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to procedures which cause segregation.

Concrete to receive other construction must be screeded to proper level to avoid excessive skimming or grouting.

Do not use concrete which becomes nonplastic and unworkable or does not meet quality control limits as specified or has been contaminated by foreign materials. Use of retempered concrete is permitted. Remove rejected concrete from the site.

3.8.2 Vibration

ACI/MCP-2. Furnish a spare, working, vibrator on the job site whenever concrete is placed. Consolidate concrete slabs greater than 4 inches in depth with high frequency mechanical vibrating equipment supplemented by hand spading and tamping. Consolidate concrete slabs 4 inches or less in depth by wood tampers, spading, and settling with a heavy leveling straightedge. Operate internal vibrators with vibratory element submerged in the concrete, with a minimum frequency of not less than 6000 impulses per minute when submerged. Do not use vibrators to transport the concrete in the forms. Insert and withdraw vibrators approximately 20 inches apart. Penetrate the previously placed lift with the vibrator when more than one lift is required. Place concrete in 20 inch maximum vertical lifts. Use external vibrators on the exterior surface of the forms when internal vibrators do not provide adequate consolidation of the concrete.

3.8.3 Cold Weather

ACI/MCP-2. Do not allow concrete temperature to decrease below 50 degrees F Obtain approval prior to placing concrete when the ambient temperature is below 40 degrees F or when concrete is likely to be subjected to freezing temperatures within 24 hours. Cover concrete and provide sufficient heat to maintain 50 degrees F minimum adjacent to both the formwork and the structure while curing. Limit the rate of cooling to 37 degrees F in any 1 hour and 50 degrees F per 24 hours after heat application.

3.8.4 Hot Weather

Maintain required concrete temperature using Figure 2.1.5 in ACI/MCP-2 to prevent the evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing. Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment, and water hauling equipment, where job site is remote to water source, to maintain a moist concrete surface throughout the curing period. Provide burlap cover or other suitable, permeable material with fog spray or continuous wetting of the concrete when weather conditions prevent the use of either liquid membrane curing compound or impervious sheets. For vertical surfaces, protect forms from direct sunlight and add water to top of structure once concrete is set.

3.8.5 Follow-up

Check concrete within 24 hours of placement for flatness, levelness, and other specified tolerances. Adjust formwork and placement techniques on subsequent pours to achieve specified tolerances.

3.8.6 Placing Concrete in Forms

Deposit concrete placed in forms in horizontal layers not exceeding 24 inches.

Remove temporary spreaders in forms when concrete placing has reached elevation of spreaders.

Consolidate concrete placed in forms by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Design vibrators to operate with vibratory element submerged in concrete and maintain a speed of not less than 9,000 impulses per minute when submerged in concrete. Provide vibrating equipment adequate in number of units and power of each unit to properly consolidate concrete. Vibration of forms and reinforcement is not be permitted. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced points not farther apart than visible effectiveness of machine. Do not insert vibrator into lower courses of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of concrete mix.

Do not start placing of concrete in supporting elements until concrete previously placed in columns and walls is no longer plastic and has been in place a minimum of 2 hours.

3.8.7 Placing Concrete Slabs

Place and consolidate concrete for slabs in a continuous operation, within the limits of approved construction joints until placing of panel or section is completed.

During concrete placing operations, consolidate concrete by mechanical vibrating equipment so that concrete is worked around reinforcement and other embedded items and into corners. Consolidate concrete placed in beams and girders of supported slabs and against bulkheads of slabs on ground by mechanical vibrators as specified. Consolidate concrete in remainder of slabs by vibrating bridge screeds, roller pipe screeds, or other approved method. Limit consolidation operations to time necessary to obtain consolidation of concrete without bringing an excess of fine aggregate to the surface. Concrete to be consolidated must be as dry as practical and surfaces thereof must not be manipulated prior to finishing operations. Bring concrete correct level with a straightedge and struck-off. Use bull floats or darbies to smooth surface, leaving it free of humps or hollows. Sprinkling of water on plastic surface is not permitted.

Provide finish of slabs as specified.

3.8.8 Bonding

Surfaces of set concrete at joints, except where bonding is obtained by use of concrete bonding agent, must be roughened and cleaned of laitance, coatings, loose particles, and foreign matter. Roughen surfaces in a manner that exposes the aggregate uniformly and does not leave laitance, loosened particles of aggregate, nor damaged concrete at the surface.

Obtain bonding of fresh concrete that has set as follows:

At joints between footings and walls or columns, between walls or columns and the beams or slabs they support, and elsewhere unless otherwise specified; roughened and cleaned surface of set concrete must be dampened, but not saturated, immediately prior to placing of fresh concrete.

At joints in exposed-to-view work; at vertical joints in walls; at joints near midpoint of span in girders, beams, supported slabs, other structural members; in work designed to contain liquids; the roughened and cleaned surface of set concrete must be dampened but not saturated and covered with a cement grout coating.

Provide cement grout that consists of equal parts of portland cement and fine aggregate by weight with not more than of water per sack of cement. Apply cement grout with a stiff broom or brush to a minimum thickness of 1/16 inch. Deposit fresh concrete before cement grout has attained its initial set.

Bonding of fresh concrete to concrete that has set may be obtained by use of a concrete bonding agent. Apply such bonding material to cleaned concrete surface in accordance with approved printed instructions of bonding material manufacturer.

3.9 SURFACE FINISHES EXCEPT FLOOR, SLAB, AND PAVEMENT FINISHES

3.9.1 Defects

Repair formed surfaces by removing minor honeycombs, pits greater than 1 square inch surface area or 0.25 inch maximum depth, or otherwise defective areas. Provide edges perpendicular to the surface and patch with nonshrink grout. Patch tie holes and defects when the forms are removed. Concrete with extensive honeycomb including exposed steel reinforcement, cold joints, entrapped debris, separated aggregate, or other defects which affect the serviceability or structural strength will be rejected, unless correction of defects is approved. Obtain approval of corrective action prior to repair. The surface of the concrete must not vary more than the allowable tolerances of ACI/MCP-4. Exposed surfaces must be uniform in appearance and finished to a smooth form finish unless otherwise specified.

3.9.2 Not Against Forms (Top of Walls)

Surfaces not otherwise specified must be finished with wood floats to even surfaces. Finish must match adjacent finishes.

3.9.3 Formed Surfaces

3.9.3.1 Tolerances

ACI/MCP-1 and as indicated.

3.9.3.2 As-Cast Rough Form

Provide for surfaces not exposed to public view. Patch these holes and defects and level abrupt irregularities. Remove or rub off fins and other projections exceeding 0.25 inch in height.

3.9.3.3 Standard Smooth Finish

Finish must be as-cast concrete surface as obtained with form facing

material for standard smooth finish. Repair and patch defective areas as specified; and all fins and remove other projections on surface.

3.9.4 Grout Finish

Provide finish that is standard, smooth coated with grout as specified.

Give finish to interior and exterior concrete vertical surfaces that are to be exposed to view.

Grout is required consisting of one part portland cement to 1-1/2 parts fine aggregate by volume, mixed with water to produce a consistency of thick paint. Portland cement portion must be a blend of standard portland cement and white portland cement, proportioned as determined by trial mixes so that final color of grout when dry approximates color of surrounding concrete. Fine aggregate must pass No. 30 mesh sieve.

Surface of concrete is required to be wetted, and grout must be applied immediately to wetted surfaces. Spread grout over surface with clean burlap pads or sponge-rubber floats to fill pits, air bubbles, and surface holes. Remove excess grout by scraping, then rubbing surface with clean burlap to remove visible grout film. Keep grout damp by means of fog spray during setting period. Complete finish the day it is started, and make limits of a finished area at natural breaks in finished surface.

3.10 FLOOR, SLAB, AND PAVEMENT FINISHES AND MISCELLANEOUS CONSTRUCTION

ACI/MCP-2, unless otherwise specified. Slope floors uniformly to drains where drains are provided.

3.10.1 Finish

Place, consolidate, and immediately strike off concrete to obtain proper contour, grade, and elevation before bleedwater appears. Permit concrete to attain a set sufficient for floating and supporting the weight of the finisher and equipment. If bleedwater is present prior to floating the surface, drag the excess water off or remove by absorption with porous materials. Do not use dry cement to absorb bleedwater.

3.10.1.1 Broomed

Use on surfaces of exterior walks, platforms, patios, and ramps, unless otherwise indicated. Perform a floated finish, then draw a broom or burlap belt across the surface to produce a coarse scored texture. Permit surface to harden sufficiently to retain the scoring or ridges. Broom transverse to traffic or at right angles to the slope of the slab.

3.10.1.2 Pavement

Screed the concrete with a template advanced with a combined longitudinal and crosswise motion. Maintain a slight surplus of concrete ahead of the template. After screeding, float the concrete longitudinally. Use a straightedge to check slope and flatness; correct and refloat as necessary. Obtain final finish by a burlap drag. Drag a strip of clean, wet burlap from 3 to 10 feet wide and 2 feet longer than the pavement width across the slab. Produce a fine, granular, sandy textured surface without disfiguring marks. Round edges and joints with an edger having a radius of 1/8 inch.

3.10.2 Concrete Walks

Provide 4 inches thick minimum. Provide contraction joints spaced every 5 linear feet unless otherwise indicated. Cut contraction joints one inch deep with a jointing tool after the surface has been finished. Provide 0.5 inch thick transverse expansion joints at changes in direction where sidewalk abuts curb, steps, rigid pavement, or other similar structures; space expansion joints every 50 feet maximum. Give walks a broomed finish. Unless indicated otherwise, provide a transverse slope of 1/48. Limit variation in cross section to 1/4 inch in 5 feet.

3.10.3 Pits and Trenches

Place bottoms and walls monolithically or provide waterstops and keys.

3.10.4 Curbs and Gutters

Provide contraction joints spaced every 10 feet maximum unless otherwise indicated. Cut contraction joints 3/4 inch deep with a jointing tool after the surface has been finished. Provide expansion joints 1/2 inch thick and spaced every 100 feet maximum unless otherwise indicated. Perform pavement finish.

3.10.5 Splash Blocks

Provide at outlets of downspouts emptying at grade. Splash blocks may be precast concrete, and must be 24 inches long, 12 inches wide, and 4 inches thick, unless otherwise indicated, with smooth-finished countersunk dishes sloped to drain away from the building.

3.11 CURING AND PROTECTION

ACI/MCP-2 unless otherwise specified. Begin curing immediately following form removal. Avoid damage to concrete from vibration created by blasting, pile driving, movement of equipment in the vicinity, disturbance of formwork or protruding reinforcement, and any other activity resulting in ground vibrations. Protect concrete from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, and oil stains. Do not allow concrete to dry out from time of placement until the expiration of the specified curing period. Do not use membrane-forming compound on surfaces where appearance would be objectionable, on any surface to be painted, where coverings are to be bonded to the concrete, or on concrete to which other concrete is to be bonded. If forms are removed prior to the expiration of the curing period, provide another curing procedure specified herein for the remaining portion of the curing period. Provide moist curing for those areas receiving liquid chemical sealer-hardener or epoxy coating.

3.11.1 General

Protect freshly placed concrete from premature drying and cold or hot temperature and maintain without drying at a relatively constant temperature for the period of time necessary for hydration of cement and proper hardening of concrete.

Start initial curing as soon as free water has disappeared from surface of concrete after placing and finishing. Keep concrete moist for minimum 72 hours.

Final curing must immediately follow initial curing and before concrete has dried. Continue final curing until cumulative number of hours or fraction thereof (not necessarily consecutive) during which temperature of air in contact with the concrete is above 50 degrees F has totaled 168 hours. Alternatively, if tests are made of cylinders kept adjacent to the structure and cured by the same methods, final curing may be terminated when the average compressive strength has reached 70 percent of the 28-day design compressive strength. Prevent rapid drying at end of final curing period.

3.11.2 Moist Curing

Remove water without erosion or damage to the structure. Prevent water run-off.

3.11.2.1 Ponding or Immersion

Continually immerse the concrete throughout the curing period. Water must not be more than 50 degrees F less than the temperature of the concrete. For temperatures between 40 and 50 degrees F, increase the curing period by 50 percent.

3.11.2.2 Fog Spraying or Sprinkling

Apply water uniformly and continuously throughout the curing period. For temperatures between 40 and 50 degrees F, increase the curing period by 50 percent.

3.11.2.3 Pervious Sheeting

Completely cover surface and edges of the concrete with two thicknesses of wet sheeting. Overlap sheeting 6 inches over adjacent sheeting. Provide sheeting that is at least as long as the width of the surface to be cured. During application, do not drag the sheeting over the finished concrete nor over sheeting already placed. Wet sheeting thoroughly and keep continuously wet throughout the curing period.

3.11.2.4 Impervious Sheeting

Wet the entire exposed surface of the concrete thoroughly with a fine spray of water and cover with impervious sheeting throughout the curing period. Lay sheeting directly on the concrete surface and overlap edges 12 inches minimum. Provide sheeting not less than 18 inches wider than the concrete surface to be cured. Secure edges and transverse laps to form closed joints. Repair torn or damaged sheeting or provide new sheeting. Cover or wrap columns, walls, and other vertical structural elements from the top down with impervious sheeting; overlap and continuously tape sheeting joints; and introduce sufficient water to soak the entire surface prior to completely enclosing.

3.11.3 Liquid Membrane-Forming Curing Compound

Seal or cover joint openings prior to application of curing compound. Prevent curing compound from entering the joint. Apply in accordance with the recommendations of the manufacturer immediately after any water sheen which may develop after finishing has disappeared from the concrete surface. Provide and maintain compound on the concrete surface throughout the curing period. Do not use this method of curing where the use of Figure 2.1.5 in ACI/MCP-2 indicates that hot weather conditions cause an

evaporation rate exceeding 0.2 pound of water per square foot per hour.

3.11.3.1 Application

Unless the manufacturer recommends otherwise, apply compound immediately after the surface loses its water sheen and has a dull appearance, and before joints are sawed. Mechanically agitate curing compound thoroughly during use. Use approved power-spraying equipment to uniformly apply two coats of compound in a continuous operation. The total coverage for the two coats must be 200 square feet maximum per gallon of undiluted compound unless otherwise recommended by the manufacturer's written instructions. The compound must form a uniform, continuous, coherent film that does not check, crack, or peel. Immediately apply an additional coat of compound to areas where the film is defective. Re-spray concrete surfaces subjected to rainfall within 3 hours after the curing compound application.

3.11.3.2 Protection of Treated Surfaces

Prohibit pedestrian and vehicular traffic and other sources of abrasion at least 72 hours after compound application. Maintain continuity of the coating for the entire curing period and immediately repair any damage.

3.11.4 Liquid Chemical Sealer-Hardener

Apply sealer-hardener to interior floors not receiving floor covering and floors located under access flooring. Apply the sealer-hardener in accordance with manufacturer's recommendations. Seal or cover joints and openings in which joint sealant is to be applied as required by the joint sealant manufacturer. Do not apply the sealer hardener until the concrete has been moist cured and has aged for a minimum of 30 days. Apply a minimum of two coats of sealer-hardener.

3.11.5 Requirements for Type III, High-Early-Strength Portland Cement

The curing periods are required to be not less than one-fourth of those specified for portland cement, but in no case less than 72 hours.

3.11.6 Curing Periods

ACI/MCP-2 except 10 days for retaining walls, pavement or chimneys, 21 days for concrete that is in full-time or intermittent contact with seawater, salt spray, alkali soil or waters. Begin curing immediately after placement. Protect concrete from premature drying, excessively hot temperatures, and mechanical injury; and maintain minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing are subject to approval by the Contracting Officer.

3.11.7 Curing Methods

Accomplish curing by moist curing, by moisture-retaining cover curing, by membrane curing, and by combinations thereof, as specified.

Moist curing:

Accomplish moisture curing by any of the following methods:

Keeping surface of concrete wet by covering with water

Continuous water spraying

Covering concrete surface with specified absorptive cover for curing concrete saturated with water and keeping absorptive cover wet by water spraying or intermittent hosing. Place absorptive cover to provide coverage of concrete surfaces and edges with a slight overlap over adjacent absorptive covers.

Moisture-cover curing:

Accomplish moisture-retaining cover curing by covering concrete surfaces with specified moisture-retaining cover for curing concrete. Place cover directly on concrete in widest practical width, with sides and ends lapped at least 3 inches. Weight cover to prevent displacement; immediately repair tears or holes appearing during curing period by patching with pressure-sensitive, waterproof tape or other approved method.

Membrane curing:

Accomplish membrane curing by applying specified membrane-forming curing compound to damp concrete surfaces as soon as moisture film has disappeared. Apply curing compound uniformly in a two-coat operation by power-spraying equipment using a spray nozzle equipped with a wind guard. Apply second coat in a direction at right angles to direction of first coat. Total coverage for two coats must be not more than 200 square feet per gallon of curing compound. Respray concrete surfaces which are subjected to heavy rainfall within 3 hours after curing compound has been applied by method and at rate specified. Maintain continuity of coating for entire curing period and immediately repair damage to coating during this period.

Membrane-curing compounds must not be used on surfaces that are to be covered with coating material applied directly to concrete or with a covering material bonded to concrete, such as other concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, painting, and other coatings and finish materials.

3.11.8 Curing Formed Surfaces

Accomplish curing of formed surfaces, including undersurfaces of girders, beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed before end of curing period, accomplish final curing of formed surfaces by any of the curing methods specified above, as applicable.

3.11.9 Curing Unformed Surfaces

Accomplish initial curing of unformed surfaces, such as monolithic slabs, floor topping, and other flat surfaces, by membrane curing.

Unless otherwise specified, accomplish final curing of unformed surfaces by any of curing methods specified above, as applicable.

Accomplish final curing of concrete surfaces to receive liquid floor hardener of finish flooring by moisture-retaining cover curing.

3.11.10 Temperature of Concrete During Curing

When temperature of atmosphere is 41 degrees F and below, maintain temperature of concrete at not less than 55 degrees F throughout concrete curing period or 45 degrees F when the curing period is measured by maturity. When necessary, make arrangements before start of concrete placing for heating, covering, insulation, or housing as required to maintain specified temperature and moisture conditions for concrete during curing period.

When the temperature of atmosphere is 80 degrees F and above or during other climatic conditions which cause too rapid drying of concrete, make arrangements before start of concrete placing for installation of wind breaks, of shading, and for fog spraying, wet sprinkling, or moisture-retaining covering of light color as required to protect concrete during curing period.

Changes in temperature of concrete must be uniform and not exceed 37 degrees F in any 1 hour nor 80 degrees F in any 24-hour period.

3.11.11 Protection from Mechanical Injury

During curing period, protect concrete from damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration and from damage caused by rain or running water.

3.11.12 Protection After Curing

Protect finished concrete surfaces from damage by construction operations.

3.12 FIELD QUALITY CONTROL

3.12.1 Sampling

ASTM C 172. Collect samples of fresh concrete to perform tests specified. ASTM C 31/C 31M for making test specimens.

3.12.2 Testing

3.12.2.1 Slump Tests

ASTM C 143/C 143M. Take concrete samples during concrete placement. The maximum slump may be increased as specified with the addition of an approved admixture provided that the water-cement ratio is not exceeded. Perform tests at commencement of concrete placement, when test cylinders are made, and for each batch (minimum) or every 20 cubic yards (maximum) of concrete.

3.12.2.2 Temperature Tests

Test the concrete delivered and the concrete in the forms. Perform tests in hot or cold weather conditions (below 50 degrees F and above 80 degrees F) for each batch (minimum) or every 20 cubic yards (maximum) of concrete, until the specified temperature is obtained, and whenever test cylinders and slump tests are made.

3.12.2.3 Compressive Strength Tests

ASTM C 39/C 39M. Make five test cylinders for each set of tests in

accordance with ASTM C 31/C 31M. Take precautions to prevent evaporation and loss of water from the specimen. Test two cylinders at 7 days, two cylinders at 28 days, and hold one cylinder in reserve. Take samples for strength tests of each mix design of concrete placed each day not less than once a day, nor less than once for each 160 cubic yards of concrete, nor less than once for each 5400 square feet of surface area for slabs or walls. For the entire project, take no less than five sets of samples and perform strength tests for each mix design of concrete placed. Each strength test result must be the average of two cylinders from the same concrete sample tested at 28 days. If the average of any three consecutive strength test results is less than f'c or if any strength test result falls below f'c by more than 450 psi, take a minimum of three ASTM C 42/C 42M core samples from the in-place work represented by the low test cylinder results and test. Concrete represented by core test is considered structurally adequate if the average of three cores is equal to at least 85 percent of f'c and if no single core is less than 75 percent of f'c. Retest locations represented by erratic core strengths. Remove concrete not meeting strength criteria and provide new acceptable concrete. Repair core holes with nonshrink grout. Match color and finish of adjacent concrete.

3.12.2.4 Air Content

ASTM C 173/C 173M or ASTM C 231 for normal weight concrete. Test air-entrained concrete for air content at the same frequency as specified for slump tests.

3.12.2.5 Strength of Concrete Structure

Compliance with the following is considered deficient if it fails to meet the requirements which control strength of structure in place, including following conditions:

Failure to meet compressive strength tests as evaluated

Reinforcement not conforming to requirements specified

Concrete which differs from required dimensions or location in such a manner as to reduce strength

Concrete curing and protection of concrete against extremes of temperature during curing, not conforming to requirements specified

Concrete subjected to damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration

Poor workmanship likely to result in deficient strength

3.12.2.6 Testing Concrete Structure for Strength

When there is evidence that strength of concrete structure in place does not meet specification requirements, make cores drilled from hardened concrete for compressive strength determination in accordance with ASTM C 42/C 42M, and as follows:

Take at least three representative cores from each member or area of concrete-in-place that is considered potentially deficient. Location of cores will be determined by the Contracting Officer.

Test cores after moisture conditioning in accordance with ASTM C 42/C 42M if concrete they represent is more than superficially wet under service.

Air dry cores, (60 to 80 degrees F with relative humidity less than 60 percent) for 7 days before test and test dry if concrete they represent is dry under service conditions.

Strength of cores from each member or area are considered satisfactory if their average is equal to or greater than 85 percent of the 28-day design compressive strength of the class of concrete.

Core specimens will be taken and tested by the Government. If the results of core-boring tests indicate that the concrete as placed does not conform to the drawings and specification, the cost of such tests and restoration required must be borne by the Contractor.

Fill core holes solid with patching mortar and finished to match adjacent concrete surfaces.

Correct concrete work that is found inadequate by core tests in a manner approved by the Contracting Officer.

3.13 WASTE MANAGEMENT

As specified in the Waste Management Plan and as follows.

3.13.1 Mixing Equipment

Before concrete pours, designate for cleaning out concrete mixing trucks. Minimize water used to wash equipment.

3.13.2 Hardened, Cured Waste Concrete

Use hardened, cured waste concrete as aggregate in concrete mix if approved by Contracting Officer.

3.13.3 Reinforcing Steel

Collect reinforcing steel and place in designated area for recycling.

3.13.4 Other Waste

Identify concrete manufacturer's or supplier's policy for collection or return of construction waste, unused material, deconstruction waste, and/or packaging material. Return excess cement to supplier.

3.14 JOINTS

3.14.1 Construction Joints

Make and locate joints not indicated so as not to impair strength and appearance of the structure, as approved. Locate construction joints as follows:

a. In walls at not more than 60 feet in any horizontal direction; at top of footing; at top of slabs on ground; at top and bottom of door and window openings or where required to conform to architectural details; and at underside of deepest beam or girder framing into wall

b. In columns or piers, at top of footing; at top of slabs on ground; and at underside of deepest beam or girder framing into column or pier

c. Near midpoint of spans for supported slabs, beams, and girders unless a beam intersects a girder at the center, in which case construction joints in girder must offset a distance equal to twice the width of the beam. Make transfer of shear through construction joint by use of inclined reinforcement.

d. In slabs on ground, so as to divide slab into areas not in excess of 1,200 square feet

Provide keyways at least 1-1/2-inches deep in construction joints in walls and slabs and between walls and footings; approved bulkheads may be used for slabs.

Joints must be perpendicular to main reinforcement. Reinforcement must be continued across construction joints.

3.14.2 Isolation Joints in Slabs on Ground

Provide joints at points of contact between slabs on ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated.

Fill joints with premolded joint filler strips 1/2 inch thick, extending full slab depth. Install filler strips at proper level below finish floor elevation with a slightly tapered, dress-and-oiled wood strip temporarily secured to top of filler strip to form a groove not less than 3/4 inch in depth where joint is sealed with sealing compound and not less than 1/4 inch in depth where joint sealing is not required. Remove wood strip after concrete has set. Contractor must clean groove of foreign matter and loose particles after surface has dried.

3.14.3 Control Joints in Slabs on Ground

Provide joints to form panels as indicated.

Under and on exact line of each control joint, cut 50 percent of welded wire fabric reinforcement before placing concrete.

Joints must be 1/8-inch wide by 1/5 to 1/4 of slab depth and formed by inserting hand-pressed fiberboard strip into fresh concrete until top surface of strip is flush with slab surface or by cutting the concrete with a saw after the concrete has set. After concrete has cured for at least 7 days, the Contractor must remove inserts and clean groove of foreign matter and loose particles.

3.14.4 Sealing Joints in Slabs on Ground

Isolation and control joints which are to receive finish flooring material must be sealed with joint sealing compound after concrete curing period. Slightly underfill groove with joint sealing compound to prevent extrusion of compound. Remove excess material as soon after sealing as possible.

Sealing is not required for isolation and control joints to be covered with finish flooring material. Groove must be left ready to receive filling material that is provided as part of finish floor covering work.

3.15 INSTALLATION OF ANCHORAGE DEVICES

3.15.1 General

Anchorage devices and embedded items required for other work that is attached to, or supported by, set and build in cast-in-place concrete as part of the work of this section, using setting drawings, instructions, and directions for work to be attached thereto.

3.15.2 Placing Anchorage Devices

Anchorage devices and embedded items must be positioned accurately and supported against displacement. Fill openings in anchorage devices such as slots and threaded holes with an approved, removable material to prevent entry of concrete into openings.

3.16 CONCRETE CONVEYING

3.16.1 Transfer of Concrete At Project Site

Handle concrete from point of delivery and transfer to concrete conveying equipment and to locations of final deposit as rapidly as practical by methods which prevent segregation and loss of concrete mix materials.

3.16.2 Mechanical Equipment for Conveying Concrete

Equipment must ensure a continuous flow of concrete at delivery end, as approved. Provide runways for wheeled concrete-conveying equipment from concrete delivery point to locations of final deposit. Interior surfaces of concrete conveying equipment must be free of hardened concrete, debris, water, snow, ice, and other deleterious substances.

-- End of Section --

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SECTION 05 12 00

STRUCTURAL STEEL
10/07

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 201-06	(2006) AISC Certification Program for Structural Steel Fabricators
AISC 317	(1992; Reprint 1999) ASD Manual of Steel Construction, Vol II: Connections
AISC 325	(2005) Manual of Steel Construction
AISC 326	(2002) Detailing for Steel Construction
AISC 348	(2000) Structural Joints Using ASTM A325 or A490 Bolts
AISC 360	(2005) Specification for Structural Steel Buildings, with Commentary

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(2007) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS D1.1/D1.1M	(2008; Errata 2009) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME B46.1	(2002) Surface Texture (Surface Roughness, Waviness and Lay)

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M	(2009) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 307	(2007b) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength

ASTM A 325	(2009) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 36/A 36M	(2008) Standard Specification for Carbon Structural Steel
ASTM A 490	(2008b) Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
ASTM A 500/A 500M	(2007) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 563	(2007a) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A 6/A 6M	(2009) Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM A 780/A 780M	(2001; R 2006) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A 992/A 992M	(2006a) Standard Specification for Structural Steel Shapes
ASTM C 1107/C 1107M	(2008) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C 827	(2001a; R 2005) Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures
ASTM F 1554	(2007a)Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
ASTM F 436	(2009) Hardened Steel Washers
ASTM F 844	(2007a) Washers, Steel, Plain (Flat), Unhardened for General Use

1.2 SYSTEM DESCRIPTION

Provide the structural steel system, including galvanizing, complete and ready for use. Structural steel systems including design, materials, installation, workmanship, fabrication, assembly, erection, inspection, quality control, and testing shall be provided in accordance with AISC 325 and AISC 317 except as modified in this contract.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fabrication drawings including description of connections; G

SD-03 Product Data

Welding electrodes and rods

Non-Shrink Grout

SD-06 Test Reports

Bolts, nuts, and washers

Supply the certified manufacturer's mill reports which clearly show the applicable ASTM mechanical and chemical requirements together with the actual test results for the supplied fasteners.

SD-07 Certificates

Steel

Bolts, nuts, and washers

Galvanizing

AISC Quality Certification

Welding procedures and qualifications

1.4 AISC QUALITY CERTIFICATION

Work shall be fabricated in an AISC certified Category Sbd fabrication plant.

1.5 QUALITY ASSURANCE

1.5.1 Drawing Requirements

Submit fabrication drawings for approval prior to fabrication. Prepare in accordance with AISC 326, AISC 325 and AISC 317. Fabrication drawings shall not be reproductions of contract drawings. Sign and seal fabrication drawings by a professional engineer registered in the State where the project is located. Include complete information for the fabrication and erection of the structure's components, including the location, type, and size of bolts, welds, member sizes and lengths, connection details, blocks, copes, and cuts. Use AWS A2.4 standard welding symbols. Shoring and temporary bracing shall be designed and sealed by a registered professional engineer and submitted for record purposes, as part of the drawings. Member substitutions of details shown on the contract drawings shall be clearly highlighted on the fabrication drawings. Explain the reasons for any deviations from the contract drawings.

1.5.2 Certifications

1.5.2.1 Welding Procedures and Qualifications

Prior to welding, submit certification for each welder stating the type of

welding and positions qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualification tests. If the qualification date of the welding operator is more than one-year old, the welding operator's qualification certificate shall be accompanied by a current certificate by the welder attesting to the fact that he has been engaged in welding since the date of certification, with no break in welding service greater than 6 months.

Conform to all requirements specified in AWS D1.1/D1.1M.

PART 2 PRODUCTS

2.1 STEEL

2.1.1 Structural Steel

ASTM A 36/A 36M.

2.1.2 Structural Shapes for Use in Building Framing

Wide flange shapes, ASTM A 992/A 992M.

2.1.3 Structural Steel Tubing

ASTM A 500/A 500M, Grade B.

2.2 BOLTS, NUTS, AND WASHERS

Provide the following unless indicated otherwise.

2.2.1 Structural Steel

2.2.1.1 Bolts

ASTM A 307, Grade A; ASTM A 325, Type 1. The bolt heads and the nuts of the supplied fasteners must be marked with the manufacturer's identification mark, the strength grade and type specified by ASTM specifications.

2.2.1.2 Nuts

ASTM A 563, Grade and Style for applicable ASTM bolt standard recommended.

2.2.1.3 Washers

ASTM F 844 washers for ASTM A 307 bolts, and ASTM F 436 washers for ASTM A 325 and ASTM A 490 bolts.

2.2.2 High-Strength Structural Steel

2.2.2.1 Bolts

ASTM A 325, Type 1 or 2.

2.2.2.2 Nuts

ASTM A 563, Grade and Style as specified in the applicable ASTM bolt standard.

2.2.2.3 Washers

ASTM F 436.

2.2.3 Weathering Structural Steel

2.2.3.1 Bolts

ASTM A 325, Type 3; ASTM A 490, Type 3.

2.2.3.2 Nuts

ASTM A 563, heavy hex style, Grade DH3, except Grade C3 may be furnished for ASTM A 325 bolts.

2.2.3.3 Washers

ASTM F 436.

2.2.4 Foundation Anchorage

2.2.4.1 Anchor Bolts

ASTM F 1554.

2.2.4.2 Anchor Nuts

ASTM A 563, Grade A, hex style.

2.2.4.3 Anchor Washers

ASTM F 844.

2.3 STRUCTURAL STEEL ACCESSORIES

2.3.1 Welding Electrodes and Rods

AWS D1.1/D1.1M.

2.3.2 Non-Shrink Grout

ASTM C 1107/C 1107M, with no ASTM C 827 shrinkage. Grout shall be nonmetallic.

2.4 GALVANIZING

All structural steel and fasteners shall be galvanized per ASTM A 123/A 123M or ASTM A 153/A 153M. Unless specified otherwise, galvanize after fabrication where practicable.

2.5 FABRICATION

2.5.1 Markings

Prior to erection, members shall be identified by a painted erection mark. Connecting parts assembled in the shop for reaming holes in field connections shall be match marked with scratch and notch marks. Do not locate erection markings on areas to be welded. Do not locate match markings in areas that will decrease member strength or cause stress

concentrations.

2.5.2 Surface Finishes

ASME B46.1 maximum surface roughness of 125 for pin, pinholes, and sliding bearings, unless indicated otherwise.

2.6 DRAINAGE HOLES

Adequate drainage holes shall be drilled to eliminate water traps. Hole diameter shall be 1/2 inch and location shall be indicated on the detail drawings. Hole size and location shall not affect the structural integrity.

PART 3 EXECUTION

3.1 FABRICATION

Fabrication shall be in accordance with the applicable provisions of AISC 325. Fabrication and assembly shall be done in the shop to the greatest extent possible. The fabricating plant shall be certified under the AISC 201-06 for structural steelwork.

Compression joints depending on contact bearing shall have a surface roughness not in excess of 500 micro inch as determined by ASME B46.1, and ends shall be square within the tolerances for milled ends specified in ASTM A 6/A 6M.

Shop splices of members between field splices will be permitted only where indicated on the Contract Drawings. Splices not indicated require the approval of the Contracting Officer.

3.2 INSTALLATION

3.3 ERECTION

a. Erection of structural steel, except as indicated in item b. below, shall be in accordance with the applicable provisions of AISC 325. Erection plan shall be reviewed, stamped and sealed by a licensed structural engineer.

Provide for drainage in structural steel. After final positioning of steel members, provide full bearing under base plates and bearing plates using nonshrink grout. Place nonshrink grout in accordance with the manufacturer's instructions.

3.3.1 STORAGE

Material shall be stored out of contact with the ground in such manner and location as will minimize deterioration.

3.4 CONNECTIONS

Except as modified in this section, connections not detailed shall be designed in accordance with AISC 360. Build connections into existing work. Do not tighten anchor bolts set in concrete with impact torque wrenches. Punch, subpunch and ream, or drill bolt holes perpendicular to the surface of the member. Holes shall not be cut or enlarged by burning. Bolts, nuts, and washers shall be clean of dirt and rust, and lubricated immediately prior to installation.

3.4.1 Common Grade Bolts

ASTM A 307 bolts shall be tightened to a "snug tight" fit. "Snug tight" is the tightness that exists when plies in a joint are in firm contact. If firm contact of joint plies cannot be obtained with a few impacts of an impact wrench, or the full effort of a man using a spud wrench, contact the Contracting Officer for further instructions.

3.4.2 High-Strength Bolts

ASTM A 325 and ASTM A 490 bolts shall be fully tensioned to 70 percent of their minimum tensile strength. Bolts shall be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, bolts shall then be fully tensioned, progressing from the most rigid part of a connection to the free edges.

3.5 GAS CUTTING

Use of gas-cutting torch in the field for correcting fabrication errors will not be permitted on any major member in the structural framing. Use of a gas cutting torch will be permitted on minor members not under stress only after approval has been obtained from the Contracting Officers.

3.6 WELDING

AWS D1.1/D1.1M. Grind exposed welds smooth as indicated. Provide AWS D1.1/D1.1M qualified welders, welding operators, and tackers.

