

22-0005 REPAIR HEAD FACILITY BLDG AS2818

CONTRACT N40085-22-B-0005
NAVFAC SPECIFICATION
NO. 22-0005

REPAIR HEAD FACILITY BLDG AS2818

AT THE

MARINE CORPS AIR STATION, NEW RIVER, NORTH CAROLINA
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

DESIGN BY:

Morgan Hunter
Architect, Design Branch

SPECIFICATION PREPARED BY:

Kim R. Sample

Date: November 17, 2023

SPECIFICATION APPROVED BY:



J. Franklin Orr, P.E., Director
Design Branch, Public Works Division

R. M. Syre, Commander, CEC, U.S. Navy for
Commander, Naval Facilities Engineering

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TITLE: REPAIR HEADS AS2818

SCOPE OF WORK:

The contractor shall provide all material, labor, equipment and supervision required to accomplish the following:

General Description

The intent of this project shall be to repair male and female heads building AS2818 (740 SF). AS2818 is a public toilet located on E Old Perimeter RD on New River Air Station at the marina adjacent to building AS2800. This project will include replacing the roof, windows, all interior finishes, all electrical components, and all plumbing fixtures. This project will include reconfiguring the existing heads to include a laundry facility and a wash station. This project will include the addition of a black water pump. Fixtures and materials shall be listed in the detailed requirements and specifications section.

DETAILED REQUIREMENTS AND SPECIFICATIONS

1. Demo
 - a. Demolish existing asphalt shingle roof, flashing, trim items, vapor barrier, and any other related items. Remove all unsuitable substrate, fascia, gable ends, soffit, etc. Demolish all louvers, fascia, trim, soffit, and vents.
 - b. Demolish existing concrete slab, approx. 4" thick. (740 SF).
 - c. Demolish existing interior CMU walls and gypsum board ceiling (including insulation and lighting).
 - d. Demolish existing toilet partitions and associated hardware. Demolish existing toilet accessories (paper towel dispenser, soap dispenser, grab bars, toilet paper holder, etc.). Demolish existing benches and associated hardware. Demolish changing tables.
 - e. Demolish existing plumbing fixtures to include shower pans and all support brackets and components associated with plumbing fixtures. Demolish existing outdoor showers and shower pans.
 - f. Demolish existing water coolers.
 - g. Demolish existing electrical components and fixtures to include panel box and breakers. Demolish existing overhead secondary conductors.
 - h. Demolish existing windows and doors.
 - i. All holes and damage left by demolition shall be patched with an approved material.
2. Construction
 - a. Install new standing seam metal roof. Roof color shall match adjacent building and be approved by Camp Lejeune Base Architect. All fascia shall be covered with trim coil with vinyl soffit. All gables shall be vinyl.
 - b. Provide interior CMU walls to accommodate new floor plan (attached).
 - c. Provide ceilings throughout with a panel approved for wet locations.
 - d. Provide new plumbing fixtures to include (5) toilets, (2) urinals, (4) shower pans, (4) sinks, laundry sink, washing machine hook-up, and outdoor wash station. Provide (5) floor drains.
 - e. Provide solid surface counter tops for sinks.
 - f. Provide grab bars in (2) handicap stalls and (2) handicap showers. Provide handicap benches in (2) handicap showers.
 - g. Provide new toilet accessories (paper towel dispenser, soap dispensers, toilet paper holders, etc.).
 - h. Install porcelain tile walls and floors in showers.
 - i. Provide new shower valves and components (4) total.
 - j. Provide new toilet compartments (5) total and urinal screens (2) total. A color through phenolic material shall be used.
 - k. Provide (2) changing tables.

- l. Provide (2) water coolers.
 - m. Provide black water pumping station.
 - n. Provide 4" thick concrete slab (740 SF). Concrete floors and shower areas shall be coated with an approved epoxy.
 - o. Paint interior and exterior of building.
 - p. Install new vinyl windows.
 - q. Provide new hollow metal doors (5) total.
 - r. Provide new sidewalk.
3. Electrical
- a. Install appropriate lighting, exhaust fans, and switches. Lights shall be rated for wet location. Install new panel box with breakers.
 - b. Install appropriately sized hot water heater in order to supply hot water to sinks and showers.
 - c. Install appropriately sized heating system for head areas, shall be electric.
 - d. Provide electrical hook-up for washing machine and dryer.

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SUMMARY OF WORK

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PART 1 GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

1.1.1 Project Description

The work includes all items of work as described in the attached project description.

1.1.2 Location

The work shall be located at the Marine Corps Base Camp Lejeune, North Carolina, at the building and/or area as described in the attached project description. The exact location will be indicated by the Contracting Officer.

1.2 PHASED CONSTRUCTION SCHEDULE

Within the overall project schedule, commence and complete the work in phases as described in the attached project description.

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 LOCATION OF UNDERGROUND FACILITIES

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

1.4.1 Notification Prior to Excavation

Notify the Contracting Officer's Representative (COR) 48 hours prior to starting excavation work.

1.5 GOVERNMENT-FURNISHED MATERIAL AND EQUIPMENT

Government furnished material and equipment will be indicated on drawings and in scope of work if applicable.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 14 00

WORK RESTRICTIONS (MCBL)

04/22

PART 1 GENERAL

1.1 SUBMITTALS

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

SD-01 Preconstruction Submittals

List of Contact Personnel

1.2 SPECIAL SCHEDULING REQUIREMENTS

- a. The Contractor shall comply with all special scheduling requirements as described in the attached project description.
- d. Permission to interrupt any Station roads, railroads, and/or utility service shall be requested in writing a minimum of 15 calendar days prior to the desired date of interruption.

1.3 CONTRACTOR ACCESS AND USE OF PREMISES

1.3.1 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. Wear appropriate personal protective equipment (PPE) in designated areas. Do not enter any restricted areas unless required to do so and until cleared for such entry. Ensure all Contractor equipment, include delivery vehicles, are clearly identified with their company name.

1.3.1.1 Subcontractors and Personnel Contacts

Provide 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.

1.3.1.2 Installation Access

Obtain access to Navy installations through participation in the Defense Biometrics Identification System (DBIDS). Requirements for Contractor employee registration, and transition for employees currently under Navy Commercial Access Control System (NCACS), are available at <https://www.cnic.navy.mil/om/dbids.html>. No fees are associated with obtaining a DBIDS credential.

Participation in the DBIDS is not mandatory, and Contractor personnel may apply for One-Day Passes at the Base Visitor Control Office to access an installation.

The following are specific details regarding contractor personnel

requirements. For the most up-to-date information regarding Base Access please visit <https://www.lejeune.marines.mil/Base-Access/>.

1.3.1.2.1 Registration for DBIDS

Registration for DBIDS is available at <https://www.cnic.navy.mil/om/dbids.html>. Procedure includes:

- a. Present a letter or official award document (i.e. DD Form 1155 or SF 1442) from the Contracting Officer, that provides the purpose for access, to the base Visitor Control Center representative.
- b. Present valid identification, such as a passport or Real ID Act-compliant state driver's license.
- c. Provide completed SECNAV FORM 5512/1 to the base Visitor Control Center representative to obtain a background check. This form is available for download at <https://www.cnic.navy.mil/om/dbids.html>.
- d. Upon successful completion of the background check, the Government will complete the DBIDS enrollment process, which includes Contractor employee photo, fingerprints, base restriction and several other assessments.
- e. Upon successful completion of the enrollment process, the Contractor employee will be issued a DBIDS credential, and will be allowed to proceed to worksite.

1.3.1.2.2 DBIDS Eligibility Requirements

Throughout the length of the contract, the Contractor employee must continue to meet background screen standards. Periodic background screenings are conducted to verify continued DBIDS participation and installation access privileges. DBIDS access privileges will be immediately suspended or revoked if at any time a Contractor employee becomes ineligible.

An adjudication process may be initiated when a background screen failure results in disqualification from participation in the DBIDS, and Contractor employee does not agree with the reason for disqualification. The Government is the final authority.

1.3.1.2.3 DBIDS Notification Requirements

- a. Immediately report instances of lost or stolen badges to the Contracting Officer.
- b. Immediately collect DBIDS credentials and notify the Contracting Officer in writing under the following circumstances:
 - (1) An employee has departed the company without having properly returned or surrendered their DBIDS credentials.
 - (2) There is a reasonable basis to conclude that an employee, or former employee, might pose a risk, compromise, or threat to the safety or security of the Installation or anyone therein.

1.3.1.2.4 One-Day Passes

Personnel applying for One-Day passes at the Base Visitor Control Office are subject to daily mandatory vehicle inspection, and will have limited access to the installation. The Government is not responsible for any cost or lost time associated with obtaining daily passes or added vehicle inspections incurred by non-participants in the DBIDS.

1.3.2 No Smoking Policy

Smoking is prohibited within and outside of all buildings on installation, 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.

1.3.3 Working Hours

Regular working hours shall be 0730-1600, Monday through Friday, excluding Government holidays.

1.3.4 Work Outside Regular Hours

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

1.3.5 Occupied Building and Existing Buildings

The Contractor shall be working in a a portion of an existing building which is not occupied. The existing building and its contents shall be kept secure at all times.

1.3.6 Utility Cutovers and Interruptions

- a. The Contractor shall coordinate a minimum of 14 calendar days prior to any planned utility cutover / interruption. Make utility cutovers and interruptions during normal working 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. This time limit includes time for deactivation and reactivation.
- d. Operation of Station Utilities: The Contractor shall not operate nor disturb the setting of control devices in the station utilities system, including water, sewer, electrical, and steam services. The Government will operate the control devices as required for normal conduct of the work. The Contractor shall notify the Contracting Officer at least 15 days prior to such operation.

1.4 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," apply.

1.5 EMERGENCY UNEXPLODED ORDNANCE (UXO) RESPONSE

In the event that UXO, as defined in 40 CFR 260 is encountered during the construction activities that are deemed to be a threat to human health or the environment, Camp Lejeune Military Police and EOD professionals shall be immediately contacted to conduct an emergency response. Additionally, immediately contact the Contracting Officer if UXO is encountered. An evaluation of this scenario and procedures, with contract numbers, shall be included in the Health and Safety Plan (HASP) for the fieldwork.

1.5.1 3R TRAINING

All Contractor personnel performing ground disturbing activities must complete contractor awareness training related to recognizing UXO. This training (3R TRAINING) is available online at:
<http://www.lejeune.marines.mil/OfficesStaff/EnvironmentalMgmt/TrainingVideo.aspx>

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES (MCBCL)

04/22

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

(2021) Engineering and Design --
Construction Equipment Ownership and
Operating Expense Schedule

1.2 SUBMITTALS

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

SD-01 Preconstruction Submittals

Schedule of Prices; G

1.3 SCHEDULE OF PRICES

1.3.1 Data Required

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

1.3.2 Payment Schedule Instructions

Payments will not be made until the Schedule of Prices has been submitted to and accepted by the Contracting Officer.

Additionally, the Schedule of Prices must be separated as follows:

a. Primary Facilities Cost Breakdown:

Defined as work on the primary facilities out to the 5 foot line. Work out to the 5 foot line includes construction encompassed within a theoretical line 5 foot from the face of exterior walls and includes attendant construction, such as pad mounted HVAC cooling equipment, cooling towers, and transformers placed beyond the 5 foot line.

b. Supporting Facilities Cost Breakdown:

Defined as site work, including incidental work, outside 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, base equipment use rates upon the applicable provisions of the EP 1110-1-8.

1.5 CONTRACTOR'S INVOICE AND CONTRACT PERFORMANCE STATEMENT

1.5.1 Content of Invoice

Requests for payment will be processed in accordance with the Contract Clause FAR 52.232-27 Prompt Payment for Construction Contracts and FAR 52.232-5 Payments Under Fixed-Price Construction Contracts. Invoices not completed in accordance with contract requirements will be returned to the Contractor for correction of the deficiencies. The requests for payment shall include the documents listed below.

- a. The Contractor's invoice, on NAVFAC Form 7300/30 furnished by the Government, showing in summary form, the basis for arriving at the amount of the invoice. Form 7300/30 must include certification by Quality Control (QC) Manager as required by the Contract.
- b. The Estimate for Voucher/ Contract Performance Statement on NAVFAC Form 4330/54 furnished by the Government. Use NAVFAC Form 4330, unless otherwise directed by the Contracting Officer, on NAVFAC Contracts when a Monthly Estimate for Voucher is required.
- c. Contractor's Monthly Estimate for Voucher and Contractors Certification (NAVFAC Form 4330) with Subcontractor and supplier payment certification. Other documents, including but not limited to, that need to be received prior to processing payment include the following submittals as required. These items are still required monthly even when a pay voucher is not submitted.
- d. Monthly Work-hour report.
- e. Updated Construction Progress Schedule and tabular reports required by the contract.
- f. Contractor Safety Self Evaluation Checklist.
- g. Updated submittal register.
- h. Solid Waste Disposal Report.
- i. Certified payrolls.
- j. Updated testing logs.
- k. Other supporting documents as requested.

1.5.2 Submission of Invoices

If DFARS Clause 252.232-7006 Wide Area WorkFlow Payment Instructions is included in the Contract, provide the documents listed in above paragraph CONTENT OF INVOICE in their entirety as attachments in Wide Area Work Flow

(WAWF) for each invoice submitted. The maximum size of each WAWF attachment is two megabytes, but there are no limits on the number of attachments. If a document cannot be attached in WAWF due to system or size restriction, provide it as instructed by the Contracting Officer.

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

1.5.3 Final Invoice

- a. A final invoice must be accompanied by the certification required by DFARS 252.247.7023 Transportation of Supplies by Sea, and the Contractor's Final Release. If the Contractor is incorporated, the Final Release must contain the corporate seal. An officer of the corporation must sign and the corporate secretary must certify the Final Release.
- b. For final invoices being submitted via WAWF, the original Contractor's Final Release Form and required certification of Transportation of Supplies by Sea must be provided directly to the respective Contracting Officer prior to submission of the final invoice. Once receipt of the original Final Release Form and required certification of Transportation of Supplies by Sea has been confirmed by the Contracting Officer, the Contractor must then submit final invoice and attach a copy of the Final Release Form and required certification of Transportation of Supplies by Sea in WAWF.
- c. Final invoices not accompanied by the Contractor's Final Release and required certification of Transportation of Supplies by Sea will be considered incomplete and will be returned to the Contractor.

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 suspensions permitted under the FAR and agency regulations including the following in accordance with FAR 32.103 Progress Payments Under Construction Contracts:

- 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 maintain accurate "as-built" or record drawings in

accordance with FAR 52.236.21.

1.6.2 Payment for Onsite and Offsite Materials

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

- a. FAR 52.232-5(b) Payments Under Fixed Price Construction Contracts.
- b. Materials delivered on the site but not installed, including completed preparatory work, and off-site materials to be considered for progress payment must be major high cost, long lead, special order, or specialty items, not susceptible to deterioration or physical damage in storage or in transit to the construction site. Examples of materials acceptable for payment consideration include, but are not limited to, structural steel, non-magnetic steel, non-magnetic aggregate, equipment, machinery, large pipe and fittings, precast/prestressed concrete products, plastic lumber (e.g., fender piles/curbs), and high-voltage electrical cable. Materials not acceptable for payment include consumable materials such as nails, fasteners, conduits, gypsum board, glass, insulation, and wall coverings.
- c. Materials to be considered for progress payment prior to installation must be specifically and separately identified in the Contractor's estimates of work submitted for the Contracting Officer's approval in accordance with Schedule of Prices requirement of this Contract. Requests for progress payment consideration for such items must be supported by documents establishing their value and that the title requirements of the clause at FAR 52.232-5 Payments Under Fixed-Price Construction Contracts have been met.
- d. Materials are adequately insured and protected from theft and exposure.
- e. Provide a written consent from the surety company with each payment request for offsite materials.
- f. Materials to be considered for progress payments prior to installation must be stored either in Hawaii, Guam, Puerto Rico, or the Continental United States. Other locations are subject to written approval by the Contracting Officer.
- g. Materials in transit to the job site or storage site are not acceptable for payment.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

01/23

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)

EM 385-1-1

(2014) Safety and Health Requirements
Manual

1.2 SUBMITTALS

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

[SD-01 Preconstruction Submittals](#)

[View Location Map](#)

[Progress and Completion Pictures](#)

1.3 VIEW LOCATION MAP

Submit, 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.

1.4 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 different viewpoints selected by the Contractor unless otherwise directed by the Contracting Officer. Submit with the monthly invoice two sets of digital photographs, each set on a separate compact disc (CD) or data versatile disc (DVD), cumulative of all photos to date. Indicate photographs demonstrating environmental procedures. Provide photographs for each month in a separate monthly directory and name each file to indicate its location on the view location sketch. Also provide the view location sketch on the CD or DVD as a digital file. Include a date designator in file names. Photographs provided are for unrestricted use by the Government.

1.5 MINIMUM INSURANCE REQUIREMENTS

Provide the minimum insurance coverage required by FAR 28.307-2 Liability, during the entire period of performance under this contract. Provide other insurance coverage as required by State law.

1.6 ELECTRONIC MAIL (EMAIL)

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

1.7 SUPERVISION

1.7.1 Superintendent Qualifications

Provide project superintendent with a minimum of 10 years experience in construction with at least 5 of those years as a superintendent on projects similar in size and complexity. The individual must be familiar with the requirements of EM 385-1-1 and have experience in the areas of hazard identification and safety compliance. The individual must be capable of interpreting a critical path schedule and construction drawings. The qualification requirements for the alternate superintendent are the same as for the project superintendent. The Contracting Officer may request proof of the superintendent's qualifications at any point in the project if the performance of the superintendent is in question.

For projects where the superintendent is permitted to also serve as the Quality Control (QC) Manager as established in Section 01 45 10 QUALITY CONTROL, the superintendent must have qualifications in accordance with that section.

1.7.2 Minimum Communication Requirements

Have at least one qualified superintendent, or competent alternate, capable of reading, writing, and conversing fluently in the English language, on the job-site at all times during the performance of Contract work. In addition, if a Quality Control (QC) representative is required on the Contract, then that individual must also have fluent English communication skills.

1.7.3 Duties

The project superintendent is primarily responsible for managing subcontractors and coordinating day-to-day production and schedule adherence on the project. The superintendent is required to attend Red

Zone meetings, partnering meetings, and quality control meetings. The superintendent or qualified alternative must be on-site at all times during the performance of this contract until the work is completed and accepted.

1.7.4 Non-Compliance Actions

The Project Superintendent is subject to removal by the Contracting Officer for non-compliance with requirements specified in the contract and for failure to manage the project to ensure timely completion. Furthermore, 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 is acceptable as the subject of claim for extension of time for excess costs or damages by the Contractor.

1.8 PRECONSTRUCTION MEETING

Immediately after award, prior to commencing any work at the site, coordinate with the Contracting Officer a time and place to meet for the Preconstruction Meeting. The meeting must take place within 35 calendar days after award of the contract, but prior to commencement of any work at the site. The purpose of this meeting is to discuss and develop a mutual understanding of the administrative requirements of the Contract including but not limited to: daily reporting, invoicing, value engineering, safety, base-access, outage requests, hot work permits, schedule requirements, quality control, schedule of prices or earned value report, shop drawings, submittals, cybersecurity, prosecution of the work, government acceptance, final inspections and contract close-out. Contractor must present and discuss their basic approach to scheduling the construction work and any required phasing.

1.8.1 Attendees

Contractor attendees must include the Project Manager, Superintendent, Site Safety and Health Officer (SSHO), Quality Control Manager and major subcontractors.

1.9 FACILITY TURNOVER PLANNING MEETINGS (Red Zone Meetings)

Meet with the Government to identify strategies to ensure the project is carried to expeditious closure and turnover to the Client. Start planning the turnover process at the Pre-Construction Conference meeting with a discussion of the Red Zone process and convene at regularly scheduled NRZ Meetings beginning at approximately 75 percent of project completion. Include the following in the facility Turnover effort:

1.9.1 Red Zone Checklist

- a. Contracting Officer's Technical Representative (COTR) will provide the Contractor a copy of the Red Zone Checklist template.
- b. Prior to 75 percent completion, modify the Red Zone Checklist template by adding or deleting critical activities applicable to the project and assign planned completion dates for each activity. Submit the modified Red Zone Checklist to the Contracting Officer. The Contracting Officer may request additional activities be added to the Red Zone Checklist at any time as necessary.

1.9.2 Meetings

- a. Conduct regular Red Zone Meetings beginning at approximately 75 percent project completion, or three to six months prior to Beneficial Occupancy Date (BOD), whichever comes first.
- b. The Contracting Officer will establish the frequency of the meetings, which is expected to increase as the project completion draws nearer. At the beginning, Red Zone meetings may be every two weeks then increase to weekly towards the final month of the project.
- c. Using the Red Zone Checklist as a Plan of Action and Milestones (POAM) and basis for discussion, review upcoming critical activities and strategies to ensure work is completed on time.
- d. During the Red Zone Meetings discuss with the COTR any upcoming activities that require Government involvement.
- e. Maintain the Red Zone Checklist by documenting the actual completion dates as work is completed and update the Red Zone Checklist with revised planned completion dates as necessary to match progress. Distribute copies of the current Red Zone Checklist to attendees at each Red Zone Meeting.

1.10 PARTNERING

Contractor shall host the partnering session within 45 calendar days of contract award. To most effectively accomplish this Contract, the Contractor and Government must form a cohesive partnership with the common goal of drawing on the strength of each organization in an effort to achieve a successful project without safety mishaps, conforming to the Contract, within budget and on schedule. The partnering team must consist of personnel from both the Government and Contractor including project level and corporate level leadership positions. Key Personnel from the supported command, end user, NAVFAC, PWD, FEAD/ROICC, Contractor, key subcontractors and the Designer of Record are required to participate in the Partnering process.

1.10.1 Team-Led (Informal) Partnering

- a. The Contracting Officer will coordinate the initial Team-Led (Informal) Partnering Session with key personnel of the project team, including Contractor and Government personnel. The Partnering Session will be co-led by the Government Construction Manager and Contractor's Project Manager.
- b. The Initial Team-led Partnering session may be held concurrently with the [Pre-Construction Post-Award Kickoff](#) meeting. Partnering sessions will be held at a location mutually agreed to by the Contracting Officer and the Contractor, typically at a conference room on-base or at the Contractor's temporary trailer.
- c. The Initial Team-Led Partnering Session will be conducted and facilitated using electronic media (a video and accompanying forms) provided by Contracting Officer.
- d. The Partners will determine the frequency of the follow-on sessions.
- e. Participants will bear their own costs for meals, lodging and

transportation associated with Partnering.

1.11 MOBILIZATION

Contractor shall mobilize to the jobsite within 60 calendar days after contract award. Mobilize is defined as having equipment AND having a physical presence of at least one person from the contractor's team on the jobsite.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 31 23.13 20

ELECTRONIC CONSTRUCTION AND FACILITY SUPPORT CONTRACT MANAGEMENT SYSTEM
05/17, CHG 7: 11/21

PART 1 GENERAL

1.1 CONTRACT ADMINISTRATION

Utilize the Naval Facilities Engineering Command's (NAVFAC's) Electronic Construction and Facility Support Contract Management System (eCMS) for the transfer, sharing, and management of electronic technical submittals and documents. The web-based eCMS is the designated means of transferring technical documents between the Contractor and the Government. Paper media or e-mail submission, including originals or copies, of the documents identified in Table 1 are not permitted, except where eCMS is unavailable, non-functional, or specifically requested in addition to electronic submission.

1.1.1 Format Naming Convention for Files Uploaded Into eCMS

Include the identification number of the document, the type of document, the name/subject or title, and for daily reports, the date (day of work) with format YYYY/MM/DD in the filename. For example, for RFI's, 0011_RFI_Roof_Leaking.doc; for submittals, 0032a_Submittals_Light_Fixture.pdf; for Daily Reports, 0132_Daily_Report_20190504.xls. Contact the Contracting Officer's Representative (COR) regarding availability of eCMS training and reference materials.

1.1.2 Uploading Documents Processed Outside of eCMS

When specifically requested to provide documents outside of eCMS, upload all final project documentation (e.g., documents that are signed and/or adjudicated by the Government) mentioned in Table 1 into eCMS by creating a record in the module associated with that document type and uploading the document(s). Subject/title of the record should include the type of record i.e., RFI/Submittal/Other, the identification number(s), and the statement "Processed Outside of eCMS". For example, "RFI 001-012 Processed Outside of eCMS".

1.2 USER PRIVILEGES

The Contractor will be provided access to eCMS. All technical submittals and documents must be transmitted to the Government via the COR. Project roles and system roles will be established to control each user's menu, application, and software privileges, including the ability to create, edit, or delete objects.

1.3 SUBMITTALS

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

[SD-01 Preconstruction Submittals](#)

[List of Contractor's Personnel; G](#)

1.4 SYSTEM REQUIREMENTS AND CONNECTIVITY

1.4.1 General

The eCMS requires a web-browser (platform-neutral) and Internet connection. Obtain from an approved vendor an External Certification Authority (ECA), Primary Key Infrastructure (PKI) certificate, or other similar digital identification to support two-factor authentication and access to eCMS. Provide and maintain computer hardware and software for the eCMS access throughout the duration of the contract for all Contractor-designated users. Provide connectivity, speed, bandwidth, and access to the Internet to ensure adequate functionality. 70 mbps download speed recommended, 40 mbps minimum for loading large files. Neither upgrading of the Contractor's computer system nor delays associated from the usage of the eCMS will be justification or grounds for a time extension or cost adjustment to the Contract.

1.4.2 Contractor Personnel List

Within 20 calendar days of contract award, provide to the Contracting Officer a [list of Contractor's personnel](#) who will have the responsibility for the transfer, sharing and management of electronic technical submittals and documents and will require access to the eCMS. Project personnel roles to be filled in the eCMS include the Contractor's Project Manager, Superintendent, Quality Control (QC) Manager, and Site Safety and Health Officer (SSHO). Personnel must be capable of electronic document management. Notify the COR immediately of any personnel changes to the project. The Contracting Officer reserves the right to perform a security check on all potential users. Provide the following information:

- First Name
- Last Name
- E-mail Address
- Office Address
- Project Role (e.g. Project Manager, QC Manager, Superintendent)

1.5 SECURITY CLASSIFICATION

In accordance with Department of Navy guidance, all military construction contract data are unclassified, unless specified otherwise by a properly designated Original Classification Authority (OCA) and in accordance with an established Security Classification Guide (SCG). Refer to the project's OCA when questions arise about the proper classification of information.

The eCMS and tablet computer must only be used for the transaction of unclassified information associated with construction projects. In conformance with the Freedom of Information Act (FOIA), DoD INSTRUCTION 5200.48 CONTROLLED UNCLASSIFIED INFORMATION (CUI), and DoD requirements, any unclassified project documentation uploaded into the eCMS must be designated either "U - UNCLASSIFIED" (U) or "CUI - CONTROLLED UNCLASSIFIED INFORMATION" (CUI).

1.6 ECMS UTILIZATION

Establish, maintain, and update data and documentation in the eCMS throughout the duration of the contract.

Personally Identifiable Information (PII) transmittal is not permitted in

the eCMS.

1.6.1 Information Security Classification/Identification

The eCMS must be used for the transmittal of the following documents. This requirement supersedes conflicting requirements in other sections, however, submittal review times in Section 01 33 00 SUBMITTAL PROCEDURES remain applicable. Table 1 - Project Documentation Types provides the appropriate U and CUI designations for various types of project documents. Construction documents requiring CUI status must be marked accordingly. Apply the appropriate markings before any document is uploaded into eCMS. Markings are not required on U documents.

Table 1 also identifies which eCMS application is to be used in the transmittal of data (these are subject to change based on the latest software configuration). If a designated application is not functional within 4 hours of initial attempt, defer to the Submittal application and submit the required data as an uploaded portable document (e.g. PDF), word processor, spreadsheet, drawing, or other appropriate format. Hard copy or e-mail submission of these items is acceptable only if eCMS is documented to be not available or not functional or specifically requested in addition to electronic submission. After uploading documents to the Submittal application, transmit the submittals and attachments to the COR via the Transmittal application. For Submittals, select the following:

- Preparation by = Contractor personnel assigned to prepare the submittal
- Approval by = Contracting Officer Representative (COR)
- Returned by = Design Lead/Manager
- Forwarded to = Contractor project manager

Table 1 - Project Documentation Types

SUBJECT/NAME	DESIG	REMARKS	ECMS APPLICATION
As-Built Drawings	U	Locations of sensitive areas must be labeled as either "Controlled Area" or "Restricted Area" and may be shown on unclassified documents with the approval from Site Security Manager	Submittals and Transmittals
Building Information Modeling (BIM)	U	1. Locations of sensitive areas must be labeled as either "Controlled Area" or "Restricted Area" and may be shown on unclassified documents with the approval from Site Security Manager 2. Design reviews will be performed in existing "Dr Checks"	Submittals and Transmittals
Construction Permits	U	Refer to rules of the issuing activity, state or jurisdiction	Submittals and Transmittals

SUBJECT/NAME	DESIG	REMARKS	ECMS APPLICATION
Construction Schedules (Activities and Milestones)	U	After the schedule submittal is approved by the COR, import the schedule file into the scheduling application, and select "Approve" to establish a new schedule baseline	Submittals, Transmittals and Scheduling App
Construction Schedules (Cost-Loaded)	CUI	After the schedule submittal is approved by the COR, import the schedule file into the scheduling application, and select "Approve" to establish a new schedule baseline	Submittals, Transmittals and Scheduling App
Construction Schedules (3-Week Lookahead)	U	Import the schedule file into the scheduling application, and select "Approve" to establish a new schedule baseline	Scheduling App
DD 1354 Transfer of Real Property	U		Submittals and Transmittals
Daily Production Reports	CUI	Provide weather conditions, crew size, man-hours, equipment, and materials information	Daily Report
Daily Quality Control (QC) Reports	CUI	Provide QC Phase, Definable Features of Work Identify visitors	Daily Report
Designs and Specifications	U	1. Locations of sensitive areas must be labeled as either "Controlled Area" or "Restricted Area" and may be shown on unclassified documents with the approval from Site Security Manager 2. Design reviews will be performed in existing "Dr Checks"	Submittals and Transmittals
Environmental Notice of Violation (NOV), Corrective Action Plan	U	Refer to rules of the issuing activity, state or jurisdiction	Submittals and Transmittals
Environmental Protection Plan (EPP)	CUI		Submittals and Transmittals

SUBJECT/NAME	DESIG	REMARKS	ECMS APPLICATION
Invoice (Supporting Documentation)	CUI	Applies to supporting documentation only. Invoices are submitted in Wide-Area Workflow (WAWF)	Submittals and Transmittals
Jobsite Documentation, Bulletin Board, Labor Laws, SDS	U		Submittals and Transmittals
Meeting Minutes	CUI		Meeting Minutes
Modification Documents	CUI	Provide final modification documents for the project. Upload into "Modifications - RFPs"	Document Management
Operations & Maintenance Support Information (OMSI/eOMSI), Facility Data Worksheet	U	1. Locations of sensitive areas must be labeled as either "Controlled Area" or "Restricted Area" and may be shown on unclassified documents with the approval from Site Security Manager 2. Design reviews will be performed in existing "Dr Checks"	Submittals and Transmittals
Photographs	U	Subject to base/installation restrictions	Submittals and Transmittals
QCM Initial Phase Checklists	CUI		Checklists (Site Management)
QCM Preparatory Phase Checklists	CUI		Checklists (Site Management)
Quality Control Plans	CUI		Submittals and Transmittals
QC Certifications	U		Submittals and Transmittals
QC Punch List	U		Punch Lists (Testing Logs)
Red-Zone Checklist	U		Checklists (Site Management)
Rework Items List	CUI		Punch Lists (Testing Logs)

SUBJECT/NAME	DESIG	REMARKS	ECMS APPLICATION
Request for Information (RFI) Post-Award	CUI		RFIs
Safety Plan	CUI		Daily Report
Safety - Activity Hazard Analyses (AHA)	CUI		Daily Report
Safety - Mishap Reports	CUI		Daily Report
SCIF/SAPF Accreditation Support Documents	CUI	Note: Some Construction Security plans may be classified as Secret. Classified information must not be uploaded into eCMS. Refer to the Site Security Manager, as applicable.	Submittals and Transmittals
Shop Drawings	U	Locations of sensitive areas must be labeled as either "Controlled Area" or "Restricted Area" and may be shown on unclassified documents with the approval from Site Security Manager	Submittals and Transmittals
Storm Water Pollution Prevention (Notice of Intent - Notice of Termination)	U	Refer to rules of the issuing activity, state or jurisdiction	Submittals and Transmittals
Submittals and Submittal Log	U		Submittals and Transmittals
Testing Plans, Logs, and Reports	CUI		Submittals and Transmittals
Training/Reference Materials	U		Submittals and Transmittals
Training Records (Personnel)	CUI		Submittals and Transmittals
Utility Outage/Tie-In Request/Approval	CUI		Submittals and Transmittals
Warranties/BOD Letter	CUI		Submittals and Transmittals

SUBJECT/NAME	DESIG	REMARKS	ECMS APPLICATION
Quality Assurance Reports	CUI		Checklists (Government initiated)
Non-Compliance Notices	CUI		Non-Compliance Notices (Government initiated)
Other Government-prepared documents	CUI		GOV ONLY
All Other Documents	CUI	Refer to FOIA guidelines and contact the FOIA official to determine whether exemptions exist	As applicable

1.6.2 Markings on CUI documents

- a. Only CUI documents being electronically uploaded into the eCMS (.docx, .xlsx, .pptx, and others as appropriate), and associated paper documents described in the paragraph CONTRACT ADMINISTRATION require CUI markings as indicated in the subparagraphs below.
- b. CUI documents that are originally created within the eCMS application using the web-based forms (RFIs, Daily Reports, and others as appropriate) will be automatically watermarked by the eCMS software, and these do not require additional markings.
- c. CUI documents must be marked "CONTROLLED UNCLASSIFIED INFORMATION" at the bottom of the outside of the front cover (if there is one), the title page, the first page, and the outside of the back cover (if there is one).
- d. CUI documents must be marked on the internal pages of the document as "CONTROLLED UNCLASSIFIED INFORMATION" at top and bottom.
- e. Where Installations require digital photographs to be designated CUI, place the markings on the face of the photograph.
- f. For visual documentation, other than photographs and audio documentation, mark with either visual or audio statements as appropriate at both the beginning and end of the file.