The Contractor shall develop and submit the Welding Procedure Specifications (WPS) for all welding, including welding done using prequalified procedures. Prequalified procedures may be submitted for information only; however, procedures that are not prequalified shall be submitted for approval.

3.6.1 Removal of Temporary Welds, Run-Off Plates, and Backing Strips

Remove only from finished areas.

3.7 GALVANIZING REPAIR

Provide as indicated or specified. Galvanize after fabrication where practicable. Repair damage to galvanized coatings using ASTM A 780/A 780M zinc rich paint for galvanizing damaged by handling, transporting, cutting, welding, or bolting. Do not heat surfaces to which repair paint has been applied.

3.8 FIELD QUALITY CONTROL

Perform field tests, and provide labor, equipment, and incidentals required for testing. The Contracting Officer shall be notified in writing of defective welds, bolts, nuts, and washers within 7 working days of the date of weld inspection.

3.8.1 Welds

3.8.1.1 Visual Inspection

AWS D1.1/D1.1M. Furnish the services of AWS-certified welding inspectors

for fabrication and erection inspection and testing and verification inspections. Welding inspectors shall visually inspect and mark welds, including fillet weld end returns.

3.8.1.2 Nondestructive Testing

AWS D1.1/D1.1M. Test locations shall be selected by the Contracting Officer. If more than 20 percent of welds made by a welder contain defects identified by testing, then all welds made by that welder shall be tested by radiographic or ultrasonic testing, as approved by the Contracting Officer. When all welds made by an individual welder are required to be tested, magnetic particle testing shall be used only in areas inaccessible to either radiographic or ultrasonic testing. Retest defective areas after repair.

3.8.2 High-Strength Bolts

3.8.2.1 Testing Bolt, Nut, and Washer Assemblies

Test a minimum of 3 bolt, nut, and washer assemblies from each mill certificate batch in a tension measuring device at the job site prior to the beginning of bolting start-up. Demonstrate that the bolts and nuts, when used together, can develop tension not less than the provisions specified in AISC 348, Table 4, depending on bolt size and grade. The bolt tension shall be developed by tightening the nut. A representative of the manufacturer or supplier shall be present to ensure that the fasteners are properly used, and to demonstrate that the fastener assemblies supplied satisfy the specified requirements.

3.8.2.2 Inspection

Inspection procedures shall be in accordance with AISC 348, Section 9. Confirm and report to the Contracting Officer that the materials meet the project specification and that they are properly stored. Confirm that the faying surfaces have been properly prepared before the connections are assembled. Observe the specified job site testing and calibration, and confirm that the procedure to be used provides the required tension. Monitor the work to ensure the testing procedures are routinely followed on joints that are specified to be fully tensioned.

The Contractor shall inspect high-strength bolted connections in accordance with AISC 317.

3.8.2.3 Testing

The Government has the option to perform nondestructive tests on 5 percent of the installed bolts to verify compliance with pre-load bolt tension requirements. The nondestructive testing will be done in-place using an ultrasonic measuring device or any other device capable of determining in-place pre-load bolt tension. The test locations shall be selected by the Contracting Officer. If more than 10 percent of the bolts tested contain defects identified by testing, then all bolts used from the batch from which the tested bolts were taken, shall be tested. Retest new bolts after installation.

-- End of Section --

SECTION 05 21 19

OPEN WEB STEEL JOIST FRAMING
07/07

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WELDING SOCIETY (AWS)

AWS B2.1/B2.1M	(2009) Welding Procedure and Performance Qualification
AWS D1.1/D1.1M	(2008; Errata 2009) Structural Welding Code - Steel

STEEL JOIST INSTITUTE (SJI)

SJI 279167 SPECS/LOADS	(2006) 42nd Edition Standard Specifications and Load Tables for Steel Joists and Joist Girders
SJI MANUAL	(2003) 75 Year Manual, 1928-2003
SJI TD 10	(2003) Technical Digest for the Design of Fire Resistive Assemblies with Steel Joists
SJI TD 8	(1983) Technical Digest for the Welding of Open Web Steel Joists
SJI TD 9	(2006) Technical Digest for the Handling and Erection of Steel Joists and Joist Girders

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

29 CFR 1910.1200	Hazard Communication
29 CFR 1926	Safety and Health Regulations for Construction
29 CFR 1926.757	Steel Erection; Open Web Steel Joists

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Welder qualification

Material Safety Data Sheet (MSDS) per OSHA 1910.1200

SD-02 Shop Drawings

Steel joist framing; G

SD-06 Test Reports

Erection inspection

Welding inspections

SD-07 Certificates

Accessories

Certification of Compliance

1.3 REGULATORY REQUIREMENT

All joist girder framing must conform to 29 CFR 1926.757. Secure all joist bridging and anchoring in place prior to the application of any construction loads. Distribute temporary loads so that joist capacity is not exceeded. Do not apply loads to bridging.

1.4 DELIVERY AND STORAGE

Handle, transport, and store joists in a manner to prevent damage affecting their structural integrity. Store all items off the ground in a well drained location protected from the weather and easily accessible for inspection and handling.

1.5 QUALITY ASSURANCE

All work must comply with the requirements set forth in 29 CFR 1926.

1.5.1 Drawing Requirements

Submit steel joist framing drawings. Show joist type and size, layout in plan, and erection details including methods of anchoring, framing at openings, type and spacing of bridging, requirements for field welding, and details of accessories as applicable.

1.5.2 Certification of Compliance

Prior to construction commencement, submit Material Safety Data Sheetper 29 CFR 1910.1200 for steel joists , and certification for welder qualification, compliance with AWS B2.1/B2.1M, welding operation, and tacker, stating the type of welding and positions qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualification tests.

Submit certification of compliance for the following:
SJI MANUAL
SJI TD 8
SJI TD 9
SJI TD 10
29 CFR 1926
29 CFR 1926.757

PART 2 PRODUCTS

2.1 JOISTS AND ACCESSORIES

Provide design data from SJI 279167 SPECS/LOADS for the joist series indicated.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Handling and Erection

Conform to SJI 279167 SPECS/LOADS for the joist series indicated.

3.1.2 Welding

All welding must conform to AWS B2.1/B2.1M and AWS D1.1/D1.1M.

3.2 VISUAL INSPECTIONS

3.2.1 Erection Inspection

AWS D1.1/D1.1M, Section 6. Perform erection inspection and field welding inspections with AWS certified welding inspectors. Welding inspectors must visually inspect and mark welds.

-- End of Section --

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SECTION 05 30 00

STEEL DECKS
07/06

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 360	(2005) Specification for Structural Steel Buildings, with Commentary

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG-913	(1991) LRFD Cold-formed Steel Design Manual
AISI SG03-3	(2002) Cold-Formed Steel Design Manual Set

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2008; Errata 2009) Structural Welding Code - Steel
AWS D1.3/D1.3M	(2008; Errata 2008) Structural Welding Code - Sheet Steel

ASTM INTERNATIONAL (ASTM)

ASTM A 1008/A 1008M	(2009) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened
ASTM A 108	(2007) Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
ASTM A 123/A 123M	(2009) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 36/A 36M	(2008) Standard Specification for Carbon Structural Steel
ASTM A 653/A 653M	(2009) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 780	(2001; R 2006) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

ASTM A 792/A 792M	(2009) Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

FM GLOBAL (FM)

FM DS 1-28	(2002) Design Wind Loads
FM P7825	(2005) Approval Guide

STEEL DECK INSTITUTE (SDI)

SDI DDMO3	(3rd Edition) Diaphragm Design Manual
SDI DDP	(1987; R 2000) Deck Damage and Penetrations
SDI MOC2	(2006) Manual of Construction with Steel Deck

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-310-01	Load Assumptions for Buildings

UNDERWRITERS LABORATORIES (UL)

UL 209	(2005; Rev thru May 2007) Cellular Metal Floor Raceways and Fittings
UL 580	(2006) Tests for Uplift Resistance of Roof Assemblies
UL Bld Mat Dir	(2009) Building Materials Directory

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fabrication Drawings; G

Ridge and Valley Plates

Metal Closure Strips

SD-03 Product Data

Accessories

Deck Units

Galvanizing Repair Paint

Joint Sealant Material

Mechanical Fasteners
Piston Tool Operator
Welder Qualifications

Welding Equipment

Welding Rods and Accessories
Metal Roof Deck Units

SD-05 Design Dataure Strips

Deck Units

Submit manufacturer's design calculations, or applicable published literature for the structural properties of the proposed deck units.

SD-07 Certificates

. Welding Procedures

Fire Safety

Wind Storm Resistance

1.3 QUALITY ASSURANCE

1.3.1 Deck Units

Furnish deck units and accessory products from a manufacturer regularly engaged in manufacture of steel decking. Provide manufacturer's certificates attesting that the decking material meets the specified requirements.

1.3.2 Certification of Piston Tool Operator

Manufacturer's certificate attesting that the operators are authorized to use the low velocity piston tool.

1.3.3 Qualifications for Welding Work

Follows Welding Procedures in accordance with AWS D1.1/D1.1M. Test specimens shall be made in the presence of Contracting Officer and shall be tested by an approved testing laboratory at the Contractor's expense.

Submit qualified Welder Qualifications in accordance with AWS D1.1/D1.1M, or under an equivalent approved qualification test. Perform tests on test pieces in positions and with clearances equivalent to those actually encountered. If a test weld fails to meet requirements, perform an immediate retest of two test welds until each test weld passes. Failure in the immediate retest will require the welder be retested after further practice or training, performing a complete set of test welds.

Submit manufacturer's catalog data for Welding Equipment and Welding Rods and Accessories.

1.3.4 Regulatory Requirements

1.3.4.1 Fire Safety

Test roof deck as a part of a roof deck construction assembly of the type used for this project, listing as fire classified in the UL Bld Mat Dir, or listing as Class I construction in the FM P7825, and so labeled.

1.3.4.2 Wind Storm Resistance

Provide roof construction assembly capable of withstanding an uplift pressure of 90 pounds per square foot when tested in accordance with the uplift pressure test described in the FM DS 1-28 or as described in UL 580 and in general compliance with UFC 3-310-01.

1.3.5 Fabrication Drawings

Show type and location of units, location and sequence of connections, bearing on supports, methods of anchoring, attachment of accessories, adjusting plate details, size and location of holes to be cut and reinforcement to be provided, the manufacturer's erection instructions and other pertinent details.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver deck units to the site in a dry and undamaged condition. Store and handle steel deck in a manner to protect it from corrosion, deformation, and other types of damage. Do not use decking for storage or as working platform until units have been fastened into position. Exercise care not to damage material or overload decking during construction. Must not exceed the design live load. The maximum uniform distributed storage load. Stack decking on platforms or pallets and cover with weathertight ventilated covering. Elevate one end during storage to provide drainage. Maintain deck finish at all times to prevent formation of rust. Repair deck finish using touch-up paint. Replace damaged material.

1.5 DESIGN REQUIREMENTS FOR ROOF DECKS

1.5.1 Properties of Sections

Properties of metal roof deck sections must comply with engineering design width as limited by the provisions of AISI SG-913.

1.5.2 Allowable Loads

Indicate total uniform dead and live load for detailing purposes.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Steel Sheet

Flat rolled carbon steel sheets of structural quality, thickness not less than 0.034 inch before coating, meeting the requirements of AISI SG03-3, except as modified herein.

2.1.2 Steel Coating

ASTM A 653/A 653M designation G90 galvanized. Apply coating to both sides of sheet. Conform to UL 209 for coating on decking provided as wire raceways.

2.1.3 Galvanized Steel Angles for Roof Decks

Provide hot-rolled carbon steel angles conforming to ASTM A 36/A 36M, merchant quality, Grade Designation SAE/AISI 1023 or SAE/AISI 1025, and hot-dip galvanized in accordance with ASTM A 123/A 123M.

2.1.4 Joint Sealant Material for Roof Decks

Provide a nonskinning, gun-grade, bulk compound material as recommended by the manufacturer.

2.1.5 Galvanizing Repair Paint for Roof Decks

Provide a high zinc-dust content paint for regalvanizing welds in galvanized steel and shall conform to ASTM A 780.

2.1.6 Flexible Closure Strips for Roof Decks

Provide strips made of elastomeric material specified and premolded to the configuration required to provide tight-fitting closures at open ends and sides of steel roof decking.

2.2 ACCESSORIES

Provide accessories of same material as deck, unless specified otherwise. Provide manufacturer's standard type accessories, as specified.

2.2.1 Adjusting Plates

Provide adjusting plates, or segments of deck units, of same thickness and configuration as deck units in locations too narrow to accommodate full size units. Provide factory cut plates of predetermined size where possible.

2.2.2 End Closures

Fabricated of sheet metal by the deck manufacturer. Provide end closures minimum 0.028 inch thick to close open ends at eaves and openings through deck.

2.2.3 Partition Closures

Provide closures for closing voids above interior walls and partitions that are perpendicular to the direction of the configurations.

2.2.4 Sheet Metal Collar

Where deck is cut for passage of pipes, ducts, columns, etc., and deck is to remain exposed, provide a neatly cut sheet metal collar to cover edges of deck. Do not cut deck until after installation of supplemental supports.

2.2.5 Cover Plates

Sheet metal to close panel edge and end conditions, and where panels change direction or butt. Polyethylene-coated, self-adhesive, 2 inch wide joint tape may be provided in lieu of cover plates on flat-surfaced decking butt joints.

Fabricate cover plates for abutting floor deck units from the specified structural-quality steel sheets not less than nominalthick before galvanizing. Provide 6 inch wide cover plates and form to match the contour of the floor deck units.

2.2.6 Column Closures

Sheet metal, minimum 0.0358 inch thick or metal rib lath.

2.2.7 Access Hole Covers

Sheet metal, minimum 0.0474 inch thick.

2.2.8 Shear Connectors

Provide shear connectors as headed stud type, ASTM A 108, Grade 1015 or 1020, cold finished carbon steel with dimensions complying with AISC 360 .

2.2.9 Mechanical Fasteners

Provide mechanical fasteners, such as powder actuated or pneumatically driven fasteners, for anchoring the deck to adjoining units that are designed to meet the loads indicated. Provide positive locking-type fasteners standard with the Steel Deck Institute and the steel deck manufacturer, as approved by the Contracting Officer.

2.2.10 Miscellaneous Accessories

Furnish the manufacturer's standard accessories to complete the deck installation. Furnish metal accessories of the same material as the deck and with the minimum design thickness as follows: saddles, 0.0474 inch; welding washers, 0.0598 inch cant strip, 0.0295 inch other metal accessories, 0.0358 inch unless otherwise indicated. Accessories must include but not be limited to saddles, welding washers, fasteners, cant strips, butt cover plates, underlapping sleeves, and ridge and valley plates.

2.3 FABRICATION

Furnish sample of Metal Roof Deck Units used to illustrate actual cross section dimensions and configurations.

Furnish one sample of each type Flexible Closure Strips, 12 inch long.

2.3.1 Roof Deck

Conform to ASTM A 792/A 792M or ASTM A 1008/A 1008M for deck used in conjunction with insulation and built-up roofing. Fabricate roof deck units of 0.034 inch design thickness or thicker steel and galvanized zinc-coated in conformance with ASTM A 653/A 653M, G90 coating class or aluminum-zinc coated in accordance with ASTM A 792/A 792M Coating Designation AZ55.

2.3.1.1 Ridge and Valley Plates for Roof Decks

Fabricate plates from the specified structural-quality steel sheets, not less than nominal 0.0359 inch thick before galvanizing. Provide plates of minimum 4-1/2 inch wide and bent to provide tight fitting closures at ridges and valleys. Provide a minimum length of ridge and valley plates of 10 feet.

2.3.1.2 Metal Closure Strips for Roof Decks

Fabricate strips from the specified commercial-quality steel sheets not less than nominal 0.0359 inch thick before galvanizing. Provide strips from the configuration required to provide tight-fitting closures at open ends and sides of steel roof decking.

PART 3 EXECUTION

3.1 EXAMINATION

Prior to installation of decking units and accessories, examine worksite to verify that as-built structure will permit installation of decking system without modification.

3.2 INSTALLATION

Install steel deck units in accordance with SDI DDMO3 and approved shop drawings. Place units on structural supports, properly adjusted, leveled, and aligned at right angles to supports before permanently securing in place. Damaged deck and accessories including material which is permanently stained or contaminated, deformed, or with burned holes shall not be installed. Extend deck units over three or more supports unless absolutely impractical. Report inaccuracies in alignment or leveling to the Contracting Officer and make necessary corrections before permanently anchoring deck units. Locate deck ends over supports only. Do not use unanchored deck units as a work or storage platform. Permanently anchor units placed by the end of each working day. Do not support suspended ceilings, light fixtures, ducts, utilities, or other loads by steel deck unless indicated. Distribute loads by appropriate means to prevent damage.

3.2.1 Attachment

Immediately after placement and alignment, and after correcting inaccuracies, permanently fasten steel deck units to structural supports and to adjacent deck units by welding with normal5/8 inch diameter puddle welds as indicated on the design drawings and in accordance with manufacturer's recommended procedure. Clamp or weight deck units to provide firm contact between deck units and structural supports while performing welding. Anchoring the deck to structural supports with powder-actuated fasteners or pneumatically driven fasteners is prohibited. Attachment of adjacent deck units by button-punching is prohibited.

3.2.1.1 Welding

Perform welding in accordance with AWS D1.3/D1.3M using methods and electrodes recommended by the manufacturers of the base metal alloys being used. Ensure only operators previously qualified by tests prescribed in AWS D1.1/D1.1M and AWS D1.3/D1.3M make welds. Immediately recertify, or replace qualified welders, that are producing unsatisfactory welding. Conform to the recommendations of the Steel Deck Institute and the steel

deck manufacturer for location, size, and spacing of fastening. Do use welding washers at the connections of the deck to supports. Do not use welding washers at sidelaps. Holes and similar defects will not be acceptable. Lap 2 inch deck ends. Attach all partial or segments of deck units to structural supports in accordance with Section 2.5 of SDI DDMO3. Attach shear connectors as shown and welded as per AWS D1.1/D1.1M through the steel deck to the steel member. Immediately clean welds by chipping and wire brushing. Heavily coat welds, cut edges and damaged portions of coated finish with zinc-dust paint conforming to ASTM A 780.

3.2.1.2 Fastening

Anchor deck to structural supports and adjoining units with mechanical deck fasteners as indicated. Drive the powder-actuated fasteners with a low-velocity piston tool by an operator authorized by the manufacturer of the piston tool. Drive pneumatically fasteners with a low-velocity fastening tool and comply with the manufacturer's recommendations.

3.2.2 Openings

Cut or drill all holes and openings required and be coordinated with the drawings, specifications, and other trades. Frame and reinforce openings through the deck in conformance with SDI DDP. Reinforce holes and openings 6 to 12 inch across by 0.0474 inch thick steel sheet at least 12 inch wider and longer than the opening and be fastened to the steel deck at each corner of the sheet and at a maximum of 6 inch on center. Reinforce holes and openings larger than 12 inch by steel channels or angles installed perpendicular to the steel joists and supported by the adjacent steel joists. Install steel channels or angles perpendicular to the deck ribs and fasten to the channels or angles perpendicular to the steel joists. Deck manufacturer shall approve holes or openings larger than 6 inch in diameter prior to drilling or cutting. Openings must not interfere with seismic members such as chords and drag struts.

3.2.3 Deck Damage

SDI MOC2, for repair of deck damage.

3.2.4 Accessory Installation

3.2.4.1 Adjusting Plates

Install as shown on shop drawings.

3.2.4.2 End Closures

Provide end closure to close open ends of cells at columns, walls, and openings in deck.

3.2.4.3 Closures Above Partitions

Provide for closing voids between cells over partitions that are perpendicular to direction of cells. Provide a one-piece closure strip for partitions 4 inch nominal or less in thickness and two-piece closure strips for wider partitions.

3.3 JOINT SEALING FOR ROOF DECKS

Seal sidelaps and endlaps with manufacturer's recommended joint sealing

material. Shop or field apply the material. Before applying the sealing material, completely remove dust, dirt, moisture, and other foreign material from the surfaces to which the sealing material is to be applied. Apply sealing material in strict accordance with the sealing material manufacturer's printed instructions.

3.4 CANT STRIPS FOR ROOF DECKS

Provide strips to be fusion welded to surface of roof decking, secured to wood nailers by galvanized screws or to steel framing by galvanized self-tapping screws or welds. Do not exceed spacing of welds and fasteners of 12 inch. Lap end joints a minimum 3 inch and secure with galvanized sheet metal screws spaced a maximum 4 inch on center.

3.5 RIDGE AND VALLEY PLATES FOR ROOF DECKS

Provide plates to be fusion welded to top surface of roof decking. Lap end joints a minimum 3 inch. For valley plates, provide endlaps to be in the direction of water flow.

3.6 CLOSURE STRIPS FOR ROOF DECKS

Provide closure strips at open, uncovered ends and edges of the roof decking and in voids between roof decking and top of walls and partitions where indicated. Install closure strips in position in a manner to provide a weathertight installation.

3.7 ROOF INSULATION SUPPORT FOR ROOF DECKS

Provide metal closure strips for support of roof insulation where rib openings in top surface of metal roof decking occur adjacent to edges and openings. Weld metal closure strips in position.

3.8 CLEANING AND PROTECTION FOR ROOF DECKS

Upon completion of the deck, sweep surfaces clean and prepare for installation of the roofing.

3.9 FIELD QUALITY CONTROL

3.9.1 Decks Not Receiving Concrete

Inspect the decking top surface for distortion after installation. For roof decks not receiving concrete, verify distortion by placing a straight edge across three adjacent top flanges. The maximum allowable gap between the straight edge and the top flanges is 1/16 inch; when gap is more than 1/16 inch, provide corrective measures or replacement. Reinspect decking after performing corrective measures or replacement.

-- End of Section --

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SECTION 05 50 13

MISCELLANEOUS METAL FABRICATIONS
08/08

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.3	(2006) Operations - Safety Requirements for Powder Actuated Fastening Systems

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2008; Errata 2009) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME B18.2.1	(1996; Addenda A 1999; Errata 2003; R 2005) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(1987; R 2005) Standard for Square and Hex Nuts
ASME B18.21.1	(1999; R 2005) Lock Washers (Inch Series)
ASME B18.22.1	(1965; R 2008) Plain Washers
ASME B18.6.2	(1998; R 2005) Slotted Head Cap Screws, Square Head Set Screws, and Slotted Headless Set Screws: Inch Series
ASME B18.6.3	(2003; R 2008) Machine Screws and Machine Screw Nuts

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M	(2009) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 307	(2007b) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength

ASTM A 36/A 36M	(2008) Standard Specification for Carbon Structural Steel
ASTM A 47/A 47M	(1999; R 2004) Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process
ASTM A 500/A 500M	(2007) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 53/A 53M	(2007) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 653/A 653M	(2009) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 687	(1993) Standard Specification for High-Strength Nonheaded Steel Bolts and Studs
ASTM A 780/A 780M	(2001; R 2006) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A 924/A 924M	(2009) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM F 1554	(2007a)Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
ASTM F 1679	(2004e1) Standard Test Method for Using a Variable Incidence Tribometer

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM MBG 531	(2000) Metal Bar Grating Manual

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Floor Gratings and Stair Treads installation drawings; G

Embedded angles and plates, installation drawings; G

Submit templates, erection and installation drawings indicating thickness, type, grade, class of metal, and dimensions. Show construction details, reinforcement, anchorage, and installation with relation to the building construction.

SD-03 Product Data

Floor Gratings and Stair Treads

1.3 QUALIFICATION OF WELDERS

Qualify welders in accordance with AWS D1.1/D1.1M. Use procedures, materials, and equipment of the type required for the work.

1.4 DELIVERY, STORAGE, AND PROTECTION

Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove and replace damaged items with new items.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Structural Carbon Steel

ASTM A 36/A 36M.

2.1.2 Structural Tubing

ASTM A 500/A 500M.

2.1.3 Steel Pipe

ASTM A 53/A 53M, Type E or S, Grade B.

2.1.4 Fittings for Steel Pipe

Standard malleable iron fittings ASTM A 47/A 47M.

2.1.5 Gratings

a. Metal bar type grating NAAMM MBG 531.

2.1.6 Anchor Bolts

ASTM F 1554. Where exposed, shall be of the same material, color, and finish as the metal to which applied.

2.1.6.1 Lag Screws and Bolts

ASME B18.2.1, type and grade best suited for the purpose.

2.1.6.2 Bolts, Nuts, Studs and Rivets

ASME B18.2.2 and ASTM A 687 or ASTM A 307.

2.1.6.3 Powder Driven Fasteners

Follow safety provisions of ASSE/SAFE A10.3.

2.1.6.4 Screws

ASME B18.2.1, ASME B18.6.2, and ASME B18.6.3.

2.1.6.5 Washers

Provide plain washers to conform to ASME B18.22.1. Provide beveled washers for American Standard beams and channels, square or rectangular, tapered in thickness, and smooth. Provide lock washers to conform to ASME B18.21.1.

2.2 FABRICATION FINISHES

2.2.1 Galvanizing

Hot-dip galvanize items specified to be zinc-coated, after fabrication where practicable. Galvanizing: ASTM A 123/A 123M, ASTM A 153/A 153M, ASTM A 653/A 653M or ASTM A 924/A 924M, G90, as applicable.

2.2.2 Galvanize

Anchor bolts, grating fasteners, washers, and parts or devices necessary for proper installation, unless indicated otherwise.

2.2.3 Repair of Zinc-Coated Surfaces

Repair damaged surfaces with galvanizing repair method and paint conforming to ASTM A 780/A 780M or by application of stick or thick paste material specifically designed for repair of galvanizing, as approved by Contracting Officer. Clean areas to be repaired and remove slag from welds. Heat surfaces to which stick or paste material is applied, with a torch to a temperature sufficient to melt the metallics in stick or paste; spread molten material uniformly over surfaces to be coated and wipe off excess material.

2.3 FLOOR GRATINGS AND STAIR TREADS

Design steel grating and stair treadsin accordance with NAAMM MBG 531 for bar type grating and stair treads. Galvanize steel floor gratings.

a. NAAMM MBG 531, band ends of gratings with bars of the same or greater thickness than the metal used for grating. Weld banding bars to the bearing bars or channels at least every fourth bar or channel and in every corner. Tack weld intervening bars or channels. Band diagonal or round cuts by welding bars of the same or greater thickness metal used for grating in accordance with the manufacturer's standard for trim.

b. Attach gratings to structural members with welded-on anchors. Attach stair treads to stringer with bouted carrier plates or angle. Provide stair tread with checkered nose plate.

c. Slip resistance requirements must exceed both wet and dry a static coefficient of friction of 0.5 as tested in accordance with ASTM F 1679.

2.4 MISCELLANEOUS PLATES AND SHAPES

Provide angles and plates, ASTM A 36/A 36M, for embedment as indicated. Galvanize embedded items exposed to the elements according to ASTM A 123/A 123M.

2.5 PIPE HANDRAILS AND POSTS

a. Provide steel pipe, ASTM A53 Gr B, for handrail and posts. Pipe diameter should be 38 diameter. and fabricated to dimensions indicated on drawings. Posts should be spaced at 1500 oc maximum.

b. Shop fabricate sections of handrail to greatest extent possible. Galvanize handrail and posts.

c. Connections of handrail should be able to resist a distributed load of 270 kg/m or 225 kg concentrated load at point along rail.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Install items at locations indicated, according to manufacturer's instructions. Verify all measurements and take all field measurements necessary before fabrication. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and harmonize with the material to which fastenings are applied. Include materials and parts necessary to complete each item, even though such work is not definitely shown or specified. Poor matching of holes for fasteners shall be cause for rejection. Conceal fastenings where practicable. Thickness of metal and details of assembly and supports shall provide strength and stiffness. Form joints exposed to the weather shall be formed to exclude water. Items listed below require additional procedures.

3.2 WORKMANSHIP

Provide miscellaneous metalwork that is well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Provide continuous welding along the entire area of contact except where tack welding is permitted. Do not tack weld exposed connections of work in place and ground smooth. Provide a smooth finish on exposed surfaces of work in place and unless otherwise approved, flush exposed riveting. Mill joints where tight fits are required. Corner joints shall be coped or mitered, well formed, and in true alignment. Accurately set work to established lines and elevations and securely fastened in place. Install in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

3.3 ANCHORAGE, FASTENINGS, AND CONNECTIONS

Provide anchorage where necessary for fastening miscellaneous metal items securely in place. Include for anchorage not otherwise specified or indicated slotted inserts, expansion shields, and powder-driven fasteners, when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; through bolts, lag bolts, and screws for wood. Do not use wood plugs in any material. Provide non-ferrous attachments for non-ferrous metal. Make exposed fastenings of compatible materials, generally matching in color and finish, to which fastenings are applied. Conceal fastenings where practicable.

3.4 BUILT-IN WORK

Form for anchorage metal work built-in with concrete or masonry, or provide with suitable anchoring devices as indicated or as required. Furnish metal work in ample time for securing in place as the work progresses.

3.5 WELDING

Perform welding, welding inspection, and corrective welding, in accordance with AWS D1.1/D1.1M. Use continuous welds on all exposed connections. Grind visible welds smooth in the finished installation.

3.6 FINISHES

3.6.1 Field Preparation

Remove rust preventive coating just prior to field erection, using a remover approved by the rust preventive manufacturer. Surfaces, when assembled, shall be free of rust, grease, dirt and other foreign matter.

3.6.2 Environmental Conditions

Do not clean or paint surface when damp or exposed to foggy or rainy weather, when metallic surface temperature is less than 5 degrees F above the dew point of the surrounding air, or when surface temperature is below 45 degrees F or over 95 degrees F, unless approved by the Contracting Officer.

-- End of Section --

SECTION 07 61 14.00 20

STEEL STANDING SEAM ROOFING
08/08

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG03-3	(2002) Cold-Formed Steel Design Manual Set

ASTM INTERNATIONAL (ASTM)

ASTM A 1008/A 1008M	(2009) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened
ASTM A 36/A 36M	(2008) Standard Specification for Carbon Structural Steel
ASTM A 366/A 366M	(1997e1) Standard Specification for Commercial Steel, Sheet, Carbon,(0.15 Maximum Percent Cold-Rolled
ASTM A 570/A 570M	(1998) Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled
ASTM A 653/A 653M	(2009) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 792/A 792M	(2009) Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
ASTM B 117	(2007a) Standing Practice for Operating Salt Spray (Fog) Apparatus
ASTM D 1654	(2008) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D 2247	(2002) Testing Water Resistance of Coatings in 100% Relative Humidity
ASTM D 4214	(2007) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films

ASTM D 522	(1993a; R 2008) Mandrel Bend Test of Attached Organic Coatings
ASTM D 523	(2008) Standard Test Method for Specular Gloss
ASTM D 714	(2002e1) Evaluating Degree of Blistering of Paints
ASTM D 968	(2005e1) Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM E 1592	(2005) Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
ASTM G 23	(1996) Operating Light-Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1793	(2006) Architectural Sheet Metal Manual, Sixth Edition, Second Printing

1.2 DEFINITIONS

1.2.1 Field-Formed Seam

Seams of panels so configured that when adjacent sheets are installed the seam is sealed utilizing mechanical or hand seamers. Crimped (45 degree bend), roll formed (180 degree bend), double roll formed (2 - 180 degree bends), and roll and lock systems are types of field-formed seam systems.

1.2.2 Snap Together Seam

Panels so configured that the male and female portions of the seam interlock through the application of foot pressure or tamping with a mallet. Snap-on cap configurations are a type of snap together system.

1.2.3 Pre-Formed

Formed to the final, less field-formed seam, profile and configuration in the factory.

1.2.4 Field-Formed

Formed to the final, less field-formed seam, profile and configuration at the site of work prior to installation.

1.2.5 Roofing System

The roofing system is defined as the assembly of roofing components, including roofing panels, flashing, fasteners, and accessories which, when assembled properly result in a watertight installation.

1.3 SYSTEM DESCRIPTION

1.3.1 Design Requirements

a. Panels shall be continuous lengths up to manufacturer's standard longest lengths, with no joints or seams, except where indicated or specified. Ribs of adjoining sheets shall be in continuous contact from eave to ridge. Individual panels of snap together type systems shall be removable for replacement of damaged material.

b. There shall be no exposed or penetrating fasteners except where shown on approved shop drawings. Fasteners into steel shall be stainless steel, zinc cast head, or cadmium plated steel screws inserted into predrilled holes. There shall be a minimum of two fasteners per clip. Single fasteners will be allowed when supporting structural members are prepunched or predrilled.

c. Snap together type systems shall have a capillary break and a positive side lap locking device. Field-formed seam type systems shall be mechanically locked closed by the manufacturer's locking tool. The seam shall include a continuous factory applied sealant when required by the manufacturer to withstand the wind loads specified.

d. Roof panel anchor clips shall be concealed and designed to allow for longitudinal thermal movement of the panels, except where specific fixed points are indicated. Provide for lateral thermal movement in panel configuration or with clips designed for lateral and longitudinal movement.

1.3.2 Design Conditions

The system shall be designed to resist positive and negative loads specified herein in accordance with the AISI SG03-3. Panels shall support walking loads without permanent distortion or telegraphing of the structural supports.

1.3.2.1 Wind Uplift

The design uplift pressures for the roof system shall be computed and applied using a basic wind speed of miles per hour (mph). Roof system and attachments shall resist the following wind loads, in pounds per square foot (psf):

	Negative
a. All areas	2.0

The design uplift force for each connection assembly shall be that pressure given for the area under consideration, multiplied by the tributary load area of the connection assembly, and multiplied by the appropriate factor of safety, as follows:

a. Single fastener in a connection: 3.0

b. Two or more fasteners in each connection: 2.25

1.3.2.2 Roof Live Loads

Loads shall be applied on the horizontal projection of the roof structure. The minimum roof design live load shall be 20 psf.

1.3.2.3 Thermal Movement

System shall be capable of withstanding thermal movement based on a temperature range of 10 degrees F below 0 degrees F and 140 degrees F.

1.3.2.4 Deflection

Panels shall be capable of supporting design loads between unsupported spans with deflection of not greater than L/240 of the span.

1.3.3 Structural Performance

The structural performance test methods and requirements of the Standing Seam Roofing Systems (SSRS) shall be in accordance with ASTM E 1592.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Roofing; G

Submit roofing drawings to supplement the instructions and diagrams. Drawings shall include design and erection drawings containing an isometric view of the roof showing the design uplift pressures and dimensions of edge, ridge and corner zones; and show typical and special conditions including flashings, materials and thickness, dimensions, fixing lines, anchoring methods, sealant locations, sealant tape locations, fastener layout, sizes, and spacing, terminations, penetrations, attachments, and provisions for thermal movement. Details of installation shall be in accordance with the manufacturer's Standard Instructions and details or the SMACNA 1793. Prior to submitting shop drawings, have drawings reviewed and approved by the manufacturer's technical engineering department.

SD-03 Product Data

Roofing panels; G

Attachment clips

Closures

Accessories

Fasteners

Sealants

Sample warranty certificate; G

Submit for materials to be provided. Submit data sufficient to indicate conformance to specified requirements.

SD-04 Samples

Roofing panel

Submit a 12 inch long by full width section of typical panel.

Accessories

Submit each type of accessory item used in the project including, but not limited to each type of anchor clip, closure, fastener, and leg clamp.

Sealants

Intermediate Support Section

Submit full size samples of each intermediate support section, 12 inches long.

SD-05 Design Data

Design calculations; G

SD-06 Test Reports

Field Inspection; G

Submit manufacturer's technical representative's field inspection reports as specified in paragraph entitled "Manufacturer's Field Inspection."