1.7 QUALITY ASSURANCE

Requested Government response dates on Transmittals and Submittals must be in accordance with the terms and conditions of the Contract. Requesting response dates earlier than the required review and response time, without concurrence by the Government COR, may be cause for rejection.

Incomplete submittals will be rejected without further review and must be resubmitted. Required Government response dates for resubmittals must reflect the date of resubmittal, not the original submittal date.

AS2818 Repair Heads
Marine Corps Base, Camp Lejeune

22-0005

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

SECTION 01 31 50

TRANSFER AND ACCEPTANCE OF MILITARY REAL PROPERTY

04/22

PART 1 GENERAL

1.1 SUBMITTALS

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

SD-11 Closeout Submittals

Interim DD-1354, Transfer & Acceptance of Military Real Property

1.2 Interim DD-1354, Transfer & Acceptance of Military Real Property

Submit Interim DD-1354 thirty (30) days prior to beneficial occupancy date
(draft copy attached).

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

SECTION 01 32 16.00 20

SMALL PROJECT CONSTRUCTION PROGRESS SCHEDULES
08/18, CHG 1: 08/20

PART 1 GENERAL

1.1 SUBMITTALS

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

SD-01 Preconstruction Submittals

Baseline Construction Schedule; G

SD-07 Certificates

Monthly Updates

1.2 PRE-CONSTRUCTION SCHEDULE REQUIREMENT

Within 30 calendar days after contract award prior to the start of work, prepare and submit to the Contracting Officer a [Baseline Construction Schedule](#) in accordance with the terms in Contract Clause FAR 52.236-15 Schedules for Construction Contracts, except as modified in this contract. The approval of a Baseline Construction Schedule is a condition precedent to:

- a. The Contractor starting demolition work or construction stage(s) of the contract.
- b. Processing Contractor's invoice(s) for construction activities/items of work.
- c. Review of any schedule updates.

Submittal of the Baseline Construction Schedule, and subsequent schedule updates, is understood to be the Contractor's certification that the submitted schedule meets the requirements of the Contract Documents, represents the Contractor's plan on how the work will be accomplished, and accurately reflects the work that has been accomplished and how it was sequenced (as-built logic).

1.3 SCHEDULE FORMAT

1.3.1 Schedule Submittals and Procedures

Submit Schedules and updates in hard copy and on electronic media that is acceptable to the Contracting Officer. Submit an electronic back-up of the project schedule in an import format compatible with the Government's scheduling program ([Primavera P6](#)).

1.4 SCHEDULE [MONTHLY UPDATES](#)

Update the Construction Schedule at monthly intervals or when the schedule has been revised. Keep the updated schedule current, reflecting actual activity progress and plan for completing the remaining work. Submit

copies of purchase orders and confirmation of delivery dates as directed by the Contracting Officer.

a. Narrative Report: Identify and justify the following:

- (1) Progress made in each area of the project;
- (2) Longest Path: Include printed copy on 11 by 17 inch paper, landscape setting;
- (3) Date/time constraint(s), other than those required by the contract;
- (4) Listing of changes made between the previous schedule and current updated schedule including: added or removed activities, original and remaining durations for activities that have not started, logic (sequence, constraint, lag/lead), milestones, planned sequence of operations, longest path, calendars or calendar assignments, and cost loading.
- (5) Any decrease in previously reported activity Earned Amount;
- (6) Pending items and status thereof, including permits, changes orders, and time extensions;
- (7) Status of Contract Completion Date and interim milestones;
- (8) Current and anticipated delays (describe cause of delay and corrective actions(s) and mitigation measures to minimize);
- (9) Description of current and future schedule problem areas.

For each entry in the narrative report, cite the respective Activity ID and Activity Name, the date and reason for the change, and description of the change.

1.5 3-WEEK LOOK AHEAD SCHEDULE

Prepare and issue a 3-Week Look Ahead schedule to provide a more detailed day-to-day plan of upcoming work identified on the Construction Schedule. Key the work plans to activity numbers when a NAS is required and update each week to show the planned work for the current and following two-week period. Additionally, include upcoming outages, closures, preparatory meetings, and initial meetings. Identify critical path activities on the Three-Week Look Ahead Schedule. The detail work plans are to be bar chart type schedules, maintained separately from the Construction Schedule on an electronic spreadsheet program and printed on 8-1/2 by 11 inch sheets as directed by the Contracting Officer. Activities must not exceed 5 working days in duration and have sufficient level of detail to assign crews, tools and equipment required to complete the work. Deliver three hard copies and one electronic file of the 3-Week Look Ahead Schedule to the Contracting Officer no later than 8 a.m. each Monday, and review during the weekly CQC Coordination or Production Meeting.

1.6 CORRESPONDENCE AND TEST REPORTS:

Correspondence (e.g., letters, Requests for Information (RFIs), e-mails, meeting minute items, Production and QC Daily Reports, material delivery tickets, photographs) must reference Schedule Activities that are being addressed. Test reports (e.g., concrete, soil compaction, weld, pressure)

must reference Schedule Activities that are being addressed.

1.7 ADDITIONAL SCHEDULING REQUIREMENTS

Any references to additional scheduling requirements, including systems to be inspected, tested and commissioned, that are located throughout the remainder of the Contract Documents, are subject to all requirements of this section.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 33 00

SUBMITTAL PROCEDURES

04/22

PART 1 GENERAL

1.1 SUMMARY

1.1.1 Government-Furnished Information

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

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

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

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

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

1.2 DEFINITIONS

1.2.1 Submittal

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

1.2.2 Types of Submittals

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

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

- c. Samples: Physical examples of products, materials, equipment, assemblies, or workmanship that are physically identical to portion of work, illustrating portion of work or establishing standards for evaluating appearance of finished work or both.
- d. Administrative submittals: Data presented for reviews and approval to ensure that administrative requirements of project are adequately met but not to ensure directly that work is in accordance with design concept and in compliance with contract documents.

1.2.3 Submittal Descriptions (SD)

SD-01 Preconstruction Submittals

Submittals that are required prior to or commencing with the start of work on site.

Preconstruction Submittals include schedules and a tabular list of locations, features, and other pertinent information regarding products, materials, equipment, or components to be used in the work.

Certificates Of Insurance

Surety Bonds

List Of Proposed Subcontractors

List Of Proposed Products

Baseline Network Analysis Schedule (NAS)

Submittal Register

Schedule Of Prices Or Earned Value Report

Accident Prevention 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 or equipment for some portion of the work.

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

SD-04 Samples

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

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

Field samples and mock-ups constructed on the project site establish standards by which the ensuring work can be judged. Includes assemblies or portions of assemblies which are to be incorporated into the project and those which will be removed at conclusion of the work.

SD-05 Design Data

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

SD-06 Test Reports

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

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

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

Document required of Contractor, or of a supplier, installer or subcontractor through Contractor, the purpose of which is to further

quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.

Confined space entry permits.

Text of posted operating instructions

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and (SDS) 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 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 provided by the manufacturer, or the system provider, including manufacturer's help and product line documentation, necessary to maintain and install equipment, for operating and maintenance use by facility personnel.

Data required by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.

Data 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.

Submittals required for Guiding Principle Validation (GPV) or Third Party Certification (TPC).

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

1.2.4 Approving Authority

Office or designated person authorized to approve the submittal.

1.2.5 Work

As used in this section, on-site 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. In exception, excludes work to produce SD-01 submittals.

1.3 SUBMITTALS

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

SD-11 Closeout Submittals

Submittal register

Complete Submittal Package 2 CD/DVD's

1.4 USE OF SUBMITTAL REGISTER

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

1.4.1 Submittal Register

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

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

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

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

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

1.4.2 Contractor Use of Submittal Register

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

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

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

Column (l) List date of submittal transmission.

Column (q) List date approval received.

1.4.3 Approving Authority Use of Submittal Register

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

Column (b) .

Column (l) List date of submittal receipt.

Column (m) through (p) .

Column (q) List date returned to contractor.

1.4.4 Contractor Action Code and Action Code

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

NR - Not Received

AN - Approved as noted

A - Approved

RR - Disapproved, Revise, and Resubmit

1.4.5 Copies Delivered to the Government

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

1.4.6 Submittals reserved for Marine Corps North Carolina IPT approval

- a. Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM: All submittals. Provide an information copy of all submittals to Base Telephone through the Contracting Officer. Base Telephone will coordinate their review and approval through the Marine Corps North Carolina IPT.
- b. Section 33 82 00 TELECOMMUNICATIONS OUTSIDE PLANT (OSP): All submittals. Provide an information copy of all submittals to Base Telephone through the Contracting Officer. Base Telephone will coordinate their review and approval through the Marine Corps North Carolina IPT.

1.5 PROCEDURES FOR SUBMITTALS

1.5.1 Reviewing, Certifying, Approving Authority

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

1.5.2 Constraints

- a. Submittals listed or specified in this contract shall conform to provisions of this section, unless explicitly stated otherwise.
- b. Submittals shall be complete for each definable feature of work; components of definable feature interrelated as a system shall be submitted at same time.
- c. When acceptability of a submittal is dependent on conditions,

items, or materials included in separate subsequent submittals, submittal will be returned without review.

- d. Approval of a separate material, product, or component does not imply approval of assembly in which item functions.

1.5.3 Scheduling

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

1.5.4 Variations

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

1.5.4.1 Considering Variations

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

1.5.4.2 Proposing Variations

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

1.5.4.3 Warranting That Variation Are Compatible

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

1.5.4.4 Review Schedule Is Modified

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

1.5.5 Contractor's Responsibilities

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

1.5.6 QC Organization Responsibilities

- a. Note date on which submittal was received from contractor on each submittal.
- b. Review each submittal; and check and coordinate each submittal with requirements of work and contract documents.
- c. Review submittals for conformance with project design concepts and compliance with contract documents.
- d. Act on submittals, determining appropriate action based on QC organization's review of submittal.
 - (1) When QC manager is approving authority, take appropriate action on submittal from the possible actions defined in paragraph entitled, "Actions Possible."
 - (2) When contracting officer is approving authority or when variation has been proposed, forward submittal to Government with

certifying statement or return submittal marked "not reviewed" or "revise and resubmit" as appropriate. The QC organization's review of submittal determines appropriate action.

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

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

"I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated with contract Number N40085-17-B-0056, is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is submitted for Government approval.

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

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

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

1.5.7 Government's Responsibilities

When approving authority is contracting Officer, the Government will:

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

1.5.8 Actions Possible

Submittals will be returned with one of the following notations:

- a. Submittals marked "not reviewed" will indicate submittal has been

previously reviewed and approved, is not required, does not have evidence of being reviewed and approved by contractor, or is not complete. A submittal marked "not reviewed" will be returned with an explanation of the reason it is not reviewed. Resubmit submittals returned for lack of review by contractor or for being incomplete, with appropriate action, coordination, or change.

- b. Submittals marked "approved" "approved as submitted" authorize contractor to proceed with work covered.
- c. Submittals marked "approved as noted" authorize contractor to proceed with work as noted provided contractor takes no exception to the notations.
- d. Submittals marked "revise and resubmit" or "disapproved" indicate submittal is incomplete or does not comply with design concept or requirements of the contract documents and shall be resubmitted with appropriate changes. No work shall proceed for this item until resubmittal is approved.

1.6 FORMAT OF SUBMITTALS

1.6.1 Complete Submittal Package

Contractor shall make electronic copies of all submittals, including the approved transmittal sheets, and provide two (2) CD/DVD's containing all submittals for the project.

The CD/DVD's shall be marked "Complete Submittal Package - Contract # _____"

1.6.2 Transmittal Form

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

1.6.3 Identifying Submittals

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

- a. Project title and location.
- b. Construction contract number.
- c. Section number of the specification section by which submittal is required.
- d. Submittal description (SD) number of each component of submittal.
- e. When a resubmission, alphabetic suffix on submittal description, for example, SD-10A, to indicate resubmission.

- f. Name, address, and telephone number of subcontractor, supplier, manufacturer and any other second tier contractor associated with submittal.
- g. Product identification and location in project.

1.6.4 Format for Product Data

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

1.6.5 Format for Shop Drawings

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

1.6.6 Format of Samples

- a. Furnish samples in sizes below, unless otherwise specified or unless the manufacturer has prepackaged samples of approximately same size as specified:
 - (1) Sample of Equipment or Device: Full size.
 - (2) Sample of Materials Less Than 2 by 3 inches: Built up to 8 1/2 by 11 inches.
 - (3) Sample of Materials Exceeding 8 1/2 by 11 inches: Cut down to 8 1/2 by 11 inches and adequate to indicate color, texture, and material variations.
 - (4) Sample of Linear Devices or Materials: 10 inch length or length to be supplied, if less than 10 inches. Examples of linear devices or materials are conduit and handrails.

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

1.6.7 Format of Administrative Submittals

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

1.7 QUANTITY OF SUBMITTALS

1.7.1 Number of Copies of Product Data

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

1.7.2 Number of Copies of Shop Drawings

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

1.7.3 Number of Samples

- a. Submit two samples, or two sets of samples showing range of variation, of each required item. One approved sample or set of samples will be retained by approving authority and one will be returned to contractor.
- b. Submit one sample panel. Include components listed in technical

section or as directed.

- c. Submit one sample installation, where directed.
- d. Submit one sample of non-solid materials.

1.7.4 Number of Copies of Administrative Submittals

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

1.8 FORWARDING SUBMITTALS

1.8.1 Samples and Submittals

Except as otherwise noted, submit samples and submittals to:

ROICC/OICC
Jacksonville, North Carolina Area
1005 Michael Road
Camp Lejeune, NC 28542-2521

--OR--

Architect-Engineer Firm
Full Address

1.8.1.1 Administrative Submittals

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

1.8.1.2 Fire Protection and Fire Alarm System Submittals

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

1.8.1.3 TAB Submittals

Submit to ROICC/OICC for all projects.

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

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

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

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						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		MAILED TO CONTR/ DATE RCD FRM APPR AUTH
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01 14 00	SD-01 Preconstruction Submittals														
			List of Contact Personnel	1.3.1.1													
		01 20 00	SD-01 Preconstruction Submittals														
			Schedule of Prices	1.3	G												
		01 30 00	SD-01 Preconstruction Submittals														
			View Location Map	1.3													
			Progress and Completion	1.4													
			Pictures														
		01 31 23.13 20	SD-01 Preconstruction Submittals														
			List of Contractor's Personnel	1.4.2	G												
		01 31 50	SD-11 Closeout Submittals														
			Interim DD-1354, Transfer & Acceptance of Military Real Property	1.2													
		01 32 16.00 20	SD-01 Preconstruction Submittals														
			Baseline Construction Schedule	1.2	G												
			SD-07 Certificates														
			Monthly Updates	1.4													
		01 33 00	SD-11 Closeout Submittals														
			Submittal register	1.4.1													
			Complete Submittal Package	1.6.1													
		01 35 26	SD-01 Preconstruction Submittals														
			APP - Construction	1.8.1	G												
			Dive Operations Plan	1.17	G												
			Accident Prevention Plan (APP)	1.8	G												
			SD-06 Test Reports														

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						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE			DATE OF ACTION
		01 35 26	Monthly Exposure Reports	1.4													
			Notifications and Reports	1.13													
			Accident Reports	1.13.2	G												
			LHE Inspection Reports	1.13.3													
			SD-07 Certificates														
			Contractor Safety Self-Evaluation Checklist	1.5													
			Crane Operators/Riggers	1.7.1.5													
			Standard Lift Plan	1.8.3.2	G												
			Critical Lift Plan	1.8.3.3	G												
			Naval Architecture Analysis	1.8.3.4	G												
			Activity Hazard Analysis (AHA)	1.9													
			Confined Space Entry Permit	1.10.1													
			Hot Work Permit	1.10.1													
			Certificate of Compliance	1.13.4													
			Third Party Certification of Floating Cranes and Barge-Mounted Mobile Cranes	1.13.5													
			License Certificates	1.15													
			Radiography Operation Planning Work Sheet	1.15.1	G												
			Portable Gauge Operations Planning Worksheet	1.15.1	G												
		01 35 29.13	SD-02 Shop Drawings														
			Work Zones	3.9.1	G												
			Decontamination Facilities	3.10.1	G												

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						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/	DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER			ACTION CODE	DATE OF ACTION
		01 35 29.13	SD-03 Product Data															
			Amendments to the APP/SSHP	1.4	G													
			Exposure Monitoring/Air	3.5														
			Sampling Program															
			Site Control Log	3.9.2														
			SSHO's Daily Inspection Logs	1.8														
			SD-07 Certificates															
			Certificate Of Worker/Visitor	1.7														
			Acknowledgement															
			SD-11 Closeout Submittals															
			Safety And Health Phase-Out	1.9	G													
			Report															
		01 45 10	SD-11 Closeout Submittals															
			QC PLAN	1.6														
		01 50 00	SD-01 Preconstruction Submittals															
			Traffic Control Plan	3.4.1														
			SD-03 Product Data															
			Backflow Preventers	1.3														
			SD-06 Test Reports															
			Backflow Preventer Tests	3.5														
			SD-07 Certificates															
			Backflow Tester	1.3.1														
			Backflow Preventers	1.3														
		01 57 19	SD-01 Preconstruction Submittals															
			Environmental Protection Plan	1.6.1														
			SD-06 Test Reports															

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						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE			DATE OF ACTION	
																		(g)
		01 57 19	Abrasive blasting	3.7.1														
			SD-11 Closeout Submittals															
			Solid waste disposal permit	1.4.1														
			Disposal permit for hazardous waste	1.4.2														
			Environmental training documentation	1.2														
			Permit to transport hazardous waste	1.4.3														
			Hazardous waste certification	1.4.4														
			Environmental Plan Review	1.6.3														
			Annual Report of Products Containing Recovered Materials	2.1														
		01 78 00	SD-03 Product Data															
			Warranty Management Plan	1.6.1														
			Warranty Tags	1.6.4														
			Final Cleaning	3.4														
			Spare Parts Data	1.5														
			SD-08 Manufacturer's Instructions															
			Instructions	1.6.1														
			SD-10 Operation and Maintenance Data															
			Operation and Maintenance Manuals	3.3	G													
			SD-11 Closeout Submittals															
			As-Built Drawings	3.1	G													

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						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/	DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER			ACTION CODE	DATE OF ACTION
		01 78 00	Record Drawings	3.2	G													
			As-Built Record of Equipment and Materials	1.6.1														
			Final Approved Shop Drawings	3.6														
			Construction Contract Specifications															
			Certification of EPA Designated Items	2.1	G													
			Certification Of USDA Designated Items	2.2	G													
			Interim DD FORM 1354	3.5	G													
			Checklist for DD FORM 1354	3.5	G													
		01 78 23	SD-10 Operation and Maintenance Data															
			O&M Database		G													
			Training Plan	3.1.1	G													
			Training Outline	3.1.3	G													
			Training Content	3.1.2	G													
			SD-11 Closeout Submittals															
			Training Video Recording	3.1.4	G													
			Validation of Training Completion	3.1.6	G													
		01 78 24.00 20	SD-11 Closeout Submittals															
			eOMSI, Progress Submittal	1.4.1	G													
			eOMSI, Prefinal Submittal	1.4.2	G													
			eOMSI, Final Submittal	1.4.3	G													
		01 78 30.00 22	SD-11 Closeout Submittals															

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																		(g)
		01 78 30.00 22	GIS Data Deliverables	1.3.9	G													
		02 82 16	SD-06 Test Reports															
			Air sampling results	1.5.2														
			Pressure differential recordings for local exhaust system	1.5.3														
			Clearance sampling	3.3.3.2														
			SD-07 Certificates															
			Asbestos hazard abatement plan	1.5.1														
			SD-11 Closeout Submittals															
			Asbestos Waste Shipment Record N.C. (DHHS-HHCU) Form 3787	1.5.4														
			Daily log	1.5.5														
			North Carolina permit	1.5.6														
			Modifications to the North Carolina permit	1.5.7														
			Asbestos Inspection Reporting Form	1.5.8														
		03 30 00	SD-01 Preconstruction Submittals															
			Concrete Curing Plan	1.6.3.1														
			Quality Control Plan	1.6.6	G													
			Quality Control Personnel Certifications	1.6.7	G													
			Quality Control Organizational Chart	1.6.7														
			Laboratory Accreditation	1.6.9	G													

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						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/	DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER			ACTION CODE	DATE OF ACTION
		03 30 00	Maturity Method Data															
			SD-02 Shop Drawings															
			Complete colored concrete flooring system															
			SD-03 Product Data															
			Joint Sealants	2.2.5														
			Concrete bonding agent; G															
			Cementitious Materials	2.1.1														
			Vapor Barrier; G															
			Concrete Curing Materials; G															
			Liquid Chemical Floor Hardeners and Sealers; G															
			Admixtures; G															
			Reinforcing Fibers; G															
			Pumping Concrete	1.6.3.2														
			Finishing Plan; G															
			Nonshrink Grout; G															
			SD-04 Samples															
			Slab Finish Sample, G															
			Surface Finish Samples; G															
			SD-05 Design Data															
			Concrete Mix Design	1.6.1.1	G													
			SD-06 Test Reports															
			Concrete Mix Design	1.6.1.1	G													
			Slag Cement	1.6.4.2														
			Aggregates	1.6.4.3														

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						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		MAILED TO CONTR/ DATE RCD FRM APPR AUTH	
																		(g)
		03 30 00	Fiber-Reinforced Concrete	1.6.4.4	G													
			Compressive Strength Tests		G													
			Unit Weight of Structural Concrete															
			Chloride Ion Concentration															
			Air Content															
			Slump Tests	3.9.2.1														
			Water	2.1.2														
			SD-07 Certificates															
			VOC Content for Form Release Agents, Curing Compounds, and Concrete Penetrating Sealers	1.6.3.5														
			Safety Data Sheets	1.6.3.6														
			Field Testing Technician and Testing Agency	1.6.7.2														
			SD-08 Manufacturer's Instructions															
			Liquid Chemical Floor Hardeners and Sealers															
			Joint Sealants	2.2.5														
			Curing Compound	2.2.1														
		07 22 00	SD-02 Shop Drawings															
			Insulation Board Layout	1.3	G													
			Verification of Existing Conditions	1.3	G													
			SD-03 Product Data															
			Insulation	2.1	G													
			Cover Board	1.4	G													

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						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/	DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER			ACTION CODE	DATE OF ACTION
		07 22 00	Fasteners	2.5	G													
			Sheathing Paper	2.3	G													
			Moisture Control	2.4	G													
			Asphalt	1.10.1	G													
			Recycled Content For Insulation	2.1.2														
			SD-06 Test Reports															
			Flame Spread Rating	1.8.1	G													
			SD-07 Certificates															
			Installer Qualifications	1.6	G													
			Certificates Of Compliance For Felt Materials	1.6	G													
			Indoor Air Quality For Insulation	2.1.3														
			SD-08 Manufacturer's Instructions															
			Fasteners	2.5	G													
			Insulation	2.1	G													
		07 27 10.00 10	SD-02 Shop Drawings															
			Air Barrier System Shop Drawings	2.1	G													
			SD-03 Product Data															
			Air Barrier System Product Data	2.1	G													
			SD-04 Samples															
			Mock-Up	3.1.2	G													
			Material Samples For Air Barrier System	2.1	G													
			SD-05 Design Data															

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		07 27 10.00 10	Design Data And Calculations For The Air Barrier System	1.8	G														
			SD-06 Test Reports																
			Design Review Report	1.8	G														
			Testing and Inspection	3.1.3	G														
			SD-07 Certificates																
			Air Barrier Inspector	1.7	G														
		07 27 19.01	SD-01 Preconstruction Submittals																
			Qualifications of Manufacturer	1.7.1	G														
			Qualifications of Installer	1.7.2	G														
			SD-02 Shop Drawings																
			Self-adhering Air Barrier	1.4	G														
			SD-03 Product Data																
			Self-adhering Air Barrier	1.4	G														
			Primers, Adhesives, and Mastics	2.2	G														
			Safety Data Sheets	1.4.2	G														
			SD-04 Samples																
			Self-adhering Air Barrier	1.4	G														
			SD-06 Test Reports																
			Field Peel Adhesion Test	1.6	G														
			Flame Propagation of Wall Assemblies	1.4.4	G														
			Flame Spread and Smoke Developed Index Ratings	1.4.4	G														
			Site Inspections and Testing		G														
			SD-07 Certificates																

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						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE			DATE OF ACTION
		07 27 19.01	Self-adhering Air Barrier	1.4	G												
			SD-08 Manufacturer's Instructions														
			Self-adhering Air Barrier	1.4	G												
			Primers, Adhesives, and Mastics	2.2	G												
		07 27 36	SD-01 Preconstruction Submittals														
			Qualification of Manufacturer	1.10.1	G												
			Qualification of Installer	1.10.2	G												
			Quality Control Plan	1.11	G												
			Safety Plan	1.11	G												
			Fire Prevention Plan	1.9.1	G												
			Respirator Plan	1.9.2	G												
			SD-02 Shop Drawings														
			Spray Foam Air Barrier	1.5													
			Foam Air Barrier System	1.11	G												
			Fire-Rated Assemblies	1.5.1	G												
			SD-03 Product Data														
			Closed Cell	2.1.2	G												
			Transition Membrane	2.2	G												
			Primers, Adhesives, and Mastics	2.3	G												
			Sealants	2.5	G												
			Safety Data Sheets	1.5.2	G												
			Thermal Barrier Materials	2.1.1	G												
			Ignition Barrier Coatings		G												
			Accessories		G												
			SD-04 Samples														
			Spray Foam Air Barrier	1.5	G												

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						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE			DATE OF ACTION
		07 27 36	SD-06 Test Reports														
			Site Inspections	3.4.1	G												
			SD-07 Certificates														
			Closed cell	2.1.2	G												
			Transition Membrane	2.2	G												
			Indoor Air Quality for Spray Foam Air Barrier	2.1.5	G												
			SD-08 Manufacturer's Instructions														
			SPF Handling, Storage, and Spray Procedures	1.6.1	G												
			Substrate Preparation	3.2.1	G												
			Thermal Barrier	1.5.1	G												
			Ignition Barrier		G												
			Transition Membrane	2.2	G												
			Primers, Adhesives, and Mastics	2.3	G												
			SD-09 Manufacturer's Field Reports														
			Core Samples	1.11													
			Daily Work Record	3.3.3													
		07 60 00	SD-02 Shop Drawings														
			Exposed Sheet Metal	2.2.1	G												
			Gutters	3.1.15	G												
			Downspouts	3.1.16	G												
			Expansion Joints	3.1.22	G												
			Gravel Stops and fascia	2.2.1	G												
			Splash Pans	3.1.19	G												

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						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/	DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER			ACTION CODE	DATE OF ACTION
		07 60 00	Flashing for Roof Drains	3.1.17	G													
			Base Flashing	3.1.9	G													
			Counterflashing	3.1.10	G													
			Flashing at Roof Penetrations and Equipment Supports	3.1.23	G													
			Reglets	2.2.10	G													
			Scuppers		G													
			Copings		G													
			Drip Edges	3.1.14	G													
			Conductor Heads	3.1.18	G													
			Open Valley Flashing		G													
			Eave Flashing	3.1.20	G													
			SD-04 Samples															
			Finish Samples for color selection		G													
			SD-08 Manufacturer's Instructions															
			Instructions for Installation	1.4.3	G													
			Quality Control Plan	3.5	G													
			SD-10 Operation and Maintenance Data															
			Cleaning and Maintenance	1.4.3	G													
		07 61 15.00 20	SD-02 Shop Drawings															
			Roofing Panels	2.1	G													
			Gutter/Downspout System		G													
			SD-03 Product Data															
			Roofing Panels	2.1	G													
			Attachment Clips	2.2	G													

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						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/	DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER			ACTION CODE	DATE OF ACTION
		07 61 15.00 20	Closures	2.3.1														
			Accessories	2.3														
			Underlayment	2.4														
			Fasteners	2.3.2														
			Sealant Tape	2.3.4														
			Gaskets															
			Sealant	2.3.3														
			Sealing Compounds															
			Warranty	1.8	G													
			SD-04 Samples															
			Roofing panels	2.1														
			Accessories	2.3														
			SD-05 Design Data															
			Load calculations	1.5	G													
			SD-06 Test Reports															
			Structural performance		G													
			Panel Finish (Color)		G													
			Leakage Test Report															
			Wind Uplift Test Report															
			Factory Finish And Color															
			Performance Requirements															
			Manufacturer's field inspection	3.5	G													
			SD-07 Certificates															
			Technical representative	1.6.2														
			Qualification of Installer	1.6.3														
			Coil stock	2.1.1.5														

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						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE			DATE OF ACTION	
																		(g)
		07 61 15.00 20	SD-08 Manufacturer's Instructions															
			Sealant	2.3.3														
			Installation	3.3														
			SD-11 Closeout Submittals															
			Information card	3.7														
		07 92 00	SD-03 Product Data															
			Sealants	2.1	G													
			Primers	2.2	G													
			Bond Breakers	2.3	G													
			Backstops	2.4	G													
			Field Adhesion	3.1	G													
			SD-07 Certificates															
			Indoor Air Quality For Interior Sealants	2.1.1	S													
			Indoor Air Quality For Interior Floor Joint Sealants		S													
			Indoor Air Quality For Interior Acoustical Sealants		S													
			Indoor Air Quality For Interior Caulking	2.5	S													
		08 11 13	SD-02 Shop Drawings															
			Doors	2.1	G													
			Doors	2.1	G													
			Frames and Flashing		G													
			Accessories															
			Frames	2.4	G													