Structural performance tests

Finish tests

SD-07 Certificates

Manufacturer's Technical Representative's Qualifications

Statement of Installer's Qualifications

Submit documentation from roofing manufacturer proving the manufacturer's technical representative meets below specified requirements. Include name, address, telephone number, and experience record.

Submit documentation proving the installer is factory-trained, has the specified experience, and authorized by the manufacturer to install the products specified.

SD-08 Manufacturer's Instructions

Installation manual; G

Submit manufacturers printed installation manual, instructions, and standard details.

SD-11 Closeout Submittals

Information card

For each roofing installation, submit a typewritten card or photoengraved aluminum card containing the information listed on Form 1 located at the end of this section.

1.5 DESIGN CALCULATIONS

Provide design calculations prepared by a professional engineer specializing in structural engineering verifying that system supplied and any additional framing meets design load criteria indicated. Coordinate calculations with manufacturer's test results. Include calculations for:

Wind load uplift design pressure at roof locations specified in paragraph entitled "Wind Uplift."

Clip spacing and allowable load per clip.

Fastening of clips to structure or intermediate supports.

Intermediate support spacing and framing and fastening to structure when required.

Allowable panel span at anchorage spacing indicated.

Safety factor used in design loading.

Governing code requirements or criteria.

Edge and termination details.

1.6 QUALITY ASSURANCE

1.6.1 Preroofing Conference

After submittals are received and approved but before roofing work, including associated work, is preformed, the Contracting Officer will hold a preroofing conference to review the following:

a. The drawings and specifications

b. Procedure for on site inspection and acceptance of the roofing substrate and pertinent structural details relating to the roofing system

c. Contractor's plan for coordination of the work of the various trades involved in providing the roofing system and other components secured to the roofing

d. Safety requirements

The preroofing conference shall be attended by the Contractor and personnel directly responsible for the roofing installation, mechanical and electrical work, and the roofing manufacturer's technical representative. Conflicts

among those attending the preroofing conference shall be resolved and confirmed in writing before roofing work, including associated work, is begun. Prepare written minutes of the preroofing conference and submit to the Contracting Officer.

1.6.2 Manufacturer

The SSMRS shall be the product of a metal roofing industry - recognized manufacturer who has been in the practice of manufacturing SSMRS for a period of not less than 5 years and who has been involved in at least 5 projects similar in size and complexity to this project.

1.6.3 Manufacturer's Technical Representative

The representative shall have authorization from manufacturer to approve field changes and be thoroughly familiar with the products and with installations in the geographical area where construction will take place. The manufacturer's representative shall be an employee of the manufacturer with at least 5 years experience in installing the roof system. The representative shall be available to perform field inspections and attend meetings as required herein, and as requested by the Contracting Officer.

1.6.4 Installer's Qualifications

The roofing system installer shall be factory-trained, approved by the metal roofing system manufacturer to install the system, and shall have a minimum of three years experience as an approved applicator with that manufacturer. The applicator shall have applied five installations of similar size and scope as this project within the previous 3 years.

1.6.5 Single Source

Roofing panels, clips, closures, and other accessories shall be standard products of the same manufacturer; shall be the latest design by the manufacturer; and shall have been designed by the manufacturer to operate as a complete system for the intended use.

1.6.6 Laboratory Tests For Panel Finish

The term "appearance of base metal" refers to the metal coating on steel. Panels shall meet the following test requirements:

a. Formability Test: When subjected to a 180 degree bend over a 1/8 inch diameter mandrel in accordance with ASTM D 522, exterior coating film shall show only slight microchecking and no loss of adhesion.

b. Accelerated Weathering Test: Withstand a weathering test for a minimum of 2000 hours in accordance with ASTM G 23, Method 1 without cracking, peeling, blistering, loss of adhesion of the protective coating, or corrosion of the base metal. Protective coating that can be readily removed from the base metal with a penknife blade or similar instrument shall be considered to indicate loss of adhesion.

c. Chalking Resistance: After the 2000-hour weatherometer test, exterior coating shall not chalk greater than No. 8 rating when measured in accordance with ASTM D 4214 test procedures.

d. Salt Spray Test: Withstand a salt spray test for a minimum of 1000 hours in accordance with ASTM B 117, including the scribe requirement in the test. Immediately upon removal of the panel from the test, the coating shall receive a rating of 8, few blisters in field as determined by ASTM D 714; and an average rating of [6, 1/8 inch] [7, 1/16 inch] failure at scribe, as determined by ASTM D 1654. Rating Schedule No. 1.

e. Abrasion Resistance Test for Color Coating: When subjected to the falling sand test in accordance with ASTM D 968, coating system shall withstand a minimum of 50 liters of sand per mil thickness before appearance of base metal.

f. Humidity Test: When subjected to a humidity cabinet test in accordance with ASTM D 2247 for 1000 hours, a scored panel shall show no signs of blistering, cracking, creepage, or corrosion.

g. Gloss Test: The gloss of the finish shall be 30 plus or minus 5 at an angle of 60 degrees, when measured in accordance with ASTM D 523.

1.7 WARRANTY

Furnish manufacturer's no-dollar-limit materials and workmanship warranty for the roofing system. The warranty period shall be not less than 20 years from the date of Government acceptance of the work. The warranty shall be issued directly to the Government. The warranty shall provide that if within the warranty period the metal roofing system becomes non-watertight or shows evidence of corrosion, perforation, rupture or excess weathering due to deterioration of the roofing system resulting from defective materials or installed workmanship the repair or replacement of the defective materials and correction of the defective workmanship shall be the responsibility of the roofing system manufacturer. Repairs that become necessary because of defective materials and workmanship while roofing is under warranty shall be performed within 7 days after notification, unless additional time is approved by the Contracting Officer. Failure to perform repairs within the specified period of time will constitute grounds for having the repairs performed by others and the cost billed to the manufacturer. The Contractor shall also provide a 2 year contractor installation warranty.

1.8 DELIVERY, STORAGE AND HANDLING

Deliver, store, and handle preformed panels, bulk roofing products and other manufactured items in a manner to prevent damage or deformation.

1.8.1 Delivery

Provide adequate packaging to protect materials during shipment. Crated materials shall not be uncrated until ready for use, except for inspection. Immediately upon arrival of materials at the jobsite, inspect materials for damage, dampness, and staining. Damaged or permanently stained materials that cannot be restored to like-new condition shall be replaced with satisfactory material. If materials are wet, remove the moisture and re-stack and protect the panels until used.

1.8.2 Storage

Stack materials on platforms or pallets and cover with tarpaulins or other

suitable weathertight covering which prevents water trapping or condensation. Store materials so that water which might have accumulated during transit or storage will drain off. Do not store the panels in contact with materials that might cause staining, such as mud, lime, cement, fresh concrete or chemicals. Protect stored panels from wind damage.

1.8.3 Handling

Handle material carefully to avoid damage to surfaces, edges and ends.

PART 2 PRODUCTS

2.1 ROOFING PANELS

Panels shall have interlocking ribs for securing adjacent sheets. System for securing the roof covering to structural framing members shall be concealed clip fastening system with no fasteners penetrating the panels except at the ridge or eave, rakes, penetrations, and end laps. Backing plates and ends of panels at end laps shall be predrilled or prepunched; factory prepare ends of panels to be lapped by trimming part of seam, die-setting or swaging ends of panels. Length of sheets shall be sufficient to cover the entire length of any unbroken roof slope when such slope is 30 feet or less. When length of run exceeds 30 feet, each sheet in the run shall extend over two or more spans. Sheets longer than 30 feet may be furnished if approved by the Contracting Officer. Width of sheets shall provide not less than 12 inches of coverage in place. Height of corrugations of adjacent roof sheets shall be not less than [1.75] [2.25] [3.0] inches (nominal). Make provisions for expansion and contraction at either ridge or eave, consistent with the type of system to be used. Panels from coil stock shall be formed without warping, waviness or ripples not part of the panel profile and shall be free of damage to the finish coating system.

2.1.1 Material

Zinc-coated steel conforming to ASTM A 653/A 653M, G90coating designation or aluminum-zinc alloy coated steel conforming to ASTM A 792/A 792M, AZ 55 coating. Minimum thickness to be 0.023 inch thick (24 gage) minimum except when mid field of roof is subject to design wind uplift pressures of 60 psf or greater, entire roof system shall have a minimum thickness of 0.030 inch (22 gage). Prior to shipment, treat mill finish panels with a passivating chemical and oil to inhibit the formation of oxide corrosion products. Dry, retreat, and re-oil panels that have become wet during shipment or storage but have not started to oxidize.

2.1.2 Texture

Smooth with raised intermediate ribs for added stiffness.

2.1.3 Finish

Unpainted.

2.2 INTERMEDIATE SUPPORTS

Fabricate panel subgirts, subpurlins, T-bars, Z-bars and tracks from galvanized steel conforming to ASTM A 653/A 653M, G90, Grade D (16 gage and heavier), Grade A (18 gage and lighter); or steel conforming to

ASTM A 36/A 36M, ASTM A 570/A 570M , or ASTM A 1008/A 1008M prime painted with zinc-rich primer. Size, shape, thickness and capacity as required to meet the load and deflection criteria specified.

2.3 ATTACHMENT CLIPS

Fabricate clips from ASTM A 366/A 366M, ASTM A 570/A 570M, or ASTM A 1008/A 1008M steel hot-dip galvanized in accordance with ASTM A 653/A 653M, G 90, or Series 300 stainless steel. Size, shape, thickness and capacity as required to meet the load, insulation thickness and deflection criteria specified.

2.4 ACCESSORIES

Sheet metal flashings, gutters, downspouts, trim, moldings, closure strips, pre-formed crickets, caps, equipment curbs, and other similar sheet metal accessories used in conjunction with preformed metal panels shall be of the same material as used for the panels. Provide metal accessories with a factory color finish to match the roofing panels, except that such items which will be concealed after installation may be provided without the finish if they are stainless steel. Metal shall be of a thickness not less than that used for the panels. Thermal spacer blocks and other thermal barriers at concealed clip fasteners shall be as recommended by the manufacturer except that wood spacer blocks are not allowed.

2.4.1 Closures

2.4.1.1 Rib Closures

Corrosion resisting steel, closed-cell or solid-cell synthetic rubber, neoprene or polyvinyl chloride pre-molded to match configuration of rib opening. Material for closures shall not absorb water.

2.4.1.2 Ridge Closures

Metal-clad foam or metal closure with foam secondary closure matching panel configuration for installation on surface of roof panel between panel ribs at ridge and headwall roof panel flashing conditions and terminations. Foam material shall not absorb water.

2.4.2 Fasteners

Zinc-coated steel, corrosion resisting steel, zinc cast head, or nylon capped steel, type and size specified below or as otherwise approved for the applicable requirements. Design the fastening system to withstand the design loads specified. Exposed fasteners shall be gasketed or have gasketed washers on the exterior side of the covering to waterproof the penetration. Washer material shall be compatible with the covering; have a minimum diameter of 3/8 inch for structural connections; and gasketed portion of fasteners or washers shall be neoprene or other equally durable elastomeric material approximately 1/8 inch thick.

2.4.2.1 Screws

Not smaller than No. 14 diameter if self-tapping type and not smaller than No. 12 diameter if self-drilling and self-tapping.

2.4.2.2 Bolts

Not smaller than 1/4 inch diameter, shouldered or plain shank as required, with proper nuts.

2.4.2.3 Automatic End-Welded Studs

Automatic end-welded studs shall be shouldered type with a shank diameter of not smaller than 3/16 inch and cap or nut for holding covering against the shoulder.

2.4.2.4 Explosive Driven Fasteners

Fasteners for use with explosive actuated tools shall have a shank diameter of not smaller than 0.145 inch with a shank length of not smaller than 1/2 inch for fastening to steel and not smaller than one inch for fastening to concrete.

2.4.2.5 Rivets

Blind rivets shall be stainless steel with 1/8 inch nominal diameter shank. Rivets shall be threaded stem type if used for other than the fastening of trim. Rivets with hollow stems shall have closed ends.

2.4.3 Sealants

Elastomeric type containing no oil or asphalt. Exposed sealant shall cure to a rubberlike consistency. Concealed sealant shall be the non-hardening type. Seam sealant shall be factory-applied, non-skinning, non-drying, and shall conform to the roofing manufacturer's recommendations. Silicone-based sealants shall not be used in contact with finished metal panels and components unless approved otherwise by the Contracting Officer.

2.4.4 GASKETS AND INSULATING COMPOUNDS

Nonabsorptive and suitable for insulating contact points of incompatible materials. Insulating compounds shall be nonrunning after drying.

2.5 LINER PANELS

Fabricate liner panels of the same material as roof panels, and formed or patterned to prevent waviness and distortion. Liner panels shall have a factory applied, one mil thick minimum painted coating on the inside face and a prime coat on the liner side.

PART 3 EXECUTION

3.1 EXAMINATION

Examine surfaces to receive standing seam metal roofing and flashing. Ensure that surfaces are plumb and true, clean, even, smooth, as dry and free from defects and projections which might affect the installation.

3.2 PROTECTION FROM CONTACT WITH DISSIMILAR MATERIALS

3.2.1 Cementitious Materials

Paint metal surfaces which will be in contact with mortar, concrete, or other masonry materials with one coat of alkali-resistant coating such as

heavy-bodied bituminous paint.

3.2.2 Contact with Wood

Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.3 INSTALLATION

Install in accordance with the approved manufacturer's erection instructions, shop drawings, and diagrams. Panels shall be in full and firm contact with attachment clips. Where prefinished panels are cut in the field, or where any of the factory applied coverings or coatings are abraded or damaged in handling or installation, they shall, after necessary repairs have been made with material of the same color as the weather coating, be approved before being installed. Seal completely openings through panels. Correct defects or errors in the materials. Replace materials which cannot be corrected in an approved manner with nondefective materials. Provide molded closure strips where indicated and where necessary to provide weathertight construction. Use shims as required to ensure attachment clip line is true. Use a spacing gage at each row of panels to ensure that panel width is not stretched or shortened.

3.3.1 Roof Panels

Apply roofing panels with the standing seams parallel to the slope of the roof. Provide roofing panels in longest practical lengths from ridge to eaves (top to eaves on shed roofs), with no transverse joints except at the junction of ventilators, curbs, skylights, chimneys, and similar openings. Install flashing to assure positive water drainage away from roof penetrations. Locate panel end laps such that fasteners do not engage supports or otherwise restrain the longitudinal thermal movement of panels. Form field-formed seam type system seams in the field with an automatic mechanical seamer approved by the manufacturer. Attach panels to the structure with concealed clips incorporated into panel seams. Clip attachment shall allow roof to move independently of the structure, except at fixed points as indicated.

3.3.2 Flashings

Provide flashing, related closures and accessories as indicated and as necessary to provide a weathertight installation. Install flashing to ensure positive water drainage away from roof penetrations. Flash and seal the roof at the ridge, eaves and rakes, and projections through the roof. Place closure strips, flashing, and sealing material in an approved manner that will assure complete weathertightness. Details of installation which are not indicated shall be in accordance with the SMACNA 1793, panel manufacturer's approved printed instructions and details, or the approved shop drawings. Allow for expansion and contraction of flashing.

3.3.3 Flashing Fasteners

Fastener spacings shall be in accordance with the panel manufacturer's recommendations and as necessary to withstand the design loads indicated. Install fasteners in roof valleys as recommended by the manufacturer of the panels. Install fasteners in straight lines within a tolerance of 1/2 inch in the length of a bay. Drive exposed penetrating type fasteners normal to the surface and to a uniform depth to seat gasketed washers properly and

drive so as not to damage factory applied coating. Exercise extreme care in drilling pilot holes for fastenings to keep drills perpendicular and centered. Do not drill through sealant tape. After drilling, remove metal filings and burrs from holes prior to installing fasteners and washers. Torque used in applying fasteners shall not exceed that recommended by the manufacturer. Remove panels deformed or otherwise damaged by over-torqued fastenings, and provide new panels.

3.3.4 Rib and Ridge Closure/Closure Strips

Set closure/closure strips in joint sealant material and apply sealant to mating surfaces prior to adding panel.

3.4 PROTECTION OF APPLIED ROOFING

Do not permit storing, walking, wheeling, and trucking directly on applied roofing materials. Provide temporary walkways, runways, and platforms of smooth clean boards or planks as necessary to avoid damage to applied roofing materials, and to distribute weight to conform to indicated live load limits of roof construction.

3.5 CLEANING

Clean exposed sheet metal work at completion of installation. Remove metal shavings, filings, nails, bolts, and wires from roofs. Remove grease and oil films, excess sealants, handling marks, contamination from steel wool, fittings and drilling debris and scrub the work clean. Exposed metal surfaces shall be free of dents, creases, waves, scratch marks, solder or weld marks and damage to the finish coating.

3.6 MANUFACTURER'S FIELD INSPECTION

Manufacturer's technical representative shall visit the site as necessary during the installation process to assure panels, flashings, and other components are being installed in a satisfactory manner. Manufacturer's technical representative shall perform a field inspection during the first 20 squares of roof panel installation and at substantial completion prior to issuance of warranty, as a minimum, and as otherwise requested by the Contracting Officer. Additional inspections shall not exceed one for 100 squares of total roof area with the exception that follow-up inspections of previously noted deficiencies or application errors shall be performed as requested by the Contracting Officer. Each inspection visit shall include a review of the entire installation to date. After each inspection, a report, signed by the manufacturer's technical representative, shall be submitted to the Contracting Officer noting the overall quality of work, deficiencies and any other concerns, and recommended corrective actions in detail. Notify Contracting Officer a minimum of 2 working days prior to site visit by manufacturer's technical representative.

3.7 COMPLETED WORK

Completed work shall be plumb and true without oil canning, dents, ripples, abrasion, rust, staining, or other damage detrimental to the performance or aesthetics of the completed roof assembly.

3.8 INFORMATION CARD

For each roof, provide a typewritten card, laminated in plastic and framed for interior display or a photoengraved 0.032 inchthick aluminum card for

exterior display. Card to be 8 1/2 by 11 inches minimum and contain the information listed on Form 1 at end of this section. Install card near point of access to roof, or where indicated. Send a photostatic paper copy to LANTNAVFACENGCOM, Code 1613, 1510 Gilbert Street, Norfolk, VA 23511-2699.

3.9 FORM ONE

FORM 1 - PREFORMED STEEL STANDING SEAM ROOFING SYSTEM COMPONENTS

1. Contract Number:

2. Building Number & Location:

3. NAVFAC Specification Number:

4. Deck/Substrate Type:

5. Slopes of Deck/Roof Structure:

6. Insulation Type & Thickness:

7. Insulation Manufacturer:

8. Vapor Retarder: ( )Yes ( )No

9. Vapor Retarder Type:

10. Preformed Steel Standing Seam Roofing Description:

a. Manufacturer (Name, Address, & Phone No.):
b. Product Name: c. Width: d. Gage:
e. Base Metal: f. Method of Attachment:

11. Repair of Color Coating:

a. Coating Manufacturer (Name, Address & Phone No.):
b. Product Name:
c. Surface Preparation:
d. Recoating Formula:
e. Application Method:

12. Statement of Compliance or Exception:_____
_____
_____

13. Date Roof Completed:

14. Warranty Period: From_____ To_____

15. Roofing Contractor (Name & Address):

16. Prime Contractor (Name & Address):

Contractor's Signature _____ Date:

Inspector's Signature _____ Date:

-- End of Section --

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SECTION 09 97 13.27

EXTERIOR COATING OF STEEL STRUCTURES
01/07

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM D 1200	(1994; R 2005) Viscosity by Ford Viscosity Cup
ASTM D 3276	(2007) Painting Inspectors (Metal Substrates)
ASTM D 3925	(2002) Sampling Liquid Paints and Related Pigmented Coatings
ASTM D 4285	(1983; R 2006) Indicating Oil or Water in Compressed Air
ASTM D 7127	(2005) Measurement of Surface Roughness of Abrasive Blast Cleaned Metal Surfaces using a Portable Stylus Instrument

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 9001	(2000) Quality management systems-Requirements

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC AB 2	(1996; E 2004) Cleanliness of Recycled Ferrous Metallic Abrasive
SSPC AB 3	(2003; E 2004) Newly Manufactured or Re-Manufactured Steel Abrasives
SSPC Guide 12	(1998; E 2004) Guide for Illumination of Industrial Painting Projects
SSPC Guide 6	(2004) Guide for Containing Debris Generated During Paint Removal Operations
SSPC PA 1	(2000; E 2004) Shop, Field, and Maintenance Painting
SSPC PA 2	(2004) Measurement of Dry Coating Thickness With Magnetic Gages

SSPC QP 1	(1998; E 2004) Standard Procedure for Evaluating Painting Contractors (Field Application to Complex Industrial Structures)
SSPC QP 5	(1999; E 2004) Standard Procedure for Evaluating the Quality of Coating and Lining Inspection Companies
SSPC QS 1	(2004) Standard Procedure for Evaluating a Contractor's Advanced Quality Management System
SSPC SP 1	(1982; E 2004) Solvent Cleaning
SSPC SP 10	(2007) Near-White Blast Cleaning
SSPC SP 7	(2007) Brush-Off Blast Cleaning
SSPC SP COM	(2004) Surface Preparation Commentary for Steel and Concrete Substrates
SSPC VIS 1	(2002; E 2004) Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-A-22262	(Rev B; Am 2) Abrasive Blasting Media Ship Hull Blast Cleaning
MIL-DTL-24441	(Rev C; Supp 1; INT Am 1) Paint, Epoxy-Polyamide
MIL-DTL-24441/19	(Rev B) Paint, Epoxy-Polyamide, Zinc Primer, Formula 159, Type III
MIL-DTL-24441/31	(Rev A) Paint, Epoxy-Polyamide, White, Formula 152, Type IV
MIL-PRF-85285	(Rev D; Am 1, Am 2) Coating: Polyurethane Aircraft and Support Equipment
MIL-STD-161	(Rev G) Identification Methods for Bulk Petroleum Products Systems Including Hydrocarbon Missile Fuels

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD-595	(Rev B; Am 1) Colors Used in Government Procurement

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

29 CFR 1910.1000	Air Contaminants
29 CFR 1910.134	Respiratory Protection
29 CFR 1926.59	Hazard Communication

1.2 DEFINITIONS

Definitions are provided throughout this Section, generally in the paragraph where used, and denoted by capital letters.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-05, Design Data

Containment System

SD-06 Test Reports

Coatings Qualification Test Reports

Metallic Abrasive Qualification Test Reports

Coating Sample Test Reports

Abrasive Sample Test Reports

Inspection Report Forms

Daily Inspection Reports

Recycled Metallic Abrasive Field Test Reports (Daily and Weekly)

SD-07 Certificates

Contract Errors, Omissions, and Other Discrepancies

Corrective Action Procedures

Coating Work Plan

Qualifications of Certified Industrial Hygienist (CIH)

Qualifications Of Individuals Performing Abrasive Blasting

Qualifications of Certified Protective Coatings Specialist (PCS)

Qualifications of Coating Inspection Company

Qualifications of QC Specialist Coating Inspector

Qualifications of Testing Laboratory for Coatings

Qualifications of Testing Laboratory for Abrasive

Qualifications of Coating Contractors

Coating Materials

Coating System Component Compatibility

Non-metallic Abrasive

Metallic Abrasive

SD-08 Manufacturer's Instructions

Coating System Instructions

SD-11 Closeout Submittals

Disposal of Used Abrasive

Inspection Logbook; G

1.4 QUALITY ASSURANCE

1.4.1 Contract Errors, Omissions, and Other Discrepancies

Submit all errors, omissions, and other discrepancies in contract documents the Contracting Officer within 30 days of contract award for all work covered in this Section, other than the work that will not be uncovered until a later date. All such discrepancies shall be addressed and resolved, and the Coating Work Plan modified, prior to beginning the Initial and Follow-Up phases of work. Discrepancies that become apparent only after work is uncovered shall be identified at the earliest discoverable time and submitted for resolution. Schedule time (Float) should be built into the project schedule at those points where old work is to be uncovered or where access is not available during the first 30 days after award, to allow for resolution of contract discrepancies.

1.4.2 Corrective Action (CA)

CA shall be included in the Quality Control Plan.

1.4.2.1 Corrective Action Procedures

Develop procedures for determining the root cause of each non-compliance, developing a plan to eliminate the root cause so that the non-compliance does not recur, and following up to ensure that the root cause was eliminated. Develop Corrective Action Request (CAR) forms for initiating CA, and for tracking and documenting each step.

1.4.2.2 Implement Corrective Action

The Contractor shall take action to identify and eliminate the root cause of each non-compliance so as to prevent recurrence. These procedures shall apply to non-compliance in the work, and to non-compliance in the QC System. Corrective actions shall be appropriate to the effects of the non-compliance encountered. Each CAR shall be serialized, tracked in a Log to completion and acceptance by the Contracting Officer, and retained in project records. The Corrective Action Log, showing status of each CAR, shall be submitted to the Contracting Officer monthly. A CAR may be initiated by either the Contractor or the Contracting Officer. The Contracting Officer must approve each CAR at the root cause identification stage, the plan for elimination stage, and the close out stage after verification that the root cause has been eliminated.

1.4.3 Coating Work Plan

This work plan shall be considered as part of the Quality Control Plan.

Provide procedures for reviewing contract documents immediately after award to identify errors, omissions, and discrepancies so that any such issues can be resolved prior to project planning and development of detailed procedures.

Provide procedures for verification of key processes during Initial Phase to ensure that contract requirements can be met. Key processes shall include surface preparation, coating application and curing, inspection, and documentation, and any other process that might adversely impact orderly progression of work.

Provide procedures for all phases of coating operations, including planned work, rework, repair, inspection, and documentation. Address mobilization and setup, surface preparation, coating application, coating initial cure, tracking and correction of noncompliant work, and demobilization. Coordinate work processes with health and safety plans and confined space entry plans. For each process, provide procedures that include appropriate work instructions, material and equipment requirements, personnel qualifications, controls, and process verification procedures. Provide procedures for inspecting work to verify and document compliance with contract requirements, including inspection forms and checklists, and acceptance and rejection criteria.

Provide procedures for correcting noncompliant work. Detailed procedures are required in advance to avoid delays in meeting overcoat windows as well as to avoid delays in production. Provide procedures for repairing defects in the coating film, such as runs, drips, sags, holidays, overspray, as well as how to handle correct coating thickness noncompliance, any other areas of repair or rework that might be adversely affected by delays in preparing and approving new procedures.

If a procedure is based on a proposed or approved request for deviation, the deviation shall be referenced. Changes to procedures shall be noted by submittal number and date approved, clearly delineating old requirements and new requirements, so that the records provide a continuous log of requirements and procedures.

1.4.4 Design Data

1.4.4.1 Containment System

Submit complete design drawings and calculations for the scaffolding and containment system, including an analysis of the loads which will be added to the structure by the containment system and waste materials. A registered engineer shall approve calculations and scaffold system design.

1.4.5 Test Reports

1.4.5.1 Coatings Qualification Test Reports

Submit test results from independent laboratory of representative samples of each coating material. U.S. Department of Defense laboratories are considered to be independent laboratories for purposes of compliance with "QUALIFICATION INSPECTION" requirements herein. Samples must have been tested within the last three years. Submit results for epoxy materials as

required in paragraph QUALIFICATION INSPECTION of MIL-DTL-24441, and as revised by paragraph COATING SYSTEM herein. Submit results for polyurethane materials as required in paragraph QUALIFICATION INSPECTION of MIL-PRF-85285, and as revised by paragraph COATING SYSTEM herein. Note that requirement for QUALIFICATION INSPECTION is a pre-qualification requirement, and involves the same testing required for listing in the Qualified Products List of the respective material. See appropriate Military Specification for specific test requirements.

1.4.5.2 Metallic Abrasive Qualification Test Reports

Submit results for abrasive as required in paragraph 4 REQUIREMENTS of SSPC AB 3. Submit test results from independent laboratory of representative samples of each abrasive to be used on the jobsite. Samples must have been tested within the last three years. Note that this testing is for the purpose of prequalifying the abrasive.

1.4.5.3 Recycled Metallic Abrasive Field Test Reports (Daily and Weekly)

Submit test results from independent laboratory of daily and weekly Quality Control testing required by SSPC AB 2, as modified in paragraph ABRASIVE.

1.4.6 Qualifications

1.4.6.1 Qualifications of Certified Industrial Hygienist (CIH)

Submit name, address, telephone number, FAX number, and e-mail address of the independent third party CIH. Submit documentation that hygienist is certified by the American Board of Industrial Hygiene in comprehensive practice, including certification number and date of certification/recertification. Provide evidence of experience with hazards involved in industrial coating application work.

1.4.6.2 Qualifications of Certified Protective Coatings Specialist (PCS)

Submit name, address, telephone number, FAX number, and e-mail address of the independent third party PCS. Submit documentation that specialist is certified by SSPC: The Society for Protective Coatings (SSPC) as a PCS, including certification number and date of certification/recertification. If the PCS is employed by the same coating inspection company to which the coating inspector is employed, this does not violate the independent third-party requirements. The PCS shall remain certified during the entire project, and the Contracting Officer shall be notified of any change in certification status within 10 days of the change. The PCS shall not be the designated coating inspector.

1.4.6.3 Qualifications of Coating Inspection Company

Submit documentation that the coating inspection company that will be performing all coating inspection functions is certified by SSPC to the requirements of SSPC QP 5 prior to contract award, and shall remain certified while accomplishing any coating inspection functions. The coating inspection company must remain so certified for the duration of the project. If a coating inspection company's certification expires, the firm will not be allowed to perform any inspection functions, and all surface preparation and coating application work must stop, until the certification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive certification will not be considered and liquidated damages will apply. Notify the Contracting

Officer of any change in coating inspection company certification status.

1.4.6.4 Qualifications of QC Specialist Coating Inspector

Submit documentation that each coating inspector is employed, and qualified to SSPC QP 5, Level III, by the selected coating inspection company. Each inspector shall remain employed by the coating inspection company while performing any coating inspection functions.

1.4.6.5 Qualifications Of Individuals Performing Abrasive Blasting

Submit name, address, and telephone number of each person that will be performing abrasive blasting. Submit documentation that each blaster is qualified by SSPC to the SSPC C-7 Dry Abrasive Blaster Qualification Program. Each blaster shall remain qualified during the entire period of abrasive blasting, and the Contracting Officer shall be notified of any change in qualification status.

1.4.6.6 Qualifications of Testing Laboratory for Coatings

Submit name, address, telephone number, FAX number, and e-mail address of the independent third party laboratory selected to perform testing of coating samples for compliance with specification requirements. Submit documentation that laboratory is regularly engaged in testing of paint samples for conformance with specifications, and that persons performing analyses are qualified.

1.4.6.7 Qualifications of Testing Laboratory for Abrasive

Submit name, address, telephone number, FAX number, and e-mail address of the independent third party laboratory selected to perform testing of abrasive for compliance with specification requirements. Submit documentation that laboratory has experience in testing samples of abrasive for conformance with specifications, and that persons performing analyses are qualified.

1.4.6.8 Qualifications of Coating Contractors

All Contractors and Subcontractors that perform surface preparation or coating application shall be certified to either ISO 9001 or SSPC QP 1 and SSPC QS 1 prior to contract award, and shall remain certified while accomplishing any surface preparation or coating application. The painting Contractors and painting Subcontractors must remain so certified for the duration of the project. If a Contractor's or Subcontractor's certification expires, the firm will not be allowed to perform any work until the certification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive certification will not be considered and liquidated damages will apply. Notify the Contracting Officer of any change in Contractor certification status.

1.4.6.9 Coating Materials

Provide manufacturer's certification of conformance to contract requirements.

1.4.6.10 Coating System Component Compatibility

Provide certification from each manufacturer of components of the coating system, epoxy primer, epoxy intermediate, and polyurethane topcoat, that

the supplied coating material is suitable for use in the specified coating system. Each manufacturer shall identify the specific products, including manufacturer's name, which their product may be used with. The certification shall provide the name of the manufacturer that will provide technical support for the entire system. When all coating materials are manufactured by one manufacturer, this certification is not required.

1.4.6.11 Non-metallic Abrasive

Provide manufacturer's certification that the materials are currently approved by the Naval Sea Systems Command and listed on the Qualified Products Lists (QPL) for the specified materials.

1.4.6.12 Metallic Abrasive

Provide manufacturer's certification of conformance to contract requirements and provide copies of test results.

1.4.7 Protective Coating Specialist (PCS)

The PCS shall be considered a QC Specialist and shall report to the QC Manager, as specified in Section 01 45 02 NAVFAC QUALITY CONTROL. The PCS shall approve all submittals prior to submission to the QC Manager for approval or submission to the government for approval.

1.4.8 Pre-Application Meeting

After approval of submittals but prior to the initiation of coating work, Contractor representatives, including at a minimum, project superintendent and QC manager, paint foreman, coating inspector, and PCS shall have a pre-application coating preparatory meeting. This meeting shall be in addition to the pre-construction conference. Specific items addressed shall include: corrective action requirements and procedures, coating work plan, safety plan, coordination with other Sections, inspection standards, inspection requirements and tools, test procedures, environmental control system, safety plan, and test logs. Notify Contracting Officer at least ten days prior to meeting.

1.5 PRODUCT DATA

1.5.1 Coating System Instructions

Submit manufacturer's printed instructions including detailed mixing and application procedures, number and types of coats required, minimum and maximum application temperatures, and curing procedures. Include materials safety data sheets (MSDS) for materials to be used at the job site in accordance with 29 CFR 1926.59.

1.6 DELIVERY AND STORAGE

Ship, store, and handle materials in accordance with SSPC PA 1, and as modified in this Section. Maintain temperature in storage spaces between 40 and 85 degrees F, and air temperature more than 5 degrees F above the dew-point at all times. Inspect materials for damage prior to use and return non-compliant materials to manufacturer. Remove materials with expired shelf life from government property immediately and notify the Contracting Officer.

If materials are approaching shelf life expiration and an extension is

desired, samples may be sent to the manufacturer, along with complete records of storage conditions, with a request for shelf life extension. If the manufacturer finds the samples and storage data suitable for shelf life extension, the manufacturer may issue an extension, referencing the product evaluation and the review of storage records. Products may not be extended longer than allowed in the product specification.

1.7 COATING HAZARDS

Ensure that employees are trained in all aspects of the safety plan. Specified coatings may have potential health hazards if ingested or improperly handled. The coating manufacturer's written safety precautions shall be followed throughout mixing, application, and curing of the coatings. During all cleaning, cleanup, surface preparation, and paint application phases, ensure that employees are protected from toxic and hazardous chemical agents which exceed concentrations in 29 CFR 1910.1000. Comply with respiratory protection requirements in 29 CFR 1910.134. The CIH shall approve work procedures and personal protective equipment.

1.8 JOB SITE REFERENCES

Make available to the Contracting Officer at least one copy each of ASTM D 3276, ASTM D 3925, ASTM D 4285, ASTM D 7127, SSPC SP COM, SSPC SP 1, SSPC SP 7, SSPC SP 10, SSPC PA 1, SSPC PA 2, SSPC Guide 6, SSPC VIS 1, SSPC QP 1, SSPC QS 1, and an SSPC Certified Contractor Evaluation Form at the job site.

PART 2 PRODUCTS

2.1 COATING SYSTEM

Alternate systems or products will not be considered. All primer, intermediate coat and topcoat materials shall be supplied by one supplier. The entire coating system is intended to be applied in the field. Alternatively, surface preparation may be accomplished in the shop, following all temperature, humidity, and testing requirements listed herein, followed by an application of a hold-primer. Remove all shop-applied primer prior to final field surface preparation and coating system application. Adjust all shop preparation to avoid conflicts with final surface preparation requirements.