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						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE			DATE OF ACTION
		08 11 13	SD-03 Product Data														
			Doors	2.1	G												
			Frames	2.4	G												
			Accessories														
		08 51 13	SD-02 Shop Drawings														
			Windows	2.1	G												
			Fabrication Drawings	1.6													
			SD-03 Product Data														
			Windows	2.1	G												
			Hardware	2.2.6.1	G												
			Fasteners	2.2.2	G												
			Window Performance	1.7	G												
			Thermal-Barrier Windows	2.3	G												
			Mullions	2.4	G												
			Screens		G												
			Weatherstripping	2.1.4	G												
			Accessories	2.2.6	G												
			Adhesives	2.2.3													
			Thermal Performance	1.7.4	G												
			SD-04 Samples														
			Finish Sample for color selection														
			Mock-Ups including Flashing		G												
			SD-05 Design Data														
			Structural Calculations for	2.1	G												
			Deflection														
			Design Analysis		G												

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						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/	DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER			ACTION CODE	DATE OF ACTION
		08 51 13	SD-06 Test Reports															
			Minimum Condensation Resistance Factor	1.3.4														
			Standard Airblast Test		G													
			Windborne-Debris-Impact Performance	1.7.6														
			SD-10 Operation and Maintenance Data															
			Windows	2.1	G													
		08 71 00	SD-02 Shop Drawings															
			Manufacturer's Detail Drawings	1.3	G													
			Verification of Existing Conditions	1.3	G													
			Hardware Schedule	1.5	G													
			Keying System	2.3.4	G													
			SD-03 Product Data															
			Hardware Items	2.3	G													
			SD-08 Manufacturer's Instructions															
			Installation	3.1														
			SD-10 Operation and Maintenance Data															
			Hardware Schedule	1.5	G													
			SD-11 Closeout Submittals															
			Key Bitting	1.6.1														
		08 81 00	SD-03 Product Data															
			Insulating Glass	2.3														
			Glazing Accessories	1.3														

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						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/	DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER			ACTION CODE	DATE OF ACTION
		08 81 00	Sealants	2.4.3.1														
			Joint Backer	2.4.4														
			SD-04 Samples															
			Insulating Glass	2.3														
			Glazing Compound	2.4.2														
			Tape	2.4.6														
			Sealing Tapes	2.4.6														
			SD-07 Certificates															
			Insulating Glass	2.3														
			SD-08 Manufacturer's Instructions															
			Setting and Sealing Materials	2.4														
			Glass Setting	3.2														
			SD-11 Closeout Submittals															
			Insulated Glass Units	1.7.1														
		09 30 10	SD-02 Shop Drawings															
			Detail Drawings	3.2	G													
			SD-03 Product Data															
			Porcelain Tile	2.1.1	G													
			Gauged Porcelain Tile		G													
			Quarry Tile		G													
			Mosaic Tile		G													
			Large Format Glass Tile		G													
			Glazed Ceramic Wall Tile		G													
			Transition Strips	2.1	G													
			Metal Strips	2.5.1	G													
			Setting-Bed	2.2	G													

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																		(g)
		09 30 10	Mortar, Grout, and Adhesive	2.4	G													
			Reinforcing Wire Fabric	2.2.6														
			Waterproof Membrane	2.6	G													
			Crack Isolation Membrane		G													
			SD-04 Samples															
			Tile	2.1	G													
			Accessories	2.1	G													
			Transition Strips	2.1	G													
			Metal Strips	2.5.1	G													
			Grout	2.4.4	G													
			SD-08 Manufacturer's Instructions															
			Manufacturer's Approved	3.8														
			Cleaning Instructions															
			SD-10 Operation and Maintenance															
			Data															
			Gauged Porcelain Tile		G													
			Porcelain Tile	2.1.1	G													
			Quarry Tile		G													
			Mosaic Tile		G													
			Large Format Glass Tile		G													
			Glazed Ceramic Wall Tile		G													
			Transition Strips	2.1	G													
			Metal Strips	2.5.1	G													
		09 67 23.13	SD-03 Product Data															
			Manufacturer's Catalog Data	1.2.1														
			SD-04 Samples															

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																		(g)
		09 67 23.13	Hardboard Mounted	1.5.2														
			SD-05 Design Data															
			Design Mix Data	1.2.2														
			SD-07 Certificates															
			Listing of Product Installations	1.5.1														
			Referenced Standards	1.5														
			Certificates															
			SD-11 Closeout Submittals															
			Warranty	1.6														
		09 90 00	SD-02 Shop Drawings															
			Piping Identification															
			SD-03 Product Data															
			Coating	2.1	G													
			Product Data Sheets	2.1														
			Sealant	3.2.5														
			SD-04 Samples															
			Color	2.2	G													
			SD-07 Certificates															
			Indoor Air Quality for Paints and Primers	1.5.3														
			Indoor Air Quality for Consolidated Latex Paints															
			SD-08 Manufacturer's Instructions															
			Application Instructions	3.3.1														
			Mixing	2.1														

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		09 90 00	Manufacturer's Safety Data Sheets	1.7.1														
			SD-10 Operation and Maintenance Data															
			Coatings	2.1	G													
		10 28 13	SD-02 Shop Drawings															
			Product Schedule	2.1	G													
			SD-03 Product Data															
			Item A4995	2.1.3	G													
			Item A5030	2.1.4	G													
			Item A50001A	2.1.5	G													
			Item A5080	2.1.6	G													
			Item A5082	2.1.8	G													
			Item A5109	2.1.9	G													
			Item A5110	2.1.10	G													
			Item A5140	2.1.11	G													
			Item A5170	2.1.12	G													
			Item A5200	2.1.13	G													
			Item A5205	2.1.14	G													
			SD-07 Certificates															
			Baby Changing Stations	1.3.1														
		22 00 00	SD-02 Shop Drawings															
			Plumbing System	3.9.1	G													
			SD-03 Product Data															
			Fixtures	2.4														
			Drinking-water coolers		G													

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		22 00 00	Water heaters; G															
			Backflow prevention assemblies	2.5	G													
			Backflow prevention assemblies	3.9.1.1	G													
			Shower Faucets; G															
			Automatic Controls	2.4.1	G													
			Laundry Sink/Utility Tub	2.4.5	G													
			Outdoor Service Sink	2.4.6	G													
			Countertop Lavatories	2.4.4	G													
			Flush Valve Urinals	2.4.3	G													
			Flush Valve Water Closets	2.4.2	G													
			Outdoor Drinking Fountain	2.4.7	G													
			Yard Hydrant	2.3.3	G													
			Floor And Shower Drains	2.6.1	G													
			Backflow Device Enclosure	2.5.1	G													
			SD-06 Test Reports															
			Tests, Flushing and Disinfection	3.9														
			Test of Backflow Prevention Assemblies	3.9.1.1	G													
			SD-07 Certificates															
			Materials and Equipment	1.3														
			Bolts	2.1.1														
			SD-10 Operation and Maintenance Data															
			Plumbing System	3.9.1	G													
			Outdoor Drinking Fountain	2.4.7														
		23 05 93	SD-01 Preconstruction Submittals															

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						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/	DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER			ACTION CODE	DATE OF ACTION
		23 05 93	Records Of Existing Conditions	1.3														
			Records Of Existing Conditions	1.3.2														
			Independent TAB Agency and Personnel Qualifications	1.5.1														
			TAB Design Review Report															
			Pre-Field TAB Engineering Report															
			DALT and TAB Work Execution Schedule															
			SD-02 Shop Drawings															
			TAB Schematic Drawings and Report Forms	1.3.2														
			SD-03 Product Data															
			Equipment and Performance Data	1.3														
			Tab Verification	1.5.2.3														
			SD-06 Test Reports															
			Pre-Final TAB Report for Proportional Balancing															
			Final TAB Report for Proportional Balancing;G															
			Advance Notice Of Final Dalt Field Work															
			SD-07 Certificates															
			Independent TAB agency and personnel qualifications	1.5.1														

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		23 07 00	SD-03 Product Data														
			Piping insulation	2.1													
			Piping insulation finishes	2.1.10													
			Heating, ventilating, and air conditioning systems insulation	2.2													
			Duct insulation finishes	2.2.6													
			Accessory materials	2.5													
			Adhesives, sealants, and coating compounds	2.4													
		23 73 33	SD-02 Shop Drawings														
			Temperature control systems	1.3.1													
			SD-03 Product Data														
			Exhaust fans	2.1.2													
			Dampers	2.3.3													
			Diffusers, registers, and grilles	2.3.4													
			Cove Unit Heater	2.1.1	G												
			SD-10 Operation and Maintenance Data														
			Exhaust fans	2.1.2													
			Cove Unit Heater	2.1.1													
		26 20 00	SD-06 Test Reports														
			600-volt Wiring Test	3.4.2													
			Grounding System Test	3.4.4													
			Ground-fault Receptacle Test	3.4.3													
			SD-09 Manufacturer's Field Reports														

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CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS		
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/	DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER			ACTION CODE	DATE OF ACTION
		26 20 00	Transformer Factory Tests															
		26 51 00	SD-03 Product Data															
			Luminaires	2.2														
			Luminaire Warranty	1.5.1														
			Switches															
			Occupancy/Vacancy Sensors															
			Photosensors															
			SD-06 Test Reports															
			ANSI/IES LM-79 Test Report	1.4.3														
			ANSI/IES LM-80 Test Report	1.4.4														
			ANSI/IES TM-21 Test Report	1.4.5														
			ANSI/IES TM-30 Test Report	1.4.6														
			Occupancy/Vacancy Sensor	3.2.1.1														
			Verification Test															
			Photosensor Verification Test	3.2.1.1														
			SD-10 Operation and Maintenance															
			Data															
			Lighting System															
		33 71 01	SD-03 Product Data															
			Conductors															
			SD-06 Test Reports															
			Field Test Plan															
			Field Quality Control	3.2														

SECTION 01 35 26

GOVERNMENTAL SAFETY REQUIREMENTS
11/20, CHG 3: 02/22

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 MECHANICAL ENGINEERS (ASME)

ASME B30.3	(2020) Tower Cranes
ASME B30.5	(2021) Mobile and Locomotive Cranes
ASME B30.7	(2021) Winches
ASME B30.8	(2020) Floating Cranes and Floating Derricks
ASME B30.9	(2018) Slings
ASME B30.20	(2018) Below-the-Hook Lifting Devices
ASME B30.22	(2016) Articulating Boom Cranes
ASME B30.23	(2016) Personnel Lifting Systems Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings
ASME B30.26	(2015; R 2020) Rigging Hardware

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP A10.22	(2007; R 2017) Safety Requirements for Rope-Guided and Non-Guided Workers' Hoists
ASSP A10.34	(2021) Protection of the Public on or Adjacent to Construction Sites
ASSP A10.44	(2020) Control of Energy Sources (Lockout/Tagout) for Construction and Demolition Operations
ASSP Z244.1	(2016) The Control of Hazardous Energy Lockout, Tagout and Alternative Methods
ASSP Z359.0	(2018) Definitions and Nomenclature Used for Fall Protection and Fall Arrest
ASSP Z359.1	(2020) The Fall Protection Code
ASSP Z359.2	(2017) Minimum Requirements for a Comprehensive Managed Fall Protection

Program

- ASSP Z359.3 (2019) Safety Requirements for Lanyards and Positioning Lanyards
- ASSP Z359.4 (2013) Safety Requirements for Assisted-Rescue and Self-Rescue Systems, Subsystems and Components
- ASSP Z359.6 (2016) Specifications and Design Requirements for Active Fall Protection Systems
- ASSP Z359.7 (2019) Qualification and Verification Testing of Fall Protection Products
- ASSP Z359.11 (2014) Safety Requirements for Full Body Harnesses
- ASSP Z359.12 (2019) Connecting Components for Personal Fall Arrest Systems
- ASSP Z359.13 (2013) Personal Energy Absorbers and Energy Absorbing Lanyards
- ASSP Z359.14 (2014) Safety Requirements for Self-Retracting Devices for Personal Fall Arrest and Rescue Systems
- ASSP Z359.15 (2014) Safety Requirements for Single Anchor Lifelines and Fall Arresters for Personal Fall Arrest Systems
- ASSP Z359.16 (2016) Safety Requirements for Climbing Ladder Fall Arrest Systems
- ASSP Z359.18 (2017) Safety Requirements for Anchorage Connectors for Active Fall Protection Systems

ASTM INTERNATIONAL (ASTM)

- ASTM F855 (2019) Standard Specifications for Temporary Protective Grounds to Be Used on De-energized Electric Power Lines and Equipment

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

- IEEE 1048 (2016) Guide for Protective Grounding of Power Lines
- IEEE C2 (2017; Errata 1-2 2017; INT 1 2017) National Electrical Safety Code

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- NEMA Z535.2 (2011; R 2017) Environmental and Facility Safety Signs

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 10 (2022) Standard for Portable Fire Extinguishers
- NFPA 51B (2019; TIA 20-1) Standard for Fire Prevention During Welding, Cutting, and Other Hot Work
- NFPA 70 (2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code
- NFPA 70E (2021) Standard for Electrical Safety in the Workplace
- NFPA 241 (2022) Standard for Safeguarding Construction, Alteration, and Demolition Operations

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

- TIA-222 (2018H; Add 1 2019) Structural Standard for Antenna Supporting Structures and Antennas and Small Wind Turbine Support Structures
- TIA-1019 (2012; R 2016) Standard for Installation, Alteration and Maintenance of Antenna Supporting Structures and Antennas

U.S. ARMY CORPS OF ENGINEERS (USACE)

- EM 385-1-1 (2014) Safety -- Safety and Health Requirements Manual

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

- 10 CFR 20 Standards for Protection Against Radiation
- 29 CFR 1910 Occupational Safety and Health Standards
- 29 CFR 1910.146 Permit-required Confined Spaces
- 29 CFR 1910.147 The Control of Hazardous Energy (Lock Out/Tag Out)
- 29 CFR 1910.333 Selection and Use of Work Practices
- 29 CFR 1915 Confined and Enclosed Spaces and Other Dangerous Atmospheres in Shipyard Employment
- 29 CFR 1915.89 Control of Hazardous Energy (Lockout/Tags-Plus)
- 29 CFR 1919 Gear Certification

29 CFR 1926	Safety and Health Regulations for Construction
29 CFR 1926.16	Rules of Construction
29 CFR 1926.450	Scaffolds
29 CFR 1926.500	Fall Protection
29 CFR 1926.552	Material Hoists, Personal Hoists, and Elevators
29 CFR 1926.553	Base-Mounted Drum Hoists
29 CFR 1926.1400	Cranes and Derricks in Construction
49 CFR 173	Shippers - General Requirements for Shipments and Packagings
CPL 02-01-056	(2014) Inspection Procedures for Accessing Communication Towers by Hoist
CPL 2.100	(1995) Application of the Permit-Required Confined Spaces (PRCS) Standards, 29 CFR 1910.146

1.2 DEFINITIONS

1.2.1 Competent Person (CP)

The CP is a person designated in writing, who, through training, knowledge and experience, is capable of identifying, evaluating, and addressing existing and predictable hazards in the working environment or working conditions that are dangerous to personnel, and who has authorization to take prompt corrective measures with regards to such hazards.

1.2.2 Competent Person, Confined Space

The CP, Confined Space, is a person meeting the competent person requirements as defined EM 385-1-1 Appendix Q, with thorough knowledge of OSHA's Confined Space Standard, 29 CFR 1910.146, and designated in writing to be responsible for the immediate supervision, implementation and monitoring of the confined space program, who through training, knowledge and experience in confined space entry is capable of identifying, evaluating and addressing existing and potential confined space hazards and, who has the authority to take prompt corrective measures with regard to such hazards.

1.2.3 Competent Person, Cranes and Rigging

The CP, Cranes and Rigging, as defined in EM 385-1-1 Appendix Q, is a person meeting the competent person requirements, who has been designated in writing to be responsible for the immediate supervision, implementation and monitoring of the Crane and Rigging Program, who through training, knowledge and experience in crane and rigging is capable of identifying, evaluating and addressing existing and potential hazards and, who has the authority to take prompt corrective measures with regard to such hazards.

1.2.4 Competent Person, Excavation/Trenching

A CP, Excavation/Trenching, is a person meeting the competent person requirements as defined in EM 385-1-1 Appendix Q and 29 CFR 1926, who has been designated in writing to be responsible for the immediate supervision, implementation and monitoring of the excavation/trenching program, who through training, knowledge and experience in excavation/trenching is capable of identifying, evaluating and addressing existing and potential hazards and, who has the authority to take prompt corrective measures with regard to such hazards.

1.2.5 Competent Person, Fall Protection

The CP, Fall Protection, is a person meeting the competent person requirements as defined in EM 385-1-1 Appendix Q and in accordance with ASSP Z359.0, who has been designated in writing by the employer to be responsible for immediate supervising, implementing and monitoring of the fall protection program, who through training, knowledge and experience in fall protection and rescue systems and equipment, is capable of identifying, evaluating and addressing existing and potential fall hazards and, who has the authority to take prompt corrective measures with regard to such hazards.

1.2.6 Competent Person, Scaffolding

The CP, Scaffolding is a person meeting the competent person requirements in EM 385-1-1 Appendix Q, and designated in writing by the employer to be responsible for immediate supervising, implementing and monitoring of the scaffolding program. The CP for Scaffolding has enough training, knowledge and experience in scaffolding to correctly identify, evaluate and address existing and potential hazards and also has the authority to take prompt corrective measures with regard to these hazards. CP qualifications must be documented including experience on the specific scaffolding systems/types being used, assessment of the base material that the scaffold will be erected upon, load calculations for materials and personnel, and erection and dismantling. The CP for scaffolding must have a documented minimum of 8-hours of scaffold training to include training on the specific type of scaffold being used (e.g. mast-climbing, adjustable, tubular frame), in accordance with EM 385-1-1 Section 22.B.02.

1.2.7 Competent Person (CP) Trainer

A competent person trainer as defined in EM 385-1-1 Appendix Q, who is qualified in the training material presented, and who possesses a working knowledge of applicable technical regulations, standards, equipment and systems related to the subject matter on which they are training Competent Persons. A competent person trainer must be familiar with the typical hazards and the equipment used in the industry they are instructing. The training provided by the competent person trainer must be appropriate to that specific industry. The competent person trainer must evaluate the knowledge and skills of the competent persons as part of the training process.

1.2.8 High Risk Activities

High Risk Activities are activities that involve work at heights, crane and rigging, excavations and trenching, scaffolding, electrical work, and confined space entry.

1.2.9 High Visibility Accident

A High Visibility Accident is any mishap which may generate publicity or high visibility.

1.2.10 Load Handling Equipment (LHE)

LHE is a term used to describe cranes, hoists and all other hoisting equipment (hoisting equipment means equipment, including crane, derricks, hoists and power operated equipment used with rigging to raise, lower or horizontally move a load).

1.2.11 Medical Treatment

Medical Treatment is 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 when provided by a physician or registered personnel.

1.2.12 Near Miss

A Near Miss is a mishap resulting in no personal injury and zero property damage, but given a shift in time or position, damage or injury may have occurred (e.g., a worker falls off a scaffold and is not injured; a crane swings around to move the load and narrowly misses a parked vehicle).

1.2.13 Operating Envelope

The Operating Envelope is the area surrounding any crane or load handling equipment. Inside this "envelope" is the crane, the operator, riggers and crane walkers, other personnel involved in the operation, rigging gear between the hook, the load, the crane's supporting structure (i.e. ground or rail), the load's rigging path, the lift and rigging procedure.

1.2.14 Qualified Person (QP)

The QP is a person designated in writing, who, by possession of a recognized degree, certificate, or professional standing, or extensive knowledge, training, and experience, has successfully demonstrated their ability to solve or resolve problems related to the subject matter, the work, or the project.

1.2.15 Qualified Person, Fall Protection (QP for FP)

A QP for FP is a person meeting the definition requirements of EM 385-1-1 Appendix Q, and ASSP Z359.2 standard, having a recognized degree or professional certificate and with extensive knowledge, training and experience in the fall protection and rescue field who is capable of designing, analyzing, and evaluating and specifying fall protection and rescue systems.

1.2.16 Recordable Injuries or Illnesses

Recordable Injuries or Illnesses are any work-related injury or illness that results in:

- a. Death, regardless of the time between the injury and death, or the length of the illness;

- b. Days away from work (any time lost after day of injury/illness onset);
- c. Restricted work;
- d. Transfer to another job;
- e. Medical treatment beyond first aid;
- f. Loss of consciousness; or
- g. A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (a) through (f) above

1.2.17 Government Property and Equipment

Interpret "USACE" property and equipment specified in USACE EM 385-1-1 as Government property and equipment.

1.2.18 Load Handling Equipment (LHE) Accident or Load Handling Equipment Mishap

A LHE accident occurs when any one or more of the eight 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; or collision, including unplanned contact between the load, crane, 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, or roll over). Document an LHE mishap or accident using the NAVFAC prescribed Navy Crane Center (NCC) accident form.

1.3 SUBMITTALS

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

SD-01 Preconstruction Submittals

- APP - Construction; G
- Dive Operations Plan; G
- Accident Prevention Plan (APP); G

SD-06 Test Reports

- Monthly Exposure Reports
- Notifications and Reports
- Accident Reports; G
- LHE Inspection Reports

SD-07 Certificates

Contractor Safety Self-Evaluation Checklist

Crane Operators/Riggers

Standard Lift Plan; G

Critical Lift Plan ; G

Naval Architecture Analysis; G

Activity Hazard Analysis (AHA)

Confined Space Entry Permit

Hot Work Permit

Certificate of Compliance

Third Party Certification of Floating Cranes and Barge-Mounted
Mobile Cranes

License Certificates

Radiography Operation Planning Work Sheet; G

Portable Gauge Operations Planning Worksheet; G

1.4 MONTHLY EXPOSURE REPORTS

Provide a Monthly Exposure Report and attach to the monthly billing request. This report is a compilation of employee-hours worked each month for all site workers, both Prime and subcontractor. Failure to submit the report may result in retention of up to 10 percent of the voucher.

1.5 CONTRACTOR SAFETY SELF-EVALUATION CHECKLIST

Contracting Officer will provide a "Contractor Safety Self-Evaluation checklist" to the Contractor at the pre-construction meeting. Complete the checklist monthly and submit with each request for payment voucher. An acceptable score of 90 or greater is required. Failure to submit the completed safety self-evaluation checklist or achieve a score of at least 90 may result in retention of up to 10 percent of the voucher. The Contractor Safety Self-Evaluation checklist can be found on the Whole Building Design Guide website at www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-01-35-26

1.6 REGULATORY REQUIREMENTS

In addition to the detailed requirements included in the provisions of this Contract, comply with the most recent edition 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.

1.6.1 Subcontractor Safety Requirements

For this Contract, neither Contractor nor any subcontractor may enter into Contract with any subcontractor that fails to meet the following requirements. The term subcontractor in this and the following paragraphs means any entity holding a Contract with the Contractor or with a subcontractor at any tier.

1.6.1.1 Experience Modification Rate (EMR)

Subcontractors on this Contract must have an effective EMR less than or equal to 1.10, as computed by the National Council on Compensation Insurance (NCCI) or if not available, as computed by the state agency's rating bureau in the state where the subcontractor is registered, when entering into a subcontract agreement with the Prime Contractor or a subcontractor at any tier. The Prime Contractor may submit a written request for additional consideration to the Contracting Officer where the specified acceptable EMR range cannot be achieved. Relaxation of the EMR range will only be considered for approval on a case-by-case basis for special conditions and must not be anticipated as tacit approval. Contractor's Site Safety and Health Officer (SSHO) must collect and maintain the certified EMR ratings for all subcontractors on the project and make them available to the Government at the Government's request.

1.6.1.2 OSHA Days Away from Work, Restricted Duty, or Job Transfer (DART) Rate

Subcontractors on this Contract must have a DART rate, calculated from the most recent, complete calendar year, less than or equal to 3.4 when entering into a subcontract agreement with the Prime Contractor or a subcontractor at any tier. The OSHA Dart Rate is calculated using the following formula:

$$(N/EH) \times 200,000$$

where:

N = number of injuries and illnesses with days away, restricted work, or job transfer

EH = total hours worked by all employees during most recent, complete calendar year

200,000 = base for 100 full-time equivalent workers (working 40 hours per week, 50 weeks per year)

The Prime Contractor may submit a written request for additional consideration to the Contracting Officer where the specified acceptable OSHA Dart rate range cannot be achieved for a particular subcontractor. Relaxation of the OSHA DART rate range will only be considered for approval on a case-by-case basis for special conditions and must not be anticipated as tacit approval. Contractor's Site Safety and Health Officer (SSHO) must collect and maintain self-certified OSHA DART rates for all subcontractors on the project and make them available to the Government at the Government's request.

1.7 SITE QUALIFICATIONS, DUTIES, AND MEETINGS

1.7.1 Personnel Qualifications

1.7.1.1 Site Safety and Health Officer (SSHO)

Provide an SSHO that meets the requirements of EM 385-1-1 Section 1. The SSHO must ensure that the requirements of 29 CFR 1926.16 are met for the project. Provide a Safety oversight team that includes a minimum of one person at each project site to function as the Site Safety and Health Officer (SSHO). The SSHO or an equally-qualified Alternate SSHO must be at the work site at all times to implement and administer the Contractor's safety program and Government-accepted Accident Prevention Plan. The SSHO and Alternate SSHO must have the required training, experience, and qualifications in accordance with EM 385-1-1 Section 01.A.17, and all associated sub-paragraphs.

If the SSHO is off-site for a period longer than 24 hours, an equally-qualified alternate SSHO must be provided and must fulfill the same roles and responsibilities as the primary SSHO. When the SSHO is temporarily (up to 24 hours) off-site, a Designated Representative (DR), as identified in the AHA may be used in lieu of an Alternate SSHO, and must be on the project site at all times when work is being performed. Note that the DR is a collateral duty safety position, with safety duties in addition to their full time occupation.

1.7.1.2 Competent Person Qualifications

Provide Competent Persons in accordance with EM 385-1-1, Appendix Q and herein. Competent Persons for high risk activities include confined space, cranes and rigging, excavation/trenching, fall protection, and electrical work. The CP for these activities must be designated in writing, and meet the requirements for the specific activity (i.e. competent person, fall protection).

The Competent Person identified in the Contractor's Safety and Health Program and accepted Accident Prevention Plan, must be on-site at all times when the work that presents the hazards associated with their professional expertise is being performed. Provide the credentials of the Competent Persons(s) to the Contracting Officer for information in consultation with the Safety Office.

1.7.1.2.1 Competent Person for Confined Space Entry

Provide a Confined Space (CP) Competent Person who meets the requirements of EM 385-1-1, Appendix Q, and herein. The CP for Confined Space Entry must supervise the entry into each confined space in accordance with EM 385-1-1, Section 34.

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

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

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

- a. Capable by education, specialized training and/or experience of

anticipating, recognizing, and evaluating employee exposure to hazardous chemical, physical and biological agents in accordance with USACE EM 385-1-1, Section 6.

b. Capable of specifying necessary controls and protective actions to ensure worker health.

1.7.1.2.3 Competent Person for Scaffolding

Provide a Competent Person for Scaffolding who meets the requirements of EM 385-1-1, Section 22.B.02 and herein.

1.7.1.2.4 Competent Person for Fall Protection

Provide a Competent Person for Fall Protection who meets the requirements of EM 385-1-1, Section 21.C.04, 21.B.03, and herein.

1.7.1.3 Qualified Trainer Requirements

Individuals qualified to instruct the 40 hour contract safety awareness course, or portions thereof, must meet the definition of a Competent Person Trainer, and, at a minimum, possess a working knowledge of the following subject areas: EM 385-1-1, Electrical Standards, Lockout/Tagout, Fall Protection, Confined Space Entry for Construction; Excavation, Trenching and Soil Mechanics, and Scaffolds in accordance with 29 CFR 1926.450, Subpart L.

Instructors are required to:

- a. Prepare class presentations that cover construction-related safety requirements.
- b. Ensure that all attendees attend all sessions by using a class roster signed daily by each attendee. Maintain copies of the roster for at least five years. This is a certification class and must be attended 100 percent. In cases of emergency where an attendee cannot make it to a session, the attendee can make it up in another class session for the same subject.
- c. Update training course materials whenever an update of the EM 385-1-1 becomes available.
- d. Provide a written exam of at least 50 questions. Students are required to answer 80 percent correctly to pass.
- e. Request, review and incorporate student feedback into a continuous course improvement program.

1.7.1.4 Dredging Contract Requirements

1.7.1.4.1 Dredging Safety Personnel Requirements

- a. Provide a minimum of one SSHO assigned per project site for the primary working shift.
- b. For a project involving multiple work shifts, provide one collateral duty SSHO for each additional shift.
- c. For individual dredging projects or sites with a dredge crew and fill

crew on watch of eight employees or less, a CDSO must be appointed, instead of an SSHO. The CDSO assumes the same responsibilities as a full-time SSHO.

- d. An example of one dredging project site is reflected in each of the following:
 - (1) a mechanical dredge, tug(s) and scow(s), scow route, and material placement site; or
 - (2) a hydraulic pipeline dredge, attendant plant, and material placement site; or,
 - (3) a hopper dredge (include land-based material placement site - if applicable.)
- e. For Hopper Dredges with the U.S. Coast Guard, documented crews may designate an officer as a Collateral Duty Safety Officer (CDSO) instead of having a full-time SSHO onboard if the officer meets the SSHO training and experience requirements.

1.7.1.4.2 SSHO Requirements for Dredging

- a. In addition to requirements stated elsewhere in this specification, an individual serving as a SSHO must be present at the project site, located so that they have full mobility and reasonable access to all major work operations, for at least one shift in each 24 hour period when work is being performed. The SSHO must be available during their shift for immediate verbal consultation and notification, either by phone or radio.
- b. The SSHO is a full-time, dedicated position, except as noted above, who must report to a senior project (or corporate) official. When the SSHO is permitted to be a collateral duty, the SSHO is not permitted to be in another position requiring continuous mechanical or equipment operations, such as equipment operators.
- c. The SSHO must inspect all work areas and operations during initial set-up and at least monthly observe and provide personal oversight on each shift during dredging operations for projects with many work sites, more often for those with less work sites.

1.7.1.4.3 Collateral Duty Safety Officer (CDSO) Requirements for Dredging

- a. A CDSO is an individual who is assigned collateral duty safety responsibilities in addition to their full-time occupation, and who supports and supplements the SSHO efforts in managing, implementing and enforcing the Contractor's Safety and Health Program. The assigned CDSO must be an individual(s) with work oversight responsibilities, such as master, mate, fill foreman, or superintendent. A CDSO must not be an employee responsible for continuous mechanical or equipment operations, such as an equipment operator.
- b. A CDSO performs safety program tasks as assigned by the SSHO and must report safety findings to the SSHO. The SSHO must document results of safety findings and provide information for inclusion in the CQC reports to the Contracting Officer.

1.7.1.4.4 Safety Personnel Training Requirements for Dredging

A SSHO and a CDSO for dredging Contracts must take either a formal classroom or online OSHA 30-hour Construction Safety Course, or an equivalent 30 hours of formal classroom or online safety and health training covering the subjects of the OSHA 30-hour Course in accordance with EM 385-1-1 Appendix A, paragraph 3.d.(3), applicable to dredging work, and given by qualified instructors. In exception to EM 385-1-1, Section 01.A.17, comply with the following:

- a. The SSHO must maintain competency through having taken 8 hours of formal classroom or online safety and health related coursework every year. Hours spent as an instructor in such courses will be considered the same as attending them, but each course only gets credit once (for example, instructing a 1-hour asbestos awareness course five times in a year provides one hour credit for training).
- b. The SSHO and a CDSO must have a minimum of three years of experience within the past five years in one of the following:
 - (1) Supervising/managing dredging activities
 - (2) Supervising/managing marine construction activities
 - (3) Supervising/managing land-based construction activities
 - (4) Work managing safety programs or processes
 - (5) Conducting hazard analyses and developing controls in activities or environments with similar hazards

1.7.1.5 Crane Operators/Riggers

Provide Operators, Signal Persons, and Riggers meeting the requirements in EM 385-1-1, Section 15.B for Riggers and Section 16.B for Crane Operators and Signal Persons. In addition, for mobile cranes with Original Equipment Manufacturer (OEM) rated capacities of 50,000 pounds or greater, designate crane operators qualified by a source that qualifies crane operators (i.e., union, a Government agency, or an organization that tests and qualifies crane operators). Provide proof of current qualification.