The Military specification epoxy and polyurethane products specified in this Section do not require approval for listing on the QPL prior to contract award, as indicated in paragraph 3.2 of MIL-DTL-24441 and paragraph 3.1 of MIL-PRF-85285. Testing of products by an independent laboratory to the QUALIFICATION INSPECTION requirements of MIL-DTL-24441 and MIL-PRF-85285prior to contract award is required. See specific submittal requirements in paragraph QUALITY ASSURANCE.

2.1.1 Zinc-Rich Epoxy Primer Coat

Epoxy polyamide, MIL-DTL-24441/19 (Formula 159, Type III).

2.1.2 Epoxy Intermediate Coat

Epoxy polyamide, MIL-DTL-24441/31 (Formula 152, Type IV, White (Tinted)). Tint to approximately FED-STD-595 color number 27778 parchment using pigment dispersions prepared for epoxy paint tinting. Manufacturer shall tint material and appropriately label. All other requirements of this

Military Specification apply.

2.1.3 Polyurethane Topcoat

Polyurethane coating topcoat of MIL-PRF-85285, Type II, White FED-STD-595 color number 17925.

Modify paragraph 3.6.4 of MIL-PRF-85285, Viscosity and Pot Life, as follows:

The viscosity of the admixed coating, when tested in accordance with ASTM D 1200 through a No. 4 Ford cup, shall be as follows:

Time from mix (minimum)	Maximum time through a No. 4 Ford cup
Initially	30 seconds
2 hours	60 seconds
4 hours	No gel

Modify paragraph 3.7.1 of MIL-PRF-85285, Drying Time, as follows:

When applied by spray techniques and when tested in accordance with ASTM D 1640, the coating shall be set-to-touch within four hours and dry-hard within eight hours (see 4.6 and table I).

2.2 COLOR IDENTIFICATION OF FUEL HANDLING AND STORAGE FACILITIES

Piping, conduit, and tank identification shall be in accordance with MIL-STD-161. Mark direction of fluids in accordance with MIL-STD-161.

2.3 COATING SAMPLE COLLECTION AND SHIPPING KIT

Provide a kit that contains one quart can for the base of each coating material, an appropriately sized can for each activator, dipping cups for each component to be sampled, a shipping box sized for the samples to to be shipped, and packing material. Mark cans for the appropriate component. Provide shipping documents, including either pre-paid shipping or a shipper number that can be used by the QC Manager to arrange pickup, addressed to the approved coating testing laboratory.

2.4 ABRASIVE SAMPLE COLLECTION AND SHIPPING KIT

Provide a kit that contains one suitable plastic bag or container for each sample to be collected. Mark containers for the appropriate component. Provide shipping documents, including either pre-paid shipping or a shipper number that can be used by the QC Manager to arrange pickup, addressed to the approved coating testing laboratory.

2.5 TEST KITS

2.5.1 Test Kit for Measuring Chloride, Sulfate and Nitrate Ions on Steel and Coated Surfaces

Provide test kits called CHLOR*TEST CSN Salts, as manufactured by CHLOR*RID International Inc. of Chandler, Arizona (www.chlor-rid.com) or equal. An "equal" test kit shall meet the following requirements:

a. Kit contains all materials,supplies, tools and instructions for field testing and on-site quantitative evaluation of chloride, sulfate and nitrate ions;

b. Kit extract solution is acidic, factory pre-measured, pre-packaged, and of uniform concentration;

c. Kit components and solutions are mercury free and environmentally friendly;

d. Kit contains new materials and solutions for each test extraction;

e. Extraction test container (vessel, sleeve, cell. etc.) creates a sealed, encapsulated environment during salt ion extraction;

f. Test extract container is suitable for testing the following steel surfaces: horizontal (up/down configuration), vertical, flat, curved, smooth, pitted, and rough;

g. All salt ion concentrations are directly measured in micrograms per square centimeter.

2.5.2 Test Kit for Identifying Amine Blush on Epoxy Surfaces

After coating and/or primer has hardened and prior to applying the next coat, test for unreacted amines using the AMINE BLUSH CHECK, manufactured by Elcometer, Rochester Hills, Michigan, or equal. To be considered for approval as an "equal" test kit it shall meet the following requirements:

a. Be a completely self-contained field test kit with all materials, supplies, tools and instructions to perform tests and indicate the presence of unreacted amines;

b. Use an identifiable, consistent, uniform, pre-packaged, factory pre-measured indicating solution;

c. Kit contains no mercury or lead and is environmentally friendly;

d. Kit contains a solution of an unreacted amine for the purpose of "self checking" the indicator solution;

2.6 ABRASIVE

The referenced abrasive specifications have maximum limits for soluble salts contamination, however, this maximum level of contamination does not guarantee that contamination will not be transferred to the steel surface during abrasive blasting. Other factors such as on-site handling and recycling can allow contamination of abrasive. Contractors are cautioned to verify that the chosen abrasive, along with work and storage processes, allow the final surface cleanliness requirements to be achieved. Successful testing of chlorides in abrasive does not negate the final acceptance testing of steel surfaces.

2.6.1 Non-metallic Abrasive

Conform to MIL-A-22262, Type I (Inorganic materials). Abrasive shall be approved by the Naval Sea Systems Command and listed on the appropriate Qualified Products List (QPL) for the specified materials. Use sampling procedures and testing frequencies as prescribed in MIL-A-22262. Use abrasive that is specifically selected and graded to provide a sharp, angular profile to the specified depth. Do not use ungraded abrasive.

Make adjustments to processes or abrasive gradation to achieve specified surface profile. Recycled non-metallic abrasive shall meet all requirements of the specification each time that it is placed in the blast pot.

2.6.2 Metallic Abrasive

2.6.2.1 New and Remanufactured Steel Grit

Conform to the chemical and physical properties of SSPC AB 3 Class 1 (Steel) only. Class 2 (Iron) abrasive shall not be used.

To develop a suitable work mix from new steel abrasive, a minimum of 200 - 400 recycles is required, therefore, it is advantageous for a Contractor to use remanufactured steel grit or grit reclaimed from a previous project. Such grit shall be considered to conform if it can be traced to new grit conforming to SSPC AB 3 Class 1 and it meets all cleanliness requirements of SSPC AB 3 Class 1 when brought to the current jobsite. Submit one representative sample of this work mix to the laboratory for testing, along with samples of new material. Acceptance and use of this work mix shall not be used to justify any deviation from surface preparation requirements.

2.6.2.2 Recycled Steel Grit

Conform to the chemical and physical properties of SSPC AB 2

2.7 White Aluminum Oxide Non-skid Grit

Size #60, dust free (washed and dry), minimum 99 percent pure, having the following sieve analysis when tested in accordance with ASTM E 11 using a 2.2 pound sample:

Sieve #	% Retained
40	0
50	15-40
60	60-85

PART 3 EXECUTION

Perform all work, rework, and repair in accordance with approved procedures in the Coating Work Plan.

3.1 COATING AND ABRASIVE SAMPLE COLLECTION AND TESTING

Sample and test materials delivered to the jobsite. Notify Contracting Officer three days in advance of sampling. The QC Manager and either the PCS or coating inspector shall witness all sampling.

3.1.1 Coating Sample Collection

Provide a sample collection kit as required in paragraph COATING SAMPLE COLLECTION AND SHIPPING KIT. From each lot, obtain a one quart sample of each base material, and proportional samples of each activator based on mix ratio, by random selection from sealed containers in accordance with ASTM D 3925. Prior to sampling, mix contents of each sealed container to ensure uniformity. As an alternative to collecting small samples from kits, entire kits may be randomly selected and shipped to laboratory, observing all requirements for witnessing and traceability. For purposes

of quality conformance inspection, a lot is defined as that quantity of materials from a single, uniform batch produced and offered for delivery at one time. A batch is defined as that quantity of material processed by the manufacturer at one time and identified by number on the label. Identify samples by designated name, specification number, batch number, project contract number, sample date, intended use, and quantity involved. The QC manager will take possession of the packaged samples, contact the shipping company to arrange for pickup, and relinquish the samples only to the shipping representative for shipment to the approved laboratory for testing as required by the paragraph COATING SAMPLE TEST REPORTS.

3.1.2 Abrasive Sample Collection

Provide a sample collection kit as required in paragraph ABRASIVE SAMPLE COLLECTION AND SHIPPING KIT. For purposes of quality conformance inspection, a lot shall consist of all abrasive materials of the same type from a single, uniform batch produced and offered for delivery at one time. Obtain samples of each abrasive lot using the sampling techniques and schedule of MIL-A-22262. The addition of any substance to a batch shall constitute a new lot. Identify samples by designated name, specification number, lot number, project contract number, sample date, intended use, and quantity involved. The QC manager will take possession of the packaged samples, contact the shipping company to arrange for pickup, and relinquish the samples only to the shipping representative for shipment to the approved laboratory for testing as required by the paragraph ABRASIVE SAMPLE TEST REPORTS.

3.1.3 Coating Sample Test Reports

Submit test results for each lot of coating material delivered to the jobsite. Test samples of primer, intermediate, and topcoat materials for compliance with requirements of Table I. Reject entire lot represented by samples that fail one or more tests, select new lots, and test samples.

3.1.4 Abrasive Sample Test Reports

Submit test results for each lot of abrasive delivered to the jobsite. Test samples of metallic abrasive to the requirements of paragraph REQUIREMENTS of SSPC AB 3, except paragraph 4.1.5 DURABILITY. Test samples of non-metallic abrasive as required in paragraph QUALITY CONFORMANCE INSPECTION of MIL-A-22262. Reject entire lot represented by samples that fail one or more tests, select new lots, and test samples.

3.2 SURFACES TO BE COATED

Coat exterior surfaces of piping and other exterior appurtenances.

3.3 LIGHTING

Provide lighting for all work areas as prescribed in SSPC Guide 12.

3.4 ENVIRONMENTAL CONDITIONS

3.4.1 Containment

Design and provide a containment system for the capture, containment, collection, storage and disposal of the waste materials generated by the work under this Section, to meet the requirements of SSPC Guide 6, Class 3. Vapor concentrations shall be kept at or below 10 percent of Lower

Explosive Limit (LEL) at all times. Containment may be designed as fixed containment for complete structure or portable containment for sections of structure, however, containment shall remain in any one place from beginning of abrasive blasting through initial cure of coating. Waste materials covered by this paragraph shall not include any material or residue from removal of coatings containing lead, chromium, cadmium, PCB, or any other hazardous material.

It is the Contractors responsibility to insure the feasibility and workability of the containment system. The Contractor shall perform his operations and work schedule in a manner as to minimize leakage of the containment system. The containment system shall be properly maintained and shall not deviate from the approved drawings. If the containment system fails to function satisfactorily, the Contractor shall suspend all operations, except those required to minimize adverse impact on the environment or government property. Operations shall not resume until modifications have been made to correct the cause of the failure.

3.4.2 Automated Monitoring Requirements

Provide continuous monitoring of temperature, relative humidity, and dew point data at pertinent points on the structure, during surface preparation, coating application, and initial cure. Locate sensors to provide pertinent data for the surface preparation and coat application being performed. Monitor any heating, cooling, or dehumidification equipment used. Make data available to the Contracting Officer through Internet access. Provide monitoring equipment to perform as follows:

a. Data is collected in the field unit in one minute increments, and available for download (on-site) in a standard format. Contractor shall collect this data and make available to the Contracting Officer;

b. Monitoring equipment shall have backup power such that data collection and transmission to web server will be uninterrupted during the entire period of the dehumidification requirement;

c. Monitoring equipment shall have capability to measure surface temperatures at a minimum of four locations anywhere on a 150 foot diameter by 50 foot high tank;

d. Monitoring equipment shall have capability to measure interior and exterior dry bulb temperature (DB), relative humidity (RH), and dewpoint temperature (DP);

e. Data shall be available continuously through secure Internet connection, using widely available web browsers;

f. Internet accessible data shall be collected and stored in maximum 15 minute increments, and lag time between data collection and online availability shall be no greater than 70 minutes;

g. Internet accessible data shall be available for viewing online in tabular format, and graphical format using selected data;

h. Internet accessible data shall be available for download in user-defined segments, or entire project to date, in a standard format usable by Microsoft Excel and other spreadsheet programs.

i. Internet-based controls shall provide alerts to pre-designated

parties through email messaging;

j. Internet-based controls shall monitor data uploads from field unit and issue alert if data not initiated within 60 minutes of last upload;

k. Internet-based controls shall monitor operation of DH equipment and issues alert when power remains off for more than 15 seconds, or if pre-determined temperature, RH, or DP conditions are exceeded;

The requirements listed here were developed around the Munters Exactaire Monitoring System, as this was the only monitoring system having Internet connectivity known to be commercially available. There is no requirement for connectivity of the monitoring system to control the DH equipment, therefore, any combination of equipment having the required functionality will be accepted.

3.5 SURFACE PREPARATION

3.5.1 Abrasive Blasting Equipment

Use abrasive blasting equipment of conventional air, force-feed, or pressure type. Maintain a minimum pressure of 95 psig at nozzle. Confirm that air supply for abrasive blasting is free of oil and moisture when tested in accordance with ASTM D 4285. Test air quality at each startup, but in no case less often than every five operating hours.

3.5.2 Operational Evaluation of Abrasive

Test abrasive for salt contamination and oil contamination as required by the appropriate abrasive specification daily at startup and every five operating hours thereafter.

3.5.3 Surface Standard

Inspect surfaces to be coated, and select plate with similar properties and surface characteristics for use as a surface standard. Blast clean one or more 1 foot square steel panels as specified in paragraph SURFACE PREPARATION. Record blast nozzle type and size, air pressure at nozzle and compressor, distance of nozzle from panel, and angle of blast to establish procedures for blast cleaning. Measure surface profile in accordance with ASTM D 7127. When the surface standard complies with all specified requirements, seal with a clearcoat protectant. Use the surface standard for comparison to abrasive blasted surfaces throughout the course of work.

3.5.4 Pre-Preparation Testing for Surface Contamination

Perform testing, abrasive blasting, and testing in the prescribed order.

3.5.4.1 Pre-Preparation Testing for Oil and Grease Contamination

Inspect all surfaces for oil and/or grease contamination using two or more of the following inspection techniques: 1) Visual inspection, 2) WATER BREAK TEST, 3) CLOTH RUB TEST. Reject oil and/or grease contaminated surfaces, clean in accordance with SSPC SP 1, and recheck for contamination until surfaces are free of oil and grease.

WATER BREAK TEST - Spray atomized mist of distilled water onto surface, and observe for water beading. If water "wets" surface rather than beading up, surface can be considered free of oil or grease contamination. Beading of

water (water forms droplets) is evidence of oil or grease contamination.

CLOTH RUB TEST - Rub a clean, white, lint free, cotton cloth onto surface and observe for discoloration. To confirm oil or grease contamination in lightly stained areas, a non-staining solvent may be used to aid in oil or grease extraction. Any visible discoloration is evidence of oil or grease contamination.

3.5.4.2 Pre-Preparation Testing for Soluble Salts Contamination

Test surfaces for soluble salts, and wash as required, prior to abrasive blasting. Soluble salt testing is also required in paragraph PRE-APPLICATION TESTING FOR SOLUBLE SALTS CONTAMINATION as a final acceptance test of prepared surfaces after abrasive blasting, and successful completion of this phase does not negate that requirement. This phase is recommended since pre-preparation testing and washing are generally more advantageous than attempting to remove soluble salt contamination after abrasive blasting. Effective removal of soluble salts will require removal of any barrier to the steel surface, including rust. This procedure may necessitate combinations of wet abrasive blasting, high pressure water rinsing, and cleaning using a solution of water washing and soluble salts remover. The soluble salts remover shall be acidic, biodegradable, nontoxic, noncorrosive, and after application, will not interfere with primer adhesion. Delays between testing and preparation, or testing and coating application, may allow for the formation of new contamination. Use potable water, or potable water modified with soluble salt remover, for all washing or wet abrasive blasting. Test methods and equipment used in this phase are selected at the Contractor's discretion.

3.5.5 Abrasive Blasting

Abrasive blast steel surfaces to near-white metal in accordance with SSPC SP 10. Prepared surfaces shall conform to SSPC VIS 1 and shall match the prepared test-panels. Provide a 2 to 3 mil surface profile. Reject profile greater than 3 mils, discontinue abrasive blasting, and modify processes and materials to provide the specified profile. Measure surface profile in accordance with ASTM D 7127, using Rmax as the measure of profile height. Record all measurements required in this standard. Measure profile at rate of three test areas for the first 1000 square feet plus one test area for each additional 1000 square feet or part thereof. When surfaces are reblasted for any reason, retest profile as specified. Following abrasive blasting, remove dust and debris by vacuum cleaning. Do not attempt to wipe surface clean.

3.5.6 Disposal of Used Abrasive

Dispose of used abrasive off Government property in accordance with Federal, State, and Local mandated regulations.

3.5.7 Pre-Application Testing For Surface Contamination

3.5.7.1 Pre-Application Testing for Oil and Grease Contamination

Ensure surfaces are free of contamination as described in paragraph PRE-PREPARATION TESTING FOR OIL AND GREASE CONTAMINATION, except that only questionable areas need be checked for beading of water misted onto surface.

3.5.7.2 Pre-Application Testing for Soluble Salts Contamination

Test surfaces for chloride contamination using the Test Kit described in TEST KIT FOR MEASURING CHLORIDE, SULFATE AND NITRATE IONS ON STEEL AND COATED SURFACES. Test all surfaces at rate of three tests for the first 1000 square feet plus one test for each additional 2000 square feet or part thereof. Perform 30% of tests on bare steel at welds, divided equally between horizontal and vertical welds. One or more readings greater than 3 micrograms per square centimeter of chlorides or 10 micrograms per square centimeter of sulfates or 5 micrograms per square centimeter of nitrates is evidence of soluble salt contamination. Reject contaminated surfaces, wash as discussed in paragraph PRE-PREPARATION TESTING FOR SOLUBLE SALTS CONTAMINATION, allow to dry, and re-test until all required tests show allowable results. Reblast tested and cleaned areas as required. Label all test tubes and retain for test verification.

3.5.7.3 Pre-Application Testing for Surface Cleanliness

Apply coatings to dust free surfaces. To test surfaces, apply strip of clear adhesive tape to surface and rub onto surface with finger. When removed, the tape should show little or no dust, blast abrasive, or other contaminant. Reject contaminated surfaces and retest. Test surfaces at rate of three tests for the first 1000 square feet plus one test for each additional 1000 square feet or part thereof. Provide two additional tests for each failed test or questionable test. Attach test tapes to Daily Inspection Reports.

3.6 MIXING AND APPLICATION OF SEALANT AND COATING SYSTEM

3.6.1 Preparation of Sealant and Coating Materials for Application

Each of the sealant, primer, intermediate, and topcoat materials is a two-component material supplied in separate containers.

3.6.1.1 Mixing Sealant, Primer and Intermediate Coat Materials

Mix in accordance with manufacturer's instructions, which may differ for each product. Do not mix partial kits, or alter mix ratios. Mix materials in same temperature and humidity conditions specified in paragraph DELIVERY AND STORAGE. Allow mixed material to stand for the required induction time based on its temperature.

3.6.1.2 Mixing Topcoat Material

Do not mix partial kits, or alter mix ratios. Mix polyurethane coating materials in same temperature conditions specified in paragraph DELIVERY AND STORAGE. The polyurethane coating material is moisture sensitive and any introduction of moisture or water into the material during mixing or application will shorten usable pot life. Use a mixer that does not create a vortex. Do not add solvent without specific written recommendation from the manufacturer. No induction time is required, only thorough agitation of the mixed material.

3.6.1.3 Pot Life

Apply mixed products within stated pot life for each product. Stop applying when material becomes difficult to apply in a smooth, uniform wet film. Add all required solvent at time of mixing. Do not add solvent to extend pot life. Pot life is based on standard conditions at 70 degrees F

and 50 percent relative humidity. For every 18 degrees F rise in temperature, pot life is reduced by approximately half, and for every 18 degrees F drop it is approximately doubled. Usable pot life depends on the temperature of the material at the time of mixing and the sustained temperature at the time of application. Other factors such as the shape of the container and volume of mixed material may also affect pot life. Precooling or exterior icing of components for at least 24 hours to a minimum of 50 degrees F in hot climates will extend pot life. High humidity at time of mixing and application shortens pot life of the Polyurethane topcoat material. Following are approximate pot life times:

Epoxy primer and intermediate materials	4 hoursy manufacturer
Polyurethane topcoat materials	2 hours.

3.6.1.4 Application Conditions and Recoat Windows

The application condition requirements for the coating system are very time and temperature sensitive, and are intended to avoid the delamination problems frequently found on industrial structures. Plan coating application to ensure that specified temperature, humidity, and condensation conditions are met. If conditions do not allow for orderly application of sealant, primer, stripe coat, intermediate coat and topcoat, use appropriate means of controlling air and surface temperatures, as required. Partial or total enclosures, insulation, heating or cooling, or other appropriate measures may be required to control conditions to allow for orderly application of all required coats.

Maintain air and steel surface temperature between 60 and 100 degrees F during application and the first four hours of cure for epoxy coats and the first eight hours of cure for polyurethane coats. Maintain steel surface temperature more than 5 degrees F above the dew-point of the ambient air for the same period.

Use Table entitled "RECOAT WINDOWS" to determine appropriate recoat windows for each coat after the initial coat. Apply each coat during appropriate RECOAT WINDOW of preceding coat. If a RECOAT WINDOW is missed, the minimum and maximum primer and intermediate coat thickness may be adjusted to accommodate a FILL COAT, however, requirements for total epoxy coating thickness and total coating thickness will not be modified. Missing more than one RECOAT WINDOW may require complete removal of coating if maximum total coating thickness requirements cannot be achieved.

If coating is not applied during RECOAT WINDOW, or if surface temperature exceeds 120 degrees F between applications, provide GLOSS REMOVAL, apply next coat within 24 hours. If next planned coat is topcoat, apply FILL COAT if required to fill sanding marks. Sanding marks from GLOSS REMOVAL of intermediate coat reflecting through topcoat will be considered as noncompliant. Apply FILL COAT within 24 hours of GLOSS REMOVAL, then apply topcoat within RECOAT WINDOW of FILL COAT.

RECOAT WINDOWS

EPOXY OVER EPOXY

Temperature degrees F	60-70	71-80	81-90	91-100	101-110	111-120
RECOAT WINDOW (Hrs.)	24-72	18-60	16-48	12-36	8-18	4-6

POLYURETHANE OVER EPOXY

RECOAT WINDOWS

Temperature degrees F	60-70	71-80	81-90	91-100	101-110	111-120
RECOAT WINDOW (Hrs.)	24-96	24-72	16-48	12-36	10-24	8-16

POLYURETHANE OVER POLYURETHANE

Temperature degrees F	60-70	71-80	81-90	91-100	101-110	111-120
RECOAT WINDOW (Hrs.)	8-48	6-48	4-36	3-24	2-12	1-2

The temperature ranges shown in the table above are for determining recoat windows. Choose recoat window based on the highest surface temperature that was sustained for one or more hours between coats. This applies to the entire time between coats. Measure and record air and surface temperatures on hourly basis to determine appropriate recoat windows. If surface temperature goes above 100 degrees F, measure and record temperatures every half hour.

FILL COAT - Where indicated, apply coat of intermediate coat epoxy, at 2 to 3 mils DFT, then apply next specified full coat within recoat window of FILL COAT. A FILL COAT may be used to adjust coating thickness to comply with requirements or to fill sanding marks in intermediate coat.

GLOSS REMOVAL - Where required, hand sand in a linear fashion to remove gloss using 120-200 grit wet/dry sandpaper, followed by solvent wiping with a clean rag soaked with denatured alcohol to remove all dust. GLOSS REMOVAL of primer coat is to scarify surface and shall consist of removal of approximately 1 mil of coating. If steel is exposed during GLOSS REMOVAL, repair in accordance with paragraph PROCEDURE FOR HOLIDAY AND SPOT REPAIRS OF NEWLY APPLIED COATING. GLOSS REMOVAL of intermediate coat may include removal of up to 3 mils of coating to avoid excess thickness, prior to application of FILL COAT.

3.6.2 Amine Blush Testing of Epoxy Coat Prior to Overcoating

Test epoxy surfaces prior to application of roof joint sealant, epoxy coat, or polyurethane topcoat for amine blush contamination using the Test Kit described in paragraph TEST KIT FOR IDENTIFYING AMINE BLUSH ON EPOXY SURFACES. Test all surfaces at rate of three tests for the first 1000 square feet plus one test for each additional 2000 square feet or part thereof. Remove any identified contamination using an approved procedure.

3.6.3 Application of Coating System

Apply coatings in accordance with SSPC PA 1 and as specified herein. Apply coatings to surfaces that meet all stated surface preparation requirements.

After application of primer coat and prior to application of each subsequent coat, perform testing prescribed in paragraph PRE-APPLICATION TESTING FOR SURFACE CONTAMINATION, as necessary, to ensure minimal intercoat contamination. This testing may be reduced to one half of the prescribed rate for bare steel if the testing indicates no contamination when sampling is evenly distributed over surfaces being tested. If contamination is found between coats, revert to the specified testing rate. Generally, oil and grease contamination and soluble salts contamination are not encountered if subsequent coats are applied within

specified recoat windows and unusual atmospheric events do not occur. Such atmospheric events as a coastal storm blowing onshore can bring unusual chloride contamination. Concern for intercoat contamination should be continually prevalent, and spot testing should be accomplished to verify satisfactory conditions. Where visual examination or spot testing indicates contamination, perform sufficient testing to verify non-contamination, or to define extent of contamination for appropriate treatment.

Apply each coat in a consistent wet film, at 90 degrees to previous coat. Ensure that primer and intermediate coat "cold joints" are no less than six inches from welds. Apply stripe coat by brush. For convenience, stripe coat material may be delivered by spray if followed immediately with brush-out and approved procedures include appropriate controls on thickness. Apply all other coats by spray application. Use appropriate controls to prevent airborne coating fog from drifting beyond [15][____] feet the tank berm. Cover or protect all surfaces that will not be coated. The cleanliness, temperature, recoat windows, and airborne paint containment requirements may necessitate the use of enclosures, portable shelters, or other appropriate controls.

Apply coatings at the following specified thickness:

Coat	Minimum DFT (Mils)	Maximum DFT (Mils)
Primer	3	5
Intermediate	3	5
Top	2	3
Total system	8	13

3.6.3.1 Application of Primer

Apply primer coat, maintaining paint supply container height within 3 feet of the paint nozzle for applying zinc primer. Maintain constant agitation of paint pot to ensure that zinc does not settle in container.

3.6.3.2 Application of Stripe Coat

Apply a stripe coat of intermediate coat epoxy material within RECOAT WINDOW of primer, allowing sufficient dry time to allow application of intermediate coat within RECOAT WINDOW of primer. Apply by brush, working material into corners, crevices, angles, and welds, and onto outside corners and angles.

3.6.3.3 Application of Intermediate Coat

Apply intermediate coat within RECOAT WINDOW of primer coat.

3.6.3.4 Non-skid for Stairs and Top

Where non-skid is required, apply a second intermediate coat, and immediately follow with application of non-skid grit, broadcast at the rate of 2 pounds per 100 square feet, and backroll. Apply topcoat as specified.

3.6.3.5 Application of Topcoat

Make all required repairs to primer and intermediate coats as specified in

paragraph entitled "Procedure for Holiday and Spot Repairs of Newly Applied Coating" prior to applying topcoat. Apply topcoat within RECOAT WINDOW of intermediate coat. The polyurethane topcoat may require multiple passes to achieve desired aesthetics and required thickness. Consult manufacturer for thinning and application procedures for anticipated temperature, humidity, and wind conditions. Touch-up blemishes and defects within recoat window of polyurethane topcoat. Retain sample of polyurethane topcoat, from the same batch used to coat structure, to make touch-ups that might be required later.

3.6.3.6 Procedure for Holiday and Spot Repairs of Newly Applied Coating

Repair coating film defects at the earliest practicable time, preferably before application of the succeeding coat. Observe all requirements for soluble salts contamination, cleanliness between coats, and application conditions. Prepare defective area in accordance with SSPC SP 10, and feather coating as required to leave 4 inches of each succeeding coat feathered and abraded. Protect adjacent areas from damage and overspray. Remove dust and solvent wipe the prepared area plus an additional 4 inches beyond the prepared area with clean denatured alcohol. Apply each coat within RECOAT WINDOW of preceeding coat. Within four hours of preparation, apply zinc-rich primer to prepared steel and feather onto prepared primer. Apply intermediate coat to primed area and feather to prepared intermediate area. Apply topcoat to intermediate coat and feather to prepared topcoat. Apply each repair coat to approximate thickness of surrounding coating system.

3.6.3.7 Structure Occupancy After Coating Application

Use clean canvas or other approved shoe covers when walking on coated surfaces, regardless of curing time allowed. For heavily trafficked areas, provide cushioned mats for additional protection.

3.7 FIELD QUALITY CONTROL

For marking of tank surfaces, use chalk for marking bare steel, and water based markers for marking coated surfaces, and remove marks prior to coating. Do not use any wax or grease based markers, or any other markers that leave a residue or stain.

3.7.1 Coating Inspector

The coating inspector shall be considered a QC Specialist and shall report to the QC Manager, as specified in Section 01 45 02 NAVFAC QUALITY CONTROL. The Coating Inspector shall be present during all pre-preparation testing, surface preparation, coating application, initial cure of the coating system, during all coating repair work, and during completion activities as specified in Section 01 45 02 NAVFAC QUALITY CONTROL. The Coating Inspector shall provide complete documentation of conditions and occurrences on the job site, and be aware of conditions and occurrences that are potentially detrimental to the coating system. The requirements for inspection listed in this Section are in addition to the QC inspection and reporting requirements specified in Section 01 45 02 NAVFAC QUALITY CONTROL.

3.7.2 Field Inspection

3.7.2.1 Inspection Requirements

Perform field inspection in accordance with ASTM D 3276 and the approved Coating Work Plan. Document Contractor's compliance with the approved Coating Work Plan.

Provide all tools and instruments required to perform the required testing, as well as any tools or instruments that the inspector considers necessary to perform the required inspections and tests. Document each inspection and test, including required hold points and other required inspections and tests, as well as those inspections and tests deemed prudent from on-site evaluation to document a particular process or condition, as follows:

a. Location or area;
b. Purpose (required or special);
c. Method;
d. Criteria for evaluation;
e. Results;
f. Determination of compliance;
g. List of required rework;
h. Observations.

Collect and record Environmental Conditions as described in ASTM D 3276 on a 24 hour basis, as follows:

a. During surface preparation, every two hours or when changes occur;
b. During coating application and the first four days of initial cure, every hour, or when changes occur;
c. Note location, time, and temperature of the highest and lowest surface temperatures each day;
d. Use a non-contact thermometer to locate temperature extremes, then verify with contact thermometers.

Document all equipment used in inspections and testing, including manufacturer, model number, serial number, last calibration date and future calibration date, and results of on-site calibration performed.

Document Contractors compliance with the approved Coating Work Plan.

3.7.2.2 Inspection Report Forms

Develop project-specific report forms as required to report measurements, test results, and observations being complete and and conforming to contract requirements. This includes all direct requirements of the contract documents and indirect requirements of referenced documents. Show acceptance criteria with each requirement and indication of conformity of each inspected item. The data may be in any format, but must be legible and presented so that entered data can be quickly compared to the appropriate requirement.

3.7.2.3 Daily Inspection Reports

Submit one copy of daily inspection report completed each day when performing work under this Section, to the Contracting Officer. Note all non-compliance issues, and all issues that were reported for rework in accordance with QC procedures of Section 01 45 02 NAVFAC QUALITY CONTROL. Each report shall be signed by the coating inspector and the QC Manager.

Submit report within 24 hours of date recorded on the report.

3.7.2.4 Inspection Logbook

A continuous record of all activity related to this Section shall be maintained in an Inspection Logbook on a daily basis. The logbook shall be hard or spiral bound with consecutively numbered pages, and shall be used to record all information provided in the Daily Inspection Reports, as well as other pertinent observations and information. The Coating Inspector's Logbook that is sold by NACE is satisfactory. Submit the original Inspection Logbook to the Contracting Officer upon completion of the project and prior to final payment.

3.7.2.5 Inspection Equipment

All equipment shall be in good condition, operational within its design range, and calibrated as required by the specified standard for use of each device.

3.8 FINAL CLEANUP

Following completion of the work, remove debris, equipment, and materials from the site. Remove temporary connections to Government or Contractor furnished water and electrical services. Restore existing facilities in and around the work areas to their original condition.

TABLE 1
COATING QUALITY CONFORMANCE INSPECTION REQUIREMENTS

Table Ia - Zinc-rich Epoxy Primer Coat MIL-DTL-24441/19 Formula 159

Test	Component A		Component B		Mixed	
	Min.	Max.	Min.	Max.	Min.	Max.
Pigment content, percent (zinc dust)	---	---	81.5	85.5	---	---
Volatiles, percent	42.8	44.3	8.0	8.4	---	---
Non-volatile vehicle percent	53.7	57.7	8.3	8.7	---	---
Weight,						
Kilograms/liter	0.87	1.01	3.30	3.40	2.80	2.91
Pounds/gallon	7.3	8.4	27.5	28.4	23.4	24.4
Flashpoint						
Degrees C	35.6	---	37.8	---	---	---
Degrees F	96	---	100	---	---	---
Consistency, grams	---	---	250	500	150	300
Set to touch time, hours at 23 degrees C, 73 degrees F	---	---	---	---	---	2
Dry-hard time, hours at 23 degrees C, 73 degrees F	---	---	---	---	---	8
Pot life, hours at 23 degrees C, 73 degrees F	---	---	---	---	4	---
Sag resistance						
Micrometers	---	---	---	---	300	---
Mils	---	---	---	---	12	---
VOC						
Grams/liter	---	---	---	---	---	304
Pounds/gallon	---	---	---	---	---	2.5

NOTES:
Test methods as specified in MIL-DTL-24441.

TABLE 1
COATING QUALITY CONFORMANCE INSPECTION REQUIREMENTS

Table Ib. - Epoxy Intermediate Coat MIL-DTL-24441/31 Formula 152 Type IV (White (Tinted))

Test	Component A		Component B		Mixed	
	Min.	Max.	Min.	Max.	Min.	Max.
Pigment content, percent	44.0	49.0	33.0	38.0	---	---
Volatiles, percent	29.0	35.0	16.0	21.0	---	---
Non-volatile vehicle, percent	17.5	23.5	44.0	49.0	---	---
Coarse particles, percent	---	0.3	---	0.3	---	---
Consistency, grams	180	320	300	470	180	245
Weight						
Kilograms/liter	1.39	1.45	1.29	1.35	1.34	1.40
Pounds per gallon	11.6	12.1	10.8	11.3	11.2	11.7
Set to touch, hours at 23 degrees C, 73 degrees F	---	---	---	---	---	3
Dry-hard time, hours at 23 degrees C, 73 degrees F	---	---	---	---	---	8
Fineness of grind, Hegman	4	---	4	---	---	---
Flashpoint						
Degrees C	35.5	---	37.8	---	---	---
Degrees F	96	---	100	---	---	---
Titanium dioxide, percent of pigment	91	---	---	---	---	---
Pot life, hours at 23 degrees C, 73 degrees F	---	---	---	---	4	---
Sag resistance						
Micrometers	---	---	---	---	300	---
Mils	---	---	---	---	12	---
Color of dry film to approximate color of FED-STD 595 color 27778	---	---	---	---	Conform	
Contrast ratio, at 75 micrometers, 3 mils DFT	---	---	---	---	0.98	---
Gloss, 60 degree specular	---	---	---	---	35	---
VOC						
Grams/liter	---	---	---	---	---	340
Pounds/gallon	---	---	---	---	---	2.8

GENERAL NOTES:
Test methods as specified in MIL-DTL-24441.
Where "Conform" is indicated, refer to specific requirements of MIL-DTL-24441/31.