1.7.2 Personnel Duties

1.7.2.1 Duties of the Site Safety and Health Officer (SSHO)

The SSHO must:

- 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 production report.
- b. Conduct mishap investigations and complete required accident reports. Report mishaps and near misses.
- c. Use and maintain OSHA's Form 300 to log work-related injuries and illnesses occurring on the project site for Prime Contractors and subcontractors, and make available to the Contracting Officer upon

request. Post and maintain the Form 300A on the site Safety Bulletin Board.

- d. Maintain applicable safety reference material on the job site.
- e. Attend the pre-construction meeting, pre-work meetings including preparatory meetings, and periodic in-progress meetings.
- f. Review the APP and AHAs for compliance with EM 385-1-1, and approve, sign, implement and enforce them.
- g. Establish a Safety and Occupational Health (SOH) Deficiency Tracking System that lists and monitors outstanding deficiencies until resolution.
- h. Ensure subcontractor compliance with safety and health requirements.
- i. Maintain a list of hazardous chemicals on site and their material Safety Data Sheets (SDS).
- j. Maintain a weekly list of high hazard activities involving energy, equipment, excavation, entry into confined space, and elevation, and be prepared to discuss details during QC Meetings.
- k. Provide and keep a record of site safety orientation and indoctrination for Contractor employees, subcontractor employees, and site visitors.

Superintendent, QC Manager, and SSHO are subject to dismissal if the above or any other required duties are not being effectively carried out. If either the Superintendent, QC Manager, or SSHO are dismissed, project work will be stopped and will not be allowed to resume until a suitable replacement is approved and the above duties are again being effectively carried out.

1.7.3 Meetings

1.7.3.1 Preconstruction Meeting

- a. Contractor representatives who have a responsibility or significant role in accident prevention on the project must attend the preconstruction meeting. This includes the project superintendent, Site Safety and Occupational Health Officer, quality control manager, 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 and an agreement will be reached between the Contractor and the Contracting Officer as to which phases will require an analysis. In addition, establish a schedule for the preparation, submittal, and Government review of AHAs to preclude project delays.
- c. Deficiencies in the submitted APP, identified during the Contracting Officer's review, must be corrected, and the APP re-submitted for review prior to the start of construction. Work is not permitted to begin until an APP is established that is acceptable to the Contracting

Officer.

1.7.3.2 Safety Meetings

Conduct safety meetings to review past activities, plan for new or changed operations, review pertinent aspects of appropriate AHA (by trade), establish safe working procedures for anticipated hazards, and provide pertinent Safety and Occupational Health (SOH) training and motivation. Conduct meetings at least once a month for all supervisors at the project location. The SSHO, supervisors, foremen, or CDSOs must conduct meetings at least once a week for the trade workers. Document meeting minutes to include the date, persons in attendance, subjects discussed, and names of individual(s) who conducted the meeting. Maintain documentation on-site and furnish copies to the Contracting Officer on request. Notify the Contracting Officer of all scheduled meetings 7 calendar days in advance.

1.8 ACCIDENT PREVENTION PLAN (APP)

1.8.1 APP - Construction

A qualified person must prepare the written site-specific APP. Prepare the APP in accordance with the format and requirements of EM 385-1-1, Appendix A, and as supplemented herein. Cover all paragraph and subparagraph elements in EM 385-1-1, Appendix A. The APP must be job-specific and address any unusual or unique aspects of the project or activity for which it is written. The APP must interface with the Contractor's overall safety and health program referenced in the APP in the applicable APP element, and made site-specific. Describe the methods to evaluate past safety performance of potential subcontractors in the selection process. Also, describe innovative methods used to ensure and monitor safe work practices of subcontractors. 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 must be signed by an officer of the firm (Prime Contractor senior person), the individual preparing the APP, the on-site superintendent, the designated SSHO, the Contractor Quality Control Manager, and any designated Certified Safety Professional (CSP) or Certified Health Physicist (CIH). The SSHO must provide and maintain the APP and a log of signatures by each subcontractor foreman, attesting that they have read and understand the APP, and make the APP and log available on-site to the Contracting Officer. If English is not the foreman's primary language, the Prime Contractor must provide an interpreter.

Submit the APP to the Contracting Officer 15 calendar days prior to the date of the preconstruction meeting for acceptance. Work cannot proceed without an accepted APP. Once reviewed and 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 is cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified. Continuously review and amend the APP, as necessary, throughout the life of the Contract. Changes to the accepted APP must be made with the knowledge and concurrence of the Contracting Officer, project superintendent, SSHO and Quality Control Manager. Incorporate unusual or high-hazard activities not identified in the

original APP as they are discovered. 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 and 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 ASSP A10.34), and the environment.

1.8.2 Names and Qualifications

Provide plans in accordance with the requirements outlined in Appendix A of EM 385-1-1, including the following:

- a. Names and qualifications (resumes including education, training, experience and certifications) of 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. 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; and personal protective equipment and clothing to include selection, use and maintenance.

1.8.3 Plans

Provide plans in the APP in accordance with the requirements outlined in Appendix A of EM 385-1-1, including the following:

1.8.3.1 Confined Space Entry Plan

Develop a confined or enclosed space entry plan in accordance with EM 385-1-1, applicable OSHA standards 29 CFR 1910, 29 CFR 1915, and 29 CFR 1926, OSHA Directive CPL 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.)

1.8.3.2 Standard Lift Plan (SLP)

Plan lifts to avoid situations where the operator cannot maintain safe control of the lift. Prepare a written SLP in accordance with EM 385-1-1, Section 16.A.03, using Form 16-2 for every lift or series of lifts (if duty cycle or routine lifts are being performed). The SLP must be developed, reviewed and accepted by all personnel involved in the lift in conjunction with the associated AHA. Signature on the AHA constitutes acceptance of the plan. Maintain the SLP on the LHE for the current lift(s) being made. Maintain historical SLPs for a minimum of three months.

1.8.3.3 Critical Lift Plan - Crane or Load Handling Equipment

Provide a Critical Lift Plan as required by EM 385-1-1, Section 16.H.01, using Form 16-3. In addition, Critical Lift Plans are required for the following:

- a. Lifts over 50 percent of the capacity of barge mounted mobile crane's hoist.
- b. When working around energized power lines where the work will get closer than the minimum clearance distance in EM 385-1-1 Table 16-1.
- c. For lifts with anticipated binding conditions.
- d. When erecting cranes.

1.8.3.3.1 Critical Lift Plan Planning and Schedule

Critical lifts require detailed planning and additional or unusual safety precautions. Develop and submit a critical lift plan to the Contracting Officer 30 calendar days prior to critical lift. Comply with load testing requirements in accordance with EM 385-1-1, Section 16.F.03.

1.8.3.3.2 Lifts of Personnel

In addition to the requirements of EM 385-1-1, Section 16.H.02, for lifts of personnel, demonstrate compliance with the requirements of 29 CFR 1926.1400 and EM 385-1-1, Section 16.T.

1.8.3.4 Barge Mounted Mobile Crane Lift Plan

Provide a Naval Architecture Analysis and include an LHE Manufacturer's Floating Service Load Chart in accordance with EM 385-1-1, Section 16.L.03.

1.8.3.5 Multi-Purpose Machines, Material Handling Equipment, and Construction Equipment Lift Plan

Multi-purpose machines, material handling equipment, and construction equipment used to lift loads that are suspended by rigging gear, require proof of authorization from the machine OEM that the machine is capable of making lifts of loads suspended by rigging equipment. Written approval from a qualified registered professional engineer, after a safety analysis is performed, is allowed in lieu of the OEM's approval. Demonstrate that the operator is properly trained and that the equipment is properly configured to make such lifts and is equipped with a load chart.

1.8.3.6 Fall Protection and Prevention (FP&P) Plan

The plan must be in accordance with the requirements of EM 385-1-1, Section 21.D and ASSP Z359.2, 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 competent person or qualified person for fall protection must prepare and sign the plan documentation. Include fall protection and prevention systems, equipment and methods employed for every phase of work, roles and responsibilities, assisted rescue, self-rescue and evacuation procedures, training requirements, and monitoring methods. Review and revise, as necessary, the Fall Protection and Prevention Plan documentation as conditions change, but at a minimum

every six months, for lengthy projects, reflecting any changes during the course of construction due to changes in personnel, equipment, systems or work habits. Keep and maintain the accepted Fall Protection and Prevention Plan documentation at the job site for the duration of the project. Include the Fall Protection and Prevention Plan documentation in the Accident Prevention Plan (APP).

1.8.3.7 Rescue and Evacuation Plan

Provide a Rescue and Evacuation Plan in accordance with EM 385-1-1 Section 21.N and ASSP Z359.2, and include in the FP&P Plan and as part of the APP. 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.

1.8.3.8 Hazardous Energy Control Program (HECP)

Develop a HECP in accordance with EM 385-1-1 Section 12, 29 CFR 1910.147, 29 CFR 1910.333, 29 CFR 1915.89, ASSP Z244.1, and ASSP A10.44. Submit this HECP as part of the Accident Prevention Plan (APP). Conduct a preparatory meeting and inspection with all effected personnel to coordinate all HECP activities. Document this meeting and inspection in accordance with EM 385-1-1, Section 12.A.02. Ensure that each employee is familiar with and complies with these procedures.

1.8.3.9 Excavation Plan

Identify the safety and health aspects of excavation, and provide and prepare the plan in accordance with EM 385-1-1, Section 25.A.

1.8.3.10 Lead, Cadmium, and Chromium Compliance Plan

Identify the safety and health aspects of work involving lead, cadmium and chromium, and prepare in accordance with Section 02 83 00 LEAD REMEDIATION.

1.8.3.11 Asbestos Hazard Abatement Plan

Identify the safety and health aspects of asbestos work, and prepare in accordance with Section 02 82 00 ASBESTOS REMEDIATION.

1.8.3.12 Site Safety and Health Plan

Identify the safety and health aspects, and prepare in accordance with Section 01 35 29.13 HEALTH, SAFETY, AND EMERGENCY RESPONSE PROCEDURES FOR CONTAMINATED SITES.

1.8.3.13 Polychlorinated Biphenyls (PCB) Plan

Identify the safety and health aspects of Polychlorinated Biphenyls work, and prepare in accordance with Sections 02 84 33 REMOVAL AND DISPOSAL OF POLYCHLORINATED BIPHENYLS (PCBs) and 02 61 23 REMOVAL AND DISPOSAL OF PCB CONTAMINATED SOILS.

1.8.3.14 Site Demolition Plan

Identify the safety and health aspects, and prepare in accordance with Section 02 41 00 DEMOLITION and referenced sources. Include engineering survey as applicable.

1.9 ACTIVITY HAZARD ANALYSIS (AHA)

Before beginning each activity, task or Definable Feature of Work (DFOW) involving a type of work presenting hazards not experienced in previous project operations, or where a new work crew or subcontractor is to perform the work, the Contractor(s) performing that work activity must prepare an AHA. AHAs must be developed by the Prime Contractor, subcontractor, or supplier performing the work, and provided for Prime Contractor review and approval before submitting to the Contracting Officer. AHAs must be signed by the SSHO, Superintendent, QC Manager and the subcontractor Foreman performing the work. Format the AHA in accordance with EM 385-1-1, Section 1 or as directed by the Contracting Officer. Submit the AHA for review at least 15 working days prior to the start of each activity task, or DFOW. The Government reserves the right to require the Contractor to revise and resubmit the AHA if it fails to effectively identify the work sequences, specific anticipated hazards, site conditions, equipment, materials, personnel and the control measures to be implemented.

AHAs must identify competent persons required for phases involving high risk activities, including confined entry, crane and rigging, excavations, trenching, electrical work, fall protection, and scaffolding.

1.9.1 AHA Management

Review the AHA list periodically (at least monthly) at the Contractor supervisory safety meeting, and update as necessary when procedures, scheduling, or hazards change. Use the AHA during daily inspections by the SSHO to ensure the implementation and effectiveness of the required safety and health controls for that work activity.

1.9.2 AHA Signature Log

Each employee performing work as part of an activity, task or DFOW must review the AHA for that work and sign a signature log specifically maintained for that AHA prior to starting work on that activity. The SSHO must maintain a signature log on site for every AHA. Provide employees whose primary language is other than English, with an interpreter to ensure a clear understanding of the AHA and its contents.

1.10 DISPLAY OF SAFETY INFORMATION

1.10.1 Safety Bulletin Board

Prior to 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, may 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.07. Additional items required to be posted include:

- a. Confined space entry permit.
- b. Hot work permit.

1.10.2 Safety and Occupational Health (SOH) Deficiency Tracking System

Establish a SOH deficiency tracking system that lists and monitors the status of SOH deficiencies in chronological order. Use the tracking system to evaluate the effectiveness of the APP. A monthly evaluation of the data must be discussed in the QC or SOH meeting with everyone on the project. The list must be posted on the project bulletin board and updated daily, and provide the following information:

- a. Date deficiency identified;
- b. Description of deficiency;
- c. Name of person responsible for correcting deficiency;
- d. Projected resolution date;
- e. Date actually resolved.

1.11 SITE SAFETY REFERENCE MATERIALS

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

1.12 EMERGENCY MEDICAL TREATMENT

Contractors must arrange for their own emergency medical treatment in accordance with [EM 385-1-1](#). Government has no responsibility to provide emergency medical treatment.

1.13 NOTIFICATIONS and REPORTS

1.13.1 Mishap Notification

Notify the Contracting Officer as soon as practical, but no more than twenty-four hours, after any mishaps, including recordable accidents, incidents, and near misses, as defined in [EM 385-1-1](#) Appendix Q, any report of injury, illness, or any property damage. For LHE or rigging mishaps, notify the Contracting Officer as soon as practical but not more than four hours after mishap. The Contractor is responsible for obtaining appropriate medical and emergency assistance and for notifying fire, law enforcement, and regulatory agencies. Immediate reporting is required for electrical mishaps, to include Arc Flash; shock; uncontrolled release of hazardous energy (includes electrical and non-electrical); load handling equipment or rigging; fall from height (any level other than same surface); and underwater diving. These mishaps must be investigated in depth to identify all causes and to recommend hazard control measures.

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 (for example, type of construction equipment used and PPE used). Preserve the conditions and evidence on the accident site until the Government investigation team arrives on-site and Government investigation is conducted. Assist and cooperate fully with the Government's investigation(s) of any mishap.

1.13.2 Accident Reports

- a. Conduct an accident investigation for recordable injuries and illnesses, property damage, and near misses as defined in EM 385-1-1, to establish the root cause(s) of the accident. Complete the applicable NAVFAC Contractor Incident Reporting System (CIRS), and electronically submit via the NAVFAC Enterprise Safety Applications Management System (ESAMS). Complete and submit an accident investigation report in ESAMS within 5 days for mishaps defined in EM 385-1-1 01.D.03 and 10 days for accidents defined by EM 385-1-1 01.D.05. Complete an investigation report within 30 days for those mishaps defined by EM 385-1-1 01.D.04. Mishaps defined by EM 385-1-1 01.D.04 and 01.D.05 must include a written report submitted as an attachment in ESAMS using the following outline: (1) Mishap summary description to include process, findings and outcomes; (2) Root Cause; (3) Direct Factors; (4) Indirect and Contributing Factors; (5) Corrective Actions; and (6) Recommendations. The Contracting Officer will provide copies of any required or special forms.
- b. Near Misses: For Navy Projects, complete the applicable documentation in NAVFAC Contractor Incident Reporting System (CIRS), and electronically submit via the NAVFAC Enterprise Safety Applications Management System (ESAMS). Near miss reports are considered positive and proactive Contractor safety management actions.
- c. Conduct an accident investigation for any load handling equipment accident (including rigging accidents) to establish the root cause(s) of the accident. Complete the LHE Accident Report (Crane and Rigging Accident Report) 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.

1.13.3 LHE Inspection Reports

Submit LHE inspection reports required in accordance with EM 385-1-1 and as specified herein with Daily Reports of Inspections.

1.13.4 Certificate of Compliance and Pre-lift Plan/Checklist for LHE and Rigging

Provide a FORM 16-1 Certificate of Compliance for LHE entering an activity under this Contract and in accordance with EM 385-1-1. Post certifications on the crane.

Develop a Standard Lift Plan (SLP) in accordance with EM 385-1-1, Section 16.H.03 using Form 16-2 Standard Pre-Lift Crane Plan/Checklist for each lift planned. Submit SLP to the Contracting Officer for approval within 15 calendar days in advance of planned lift.

1.13.5 Third Party Certification of Floating Cranes and Barge-Mounted Mobile Cranes

Floating cranes and barge-mounted mobile cranes used to perform work under the terms of this Contract must be certified in accordance with 29 CFR 1919 by an OSHA accredited person prior to submitting the required Lift Plan. Include proof of certification with the initial Lift Plan submission.

1.14 HOT WORK

1.14.1 Permit and Personnel Requirements

Submit and obtain a written permit prior to performing "Hot Work" (i.e. welding or cutting) 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. Provide at least two 20 pound 4A:20 BC rated extinguishers for normal "Hot Work". The extinguishers must be current inspection tagged, and contain an 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 must be trained in accordance with NFPA 51B and remain on-site for a minimum of one hour 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. REPORT ANY FIRE, NO MATTER HOW SMALL, TO THE RESPONSIBLE FIRE DIVISION IMMEDIATELY.

1.14.2 Work Around Flammable Materials

Obtain permit approval from a NFPA Certified Marine Chemist, or Certified Industrial Hygienist for "HOT WORK" within or around flammable materials (such as fuel systems or welding/cutting on fuel pipes) or confined spaces (such as sewer wet wells, manholes, or vaults) that have the potential for flammable or explosive atmospheres.

Whenever these materials, except beryllium and chromium (VI), are encountered in indoor operations, local mechanical exhaust ventilation systems that are sufficient to reduce and maintain personal exposures to within acceptable limits must be used and maintained in accordance with manufacturer's instruction and supplemented by exceptions noted in EM 385-1-1, Section 06.H

1.15 RADIATION SAFETY REQUIREMENTS

Submit License Certificates, employee training records, and Leak Test Reports for radiation materials and equipment to the Contracting Officer and Radiation Safety Office (RSO), and Contracting Oversight Technician (COT) for all specialized and licensed material and equipment proposed for use on the construction project (excludes portable machine sources of ionizing radiation including moisture density and X-Ray Fluorescence (XRF)). Maintain on-site records whenever licensed radiological materials or ionizing equipment are on Government property.

Protect workers from radiation exposure in accordance with 10 CFR 20, ensuring any personnel exposures are maintained As Low As Reasonably Achievable.

1.15.1 Radiography Operation Planning Work Sheet

Submit a Gamma and X-Ray Radiography Operation Planning Work Sheet to Contracting Officer 14 days prior to commencement of operations involving radioactive materials or radiation generating devices. For portable machine sources of ionizing radiation, including moisture density and XRF,

use and submit the [Portable Gauge Operations Planning Worksheet](#) instead. The Contracting Officer and COT will review the submitted worksheet and provide questions and comments.

Contractors must use primary dosimeters process by a National Voluntary Laboratory Accreditation Program (NVLAP) accredited laboratory.

1.15.2 Site Access and Security

Coordinate site access and security requirements with the Contracting Officer and COT for all radiological materials and equipment containing ionizing radiation that are proposed for use on a government facility. For gamma radiography materials and equipment, a Government escort is required for any travels on the Installation. The [Navy COT or](#) Government authorized representative will meet the Contractor at a designated location outside the Installation, ensure safety of the materials being transported, and will escort the Contractor for gamma sources onto the Installation, to the job site, and off the Installation. For portable machine sources of ionizing radiation, including moisture density and XRF, the [Navy COT or](#) Government authorized representative will meet the Contractor at the job site.

Provide a copy of all calibration records, and utilization records [to the COT](#) for radiological operations performed on the site.

1.15.3 Loss or Release and Unplanned Personnel Exposure

Loss or release of radioactive materials, and unplanned personnel exposures must be reported immediately to the Contracting Officer, RSO, and Base Security Department Emergency Number.

1.15.4 Site Demarcation and Barricade

Properly demark and barricade an area surrounding radiological operations to preclude personnel entrance, in accordance with [EM 385-1-1](#), Nuclear Regulatory Commission, and Applicable State regulations and license requirements, and in accordance with requirements established in the accepted Radiography Operation Planning Work Sheet.

Do not close or obstruct streets, walks, and other facilities occupied and used by the Government without written permission from the Contracting Officer.

1.15.5 Security of Material and Equipment

Properly secure the radiological material and ionizing radiation equipment at all times, including keeping the devices in a properly marked and locked container, and secondarily locking the container to a secure point in the Contractor's vehicle or other approved storage location during transportation and while not in use. While in use, maintain a continuous visual observation on the radiological material and ionizing radiation equipment. In instances where radiography is scheduled near or adjacent to buildings or areas having limited access or one-way doors, make no assumptions as to building occupancy. Where necessary, the Contracting Officer will direct the Contractor to conduct an actual building entry, search, and alert. Where removal of personnel from such a building cannot be accomplished and it is otherwise safe to proceed with the radiography, position a fully instructed employee inside the building or area to prevent exiting while external radiographic operations are in process.

1.15.6 Transportation of Material

Comply with [49 CFR 173](#) for Transportation of Regulated Amounts of Radioactive Material. Notify Local Fire authorities and the site Radiation Safety Officer (RSO) of any Radioactive Material use.

1.15.7 Schedule for Exposure or Unshielding

Actual exposure of the radiographic film or unshielding the source must not be initiated until after 5 p.m. on weekdays.

1.15.8 Transmitter Requirements

Adhere to the base policy concerning the use of transmitters, such as radios and cell phones. Obey Emissions control (EMCON) restrictions.

1.16 CONFINED SPACE ENTRY REQUIREMENTS

Confined space entry must comply with Section 34 of [EM 385-1-1](#), OSHA [29 CFR 1926](#), OSHA [29 CFR 1910](#), OSHA [29 CFR 1910.146](#), and OSHA Directive [CPL 2.100](#). Any potential for a hazard in the confined space requires a permit system to be used.

1.16.1 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. Comply with [EM 385-1-1](#), Section 34 for entry procedures. Hazards pertaining to the space must be reviewed with each employee during review of the AHA.

1.16.2 Forced Air Ventilation

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.

1.16.3 Sewer Wet Wells

Sewer wet wells require continuous atmosphere monitoring with audible alarm for toxic gas detection.

1.16.4 Rescue Procedures and Coordination with Local Emergency Responders

Develop and implement an on-site rescue and recovery plan and procedures. The rescue plan must not rely on local emergency responders for rescue from a confined space.

1.17 DIVE SAFETY REQUIREMENTS

Develop a [Dive Operations Plan](#), AHA, emergency management plan, and personnel list that includes qualifications, for each separate diving operation. Submit these documents to the District Dive Coordinator (DDC) via the Contracting Officer or Government Designated Authority (GDA), for review and approval at least 15 working days prior to commencement of

diving operations. These documents must be at the diving location at all times. Provide each of these documents as a part of the project file.

1.18 SEVERE STORM PLAN

In the event of a severe storm warning, the Contractor must comply with the applicable Storm Plan and:

- 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.

PART 2 PRODUCTS

2.1 CONFINED SPACE SIGNAGE

Provide permanent signs integral to or securely attached to access covers for new permit-required confined spaces. Signs for confined spaces must comply with NEMA Z535.2. Provide signs with 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" must be red and readable from 5 feet.

PART 3 EXECUTION

3.1 CONSTRUCTION AND OTHER WORK

Comply with EM 385-1-1, NFPA 70, NFPA 70E, NFPA 241, the APP, the AHA, Federal and State OSHA regulations, and other related submittals and activity fire and safety regulations. The most stringent standard prevails.

PPE is governed in all areas by the nature of the work the employee is performing. Use personal hearing protection at all times in designated noise hazardous areas or when performing noise hazardous tasks. Safety glasses must be worn or carried/available on each person. Mandatory PPE includes:

- a. Hard Hat
- b. Long Pants
- c. Appropriate Safety Shoes
- d. Appropriate Class Reflective Vests

3.1.1 Worksite Communication

Employees working alone in a remote location or away from other workers must be provided an effective means of emergency communications (i.e., cellular phone, two-way radios, land-line telephones or other acceptable means). The selected communication must be readily available (easily within the immediate reach) of the employee and must be tested prior to the start of work to verify that it effectively operates in the

area/environment. Develop an employee check-in/check-out communication procedure to ensure employee safety.

3.1.2 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.

3.1.3 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 EM 385-1-1 such as nuclear density meters for compaction testing and laboratory equipment with radioactive sources) as well as materials which contain asbestos, mercury or polychlorinated biphenyls, di-isocyanates, lead-based paint, and hexavalent chromium, are prohibited. The Contracting Officer, upon written request by the Contractor, may consider exceptions to the use of any of the above excluded materials. Low mercury lamps used within fluorescent lighting fixtures are allowed as an exception without further Contracting Officer approval. Notify the Radiation Safety Officer (RSO) prior to excepted items of radioactive material and devices being brought on base.

3.1.4 Unforeseen Hazardous Material

Contract documents identify 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 material(s) that may be hazardous to human health upon disturbance are encountered during construction operations, 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 UTILITY OUTAGE REQUIREMENTS

Apply for utility outages at least 30 days in advance. At a minimum, the written request must include the location of the outage, utilities being affected, duration of outage, any necessary sketches, and a description of the means to fulfill energy isolation requirements in accordance with EM 385-1-1, Section 11.A.02 (Isolation). Some examples of energy isolation devices and procedures are highlighted in EM 385-1-1, Section 12.D. In accordance with EM 385-1-1, Section 12.A.01, where outages involve Government or Utility personnel, coordinate with the Government on all activities involving the control of hazardous energy.

These activities include, but are not limited to, a review of HECF and HEC procedures, as well as applicable Activity Hazard Analyses (AHAs). In accordance with EM 385-1-1, Section 11.A.02 and NFPA 70E, work on energized electrical circuits must not be performed without prior Government authorization. Government permission is considered through the permit process and submission of a detailed AHA. Energized work permits are

considered only when de-energizing introduces additional or increased hazard or when de-energizing is infeasible.

3.3 OUTAGE COORDINATION MEETING

After the utility outage request is approved and prior to beginning work on the utility system requiring shut-down, conduct a pre-outage coordination meeting in accordance with EM 385-1-1, Section 12.A. This meeting must include the Prime Contractor, the Prime and subcontractors performing the work, the Contracting Officer, and the Public Utilities representative. All parties must fully coordinate HEC activities with one another. During the coordination meeting, all parties must discuss and coordinate on the scope of work, HEC procedures (specifically, the lock-out/tag-out procedures for worker and utility protection), the AHA, assurance of trade personnel qualifications, identification of competent persons, and compliance with HECP training in accordance with EM 385-1-1, Section 12.C. Clarify when personal protective equipment is required during switching operations, inspection, and verification.

3.4 CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

Provide and operate a Hazardous Energy Control Program (HECP) in accordance with EM 385-1-1 Section 12, 29 CFR 1910.333, 29 CFR 1915.89, ASSP A10.44, NFPA 70E, and paragraph HAZARDOUS ENERGY CONTROL PROGRAM (HECP).

3.4.1 Safety Preparatory Inspection Coordination Meeting with the Government or Utility

For electrical distribution equipment that is to be operated by Government or Utility personnel, the Prime Contractor and the subcontractor performing the work must attend the safety preparatory inspection coordination meeting, which will also be attended by the Contracting Officer's Representative, and required by EM 385-1-1, Section 12.A.02. The meeting will occur immediately preceding the start of work and following the completion of the outage coordination meeting. Both the safety preparatory inspection coordination meeting and the outage coordination meeting must occur prior to conducting the outage and commencing with lockout/tagout procedures.

3.4.2 Lockout/Tagout Isolation

Where the Government or Utility performs equipment isolation and lockout/tagout, the Contractor must place their own locks and tags on each energy-isolating device and proceed in accordance with the HECP. Before any work begins, both the Contractor and the Government or Utility must perform energy isolation verification testing while wearing required PPE detailed in the Contractor's AHA and required by EM 385-1-1, Sections 05.I and 11.B. Install personal protective grounds, with tags, to eliminate the potential for induced voltage in accordance with EM 385-1-1, Section 12.E.06.

3.4.3 Lockout/Tagout Removal

Upon completion of work, conduct lockout/tagout removal procedure in accordance with the HECP. In accordance with EM 385-1-1, Section 12.E.08, each lock and tag must be removed from each energy isolating device by the authorized individual or systems operator who applied the device. Provide formal notification to the Government (by completing the Government form if provided by Contracting Officer's Representative), confirming that steps of

de-energization and lockout/tagout removal procedure have been conducted and certified through inspection and verification. Government or Utility locks and tags used to support the Contractor's work will not be removed until the authorized Government employee receives the formal notification.

3.5 FALL PROTECTION PROGRAM

Establish a fall protection program, for the protection of all employees exposed to fall hazards. Within the program include company policy, identify roles and 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 in accordance with [ASSP Z359.2](#) and [EM 385-1-1](#), Sections 21.A and 21.D.

3.5.1 Training

Institute a fall protection training program. As part of the Fall Protection Program, provide training for each employee who might be exposed to fall hazards and using personal fall protection equipment. Provide training by a competent person for fall protection in accordance with [EM 385-1-1](#), Section 21.C. Document training and practical application of the competent person in accordance with [EM 385-1-1](#), Section 21.C.04 and [ASSP Z359.2](#) in the AHA.

3.5.2 Fall Protection Equipment and Systems

Enforce use of personal fall protection equipment and systems designated (to include fall arrest, restraint, and positioning) for each specific work activity in the Site Specific Fall Protection and Prevention Plan and 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.

Provide personal fall protection equipment, systems, subsystems, and components that comply with [EM 385-1-1](#) Section 21.I, [29 CFR 1926.500](#) Subpart M, [ASSP Z359.0](#), [ASSP Z359.1](#), [ASSP Z359.2](#), [ASSP Z359.3](#), [ASSP Z359.4](#), [ASSP Z359.6](#), [ASSP Z359.7](#), [ASSP Z359.11](#), [ASSP Z359.12](#), [ASSP Z359.13](#), [ASSP Z359.14](#), [ASSP Z359.15](#), [ASSP Z359.16](#) and [ASSP Z359.18](#).

3.5.2.1 Additional Personal Fall Protection Measures

In addition to the required fall protection systems, other protective measures such as safety skiffs, personal floatation devices, and life rings, are required when working above or next to water in accordance with [EM 385-1-1](#), Sections 21.0 through 21.0.06. Personal fall protection systems and equipment are required when working from an articulating or extendible boom, swing stages, or suspended platform. In addition, personal fall protection systems are required when operating other equipment such as scissor lifts. The need for tying-off in such equipment is to prevent ejection of the employee from the equipment during raising, lowering, travel, or while performing work.

3.5.2.2 Personal Fall Protection Equipment

Only a full-body harness with a shock-absorbing lanyard or self-retracting lanyard is an acceptable personal fall arrest body support device. The use of body belts is not acceptable. Harnesses must 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. Snap

hooks and carabineers must be self-closing and self-locking, capable of being opened only by at least two consecutive deliberate actions and have a minimum gate strength of 3,600 lbs in all directions. Use webbing, straps, and ropes made of synthetic fiber. The maximum free fall distance when using fall arrest equipment must not exceed 6 feet, unless the proper energy absorbing lanyard is used. Always take into consideration the total fall distance and any swinging of the worker (pendulum-like motion), that can occur during a fall, when attaching a person to a fall arrest system. Equip all full body harnesses with Suspension Trauma Preventers such as stirrups, relief steps, or similar in order to provide short-term relief from the effects of orthostatic intolerance in accordance with EM 385-1-1, Section 21.I.06.

3.5.3 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 from unprotected edge of a roof having a slope less than or equal to 4:12 (vertical to horizontal), protect personnel from falling by the use of conventional fall protection systems (personal fall arrest/restraint systems, guardrails, or safety nets) in accordance with EM 385-1-1, Section 21 and 29 CFR 1926.500. A safety monitoring system is not adequate fall protection and is not authorized.
- (2) For work greater than 6 feet from the unprotected roof edge, addition to the use of conventional fall protection systems the use of a warning line system is also permitted, in accordance with 29 CFR 1926.500 and EM 385-1-1, Section 21.L.

- #### b. Steep-Sloped Roofs:
- Work on a roof having a slope greater than 4:12 (vertical to horizontal) requires a personal fall arrest system, guardrails with toe-boards, or safety nets. This requirement also applies to residential or housing type construction.

3.5.4 Horizontal Lifelines (HLL)

Provide HLL in accordance with EM 385-1-1, Section 21.I.08.d.2. Commercially manufactured horizontal lifelines (HLL) must be designed, installed, certified and used, under the supervision of a qualified person, for fall protection as part of a complete fall arrest system which maintains a safety factor of 2 (29 CFR 1926.500). The competent person for fall protection may (if deemed appropriate by the qualified person) supervise the assembly, disassembly, use and inspection of the HLL system under the direction of the qualified person. Locally manufactured HLLs are not acceptable unless they are custom designed for limited or site specific applications by a Registered Professional Engineer who is qualified in designing HLL systems.

3.5.5 Guardrails and Safety Nets

Design, install and use guardrails and safety nets in accordance with EM 385-1-1, Section 21.F.01 and 29 CFR 1926 Subpart M.

3.5.6 Rescue and Evacuation Plan and Procedures

When personal fall arrest systems are used, 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 or assisted-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). The plan must be in accordance with the requirements of [EM 385-1-1](#), [ASSP Z359.2](#), and [ASSP Z359.4](#).

3.6 WORK PLATFORMS

3.6.1 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. Comply with the following requirements:

- a. Scaffold platforms greater than [20 feet](#) in height must be accessed by use of a scaffold stair system.
- b. Ladders commonly provided by scaffold system manufacturers are prohibited for accessing scaffold platforms greater than [20 feet](#) maximum in height.
- c. An adequate gate is required.
- d. Employees performing scaffold erection and dismantling must be qualified.
- e. Scaffold must be capable of supporting at least four times the maximum intended load, and provide appropriate fall protection as delineated in the accepted fall protection and prevention plan.
- f. Stationary scaffolds must be attached to structural building components to safeguard against tipping forward or backward.
- g. Special care must be given to ensure scaffold systems are not overloaded.
- h. Side brackets used to extend scaffold platforms on self-supported scaffold systems for the storage of material are prohibited. The first tie-in must be at the height equal to 4 times the width of the smallest dimension of the scaffold base.
- i. Scaffolding other than suspended types must bear on base plates upon wood mudsills ([2 in x 10 in x 8 in](#) minimum) or other adequate firm foundation.
- j. Scaffold or work platform erectors must have fall protection during the erection and dismantling of scaffolding or work platforms that are more than [6 feet](#).
- k. Delineate fall protection requirements when working above [6 feet](#) or above dangerous operations in the Fall Protection and Prevention (FP&P)

Plan and Activity Hazard Analysis (AHA) for the phase of work.

3.6.2 Elevated Aerial Work Platforms (AWPs)

Workers must be anchored to the basket or bucket in accordance with manufacturer's specifications and instructions (anchoring to the boom may only be used when allowed by the manufacturer and permitted by the CP). Lanyards used must be sufficiently short to prohibit worker from climbing out of basket. The climbing of rails is prohibited. Lanyards with built-in shock absorbers are acceptable. Self-retracting devices are not acceptable. Tying off to an adjacent pole or structure is not permitted unless a safe device for 100 percent tie-off is used for the transfer.

Use of AWPs must be operated, inspected, and maintained as specified in the operating manual for the equipment and delineated in the AHA. Operators of AWPs must be designated as qualified operators by the Prime Contractor. Maintain proof of qualifications on site for review and include in the AHA.

3.7 EQUIPMENT

3.7.1 Material Handling Equipment (MHE)

- a. Material handling equipment such as forklifts must not be modified with work platform attachments for supporting employees unless specifically delineated in the manufacturer's printed operating instructions. Material handling equipment fitted with personnel work platform attachments are prohibited from traveling or positioning while personnel are working on the platform.
- b. The use of hooks on equipment for lifting of material must be in accordance with manufacturer's printed instructions. Material Handling Equipment Operators must be trained in accordance with OSHA 29 CFR 1910, Subpart N.
- c. Operators of forklifts or power industrial trucks must be licensed in accordance with OSHA.

3.7.2 Load Handling Equipment (LHE)

The following requirements apply. In exception, these requirements do not apply to commercial truck mounted and articulating boom cranes used solely to deliver material and supplies (not prefabricated components, structural steel, or components of a systems-engineered metal building) where the lift consists of moving materials and supplies from a truck or trailer to the ground; to cranes installed on mechanics trucks that are used solely in the repair of shore-based equipment; to crane that enter the activity but are not used for lifting; nor to other machines not used to lift loads suspended by rigging equipment. However, LHE accidents occurring during such operations must be reported.

- a. Equip cranes and derricks as specified in EM 385-1-1, Section 16.
- b. Notify the Contracting Officer 15 working days in advance of any LHE entering the activity, in accordance with EM 385-1-1, Section 16.A.02, so that necessary quality assurance spot checks can be coordinated. Prior to cranes entering federal activities, a Crane Access Permit must be obtained from the Contracting Officer. A copy of the permitting process will be provided at the Preconstruction Meeting. Contractor's operator must remain with the crane during the spot check. Rigging

gear must be in accordance with OSHA, ASME B30.9 Standards safety standards.

- c. Comply with the LHE 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, ASME B30.8 for floating cranes and floating derricks, ASME B30.9 for slings, ASME B30.20 for below the hook lifting devices and ASME B30.26 for rigging hardware.
- e. When operating in the vicinity of overhead transmission lines, operators and riggers must be alert to this special hazard and follow the requirements of EM 385-1-1 Section 11, and ASME B30.5 or ASME B30.22 as applicable.
- f. Do not use 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. Additionally, submit a specific AHA for this work to the Contracting Officer. Ensure the activity and AHA are thoroughly reviewed by all involved personnel.
- g. Inspect, maintain, and recharge portable fire extinguishers as specified in NFPA 10, Standard for Portable Fire Extinguishers.
- h. All employees must keep clear of loads about to be lifted and of suspended loads, except for employees required to handle the load.
- i. Use cribbing when performing lifts on outriggers.
- j. The crane hook/block must be positioned directly over the load. Side loading of the crane is prohibited.
- k. A physical barricade must be positioned to prevent personnel access where accessible areas of the LHE's rotating superstructure poses a risk of striking, pinching or crushing personnel.
- l. Maintain inspection records in accordance by EM 385-1-1, Section 16.D, including shift, monthly, and annual inspections, the signature of the person performing the inspection, and the serial number or other identifier of the LHE that was inspected. Records must be available for review by the Contracting Officer.
- m. Maintain written reports of operational and load testing in accordance with EM 385-1-1, Section 16.F, listing the load test procedures used along with any repairs or alterations performed on the LHE. Reports must be available for review by the Contracting Officer.
- n. Certify that all LHE operators have been trained in proper use of all safety devices (e.g. anti-two block devices).
- o. Take steps to ensure that wind speed does not contribute to loss of control of the load during lifting operations. At wind speeds greater than 20 mph, the operator, rigger and lift supervisor must cease all

crane operations, evaluate conditions and determine if the lift may proceed. Base the determination to proceed or not on wind calculations per the manufacturer and a reduction in LHE rated capacity if applicable. Include this maximum wind speed determination as part of the activity hazard analysis plan for that operation.

- p. On mobile cranes, lifts where the load weight is greater than 90 percent of the equipment's capacity are prohibited.
- q. Follow FAA guidelines when required based on project location.

3.7.3 Machinery and Mechanized Equipment

- a. Proof of qualifications for operator must be kept on the project site for review.
- b. Manufacture specifications or owner's manual for the equipment must 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.

3.7.4 Base Mounted Drum Hoists

- a. Operation of base mounted drum hoists must be in accordance with EM 385-1-1 and ASSP A10.22.
- b. Rigging gear must be in accordance with applicable ASME/OSHA standards.
- c. When used on telecommunication towers, base mounted drum hoists must be in accordance with TIA-1019, TIA-222, ASME B30.7, 29 CFR 1926.552, and 29 CFR 1926.553.
- d. When used to hoist personnel, the AHA must include a written standard operating procedure. Operators must have a physical examination in accordance with EM 385-1-1 Section 16.B.05 and trained, at a minimum, in accordance with EM 385-1-1 Section 16.U and 16.T. The base mounted drum hoist must also comply with OSHA Instruction CPL 02-01-056 and ASME B30.23.
- e. Material and personnel must not be hoisted simultaneously.
- f. Personnel cage must be marked with the capacity (in number of persons) and load limit in pounds.
- g. Construction equipment must not be used for hoisting material or personnel or with trolley/tag lines. Construction equipment may be used for towing and assisting with anchoring guy lines.

3.7.5 Use of Explosives

Explosives must not be used or brought to the project site without prior written approval from the Contracting Officer. Such approval does 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, must be only where directed and in approved storage facilities. These facilities must be kept locked at all times except for inspection, delivery, and withdrawal

of explosives.

3.8 EXCAVATIONS

Soil classification must be performed by a competent person in accordance with 29 CFR 1926 and EM 385-1-1.

3.8.1 Utility Locations

Provide a third party, independent, private utility locating company to positively identify underground utilities in the work area in addition to any station locating service and coordinated with the station utility department.

3.8.2 Utility Location Verification

Physically verify underground utility locations, including utility depth, by hand digging using wood or fiberglass handled tools when any adjacent construction work is expected to come within 3 feet of the underground system.

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

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

3.9 ELECTRICAL

Perform electrical work in accordance with EM 385-1-1, Sections 11 and 12.

3.9.1 Conduct of Electrical Work

As delineated in EM 385-1-1, electrical work is to be conducted in a de-energized state unless there is no alternative method for accomplishing the work. In those cases obtain an energized work permit from the Contracting Officer. The energized work permit application must be accompanied by the AHA and a summary of why the equipment/circuit needs to be worked energized. 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. Attach temporary grounds in accordance with ASTM F855 and IEEE 1048. 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 is 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 are permitted to enter. When work requires work near energized circuits as defined by NFPA 70, high voltage personnel must use personal protective equipment that includes, as a minimum, electrical hard hat, safety shoes, insulating gloves and 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. Ensure that each employee is familiar with and complies with these procedures and 29 CFR 1910.147.

3.9.2 Qualifications

Electrical work must be performed by QP with verifiable credentials who are familiar with applicable code requirements. Verifiable credentials consist of State, National and Local Certifications or Licenses that a Master or Journeyman Electrician may hold, depending on work being performed, and must be identified in the appropriate AHA. Journeyman/Apprentice ratio must be in accordance with State, Local requirements applicable to where work is being performed.

3.9.3 Arc Flash

Conduct a hazard analysis/arc flash hazard analysis whenever work on or near energized parts greater than 50 volts is necessary, in accordance with NFPA 70E.

All personnel entering the identified arc flash protection boundary must be QPs and properly trained in NFPA 70E requirements and procedures. Unless permitted by NFPA 70E, no Unqualified Person is permitted to approach nearer than the Limited Approach Boundary of energized conductors and circuit parts. Training must be administered by an electrically qualified source and documented.

3.9.4 Grounding

Ground electrical circuits, equipment and enclosures in accordance with NFPA 70 and IEEE C2 to provide a permanent, continuous and effective path to ground unless otherwise noted by EM 385-1-1.

Check grounding circuits to ensure that the circuit between the ground and a grounded power conductor has a resistance low enough to permit sufficient current flow to allow the fuse or circuit breaker to interrupt the current.

3.9.5 Testing

Temporary electrical distribution systems and devices must be inspected, tested and found acceptable for Ground-Fault Circuit Interrupter (GFCI) protection, polarity, ground continuity, and ground resistance before initial use, before use after modification and at least monthly. Monthly inspections and tests must be maintained for each temporary electrical distribution system, and signed by the electrical CP or QP.

-- End of Section --

SECTION 01 35 29.13

HEALTH, SAFETY, AND EMERGENCY RESPONSE PROCEDURES FOR CONTAMINATED SITES
11/15, CHG 1: 08/22

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 RP 2219 (2016) Safe Operation of Vacuum Trucks Handling Flammable and Combustible Liquids in Petroleum Service

INTERNATIONAL SAFETY EQUIPMENT ASSOCIATION (ISEA)

ANSI/ISEA Z358.1 (2014) American National Standard for Emergency Eyewash and Shower Equipment

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH 85-115 (1985) Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2014) Safety -- Safety and Health Requirements Manual

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

29 CFR 1904 Recording and Reporting Occupational Injuries and Illnesses

29 CFR 1910 Occupational Safety and Health Standards

29 CFR 1910.120 Hazardous Waste Operations and Emergency Response

29 CFR 1926 Safety and Health Regulations for Construction

29 CFR 1926.65 Hazardous Waste Operations and Emergency Response

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

1.2 PRECONSTRUCTION SAFETY CONFERENCE

Conduct a preconstruction safety conference prior to the start of site activities and after submission of the Accident Prevention Plan/Site Safety And Health Plan (APP/SSHP). The objective of the meeting is to discuss health and safety concerns related to the impending work, discuss project health and safety organization and expectations, review and answer comments and concerns regarding the APP/SSHP or other health and safety concerns. Ensure that those individuals responsible for health and safety at the project level are available and attend this meeting.

1.3 SUBMITTALS

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

SD-02 Shop Drawings

Work Zones; G

Decontamination Facilities; G

SD-03 Product Data

Amendments to the APP/SSHP; G

Exposure Monitoring/Air Sampling Program

Site Control Log

SSHO's Daily Inspection Logs

SD-07 Certificates

Certificate Of Worker/Visitor Acknowledgement

SD-11 Closeout Submittals

Safety And Health Phase-Out Report; G

1.4 ACCIDENT PREVENTION PLAN/SITE SAFETY AND HEALTH PLAN (APP/SSHP)

Develop and implement a Site Safety and Health Plan in accordance with Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS, and attach to the Accident Prevention Plan (APP) as an appendix (APP/SSHP). Address all occupational safety and health hazards (traditional construction as well as contaminant-related hazards) associated with cleanup operations within the APP/SSHP. Cover each SSHP element in sections 28.A.01 and 33.B of EM 385-1-1 and each APP element in Appendix A of EM 385-1-1. There are overlapping elements in Section 28.A.01 and Appendix A of EM 385-1-1. SSHP appendix elements that overlap with APP elements need not be duplicated in the APP/SSHP provided each safety and occupational health (SOH) issue receives adequate attention and is documented in the APP/SSHP. The APP/SSHP is a dynamic document, subject to change as project operations/execution change. Modify the APP/SSHP to address changing and previously unidentified health and safety conditions. Ensure that the APP/SSHP is updated accordingly. Submit amendments to the APP/SSHP to the Contracting Officer as the APP/SSHP is updated. For long duration projects

resubmit the APP/SSHP to the Contracting Officer annually for review. The APP/SSHP must contain all updates.

1.4.1 Acceptance and Modifications

Prior to submittal, the APP/SSHP must be signed and dated by the Safety and Health Manager and the Site Superintendent. Submit for review 14 days prior to the Preconstruction Safety Conference. Deficiencies in the APP/SSHP will be discussed at the preconstruction safety conference, and must be revised to correct the deficiencies and resubmitted for acceptance. Onsite work must not begin until the plan has been accepted. Maintain a copy of the written APP/SSHP onsite. Changes and modifications to the APP/SSHP must be made with the knowledge and concurrence of the Safety and Health Manager, the Site Superintendent, and the Contracting Officer. Bring to the attention of the Safety and Health Manager, the Site Superintendent, and the Contracting Officer any unforeseen hazard that becomes evident during the performance of the work, through the Site Safety and Health Officer (SSHO) for resolution as soon as possible. In the interim, take necessary action to re-establish and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public, and the environment. Disregard for the provisions of this specification or the accepted APP/SSHP is cause for stopping work until the matter has been rectified.

1.4.2 Availability

Make available the APP/SSHP in accordance with 29 CFR 1910.120, (b) (1) (v) and 29 CFR 1926.65, (b) (1) (v).

1.5 STAFF ORGANIZATION, QUALIFICATION AND RESPONSIBILITIES

Provide hazardous waste operations and emergency response organization in accordance with EM 385-1-1, Section 33.

1.5.1 Safety and Health Manager

Safety and Health Manager must be an Industrial Hygienist certified by the American Board of Industrial Hygiene.

Apply the following in conjunction with the required qualifications and responsibilities stated in EM 385-1-1, Section 33.C.01.

1.5.1.1 Additional Qualifications

The Safety and Health Manager must have the following qualifications:

- a. A minimum of 3 years experience in developing and implementing safety and occupational health programs .
- b. Documented experience in supervising professional and technician level personnel.
- c. Documented experience in developing worker exposure assessment programs and air monitoring programs and techniques.
- d. Documented experience in managing personal protective equipment (PPE) programs and conducting PPE hazard evaluations for the types of activities and hazards likely to be encountered on the project.

- e. Working knowledge of state and Federal occupational safety and health regulations.

1.5.1.2 Responsibilities and Duties

- a. Development, implementation, oversight, and enforcement of the APP/SSHP.
- b. Provide onsite consultation as needed to ensure the APP/SSHP is fully implemented.
- c. Conduct initial site-specific training.
- d. Be present onsite during the **before start** of remedial activities and at the startup of each new major phase of work.
- e. Visit the site as needed and at least once per week for the duration of activities, to audit the effectiveness of the APP/SSHP.
- f. Be available for emergencies.
- g. Coordinate any modifications to the APP/SSHP with the Site Superintendent, the SSHO, and the Contracting Officer.
- h. Be responsible for evaluating air monitoring data and recommending changes to engineering controls, work practices, and PPE.
- i. Provide continued support for upgrading/downgrading of the level of personal protection.
- j. Serve as a member of the quality control staff.
- k. Review accident reports and results of daily inspections.
- l. Sign and date the APP/SSHP prior to submittal.

1.5.2 Site Safety and Health Officer

Designate an individual and one alternate as the Site Safety and Health Officer (SSHO). Include the name, qualifications (education and training summary and documentation), and work experience of the Site Safety and Health Officer and alternate in the APP/SSHP.

The Apply the following in conjunction with the required qualifications and responsibilities stated in **EM 385-1-1**, Section 33.C.02.

1.5.2.1 Qualifications

The following requirements are in addition to those in Section **01 35 26** GOVERNMENTAL SAFETY REQUIREMENTS.

- a. A minimum of 1 year experience in implementing SOH programs where personal protective equipment was required.
- b. Meet **29 CFR 1910.120/29 CFR 1926.65** requirements for 40-hour initial and 8-hour supervisor training and, maintain 8-hour refresher training requirements.
- c. Specific training in personal and respiratory protective equipment,

confined space entry and in the proper use of air monitoring instruments and air sampling methods including monitoring for ionizing radiation.

- d. Documented experience in construction techniques and construction safety procedures.
- e. Working knowledge of Federal and state occupational SOH regulations.

1.5.2.2 Responsibilities and Duties

The following requirements are in addition to those in Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS.

- a. Assist and represent the Safety and Health Manager in onsite training and the day to day onsite implementation and enforcement of the accepted APP/SSHP.
- b. Be assigned to the site on a full time basis for the duration of field activities. The SSHO can have collateral duties in addition to SOH related duties. If operations are performed during more than 1 work shift per day, a site Safety and Health Officer must be present for each shift and when applicable, act as the radiation safety officer (RSO) as defined in paragraph 06.F.02 of EM 385-1-1 on radioactive waste cleanup projects.
- c. Have authority to stop work if unacceptable health or safety conditions exist, and take necessary action to re-establish and maintain safe working conditions.
- d. Have authority to ensure site compliance with specified SOH requirements, Federal, state and OSHA regulations and all aspects of the APP/SSHP including, but not limited to, activity hazard analyses, air monitoring, monitoring for ionizing radiation, use of PPE, decontamination, site control, standard operating procedures used to minimize hazards, safe use of engineering controls, the emergency response plan, confined space entry procedures, spill containment program, and preparation of records by performing a daily SOH inspection and documenting results on the Daily Safety Inspection Log in accordance with 29 CFR 1904.
- e. In coordination with site management and the Safety and Health Manager, recommend corrective actions for identified deficiencies and oversee the corrective actions.
- f. Consult with and coordinate any modifications to the APP/SSHP with the Safety and Health Manager, the Site Superintendent, and the Contracting Officer.
- g. Conduct daily safety inspection and document SOH findings into the Daily Safety Inspection Log. Track noted SOH deficiencies to ensure that they are corrected.
- h. Conduct accident investigations and prepare accident reports.
- i. Serve as a member of the quality control staff on matters relating to SOH.

1.5.3 Additional Certified Health and Safety Support Personnel

Retain industrial hygiene support from an industrial hygienist certified by the American Board of Industrial Hygiene to develop occupational health practices for the APP/SSHP and, if necessary, visit the site to help implement APP/SSHP requirements.

1.5.4 Occupational Physician

Utilize the services of a licensed physician, who is certified in occupational medicine by the American Board of Preventative Medicine, or who, by necessary training and experience is Board eligible. The physician must be familiar with the site's hazards and the scope of this project. Include the medical consultant's name, qualifications, and knowledge of the site's conditions and proposed activities in the APP/SSHP. The physician is responsible for the determination of medical surveillance protocols and for review of examination/test results performed in compliance with 29 CFR 1910.120, (f) and 29 CFR 1926.65, (f) and paragraph MEDICAL SURVEILLANCE PROGRAM.

1.5.5 Persons Certified in First Aid and CPR

At least two persons who are currently certified in first aid and CPR by the American Red Cross or other approved agency must be onsite at all times during site operations. They must be trained in universal precautions and the use of PPE as described in the Bloodborne Pathogens Standard of 29 CFR 1910, Section .1030. These persons may perform other duties but must be immediately available to render first aid when needed.

1.5.6 Safety and Health Technicians

For each work crew in the exclusion zone, one person, designated as a Safety and Health technician, must perform activities such as air monitoring, decontamination, and safety oversight on behalf of the SSHO. They must have appropriate training equivalent to the SSHO in each specific area for which they have responsibility and report to and be under the supervision of the SSHO.

1.6 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES

Develop and implement an Emergency Response Plan, that meets the requirements of EM 385-1-1 Section 33.G, 29 CFR 1910.120 (l) and 29 CFR 1926.65 (l), as a section of the APP/SSHP. In the event of any emergency associated with remedial action, without delay, alert all onsite employees and as necessary offsite emergency responders that there is an emergency situation; take action to remove or otherwise minimize the cause of the emergency; alert the Contracting Officer; and institute measures necessary to prevent repetition of the conditions or actions leading to, or resulting in, the emergency. Train employees that are required to respond to hazardous emergency situations to their level of responsibility according to 29 CFR 1910.120 (q) and 29 CFR 1926.65 (q) requirements. Rehearse the plan regularly as part of the overall training program for site operations. Review the plan periodically and revised as necessary to reflect new or changing site conditions or information. Provide copies of the Emergency Response Portion of the accepted APP/SSHP to the affected local emergency response agencies. Address, as a minimum, the following elements in the plan:

- a. Pre-emergency planning. Coordinate with local emergency response

providers during preparation of the Emergency Response Plan. At a minimum, coordinate with local fire, rescue, hazardous materials response teams, police and emergency medical providers to assure all organizations are capable and willing to respond to and provide services for on-site emergencies. Ensure the Emergency Response Plan for the site is compatible and integrated with the local fire, rescue, medical and police security services available from local emergency response planning agencies.

- b. Personnel roles, lines of authority, communications for emergencies.
- c. Emergency recognition and prevention.
- d. Site topography, layout, and prevailing weather conditions.
- e. Criteria and procedures for site evacuation (emergency alerting procedures, employee alarm system, emergency PPE and equipment, safe distances, places of refuge, evacuation routes, site security and control).
- f. Route maps to nearest prenotified medical facility. Site-support vehicles must be equipped with maps. At the beginning of project operations, drivers of the support vehicles must become familiar with the emergency route and the travel time required.
- g. Specific procedures for decontamination and medical treatment of injured personnel.
- h. Emergency alerting and response procedures including posted instructions and a list of names and telephone numbers of emergency contacts (physician, nearby medical facility, fire and police departments, ambulance service, Federal, state, and local environmental agencies; as well as Safety and Health Manager, the Site Superintendent, the Contracting Officer and their alternates).
- i. Criteria for initiating community alert program, contacts, and responsibilities.
- j. Procedures for reporting incidents to appropriate government agencies. In the event that an incident such as an explosion or fire, or a spill or release of toxic materials occurs during the course of the project, the appropriate government agencies must be immediately notified. In addition, verbally notify the Contracting Officer and the local district safety office immediately and submit a written notification within 24 hours. Include within the report the following items:
 - (1) Name, organization, telephone number, and location of the Contractor.
 - (2) Name and title of the person(s) reporting.
 - (3) Date and time of the incident.
 - (4) Location of the incident, i.e., site location, facility name.
 - (5) Brief summary of the incident giving pertinent details including type of operation ongoing at the time of the incident.
 - (6) Cause of the incident, if known.

- (7) Casualties (fatalities, disabling injuries).
- (8) Details of any existing chemical hazard or contamination.
- (9) Estimated property damage, if applicable.
- (10) Nature of damage, effect on contract schedule.
- (11) Action taken to ensure safety and security.
- (12) Other damage or injuries sustained, public or private.

k. Procedures for critique of emergency responses and follow-up.

1.7 CERTIFICATE OF WORKER/VISITOR ACKNOWLEDGEMENT

A copy of a [certificate of worker/visitor acknowledgement](#) must be completed and submitted for each visitor allowed to enter contamination reduction or exclusion zones, and for each employee, following the Example Certificate Of Worker/Visitor Acknowledgement at the end of this section.

1.8 INSPECTIONS

Attach to and submit with the Daily Quality Control reports the [SSHO's Daily Inspection Logs](#). Include with each entry the following: date, work area checked, employees present in work area, PPE and work equipment being used in each area, special SOH issues and notes, and signature of preparer.

1.9 SAFETY AND HEALTH PHASE-OUT REPORT

Submit a [Safety and Health Phase-Out Report](#) in conjunction with the project close out report, prior to final acceptance of the work. Include the following minimum information :

- a. Summary of the overall performance of SOH (e.g., accidents or incidents including near misses, unusual events, lessons learned).
- b. Final decontamination documentation including procedures and techniques used to decontaminate equipment, vehicles, and on site facilities.
- c. Summary of exposure monitoring and air sampling accomplished during the project.
- d. Signatures of Safety and Health Manager and SSHO.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

Comply with [EM 385-1-1](#), [29 CFR 1926.65](#), [29 CFR 1910.120](#), OSHA requirements in [29 CFR 1910](#) and [29 CFR 1926](#) with work performed under this contract, and state specific OSHA requirements where applicable. Submit to the Contracting Officer for resolution matters of interpretation of standards before starting work. The most stringent requirements apply where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary.

2.2 PERSONAL PROTECTIVE EQUIPMENT

2.2.1 Site Specific PPE Program

Provide onsite personnel exposed to contaminants with appropriate personal protective equipment. Components of levels of protection (B, C, D and modifications) must be relevant to site-specific conditions, including heat and cold stress potential and safety hazards. Use only respirators approved by NIOSH.

Keep protective equipment and clothing clean and well maintained. Include site-specific procedures to determine PPE program effectiveness and for onsite fit-testing of respirators, cleaning, maintenance, inspection, cartridge change out, and storage of PPE within the PPE section of the APP/SSHP.

2.2.2 Levels of Protection

The Safety and Health Manager must establish and evaluate as the work progresses the levels of protection for each work activity. Also establish action levels for upgrade or downgrade in levels of PPE. Describe in the SSHP the protocols and the communication network for changing the level of protection. Address air monitoring results, potential for exposure, changes in site conditions, work phases, job tasks, weather, temperature extremes, and individual medical considerations within the PPE evaluation protocol.

2.2.3 PPE for Government Personnel

Three clean sets of personal protective equipment and personal dosimeters for work on radioactive waste cleanup sites and clothing (excluding air-purifying negative-pressure respirators and safety shoes, which will be provided by individual visitors), as required for entry into the Exclusion Zone and Contamination Reduction Zone, must be available for use by the Contracting Officer or official visitors. The items must be cleaned, maintained and stored and clearly marked: "FOR USE BY GOVERNMENT ONLY." Provide basic training in the use and limitations of the PPE provided.

2.3 EMERGENCY EQUIPMENT AND FIRST AID REQUIREMENTS

Maintain, as a minimum, the following items onsite and available for immediate use:

- a. First aid equipment and supplies approved by the consulting physician.
- b. Emergency eyewashes and showers that comply with ANSI/ISEA Z358.1.
- c. Provide fire extinguishers of sufficient size and type at site facilities and in all vehicles and at any other site locations where flammable or combustible materials present a fire risk.

PART 3 EXECUTION

3.1 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION

3.1.1 Project/Site Conditions

Refer to the following reports and information for the site description and contamination characterization. They are located at the ROICC offices.

3.1.2 Ordnance and Explosives (OE)

Stop work and contact the Contracting Officer if ordnance and explosives (OE), explosive media or chemical agent contaminated media (CACM) are discovered during HTRW site cleanup activities.

3.2 TASK SPECIFIC HAZARDS, INITIAL PPE, HAZWOPER MEDICAL SURVEILLANCE AND TRAINING APPLICABILITY

Task specific occupational hazards, task specific HAZWOPER medical surveillance and training applicability and task specific initial PPE requirements for the project are listed on the Task Hazard and Control Sheets at the end of this section. Reevaluate occupational safety and health hazards as the work progresses and to adjust the PPE and onsite operations, if necessary, so that the work is performed safely and in compliance with occupational safety and health regulations.

3.3 TRAINING

In conjunction with EM 385-1-1, Section 33D, meet the training program requirements for workers performing cleanup operations and who will be exposed to contaminants.

3.3.1 General HTRW Operations Training

All Personnel performing duties with potential for exposure to onsite contaminants must meet and maintain the following 29 CFR 1910.120/29 CFR 1926.65 (e) training requirements:

- a. 40 hours of off site HTRW instruction.
- b. 3 days actual on-the-job field experience under the direct supervision of a trained, experienced supervisor.
- c. 8 hours refresher training annually.

Onsite supervisors must have an additional 8 hours management and supervisor training specified in 29 CFR 1910.120/29 CFR 1926.65 (e) (4).

3.3.2 Pre-Entry Briefing

Prior to commencement of onsite field activities, all site employees, including those assigned only to the Support Zone, must attend a site-specific SOH training session. This session will be conducted by the Safety and Health Manager and the Site Safety and Health Officer to ensure that all personnel are familiar with requirements and responsibilities for maintaining a safe and healthful work environment. Thoroughly discuss procedures and contents of the accepted APP/SSHP and Sections 01.B.02 and 28.D.03 of EM 385-1-1. Each employee must sign a training log to acknowledge attendance and understanding of the training. Notify the Contracting Officer at least 5 days prior to the initial site-specific training session so government personnel involved in the project may attend.

3.3.3 Periodic Sessions

Conduct periodic onsite training by the SSHO at least weekly for personnel assigned to work at the site during the following week. Address SOH procedures, work practices, any changes in the APP/SSHP, activity hazard

analyses, work tasks, or schedule; results of previous week's air monitoring, review of safety discrepancies and accidents. Convene a meeting prior to implementation of the change should an operational change affecting onsite field work be made, to explain SOH procedures. Conduct a site-specific training sessions for new personnel, visitors, and suppliers by the SSHO using the training curriculum outlines developed by the Safety and Health Manager. Each employee must sign a training log to acknowledge attendance and understanding of the training.