TABLE 1
COATING QUALITY CONFORMANCE INSPECTION REQUIREMENTS

Table Ic - Polyurethane Topcoat MIL-PRF-85285 Type II
(White and Colors)

Test	Component A		Component B		Mixed	
	Min.	Max.	Min.	Max.	Min.	Max.
Moisture content, percent	---	2	---	---	---	---
Coarse particles, percent	---	---	---	---	---	.5
Viscosity	---	---	---	---	See Note 1	
Fineness of grind, Hegman	---	---	---	---	7	---
Drying to touch (See Note 2)	---	---	---	---	---	4
Dry hard (See Note 2)	---	---	---	---	---	8
VOC, grams per liter	---	---	---	---	---	340
Color	---	---	---	---	delta E+-1.0	
Gloss 60 degree specular gloss						
Gloss	---	---	---	---	---	90
Semi-gloss	---	---	---	---	15	45
Opacity	---	---	---	---	0.95	---
Flexibility	---	---	---	---	Conform	
Fluid resistance	---	---	---	---	Conform	
Heat resistance (cure)	---	---	---	---	Conform	
Solvent resistance (cure)	---	---	---	---	Conform	
Condition in container	---	---	---	---	Conform	
Odor	---	---	---	---	Conform	
Lead percent	---	---	---	---	---	0.06
Cadmium percent	---	---	---	---	---	0.06
Chromium percent	---	---	---	---	---	0.00

NOTES:
(1) Modify paragraph 3.6.4 Viscosity and Pot Life, of MIL-PRF-85285 as follows:

The viscosity of the admixed coating, when tested in accordance with ASTM D 1200 through a No. 4 Ford cup, shall be as follows:

Time from mix (minimum)	Maximum time through a No. 4 Ford cup
Initially	30 seconds
2 hours	60 seconds
4 hours	No gel

(2) Modify paragraph 3.7.1 Drying Time, of MIL-PRF-85285

When applied by spray techniques and when tested in accordance with ASTM D 1640, the coating shall be set-to-touch within four hours and dry-hard within eight hours (see 4.6 and table I).

GENERAL NOTES:
- Test methods as specified in MIL-PRF-85285.
- Where "Conform" is indicated, refer to specific requirements of MIL-PRF-85285.

-- End of Section --

SECTION 26 00 00.00 20

BASIC ELECTRICAL MATERIALS AND METHODS
07/06

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM D 709	(2001; R 2007) Laminated Thermosetting Materials

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2	(2007; Errata 2006; Errata 2007; INT 44-56 2007; INT 47, 49, 50, 52-56 2008; INT 57, 58, 51, 48 2009) National Electrical Safety Code
IEEE Std 100	(2000) The Authoritative Dictionary of IEEE Standards Terms

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2008) Enclosures for Electrical Equipment (1000 Volts Maximum)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2008; AMD 1 2008) National Electrical Code - 2008 Edition

1.2 RELATED REQUIREMENTS

This section applies to certain sections of Division 02, EXISTING CONDITIONS. This section applies to all sections of Division 26 and 33, ELECTRICAL and UTILITIES, of this project specification unless specified otherwise in the individual sections. This section has been incorporated into, and thus, does not apply to, and is not referenced in the following sections.

Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM
Section 33 71 02.00 20 UNDERGROUND ELECTRICAL DISTRIBUTION

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 480Y/277 volts secondary, three phase, four wire.

1.5 ADDITIONAL SUBMITTALS INFORMATION

Submittals required in other sections that refer to this section must conform to the following additional requirements as applicable.

1.5.1 Shop Drawings (SD-02)

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.

1.5.2 Product Data (SD-03)

Submittal shall include performance and characteristic curves.

1.6 QUALITY ASSURANCE

1.6.1 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.6.2 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in the technical section.

1.6.2.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.6.2.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

1.7 WARRANTY

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.8 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.

1.9 MANUFACTURER'S NAMEPLATE

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.10 FIELD FABRICATED NAMEPLATES

ASTM D 709. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified in the technical sections or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, 0.125 inch thick, white with black center core.

Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be one by 2.5 inches. Lettering shall be a minimum of 0.25 inch high normal block style.

1.11 ELECTRICAL REQUIREMENTS

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

1.12 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.

PART 2 PRODUCTS

2.1 FACTORY APPLIED FINISH

Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA 250 corrosion-resistance test.

PART 3 EXECUTION

3.1 FIELD APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be as specified in the section specifying the associated electrical equipment.

3.2 FIELD FABRICATED NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

3.3 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.

-- End of Section --

SECTION 26 08 00

APPARATUS INSPECTION AND TESTING
08/08

PART 1 GENERAL

1.1 REFERENCES

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

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS (2003) Acceptance Testing Specifications

1.2 RELATED REQUIREMENTS

Section 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS applies to this section with additions and modifications specified herein.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Acceptance tests and inspections; G

SD-07 Certificates

Qualifications of organization, and lead engineering technician; G

Acceptance test and inspections procedure; G

1.4 QUALITY ASSURANCE

1.4.1 Qualifications

Contractor shall engage the services of a qualified testing organization to provide inspection, testing, calibration, and adjustment of the electrical distribution system and generation equipment listed in paragraph entitled "Acceptance Tests and Inspections" herein. Organization shall be independent of the supplier, manufacturer, and installer of the equipment. The organization shall be a first tier subcontractor. No work required by this section of the specification shall be performed by a second tier subcontractor.

a. Submit name and qualifications of organization. Organization shall have been regularly engaged in the testing of electrical materials, devices, installations, and systems for a minimum of 5 years. The organization shall have a calibration program, and test instruments used shall be calibrated in accordance with NETA ATS.

b. Submit name and qualifications of the lead engineering technician performing the required testing services. Include a list of three comparable jobs performed by the technician with specific names and telephone numbers for reference. Testing, inspection, calibration, and adjustments shall be performed by an engineering technician, certified by NETA or the National Institute for Certification in Engineering Technologies (NICET) with a minimum of 5 years' experience inspecting, testing, and calibrating electrical distribution and generation equipment, systems, and devices.

1.4.2 Acceptance Tests and Inspections Reports

Submit certified copies of inspection reports and test reports. Reports shall include certification of compliance with specified requirements, identify deficiencies, and recommend corrective action when appropriate. Type and neatly bind test reports to form a part of the final record. Submit test reports documenting the results of each test not more than 10 days after test is completed.

1.4.3 Acceptance Test and Inspections Procedure

Submit test procedure reports for each item of equipment to be field tested at least 45 days prior to planned testing date. Do not perform testing until after test procedure has been approved.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 ACCEPTANCE TESTS AND INSPECTIONS

Testing organization shall perform acceptance tests and inspections. Test methods, procedures, and test values shall be performed and evaluated in accordance with NETA ATS, the manufacturer's recommendations, and paragraph entitled "Field Quality Control" of each applicable specification section. Tests identified as optional in NETA ATS are not required unless otherwise specified. Equipment shall be placed in service only after completion of required tests and evaluation of the test results have been completed. Contractor shall supply to the testing organization complete sets of shop drawings, settings of adjustable devices, and other information necessary for an accurate test and inspection of the system prior to the performance of any final testing. Contracting Officer shall be notified at least 14 days in advance of when tests will be conducted by the testing organization. Perform acceptance tests and inspections on applicable equipment and systems specified in the following sections:

a. Section 33 71 02.00 20 UNDERGROUND ELECTRICAL DISTRIBUTION

3.2 SYSTEM ACCEPTANCE

Final acceptance of the system is contingent upon satisfactory completion of acceptance tests and inspections.

3.3 PLACING EQUIPMENT IN SERVICE

A representative of the approved testing organization shall be present when equipment tested by the organization is initially energized and placed in service.

-- End of Section --

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SECTION 26 20 00

INTERIOR DISTRIBUTION SYSTEM
08/08

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM B 1	(2001; R 2007) Standard Specification for Hard-Drawn Copper Wire
ASTM B 8	(2004) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM D 709	(2001; R 2007) Laminated Thermosetting Materials

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2	(2007; Errata 2006; Errata 2007; INT 44-56 2007; INT 47, 49, 50, 52-56 2008; INT 57, 58, 51, 48 2009) National Electrical Safety Code
IEEE Std 100	(2000) The Authoritative Dictionary of IEEE Standards Terms
IEEE Std 81	(1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1)Normal Measurements

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 2	(2000; Errata 2002; R 2005; Errata 2006) Standard for Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated Not More than 2000 Volts AC or 750 Volts DC: Part 8 - Disconnect Devices for Use in Industrial Control Equipment
NEMA ICS 4	(2005) Industrial Control and Systems:

	Terminal Blocks
NEMA ICS 6	(1993; R 2006) Standard for Industrial Controls and Systems Enclosures
NEMA MG 1	(2007; Errata 2008) Standard for 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 RN 1	(2005) Standard for Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
NEMA TC 2	(2003) Standard for Electrical Polyvinyl Chloride (PVC) Tubing and Conduit
NEMA TC 3	(2004) Standard for Polyvinyl Chloride PVC Fittings for Use With Rigid PVC Conduit and Tubing
NEMA WD 1	(1999; R 2005) Standard for General Requirements for Wiring Devices
NEMA Z535.4	(2007; Errata 2007) Product Safety Signs and Labels

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2008; AMD 1 2008) National Electrical Code - 2008 Edition
NFPA 70E	(2009; Errata 2009) Standard for Electrical Safety in the Workplace
NFPA 780	(2007) Standard for the Installation of Lightning Protection Systems

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

29 CFR 1910.147	Control of Hazardous Energy (Lock Out/Tag Out)

UNDERWRITERS LABORATORIES (UL)

UL 1010	(2006) Receptacle-Plug Combinations for Use in Hazardous (Classified) Locations
UL 1063	(2006) Standard for Safety Machine-Tools Wires and Cables
UL 20	(2000 ; Rev thru Dec 2008) Standard for General-Use Snap Switches
UL 44	(2005; Rev thru Nov 2005)

	Thermoset-Insulated Wires and Cables
UL 467	(2007) Standard for Grounding and Bonding Equipment
UL 486A-486B	(2003; Rev thru Apr 2009) Standard for Wire Connectors
UL 486C	(2004; Rev thru Apr 2009) Standard for Splicing Wire Connectors
UL 508	(1999; Rev thru Sep 2008) Standard for Industrial Control Equipment
UL 510	(2005; Rev thru Aug 2005) Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
UL 514B	(2004; Rev thru Aug 2007) Standard for Conduit, Tubing and Cable Fittings
UL 651	(2005; Rev thru May 2007) Standard for Schedule 40 and 80 Rigid PVC Conduit and Fittings
UL 674	(2003; Rev thru Aug 2008) Standard for Electric Motors and Generators for Use in Division 1 Hazardous (Classified) Locations
UL 698	(2006) Industrial Control Equipment for Hazardous (Classified) Locations
UL 83	(20086) Standard for Thermoplastic-Insulated Wires and Cables
UL 870	(1995; Rev thru Jul 2003) Standard for Wireways, Auxiliary Gutters, and Associated Fittings
UL 877	(1993; Rev thru Nov 1999) Circuit Breakers and Circuit-Breaker Enclosures for Use in Hazardous (Classified) Locations
UL 886	(1994; Rev thru Nov 2005) Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations

1.2 DEFINITIONS

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.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data;G

Motor controllers; G

Submittals shall include performance and characteristic curves.

SD-06 Test Reports

600-volt wiring test; G

Grounding system test; G

SD-10 Operation and Maintenance Data

Electrical Systems, Data Package 5; G

Submit operation and maintenance data in accordance with Section 01 33 00 SUBMITTAL PROCEDURES and as specified herein.

1.4 QUALITY ASSURANCE

1.4.1 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.4.2 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.4.2.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.4.2.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

1.5 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. Schematic diagram of electrical control system (other than HVAC, covered elsewhere).

b. Manufacturers' operating and maintenance manuals on active electrical equipment.

1.6 WARRANTY

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

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 Nonmetallic Conduit

PVC Type EPC-40 in accordance with NEMA TC 2,UL 651.

2.2.2 Plastic-Coated Rigid Steel and IMC Conduit

NEMA RN 1, Type 40(40 mils thick).

2.2.3 Fittings for Metal Conduit, and Flexible Metal Conduit

2.2.3.1 Fittings for Rigid Metal Conduit and IMC

Threaded-type. Split couplings unacceptable.

2.2.4 Fittings for Rigid Nonmetallic Conduit

NEMA TC 3 for PVC and UL 514B.

2.3 CABINETS, JUNCTION BOXES, AND PULL BOXES

Provide NEMA 4X enclosures per NEMA ICS 6.

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 capacities shown are based on copper, unless indicated otherwise.

2.4.1.1 Equipment Manufacturer Requirements

When manufacturer's equipment requires copper conductors at the terminations or requires copper conductors to be provided between components of equipment, provide copper conductors or splices, splice boxes, and other work required to satisfy manufacturer's requirements.

2.4.1.2 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 neutrals shall be white with a different colored (not green) stripe for each. Color of ungrounded conductors in different voltage systems shall be as follows:

a. 480/277 volt, three-phase

(1) Phase A - brown

(2) Phase B - orange

(3) Phase C - yellow

b. 120/240 volt, single phase: Black and red

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, 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.

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.

2.5 SPLICES AND TERMINATION COMPONENTS

UL 486A-486B 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-486B or UL 486C (twist-on splicing connector). Provide solderless terminal lugs on stranded conductors.

2.6 SWITCHES

2.6.1 Toggle Switches

NEMA WD 1, UL 20, three-way, totally enclosed with bodies of thermoplastic or thermoset plastic and mounting strap with grounding screw. Handles shall be brown thermoplastic. Wiring terminals shall be screw-type, side-wired or of the solderless pressure type having suitable conductor-release arrangement. 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 MOTORS

NEMA MG 1. 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. Unless otherwise indicated, motors rated 1 HP and above shall be continuous duty type.

2.7.1 Premium Efficiency Polyphase Motors

Polyphase motors shall be selected based on high efficiency characteristics relative to typical characteristics and applications as listed in NEMA MG 10. In addition, continuous rated, polyphase squirrel-cage medium induction motors shall meet the requirements for premium efficiency electric motors in accordance with NEMA MG 1, including the NEMA full load efficiency ratings. In exception, for motor-driven equipment with a minimum seasonal or overall efficiency rating, such as a SEER rating, provide equipment with motor to meet the overall system rating indicated.

2.7.2 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. 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.

2.7.3 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 as specified herein. Power wiring and conduit shall conform to the requirements specified herein. Control wiring shall be provided under, and conform to the requirements of the section specifying the associated equipment.

2.8 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. 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. 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. 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.

2.8.1 Control Wiring

All control wire shall be stranded tinned copper switchboard wire with 600-volt flame-retardant insulation Type SIS meeting UL 44, or Type MTW meeting UL 1063, and shall pass the VW-1 flame tests included in those standards. Hinge wire shall have Class K stranding. Current transformer secondary leads shall be not smaller than No. 10 AWG. The minimum size of control wire shall be No. 14 AWG. Power wiring for 480-volt circuits and below shall be of the same type as control wiring and the minimum size shall be No. 12 AWG. Special attention shall be given to wiring and terminal arrangement on the terminal blocks to permit the individual conductors of each external cable to be terminated on adjacent terminal points.

2.8.2 Control Circuit Terminal Blocks

NEMA ICS 4. Control circuit terminal blocks for control wiring shall be molded or fabricated type with barriers, rated not less than 600 volts. The terminals shall be removable binding, fillister or washer head screw type, or of the stud type with contact and locking nuts. The terminals shall be not less than No. 10 in size and shall have sufficient length and space for connecting at least two indented terminals for 10 AWG conductors to each terminal. The terminal arrangement shall be subject to the approval of the Contracting Officer and not less than four (4) spare terminals or 10 percent, whichever is greater, shall be provided on each block or group of blocks. Modular, pull apart, terminal blocks will be acceptable provided they are of the channel or rail-mounted type. The Contractor shall submit data showing that the proposed alternate will accommodate the specified number of wires, are of adequate current-carrying capacity, and are constructed to assure positive contact between current-carrying parts.

2.8.2.1 Types of Terminal Blocks

a. Short-Circuiting Type: Short-circuiting type terminal blocks shall be furnished for all current transformer secondary leads and shall have provision for shorting together all leads from each current transformer without first opening any circuit. Terminal blocks shall meet the requirements of paragraph CONTROL CIRCUIT TERMINAL BLOCKS above.

b. Load Type: Load terminal blocks rated not less than 600 volts and of adequate capacity shall be provided for the conductors for NEMA Size 3 and smaller motor controllers and for other power circuits, except those for feeder tap units. The terminals shall be of either the stud type with contact nuts and locking nuts or of the removable screw type, having length and space for at least two indented terminals of the size required on the conductors to be terminated. For conductors rated more than 50 amperes, screws shall have hexagonal heads. Conducting parts between connected terminals shall have adequate contact surface and cross-section to operate without overheating. Each connected terminal shall have the circuit designation or wire number placed on or near the terminal in permanent contrasting color.

2.8.3 Control Circuits

Control circuits shall have maximum voltage of 120 volts derived from control transformer in same enclosure.

2.8.4 Enclosures for Motor Controllers

NEMA ICS 6.

2.8.5 Pilot and Indicating Lights

Provide LED cluster lamps.

2.8.6 Reduced-Voltage Controllers

Reduced-voltage starters shall be single-step, closed transition solid state-type, and shall have adjustable time interval between application of

reduced and full voltages to motors.

2.9 LOCKOUT REQUIREMENTS

Provide disconnecting means capable of being locked out for machines and other equipment to prevent unexpected startup or release of stored energy in accordance with 29 CFR 1910.147. Mechanical isolation of machines and other equipment shall be in accordance with requirements of Division 23, "Mechanical."

2.10 GROUNDING AND BONDING EQUIPMENT

2.10.1 Ground Rods

UL 467. Ground rods shall be sectional type, copper-clad steel, with minimum diameter of 3/4 inch and minimum length[of 10 feet][of 20 feet].

2.11 HAZARDOUS LOCATIONS

Electrical materials, equipment, and devices for installation in hazardous locations, as defined by NFPA 70, shall be specifically approved by Underwriters' Laboratories, Inc., or Factory Mutual for particular "Class," "Division," and "Group" of hazardous locations involved. Boundaries and classifications of hazardous locations shall be as indicated. Equipment in hazardous locations shall comply with UL 877 for circuit breakers, UL 886 for outlet boxes and fittings, UL 1010 for receptacles, UL 674 for motors, and UL 698 for industrial controls.

2.12 MANUFACTURER'S NAMEPLATE

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

2.13 FIELD FABRICATED NAMEPLATES

ASTM D 709. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, 0.125 inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be one by 2.5 inches. Lettering shall be a minimum of 0.25 inch high normal block style.

2.14 WARNING SIGNS

Provide warning signs for flash protection in accordance with NFPA 70E and NEMA Z535.4 for switchboards, panelboards, industrial control panels, and motor control centers that are in other than dwelling occupancies and are likely to require examination, adjustment, servicing, or maintenance while energized. Provide field installed signs to warn qualified persons of potential electric arc flash hazards when warning signs are not provided by the manufacturer. The marking shall be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

2.15 WIREWAYS

UL 870. Material shall be 316 stainless steel 16 gauge for heights and depths up to 6 by 6 inches, and 14 gauge for heights and depths up to 12 by 12 inches. Provide in length required for the application withhinged-cover NEMA 3R enclosure per NEMA ICS 6.

2.16 FACTORY APPLIED FINISH

Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA 250 corrosion-resistance test and the additional requirements as specified herein. Interior and exterior steel surfaces of equipment enclosures shall be thoroughly cleaned and then receive a rust-inhibitive phosphatizing or equivalent treatment prior to painting. Exterior surfaces shall be free from holes, seams, dents, weld marks, loose scale or other imperfections. Interior surfaces shall receive not less than one coat of corrosion-resisting paint in accordance with the manufacturer's standard practice. Exterior surfaces shall be primed, filled where necessary, and given not less than two coats baked enamel with semigloss finish. Equipment located indoors shall be ANSI Light Gray, and equipment located outdoors shall be ANSI Dark Gray. Provide manufacturer's coatings for touch-up work and as specified in paragraph FIELD APPLIED PAINTING.

PART 3 EXECUTION

3.1 INSTALLATION

Electrical installations, including weatherproof and hazardous locations and ducts, plenums and other air-handling spaces, shall conform to requirements of NFPA 70 and IEEE C2 and to requirements specified herein.

3.1.1 Hazardous Locations

Work in hazardous locations, as defined by NFPA 70, shall be performed in strict accordance with NFPA 70 for particular "Class," "Division," and "Group" of hazardous locations involved. Provide conduit and cable seals where required by NFPA 70. Conduit shall have tapered threads.

3.1.2 Wiring Methods

Provide insulated conductors installed in plastic coated rigid steel conduit, rigid nonmetallic conduit, except where specifically indicated or specified otherwise or required by NFPA 70 to be installed otherwise. Grounding conductor shall be separate from electrical system neutral conductor. Provide insulated green equipment grounding conductor for circuit(s) installed in conduit and raceways. Minimum conduit size shall be 1/2 inch in diameter for low voltage lighting and power circuits.

3.1.2.1 Pull Wire

Install pull wires in empty conduits. Pull wire shall be plastic having minimum 200-pound force tensile strength. Leave minimum 36 inches of slack at each end of pull wire.

3.1.3 Conduit Installation

Unless indicated otherwise, conceal conduit under floor slabs and within finished walls, ceilings, and floors. Keep conduit minimum 6 inches away

from parallel runs of flues and steam or hot water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit will be visible after completion of project.

3.1.3.1 Restrictions Applicable to Nonmetallic Conduit

a. PVC Schedule 40

(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, nor in underground areas below hazardous classified areas.

(5) Do not use above grade, except where allowed in this section for rising through floor slab or indicated otherwise.

3.1.3.2 Restrictions Applicable to Flexible Conduit

Use only as specified in paragraph FLEXIBLE CONNECTIONS.

3.1.3.3 Underground Conduit Other Than Service Entrance

Plastic-coated rigid steel; PVC. Convert nonmetallic conduit, other than PVC Schedule 40, to plastic-coated rigid, or IMC, steel conduit before rising through floor slab. Plastic coating shall extend minimum 6 inches above floor. Nonmetallic conduit and fittings shall not be used within the indicated hazardous areas.

3.1.3.4 Conduit Installed Under Floor Slabs

Conduit run under floor slab shall be located a minimum of 12 inches below the vapor barrier. Seal around conduits at penetrations thru vapor barrier.

3.1.3.5 Conduit Through Floor Slabs

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

3.1.3.6 Stub-Ups

Provide conduits stubbed up through concrete floor for connection to equipment. Conduit shall be continuous to seal fitting where required. Extend conductors to equipment in rigid steel conduit, except that flexible metal conduit may be used 6 inches above floor.

3.1.3.7 Conduit Support

Support conduit by pipe straps, wall brackets, hangers, or ceiling trapeze. Fasten 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.

3.1.3.8 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.

3.1.3.9 Locknuts and Bushings

Fasten conduits to sheet metal boxes and cabinets with two locknuts where required by NFPA 70, where insulated bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, use at least minimum single locknut and bushing. Locknuts shall have sharp edges for digging into wall of metal enclosures. Install bushings on ends of conduits, and provide insulating type where required by NFPA 70.

3.1.4 Boxes, Outlets, and Supports

Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways shall be cast-metal, hub-type when located in wet locations, when surface mounted on outside of exterior surfaces and when specifically indicated. Boxes in other locations shall be sheet steel. Each box shall have volume required by NFPA 70 for number of conductors enclosed in box. Provide gaskets for cast-metal boxes installed in wet locations and boxes installed flush with outside of exterior surfaces. 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 inches 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 inches deep, except where shallower boxes required by structural conditions are approved. Boxes for other than lighting fixture outlets shall be minimum 4 inches square, except that 4 by 2 inch boxes may be used where only one raceway enters outlet. Mount outlet boxes flush in finished walls.

3.1.4.2 Pull Boxes

Construct of at least minimum size required by NFPA 70 of code-gauge 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 motor controller so height of operating handle at its highest position is maximum 78 inches above floor.

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.

3.1.6.1 Marking Strips

White or other light-colored plastic marking strips, fastened by screws to each terminal block, shall be provided for wire designations. The wire numbers shall be made with permanent ink. The marking strips shall be reversible to permit marking both sides, or two marking strips shall be furnished with each block. Marking strips shall accommodate the two sets of wire numbers. Each device to which a connection is made shall be assigned a device designation in accordance with NEMA ICS 1 and each device terminal to which a connection is made shall be marked with a distinct terminal marking corresponding to the wire designation used on the Contractor's schematic and connection diagrams. The wire (terminal point) designations used on the Contractor's wiring diagrams and printed on terminal block marking strips may be according to the Contractor's standard practice; however, additional wire and cable designations for identification of remote (external) circuits shall be provided for the Government's wire designations. Prints of the marking strips drawings submitted for approval will be so marked and returned to the Contractor for addition of the designations to the terminal strips and tracings, along with any rearrangement of points required.

3.1.7 Grounding and Bonding

Provide In accordance with NFPA 70 and NFPA 780. Ground exposed, non-current-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in metallic and nonmetallic raceways, telecommunications system grounds, and neutral conductor of wiring systems.

3.1.7.1 Ground Rods

Provide cone pointed ground rods. The resistance to ground shall be measured using the fall-of-potential method described in IEEE Std 81. The maximum resistance of a driven ground shall not exceed 25 ohms under normally dry conditions. If this resistance cannot be obtained with a single rod,provide additional rods not less than 6 feet on centers, or if sectional type rods are used,two additional sections may be coupled and driven with the first rod. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, notify the Contracting Officer who will decide on the number of ground rods to add.

3.1.7.2 Grounding Connections

Make grounding connections which are buried or otherwise normally inaccessible, by exothermic weld or compression connector.

a. Make exothermic welds strictly in accordance with the weld manufacturer's written recommendations. Welds which are "puffed up" or which show convex surfaces indicating improper cleaning are not acceptable. Mechanical connectors are not required at exothermic welds.

b. Make compression connections using a hydraulic compression tool to provide the correct circumferential pressure. Tools and dies shall be as recommended by the manufacturer. An embossing die code or other standard method shall provide visible indication that a connector has been adequately compressed on the ground wire.

3.1.7.3 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.

3.1.8 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.

3.1.9 Repair of Existing Work

Repair of existing work shall be performed as follows:

3.1.9.1 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.

3.1.9.2 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.

3.1.9.3 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 FABRICATED NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

3.3 WARNING SIGN MOUNTING

Provide the number of signs required to be readable from each accessible side. Space the signs in accordance with NFPA 70E.

3.4 FIELD APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Where field painting of enclosures for panelboards, load centers or the like is specified to match adjacent surfaces, to correct damage to the manufacturer's factory applied coatings, or to meet the indicated or specified safety criteria, provide manufacturer's recommended coatings and apply in accordance to manufacturer's instructions.

3.5 FIELD QUALITY CONTROL

Furnish test equipment and personnel and submit written copies of test results. Give Contracting Officer 5 working days notice prior to each test.

3.5.1 Devices Subject to Manual Operation

Each device subject to manual operation shall be operated at least five times, demonstrating satisfactory operation each time.

3.5.2 600-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.

3.5.3 Grounding System Test

Test grounding system to ensure continuity, and that resistance to ground is not excessive. Test each ground rod for resistance to ground before making connections to rod; tie grounding system together and test for resistance to ground. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall. Submit written results of each test to Contracting Officer, and indicate location of rods as well as resistance and soil conditions at time measurements were made.

-- End of Section --

SECTION 26 51 00

INTERIOR LIGHTING
07/07

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.

CALIFORNIA ENERGY COMMISSION (CEC)

CEC Title 24	(1978; R 2005) California's Energy Efficiency Standards for Residential and Nonresidential Buildings

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA)

IESNA HB-9	(2000; Errata 2004; Errata 2005) IES Lighting Handbook

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2	(2007; Errata 2006; Errata 2007; INT 44-56 2007; INT 47, 49, 50, 52-56 2008; INT 57, 58, 51, 48 2009) National Electrical Safety Code
IEEE C62.41.1	(2002; R 2008) IEEE Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits
IEEE C62.41.2	(2002) IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits
IEEE Std 100	(2000) The Authoritative Dictionary of IEEE Standards Terms

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2008) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA C82.11	(2002) High-Frequency Fluorescent Lamp Ballasts
NEMA LL 1	(1997; R 2002) Procedures for Linear Fluorescent Lamp Sample Preparation and the TCLP Extraction

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2008; AMD 1 2008) National Electrical Code - 2008 Edition

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System

UNDERWRITERS LABORATORIES (UL)

UL 1598	(2008; Rev thru Feb 2009) Luminaires
UL 595	(1985; Rev thru Sep 1991) Marine-Type Electric Lighting Fixtures
UL 844	(2006; Rev thru Nov 2008) Standard for Electric Lighting Fixtures for Use in Hazardous (Classified) Locations
UL 935	(2001; Rev thru Jul 2009) Standard for Fluorescent-Lamp Ballasts

1.2 RELATED REQUIREMENTS

Materials not considered to be lighting equipment or lighting fixture accessories are specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Lighting fixtures and accessories mounted on exterior surfaces of buildings are specified in this section.

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. Average life is the time after which 50 percent will have failed and 50 percent will have survived under normal conditions.

c. Total harmonic distortion (THD) is the root mean square (RMS) of all the harmonic components divided by the total fundamental current.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. 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; G,

Fluorescent electronic ballasts; G,

Fluorescent lamps; G,

Documentation indicating distance between manufacturing facility and the project site. Indicate distance of raw material origin from the project site. Indicate relative dollar value of local/regional materials to total dollar value of products included in project.

Energy Efficiency

SD-06 Test Reports

Operating test

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

Submit documentation that includes contact information, summary of procedures, and the limitations and conditions applicable to the project. Indicate manufacturer's commitment to reclaim materials for recycling and/or reuse.

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 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.5.3 Standard Products

Provide materials and equipment that are products of manufacturers

regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.5.3.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.5.3.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

1.5.3.3 Energy Efficiency

Comply with National Energy Policy Act and Energy Star requirements for lighting products. Submit data indicating lumens per watt efficiency and color rendition index of light source.

1.6 WARRANTY

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.6.1 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.

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, NFPA 70, and CEC Title 24 unless specified otherwise. Ballast shall be 100% electronic high frequency type with no magnetic core and coil components. Ballast shall provide transient immunity as recommended by IEEE C62.41.1 and IEEE C62.41.2. 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 factor shall be between 0.85 (minimum) and 1.00 (maximum). Current crest factor shall be 1.7 (maximum).

f. Ballast shall be UL listed Class P with a sound rating of "A."

g. Ballast shall have circuit diagrams and lamp connections displayed on the ballast.

h. 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..

k. Ballast shall be capable of starting and maintaining operation at a minimum of 0 degrees F unless otherwise indicated.

l. 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.

2. 62 watts (maximum) when operating two F32T8 lamps

c. Ballast efficacy factor.

2. 1.44 (minimum) when operating two F32T8 lamps

2.1.2 Fluorescent Lamps

a. T-8 rapid start low mercury lamps shall be rated 32 watts (maximum), 2800 initial lumens (minimum), CRI of 75 (minimum), color temperature of 3500 K, and an average rated life of 20,000 hours. 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.

2.2 FIXTURES FOR HAZARDOUS LOCATIONS

In addition to requirements stated herein, provide fluorescent fixtures for hazardous locations which conform to UL 844 or which have Factory Mutual certification for the class and division indicated. Fixture shall also conform to UL 595 for marine environments as indicated.

2.3 SWITCHES

2.3.1 Toggle Switches

Provide toggle switches as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

2.4 EQUIPMENT IDENTIFICATION

2.4.1 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

2.4.2 Labels

Provide labeled luminaires in accordance with UL 1598 requirements. All luminaires shall be clearly marked for operation of specific lamps and ballasts according to proper lamp type. The following lamp characteristics shall be noted in the format "Use Only _____":

a. Lamp diameter code (T-4, T-5, T-8, T-12), tube configuration (twin, quad, triple), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.

c. Start type (preheat, rapid start, instant start) for fluorescent and compact fluorescent luminaires.

e. Correlated color temperature (CCT) and color rendering index (CRI) for all luminaires.

All markings related to lamp type shall be clear and located to be readily visible to service personnel, but unseen from normal viewing angles when lamps are in place. Ballasts shall have clear markings indicating multi-level outputs and indicate proper terminals for the various outputs.

2.5 FACTORY APPLIED FINISH

Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA 250 corrosion-resistance test.

PART 3 EXECUTION

3.1 INSTALLATION

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

3.1.1 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. Mount fixtures with 19mm metal channels supported from building structure.

3.2 FIELD QUALITY CONTROL

Upon completion of installation, verify that equipment is properly installed, connected, and adjusted. Conduct an operating test to show that equipment operates in accordance with requirements of this section.

-- End of Section --

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SECTION 31 23 00.00 20

EXCAVATION AND FILL
04/06

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C600	(2005) Installation of Ductile-Iron Water Mains and Their Appurtenances

ASTM INTERNATIONAL (ASTM)

ASTM C 136	(2006) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C 33/C 33M	(2008) Standard Specification for Concrete Aggregates
ASTM D 1140	(2000; R 2006) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
ASTM D 1556	(2007) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(2007) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
ASTM D 2321	(2005) Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D 2434	(1968; R 2006) Permeability of Granular Soils (Constant Head)
ASTM D 2487	(2006e1) Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(2005) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(2005) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(2005) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 698	(2007e1) Laboratory Compaction

Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.))

1.2 DEFINITIONS

1.2.1 Capillary Water Barrier

A layer of clean, poorly graded crushed rock, stone, or natural sand or gravel having a high porosity which is placed beneath a building slab with or without a vapor barrier to cut off the capillary flow of pore water to the area immediately below a slab.

1.2.2 Degree of Compaction

Degree of compaction is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557, for general soil types, abbreviated as percent laboratory maximum density.

1.2.3 Hard Materials

Weathered rock, dense consolidated deposits, or conglomerate materials which are not included in the definition of "rock" but which usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.

1.2.4 Rock

Solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers; also large boulders, buried masonry, or concrete other than pavement exceeding [1/2] [1] [_____] cubic yard in volume. Removal of hard material will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production.

1.2.5 Pile Supported Structure

As used herein, a structure where both the foundation and floor slab are pile supported.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Submit 15 days prior to starting work.

SD-06 Test Reports

Fill and backfill test

Select material test

Porous fill test for capillary water barrier

Density tests

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

1.4 DELIVERY, STORAGE, AND HANDLING

Perform in a manner to prevent contamination or segregation of materials.

1.5 CRITERIA FOR BIDDING

Base bids on the following criteria:

a. Surface elevations are as indicated.

b. Pipes or other artificial obstructions, except those indicated, will not be encountered.

c. Ground water elevation is feet below existing surface elevation.

d. Blasting will not be permitted. Remove material in an approved manner.

1.6 REQUIREMENTS FOR OFF SITE SOIL

Do not furnish or transport soils onto the Air Station when such act would violate the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) or the Gneral Statutes of North Carolina.

Provide certification that all soil furnished under the contract contains no petroleum or hazardous or toxic materials as defined in DoD Instruction 4715.6, which implements 10 U.S.C. 2692. The following methods shall be used to determine if soil meets this standard.