3.3.4 Other Training

3.4 MEDICAL SURVEILLANCE PROGRAM

Meet all requirements of 29 CFR 1910.120/29 CFR 1926.65 medical surveillance program and EM 385-1-1, Section 33.G for workers performing cleanup operations and who will be exposed to contaminants. Ensure the Occupational Physician or the physician's designee performs the physical examinations and reviews examination results. Participation in the medical surveillance program is without cost to the employee, without loss of pay and at a reasonable time and place.

3.5 EXPOSURE MONITORING/AIR SAMPLING PROGRAM

Prepare and implement by the Safety and Health Manager an exposure monitoring/air sampling program to identify and quantify SOH hazards and airborne levels of hazardous substances in order to assure proper selection of engineering controls, work practices and personal protective equipment for affected site personnel. Include action levels for upgrading/downgrading PPE in the program. Submit personnel exposure monitoring/sampling results.

3.6 HEAT STRESS MONITORING AND MANAGEMENT

Document in the APP/SSHP and implement the procedures and practices in section 06.J. in EM 385-1-1 to monitor and manage heat stress.

3.7 SPILL AND DISCHARGE CONTROL

Develop and implement written spill and discharge containment/control procedures. Address radioactive wastes, shock sensitive wastes, laboratory waste packs, material handling equipment, as well as drum and container handling, opening, sampling, shipping and transport. Describe prevention measures, such as building berms or dikes; spill control measures and material to be used (e.g. booms, vermiculite); location of the spill control material; personal protective equipment required to cleanup spills; disposal of contaminated material; and who is responsible to report the spill. Storage of contaminated material or hazardous materials must be appropriately bermed, diked and contained to prevent any spillage of material on uncontaminated soil. If the spill or discharge is reportable, or human health or the environment are threatened, notify the National Response Center, the state, and the Contracting Officer as soon as possible. Provide control as required by Section 01 57 19 TEMPORARY ENVIRONMENT CONTROLS. Reporting requirements must be in accordance with .

3.8 MATERIALS TRANSFER SAFETY

Remove liquids and residues from the tanks using explosion-proof or air-driven pumps. In accordance with EM 385-1-1, Section 9, electrically

bond the tank and ground pump motors and suction hoses to prevent electrostatic ignition hazards. Use of a hand pump will be permitted to remove the last of the liquid from the bottom of the tanks. If a vacuum truck is used for removal of liquids or residues, the area of operation for the vacuum truck must be vapor free. Locate the truck upwind from the tank and outside the path of probable vapor travel. Discharge the vacuum pump exhaust gases through a hose of adequate size and length downwind of the truck and tank area. Vacuum truck operating and safety practices must conform to [API RP 2219](#). Collect tank residues in drums, tanks, or tank trucks labeled according to [49 CFR 171](#) and [49 CFR 172](#) and disposed of as specified. Disconnect and drain fittings and lines of their contents after the materials have been transferred and the tanks have been exposed. Do not spill contents into the environment during cutting or disconnecting of tank fittings. Transfer materials drained into DOT-approved drums for storage and transportation. Use only non-sparking or non-heat producing tools to disconnect and drain or to cut through tank fittings. Electrical equipment (e.g., pumps, portable hand tools) used for tank preparation must be explosion-proof. Following cutting or disconnecting of the fittings, plug openings leading to the tanks.

3.9 SITE CONTROL MEASURES

Coordinate site control measures with Section [01 57 19](#) TEMPORARY ENVIRONMENT CONTROLS.

3.9.1 Work Zones

Initial anticipated work zone boundaries (exclusion zone, contamination reduction zone, support zone, all access points and decontamination areas) are to be clearly delineated on the site drawings. Base delineation of work zone boundaries on the contamination characterization data and the hazard/risk analysis to be performed as described in [EM 385-1-1 06.A.02](#). As work progresses and field conditions are monitored, work zone boundaries may be modified (and site drawings modified) with approval of the Contracting Officer. Clearly identify work zones and mark in the field (using fences, tape, or signs). Submit and post a site map, showing work zone boundaries and locations of decontamination facilities in the onsite office. Work zones must consist of the following:

3.9.1.1 Exclusion Zone (EZ)

The exclusion zone is the area where hazardous contamination is either known or expected to occur and the greatest potential for exposure exists. Control entry into this area and exit may only be made through the Contamination Reduction Zone (CRZ).

3.9.1.2 Contamination Reduction Zone (CRZ)

The CRZ is the transition area between the Exclusion Zone and the Support Zone. The personnel and equipment decontamination areas must be separate and unique areas located in the CRZ.

3.9.1.3 Support Zone (SZ)

The Support Zone is defined as areas of the site, other than exclusion zones and contamination reduction zones, where workers do not have the potential to be exposed to hazardous substances or dangerous conditions resulting from HTRW operations. Secure the Support Zone against active or passive contamination. Site offices, parking areas, and other support

facilities must be located in the Support Zone.

3.9.2 Site Control Log

A log of personnel visiting, entering, or working on the site must be maintained. Include the following: date, name, agency or company, time entering and exiting site, time entering and exiting the exclusion zone (if applicable). Before visitors are allowed to enter the Contamination Reduction Zone or Exclusion Zone, they must show proof of current training, medical surveillance and respirator fit testing (if respirators are required for the tasks to be performed) and fill out a Certificate of Worker or Visitor Acknowledgment. Record this visitor information, including date, in the log.

3.9.3 Communication

Provide and install an employee alarm system that has adequate means of on and off site communication in accordance with 29 CFR 1910 Section .165. The means of communication must be able to be perceived above ambient noise or light levels by employees in the affected portions of the workplace. The signals must be distinctive and recognizable as messages to evacuate or to perform critical operations.

3.9.4 Site Security

Provide the following site security: Print signs in bold large letters on contrasting backgrounds. Signs must be visible from all points where entry might occur and at such distances from the restricted area that employees may read the signs and take necessary protective steps before entering.

3.10 PERSONAL HYGIENE AND DECONTAMINATION

Personnel entering the Exclusion or Contamination Reduction Zones or otherwise exposed to hazardous chemical vapors, gases, liquids, or contaminated solids must decontaminate themselves and their equipment prior to exiting the contamination reduction zone (CRZ) and entering the support zone. Consult Chapter 10.0 of NIOSH 85-115 when preparing decontamination procedures. Submit a detailed discussion of personal hygiene and decontamination facilities and procedures to be followed by site workers as part of the APP/SSHP. Train employees in the procedures and enforce the procedures throughout site operations.

3.10.1 Decontamination Facilities

Submit drawings showing the layout of the personnel and equipment decontamination areas.

3.10.2 Personnel Decontamination

Initially set up a decontamination line in the CRZ. Employees must exit the exclusion zone through the CRZ and implement the following decontamination procedures and techniques: Scrub and rinse water proof outer garments hand and face wash. Showers, if needed, must comply with 29 CFR 1910, Section.141 and EM 385-1-1, 02 F, Washing Facilities. It is the Site Safety and Health Officer's responsibility to recommend techniques to improve personnel decontamination procedures, if necessary.

3.10.3 Equipment Decontamination

Decontaminate the vehicles and equipment used in the EZ in the CRZ prior to leaving the EZ.

3.10.3.1 Facilities for Equipment and Personnel

Provide a vehicle/equipment decontamination station within the CRZ for decontaminating vehicles and equipment leaving the EZ.

3.10.3.2 Procedures

Procedures for equipment decontamination must be developed and utilized to prevent the spread of contamination into the SZ and offsite areas. These procedures must address disposal of contaminated products and spent materials used on the site, including, as a minimum, containers, fluids, and oils. Assume any item taken into the EZ to be contaminated and perform an inspection and decontaminate. Vehicles, equipment, and materials must be cleaned and decontaminated prior to leaving the site. Handle construction material in such a way as to minimize the potential for contaminants being spread or carried offsite. Prior to exiting the site, vehicles and equipment must be monitored to ensure the adequacy of decontamination.

Task Hazard and Control Requirements Sheet	
Task	
Initial Anticipated Hazards	
Initial PPE	
Initial Controls	
Initial Exposure Monitoring	
No	HAZWOPER Medical Surveillance Required
Yes	HAZWOPER Training Required

-- End of Section --

SECTION 01 42 00

SOURCES FOR REFERENCE PUBLICATIONS

02/19

PART 1 GENERAL

1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the standards producing organization (e.g., ASTM B564 Standard Specification for Nickel Alloy Forgings). However, when the standards producing organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

1.2 ORDERING INFORMATION

The addresses of the standards publishing organizations whose documents are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided.

AIR BARRIER ASSOCIATION OF AMERICA (ABAA)
1600 Boston-Providence Hwy
Walpole, MA 02081
Ph: 1-866-956-5888
Fax: 1-866-956-5819
Internet: <https://www.airbarrier.org/>

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

ALUMINUM ASSOCIATION (AA)
1400 Crystal Drive
Suite 430
Arlington, VA 22202
Ph: 703-358-2960
E-Mail: info@aluminum.org
Internet: <https://www.aluminum.org/>

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)
1900 E Golf Rd, Suite 1250
Schaumburg, IL 60173
Ph: 847-303-5664
E-mail: customerservice@aamanet.org
Internet: <https://aamanet.org/>

AMERICAN CONCRETE INSTITUTE (ACI)
38800 Country Club Drive
Farmington Hills, MI 48331-3439

Ph: 248-848-3700
Fax: 248-848-3701
Internet: <https://www.concrete.org/>

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

AMERICAN IRON AND STEEL INSTITUTE (AISI)
25 Massachusetts Avenue, NW Suite 800
Washington, DC 20001
Ph: 202-452-7100
Internet: <https://www.steel.org/>

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
1899 L Street, NW, 11th Floor
Washington, DC 20036
Ph: 202-293-8020
Fax: 202-293-9287
E-mail: storemanager@ansi.org
Internet: <https://www.ansi.org/>

AMERICAN PETROLEUM INSTITUTE (API)
1220 L Street, NW
Washington, DC 20005-4070
Ph: 202-682-8000
Internet: <https://www.api.org/>

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

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
Two Park Avenue
New York, NY 10016-5990
Ph: 800-843-2763
Fax: 973-882-1717
E-mail: customercare@asme.org
Internet: <https://www.asme.org/>

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)
520 N. Northwest Highway
Park Ridge, IL 60068
Ph: 847-699-2929
E-mail: customerservice@assp.org
Internet: <https://www.assp.org/>

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448
Ph: 708-995-3019

Fax: 708-479-6139
Internet: <http://www.asse-plumbing.org>

AMERICAN WATER WORKS ASSOCIATION (AWWA)
6666 W. Quincy Avenue
Denver, CO 80235 USA
Ph: 303-794-7711 or 800-926-7337
Fax: 303-347-0804
Internet: <https://www.awwa.org/>

AMERICAN WELDING SOCIETY (AWS)
8669 NW 36 Street, #130
Miami, FL 33166-6672
Ph: 800-443-9353
Internet: <https://www.aws.org/>

ASSOCIATED AIR BALANCE COUNCIL (AABC)
1220 19th St NW, Suite 410
Washington, DC 20036
Ph: 202-737-0202
Fax: 202-315-0285
E-mail: info@aabc.com
Internet: <https://www.aabc.com/>

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

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

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)
PO Box 997377, MS 0500
Sacramento, CA 95899-7377
Ph: 916-558-1784
Internet: <https://www.cdph.ca.gov/>

CAST IRON SOIL PIPE INSTITUTE (CISPI)
2401 Fieldcrest Drive
Mundelein, IL 60060
Ph: 224-864-2910
Internet: <https://www.cispi.org/>

CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC)
1600 Clifton Road
Atlanta, GA 30329-4027
Ph: 800-232-4636
TTY: 888-232-6348
Internet: <https://www.cdc.gov>

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)
933 North Plum Grove Road
Schaumburg, IL 60173-4758
Ph: 847-517-1200
Fax: 847-517-1206
Internet: <http://www.crsi.org/>

COPPER DEVELOPMENT ASSOCIATION (CDA)
Internet: <https://www.copper.org/>

EUROPEAN UNION (EU)
European Commission
Rue de la Loi 200
1000 Bruxelles
Belgium
Ph: +32 2 299 96 96
Internet: https://ec.europa.eu/info/index_en

FM GLOBAL (FM)
270 Central Avenue
Johnston, RI 02919-4949
Ph: 401-275-3000
Fax: 401-275-3029
Internet: <https://www.fmglobal.com/>

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH
(FCCCHR)
USC Foundation Office
Research Annex 219
Los Angeles, CA 90089-7700
Ph: 866-545-6340
Fax: 213-740-8399
E-mail: fccchr@usc.edu
Internet: <https://fccchr.usc.edu/>

GLASS ASSOCIATION OF NORTH AMERICA (GANA)
National Glass Association
1945 Old Gallows Rd., Suite 750
Vienna, VA 22182
Ph: 866-342-5642
Ph: 703-442-4890
Fax: 703-442-0630
Internet: <http://www.glasswebsite.com>

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

ICC EVALUATION SERVICE, INC. (ICC-ES)
3060 Saturn Street, Suite 100
Brea, CA 92821
Ph: 800-423-6587
Fax: 562-695-4694
E-mail: es@icc-es.org

Internet: <https://icc-es.org/>

ILLUMINATING ENGINEERING SOCIETY (IES)
120 Wall Street, Floor 17
New York, NY 10005-4001
Ph: 212-248-5000
Fax: 212-248-5018
E-mail: membership@ies.org
Internet: <https://www.ies.org/>

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
445 and 501 Hoes Lane
Piscataway, NJ 08854-4141
Ph: 732-981-0060 or 800-701-4333
Fax: 732-981-9667
E-mail: onlinesupport@ieee.org
Internet: <https://www.ieee.org/>

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

INTERNATIONAL CODE COUNCIL (ICC)
500 New Jersey Avenue, NW
6th Floor, Washington, DC 20001
Ph: 800-786-4452 or 888-422-7233
Fax: 202-783-2348
E-mail: order@iccsafe.org
Internet: <https://www.iccsafe.org/>

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)
3050 Old Centre Ave. Suite 101
Portage, MI 49024
Ph: 269-488-6382
Fax: 269-488-6383
Internet: <https://www.netaworld.org/>

INTERNATIONAL SAFETY EQUIPMENT ASSOCIATION (ISEA)
1901 North Moore Street
Arlington, VA 22209-1762
Ph: 703-525-1695
Fax: 703-528-2148
Internet: <https://safetyequipment.org/>

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS
INDUSTRY (MSS)
127 Park Street, NE
Vienna, VA 22180-4602
Ph: 703-281-6613
E-mail: info@msshq.org
Internet: <http://msshq.org>

MASTER PAINTERS INSTITUTE (MPI)
2800 Ingleton Avenue
Burnaby, BC CANADA V5C 6G7

Ph: 1-888-674-8937
Fax: 1-888-211-8708
E-mail: info@paintinfo.com or techservices@mpi.net
Internet: <http://www.mpi.net/>

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

NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION (NECA)
3 Bethesda Metro Center, Suite 1100
Bethesda, MD 20814
Ph: 301-657-3110
Fax: 301-215-4500
Internet: <https://www.necanet.org/>

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
1300 North 17th Street, Suite 900
Arlington, VA 22209
Ph: 703-841-3200
Internet: <https://www.nema.org>

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

NATIONAL FENESTRATION RATING COUNCIL (NFRC)
6305 Ivy Lane, Suite 140
Greenbelt, MD 20770
Ph: 301-589-1776
Fax: 301-589-3884
E-Mail: info@nfrfc.org
Internet: <http://www.nfrc.org>

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
1 Batterymarch Park
Quincy, MA 02169-7471
Ph: 800-344-3555
Fax: 800-593-6372
Internet: <https://www.nfpa.org>

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)
Patriots Plaza 1
395 E Street, SW, Suite 9200
Washington, DC 20201
Ph: 800-232-4636
Fax: 513-533-8347
Internet: <https://www.cdc.gov/niosh/>

NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)
10255 West Higgins Road, Suite 600
Rosemont, IL 60018-5607
Ph: 847-299-9070

Fax: 847-299-1183
Internet: <http://www.nrca.net>

NSF INTERNATIONAL (NSF)
789 North Dixboro Road
P.O. Box 130140
Ann Arbor, MI 48105
Ph: 734-769-8010 or 800-NSF-MARK
Fax: 734-769-0109
E-mail: info@nsf.org
Internet: <http://www.nsf.org>

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

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

PORCELAIN ENAMEL INSTITUTE (PEI)
PO Box 920220
Norcross, GA 30010
Ph: 770-676-9366
Fax: 770-409-7280
E-mail: penamel@aol.com
Internet: <http://www.porcelainenamel.com>

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)
2000 Powell Street, Suite 600
Emeryville, CA 94608
Ph: 510-452-8000
Fax: 510-452-8001
E-mail: info@SCSglobalservices.com
Internet: <https://www.scsglobalservices.com/>

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

SINGLE PLY ROOFING INDUSTRY (SPRI)
465 Waverley Oaks Road, Suite 421
Waltham, MA 02452
Ph: 781-647-7026
Fax: 781-647-7222
E-mail: info@spri.org
Internet: <https://www.spri.org/>

SOCIETY FOR PROTECTIVE COATINGS (SSPC)
800 Trumbull Drive
Pittsburgh, PA 15205
Ph: 877-281-7772 or 412-281-2331
Fax: 412-444-3591
E-mail: customerservice@sspc.org
Internet: <http://www.sspc.org>

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)
400 Commonwealth Drive
Warrendale, PA 15096
Ph: 877-606-7323 or 724-776-4841
Fax: 724-776-0790
E-mail: customerservice@sae.org
Internet: <https://www.sae.org/>

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

SPRAY POLYURETHANE FOAM ALLIANCE (SPFA)
3927 Old Lee Hwy. #101B
Fairfax, VA 22030
Ph: 800-523-6154
Fax: 703-222-5816
Internet: <http://www.sprayfoam.org>

STEEL DOOR INSTITUTE (SDI/DOOR)
30200 Detroit Road
Westlake, OH 44145
Ph: 440-899-0010
Fax: 440-892-1404
E-mail: info@steeldoor.org
Internet: <https://www.steeldoor.org/>

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)
1320 North Courthouse Road, Suite 200
Arlington, VA 22201
Ph: 703-907-7700
Fax: 703-907-7727
E-mail: marketing@tiaonline.org
Internet: <https://www.tiaonline.org/>

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

U.S. ARMY CORPS OF ENGINEERS (USACE)
CRD-C DOCUMENTS available on Internet:
<http://www.wbdg.org/ffc/army-coe/standards>
Order Other Documents from:

Official Publications of the Headquarters, USACE
E-mail: hqpublications@usace.army.mil
Internet: <http://www.publications.usace.army.mil/>
or
<https://www.hnc.usace.army.mil/Missions/Engineering-Directorate/TECHINFO/>

U.S. DEPARTMENT OF DEFENSE (DOD)

Order DOD Documents from:
Room 3A750-The Pentagon
1400 Defense Pentagon
Washington, DC 20301-1400
Ph: 703-571-3343
Fax: 215-697-1462
E-mail: customerservice@ntis.gov
Internet: <https://www.ntis.gov/>
Obtain Military Specifications, Standards and Related Publications
from:
Acquisition Streamlining and Standardization Information System
(ASSIST)

Department of Defense Single Stock Point (DODSSP)
Document Automation and Production Service (DAPS)
Building 4/D
700 Robbins Avenue
Philadelphia, PA 19111-5094
Ph: 215-697-6396 - for account/password issues
Internet: <https://assist.dla.mil/online/start/>; account
registration required

Obtain Unified Facilities Criteria (UFC) from:
Whole Building Design Guide (WBDG)
National Institute of Building Sciences (NIBS)
1090 Vermont Avenue NW, Suite 700
Washington, DC 20005
Ph: 202-289-7800
Fax: 202-289-1092
Internet:
<https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc>

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

1200 Pennsylvania Avenue, N.W.
Washington, DC 20004
Ph: 202-564-4700
Internet: <https://www.epa.gov>
--- Some EPA documents are available only from:
National Technical Information Service (NTIS)
5301 Shawnee Road
Alexandria, VA 22312
Ph: 703-605-6060 or 1-800-363-2068
Fax: 703-605-6880
TDD: 703-487-4639
E-mail: info@ntis.gov
Internet: <https://www.ntis.gov/>

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

General Services Administration
1800 F Street, NW
Washington, DC 20405
Ph: 1-844-472-4111
Internet: <https://www.gsaelibrary.gsa.gov/ElibMain/home.do>
Obtain documents from:

Acquisition Streamlining and Standardization Information System
(ASSIST)

Internet: <https://assist.dla.mil/online/start/>; account
registration required

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
8601 Adelphi Road

College Park, MD 20740-6001

Ph: 866-272-6272

Internet: <https://www.archives.gov/>

Order documents from:

Superintendent of Documents

U.S. Government Publishing Office (GPO)

732 N. Capitol Street, NW

Washington, DC 20401

Ph: 202-512-1800 or 866-512-1800

Bookstore: 202-512-0132

Internet: <https://www.gpo.gov/>

UNDERWRITERS LABORATORIES (UL)

2600 N.W. Lake Road

Camas, WA 98607-8542

Ph: 877-854-3577 or 360-817-5500

E-mail: CustomerExperienceCenter@ul.com

Internet: <https://www.ul.com/>

UL Directories available through IHS at <https://ihsmarkit.com/>

UNDERWRITERS LABORATORIES OF CANADA (ULC)

7 Underwriters Road

Toronto, Ontario, Canada M1R 3A9

Ph: 866-937-3852

Fax: 416.757.8727

E-mail: cec@ul.com

Internet: <https://canada.ul.com/>

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

-- End of Section --

SECTION 01 45 10

QUALITY CONTROL

04/23

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

- | | |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ASTM A 880 | (1996) Criteria for Use in Evaluation of Testing Laboratories and Organizations for Examination and Inspection of Steel, Stainless Steel, and Related Alloys |
| ASTM C 1077 | (1998) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation |
| ASTM D 3666 | (2000) Minimum Requirements for Agencies Testing and Inspecting Bituminous Paving Materials |
| ASTM D 3740 | (1999c) Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction |
| ASTM E 329 | (2009) Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction |
| ASTM E 543 | (1999) Evaluating Agencies that Perform Nondestructive Testing |

1.2 SUBMITTALS

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

SD-11 Closeout Submittals

Quality Control Plan (QC PLAN)

Submit a QC plan within 15 calendar days after receipt of Notice of Award.

1.3 INFORMATION FOR THE CONTRACTING OFFICER

Deliver the following to the Contracting Officer:

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

1.4 QC PROGRAM REQUIREMENTS

Establish and maintain a QC program as described in this section. The QC program consists of a QC Organization, a QC Plan, attending a QC Plan meeting, attending a Coordination and Mutual Understanding Meeting, conducting QC meetings, performing three phases of control, performing submittal review, ensuring testing is performed, and preparing QC certifications and documentation necessary to provide materials, equipment, workmanship, fabrication, construction and operations which comply with the requirements of this Contract. The QC program shall cover construction operations on-site and off-site and shall be keyed to the proposed construction sequence. **No Construction work or testing may be performed unless the QC Manager is on the work site.**

1.5 QC ORGANIZATION

1.5.1 QC Manager

1.5.1.1 Duties

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

1.5.1.2 Qualifications

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

Provide a separate QC Specialist at the work site for each of the areas of responsibilities for the following:

Electrical and Telecommunication Systems QC Specialists.

Provide ICC IBC Special Inspection Certification from the following specialist:

Telecommunications Systems Installation Specialist, (10) years minimum experience in Telecommunication Systems Installation.

Area of responsibility:

Telecommunication Systems, all Division 27, Division 28, and Division 33 Outside Plant work.

Frequency of specialists is full time during systems installation and testing. QC Specialists are required to attend the Coordination and Mutual Understanding Meeting, 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.

1.5.1.3 Construction Quality Management Training

In addition to the above experience and education requirements, the QC Manager shall have completed the course entitled "Construction Quality Management for Contractors." This course is periodically offered by the Navy and the Corps of Engineers. However, it is sponsored by both the AGC and the ABC of Charlotte, North Carolina. Call one of the following to sign up for the next available class:

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

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

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

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

or: 877-470-4819

1.5.2 Alternate QC Manager Duties and Qualifications

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

1.6 QC PLAN

1.6.1 Requirements

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

- a. A table of contents listing the major sections identified with tabs in the following order:
 - I. QC ORGANIZATION
 - II. NAMES AND QUALIFICATIONS
 - III. DUTIES, RESPONSIBILITY AND AUTHORITY OF QC PERSONNEL
 - IV. OUTSIDE ORGANIZATIONS
 - V. APPOINTMENT LETTERS
 - VI. SUBMITTAL PROCEDURES AND INITIAL SUBMITTAL REGISTER
 - VII. TESTING LABORATORY INFORMATION
 - VIII. TESTING PLAN AND LOG
 - IX. PROCEDURES TO COMPLETE REWORK ITEMS
 - X. DOCUMENTATION PROCEDURES
 - XI. LIST OF DEFINABLE FEATURES
 - XII. PROCEDURES FOR PERFORMING THE THREE PHASES OF CONTROL
 - XIII. PERSONNEL MATRIX
 - XIV. PROCEDURES FOR COMPLETION INSPECTION
- b. A chart showing the QC organizational structure and its relationship to the production side of the organization.
- c. Names and qualifications, in resume format, for each person in the QC organization.
- d. Duties, responsibilities and authorities of each person in the QC organization.
- e. A listing of outside organizations such as, architectural and consulting engineering firms that will be employed by the Contractor and a description of the services these firms will provide.
- f. A letter signed by an officer of the firm appointing the QC Manager and stating that he/she is responsible for managing and implementing the QC program as described in this contract. Include in this letter the QC Manager's authority to direct the removal and replacement of non-conforming work.
- g. Procedures for reviewing, approving and managing submittals. Provide the names of the persons in the QC organization authorized to review and certify submittals prior to approval.

- h. Testing laboratory information required by the paragraphs entitled "Accredited Laboratories" or "Testing Laboratory Requirements", as applicable.
- i. A Testing Plan and Log that includes the tests required, referenced by the specification paragraph number requiring the test, the frequency, and the person responsible for each test.
- j. Procedures to identify, record, track and complete rework items.
- k. Documentation procedures, including proposed report formats.
- l. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks and requires separate control requirements. As a minimum, if approved by the Contracting Officer, consider each Section of the Specifications as a definable feature of work. However, at times, there may be more than one definable feature of work in each Section of the Specifications.
- m. A personnel matrix showing, for each section of the specification, who will perform and document the three phases of control, and who will perform and document the testing.
- o. Procedures for Identifying and Documenting the Completion Inspection process. Include in these procedures the responsible party for punch out inspection, prefinal inspection, and final acceptance inspection.

1.6.2 Preliminary Work Authorized Prior to Approval

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

1.6.3 Approval

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

1.6.4 Notification of Changes

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

1.7 QC PLAN MEETING

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

1.8 COORDINATION AND MUTUAL UNDERSTANDING MEETING

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

1.9 QC MEETINGS

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

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

1.9.1 THREE PHASES OF CONTROL

The QC Manager shall perform the three phases of control to ensure that

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

1.9.2 Preparatory Phase

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

- a. Review each paragraph of the applicable specification sections;
- b. Review the Contract drawings;
- c. Verify that appropriate shop drawings and submittals for materials and equipment have been submitted and approved. Verify receipt of approved factory test results, when required;
- d. Review the testing plan and ensure that provisions have been made to provide the required QC testing;
- e. Examine the work area to ensure that the required preliminary work has been completed;
- f. Examine the required materials, equipment and sample work to ensure that they are on hand and conform to the approved shop drawings and submitted data;
- g. Review the safety plan and appropriate activity hazard analysis to ensure that applicable safety requirements are met, and that required Material Safety Data Sheets (MSDS) are submitted; and
- h. Discuss construction methods

1.9.3 Initial Phase

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

- a. Establish the quality of workmanship required;
- b. Resolve conflicts;
- c. Review the Safety Plan and the appropriate activity hazard analysis to ensure that applicable safety requirements are met; and

- d. Ensure that testing is performed by an approved laboratory.

1.9.4 Follow-Up Phase

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

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

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

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

1.10 SUBMITTAL REVIEW

Procedures for submittals are as described in Section entitled "01 33 00 Submittal Procedures."

1.11 TESTING

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

1.11.1 Testing Laboratory Requirements

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

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

- f. Laboratories engaged in nondestructive testing (NDT) shall meet the requirements of ASTM E 543.
- g. Laboratories engaged in hazardous materials testing shall meet the requirements of OSHA and EPA.

1.11.2 Accredited Laboratories

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

1.11.3 Inspection of Testing Laboratories

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

1.11.4 Capability Check

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

1.11.5 Test Results

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

1.12 QC CERTIFICATIONS

1.12.1 Contractor Quality Control Report Certification

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

1.12.2 Invoice Certification

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

1.12.3 Completion Certification

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

1.13 DOCUMENTATION

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

1.13.1 Contractor Production Report

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

- a. Date of report, report number, name of contractor, contract number, title and location of Contract and superintendent present.
- b. Weather conditions in the morning and in the afternoon including maximum and minimum temperatures.
- c. A list of Contractor and subcontractor personnel on the work site, their trades, employer, work location, description of work performed and hours worked.
- e. A list of job safety actions taken and safety inspections conducted. Indicate that safety requirements have been met including the results on the following:
 - (1) Was a job safety meeting held this date? (If YES, attach a copy of the meeting minutes.)
 - (2) Were there any lost time accidents this date? (If YES, attach a copy of the completed OSHA report.)
 - (3) Was crane/manlift/trenching/scaffold/hv electrical/high work/hazmat work done? (If YES, attach a statement or checklist showing inspection performed.)
 - (4) Was hazardous material/waste released into the environment? (If YES, attach a description of incident and proposed action.)
- f. A list of safety actions taken today and safety inspections conducted.

- g. A list of equipment/material received each day that is incorporated into the job.
- h. A list of construction and plant equipment on the work site including the number of hours used, idle and down for repair.
- i. Include a "remarks" section in this report which will contain pertinent information including directions received, problems encountered during construction, work progress and delays, conflicts or errors in the drawings or specifications, field changes, safety hazards encountered, instructions given and corrective actions taken, delays encountered and a record of visitors to the work site.

1.13.2 Contractor Quality Control Report

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

- a. Identify the control phase and the definable feature of work.
- b. Results of the Preparatory Phase meetings held including the location of the definable feature of work and a list of personnel present at the meeting. Indicate in the report that for this definable feature of work, the drawings and specifications have been reviewed, submittals have been approved, materials comply with approved submittals, materials are stored properly, preliminary work was done correctly, the testing plan has been reviewed, and work methods and schedule have been discussed.
- c. Results of the Initial Phase meetings held including the location of the definable feature of work and a list of personnel present at the meeting. Indicate in the report that for this definable feature of work the preliminary work was done correctly, samples have been prepared and approved, the workmanship is satisfactory, test results are acceptable, work is in compliance with the Contract, and the required testing has been performed and include a list of who performed the tests.
- d. Results of the Follow-up Phase inspections held including the location of the definable feature of work. Indicate in the report for this definable feature of work that the work complies with the Contract as approved in the Initial Phase, and that required testing has been performed and include a list of who performed the tests.
- e. Results of the three phases of control for off-site work, if applicable, including actions taken.
- f. List the rework items identified, but not corrected by close of business.
- g. List the rework items corrected from the rework items list along with the corrective action taken.

- h. Include a "remarks" section in this report which will contain pertinent information including directions received, quality control problem areas, deviations from the QC plan, construction deficiencies encountered, QC meetings held, acknowledgement that as-built drawings have been updated, corrective direction given by the QC Organization and corrective action taken by the Contractor.
- i. Contractor Quality Control Report certification.

1.13.3 Testing Plan and Log

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

1.13.4 Rework Items List

The QC Manager shall maintain a list of work that does not comply with the Contract, identifying what items need to be reworked, the date the item was originally discovered, and the date the item was corrected. There is no requirement to report a rework item that is corrected the same day it is discovered. Attach a copy of the "Contractor Rework Items List" to the last daily Contractor Quality Control Report of each month. The Contractor shall be responsible for including on this list items needing rework including those identified by the Contracting Officer.

1.13.5 As-Built Drawings

The QC Manager is required to review the as-built drawings required by Section 01 78 00, "Closeout Submittals", to ensure that as-built drawings are kept current on a daily basis and marked to show deviations which have been made from the Contract drawings. The QC Manager shall initial each deviation and each revision. Upon completion of work, the QC Manager shall furnish a certificate attesting to the accuracy of the as-built drawings prior to submission to the Contracting Officer.

1.13.6 Report Forms

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

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

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

SECTION 01 50 00

TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS

12/21

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C511 (2017) Reduced-Pressure Principle Backflow
Prevention Assembly

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2014) Safety and Health Requirements
Manual

1.2 SUBMITTALS

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

SD-01 Preconstruction Submittals

Traffic Control Plan - if applicable

SD-03 Product Data

Backflow Preventers

SD-06 Test Reports

Backflow Preventer Tests

SD-07 Certificates

Backflow Tester Certification

Backflow Preventers Certificate of Full Approval

1.3 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.

1.3.1 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 a company participating in other phases of this Contract.

1.3.2 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.

1.4 WEATHER PROTECTION

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

1.5 DOD CONDITION OF READINESS (COR)

DOD will set the Condition of Readiness (COR) based on the weather forecast for sustained winds 50 knots (60 mph) or greater. Contact the Contracting Officer for the current COR setting.

Monitor weather conditions a minimum of twice a day and take appropriate actions according to the approved Emergency Plan in the accepted Accident Prevention Plan, EM 385-1-1 Section 01 Emergency Planning and the instructions below.

Unless otherwise directed by the Contracting Officer, comply with:

- a. Condition FOUR (Sustained winds of 58 mph 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 3.3 feet high. Remove all debris, trash, or objects that could become missile hazards. Review requirements pertaining to "Condition THREE" and continue action as necessary to attain "Condition FOUR" readiness. Contact Contracting Officer for weather and COR updates and completion of required actions.
- b. Condition THREE (Sustained winds of 58 mph 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. Reinforce or remove formwork 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 COR updates and completion of required actions. Review requirements pertaining to "Condition TWO" and continue action as necessary to attain "Condition THREE" readiness.

- c. Condition TWO (Sustained winds of 58 mph or greater expected within 24 hours): Secure the jobsite, and leave Government premises.
- d. Condition ONE. (Sustained winds of 58 mph or greater expected within 12 hours): Contractor access to the jobsite and Government premises is prohibited.

1.6 TRAILERS OR STORAGE BUILDINGS

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

Trailers that are placed outside of project boundaries will require base site approval and NEPA review. Any temporary trailer utilities outside the project boundary limit also will require base site approval and NEPA review. Allow 30 days for approval processing and NEPA documentation.

1.7 STORAGE AREAS

The Contract Clause entitled "FAR 52.236-10, Operations and Storage Areas" applies.

PART 2 PRODUCTS

2.1 BACKFLOW PREVENTERS

Reduced pressure principle type conforming to the applicable requirements AWWA C511.

PART 3 EXECUTION

3.1 EMPLOYEE PARKING

Construction Contract employees must park privately owned vehicles in an area designated by the Contracting Officer. 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 Temporary Utilities

- a. The Contract clause related to utilities applies. Reasonable amounts of water and electricity from the nearest outlet will be provided free of charge for pursuance of work within a facility under this contract. If the nearest available outlet cannot be utilized by the Contractor because of improper voltage, insufficient current, improper pressure, incompatible connectors, etc., it shall be the responsibility of the Contractor to provide temporary utilities as

required.

b. Reasonable amounts of utilities for contractor trailers and storage buildings will be made available to the Contractor, when available. The Contractor shall be responsible for providing transformers, electrical service poles and drops for electrical services, and backflow preventer devices on connections to domestic water lines. Final taps and tie-ins to the Government utility grid will be made by the Contractor after approval by the Contracting Officer. Tap-in cost, if any, shall be the responsibility of the Contractor. Under no circumstances will taps to base fire hydrants be allowed for obtaining domestic water.

c. Any and all utilities outside the established site boundary in support of trailers or temporary facilities will require both a Site Approval and REIR, which can either be routed separately from the trailer approvals or under the same request.

3.2.2 Energy and Utilites Conservation

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

3.2.3 Location of Underground Utilites

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

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

b. It is mandatory that the Contractor also contact the Base Telephone Office (451-2531) prior to accomplishing any digging at Camp Lejeune. A telephone office representative will assist in locating telephone lines.

c. It is mandatory that the Contractor also contact Charter Communications, cable TV service prior to accomplishing any digging at Camp Lejeune, to ensure that all buried cable lines are identified. Contact Mr. Olin Criswell at 353-8677 for assistance.

d. It is mandatory that the contractor also contact the North Carolina One-Call Center to coordinate the location of underground natural gas infrastructure. North Carolina 811, Inc. can be reached at 811 on a touch-tone phone in the state of North Carolina or toll-free at 1.800.632.4949 if calling from out of state.

3.2.4 Damage to Underground Utilities

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

3.2.5 Sanitation

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

3.3 STATION OPERATION AFFECT ON CONTRACTOR OPERATIONS

3.3.1 Restricted Access Areas

Follow guidelines identified on drawings and in scope of work.

3.4 TRAFFIC PROVISIONS

3.4.1 Traffic Control Plan

If during the performance of work, it becomes necessary to modify vehicular traffic patterns at any locations, notify 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 plans shall be in accordance with State and local regulations and the MUTCD, Part VI. Make all notifications and obtain any permits required for modification to traffic movements outside Station's jurisdiction. Provide cones, signs, barricades, lights, or other traffic control devices and personnel required to control traffic.

3.4.2 Dust Control

Dust control methods and procedures must be approved by the Contracting Officer. Coordinate dust control methods with 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS.

3.5 REDUCED PRESSURE BACKFLOW PREVENTERS

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

Perform [backflow preventer tests](#) using test equipment, procedures, and certification forms conforming to those outlined in the latest edition of the Manual of Cross-Connection Control published by the FCCCHR Manual. Test and tag each reduced pressure backflow preventer upon initial installation (prior to continued water use). Tag must contain the

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

3.6 DUMPSTERS

Equip dumpsters with a secure cover and paint the standard installation color. Keep dumpster closed, except when being loaded with trash and debris. 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 installation color to collect debris in the construction site area. For large demolitions, large dumpsters without lids are acceptable, but must not have debris higher than the sides before emptying.

3.7 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 all salvageable materials resulting from demolition activities within the fenced area described above or at the supplemental storage area. Neatly stack stored materials not in trailers, whether new or salvaged.

3.8 RESTORATION OF STORAGE AREA

Upon completion of the project remove the bulletin board, signs, barricades, haul roads, and all other temporary products from the site. After removal of trailers, materials, and equipment from within the fenced area, remove the fence. Restore areas used during the performance of the Contract to the original or better condition. Remove gravel used to traverse grassed areas and restore the area to its original condition, including top soil and seeding as necessary.

-- End of Section --

SECTION 01 57 19

TEMPORARY ENVIRONMENTAL CONTROLS

05/12

PART 1 GENERAL

1.1 REFERENCES

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

U.S. DEPARTMENT OF DEFENSE (DOD)

- | | |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| MIL-S-16165 | (Rev E) Shielding Harnesses, Shielding Items and Shielding Enclosures for Use in the Reduction of Interference from Engine Electrical Systems |
| MIL-STD-461 | (2015; Rev G) Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment |
| MIL-STD-462 | (Rev D; Notice 4) Electromagnetic Interference Characteristics |

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

- | | |
|-------------|-------------------------------------------------------------------------------------|
| 29 CFR 1910 | Occupational Safety and Health Standards |
| 40 CFR 261 | Identification and Listing of Hazardous Waste |
| 40 CFR 262 | Generators of Hazardous Waste |
| 40 CFR 263 | Transporters of Hazardous Waste |
| 40 CFR 264 | Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities |
| 40 CFR 265 | Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities |
| 40 CFR 300 | National Oil and Hazardous Substances Pollution Contingency Plan |
| 49 CFR 171 | General Information, Regulations, and Definitions |
| 49 CFR 172 | Hazardous Materials Tables and Hazardous Materials Communications Regulations |

49 CFR 178

Shipping Container Specification

1.2 Contractor Liabilities for Environmental Protection

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

1.3 DEFINITIONS

1.3.1 Sediment

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

1.3.2 Solid Waste

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

1.3.3 Sanitary Wastes

Wastes characterized as domestic sanitary sewage.

1.3.4 Rubbish

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

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

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

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

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

1.3.5 Debris

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

1.3.6 Chemical Wastes

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

1.3.7 Garbage

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

1.3.8 Hazardous Waste

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

1.3.9 Hazardous Materials

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

1.3.10 Landscape Features

Trees, plants, shrubs, and ground cover.

1.3.11 Lead Acid Battery Electrolyte

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

1.3.12 Oily Waste

Petroleum products and bituminous materials.

1.3.13 Class I Ozone Depleting Substance (ODS)

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

1.4 SUBMITTALS

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

SD-01 Preconstruction Submittals

Environmental Protection Plan

SD-06 Test Reports

Abrasive blasting

waste materials - if applicable

Submit a copy of an approved laboratory analysis of materials collected as a result from abrasive blasting operations before disposing of waste materials.

SD-11 Closeout Submittals

Solid waste disposal permit

Disposal permit for hazardous waste

Environmental training documentation

Permit to transport hazardous waste

Hazardous waste certification

Environmental Plan Review

Annual Report of Products Containing Recovered Materials

1.4.1 Solid Waste Disposal Permit

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

1.4.2 Disposal Permit for Hazardous Waste

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

1.4.3 Permit to Transport Hazardous Waste

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

1.4.4 Hazardous Waste Certification

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

1.5 ENVIRONMENTAL PROTECTION REGULATORY REQUIREMENTS

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

1.6 ENVIRONMENTAL PROTECTION PLAN

1.6.1 Contents of environmental Protection Plan

- a. Include any hazardous materials (HM) planned for use on the station shall be included in the station HM Tracking Program maintained by the Safety Department. To assist this effort, submit a list (including quantities) of HM to be brought to the station and copies of the corresponding material safety data sheets (MSDS). Submit this list to the Contracting Officer. At project completion, remove any hazardous material brought onto the station. Account for the quantity of HM brought to the station, the quantity used or expended during the job, and the leftover quantity which (1) may have additional useful life as a HM and shall be removed by the Contractor, or (2) may be a hazardous waste, which shall then be removed as specified herein.

- b. The Environmental Protection Plan shall list and quantify any Hazardous Waste (HW) to be generated during the project.
- c. In accordance with station regulations, store HW near the point of generation up to a total quantity of **one quart** of hazardous waste or **55 gallons** of hazardous waste. Move any volume exceeding these quantities to a HW permitted area within 3 days. Prior to generation of HW, contact Contracting Officer for labeling requirements for storage of hazardous wastes.
- d. In accordance with station regulations, substitute materials as necessary to reduce the generation of HW and include a statement to that effect in the Environmental Plan.
- e. Contact Contracting Officer for conditions in the area of the project which may be subject to special environmental procedures. Include this information in the Preconstruction Survey. Describe in the Environmental Protection Plan any permits required prior to working the area, and contingency plans in case an unexpected environmental condition is discovered.
- f. Obtain permits for handling HW, and deliver completed documents to Contracting Officer for review. File the documents with the appropriate agency, and complete disposal with the approval of Contracting Officer. Deliver correspondence with the State concerning the environmental permits and completed permits to Contracting Officer.

1.6.2 Environmental Protection Plan Format

The Environmental Protection Plan shall follow the following format:

ENVIRONMENTAL PROTECTION PLAN

Contractor Organization
Address and Phone Numbers

1. Hazardous materials to be brought onto the station
2. MSDS package
3. Employee training documentation
4. HW storage plan
5. HW to be generated
6. Preconstruction survey results
7. Permitting requirements identified

1.6.3 Environmental Plan Review

Fourteen days after the environmental protection meeting, submit the proposed environmental plan for further discussion, review, and approval.

1.7 ADMINISTRATIVE REQUIREMENTS

1.7.1 Licenses and Permits

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

For permits obtained by the Contracting Officer, whether or not required by

the permit, perform inspections of the work in progress, and submit certifications to the applicable regulatory agency, via the Contracting Officer, that the work conforms to the contract and permit requirements. The inspections and certifications shall be provided through the services of a Professional Engineer, registered in the State where the work is being performed. As a part of the quality control plan, which is required to be submitted for approval by the quality control section, provide a subitem containing the name, P.E. registration number, address, and telephone number of the professional engineer(s) who will be performing the inspections and certifications for each permit listed above.

1.8 GENERAL ENVIRONMENTAL MANAGEMENT SYSTEM AND ENVIRONMENTAL AWARENESS

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

1.9 CAMP LEJEUNE SANITARY LANDFILL INFORMATION SHEET

a. Contractors may ONLY use the Camp Lejeune Sanitary Landfill for the disposal of asbestos containing materials, building products with tightly adhered lead containing paint, non-contaminated clean dirt and clean gravel. The hours of operation are 0730-1530.

b. Delivery of acceptable materials (identified above) shall be by appointment only. Appointments made by phone at 910-451-5011 or 910-451-2946. ALL other contractor generated material shall be weighed through the Base Landfill scales before being removed from the Base. Contractors utilizing the base scales will require Contracting Officer assisted pre-registration with the Landfill Manager.

c. The Contracting Officer will register the contract via E-mail, with the base landfill. All haul vehicles will maintain a secure vehicle placard as a condition to utilize the scale. E-mail the contract information to the Landfill Clerk, including the name on the Prime Contractor, contract number, job name/description, completion date and whether or not any of the above materials will be delivered to the Landfill.

d. As of May 01 2014 the above supersedes any other statements/specifications pertaining to the delivery of materials to the Base Landfill.

PART 2 PRODUCTS

2.1 ANNUAL REPORT OF PRODUCTS CONTAINING RECOVERED MATERIALS

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

PART 3 EXECUTION

3.1 PROTECTION OF NATURAL RESOURCES

Preserve the natural resources within the project boundaries and outside the limits of permanent work. Restore to an equivalent or improved

condition upon completion of work. Confine construction activities to within the limits of the work indicated or specified. Conform to the state permitting requirements of the Clean Water Act.

3.1.1 Land Resources

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

3.1.1.1 Protection of Trees

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

3.1.1.2 Landscape Replacement

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

3.1.1.3 Temporary Construction

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

3.1.2 Water Resources

3.1.2.1 Stream Crossings

The Contracting Officer's approval is required before any equipment will be permitted to ford live streams.

3.1.2.2 Oily Wastes

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

3.1.3 Fish and Wildlife Resources

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.

3.2 HISTORICAL AND ARCHAEOLOGICAL RESOURCES

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

3.3 NOISE

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

3.4 RESTRICTIONS ON EQUIPMENT

3.4.1 Electromagnetic Interference Suppression

- a. Electric motors must comply with MIL-STD-461 relative to radiated and conducted electromagnetic interference. A test for electromagnetic interference will not be required for motors that are identical physically and electrically to those that have previously met the requirements of MIL-STD-461. An electromagnetic interference suppression test will not be required for electric motors without commutation or sliprings having no more than one starting contact and operated at 3,600 revolutions per minute or less.
- b. Equipment used by the Contractor shall comply with MIL-S-16165 for internal combustion engines and MIL-STD-461 for other devices capable of producing radiated or conducted interference.
- c. Conduct tests for electromagnetic interference on electric motors and Contractor's construction equipment in accordance with MIL-STD-461 and MIL-STD-462. Test location shall be reasonably free from radiated and conducted interference. Furnish testing equipment, instruments, and personnel for making the tests; a test location; and other necessary facilities.

3.4.2 Radio Transmitter Restrictions

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

3.5 CONTROL AND DISPOSAL OF SOLID WASTES

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

3.5.1 Disposal of Metal Paint Cans

All metal paint cans shall be taken to Building 962 for recycling. The cans shall be empty and completely dry. The cans shall be triple rinsed and stenciled "Triple Rinsed" prior to turn in. The Contractor shall give

the Government 72 hours advance notice prior to turn-in. Contractor is responsible for rinsing, stenciling, crushing, and deposing in Government owned receptable, located at Building 962.

3.5.2 Disposal of Rubbish and Debris, **Metal and Dirt**

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

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

<u>CATEGORY</u>	<u>CONSTRUCTION DEBRIS DISPOSAL - BASE SANITARY LANDFILL EXAMPLE/GENERAL INFORMATION FOR DEPOSIT IN THE LANDFILL</u>
Recyclable Cardboard	Breakdown corrugated cardboard boxes and deliver to the Base Recycling Center located at Building 982. If base personnel rejects the cardboard, take cardboard for off-base disposal.
Recyclable Wood Pallets	Deliver usable pallets to the Base Recycling Center located at Building 982. If base personnel rejects the pellets, take pallets for off-base disposal.
Organic Matter	Organic matter will not be accepted at the landfill.
*****	Weigh each and every vehicle delivering debris upon entrance and exit. Cover debris.
Metals	Metals will not be accepted at the landfill. Remove metals from each and every category before delivery to landfill. (Example: Remove hardware from doors and windows.) Dispose of metal construction debris at Defense Reutilization Maintenance Office (DRMO). Aluminum, brass, copper, lead, other metal, electrical wiring, cable (cut in 3 foot or less sections)
Treated & Untreated Wood/Lumber	Treated & untreated wood/lumber will not be accepted at the landfill.
Concrete	Concrete will not be accepted at the landfill.
Construction Material	Construction material should be managed and placed in a designated area. Area shall be kept clean of debris and all material removed at the end of the project.
Solid Waste	Separate each category of solid waste to enhance recycling.
Hazardous Material	This project involves demolition, renovation/repair and/or construction activities; therefore, hazardous material (such as paints, solvents, thinners, adhesives, etc) may be used during the execution of this project. The contractor

<u>CATEGORY</u>	<u>CONSTRUCTION DEBRIS DISPOSAL - BASE SANITARY LANDFILL EXAMPLE/GENERAL INFORMATION FOR DEPOSIT IN THE LANDFILL</u>
	will be required to appropriately manage the hazardous material and provide secondary containment.
Solid Waste Report	All solid waste generated and recycled will be weighed. Contractor will report the amount of solid waste disposed and recycled at the end of the project to EMD's Solid Waste Manager or the Pollution Prevention Manager via the OICC. Tonnage information for all materials delivered to the Base Landfill is available at the Landfill Office. Submit a written request to the Landfill Manager, specifying the desired information.
Recycling of Construction Debris	Recyclable material (ex. Scrap metal/aluminum/brass/copper/lead, and other metal) may be recycled through Defense Utilization Maintenance Office) DRMO using a 1348-1a with the following information (Proceeds for the sale of recyclable material are to go to the Qualified Recycling financial account - 17F3875 27RM 00767001 0 000027 3c 000000 06700198004). For additional information contact the Base Recycling Coordinator 910-451-4214.
Electrical Equipment	Before demolition or removal of electrical equipment from the Base - Contractor shall contact Base High Voltage Shop Supervisor at (910) 451-2790, to allow for first right of refusal of electrical equipment such as: ATS, transformers, and generators. Electrical equipment will not be accepted at landfill.

3.5.3 Disposal Off-Base

- a. Provide 24-hour advance written notice to the Contracting Office of Contractor's intention to dispose of off base.
- b. Disposal at sites or landfills not holding a valid State of North Carolina permit is specifically prohibited. The prohibition also applies to sites where a permit may have been applied for but not yet obtained.
- c. Off-base disposal of construction debris outside the parameters of this paragraph at site without State permits and/or not in accordance with regulatory requirements shall require the Contractor at his own expense to remove, transport and relocate the debris to a State approved site. The Contractor shall also be required to pay any fines, penalties, or fees related to the illegal disposal of construction debris

3.6 CONTROL AND DISPOSAL OF HAZARDOUS WASTE

3.6.1 Hazardous Waste Generation

Handle generated hazardous waste in accordance with 40 CFR 262.

3.6.2 Hazardous Waste Disposal

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

3.6.3 Hazardous Waste Storage

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

3.6.4 Spills of Oil and Hazardous Materials

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

3.6.5 Lead-Acid Batteries

Dispose of lead-acid batteries that are not damaged or leaking at a State-approved battery recycle or at a permitted or interim status

hazardous waste TSD facility. For lead-acid batteries that are leaking or have cracked casings, dispose of the electrolyte solution using one of the following alternatives:

- a. An industrial waste water treatment plant, if available and approved by the Contracting Officer for disposing of lead-acid battery electrolyte.
- b. Dispose of the lead-acid battery electrolyte at a permitted or interim status hazardous waste TSD facility.

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

3.6.6 Mercury Control

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

3.6.7 Petroleum Products

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

3.7 DUST CONTROL

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

3.7.1 Abrasive Blasting

3.7.1.1 Blasting Operations

The use of silica sand is prohibited in abrasive blasting.

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](#).

3.7.1.2 Disposal Requirements

Collect dust, abrasive, paint, and other debris resulting from abrasive blasting operations and store in [55 gallon](#) drums with watertight lids. Take a representative sample of this material, and test for EP toxicity with respect to lead, chromium, and cadmium content. The sampling and testing shall be performed in accordance with [40 CFR 261](#). Handle debris resulting from the abrasive blasting operations as a hazardous material, and dispose of in accordance with [40 CFR 262](#), [40 CFR 263](#), [40 CFR 264](#), and

40 CFR 265. Transport hazardous material by a transporter licensed and permitted for transportation of hazardous materials. Dispose of hazardous material in an EPA-approved and permitted facility specifically designated for hazardous waste disposal.

3.8 QUARANTINE FOR IMPORTED FIRE ANT (4/82)

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

- a. Certification is required for the following articles and they shall not be moved from the reservation to any point outside Onslow County and adjacent designated areas unless accompanied by a valid inspection certificate issued by an Officer of the Plant Protection and Quarantine Program (PPQ) of the U.S. Department of Agriculture.
 - (1) Bulk soil
 - (2) Used mechanized soil-moving equipment. (Used mechanized soil-moving equipment is exempt if cleaned of loose noncompacted soil).
 - (3) Other products, articles, or means of conveyances, if it is determined by an inspector that they present a hazard of transporting spread of the imported fire ant and the person in possession thereof has been so notified.
- b. Authorization for movement of equipment outside the imported fire and regulated area shall be obtained from USDA, Animal and Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ), Box 28, Goldsboro, North Carolina, 27533-0028, Attn: Mr. William Scroggins or Mr. Frank Best, telephone (919) 735-1941. If Mr. Scroggins or Mr. Best are not available, contact Mr. Jim Kelley at (910) 815-4667, the supervisor's office in Wilmington. Requests for inspection shall be made sufficiently in advance of the date of movement to permit arrangements for the services of authorized inspectors. The equipment shall be prepared and assembled so that it may be readily inspected. Soil on or attached to equipment, supplies, and materials shall be removed by washing with water or such other means as necessary to accomplish complete removal. Resulting spoil shall be wasted as necessary and as directed.

ANNUAL REPORT OF PRODUCTS CONTAINING RECOVERED MATERIALS

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

Contract Number: _____ Fiscal Year: _____

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

APPENDIX A

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

APPENDIX A

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

APPENDIX A

-- End of Section --

SECTION 01 78 00

CLOSEOUT SUBMITTALS

04/22

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 E1971 (2005; R 2011) Standard Guide for Stewardship for the Cleaning of Commercial and Institutional Buildings

GREEN SEAL (GS)

GS-37 (2017) Cleaning Products for Industrial and Institutional Use

U.S. DEPARTMENT OF DEFENSE (DOD)

FC 1-300-09N (2014; with Change 4) Navy and Marine Corps Design Procedures

UFC 1-300-08 (2009, with Change 2) Criteria for Transfer and Acceptance of DoD Real Property

1.2 DEFINITIONS

1.2.1 As-Built Drawings

As-built drawings are developed and maintained by the Contractor and depict actual conditions, including deviations from the Contract Documents. These deviations and additions may result from coordination required by, but not limited to: contract modifications; official responses to Contractor submitted Requests for Information; direction from the Contracting Officer; designs which are the responsibility of the Contractor, and differing site conditions. Maintain the as-builts throughout construction as red-lined hard copies on site. These files serve as the basis for the creation of the record drawings.

1.2.2 Record Drawings

The record drawings are the final compilation of actual conditions reflected in the as-built drawings.

1.2.3 Final Approved Shop Drawings

The final approved shop drawings are all approved submittals created during the execution of the project. All submittals, regardless of the approving authority, shall be submitted. Include the submittal cover sheet and all relevant attachments for all submittals. Each submittal shall be saved as a

separate file or have its own unique folder if a submittal includes attachments of multiple files or file types. Include a PDF copy of the completed submittal register.

1.3 SOURCE DRAWING FILES

Request the full set of electronic drawings, in the source format, for Record Drawing preparation, after award and at least 30 days prior to required use.

1.3.1 Terms and Conditions

Data contained on these electronic files must 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 must 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 must, 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 CAD drawing files are not construction documents. Differences may exist between the CAD files and the corresponding construction documents. The Government makes no representation regarding the accuracy or completeness of the electronic CAD files, nor does it make representation to the compatibility of these files with the Contractor hardware or software. In the event that a conflict arises between the signed and sealed construction documents prepared by the Government and the furnished Source drawing files, the signed and sealed construction documents govern. The Contractor is responsible for determining if any conflict exists. Use of these Source Drawing 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 or modifies these electronic source drawing files for use in producing construction data related to this contract, remove all previous indicia of ownership (seals, logos, signatures, initials and dates).

1.4 SUBMITTALS

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

SD-03 Product Data

Warranty Management Plan

Warranty Tags

Final Cleaning

Spare Parts Data

SD-08 Manufacturer's Instructions

Posted Instructions

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals; G

SD-11 Closeout Submittals

As-Built Drawings; G

Record Drawings; G

As-Built Record of Equipment and Materials

Final Approved Shop Drawings

Construction Contract Specifications

Certification of EPA Designated Items; G

Certification Of USDA Designated Items; G

Interim DD FORM 1354; G

Checklist for DD FORM 1354; G

1.5 SPARE PARTS DATA

Submit two copies of the Spare Parts Data list.

- a. 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.

1.6 WARRANTY MANAGEMENT

1.6.1 Warranty Management Plan

Develop a warranty management plan which contains information relevant to FAR 52.246-21 Warranty of Construction. At least 30 days before the planned pre-warranty conference, submit one set of the warranty management plan. Include within the warranty management plan all required actions and documents to assure that the Government receives all warranties to which it is entitled. The plan must be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesmen, or of engineering background, not necessarily familiar with this contract. The term "status" as indicated below must include due date and whether item has been submitted or was accomplished. Warranty information made available during the construction phase must be submitted to the Contracting Officer for approval prior to each monthly pay estimate.

Assemble approved information in a binder and turn over two (2) copies of the binder to the Government upon submittal of the initial Test & Balance (TAB) Report or no later than ninety (90) days prior to contract completion date (CCD), whichever is sooner. The contents of the binder will be verified onsite for accuracy and completeness of contents by a representative of MCBCL Public Works. Upon site approval of the binder, one copy will be distributed to the PWD representative and one copy will be stored in the O&M cabinet in the mechanical room.

The construction warranty period will begin on the date of project acceptance and continue for the full product warranty period. A joint 4 month and 9 month warranty inspection will be conducted, measured from time of acceptance, by the Contractor, Contracting Officer and the Customer Representative. Include within the warranty management plan, but not limited to, the following:

- a. Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the Contractors, subcontractors, manufacturers or suppliers involved.
- b. Furnish with each warranty the name, address, and telephone number of each of the guarantor's representatives nearest to the project location.
- c. Listing and status of delivery of all Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and for all commissioned systems such as fire protection and alarm systems, sprinkler systems, lightning protection systems, etc.
- d. **As-Built Record of Equipment and Materials** list for each warranted equipment, item, feature of construction or system indicating:
 - (1) Name of item.
 - (2) Model and serial numbers.
 - (3) Location where installed.
 - (4) Name and phone numbers of manufacturers or suppliers.
 - (5) Names, addresses and telephone numbers of sources of spare parts.
 - (6) Warranties and terms of warranty. Include one-year overall warranty of construction, including the starting date of warranty of construction. Items which have extended warranties must be indicated with separate warranty expiration dates.
 - (7) Cross-reference to warranty certificates as applicable.
 - (8) Starting point and duration of warranty period.
 - (9) Summary of maintenance procedures required to continue the warranty in force.
 - (10) Cross-reference to specific pertinent Operation and Maintenance manuals.
 - (11) Organization, names and phone numbers of persons to call for warranty service.
 - (12) Typical response time and repair time expected for various warranted equipment.
- e. The plans for attendance at the 4 and 9 month post-construction warranty inspections conducted by the Government.
- f. Procedure and status of tagging of all equipment covered by extended warranties.
- g. Copies of **instructions** to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

1.6.2 Performance Bond

The Performance Bond must remain effective throughout the construction period .

- a. In the event the Contractor fails to commence and diligently pursue any construction warranty work required, the Contracting Officer will have the work performed by others, and after completion of the work, will charge the remaining construction warranty funds of expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.
- b. In the event sufficient funds are not available to cover the construction warranty work performed by the Government at the Contractor's expense, the Contracting Officer will have the right to recoup expenses from the bonding company.
- c. Following oral or written notification of required construction warranty repair work, respond in a timely manner. Written verification will follow oral instructions. Failure to respond will be cause for the Contracting Officer to proceed against the Contractor.

1.6.3 Pre-Warranty Conference

Prior to contract completion, and at a time designated by the Contracting Officer, meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of this section. Communication procedures for Contractor notification of construction warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer for the execution of the construction warranty will be established/reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control completion inspection, furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue construction warranty work action on behalf of the Contractor. This point of contact will be located within the local service area of the warranted construction, be continuously available, and be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of its responsibilities in connection with other portions of this provision.

1.6.4 [Warranty Tags](#)

At the time of installation, tag each warranted item with a durable, oil and water resistant tag approved by the Contracting Officer. Attach each tag with a copper wire and spray with a silicone waterproof coating. Also, submit two record copies of the warranty tags showing the layout and design. 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.

Type of product/material	
Model number	
Serial number	
Contract number	

Warranty period from/to	
Inspector's signature	
Construction Contractor	
Address	
Telephone number	
Warranty contact	
Address	
Telephone number	
Warranty response time priority code	
WARNING - PROJECT PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE DURING THE WARRANTY PERIOD.	

PART 2 PRODUCTS

2.1 CERTIFICATION OF EPA DESIGNATED ITEMS

Submit the [Certification of EPA Designated Items](#) as required by FAR 52.223-9 Estimate of Percentage of Recovered Material Content for EPA Designated Items and FAR 52-223-17 Affirmative Procurement of EPA designated items in Service and Construction Contracts.. Include on the certification form the following information: project name, project number, Contractor name, license number, Contractor address, and certification. The certification will read as follows and be signed and dated by the Contractor. "I hereby certify the information provided herein is accurate and that the requisition/procurement of all materials listed on this form comply with current EPA standards for recycled/recovered materials content. The following exemptions may apply to the non-procurement of recycled/recovered content materials:

- 1) The product does not meet appropriate performance standards;
- 2) The product is not available within a reasonable time frame;
- 3) The product is not available competitively (from two or more sources);
- 4) The product is only available at an unreasonable price (compared with a comparable non-recycled content product)."