If the total amount of soil to be brought onto the Air Station for a single contract is less than , certify the soil meets the standard by inspecting for "Apparent Contamination" (visual or other indications of contamination including abnormal or unnatural color, chemical or petroleum odors, or saturation with a chemical or petroleum). Soil which is contaminated, as determined by inspecting for "Apparent Contamination," shall not be utilized on the Air Station or outlying fields.

If the total amount of soil to be brought onto the Air Station for a single contract is greater than , provide certification that the soil meets the standard by analytical testing performed by a laboratory holding current certification from the North Carolina Division of Environmental Management. Collect one representative sample of the soil to be used for each or fraction thereof, and analyze for Gasoline Range Organics, Diesel Range Organics, Oil and Grease, and 8 RCRA metals (Totals). If any of the test results are greater than the Method Detection Limits for petroleum, the soil from which the sample was taken shall not be certified as meeting the standard. If any test results are greater than the following North Carolina soil-to-groundwater target concentrations for the 8 RCRA metals, the soil from which the sample was taken shall not be certified as meeting the standard: Arsenic 26.2; Barium 848; Cadmium 2.72; Chromium 27.2; Lead 270.06; Mercury 0.0154; Selenium 12.2; and Silver 0.223 (units mg/kg).

1.7 QUALITY ASSURANCE

1.7.1 Utilities

Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk. Excavation made with power-driven equipment is not permitted within [two] [_____] feet of known Government-owned utility or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the contract excavation until approval for backfill is granted by the Contracting Officer. Report damage to utility lines or subsurface construction immediately to the Contracting Officer.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

2.1.1 Satisfactory Materials

Any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SC, free of debris, roots, wood, scrap material, vegetation, refuse, soft unsound particles, and frozen, deleterious, or objectionable materials. Unless specified otherwise, the maximum particle diameter shall be one-half the lift thickness at the intended location.

2.1.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials. Unsatisfactory materials also include man-made fills, trash, refuse, or backfills from previous construction. Unsatisfactory material also includes material classified as satisfactory which contains root and other organic matter, frozen material, and stones larger than 75 inches. The Contracting Officer shall be notified of any contaminated materials.

2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM, GP-GM, GW-GM, SW-SM, SP-SM, and SM shall be identified as cohesionless only when the fines are nonplastic (plasticity index equals zero). Materials classified as GM and SM will be identified as cohesive only when the fines have a plasticity index greater than zero.

2.1.4 Expansive Soils

Soils that have a plasticity index equal to or greater than 15 when tested in accordance with ASTM D 4318.

2.1.5 Common Fill

Approved, unclassified soil material with the characteristics required to compact to the soil density specified for the intended location.

2.1.6 Backfill and Fill Material

ASTM D 2487, classification GW, GP, GM, GC, SW, SP, SM, SC with a maximum ASTM D 4318 liquid limit of 35, maximum ASTM D 4318 plasticity index of 12, and a maximum of 25 percent by weight passing ASTM D 1140, No. 200 sieve.

2.1.7 Select Material

Provide materials classified as GW, GP, SW, SP, or by ASTM D 2487 where indicated. The liquid limit of such material shall not exceed 35 percent when tested in accordance with ASTM D 4318. The plasticity index shall not be greater than 12 percent when tested in accordance with ASTM D 4318, and not more than 35 percent by weight shall be finer than No. 200 sieve when tested in accordance with ASTM D 1140. Coefficient of permeability shall be a minimum of [0.002] [_____] feet per minute when tested in accordance with ASTM D 2434.

Sieve Size	Percent Passing by Weight
2 1/2 inches	100
No. 4	40 - 85
No. 10	20 - 80
No. 40	10 - 60
No. 200	5 - 25

2.1.8 Topsoil

Provide as specified in Section 32 92 19SEEDING.

2.2 POROUS FILL FOR CAPILLARY WATER BARRIER

ASTM C 33/C 33M fine aggregate grading with a maximum of 3 percent by weight passing ASTM D 1140, No. 200 sieve, or coarse aggregate Size 57, 67, or 77 and conforming to the general soil material requirements specified in paragraph entitled "Satisfactory Materials."

2.3 UTILITY BEDDING MATERIAL

Except as specified otherwise in the individual piping section, provide bedding for buried piping in accordance with AWWA C600, Type 4, except as specified herein. Backfill to top of pipe shall be compacted to 95 percent of ASTM D 698 maximum density. Plastic piping shall have bedding to spring line of pipe. Provide ASTM D 2321 materials as follows:

a. Class I: Angular, 0.25 to 1.5 inches, graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, and crushed shells.

b. Class II: Coarse sands and gravels with maximum particle size of 1.5 inches, including various graded sands and gravels containing small percentages of fines, generally granular and noncohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class as specified in ASTM D 2487.

2.3.1 Sand

Clean, coarse-grained sand classified as gradation 25 of the DOT North Carolina State Standard.

2.3.2 Gravel

Clean, coarsely graded natural gravel, crushed stone or a combination thereof gradation sizes 57, 67 or 77 of the DOT North Carolina State Standard.

2.4 BORROW

Obtain borrow materials required in excess of those furnished from excavations from sources outside of Government property.

2.5 BURIED WARNING AND IDENTIFICATION TAPE

Polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 inch minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.

Warning Tape Color Codes

Yellow:	Electric
Orange:	Telephone and Other Communications
Blue:	Water Systems
Green:	Sewer Systems

2.5.1 Warning Tape for Metallic Piping

Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.003 inch. Tape shall have a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.

2.5.2 Detectable Warning Tape for Non-Metallic Piping

Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.004 inch. Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.6 DETECTION WIRE FOR NON-METALLIC PIPING

Detection wire shall be insulated single strand, solid copper with a minimum of 12 AWG.

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Drainage and Dewatering

Provide for the collection and disposal of surface and subsurface water encountered during construction.

3.1.1.1 Drainage

So that construction operations progress successfully, completely drain construction site during periods of construction to keep soil materials sufficiently dry. The Contractor shall establish/construct storm drainage features (ponds/basins) at the earliest stages of site development, and throughout construction grade the construction area to provide positive surface water runoff away from the construction activity and/or provide temporary ditches, swales, and other drainage features and equipment as required to maintain dry soils. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified herein. It is the responsibility of the Contractor to assess the soil and ground water conditions presented by the plans and specifications and to employ necessary measures to permit construction to proceed. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site, the area immediately surrounding the site, and the area affecting operations at the site shall be continually and effectively drained.

3.1.1.2 Dewatering

Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, the water level shall be maintained continuously, at least 0.5 feet below the working level.

3.1.2 Underground Utilities

Location of the existing utilities indicated is approximate. The Contractor shall physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor shall scan the construction site with electromagnetic and sonic equipment and mark the surface of the ground where existing underground utilities are discovered.

3.1.3 Machinery and Equipment

Movement of construction machinery and equipment over pipes during construction shall be at the Contractor's risk. Repair, or remove and provide new pipe for existing or newly installed pipe that has been displaced or damaged.

3.2 SURFACE PREPARATION

3.2.1 Stripping

Strip suitable soil from the site where excavation or grading is indicated and stockpile separately from other excavated material. Material unsuitable for use as topsoil shall be stockpiled and used for backfilling. Locate topsoil so that the material can be used readily for the finished grading. Where sufficient existing topsoil conforming to the material requirements is not available on site, provide borrow materials suitable for use as topsoil. Protect topsoil and keep in segregated piles until needed.

3.2.2 Unsuitable Material

Remove vegetation, debris, decayed vegetable matter, sod, mulch, and rubbish underneath paved areas or concrete slabs.

3.3 EXCAVATION

Excavate to contours, elevation, and dimensions indicated. Reuse excavated materials that meet the specified requirements for the material type required at the intended location. Keep excavations free from water. Excavate soil disturbed or weakened by Contractor's operations, soils softened or made unsuitable for subsequent construction due to exposure to weather. Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be removed as directed. Refill with satisfactory material and compact to 95 percent of ASTM D 1557 maximum density. Satisfactory material removed below the depths indicated, without specific direction of the Contracting Officer, shall be replaced with satisfactory materials to the indicated excavation grade; except as specified for spread footings. Determination of elevations and measurements of approved overdepth excavation of unsatisfactory material below grades indicated shall be done under the direction of the Contracting Officer.

3.3.1 Structures With Spread Footings

Ensure that footing subgrades have been inspected and approved by the Contracting Officer prior to concrete placement. Fill over excavations with concrete during foundation placement.

3.3.2 Pile Cap Excavation and Backfilling

Excavate to bottom of pile cap prior to placing or driving piles, unless authorized otherwise by the Contracting Officer. Backfill and compact overexcavations and changes in grade due to pile driving operations to 95 percent of ASTM D 698 maximum density.

3.3.3 Pipe Trenches

Excavate to the dimension indicated. Grade bottom of trenches to provide uniform support for each section of pipe after pipe bedding placement. Tamp if necessary to provide a firm pipe bed. Recesses shall be excavated to accommodate bells and joints so that pipe will be uniformly supported for the entire length. Rock, where encountered, shall be excavated to a depth of at least 6 inches below the bottom of the pipe.

3.3.4 Excavated Materials

Satisfactory excavated material required for fill or backfill shall be placed in the proper section of the permanent work required or shall be separately stockpiled if it cannot be readily placed. Satisfactory material in excess of that required for the permanent work and all unsatisfactory material shall be disposed of as specified in Paragraph "DISPOSITION OF SURPLUS MATERIAL."

3.3.5 Final Grade of Surfaces to Support Concrete

Excavation to final grade shall not be made until just before concrete is to be placed.

3.4 SUBGRADE PREPARATION

Unsatisfactory material in surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials as directed by the Contracting Officer. The surface shall be scarified to a depth of 6 inches before the fill is started. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When subgrades are less than the specified density, the ground surface shall be broken up to a minimum depth of 6 inches, pulverized, and compacted to the specified density. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Minimum subgrade density shall be as specified herein.

3.4.1 Proof Rolling

Proof rolling shall be done on an exposed subgrade free of surface water (wet conditions resulting from rainfall) which would promote degradation of an otherwise acceptable subgrade. After stripping, proof roll the existing subgrade of the areas of new concrete with six passes of a. Operate the truck in a systematic manner to ensure the number of passes over all areas, and at speeds between 2 1/2 to 3 1/2 miles per hour. Notify the Contracting Officer a minimum of 3 days prior to proof rolling. Proof rolling shall be performed in the presence of the Contracting Officer. Rutting or pumping of material shall be undercut as directed by the Contracting Officer and replaced with fill and backfill material. Bids shall be based on replacing approximately square yards, with an average depth of inches at various locations.

3.5 FILLING AND BACKFILLING

Fill and backfill to contours, elevations, and dimensions indicated. Compact each lift before placing overlaying lift.

3.5.1 Common Fill Placement

Provide for general site. Place in [6] [_____] inch lifts. Compact areas not accessible to rollers or compactors with mechanical hand tampers.

Aerate material excessively moistened by rain to a satisfactory moisture content. Finish to a smooth surface by blading, rolling with a smooth roller, or both.

3.5.2 Backfill and Fill Material Placement

Provide for paved areas and under concrete slabs, except where select material is provided. Place in [6] [_____] inch lifts. Do not place over wet or frozen areas. Place backfill material adjacent to structures as the structural elements are completed and accepted. Backfill against concrete only when approved. Place and compact material to avoid loading upon or against the structure.

3.5.3 Select Material Placement

Provide under porous fill of structures not pile supported. Place in [6] [_____] inch lifts. Do not place over wet or frozen areas. Backfill adjacent to structures shall be placed as structural elements are completed and accepted. Backfill against concrete only when approved. Place and compact material to avoid loading upon or against structure.

3.5.4 Backfill and Fill Material Placement Over Pipes and at Walls

Backfilling shall not begin until construction below finish grade has been approved, underground utilities systems have been inspected, tested and approved, forms removed, and the excavation cleaned of trash and debris. Backfill shall be brought to indicated finish grade. Where pipe is coated or wrapped for protection against corrosion, the backfill material up to an elevation 2 feet above sewer lines and 1 foot above other utility lines shall be free from stones larger than 1 inch in any dimension. Heavy equipment for spreading and compacting backfill shall not be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of footing; the area remaining shall be compacted in layers not more than 4 inches in compacted thickness with power-driven hand tampers suitable for the material being compacted. Backfill shall be placed carefully around pipes or tanks to avoid damage to coatings, wrappings, or tanks. Backfill shall not be placed against foundation walls prior to 7 days after completion of the walls. As far as practicable, backfill shall be brought up evenly on each side of the wall and sloped to drain away from the wall.

3.5.5 Porous Fill Placement

Provide under floor and area-way slabs on a compacted subgrade. Place in [4] [_____] inch lifts with a minimum of two passes of a hand-operated plate-type vibratory compactor.

3.5.6 Trench Backfilling

Backfill as rapidly as construction, testing, and acceptance of work permits. Place and compact backfill under structures and paved areas in [6] [_____] inch lifts to top of trench and in [6] [_____] inch lifts to one foot over pipe outside structures and paved areas.

3.6 BORROW

Where satisfactory materials are not available in sufficient quantity from required excavations, approved borrow materials shall be obtained as specified herein.

3.7 BURIED WARNING AND IDENTIFICATION TAPE

Provide buried utility lines with utility identification tape. Bury tape 12 inches below finished grade; under pavements and slabs, bury tape 6 inches below top of subgrade.

3.8 BURIED DETECTION WIRE

Bury detection wire directly above non-metallic piping at a distance not to exceed 12 inches above the top of pipe. The wire shall extend continuously and unbroken, from manhole to manhole. The ends of the wire shall terminate inside the manholes at each end of the pipe, with a minimum of 3 feet of wire, coiled, remaining accessible in each manhole. The wire shall remain insulated over it's entire length. The wire shall enter manholes between the top of the corbel and the frame, and extend up through the chimney seal between the frame and the chimney seal. For force mains, the wire shall terminate in the valve pit at the pump station end of the pipe.

3.9 COMPACTION

Determine in-place density of existing subgrade; if required density exists, no compaction of existing subgrade will be required. Density requirements specified herein are for cohesionless materials. When cohesive materials are encountered or used, density requirements may be reduced by 5 percent.

3.9.1 General Site

Compact underneath areas designated for vegetation and areas outside the 5 foot line of the paved area or structure to 85 percent of ASTM D 1557.

3.9.2 Adjacent Area

Compact areas within 5 feet of structures to 90 percent of ASTM D 1557.

3.9.3 Paved Areas

Compact top 12 inches of subgrades to 95 percent of ASTM D 1557. Compact fill and backfill materials to 95 percent of ASTM D 1557.

3.10 FINISH OPERATIONS

3.10.1 Grading

Finish grades as indicated within one-tenth of one foot. Grade areas to drain water away from structures. Maintain areas free of trash and debris. For existing grades that will remain but which were disturbed by Contractor's operations, grade as directed.

3.10.2 Topsoil and Seed

Provide as specified in Section 32 92 19 SEEDING.

3.10.3 Protection of Surfaces

Protect newly backfilled, graded, and topsoiled areas from traffic, erosion, and settlements that may occur. Repair or reestablish damaged grades, elevations, or slopes.

3.11 DISPOSITION OF SURPLUS MATERIAL

Remove from Government property surplus or other soil material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber.

3.12 FIELD QUALITY CONTROL

3.12.1 Sampling

Take the number and size of samples required to perform the following tests.

3.12.2 Testing

Perform one of each of the following tests for each material used. Provide additional tests for each source change.

3.12.2.1 Fill and Backfill Material Testing

Test fill and backfill material in accordance with ASTM C 136 for conformance to ASTM D 2487 gradation limits; ASTM D 1140 for material finer than the No. 200 sieve; ASTM D 4318 for liquid limit and for plastic limit; ASTM D 698 or ASTM D 1557 for moisture density relations, as applicable.

3.12.2.2 Select Material Testing

Test select material in accordance with ASTM C 136 for conformance to ASTM D 2487 gradation limits; ASTM D 1140 for material finer than the No. 200 sieve; ASTM D 698 or ASTM D 1557 for moisture density relations, as applicable.

3.12.2.3 Porous Fill Testing

Test porous fill in accordance with ASTM C 136 for conformance to gradation specified in ASTM C 33/C 33M.

3.12.2.4 Density Tests

Test density in accordance with ASTM D 1556, or ASTM D 2922 and ASTM D 3017. When ASTM D 2922 and ASTM D 3017 density tests are used, verify density test results by performing an ASTM D 1556 density test at a location already ASTM D 2922 and ASTM D 3017 tested as specified herein. Perform an ASTM D 1556 density test at the start of the job, and for every 10 ASTM D 2922 and ASTM D 3017 density tests thereafter. Test each lift at randomly selected locations every [2000] [_____] square feet of existing grade in fills for structures and concrete slabs, and every [2500] [_____] square feet for other fill areas and every [2000] [_____] square feet of subgrade in cut. Include density test results in daily report.

a. Bedding and backfill in trenches: One test per [50] [_____] linear feet in each lift.

-- End of Section --

SECTION 32 05 33

LANDSCAPE ESTABLISHMENT
07/06

PART 1 GENERAL

1.1 REFERENCES

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

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED	(2002; R 2005) Leadership in Energy and Environmental Design(tm) Green Building Rating System for New Construction (LEED-NC)

1.2 DEFINITIONS

1.2.1 Pesticide

Any substance or mixture of substances, including biological control agents, that may pervent, destroy, repel, or mitigate pests and are specifically labeled for use by the U.S. Environmental Protection Agency (EPA). Also, any substance used as a plant regulator, defoliant, disinfectant, or biocide. Examples of pesticides include fumigants, herbicides, insecticides, fungicides, nematicides, molluscicides and rodenticides.

1.2.2 Stand of Turf

95 percent ground cover of the established species.

1.3 RELATED REQUIREMENTS

Section 32 92 19 SEEDING applies to this section for installation of seed requirements, with additions and modifications herein.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Fertilizer; G

SD-07 CertificatesMaterialsEED)

Maintenance inspection report

1.5 DELIVERY, STORAGE AND HANDLING

1.5.1 Delivery

Deliver to the site in original containers bearing manufacturer's chemical analysis, name, trade name, or trademark, and indication of conformance to state and federal laws. Instead of containers, fertilizer may be furnished in bulk with a certificate indicating the above information.

1.5.2 Storage

1.5.2.1 Fertilizer Storage

Material shall be stored in designated areas. Fertilizer shall be stored in cool, dry locations away from contaminants.

1.5.3 Handling

Do not drop or dump materials from vehicles.

PART 2 PRODUCTS

2.1 POST-PLANT FERTILIZER

2.1.1 Granular Fertilizer

Organic, granular controlled release fertilizer containing the following minimum percentages, by weight, of plant food nutrients:

12 percent available nitrogen
10 percent available phosphorus
8 percent available potassium
4 percent sulfur
5 percent iron

2.2 WATER

Source of water shall be approved by the Contracting Officer, and be of suitable quality for irrigation.

2.3 MULCHES TOPDRESSING

Free from noxious weeds, mold, pesticides, or other deleterious materials.

2.3.1 Organic Mulch Materials

Pine straw mulch

PART 3 EXECUTION

3.1 EXTENT OF WORK

Provide landscape construction maintenance to include mowing,aeration, fertilizing, watering, for all newly installed landscape areas, unless indicated otherwise, and at all areas inside or outside the limits of the construction that are disturbed by the Contractor's operations.

3.1.1 Policing

The Contractor shall police all landscaped areas. Policing includes removal of leaves, branches and limbs regardless of length or diameter, dead vegetation, paper, trash, cigarette butts, garbage, rocks or other debris. Policing shall extend to both sides of fencing or walls. Collected debris shall be promptly removed and disposed of at an approved disposal site.

3.1.2 Drainage System Maintenance

The Contractor shall remove all obstructions from surface and subsurface drain lines to allow water to flow unrestricted in swales, gutters, and catch basins. Remove grates and clear debris in catch basins. Open drainage channels are to be maintained free of all debris and vegetation at all times. Edges of these channels shall be clear of any encroachment by vegetation.

3.2 GROUNDCOVER ESTABLISHMENT PERIOD

Groundcover establishment period will commence on the date that inspection by the Contracting Officer shows that the new turf furnished under this contract has been satisfactorily installed to a 95 percent stand of coverage. The establishment period shall continue for a period of 365 days.

3.2.1 Frequency of Maintenance

Begin maintenance immediately after turf has been installed. Inspect areas once a week during the installation and establishment period and perform needed maintenance promptly.

3.2.2 Promotion of Growth

Groundcover shall be maintained in a manner that promotes proper health, growth, natural color.Turf shall have a neat uniform manicured appearance, free of bare areas, ruts, holes, weeds, pests, dead vegetation, debris, and unwanted vegetation that present an unsightly appearance. Mow, remove excess clippings, eradicate weeds, water, fertilize, and perform other operations necessary to promote growth, as approved by Contracting Officer and consistent with approved Integrated Pest Management Plan. Remove noxious weeds common to the area from planting areas by mechanical means.

3.2.3 Mowing

3.2.3.1 Turf

Turf shall be mowed at a uniform finished height. Mow turfed areas to a minimum average height of [3][4][_____] inches when average height of grass becomes inches for spring/summer maintenance and to a minimum average height of [3][4][_____] inches when the average height of grass reaches inches for fall maintenance. The height of turf is measured from the soil. Mowing of turf shall be performed in a manner that prevents scalping, rutting, bruising, uneven and rough cutting. Prior to mowing, all rubbish, debris, trash, leaves, rocks, paper, and limbs or branches on a turf area shall be picked up and disposed. Adjacent paved areas shall be swept/vacuumed clean.

3.2.4 Post-Fertilizer Application

Apply turf fertilizer in a manner that promotes health, growth, vigor, color and appearance of cultivated turf areas. The method of application, fertilizer type and frequencies shall be determined by the laboratory soil analysis results the requirements of the particular turf species. Fertilizer shall be applied by approved methods in accordance with the manufacturer's recommendations.

3.2.5 Turf Watering

The Contractor shall perform irrigation in a manner that promotes the health, growth, color and appearance of cultivated vegetation and that complies with all Federal, State, and local water agencies and authorities directives. The Contractor shall be responsible to prevent over watering, water run-off, erosion, and ponding due to excessive quantities or rate of application. The Contractor shall abide by state, local or other water conservation regulations or restrictions in force during the establishment period.

3.2.6 Replanting

Replant in accordance with Section 32 92 19 SEEDING and within specified planting dates areas which do not have a satisfactory stand of turf.

3.2.7 Final Inspection and Acceptance

Final inspection will be made upon written request from the Contractor at least 10 days prior to the last day of the turf establishment period. Final turf acceptance will be based upon a satisfactory stand of turf.

3.2.8 Unsatisfactory Work

When work is found to not meet design intent and specifications, maintenance period will be extended at no additional cost to the Government until work has been completed, inspected and accepted by Contracting Officer.

3.3 FIELD QUALITY CONTROL

3.3.1 Maintenance Inspection Report

Provide maintenance inspection report to assure that landscape maintenance is being performed in accordance with the specifications and in the best interest of plant growth and survivability. Site observations shall be documented at the start of the establishment period, then quarterly following the start, and at the end of establishment period. Results of site observation visits shall be submitted to the Contracting Officer within 7 calendar days of each site observation visit.

-- End of Section --

SECTION 32 92 19

SEEDING
10/06

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM D 4972	(2001; R 2007) pH of Soils

U.S. DEPARTMENT OF AGRICULTURE (USDA)

AMS Seed Act	(1940; R 1988; R 1998) Federal Seed Act
DOA SSIR 42	(1996) Soil Survey Investigation Report No. 42, Soil Survey Laboratory Methods Manual, Version 3.0

1.2 DEFINITIONS

1.2.1 Stand of Turf

95 percent ground cover of the established species.

1.3 RELATED REQUIREMENTS

Section 31 23 00.00 20 EXCAVATION AND FILL applies to this section for pesticide use and plant establishment requirements, with additions and modifications herein.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Wood cellulose fiber mulch

Fertilizer

Include physical characteristics, and recommendations.

SD-06 Test Reports

Topsoil composition tests (reports and recommendations).

SD-07 Certificates

State certification and approval for seed

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery

1.5.1.1 Seed Protection

Protect from drying out and from contamination during delivery, on-site storage, and handling.

1.5.1.2 Fertilizer Delivery

Deliver to the site in original, unopened containers bearing manufacturer's chemical analysis, name, trade name, trademark, and indication of conformance to state and federal laws. Instead of containers, fertilizer may be furnished in bulk with certificate indicating the above information.

1.5.2 Storage

1.5.2.1 Seed and Fertilizer Storage

Store in cool, dry locations away from contaminants.

1.5.2.2 Topsoil

Prior to stockpiling topsoil, treat growing vegetation with application of appropriate specified non-selective herbicide. Clear and grub existing vegetation three to four weeks prior to stockpiling topsoil.

1.5.2.3 Handling

Do not drop or dump materials from vehicles.

1.6 TIME RESTRICTIONS AND PLANTING CONDITIONS

1.6.1 Restrictions

Do not plant when the ground is frozen, snow covered, muddy, or when air temperature exceeds [90] [_____] degrees Fahrenheit.

1.7 TIME LIMITATIONS

1.7.1 Seed

Apply seed within twenty four hours after seed bed preparation.

PART 2 PRODUCTS

2.1 SEED

2.1.1 Classification

Provide State-certified or State-approved seed of the latest season's crop delivered in original sealed packages, bearing producer's guaranteed analysis for percentages of mixtures, purity, germination, weedseed content, and inert material. Label in conformance with AMS Seed Act and applicable state seed laws. Wet, moldy, or otherwise damaged seed will be rejected. Field mixes will be acceptable when field mix is performed on

site in the presence of the Contracting Officer.

2.1.2 Planting Dates

Planting Season	Planting Dates
Season 1	15 September through 31 October
Season 2	15 March through 1 May
Temporary Seeding	15 August through 15 May

2.1.3 Seed Purity

Botanical Name	Common Name	Min. Percent Pure Seed	Min. Percent Germination and Hard Seed	Max. Percent Weed Seed
Cynodon Dactylon	Bermuda Grass	98	85	0.5
Festuca Ariundiwaceia	Tall Fescue	98	85	0.5

2.1.4 Seed Mixture by Weight

Planting Season	Variety	Percent (by Weight)
Season 1	Bermuda Grass	100
Season 2	Bermuda Grass	100

Proportion seed mixtures by weight. Temporary seeding must later be replaced by Season 1 or Season 2 plantings for a permanent stand of grass. The same requirements of turf establishment for Season 1 or Season 2 apply for temporary seeding.

2.2 TOPSOIL

2.2.1 On-Site Topsoil

Surface soil stripped and stockpiled on site and modified as necessary to meet the requirements specified for topsoil in paragraph entitled "Composition." When available topsoil shall be existing surface soil stripped and stockpiled on-site in accordance with Section 31 23 00.00 20 EXCAVATION AND FILL.

2.2.2 Off-Site Topsoil

Conform to requirements specified in paragraph entitled "Composition." Additional topsoil shall be furnished by the Contractor.

2.2.3 Composition

Containing from 5 to 10 percent organic matter as determined by the topsoil composition tests of the Organic Carbon, 6A, Chemical Analysis Method described in DOA SSIR 42. Maximum particle size, 3/4 inch, with maximum 3 percent retained on 1/4 inch screen. The pH shall be tested in accordance with ASTM D 4972. Topsoil shall be free of sticks, stones, roots, and other debris and objectionable materials. Other components shall conform

to the following limits:

Silt	25-50 percent
Clay	10-30 percent
Sand	20-35 percent
pH	5.5 to 7.0
Soluble Salts	600 ppm maximum

2.3 FERTILIZER

2.3.1 Granular Fertilizer

Organic, granular controlled release fertilizer containing the following minimum percentages, by weight, of plant food nutrients:

12 percent available nitrogen
4 percent available phosphorus
8 percent available potassium
10 percent sulfur
5 percent iron

2.4 MULCH

Mulch shall be free from noxious weeds, mold, and other deleterious materials.

2.4.1 Straw

Stalks from oats, wheat, rye, barley, or rice. Furnish in air-dry condition and of proper consistency for placing with commercial mulch blowing equipment. Straw shall contain no fertile seed.

2.4.2 Hay

Air-dry condition and of proper consistency for placing with commercial mulch blowing equipment. Hay shall be sterile, containing no fertile seed.

2.4.3 Wood Cellulose Fiber Mulch

Use recovered materials of either paper-based (100 percent) or wood-based (100 percent) hydraulic mulch. Processed to contain no growth or germination-inhibiting factors and dyed an appropriate color to facilitate visual metering of materials application. Composition on air-dry weight basis: 9 to 15 percent moisture, pH range from 5.5 to 8.2. Use with hydraulic application of grass seed and fertilizer.

2.5 WATER

Source of water shall be approved by Contracting Officer and of suitable quality for irrigation, containing no elements toxic to plant life.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 EXTENT OF WORK

Provide soil preparation (including soil conditioners as required), fertilizing, seeding, and surface topdressing of all newly graded finished

earth surfaces, unless indicated otherwise, and at all areas inside or outside the limits of construction that are disturbed by the Contractor's operations.

3.1.1.1 Topsoil

Provide 4 inches of on-site topsoil or existing soil to meet indicated finish grade. After areas have been brought to indicated finish grade, incorporate fertilizer into soil a minimum depth of [4] [_____] inches by disking, harrowing, tilling or other method approved by the Contracting Officer. Remove debris and stones larger than 3/4 inch in any dimension remaining on the surface after finish grading. Correct irregularities in finish surfaces to eliminate depressions. Protect finished topsoil areas from damage by vehicular or pedestrian traffic.

3.1.1.2 Fertilizer Application Rates

Apply fertilizer at rates as determined by laboratory soil analysis of the soils at the job site. For bidding purposes only apply at rates for the following:

Organic Granular Fertilizer [_____] pounds per 1000 square feet.

Synthetic Fertilizer [_____] pounds per 1000 square feet.

3.2 SEEDING

3.2.1 Seed Application Seasons and Conditions

Immediately before seeding, restore soil to proper grade. Do not seed when ground is muddy, frozen, snow covered or in an unsatisfactory condition for seeding. If special conditions exist that may warrant a variance in the above seeding dates or conditions, submit a written request to the Contracting Officer stating the special conditions and proposed variance. Apply seed within twenty four hours after seedbed preparation. Sow seed by approved sowing equipment. Sow one-half the seed in one direction, and sow remainder at right angles to the first sowing.

3.2.2 Seed Application Method

Seeding method shall be broadcasted and drop seeding.

3.2.2.1 Broadcast and Drop Seeding

Seed shall be uniformly broadcast at the rate of 435 pounds per 1000 square feet. Use broadcast or drop seeders. Sow one-half the seed in one direction, and sow remainder at right angles to the first sowing. Cover seed uniformly to a maximum depth of 1/4 inch in clay soils and [1/2] [_____] inch in sandy soils by means of spike-tooth harrow, cultipacker, raking or other approved devices.

3.2.3 Mulching

3.2.3.1 Hay or Straw Mulch

Hay or straw mulch shall be spread uniformly at the rate of 2 tons per acre. Mulch shall be spread by hand, blower-type mulch spreader, or other approved method. Mulching shall be started on the windward side of relatively flat areas or on the upper part of steep slopes, and continued

uniformly until the area is covered. The mulch shall not be bunched or clumped. Sunlight shall not be completely excluded from penetrating to the ground surface. All areas installed with seed shall be mulched on the same day as the seeding. Mulch shall be anchored immediately following spreading.

3.2.4 Rolling

Immediately after seeding, firm entire area except for slopes in excess of 3 to 1 with a roller not exceeding [90] [_____] pounds for each foot of roller width.

3.2.5 Watering

Start watering areas seeded as required by temperature and wind conditions. Apply water at a rate sufficient to insure thorough wetting of soil to a depth of [2] [_____] inches without run off. During the germination process, seed is to be kept actively growing and not allowed to dry out.

3.3 PROTECTION OF TURF AREAS

Immediately after turfing, protect area against traffic and other use.

3.4 RESTORATION

Restore to original condition existing turf areas which have been damaged during turf installation operations at the Contractor's expense. Keep clean at all times at least one paved pedestrian access route and one paved vehicular access route to each building. Clean other paving when work in adjacent areas is complete.

-- End of Section --

SECTION 33 40 00

STORM DRAINAGE UTILITIES
08/09

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C104/A21.4	(2008) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C110/A21.10	(2008) Ductile-Iron and Gray-Iron Fittings for Water
AWWA C111/A21.11	(2000) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C151/A21.51	(2002; Errata 2002) Ductile-Iron Pipe, Centrifugally Cast, for Water
AWWA C153/A21.53	(2006) Ductile-Iron Compact Fittings for Water Service

ASTM INTERNATIONAL (ASTM)

ASTM A 48/A 48M	(2003; R 2008) Standard Specification for Gray Iron Castings
ASTM A 536	(1984e1; R 2004) Standard Specification for Ductile Iron Castings
ASTM A 929/A 929M	(2001; R 2007) Standard Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe
ASTM B 26/B 26M	(2009) Standard Specification for Aluminum-Alloy Sand Castings
ASTM C 1433	(2008) Standard Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers
ASTM C 270	(2008a) Standard Specification for Mortar for Unit Masonry
ASTM C 478	(2009) Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C 828	(2006) Low-Pressure Air Test of Vitrified Clay Pipe Lines

ASTM C 923	(2008) Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
ASTM C 924	(2002; R 2009) Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Placing Pipe
Ductile-Iron Piping
Precast Reinforced Concrete Manholes

Printed copies of the manufacturer's recommendations for installation procedures of the material being placed, prior to installation.

SD-07 Certificates:rts and Storm Drains

Pipeline Testing
Frame and Cover for Gratings1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery and Storage

Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. Materials shall not be stored directly on the ground. The inside of pipes and fittings shall be kept free of dirt and debris. Keep a copy of the manufacturer's instructions available at the construction site at all times and follow these instructions unless directed otherwise by the Contracting Officer.

1.3.2 Handling

Materials shall be handled in a manner that ensures delivery to the trench in sound, undamaged condition. Pipe shall be carried to the trench, not dragged.

PART 2 PRODUCTS

2.1 PIPE FOR CULVERTS AND STORM DRAINS

Pipe for culverts and storm drains shall be of the sizes indicated and shall conform to the requirements specified.

2.1.1 Ductile-Iron Piping

2.1.1.1 Ductile-Iron Pipe and Fittings

a. Pipe and Fittings: Pipe, AWWA C151/A21.51, Pressure Class 350. Fittings, AWWA C110/A21.10 or AWWA C153/A21.53. Fittings shall

have pressure rating at least equivalent to that of the pipe. Ends of pipe and fittings shall be suitable for the specified joints. Pipe and fittings shall have cement-mortar lining, AWWA C104/A21.4, standard thickness.

b. Joints and Jointing Material:

(1) Joints: Joints for pipe and fittings shall be push-on joints or mechanical joints.

(2) Push-On Joints: Shape of pipe ends and fitting ends, gaskets, and lubricant for joint assembly, AWWA C111/A21.11.

(3) Mechanical Joints: Dimensional and material requirements for pipe ends, glands, bolts and nuts, and gaskets, AWWA C111/A21.11.

2.1.1.2 Jointing Material for Ductile-Iron Piping

Gaskets shall be per manufacturer's recommendation and shall be fuel resistant.

2.2 DRAINAGE STRUCTURES

2.2.1 Flared End Sections

Sections shall be of a standard design fabricated from zinc coated steel sheets meeting requirements of ASTM A 929/A 929M.

2.2.2 Precast Reinforced Concrete Box

Manufactured in accordance with and conforming to ASTM C 1433.

2.3 MISCELLANEOUS MATERIALS

2.3.1 Concrete

Concrete shall conform to the requirements Section 03 30 00 CAST-IN-PLACE CONCRETE.

2.3.2 Mortar

Mortar for connections to other drainage structures shall conform to ASTM C 270, Type M, except that the maximum placement time shall be 1 hour. The quantity of water in the mixture shall be sufficient to produce a stiff workable mortar. Water shall be clean and free of harmful acids, alkalies, and organic impurities. The mortar shall be used within 30 minutes after the ingredients are mixed with water. The inside of the joint shall be wiped clean and finished smooth. The mortar head on the outside shall be protected from air and sun with a proper covering until satisfactorily cured.

2.3.3 Precast Reinforced Concrete Manholes

Conform to ASTM C 478. Joints between precast concrete risers and tops shall be made with flexible watertight, rubber-type gaskets meeting the requirements of paragraph RESILIENT CONNECTORS.

2.3.4 Frame and Cover for Gratings

Frame and cover for gratings shall be cast gray iron, ASTM A 48/A 48M, Class 35B; cast ductile iron, ASTM A 536, Grade 65-45-12; or cast aluminum, ASTM B 26/B 26M, Alloy 356.OT6. Weight, shape, size, and waterway openings for grates and curb inlets shall be as indicated on the plans.

2.4 RESILIENT CONNECTORS

Flexible, watertight connectors used for connecting pipe to manholes and inlets shall conform to ASTM C 923.

PART 3 EXECUTION

3.1 EXCAVATION FOR STORM DRAINS AND DRAINAGE STRUCTURES

Excavation of trenches, and for appurtenances and backfilling for culverts and storm drains, shall be in accordance with the applicable portions of Section 31 23 00.00 20 EXCAVATION AND FILL and the requirements specified below.

3.1.1 Trenching

The width of trenches at any point below the top of the pipe shall be not greater than the outside diameter of the pipe plus inches to permit satisfactory jointing and thorough tamping of the bedding material under and around the pipe. Sheeting and bracing, where required, shall be placed within the trench width as specified, without any overexcavation. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures will be necessary. Cost of this redesign and increased cost of pipe or installation shall be borne by the Contractor without additional cost to the Government.

3.1.2 Removal of Unstable Material

Where wet or otherwise unstable soil incapable of properly supporting the pipe, as determined by the Contracting Officer, is unexpectedly encountered in the bottom of a trench, such material shall be removed to the depth required and replaced to the proper grade with select granular material, compacted as provided in paragraph BACKFILLING. When removal of unstable material is due to the fault or neglect of the Contractor while performing shoring and sheeting, water removal, or other specified requirements, such removal and replacement shall be performed at no additional cost to the Government.

3.2 BEDDING

The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe.

3.2.1 Pipe Requirements

Pipe shall be bedded in granular material minimum 4 inch in depth in trenches with soil foundation. Bell holes and depressions for joints shall be removed and formed so entire barrel of pipe is uniformly supported. The bell hole and depressions for the joints shall be not more than the length, depth, and width required for properly making the particular type of joint.

3.3 PLACING PIPE

Each pipe shall be thoroughly examined before being laid; defective or damaged pipe shall not be used. Pipelines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Pipe shall not be laid in water, and pipe shall not be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary.

3.4 DRAINAGE STRUCTURES

3.4.1 Manholes and Inlets

Construction shall be complete with frames and covers or gratings. Pipe connections to concrete manholes and inlets shall be made with flexible, watertight connectors.

3.5 BACKFILLING

3.5.1 Backfilling Pipe in Trenches

After the pipe has been properly bedded, selected material from excavation or borrow, at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layers not exceeding 6 inches in compacted depth. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. The fill shall be thoroughly compacted under the haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers or rammers. This method of filling and compacting shall continue until the fill has reached an elevation of at least 12 inches above the top of the pipe. The remainder of the trench shall be backfilled and compacted by spreading and rolling or compacted by mechanical rammers or tampers in layers not exceeding inches.

3.6 PIPELINE TESTING

3.6.1 Leakage Tests

Lines shall be tested for leakage by low pressure air testing. Low pressure air testing procedures for other pipe materials shall use the pressures and testing times prescribed in ASTM C 828 or ASTM C 924.

-- End of Section --

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SECTION 33 52 43.00 20

AVIATION FUEL DISTRIBUTION AND DISPENSING
04/06

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN PETROLEUM INSTITUTE (API)

API BULL 2209	(1978) Pipe Plugging Practices
API RP 1110	(1997) Pressure Testing of Liquid Petroleum Pipelines
API Spec 6D	(2002; Errata 2005) Specification for Pipeline Valves
API Std 607	(2005) Fire Test for Soft-Seated Quarter-Turn Valves
API Std 610	(2003) Centrifugal Pumps for Petroleum, Petrochemical, and Natural Gas Industries

AMERICAN WELDING SOCIETY (AWS)

AWS A5.1	(2003) Carbon Steel Electrodes for Shielded Metal Arc Welding
AWS A5.5	(1996) Low-Alloy Steel Electrodes for Shielded Metal Arc Welding

ASME INTERNATIONAL (ASME)

ASME B16.11	(2005) Forged Fittings, Socket-Welding and Threaded
ASME B16.20	(2000) Metallic Gaskets for Pipe Flanges - Ring-Joint, Spiral Wound, and Jacketed
ASME B16.34	(2004) Valves Flanged, Threaded, and Welding End
ASME B16.39	(1998) Malleable Iron Threaded Pipe Unions
ASME B16.5	(2003) Pipe Flanges and Flanged Fittings
ASME B16.9	(2007) Standard for Factory-Made Wrought Steel Buttwelding Fittings
ASME B31.1	(2004) Power Piping
ASME B31.3	(2008) Process Piping

ASME B40.1	(1998) Pressure Gauges and Gauge Attachments

ASTM INTERNATIONAL (ASTM)

ASTM A 105/A 105M	(2005) Carbon Steel Forgings for Piping Applications
ASTM A 193/A 193M	(2005) Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A 194/A 194M	(2005) Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service or Both
ASTM A 216/A 216M	(2004) Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service
ASTM A 234/A 234M	(2005) Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
ASTM A 269	(2004) Seamless and Welded Austenitic Stainless Steel Tubing for General Service
ASTM A 36/A 36M	(2008) Standard Specification for Carbon Structural Steel
ASTM A 53/A 53M	(2007) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 743/A 743M	(2003) Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application
ASTM F 436	(2009) Hardened Steel Washers
ASTM F 436M	(2009) Hardened Steel Washers (Metric)

HYDRAULIC INSTITUTE (HI)

HI SCRRP	(1994) Centrifugal, Rotary & Reciprocating Pumps

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE Std 112	(1996) Test Procedure for Polyphase Induction Motors and Generators

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

MSS SP-58	(2002) Pipe Hangers and Supports - Materials, Design and Manufacture

MSS SP-69	(2002) Pipe Hangers and Supports - Selection and Application

METAL FRAMING MANUFACTURERS' ASSOCIATION (MFMA)

MFMA-3	Metal Framing
MFMA-102	Guidelines for the Use of Metal Framing

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(2007; Errata 2008) Standard for 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

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 30	(2003) Flammable and Combustible Liquids Code
NFPA 407	(2001) Aircraft Fuel Servicing
NFPA 70	(2008; AMD 1 2008) National Electrical Code - 2008 Edition

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA Seismic Restraint Mnl	(1998, 2nd Ed) Seismic Restraint Manual: Guidelines for Mechanical Systems

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE J514	(2001) Hydraulic Tube Fittings

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-PRF-907	(Rev E; Am 2) Antiseize Thread Compound, High Temperature
MIL-STD-161	(Rev G) Identification Methods for Bulk Petroleum Products Systems Including Hydrocarbon Missile Fuels
MIL-V-12003	(Rev F; Am 1; Notice 1) Valves, Plug, Cast-Iron or Steel, Manually Operated

1.2 DEFINITIONS

In ASME B31.3 and NFPA 30 publications, the advisory provisions shall be considered mandatory, as though the word "shall" had been substituted for "should" wherever it appears; reference to the "authority having jurisdiction" and "owner" shall be interpreted to mean the Contracting Officer.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Single System Supplier; G

Control Valve Manufacturer's Representative; G

Startup and Commissioning Plan; G

SD-02 Shop Drawings

Pipe Hangers and Supports; G

Bonding; G

Control Valves; G

Fuel Pumps; G

SD-03 Product Data

Seismic Restraint; G

Carbon Steel Pipe; G

Carbon Steel Threaded Fittings and Socket Welding Fittings; G

Carbon Steel Buttwelding Fittings and Tapered Reducing Fittings; G

Carbon Steel Welding Electrodes and Rods; G

Carbon Steel Flanges; G

Carbon Steel Unions; G

Flange Gaskets; Gubing and Fittings; G

Bolts; G

Nuts; G

Washers; G

Miscellaneous Gaskets; G

Antiseize Compound; G

Ball Valves; G

Plug (Double Block and Bleed) Valves; G

Plug Valve Thermal Relief Valves; G

Integral Piping and Tubing; G

Isolation Valves; G

Check Valves, Swing Type; G

Thermal Relief Valves; G

Pump Non-Surge Check Flow Control Valve; G

Pump Pressure Relief and Check Pressure Control Valve; G

Pipe Hangers and Supports; G

Pipe Protection Shields; G

Low Friction Supports; G

Adjustable Pipe Supports; G

Anchors; G

Anchors, Bolts, Nuts, Washers and Screws; G

Miscellaneous Metals; G

Strainers; G

Pressure Indicators; G

Sight Flow Indicators; G

Flow Switches; G

Pipe Sleeves; G

Mechanically Adjustable Segmented Elastomeric Sleeves (Pipe Seal); G

Flexible Pipe Connections; G

Temporary Conical Strainers; G

Protective Coatings; G

Fuel Pump, Centrifugal, Horizontal, End Suction, Top Vertical Discharge; G

Submit manufacturer's data including specifications and performance test data. For all fuel pumps, include manufacturer's certified pump test curves showing the characteristics over the entire operating range. For all fuel pumps, the pump manufacturer shall furnish the recommended minimum run time for the motor and the motor efficiency. For centrifugal fuel pumps, include actual diameter of impeller being furnished.

SD-04 Samples

Flange Gaskets; G

SD-07 Certificates

Process for Carbon Steel-Welding Procedure Specifications (WPS), Procedure Qualification Records (PQR) and Welder Performance Qualification(WPQ); G

SD-08 Manufacturer's Instructions

Fuel pumps; G

Protective coatings; G

SD-09 Manufacturer's Field Reports

Single System Supplier; G

Control Valve Manufacturer's Representative; G

Certified Test Curves; G

Hydrostatic, performance, and NPSH testing shall not occur prior to acceptance of SD-02, Product Data submittal. The testing shall be conducted at the factory on each pump in accordance with API Std 610 and Hydraulic Institute Standard for Centrifugal, Rotary and Reciprocating Pumps, HI SCRRP. Test each pump with the manufacturer's calibrated facility driver in order to properly record the pump input power and efficiency. The field driver manufacturer shall provide its factory standard test and report, except that the vibration report shall be included, per IEEE Std 112. Submit manufacturer's certified reports of hydrostatic, performance, vibration, and NPSH tests. Submit manufacturer's certified test curve.

SD-10 Operation and Maintenance Data

Fuel pumps, Data Package 3; G

Plug (Double Block and Bleed) Valves, Data Package 2; G

Control Valves; G

Submit in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

SD-11 Closeout Submittals

Welding Test Records; G

Piping Test Records; G

Pipe Bonding Verification Records; G

Equipment Nameplate Chart and Schedule; G

1.4 SINGLE SYSTEM SUPPLIER

The fueling control system is an integrated system and shall be furnished

by a single system supplier. The system shall include, but not be limited to: Tank Truck Off-Loading System, control valves, pressure transmitters, pressure indicators, programmable logic controllers (PLC's), control panels and their associated hardware/software systems. The single system supplier shall supply all equipment, software and appurtenances, regardless of manufacturer, and shall be responsible to the Contractor for the satisfactory operation of the entire system. Substitutions of functions specified will not be acceptable. The Contractor shall coordinate the work of the system component manufacturers' service personnel during construction, testing, calibration, startup and acceptance.

1.4.1 Qualifications

The single system supplier shall be regularly employed in the designing, furnishing, coordinating, and overseeing the installation of complete fueling control systems. The single system supplier shall have successfully designed, furnished, coordinated, and oversaw, during recent years, several fueling control system installations. At least one of these installations shall have been equal in size and construction complexity to the design proposed for this installation. All of these installations shall have successfully been in full-time service (defined hereinafter) for at least one year prior to the bid opening date of this solicitation.

1.4.2 Successful Service

"Successfully in full-time service" means "actual demonstrated system availability of 98 percent minimum." "Actual demonstrated system availability" is defined for this solicitation as "the number of full 24-hour periods the system was available for use in a calendar year, divided by the number of full 24-hour periods in that year that the owner needed the use of the system."

1.4.3 Final Evaluation and Application

The required documentation shall be ultimately utilized after contract award, but prior to approval of the fueling control system equipment, for the verification of the experience of the system supplier. Only the system supplier approved under this specified scheme will be allowed to provide the fueling control system.

1.4.4 Experience Documentation Required

The Contractor shall forward several completed experience questionnaires on the successful fueling control systems offered to meet the above specified experience requirements. The experience documentation is required on the forms at the end of this section. A separate form is required for each system offered as successful experience.

1.5 CONTROL VALVE MANUFACTURER'S REPRESENTATIVE

The Contractor shall provide a field representative authorized by the control valve manufacturer to perform maintenance and adjustments of the control valves up to and including field rebuilding of the control valves and pilots and field modifications to the pilot system. Provide a certification from the manufacturer that this (these) individual(s) are so qualified.

1.6 QUALIFICATIONS OF WELDERS

Each welder shall be qualified by test using equipment, procedures and a base metal and electrode or filler wire from the same compatible group number that will be encountered in field welding. Procedures and welders shall be qualified in accordance with Section IX, ASME Boiler and Pressure Vessel Code. Welders qualified by another employer may be accepted as permitted by ASME B31.1. The Contracting Officer shall be notified 24 hours in advance of tests and the test shall be performed at the work site if practicable. The Contracting Officer shall be furnished a copy of qualified procedures and a list of names and identification symbols of qualified welders. The welder shall apply his assigned symbol near each weld he makes as a permanent record.

1.7 REGULATORY REQUIREMENTS

Conform to the safety and fire regulations of the Station Fire Department when work is in progress. Obtain a "Hot Work" permit each day before performing welding or burning.

1.8 CONCRETE CONSTRUCTION

Provide as specified in Section 03 30 00 CAST-IN-PLACE CONCRETE, and as modified herein.

1.9 EXCAVATING, BACKFILLING, AND COMPACTING

Provide as specified in Section 31 23 00.00 20 EXCAVATION AND FILL.

1.10 RELATED REQUIREMENTS

Section 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS applies to this section, with the additions and modifications specified herein.

PART 2 PRODUCTS

2.1 SEISMIC RESTRAINT

Provide fuel oil system including equipment, materials, installation, workmanship, fabrication, assembly, erection, examination, inspection, and testing shall be in accordance with ASME B31.3, NFPA 70 and SMACNA Seismic Restraint Mnl, as modified and supplemented by the contract specifications and drawings.

2.2 SPECIAL REQUIREMENTS

2.2.1 Detail Drawing

Submit drawings showing aviation fuel distribution and dispensing system including types, sizes, location, and installation details for:

a. Pipe hangers and supports

b. Bonding

c. Control valves

d. Fuel pumps

2.2.2 Metal

Metal contacting the fuel shall be stainless steel or aluminum alloy, except as modified herein. Zinc, zinc-coated steel, zinc-coated cast iron, brass, copper, and copper-bearing alloys contacting the fuel shall not be permitted, except as modified herein. Brass contacting the fuel shall be permitted up to a maximum of 0.5 percent of the total fuel wetted surface area in each system. Aluminum castings containing up to a maximum of 10 percent copper contacting the fuel shall be permitted. Carbon steel containing up to a maximum of one percent copper contacting the fuel shall be permitted in carbon steel piping systems. Brass hose fittings and couplings will be permitted.

2.2.3 System

Capacity and efficiency of equipment shall not be less than that indicated. System components, including piping, equipment, valves, and accessories shall be suitable for maximum working pressure of ANSI Class 150, 275 psig at 100 degrees F and ANSI Class 300, 720 psig at 100 degrees F where indicated.

2.2.4 Electrical Motors, Controllers, Contractors and Disconnects

Provide explosion proof type conforming to NFPA 70, Class I, Division 1, Group D, except where NFPA 70, Class I, Division 2, Group D is indicated. Provide motors, controllers, contactors, and disconnects with respective pieces of equipment. Motors, controllers, contactors, and disconnects shall conform to and shall have electrical connections provided under Division 16, "Electrical." Controllers and contactors shall have a maximum of 120-volt control circuits and shall have auxiliary contacts for use with the controls furnished.

2.2.5 Flanged Connections

Flanged connection between piping and other system components such as valves, pumps, filters, etc. shall be coordinated with respect to type of flange face. Provide pipe flange to match flange on piping component. Aluminum piping and valves and ductile iron valves typically have flat faces and shall be mated with flat face flanges. Provide raised face unless specifically noted otherwise or not available. In addition, pipe flange ratings shall be coordinated with respect to the flange rating of the piping component.

2.3 CARBON STEEL PIPING

2.3.1 Pipe

Carbon steel pipe shall be ASTM A 53/A 53M, Type E (electric-resistance welded, Grade B) or Type S (seamless, Grade B), black steel; Weight Class Std (Standard) for pipe sizes larger than 2 inches, Weight Class XS (Extra-Strong) for pipe sizes 2 inches and smaller.

2.4 FITTINGS FOR CARBON STEEL PIPING

2.4.1 Threaded Fittings and Socket Welding Fittings

Carbon steel threaded fittings and socket welding fittings shall be ASTM A 105/A 105M, Class 3000 meeting the dimensional requirements of ASME B16.11. Carbon Steel threaded fittings shall only be permitted on

pipe sizes smaller than 1 inch where required due to the unavailability of a flanged connection or where specifically indicated or specified.

2.4.2 Buttwelding Fittings and Tapered Reducing Fittings

Carbon steel buttwelding fittings and tapered reducing fittings shall be ASME B16.9, ASTM A 234/A 234M, Type WPB, of the same material and weight as the piping in which fittings are installed. Stab connections shall not be permitted. Fillet-welded reinforced branch connections shall not be permitted where 100 percent radiography is required (only butt-welded branch connections that can be completely inspected by radiography shall be permitted) except on secondary piping 2 inches and less used for pressure gauges, relief valves, drains, vents, etc. Elbows (90 degrees, 45 degrees, 22 1/2 degrees, etc.) shall be long radius (1.5 times pipe diameter) unless specifically noted otherwise. Short radius elbows shall not be permitted unless specifically noted.

2.4.3 Flanges

Carbon steel flanges shall be ASME B16.5, Class 150 or Class 300 where indicated, raised face type, ASTM A 105/A 105M. All carbon steel flanges shall be welding neck type unless specifically noted otherwise.

2.4.4 Unions

Carbon steel unions shall be ASTM A 105/A 105M, Class 3000 or ASME B16.39, Class 150.

2.5 WELDING FOR CARBON STEEL PIPING

2.5.1 Process for Carbon Steel

ASME B31.3, shielded metal arc welding (SMAW) process, except the root pass shall be Gas Tungsten Arc Welding (GTAW) Process. Backing rings shall not be permitted. Ten percent (minimum of ten locations) of welds performed in the field and ten percent (minimum of ten locations) of welds performed in the shop shall be examined by radiography; if 25 percent of the radiographed welds fail, 100 percent of welds shall be examined by radiography. Weld examinations shall be taken over a representative sample for each welder. Acceptance criteria for all examined welds shall be "Severe Cyclic Conditions".

2.5.2 Carbon Steel Welding Electrodes and Rods

AWS A5.1 or AWS A5.5, E70XX low hydrogen electrodes. On the GTAW process, flux coated or flux core rods shall not be permitted; a back purge shielding gas is required.

2.6 STAINLESS STEEL TUBING AND FITTINGS

Seamless, fully annealed tubing conforming to ASTM A 269, Grade TP316, Rockwell hardness B80 or less. Wall thickness for 0.5 inches or smaller tubing to be 0.049 inches, for greater than 0.5 inches and less than or equal to 1 inch tubing, wall thickness to be .083 inches. Fittings shall be flareless, 316 stainless steel fittings conforming to SAE J514.

2.7 GASKETS, BOLTS, NUTS AND WASHERS

2.7.1 Flange Gaskets

ASME B16.20, except as noted. Spiral wound gasket 0.175 inches thick with Type 316L stainless steel winding, flexible graphite filler, stainless steel outer ring, and Type 316L stainless steel inner ring. Gaskets are to be resistant to the effects of aviation hydrocarbon fuels and manufactured of fire-resistant materials. When used with ANSI Class 150 flanges, gaskets shall be of the low stress variety, as necessary for the specified flanges and bolting. Gaskets selected shall have a seating stress suitable for the strength of the bolts selected. When used on flat face flanges, gasket outer ring shall extend to the outside diameter of the flange.

2.7.2 Bolts

ASTM A 193/A 193M, Grade B8M (AISI Type 316), Class 2, (ASME B16.5 intermediate strength bolt). Extend no less than two full threads beyond the nut with the bolts tightened to the required torque. Bolts selected shall be suitable for the seating stress of the gasket.

2.7.3 Nuts

ASTM A 194/A 194M, Grade 8M (AISI Type 316).

2.7.4 Washers

Flat, circular, stainless steel (AISI Type 316) washers manufactured to the dimensions of ASTM F 436. Provide washers under all bolt heads and nuts including those used on flanges.

2.7.5 Miscellaneous Gaskets

For miscellaneous flanged and bolted connections and covers provide composition gaskets that are asbestos-free, fire-resistant, 0.0625 inch thick (minimum), one piece and resistant to the effects of aviation hydrocarbon fuels.

2.7.6 Bolts

ASTM A 193/A 193M, Grade B8M (AISI Type 316), Class 1, ASME B16.5 low strength bolt. Extend no less than two full threads beyond the nut with the bolts tightened to the required torque. Bolts selected shall be suitable for the seating stress of the gasket.

2.7.7 Nuts

ASTM A 194/A 194M, Grade 8M (AISI Type 316).

2.7.8 Washers

Flat, circular, stainless steel (AISI Type 316) washers manufactured to the dimensions of ASTM F 436M. Provide washers under all bolt heads and nuts including those used on flanges.

2.8 ANTISEIZE COMPOUND

Provide antiseize compound for fasteners on flanges and bolted connections and covers. Provide MIL-PRF-907 compound on steel fasteners. Provide an

approved antiseize compound for stainless steel fasteners. Do not use MIL-PRF-907 compound on stainless steel.

2.9 MANUAL VALVES

Unless specified otherwise, valves in carbon steel piping shall have ASTM A 105 WCB steel bodies with stainless steel trim; valves in stainless steel piping shall have ASTM A 182 Type 316 (CF8M) stainless steel bodies and stainless steel trim; and valves in aluminum piping shall have aluminum alloy (3003, 6061-T6 or 356-T6) bodies except as modified in paragraph entitled "Special Requirements," in this section. Valves shall be suitable for working pressure of ANSI Class 150 275 psig at 100 degrees F, with weatherproof housing designed to exclude driving rain and snow for worm-gear operators. Valves shall have flanged ends unless specifically noted otherwise. Viton or Teflon with metal backup seals. Chromium or nickel plating shall be 0.003 inches minimum thickness.

2.9.1 Ball Valves

API Spec 6D, ANSI Class 150, reduced bore or full bore as indicated. Minimum reduced bore size shall be 55 percent of nominal pipe size. Conform to fire test requirements of API Std 607. Provide nonlubricated double seated type capable of handling two-way shutoff, with weather-proof worm-gear operators, except valves 6 inches and smaller may be lever operated with 10 positions or infinitely adjustable positions between full open and full close. Balls in valve sizes 14 inches and larger shall have trunnion type support bearings. Valves in carbon steel piping shall have steel bodies with chromium-plated, nickel-plated steel, or Type 316 stainless steel balls. Valves shall have stainless steel stems and trim, and Viton or Teflon seats, body seals, and stem seals. API Std 607 valves shall be provided with graphite seats, body seals and stem seals in accordance with the manufacturer's standard. Valve seat design shall be self-relieving (i.e. floating ball) to prevent thermal over-pressurization of body cavity.

2.9.2 Plug (Double Block and Bleed) Valves

API Spec 6D and MIL-V-12003 Type III, ANSI Class 150 or Class 300 as indicated, reduced bore, nonlubricated, resilient, double seated, tapered lift, plug type capable of handling two-way shutoff; ASTM A 216/A 216M Grade WCB cast steel body, chrome-plated interior, and tapered plug of steel or ductile iron, chrome or nickel plated, supported on upper and lower trunnions, and steel or ductile iron, sealing slips, with Viton seals. Valve design shall permit sealing slips to be replaced from the bottom with the valve mounted in the piping. Valves shall operate from fully open to fully closed by rotation of the handwheel to lift and turn the plug. Valves shall have weatherproof worm gear operators with mechanical position indicators and vertical, closed-type (suitable for underground installation), self-supported, mechanical extensions as indicated. Reduced bore valves shall have and a minimum bore size of 65 percent of nominal pipe size, unless the manufacturer can show an equivalent or greater flow rate with a lower percent internal cross sectional area.

2.9.2.1 Valve Operation

Rotation of the handwheel toward open shall lift the plug without wiping the seals and retract the sealing slips so that clearance is maintained between the sealing slips and the valve body. Rotation of the handwheel

toward closed shall lower the plug after the sealing slips are aligned with the valve body and force the sealing slips against the valve body for positive closure. When valve is closed, the slips shall form a secondary fire-safe metal-to-metal seat on both sides of the resilient seal.

2.9.2.2 Plug Valve Thermal Relief Valves

ANSI Class 150, 316 stainless steel body with Viton or Teflon elastomers. Provide plug valves with one automatic thermal relief valve (body cavity relief) integral with the plug valves to relieve the pressure buildup in the internal body cavity. Unless otherwise indicated, provide a second automatic thermal relief valve (bypass relief) integral with the plug valve to relieve pressure buildup across the valve when the plug valve is closed.

a. Body cavity relief valves shall be a spring loaded check valve with a pipe connection size of 1/2 inch (minimum) and shall open at 25 psi differential pressure, and discharge to the throat of and to the upstream side of the plug valve or where indicated.

b. Bypass relief valves shall have a pipe connection size of 1/2 inch (minimum) and shall open at the pressure indicated from the throat of the downstream side of the valve and discharge to the upstream side of the plug valve or where indicated. Valves shall be fully balanced type (back pressure shall not affect relief pressure). Bypass relief valve shall pass a minimum of 2.0 gallons per minute at a differential pressure of 55 psig and a set pressure of 50 psig and have a minimum orifice size of 1/4 inch diameter. Bypass relief valve shall be a right angled patterned relief valve or a pressure regulating control valve. Delete the bypass thermal relief valve for valves adjacent to the skin of the tank and where indicated.

2.9.2.3 Integral Piping and Tubing

All piping, tubing and fittings integral to the double block and bleed valve shall be stainless steel and shall meet the requirements called for elsewhere in this specification.

2.9.2.4 Isolation Valves

ANSI Class 150, stainless steel body valve with Viton or Teflon elastomers. Provide manually operated isolation valves that can be opened to verify that plug valves are not leaking when in the closed position. Provide discharge piping so that released liquid can be contained. Provide isolation valves also on each body connection to the plug valve and at each thermal relief valve.

2.9.3 Check Valves, Swing Type

ASME B16.34, ANSI Class 150, ASTM A 216/A 216M Grade WCB steel body and cap, raised face flanges, stainless steel trim and Teflon O-ring renewable seats.

2.9.4 Thermal Relief Valves

Thermal relief valves (not integral to the body of plug (double block and bleed) valves) shall be fully enclosed, angle pattern, fully balanced type

(back pressure shall not affect relief pressure) back pressure regulator/relief valve. Valve shall pass a minimum of [5] gallons per minute at a differential pressure of [55] psig and a set pressure of [50] psig. Valve shall have a carbon steel body with 304 stainless steel trim. Valve body shall have 1 inch (minimum) raised face flange connections unless otherwise indicated. Orifice shall be a minimum orifice size of .500 inch in diameter. Valve shall have bubble-tight piston and seat design with stainless steel piston and Viton seat. Valve shall be factory configured to open at required set pressure but shall be field adjustable by means of an enclosed adjusting screw.

2.10 CONTROL VALVES

2.10.1 General

a. Body shall be stainless steel conforming to ASTM A 743/A 743M, carbon steel conforming to ASTM A 216/A 216M (Grade WCB). Carbon steel body valves shall be interior and exterior chromium or nickel plated. Chromium or nickel plating shall be 3 mils minimum thickness. Pilot tubing shall be stainless steel. Pilot, valve trim and other accessories shall be stainless steel. Valves shall have flanged end connections, suitable for working pressure of ANSI Class 150. Elastomers shall be Buna-N, Viton or Teflon.

b. Valves shall be hydraulically operated, pilot-controlled, diaphragm type globe valves.

c. Provide each control valve with position indicator, 40-mesh pilot circuit strainer, and pressure gage quick disconnect fittings in inlet, outlet and cover.

d. All pilot system screwed connections shall be made by Conic Unions (NPT). Tubing connections shall not be welded or sealed with o-ring.

e. Provide stainless steel shut-off valves in the pilot string to allow for valve troubleshooting and removal of the pilot string from the valve body.

f. Valves shall be drip tight when closed.

g. All settings shall be field adjustable.

h. Valves shall have threaded bottom drain plug.

i. Orifice plates and float pilots for valves shall be a product of the valve manufacturer.

j. Solenoids: Solenoids for operation of pilots shall be housed in an explosion proof case suitable for the hazardous area location indicated with maximum temperature rating of "T2D" (215 degrees C), as defined in NFPA 70. Solenoid shall operate on the voltage indicated. The solenoid pilots shall be suitable for a continuously energized condition.

k. Provide a manual operator or needle valve to bypass each solenoid pilot and allow for manual operation of the valve.

2.10.2 Pump Non-Surge Check Flow Control Valve

a. Valve body shall be stainless steel or carbon steel.

b. Valve shall fail closed against reverse flow.

c. Valve shall modulate to limit flow to the indicated flowrate using an orifice plate mounted in the downstream position to sense differential pressure. The flow control pilot shall not use a shaft o-ring.

d. Valve shall open slowly. Provide needle valve for speed control.

e. Valve shall act as a check valve close rapidly when the outlet pressure exceeds the inlet pressure.

f. Provide with thermal relief pilot to relieve pressure from the downstream side to the upstream side of the control valve. Pilot shall be of the balanced type, unaffected by back pressure.

2.10.3 Pump Pressure Relief and Check Pressure Control Valve

a. Valve body shall be stainless steel or carbon steel.

b. Valve shall fail closed against reverse flow.

c. Valve shall modulate to maintain a constant inlet pressure.

d. Valve shall open rapidly.

e. Valve shall act as a check valve close rapidly when the outlet pressure exceeds the inlet pressure.

2.11 PIPING ACCESSORIES

2.11.1 Pipe Hangers and Supports

MSS SP-58 and MSS SP-69, of the adjustable type, except as modified herein or indicated otherwise. Provide steel pipe hangers and supports. The finish of rods, nuts, bolts, washers, hangers, and supports shall be hot-dip galvanized.

2.11.1.1 Pipe Protection Shields

MSS SP-58 and MSS SP-69, Type 40, except material shall be Type 316 stainless steel. Provide at each slide type pipe hanger and support.

2.11.1.2 Low Friction Supports

Supports shall have self-lubricating antifriction bearing elements composed of 100 percent virgin tetrafluoroethylene polymer and reinforcing aggregates, prebonded to appropriate backing steel members. The coefficient of static friction between bearing elements shall be 0.06 from initial installation for both vertical and horizontal loads and deformation shall not exceed 0.002 inch under allowable static loads. Bond between material and steel shall be heat cured, high temperature epoxy. Design pipe hanger and support elements for the loads applied. Antifriction material shall be a minimum of 0.09 inch thick. Steel supports shall be hot-dip galvanized. Units shall be factory designed and manufactured.

Supports shall allow for axial movement of plus or minus [4] inches. Supports shall allow for lateral movement of plus or minus [1/2] inch, except at the two supports located on each side of an expansion joint which shall allow for lateral movement of plus or minus [1/8] inches. Supports shall allow for vertical movement of plus [3/8] inches.

2.11.1.3 Adjustable Pipe Supports

Adjustable pipe supports shall consist of a cast iron saddle and a threaded nipple connected to a carbon steel pipe by means of a special reducer conforming to MSS SP-69. The supports shall be provided with Viton or Buna-n insulation strips.

2.11.1.4 Anchors

Anchors shall be factory designed and manufactured to hold the pipe against a minimum horizontal or axial force of 62,000 N.

2.11.1.5 Miscellaneous Metals

ASTM A 36/A 36M, standard mill finished structural steel shapes, hot-dip galvanized.

2.11.1.6 Anchors, Bolts, Nuts, Washers and Screws

Hot-dip galvanized steel, except provide Type 316 stainless steel bolts, nuts, washers, and screws under piers.

2.11.2 Strainers

Provide 'S' or 'T' pattern, except as modified herein. Flanged end connections shall be designed in accordance with ASME B16.5, Class 150; steel bodies, except Type 304 or 316 stainless steel, and 3003, 6061, or 356-T6 aluminum alloys. Strainers shall have removable baskets of 7-mesh, Type 316 stainless steel wire screen unless other mesh is indicated. Pressure drop for clean strainer shall not exceed 1.0 psig at design flow rates. Provide strainer with manual vent valve, bottom drain valve and differential pressure gauge. Piping on strainer shall be 1/2 inch stainless steel tubing and valves shall be stainless steel ball valves. Bottom drain connection shall be on the side of the strainer (not on the bottom) to facilitate proper installation. Piping ends shall be turned down and provided with caps. Provide isolation ball valves on both sides of differential pressure gauge. All piping, valves, gauges, etc. shall be integral to the strainer. Support strainer with pipe supports on both the inlet and outlet or provide a concrete pier support.

2.11.3 Pressure Indicators (PI)

ASME B40.1, single style pressure indicator/gage for fuel with 4.5 inch dial, case, 316 stainless steel tube, stainless steel ball valve, pressure snubbers, and scale range for the intended service. Glycerin filled, shatterproof glass, accuracy shall be ASME B40.1, Grade 2A (0.5 percent).

2.11.4 Sight Flow Indicators

Steel body in carbon steel piping systems, stainless steel body in stainless steel piping system, ANSI Class 150, flanged ends, elastomer seals suitable for the service, propeller type.

2.11.5 Flow Switches

Paddle type, factory flange mounted, ANSI Class 150, suitable for use in the hazardous area location indicated. Switch shall be rated 5A at 230V AC with two SPDT contacts.

2.11.6 Pipe Sleeves

Provide where piping passes through walls and floors. Grout sleeves in position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls and floors with a minimum one inch clearance between exterior of piping or pipe insulation, and interior of sleeve or core-drilled hole. Seal space with a mechanically adjustable segmented elastomeric seal. In fire walls and fire floors, calk both ends of pipe sleeves or core-drilled holes with UL listed fill, void, or cavity material.

2.11.6.1 Sleeves in Masonry and Concrete Walls and Floors

Provide hot-dip galvanized steel, ductile-iron, or cast-iron pipe sleeves. Core drilling of masonry and concrete may be provided in lieu of pipe sleeves provided that cavities in the core-drilled hole are completely grouted smooth.

2.11.6.2 Sleeves in Other Than Masonry and Concrete Walls and Floors

Provide galvanized steel sheet sleeves having a minimum nominal weight of 0.90 psf.

2.11.6.3 Mechanically Adjustable Segmented Elastomeric Sleeves (Pipe Seal)

Mechanically adjustable segmented elastomeric sleeves shall be constructed of fuel resistant Buna-N elastomers and Type 316 stainless steel fasteners and hardware.

2.11.7 Flexible Pipe Connections

Connection shall be a stainless steel, single-braided, close helical type hose with ANSI Class 150 end connections. Connection shall have sufficient length to absorb 0.125 inch lateral movement. Hose shall have a minimum working pressure of 275 psig at 100 degrees F.

2.11.8 Temporary Conical Strainers

Where the indicated piping arrangement does not allow installation and removal of temporary conical strainers, provide steel pipe spool piece 12 inches long with ANSI Class 150 welding neck flanges on each end of the spool piece, and of the same diameter as the ANSI Class 150 flanges on the connecting piping. Strainers shall be designed to be installed between flanges, with strainer body within the spool piece. Strainer shall be constructed of stainless steel with 0.25 inch diameter holes, and lined with 60-mesh stainless steel wire screen.

2.12 EQUIPMENT

Design pressure components of equipment for minimum working pressure of ANSI Class 150 or ANSI Class 300 where indicated. Metal contacting the fuel in aviation fuel systems shall be stainless steel Types 304 or 316, or aluminum alloys 3003, 6061-T6, or 356-T6, except as modified in paragraph

entitled "Special Requirements," in this section.

2.12.1 Fuel Pumps

2.12.1.1 Fuel Pump, Centrifugal, Horizontal, End Suction, Top Vertical Discharge

a. General Requirements

(1) Pump shall be centrifugal, horizontal, end suction, top vertical discharge, single stage, single suction, double volute, vertical or radial split case, enclosed impeller.

(2) Pump shall meet the requirements of API Std 610, latest edition. Whenever the information contained herein conflicts with said standard, the information contained herein shall govern.

(3) Material class shall be S-6 except as modified herein.

(4) Impellers shall be balanced per API Std 610 requirements.

(5) Flange ratings shall be ANSI Class 300.

(6) Pump shall be of the back pull-out design to permit access to internal parts without disturbing the piping or the motor.

(7) Provide case and cover with renewable wear rings.

(8) Provide a single, multi-spring, unbalanced mechanical seal, API Class Code USTHN.

(9) Provide oil-lubricated anti-friction, radial and thrust bearings of standard design. The bearings shall be selected to give a minimum L-10 rating life of 25,000 hours in continuous operation. Provide a sight glass for checking oil level with a permanent indication of proper oil level.

(10) Pump and motor shall be furnished as complete unit as herein specified.

(11) Provide with factory fabricated pump base and supports per API Std 610 requirements.

(12) Provide plugged casing drain.

(13) All pumps shall be factory inspected so that parts are interchangeable.

b. Capacity

(1) Capacity shall be the flowrate indicated at the total head indicated when driven at the rpm indicated (if indicated). The indicated efficiency shall be at the indicated flowrate and total head.

(2) Design shall provide for non-overloading characteristics (not including service factor) throughout the entire head capacity curve under operating conditions.

(3) Pump head capacity shall be continually rising and shall be free of dips and valleys from design point to shut-off head.

(4) Pump shut-off head shall have a 10 percent to 20 percent head rise to shut off.

(5) Pump shall be capable of at least a 10 percent head increase at rated conditions by installing a new impeller and still be non-overloading throughout the entire head capacity curve (including service factor).

(6) Pump shall not overheat or be damaged in any way while operating continuously at a minimum flow condition of 25 percent of required flow capacity and continuously at a maximum flow condition of 125 percent of required capacity.

(7) The unit will also be required to operate at a flow of 12.5 percent required of capacity without exceeding the vibration limits given in API Std 610.

(8) Pumps installed for parallel operation shall have equal head at minimum continuous stable flow, plus or minus 2 percent.

(9) If the NPSHR is not indicated on the drawings, the pump shall require no more than 15 feet Net Positive Suction Head Required (NPSHR) when it is operated with water at the rated capacity, head and speed. A hydrocarbon reduction or correction factor shall not be used. Pump suction specific speed shall be less than 12,000.

2.12.1.2 Fuel Pump Motor

a. The motor shall be furnished by the pump manufacturer and shall be suitable for the environment and operating conditions to which it will be subjected.

b. The motor shall be UL listed for use in Class I, Division 1, Group D hazardous locations.

c. The motor shall have a maximum temperature rating of "T2D - 419 degrees F" as defined by NFPA 70.

d. The motor shall be provided with a 1.15 service factor. Pump manufacturer shall ensure the pump/motor combination will be non-overloading (not including the service factor) at every point on the curve. Perform this analysis with the motor operating at 1.0 service factor.

e. The motor shall be constructed to allow, without injurious overheating of the motor, accelerating the load from standstill to rated speed at pump capacity under conditions of 10 starts per hour.

f. The motor shall be squirrel cage induction type and shall be NEMA design B for normal torque low starting current.

g. Motor insulation shall be non-hygroscopic, NEMA Class H, 356 degrees F for motors over 10 hp and NEMA Class F, 302 degrees F for 10 hp and smaller. Stator windings shall be epoxy impregnated. The impregnations shall be applied using the vacuum

h. Winding temperature rise, (based on an ambient temperature of 104 degrees F at 3300-feet altitude shall not exceed 176 degrees F.

i. Provide space heaters within the motor enclosure. Limit surface temperature of space heater to 392 degrees F. Provide separate terminal housing for heater leads.

j. Provide AFBMA minimum L10 life of 60,000 hours or L50 life of 300,000 hours bearings suitable for the size, type, and application when the pump is operating at the specified flow and head. Provide grease-lubricated bearings.

k. Provide temperature-limiting thermostats within the motor frame when required to meet surface temperature requirements.

l. Provide bronze grounding connection or bolt tap with bronze grounding bolt.

m. Provide lifting lugs and eyebolts on the motor housing,

n. Except for space heater leads, terminate all motor external electrical connections within a single terminal housing. Size terminal housing in accordance with NEC requirements.

o. Motors for conventional applications over 15 horsepower shall be the energy efficient type. This requirement is not applicable to hermetically sealed motors, integrally mounted motors, motors specified as part of energy efficient equipment, wound rotor motors, or any application involving special construction or performance. Guaranteed minimum full load efficiencies shall be (based on 1800 rpm, open drip proof):

20-40 hp	92.0%
50-60 hp	92.5%
75 hp	95.5%
100 hp	93.5%
125 hp and larger	94.5%

p. 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 medium induction motors with continuous ratings shall meet or exceed the energy efficient ratings in accordance with Table 13-10 of NEMA MG 1. Verify motor efficiencies in accordance with NEMA MG 1, 12.53a. Determine efficiencies using the dynamometer method described in IEEE Std 112, Method B.

2.13 PROTECTIVE COATINGS FOR PIPING

2.13.1 Protective Coatings for Aboveground Carbon Steel Piping

Coat piping and appurtenances in accordance with Section 09 97 13.27, EXTERIOR COATING OF STEEL STRUCTURES.

2.14 BONDING

NFPA 70 for materials and workmanship. The fuel piping system shall be bonded in metallic contact to provide electrical continuity to fixed and moving components for grounding the entire system. Provide jumpers to

overcome the insulating effects of gaskets, paints, or nonmetallic components. Minimum size ground conductor shall be No. 6, with single covered, flexible, stranded, copper conductor, Type RR-USE. Provide dielectric connection in riser pipe for underground piping protected by impressed current. Test all piping for continuity and provide pipe bonding verification records to the Contracting Officer.

2.15 MOUNTING CHANNEL

Mounting channel shall be design and manufactured in accordance with MFMA-3. Channel shall be continuous slot, bolted metal, framing channel. All channels shall be stainless steel. Stainless steel mounting channel, fittings, accessories, and hardware shall be AISI Type 304 or Type 316 stainless steel. Channel shall be 2.6 mm thick, 41 mm wide and 41 mm high or as indicated. Double mounting channel where required or indicated shall be factory welded in a back-to-back configuration. Provide end caps on all mounting channel. Provide a one-piece, oil-resistant, elastomeric, molded sleeve at each clamp that will permit axial movement of the pipe, tubing or conduit without damage. Determine spacing of mounting channel using the smallest diameter item being supported; maximum spacing shall be 3000 mm on center.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Demolition

Remove materials so as not to damage materials which are to remain. Replace existing work damaged by the Contractor's operations with new work of the same construction. The Government will drain the existing piping insofar as practicable with the existing pumps. The Contractor shall be responsible for removing the remaining fuel and sludge, and for cleaning and inerting the piping to make it safe for welding.

3.2 INSTALLATION

Provide exterior aviation fuel distribution systems including above ground piping, buried piping, piping in manholes, dispensing hardware and related work. Install piping straight and true to bear evenly on supports. Install valves with stems horizontal or above. Install flanges and unions at valves, connections to equipment, and where indicated. The work includes installing piping up to and including the pumping equipment and valves within each building. Provide each system complete and ready for operation. Equipment, materials, installation, workmanship, fabrication, assembly, erection, examination, inspection, and testing shall be in accordance with ASME B31.3 and NFPA 30, except as modified herein.

3.2.1 Protection Against Hazardous Conditions

The piping and the surrounding area shall be inspected for explosive vapors prior to work and frequently during the course of the work. If, in the opinion of the Contracting Officer, a hazardous condition exists, work shall cease until such condition has been corrected.

3.2.2 Safety

NFPA 30 and NFPA 407; safety rules shall be strictly observed. The flash points of fuels in degrees Fahrenheit are as follows:

FUELS	FLASH POINT
Diesel Fuel Marine F-76	Plus 140
Aviation Gasoline (Avgas)	Minus 50
Jet Fuel JP-4	Minus 20
Jet Fuel JP-5	Plus 140
Jet Fuel JP-7	Plus 150
Jet Fuel JP-8	Plus 100

3.2.3 Connections To Existing Systems

Notify the Contracting Officer in writing at least 15 days prior to the date the connections are required; receive approval before interrupting service. Provide materials required to make connections into existing systems and perform excavating, backfilling, compacting, and other incidental labor as required.

3.2.4 Cutting Existing Pipe

Perform the initial cutting of the existing piping with a multiwheel pipe cutter, using a nonflammable lubricant. After cutting, seal the interior of the piping with a gas barrier plug in accordance with API BULL 2209. The interior of the piping shall be purged with carbon dioxide or nitrogen during welding process. The complete method of cutting, sealing, and welding shall be approved in advance of the actual work.

3.2.5 Cleaning of Piping

Keep the interior and ends of new piping and existing piping affected by the Contractor's operations thoroughly cleaned of water and foreign matter. Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of pipe and fittings to prevent entry of water and foreign matter. Provide a 5 psig nitrogen purge on all intermediate piping sections that have been completed. Nitrogen purge shall be maintained throughout the course of the construction until the entire piping section is complete and filled with product. Inspect piping before placing into position.

3.3 PIPE AND FITTINGS

Inspect, test, and approve piping before burying, covering, or concealing. Provide fittings for changes in direction of piping and for connections. Reducing branch connections in steel piping may be made with forged branch outlet reducing fittings for branches two or more pipe sizes smaller than mains. Branch outlet fittings shall be forged, flared for improved flow where attached to the run, reinforced against external strains, and designed to withstand full pipe bursting strength. Stab type connections are prohibited. Jointing compound for pipe threads shall be polytetrafluoroethylene (PTFE) pipe thread paste or PTFE powder and oil. Pipe nipples 6 inches long and shorter shall be Schedule 80 pipe. Make changes in piping sizes through tapered reducing pipe fittings.

3.3.1 Fittings and End Connections

Install threaded fittings and end connections for sizes less than one inch; threaded or socket-welding or buttwelding fittings and end connections for sizes one to 2 inches; threaded connections for threaded valves, traps, strainers, and threaded connections to equipment; buttwelding fittings and

end connections for sizes 2.5 inches and larger; and flanged connections for flanged valves, traps, strainers, and flanged connections to equipment.

3.3.2 Pipe Hangers and Supports

Install additional hangers and supports for the concentrated loads in piping between hangers and supports, such as for valves. Install ASTM A 36/A 36M miscellaneous steel shapes as required. Support piping as follows:

Nominal Pipe Size (Inches)	One and Under	1.5	2	3	4	6	8	10	12
Maximum Hanger Spacing (Feet)	7	9	10	12	14	17	19	22	23

3.3.3 Anchors, Bolts, Nuts, Washers, and Screws

Install where required for securing the work in place. Sizes, types, and spacings of anchors and bolts not indicated or specified shall be as required.

3.4 PROTECTIVE COATINGS FOR ABOVEGROUND CARBON STEEL PIPING

For aboveground piping, coat piping and appurtenances in accordance with Section 09 97 13.27 EXTERIOR COATING OF STEEL STRUCTURES.

3.5 NAMEPLATES

Attach nameplates to equipment, gages, thermometers, and valves. Nameplates shall be 0.025 inch thick stainless steel. Accurately align lettering and engrave. Minimum size of nameplates shall be one by 2.5 inches. Lettering shall be minimum of 0.25 inch high normal block style. Attach nameplates to equipment with stainless steel beaded chain or jack chain. Key the nameplates to a chart and schedule for each system. Frame charts and schedule under glass, and locate where directed near each system. Furnish two copies of each equipment nameplate chart and schedule. Each nameplate inscription shall identify its function. Equipment nameplates shall show the following information:

a. Equipment Identification Number;

b. Manufacturer, type, and model number; and

c. Capacity or size.

3.6 COLOR IDENTIFICATION OF FUEL HANDLING FACILITIES

Piping, conduit, and equipment identification shall be in accordance with MIL-STD-161. Mark direction of fluids in accordance with MIL-STD-161. The NATO symbol for JP-8 is F-34.

3.7 FIELD QUALITY CONTROL

3.7.1 Inspections

Prior to initial operation, inspect piping system for compliance with drawings, specifications, and manufacturer's submittals.

3.7.2 Welding Test Records

Provide records of welding tests in accordance with ASME B31.3. At a minimum, records shall include drawings that indicate weld locations, welder identification, weld procedure, locations of weld examination and results of the weld examination.

3.7.3 Piping Tests

Before final acceptance of the work, test each system as in service to demonstrate compliance with contract requirements.

3.7.3.1 Pneumatic Test

Pneumatically test each piping system to 25 psig, examine joints with soap solution. Gradually increase to 50 psig and hold for one hour. The pneumatic test is more hazardous than a hydrostatic test, therefore, special safety measures, including the wearing of face masks, shall be taken during testing under pressure. Only authorized personnel shall be permitted in the area during pneumatic and hydrostatic testing.

3.7.3.2 Hydrostatic Tests

Upon completion of pneumatic testing, hydrostatically test each piping system at 1.5 times maximum system operating pressure but in no case more than 275 psig in accordance with ASME B31.3 and API RP 1110, with no leakage or reduction in gage pressure for 4 hours. Thoroughly flush piping before placing in operation. Flush piping, including branch piping, at a minimum velocity of 8 feet per second. Correct defects in work provided by the Contractor and repeat tests until work is in compliance with contract requirements. Furnish electricity, instruments, connecting devices, and personnel for the tests. Government will furnish fuel for piping testing and flushing provided by the Contractor. Contractor shall be responsible for losses greater than 10 percent.

3.7.3.3 Piping Test Records

Piping test records shall be provided in accordance with local, state, and federal regulations. Many states require records of pipe hydrostatic leak tests in their aboveground and underground tank regulations. Test records shall at a minimum indicate on drawings the piping being tested, the test procedure, the test result data and acceptance criteria.

3.7.3.4 Test Markings

Stencil on piping markings indicating successful hydrostatic testing. Markings shall include company name, date and hydrotest pressure. Provide stencil in an obvious location on the piping at a maximum of 300 feet apart and at both ends of the section of piping that was tested.

3.7.4 Testing of Protective Coatings

Perform tests with an approved silicone rubber electric wire brush or an approved electric spring coil flaw tester. Tester shall be equipped with an operating bell, buzzer, or other audible signal which will sound when a holiday is detected at minimum testing voltage equal to 1000 times the square root of the average coating thickness in mils. Tester shall be a type so fixed that field adjustment cannot be made. Calibration by tester

manufacturer shall be required at 6-month intervals or at such time as crest voltage is questionable. Maintain the battery at ample charge to produce the crest voltage during tests. Areas where arcing occurs shall be repaired by using material identical to original coating or coating used for field joints. Upon completion of installation, retest the exterior surfaces, including field joints, for holidays. Promptly repair holidays.

3.8 SYSTEM COMMISSIONING AND ACCEPTANCE TEST

As part of the commissioning process, provide certified pump station inventory calculations of the fuel quantity in gallons, signed by a professional engineer; verify during initial fill.

3.8.1 Instrument and Control Valve Adjustment

For commissioning, adjustment and final checkout of hydraulically operated control valves, the Contractor shall provide an on-site factory service engineer/technician to supervise the necessary work. All instruments and control valves shall be functionally tested and field calibrated using the checklist provided with the commissioning plan, in the presence of the Contracting Officer or his designated representative, under normal operating conditions. Methods, procedures, instrumentation and equipment employed for setting and verification of set points of control valves, flow switches and pressure switches shall be in accordance with the approved commissioning plan. Field calibration records, including tag number and final set point, shall be recorded for each item on the checklist and submitted to the Contracting Officer at completion. As a minimum, Contractor shall demonstrate that each instrument and control valve will function in accordance with all relevant specifications and manufacturer's requirements.

3.8.2 Equipment Tests

After completion of flushing, adjusting operations, re-installation of all equipment removed during flushing, the following tests shall be performed. All tests shall be witnessed by the Contracting Officer. All test results shall be recorded by the Contractor and submitted to the Contracting Officer.

3.8.2.1 Emergency Shutdown

Test each "Emergency Stop" push button station to verify that the pump stops and the motorized valves close from each pushbutton station. Repeat above procedure for each pump.

3.8.2.2 Annunciation

Verify and record that alarms function as intended by design.

3.8.3 Commissioning Procedure

Perform and the Contracting Officer shall witness the following operations with fuel in the prescribed sequence unless otherwise approved. Single system supplier shall oversee commissioning process and make adjustments as necessary.

3.8.4 Final System Performance Test

Upon satisfactory completion of the individual system components, entire

JP-8 system shall be tested as a whole. Fuel shall be transferred from one tank to each of the others at the flow rate specified.

The Contract shall submit written test data, including the following information, for each operational test conducted during the final performance test:

a. Elapsed operating time
b. Operating tank liquid level readings
c. Pump operation records
d. System flow rate reading
e. System pressure gauge readings
f. Fuel sample records
g. Controls settings records
h. A final report shall be submitted which will include the final settings of valves and controls.

3.8.5 Final Acceptance

The system shall be completely commissioned with fuel, and the installation shall be completely operable at the time of acceptance by the Government.

3.9 STARTUP AND COMMISSIONING PLAN

Prepare a detailed written plan with phased system commissioning. The plan shall be a step-by-step documentation of the means and methods the Contractor intends to use to test, flush, clean, and inspect the system. The plan shall be sufficiently detailed to demonstrate that the Contractor has thoroughly considered the work, particularly with regard to sequencing the work to optimize safety while still completing the process in a timely fashion. Develop system for keying Government action steps into the Commissioning Schedule. Submit the plan no later than 30 days prior to introducing the fuel into each construction phase segment of the piping system. Commissioning Schedule shall specifically address the following items.

3.10 FIELD PAINTING

After completion of field inspections and tests, clean and paint carbon steel surfaces exposed to the weather and in manholes, including valves, strainers, traps, flow meters, piping flanges, bolts, nuts, washers, pipe hangers, supports, expansion joints, and miscellaneous metal. Do no paint stainless steel or aluminum surfaces. Clean surfaces to remove dust, dirt, rust, oil, and grease.

3.11 MOUNTING CHANNEL

MFMA-102. Mounting channel shall be installed in accordance with manufacturers recommendation and as indicated.

QUESTIONNAIRE
FOR
SINGLE SYSTEM SUPPLIER EXPERIENCE

EXPERIENCE DOCUMENTATION REQUIRED

The single system supplier shall submit the following data on the successful fueling control systems offered to meet the above specified experience requirements.

1. Fueling control system location and mailing address:

_____

_____

2. Fueling control system current manager and phone number:

_____

_____

3. Fueling control system construction start date: _____

construction completion date: _____

date of acceptance by the owner: _____

prime contractor's name, address and current phone number:

_____

_____

4. Describe the fueling control system provided including information on the system's size and construction complexity:

_____

_____

_____

_____

_____

_____

_____

QUESTIONNAIRE
FOR
SINGLE SYSTEM SUPPLIER EXPERIENCE

4.1 Describe fueling control systems, systems controls, and equipment:

_____

_____

_____

_____

_____

_____

_____

4.2 Other pertinent fueling control systems and equipment:

_____

_____

_____

_____

_____

-- End of Section --

SECTION 33 71 02.00 20

UNDERGROUND ELECTRICAL DISTRIBUTION
08/08

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM B 1	(2001; R 2007) Standard Specification for Hard-Drawn Copper Wire
ASTM B 3	(2001; R 2007) Standard Specification for Soft or Annealed Copper Wire
ASTM B 8	(2004) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2	(2007; Errata 2006; Errata 2007; INT 44-56 2007; INT 47, 49, 50, 52-56 2008; INT 57, 58, 51, 48 2009) National Electrical Safety Code
IEEE Std 100	(2000) The Authoritative Dictionary of IEEE Standards Terms
IEEE Std 81	(1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1)Normal Measurements

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS	(2003) Acceptance Testing Specifications

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA RN 1	(2005) Standard for Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2008; AMD 1 2008) National Electrical Code - 2008 Edition

UNDERWRITERS LABORATORIES (UL)

UL 467	(2007) Standard for Grounding and Bonding Equipment
UL 486A-486B	(2003; Rev thru Apr 2009) Standard for Wire Connectors
UL 510	(2005; Rev thru Aug 2005) Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
UL 514A	(2004; Rev thru Aug 2007) Standard for Metallic Outlet Boxes
UL 514B	(2004; Rev thru Aug 2007) Standard for Conduit, Tubing and Cable Fittings
UL 651	(2005; Rev thru May 2007) Standard for Schedule 40 and 80 Rigid PVC Conduit and Fittings
UL 83	(20086) Standard for Thermoplastic-Insulated Wires and Cables

1.2 DEFINITIONS

a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE Std 100.

b. In the text of this section, the words conduit and duct are used interchangeably and have the same meaning.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Field Acceptance Checks and Tests; G

1.4 QUALITY ASSURANCE

1.4.1 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.4.2 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.4.2.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.4.2.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

PART 2 PRODUCTS

2.1 CONDUIT, DUCTS, AND FITTINGS

2.1.1 Rigid Metal Conduit

2.1.1.1 Rigid Metallic Conduit, PVC Coated

NEMA RN 1, Type A40, except that hardness shall be nominal 85 Shore A durometer, dielectric strength shall be minimum 400 volts per mil at 60 Hz, and tensile strength shall be minimum 3500 psi.

2.1.2 Plastic Conduit for Direct Burial

UL 651, EPC-40-PVC.

2.1.3 Conduit Sealing Compound

Compounds for sealing ducts and conduit shall have a putty-like consistency workable with the hands at temperatures as low as 35 degrees F, shall neither slump at a temperature of 300 degrees F, nor harden materially when exposed to the air. Compounds shall adhere to clean surfaces of fiber or plastic ducts; metallic conduits or conduit coatings; concrete, masonry, or lead; any cable sheaths, jackets, covers, or insulation materials; and the common metals. Compounds shall form a seal without dissolving, noticeably changing characteristics, or removing any of the ingredients. Compounds shall have no injurious effect upon the hands of workmen or upon materials. Inflatable bladders may be used as an option.

2.1.4 Fittings

2.1.4.1 Metal Fittings

UL 514B.

2.1.4.2 PVC Conduit Fittings

UL 514B, UL 651.

2.1.4.3 Outlet Boxes for Steel Conduit

Outlet boxes for use with rigid or flexible steel conduit shall be cast-metal cadmium or zinc-coated if of ferrous metal with gasketed closures and shall conform to UL 514A.

2.2 LOW VOLTAGE INSULATED CONDUCTORS AND CABLES

Insulated conductors shall be rated 600 volts and conform to the requirements of NFPA 70, including listing requirements. Wires and cables manufactured more than 24 months prior to date of delivery to the site shall not be accepted.

2.2.1 Conductor Types

Cable and duct sizes indicated are for copper conductors and THHN/THWN unless otherwise noted. Conductors No. 10 AWG and smaller shall be solid copper. Conductors No. 8 AWG and larger shall be stranded copper. Conductors No. 6 AWG and smaller shall be copper.

2.2.2 Conductor Material

Unless specified or indicated otherwise or required by NFPA 70, wires in conduit, other than service entrance, shall be 600-volt, Type THWN/THHN conforming to UL 83. Copper conductors shall be annealed copper complying with ASTM B 3 and ASTM B 8.

2.2.3 Jackets

Multiconductor cables shall have an overall PVC outer jacket.

2.2.4 In Duct

Cables shall be single-conductor cable.

2.2.5 Cable Marking

Insulated conductors shall have the date of manufacture and other identification imprinted on the outer surface of each cable at regular intervals throughout the cable length.

Each cable shall be identified by means of a fiber, laminated plastic, or non-ferrous metal tags, or approved equal, in each manhole, handhole, junction box, and each terminal. Each tag shall contain the following information; cable type, conductor size, circuit number, circuit voltage, cable destination and phase identification.

Conductors shall be color coded. Conductor identification shall be provided within each enclosure where a tap, splice, or termination is

made. Conductor identification shall be by color-coded insulated conductors, plastic-coated self-sticking printed markers, colored nylon cable ties and plates, heat shrink type sleeves,or colored electrical tape. Control circuit terminations shall be properly identified. 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 neutrals shall be white with a different colored (not green) stripe for each. Color of ungrounded conductors in different voltage systems shall be as follows

a. 480/277 volt, three-phase

(1) Phase A - brown

(2) Phase B - orange

(3) Phase C - yellow

b. 120/240 volt, single phase: Black and red

2.3 LOW VOLTAGE WIRE CONNECTORS AND TERMINALS

Shall provide a uniform compression over the entire conductor contact surface. Use solderless terminal lugs on stranded conductors.

a. For use with copper conductors: UL 486A-486B.

b. For use with aluminum conductors: UL 486A-486B. For connecting aluminum to copper, connectors shall be the circumferentially compressed, metallurgically bonded type.

2.4 TAPE

2.4.1 Insulating Tape

UL 510, plastic insulating tape, capable of performing in a continuous temperature environment of 80 degrees C.

2.5 GROUNDING AND BONDING

2.5.1 Driven Ground Rods

Provide copper-clad steel ground rods conforming to UL 467 not less than 3/4 inch in diameter by 10 feet in length. Sectional type rods may be used for rods 20 feet or longer.

2.5.2 Grounding Conductors

Stranded-bare copper conductors shall conform to ASTM B 8, Class B, soft-drawn unless otherwise indicated. Solid-bare copper conductors shall conform to ASTM B 1 for sizes No. 8 and smaller. Insulated conductors shall be of the same material as phase conductors and green color-coded, except that conductors shall be rated no more than 600 volts. Aluminum is not acceptable.

PART 3 EXECUTION

3.1 INSTALLATION

Install equipment and devices in accordance with the manufacturer's published instructions and with the requirements and recommendations of NFPA 70 and IEEE C2 as applicable.

3.2 CABLE INSPECTION

Prior to installation, each cable reel shall be inspected for correct storage positions, signs of physical damage, and broken end seals. If end seal is broken, moisture shall be removed from cable prior to installation in accordance with the cable manufacturer's recommendations.

3.3 UNDERGROUND CONDUIT AND DUCT SYSTEMS

3.3.1 Requirements

Depths to top of the conduit shall be in accordance with NFPA 70. Run conduit in straight lines except where a change of direction is necessary. Numbers and sizes of ducts shall be as indicated. Ducts shall have a continuous slope downward toward underground structures and away from buildings, laid with a minimum slope of [3][4] inches per 100 feet. Depending on the contour of the finished grade, the high-point may be at a terminal, a manhole, a handhole, or between manholes or handholes. Short-radius manufactured 90-degree duct bends may be used only for pole or equipment risers, unless specifically indicated as acceptable. The minimum manufactured bend radius shall be 18 inches for ducts of less than 3 inch diameter, and 36 inches for ducts 3 inches or greater in diameter. Otherwise, long sweep bends having a minimum radius of 25 feet shall be used for a change of direction of more than 5 degrees, either horizontally or vertically. Both curved and straight sections may be used to form long sweep bends, but the maximum curve used shall be 30 degrees and manufactured bends shall be used. Ducts shall be provided with end bells whenever duct lines terminate in structures.

3.3.2 Treatment

Ducts shall be kept clean of concrete, dirt, or foreign substances during construction. Field cuts requiring tapers shall be made with proper tools and match factory tapers. A coupling recommended by the duct manufacturer shall be used whenever an existing duct is connected to a duct of different material or shape. Ducts shall be stored to avoid warping and deterioration with ends sufficiently plugged to prevent entry of any water or solid substances. Ducts shall be thoroughly cleaned before being laid. Plastic ducts shall be stored on a flat surface and protected from the direct rays of the sun.

3.3.3 Conduit Cleaning

As each conduit run is completed, for conduit sizes 3 inches and larger, draw a flexible testing mandrel approximately 12 inches long with a diameter less than the inside diameter of the conduit through the conduit. After which, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel; then immediately install conduit plugs. For conduit sizes less than 3 inches, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel; then immediately install conduit plugs.

3.3.4 Jacking and Drilling Under Roads and Structures

Conduits to be installed under existing paved areas which are not to be disturbed, and under roads and railroad tracks, shall be zinc-coated, rigid steel, jacked into place.Where ducts are jacked under existing pavement, rigid steel conduit will be installed because of its strength. To protect the corrosion-resistant conduit coating, predrilling or installing conduit inside a larger iron pipe sleeve (jack-and-sleeve) is required. For crossings of existing railroads and airfield pavements greater than 50 feet in length, the predrilling method or the jack-and-sleeve method will be used. Separators or spacing blocks shall be made of steel, concrete, plastic, or a combination of these materials placed not farther apart than 4 feet on centers.

3.3.5 Galvanized Conduit Concrete Penetrations

Galvanized conduits which penetrate concrete (slabs, pavement, and walls) in wet locations shall be PVC coated and shall extend from at least 2 inches within the concrete to the first coupling or fitting outside the concrete (minimum of 6 inches from penetration).

3.3.6 Multiple Conduits

Separate multiple conduits by a minimum distance of 2 1/2 inches, except that light and power conduits shall be separated from control, signal, and telephone conduits by a minimum distance of [3][12] inches. Stagger the joints of the conduits by rows (horizontally) and layers (vertically) to strengthen the conduit assembly. Provide plastic duct spacers that interlock vertically and horizontally. Spacer assembly shall consist of base spacers, intermediate spacers, ties, and locking device on top to provide a completely enclosed and locked-in conduit assembly. Install spacers per manufacturer's instructions, but provide a minimum of two spacer assemblies per 10 feet of conduit assembly.

3.3.7 Conduit Plugs and Pull Rope

New conduit indicated as being unused or empty shall be provided with plugs on each end. Plugs shall contain a weephole or screen to allow water drainage. Provide a plastic pull rope having 3 feet of slack at each end of unused or empty conduits.

3.3.8 Conduit and Duct Without Concrete Encasement

Provide not less than 3 inches clearance from the conduit to each side of the trench. Grade bottom of trench smooth; where rock, soft spots, or sharp-edged materials are encountered, excavate the bottom for an additional 3 inches, fill and tamp level with original bottom with sand or earth free from particles, that would be retained on a 1/4 inch sieve. The first 6 inch layer of backfill cover shall be sand compacted as previously specified. The rest of the excavation shall be backfilled and compacted in3 to 6 inch layers. Provide color, type and depth of warning tape as specified in Section 31 23 00.00 20 EXCAVATION AND FILL.

3.4 CABLE PULLING

Test existing duct lines with a mandrel and thoroughly swab out to remove foreign material before pulling cables. Pull cables down grade with the feed-in point at the manhole or buildings of the highest elevation. Use

flexible cable feeds to convey cables through manhole opening and into duct runs. Do not exceed the specified cable bending radii when installing cable under any conditions, including turnups into switches, transformers, switchgear, switchboards, and other enclosures. If basket-grip type cable-pulling devices are used to pull cable in place, cut off the section of cable under the grip before splicing and terminating.

3.4.1 Cable Lubricants

Use lubricants that are specifically recommended by the cable manufacturer for assisting in pulling jacketed cables.

3.5 LOW VOLTAGE CABLE SPLICING AND TERMINATING

Make terminations and splices with materials and methods as indicated or specified herein and as designated by the written instructions of the manufacturer. Do not allow the cables to be moved until after the splicing material has completely set. Make splices in underground distribution systems only in accessible locations such as manholes,handholes, or aboveground termination cabinets.

3.6 GROUNDING SYSTEMS

3.6.1 Grounding Connections

Make grounding connections which are buried or otherwise normally inaccessible, by exothermic weld or compression connector.

a. Make exothermic welds strictly in accordance with the weld manufacturer's written recommendations. Welds which are "puffed up" or which show convex surfaces indicating improper cleaning are not acceptable. Mechanical connectors are not required at exothermic welds.

b. Make compression connections using a hydraulic compression tool to provide the correct circumferential pressure. Tools and dies shall be as recommended by the manufacturer. An embossing die code or other standard method shall provide visible indication that a connector has been adequately compressed on the ground wire.

3.6.2 Grounding Conductors

Provide bare grounding conductors, except where installed in conduit with associated phase conductors. Ground cable sheaths, cable shields, conduit, and equipment with No. 6 AWG. Ground other noncurrent-carrying metal parts and equipment frames of metal-enclosed equipment. Ground metallic frames and covers of handholes and pull boxes with a braided, copper ground strap with equivalent ampacity of No. 6 AWG.

3.7 EXCAVATING, BACKFILLING, AND COMPACTING

Provide in accordance with NFPA 70 and Section 31 23 00.00 20 EXCAVATION AND FILL.

3.8 FIELD QUALITY CONTROL

3.8.1 Performance of Field Acceptance Checks and Tests

Perform in accordance with the manufacturer's recommendations, and include

the following visual and mechanical inspections and electrical tests, performed in accordance with NETA ATS.

3.8.1.1 Grounding System

a. Visual and mechanical inspection

Inspect ground system for compliance with contract plans and specifications

b. Electrical tests

Perform ground-impedance measurements utilizing the fall-of-potential method in accordance with IEEE Std 81. On systems consisting of interconnected ground rods, perform tests after interconnections are complete. On systems consisting of a single ground rod perform tests before any wire is connected. Take measurements in normally dry weather, not less than 48 hours after rainfall. Use a portable megohmmeter tester in accordance with manufacturer's instructions to test each ground or group of grounds. The instrument shall be equipped with a meter reading directly in ohms or fractions thereof to indicate the ground value of the ground rod or grounding systems under test.3.8.2 Follow-Up Verification

Upon completion of acceptance checks and tests, the Contractor shall show by demonstration in service that circuits and devices are in good operating condition and properly performing the intended function. As an exception to requirements stated elsewhere in the contract, the Contracting Officer shall be given 5 working days advance notice of the dates and times of checking and testing.

-- End of Section --