2.2 CERTIFICATION OF USDA DESIGNATED ITEMS

Submit the [Certification of USDA Designated Items](#) as required by FAR 52-223-1 Bio-based Product Certifications and FAR 52.223-2 Affirmative Procurement of Biobased Products Under Service and Construction Contracts. Include on the certification form the following information: project name, project number, Contractor name, license number, Contractor address, and

certification. The certification will read as follows and be signed and dated by the Contractor. "I hereby certify the information provided herein is accurate and that the requisition/procurement of all materials listed on this form comply with current USDA standards for biobased materials content. The following exemptions may apply to the non-procurement of biobased content materials:

- 1) The product does not meet appropriate performance standards;
- 2) The product is not available within a reasonable time frame;
- 3) The product is not available competitively (from two or more sources);
- 4) The product is only available at an unreasonable price (compared with a comparable bio-based content product)."

PART 3 EXECUTION

3.1 AS-BUILT DRAWINGS

Provide and maintain two black line print copies of the PDF contract drawings for As-Built Drawings. At a minimum of 30 days prior to Beneficial Occupancy Date (BOD), certify both sets of as-built drawings as correct, sign, and submit the As-Built Drawings for Contracting Officer approval.

3.1.1 Markup Guidelines

Make comments and markup the drawings complete without reference to letters, memos, or materials that are not part of the As-Built drawing. Show what was changed, how it was changed, where item(s) were relocated and change related details. These working as-built markup prints must be neat, legible and accurate as follows:

- a. Use base colors of red, green, and blue. Color code for changes as follows:
 - (1) Special (Blue) - Items requiring special information, coordination, or special detailing or detailing notes.
 - (2) Deletions (Red) - Over-strike deleted graphic items (lines), lettering in notes and leaders.
 - (3) Additions (Green) - Added items, lettering in notes and leaders.
- b. Provide a legend if colors other than the "base" colors of red, green, and blue are used.
- c. Add and denote any additional equipment or material facilities, service lines, incorporated under As-Built Revisions if not already shown in legend.
- d. Use frequent written explanations on markup drawings to describe changes. Do not totally rely on graphic means to convey the revision.
- e. Use legible lettering and precise and clear digital values when marking prints. Clarify ambiguities concerning the nature and application of change involved.
- f. Wherever a revision is made, also make changes to related section

views, details, legend, profiles, plans and elevation views, schedules, notes and call out designations, and mark accordingly to avoid conflicting data on all other sheets.

- g. For deletions, cross out all features, data and captions that relate to that revision.
- h. For changes on small-scale drawings and in restricted areas, provide large-scale inserts, with leaders to the applicable location.
- i. Indicate one of the following when attaching a print or sketch to a markup print:
 - 1) Add an entire drawing to contract drawings
 - 2) Change the contract drawing to show
 - 3) Provided for reference only to further detail the initial design.
- j. Incorporate all shop and fabrication drawings into the markup drawings.

3.1.2 As-Built Drawings Content

Show on the as-built 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. Layout and schematic drawings of electrical circuits and piping.
- d. Correct grade, elevations, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made from contract plans.
- e. Changes in details of design or additional information obtained from working drawings specified to be prepared or furnished by the Contractor; including but not limited to shop drawings, fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment, and foundations.
- f. The topography, invert elevations and grades of drainage installed or affected as part of the project construction.
- g. Changes or Revisions which result from the final inspection.
- h. Where contract drawings or specifications present options, show only the option selected for construction on the working as-built markup drawings.

- i. 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.
- j. Systems designed or enhanced by the Contractor, such as HVAC controls, fire alarm, fire sprinkler, and irrigation systems.
- k. Changes in location of equipment and architectural features.
- j. Modifications (include within change order price the cost to change working as-built markup drawings to reflect modifications) and compliance with FC 1-300-09N procedures.
- l. Actual location of anchors, construction and control joints, etc., in concrete.
- m. Unusual or uncharted obstructions that are encountered in the contract work area during construction.
- n. Location, extent, thickness, and size of stone protection particularly where it will be normally submerged by water.

3.2 RECORD DRAWINGS

Prepare and provide Record Drawings in accordance with FC 1-300-09N. Provide 2 copies of Record Drawings on two separate CDs or DVDs 30 days after BOD.

3.3 OPERATION AND MAINTENANCE MANUALS

Provide project operation and maintenance manuals as specified in Section 01 78 23 OPERATION AND MAINTENANCE MANUALS DATA. Provide four electronic copies of the Operation and Maintenance Manual files. Submit to the Contracting Officer for approval within 60 calendar days of the Beneficial Occupancy Date (BOD). Update and resubmit files for final approval at BOD. Provide one hard copy and place in cabinet in main mechanical room.

3.4 CLEANUP

Provide final cleaning in accordance with ASTM E1971 and submit two copies of the listing of completed final clean-up items. Leave premises "broom clean." Comply with GS-37 for general purpose cleaning and bathroom cleaning. Use only nonhazardous cleaning materials, including natural cleaning materials, in the final cleanup. Clean interior and exterior glass surfaces exposed to view; remove temporary labels, stains and foreign substances; polish transparent and glossy surfaces; vacuum carpeted and soft surfaces. Clean equipment and fixtures to a sanitary condition. Replace filters of operating equipment and comply with the Indoor Air Quality (IAQ) Management Plan. Clean debris from roofs, gutters, downspouts and drainage systems. Sweep paved areas and rake clean landscaped areas. Remove waste and surplus materials, rubbish and construction facilities from the site. Recycle, salvage, and return construction and demolition waste from project in accordance with Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS.

3.5 REAL PROPERTY RECORD

Near the completion of Project, but a minimum of 60 days prior to final acceptance of the work, complete, update draft DD FORM 1354 attached to this section, and submit an accounting of all installed property with Interim DD FORM 1354. Include any additional assets, improvements, and alterations from the Draft DD FORM 1354. Contact the Contracting Officer for any project specific information necessary to complete the DD FORM 1354. Refer to UFC 1-300-08 for instruction on completing the DD FORM 1354. For convenience, a blank fillable PDF DD FORM 1354 may be obtained at the following link:

www.esd.whs.mil/Portals/54/Documents/DD/forms/dd/dd1354.pdf

Submit the completed Checklist for DD FORM 1354 of Installed Building Equipment items. Attach this list to the updated DD FORM 1354.

3.6 FINAL APPROVED SHOP DRAWINGS

Provide 2 copies of Final Approved Shop Drawings on two separate CDs or DVDs within 30 days after BOD.

-- End of Section --

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

04/22

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 E1971 (2005; R 2011) Standard Guide for Stewardship for the Cleaning of Commercial and Institutional Buildings

1.2 SUBMITTALS

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

SD-10 Operation and Maintenance Data

O&M Database ; G

Training Plan ; G

Training Outline ; G

Training Content ; G

SD-11 Closeout Submittals

Training Video Recording ; G

Validation of Training Completion ; G

1.3 OPERATION AND MAINTENANCE DATA

Submit Operation and Maintenance (O&M) Data for the provided equipment, product, or system, defining the importance of system interactions, troubleshooting, and long-term preventive operation and maintenance. Compile, prepare, and aggregate O&M data to include 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.

1.3.1 Package Quality

Documents must be fully legible. Operation and Maintenance data must be consistent with the manufacturer's standard brochures, schematics, printed instructions, general operating procedures, and safety precautions.

1.3.2 Package Content

Provide data package content in accordance with paragraph SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES. Comply with the data package requirements specified in the individual technical sections, including the content of the packages and addressing each product, component, and system designated for data package submission, except as follows. Use Data Package 3 for commissioned items without a specified data package requirement in the individual technical sections. Provide a Data Package 3 instead of Data Package 1 or 2, as specified in the individual technical section, for items that are commissioned.

1.3.3 Changes to Submittals

Provide manufacturer-originated changes or revisions to submitted data if a component of an item is so affected subsequent to acceptance of the O&M Data. Submit changes, additions, or revisions required by the Contracting Officer for final acceptance of submitted data within 30 calendar days of the notification of this change requirement.

1.4 OPERATION AND MAINTENANCE MANUAL FILE FORMAT

Assemble data packages into electronic Operation and Maintenance Manuals. Assemble each manual into a composite electronically indexed file using the most current version of Adobe Acrobat or similar software capable of producing PDF file format. Provide compact disks (CD) or data digital versatile disk (DVD) as appropriate, so that each one contains operation, maintenance and record files, project record documents, and training videos. Include a complete electronically linked operation and maintenance directory. Place one hard copy of each in cabinet in main mechanical room.

1.4.1 Organization

Bookmark Product and Drawing Information documents using the current version of CSI Masterformat numbering system, and arrange submittals using the specification sections as a structure. Use CSI Masterformat and UFGS numbers along with descriptive bookmarked titles that explain the content of the information that is being bookmarked.

1.4.2 CD or DVD Label and Disk Holder or Case

Provide the following information on the disk label and disk holder or case:

- a. Building Number
- b. Project Title
- c. Activity and Location
- d. Construction Contract Number
- e. Prepared For: (Contracting Agency)
- f. Prepared By: (Name, title, phone number and email address)
- g. Include the disk content on the disk label
- h. Date

- i. Virus scanning program used

1.5 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES

The following are a detailed description of the data package items listed in paragraph SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES.

1.5.1 Operating Instructions

Provide specific instructions, procedures, and illustrations for the following phases of operation for the installed model and features of each system:

1.5.1.1 Safety Precautions and Hazards

List personnel hazards and equipment or product safety precautions for operating conditions. List all residual hazards identified in the Activity Hazard Analysis provided under Section 01 35 26 GOVERNMENT SAFETY REQUIREMENTS. Provide recommended safeguards for each identified hazard.

1.5.1.2 Operator Prestart

Provide procedures required to install, set up, and prepare each system for use.

1.5.1.3 Startup, Shutdown, and Post-Shutdown Procedures

Provide narrative description for Startup, Shutdown and Post-shutdown operating procedures including the control sequence for each procedure.

1.5.1.4 Normal Operations

Provide Control Diagrams with data to explain operation and control of systems and specific equipment. Provide narrative description of Normal Operating Procedures.

1.5.1.5 Emergency Operations

Provide 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. Provide Emergency Shutdown Instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance and procedures for emergency operation of utility systems including required valve positions, valve locations and zones or portions of systems controlled.

1.5.1.6 Operator Service Requirements

Provide instructions for services to be performed by the operator such as lubrication, adjustment, inspection, and recording gauge readings.

1.5.1.7 Environmental Conditions

Provide 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.

1.5.1.8 Operating Log

Provide forms, sample logs, and instructions for maintaining necessary operating records.

1.5.1.9 Additional Requirements for HVAC Control Systems

Provide Data Package 5 and the following for control systems:

- a. Narrative description on how to perform and apply functions, features, modes, and other operations, including unoccupied operation, seasonal changeover, manual operation, and alarms. Include detailed technical manual for programming and customizing control loops and algorithms.
- b. Full as-built sequence of operations.
- c. Copies of checkout tests and calibrations performed by the Contractor (not Cx tests).
- d. Full points list. Provide a listing of rooms with the following information for each room:
 - (1) Floor
 - (2) Room number
 - (3) Room name
 - (4) Air handler unit ID
 - (5) Reference drawing number
 - (6) Air terminal unit tag ID
 - (7) Heating or cooling valve tag ID
 - (8) Minimum cfm
 - (9) Maximum cfm
- e. Full print out of all schedules and set points after testing and acceptance of the system.
- f. Full as-built print out of software program.
- g. Marking of system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.

1.5.2 Preventive Maintenance

Provide the following information for preventive and scheduled maintenance to minimize repairs for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

1.5.2.1 Lubrication Data

Include the following preventive maintenance lubrication data, in addition to instructions for lubrication required under paragraph 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.

1.5.2.2 Preventive Maintenance Plan, Schedule, and Procedures

Provide manufacturer's schedule for routine preventive maintenance, inspections, condition monitoring (predictive tests) and adjustments required to ensure proper and economical operation and to minimize repairs. Provide instructions stating when the systems should be retested. 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.

- a. Define the anticipated time required to perform each of each test (work-hours), test apparatus, number of personnel identified by responsibility, and a testing validation procedure permitting the record operation capability requirements within the schedule. Provide 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 preventive maintenance, inspection, adjustment, lubrication and cleaning necessary to minimize repairs.
- b. 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.

1.5.2.3 Cleaning Recommendations

Provide environmentally preferable cleaning recommendations in accordance with ASTM E1971.

1.5.3 Repair

Provide 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.

1.5.3.1 Troubleshooting Guides and Diagnostic Techniques

Provide 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.

1.5.3.2 Wiring Diagrams and Control Diagrams

Provide 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.

1.5.3.3 Repair Procedures

Provide instructions and a list of tools required to repair or restore the product or equipment to proper condition or operating standards.

1.5.3.4 Removal and Replacement Instructions

Provide step-by-step procedures and a list of required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Use a combination of text and illustrations.

1.5.3.5 Spare Parts and Supply Lists

Provide lists of spare parts and supplies required for 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.

1.5.3.6 Repair Work-Hours

Provide manufacturer's projection of repair work-hours including requirements by type of craft. Identify, and tabulate separately, repair that requires the equipment manufacturer to complete or to participate.

1.5.4 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:

1.5.4.1 Product Submittal Data

Provide a copy of SD-03 Product Data submittals documented with the required approval.

1.5.4.2 Certificates

Provide a copy of SD-07 Certificates submittals documented with the required approval.

1.5.4.3 Manufacturer's Instructions

Provide a copy of SD-08 Manufacturer's Instructions submittals documented with the required approval.

1.5.4.4 O&M Submittal Data

Provide a copy of SD-10 Operation and Maintenance Data submittals

documented with the required approval.

1.5.4.5 Parts Identification

Provide identification and coverage for the 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 must show the index, reference, or key number that will cross-reference the illustrated part to the listed part. Group the parts shown in the listings 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.

1.5.4.6 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 of the system. Provide copies of warranties required by Section 01 78 00 CLOSEOUT SUBMITTALS.

1.5.4.7 Extended Warranty Information

List all warranties for products, equipment, components, and sub-components whose duration exceeds one year. For each warranty listed, indicate the applicable specification section, duration, start date, end date, and the point of contact for warranty fulfillment. Also, list or reference the specific operation and maintenance procedures that must be performed to keep the warranty valid. Provide copies of warranties required by Section 01 78 00 CLOSEOUT SUBMITTALS.

1.5.4.8 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.

1.5.4.9 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. Provide final set points.

1.5.4.10 Testing and Performance Data

Include completed prefunctional checklists, functional performance test forms, and monitoring reports. Include recommended schedule for retesting and blank test forms. Provide final set points.

1.5.4.11 Field Test Reports

Provide a copy of Field Test Reports (SD-06) submittals documented with the

required approval.

1.5.4.12 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.

1.6 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

Provide the O&M data packages specified in individual technical sections. The information required in each type of data package follows:

1.6.1 Data Package 1

- a. Safety precautions and hazards
- b. Cleaning recommendations
- c. Maintenance and repair procedures
- d. Warranty information
- e. Extended warranty information
- f. Contractor information
- g. Spare parts and supply list

1.6.2 Data Package 2

- a. Safety precautions and hazards
- b. Normal operations
- c. Environmental conditions
- d. Lubrication data
- e. Preventive maintenance plan, schedule, and procedures
- 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. Extended warranty information

- m. Contractor information

1.6.3 Data Package 3

- a. Safety precautions and hazards
- b. Operator prestart
- c. Startup, shutdown, and post-shutdown procedures
- d. Normal operations
- e. Emergency operations
- f. Environmental conditions
- g. Operating log
- h. Lubrication data
- i. Preventive maintenance plan, schedule, and procedures
- 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. Product submittal data
- q. O&M submittal data
- r. Parts identification
- s. Warranty information
- t. Extended warranty information
- u. Testing equipment and special tool information
- v. Testing and performance data
- w. Contractor information
- x. Field test reports

1.6.4 Data Package 4

- a. Safety precautions and hazards
- b. Operator prestart
- c. Startup, shutdown, and post-shutdown procedures

- d. Normal operations
 - e. Emergency operations
 - f. Operator service requirements
 - g. Environmental conditions
 - h. Operating log
 - i. Lubrication data
 - j. Preventive maintenance plan, schedule, and procedures
 - k. Cleaning recommendations
 - l. Troubleshooting guides and diagnostic techniques
 - m. Wiring diagrams and control diagrams
 - n. Repair procedures
 - o. Removal and replacement instructions
 - p. Spare parts and supply list
 - q. Repair work-hours
 - r. Product submittal data
 - s. O&M submittal data
 - t. Parts identification
 - u. Warranty information
 - v. Extended warranty information
 - w. Personnel training requirements
 - x. Testing equipment and special tool information
 - y. Testing and performance data
 - z. Contractor information
 - aa. Field test reports
- 1.6.5 Data Package 5
- a. Safety precautions and hazards
 - b. Operator prestart
 - c. Start-up, shutdown, and post-shutdown procedures
 - d. Normal operations

- e. Environmental conditions
- f. Preventive maintenance plan, schedule, and procedures
- 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. Extended warranty information
- s. Testing and performance data
- t. Contractor information
- u. Field test reports
- v. Additional requirements for HVAC control systems

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 TRAINING

Prior to acceptance of the facility by the Contracting Officer for Beneficial Occupancy, provide comprehensive training for the systems and equipment specified in the technical specifications. The training must be targeted for the [Facilities Management Specialist](#), building maintenance personnel, and applicable building occupants. Instructors must be well-versed in the particular systems that they are presenting. Address aspects of the [eOMSI Manual, as submitted in Section 01 78 24.00 20 FACILITY ELECTRONIC OPERATION AND MAINTENANCE SUPPORT INFORMATION \(eOMSI\)](#). Training must include classroom or field lectures based on the system operating requirements. The location of classroom training requires approval by the Contracting Officer.

3.1.1 [Training Plan](#)

Submit a written training plan to the Contracting Officer for approval at

least 60 calendar days prior to the scheduled training. Also, coordinate the training schedule with the Contracting Officer. Include within the plan the following elements:

- a. Equipment included in training
- b. Intended audience
- c. Location of training
- d. Dates of training
- e. Objectives
- f. Outline of the information to be presented and subjects covered including description
- g. Start and finish times and duration of training on each subject
- h. Methods (e.g. classroom lecture, video, site walk-through, actual operational demonstrations, written handouts)
- i. Instructor names and instructor qualifications for each subject
- j. List of texts and other materials to be furnished by the Contractor that are required to support training
- k. Description of proposed software to be used for video recording of training sessions.

3.1.2 Training Content

The core of this training must be based on manufacturer's recommendations and the operation and maintenance information. The CxA is responsible for overseeing and approving the content and adequacy of the training. Provide a brief summary of the FACILITY INFORMATION manual, and a more detailed presentation of the PRODUCT AND DRAWING MANUAL, specified in Section 01 78 24.00 20 FACILITY ELECTRONIC OPERATION AND MAINTENANCE SUPPORT INFORMATION (eOMSI). Spend 95 percent of the instruction time during the presentation on the OPERATION AND MAINTENANCE DATA. Include the following for each system training presentation:

- a. Start-up, normal operation, shutdown, unoccupied operation, seasonal changeover, manual operation, controls set-up and programming, troubleshooting, and alarms.
- b. Relevant health and safety issues.
- c. Discussion of how the feature or system is environmentally responsive. Advise adjustments and optimizing methods for energy conservation.
- d. Design intent.
- e. Use of O&M Manual Files.
- f. Review of control drawings and schematics.
- g. Interactions with other systems.

- h. Special maintenance and replacement sources.
- i. Tenant interaction issues.

3.1.3 Training Outline

Provide the eOMSI Manual files as specified in Section 01 78 24.00 20, FACILITY ELECTRONIC OPERATION AND MAINTENANCE SUPPORT INFORMATION (eOMSI), and a written course outline listing the major and minor topics to be discussed by the instructor on each day of the course to each trainee in the course. Provide the course outline 14 calendar days prior to the training.

3.1.4 Training Video Recording

Record classroom training session(s) on video. Provide to the Contracting Officer two copies of the training session(s) in DVD video recording format. Capture within the recording, in video and audio, the instructors' training presentations including question and answer periods with the attendees. The recording camera(s) must be attended by a person during the recording sessions to assure proper size of exhibits and projections during the recording are visible and readable when viewed as training.

3.1.5 Unresolved Questions from Attendees

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

3.1.6 Validation of Training Completion

Ensure that each attendee at each training session signs a class roster daily to confirm Government participation in the training. At the completion of training, submit a signed validation letter that includes 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 copies of the signed class rosters. Provide two copies of the validation to the Contracting Officer, and one copy to the Operation and Maintenance Manual Preparer for inclusion into the Manual's documentation.

3.1.7 Quality Control Coordination

Coordinate this training with the CxA in accordance with Section 01 45 00.05 20 DESIGN AND CONSTRUCTION QUALITY CONTROL FOR DESIGN-BUILD.

-- End of Section --

SECTION 01 78 24.00 20

FACILITY ELECTRONIC OPERATION AND MAINTENANCE SUPPORT INFORMATION (eOMSI)

03/23

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. DEPARTMENT OF DEFENSE (DOD)

FC 1-300-09N

(2014; with Change 4) Navy and Marine
Corps Design Procedures

1.2 DEFINITIONS AND ABBREVIATIONS

1.2.1 eOMSI Manual

Manual (PDF file) provided by the Contractor that includes, but is not limited to, product information, a facility description with photos, and a list of primary facility systems.

1.2.2 Systems

The words "system", "systems", and "equipment", when used in this document refer to as-built systems and equipment.

1.2.3 Computer Assisted Design and Drafting (CADD)

Electronic Computer Assisted Design and Drafting graphic software program that is used to create facility design contract documents and Record Drawings.

1.2.4 KTR

An abbreviation for "Contractor."

1.3 EOMSI MEETINGS

1.3.1

Be prepared to discuss the following during this meeting:

- a. eOMSI Manual Development Meetings
- b. Processes and methods of gathering eOMSI Manual information during construction.
- c. The eOMSI Submittals schedule. Include the eOMSI submittal schedule on the Baseline Construction Schedule.

1.3.2 eOMSI Manual Coordination Meeting

Facilitate a meeting after the Post-Award Kickoff Meeting prior to the

submission of the eOMSI Progress Submittal. Meeting attendance must include the Contractor's eOMSI Manual Preparer, and Quality Control Manager, and the Government's Design Manager (DM), Contracting Officer's Representative, and NAVFAC Public Works (PW) Facilities Management Division (FMD). Include any Mechanical, Electrical, and Fire Protection Sub-Contractors.

The purpose of this meeting is to reach a mutual understanding of the scope of work concerning the contract requirements for eOMSI and coordinate the efforts necessary by both the Government and Contractor to ensure an accurate collection, preparation and timely Government review of eOMSI.

1.3.3 Facility Turnover Meeting

Include eOMSI in NAVFAC Red Zone (NRZ) facility turnover meetings as specified in Section 01 30 00, ADMINISTRATIVE REQUIREMENTS.

1.4 SUBMITTAL SCHEDULING

1.4.1 eOMSI, Progress Submittal

Submit the Progress submittal when construction is approximately 50 percent complete, to the Contracting Officer for approval. Provide eOMSI Manual Files (Bookmarked PDF). Include the elements and portions of system construction completed up to this point.

The purpose of this submittal is to verify progress is in accordance with contract requirements as discussed during the eOMSI Coordination Meeting. Field verify a portion of the eOMSI information in accordance with paragraph FIELD VERIFICATION.

1.4.2 eOMSI, Prefinal Submittal

Submit the 100 percent submittal of the eOMSI Prefinal Submittal to the Contracting Officer for approval within 90 calendar days of the Beneficial Occupancy Date (BOD). This submittal must provide a complete, working document that can be used to operate and maintain the facility. Any portion of the submittal that is incomplete or inaccurate requires the entire submittal to be returned for correction. Any discrepancies discovered during the Government's review of eOMSI Progress submittal must be corrected prior to the Prefinal submission.

The eOMSI Prefinal Submittal must include eOMSI Manual Files (Bookmarked PDF).

1.4.3 eOMSI, Final Submittal

Submit completed eOMSI Manual Files (Bookmarked PDF). The Final submittal is due at BOD. Any discrepancies discovered during the Government's review of the Prefinal eOMSI submittal, including the Field Verification, must be corrected prior to the Final eOMSI submission.

1.5 UNITS OF MEASURE

Provide eOMSI utilizing the English Inch-Pound units of measure

1.6 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL

PROCEDURES:

SD-11 Closeout Submittals

eOMSI, Progress Submittal; G

eOMSI, Prefinal Submittal; G

eOMSI, Final Submittal; G

PART 2 PRODUCTS

2.1 eOMSI FILES FORMAT

Format eOMSI manuals and files in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA. Include a complete electronically linked operation and maintenance directory. Provide four electronic copies of the eOMSI Manuals to the Contracting Officer for approval.

Scan eOMSI Manuals and Files for viruses, malware, and spyware using a commercially available scanning program that is routinely updated to identify and remove current virus threats. Provide one hard copy of eOMSI Manuals and Files in the cabinet in the main mechanical room.

2.1.1 eOMSI Manual Organization

Organize the eOMSI Manuals into two parts: 1) Product and Drawing Information, and 2) Facility Information. Bookmark the PDF files for easy access to the information.

- a. Bookmark Product and Drawing Information documents in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.
- b. Bookmark Facility Information to at least one level lower than the major system.

2.1.2 eOMSI Manual CD or DVD Disk Label and Disk Holder or Case

Provide disks in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA. At a minimum, provide four (4) disks and place one hard copy of all O&M Data in the cabinet in the main mechanical room.

2.2 eOMSI MANUAL

2.2.1 Product and Drawing Information

Provide an organized record of the facility products, materials, equipment, and minimum information necessary to operate the facility. Provide Product and Drawing Information for the systems in the final constructed facility.

2.2.1.1 O&M Data

As a minimum, provide the approved O&M Data, submitted in the technical specification sections, in accordance with paragraph TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES in Section 01 78 23 OPERATION AND MAINTENANCE DATA.

2.2.1.2 Record Drawings

Provide an electronic, PDF copy of the Record Drawings, prepared in accordance with **FC 1-300-09N** and **01 78 00 CLOSEOUT SUBMITTALS**. Bookmark drawings using the sheet title and sheet number.

Include Record Drawings as part of the Red-Zone specified in Section **01 30 00 ADMINISTRATIVE REQUIREMENTS**.

2.2.1.3 Utility Record Drawings

Using Record Source Drawings, show and document details of the actual installation of the utility systems; annotate and highlight the eOMSI information. Provide Utility Record Drawings in PDF format. Provide the following drawings at a large enough scale to differentiate designated isolation units from surrounding valves and switches.

- a. Utility Schematic Diagrams - Provide a one line schematic diagram for each utility system such as power, water, wastewater, and gas/fuel. Schematic diagram must show from the point where the utility line is connected to the mainline up to the **five-foot** connection point to the facility. Indicate location or area designation for route of transmission or distribution lines; locations of duct banks, manholes/handholes or poles; isolation units such as valves and switches; and utility facilities such as pump stations, lift stations, and substations.
- b. Enlarged Connection and Cutoff Plans - Provide enlarged floor plans that provide information between the **five foot** utility connection point and where utilities connect to facility distribution. Enlarge floor plans/ elevations of the rooms where the utility enters the building and indicate on these plans locations of the main interior and exterior connection and cutoff points for the utilities. Also enlarge floor plans / elevations of the rooms where equipment is located. Include enough information to enable someone unfamiliar with the facility to locate the connection and cutoff points. Indicate designations such as room number, panel number, circuit breaker, or valve number, of each utility and equipment connection and cutoff point, and what that connection and cutoff point controls.

2.2.2 Facility Information

Provide the following in Facility Information:

2.2.2.1 General Facility and System Description

Describe the function of the facility. Detail the overall dimensions of the facility, number of floors, foundation type, expected number of occupants, and facility Category Code. List and generally describe all the facility systems and any special building features (for example, HVAC Controls, Sprinkler Systems, Cranes, Elevators, and Generators). Include photographs marked up and labeled to show key operating components and the overall facility appearance.

2.2.2.2 Floor Plans

Provide uncluttered, legible **11 by 17 inches** floor plans. Include room numbers, type or function of spaces, and overall facility dimensions on the floor plans. Do not include items such as construction instructions,

references, or frame numbers.

2.2.2.3 Floor Coverings, Wall Surfaces, and Ceiling Surfaces

Provide a table that lists by room number (including hallways and common spaces), the type, and area of finish, manufacturer's product name, identifying number, and color. Include a facility summary of the total area for each type of space and floor, wall, or ceiling finish in the table.

2.2.2.4 Windows

Provide a table that lists by room number (including hallways and common spaces), the type of window, window size, number of each size and type, special features, manufacturer's product name, identifying number, and color. The table must include a facility summary of the total number for each type and size of window.

2.2.2.5 Roofing

Provide the total area of each type of roof surface and system. Provide the name of the roofing product and system; manufacturer's, supplier's, and installer's names, addresses, and phone numbers; manufacturer's product name, identifying number, and color. For each type of roof, provide a recommended inspection, maintenance and repair schedule that details checkpoints, frequencies, and prohibited practices. List roof structural load limits.

2.2.2.6 HVAC Filters

Provide a table that lists the quantity, type, size, and location of each HVAC filter, manufacturer's product name, and identifying number.

2.2.2.7 Plumbing Fixtures

Provide a table that lists by room number, the number and type of plumbing and bathroom plumbing fixtures (for example, sinks, water closets, urinals, showers and drinking fountains).

2.2.2.8 Lighting Fixtures

Provide a table that lists by room number (including hallways and common spaces), the type of lighting fixture, ballast, number of lighting fixtures, type of lamps and number of lamps, and the manufacturer's product name and the identifying number. The table must include a facility summary of the total number of fixtures of each type and number of lamps of each type.

2.2.2.9 Equipment Listing

Provide a table that lists the major equipment shown on the design equipment schedules. Show the item descriptions, locations, model numbers; and the names, addresses, and telephone numbers of the manufacturers, suppliers, contractors, and subcontractors.

2.2.2.10 System Flow Diagrams

Provide a flow diagram indicating system liquid, air or gas flow during normal operations. Integrate the system components into the diagram. A compilation of non-integrated, flow diagrams for the individual system

components are not acceptable.

2.2.2.11 Valve List

Provide a list of all valves associated with the system. Show valve type, identification number, function, location and normal operating position.

2.2.2.12 Riser Diagrams

Provide riser diagrams and settings of equipment.

PART 3 EXECUTION

3.1 FIELD VERIFICATION

Field verify eOMSI **Maximo and Warranty Binder** information with Contractor and Government personnel. Include the following personnel in this meeting: Contractor's eOMSI Manual and Facility Data Workbook Preparer and Quality Control Manager, and the Government's Contracting Officer's Representative and NAVFAC PW FMD. Request, and provide, an eOMSI Field Verification Meeting no sooner than 14 calendar days after submission of the Progress eOMSI submittal, and another, no sooner than 14 calendar days after submission of the Prefinal eOMSI submittal.

100 percent accuracy of eOMSI **Maximo and Warranty Binder** information is required for successful field verification.

3.2 eOMSI TRAINING

Provide training on eOMSI Manuals in accordance with Section **01 78 23** OPERATION AND MAINTENANCE DATA.

-- End of Section --

SECTION 01 78 30.00 22

GIS DATA DELIVERABLES

5/22

PART 1 GENERAL

1.1 OBJECTIVE

The primary objective of this section is to provide detailed specifications for collection and delivery of geospatial data commonly referred to as Geographic Information System (GIS) data. Additionally, this section shall provide guidance to ensure that all GIS data delivered is compatible and will add value to the Marine Corps Base (MCB) Camp Lejeune Installation Geospatial Information and Services (IGI&S) GEODatabase.

Failure to comply with the specifications outlined in this document will result in non-acceptance of data deliverables.

1.1.1 Point of Contact for MCB Camp Lejeune

The Points of Contact (POC) for assistance in preparation of GIS deliverables are as follows:

Resident Officer In Charge Of Construction Construction Manager (CM) 1005 Michael Drive Camp Lejeune, NC 28547-2521 (910) 451-2581 (Main Number)	Public Works Assigned GIS Data Manager 1005 Michael Road Camp Lejeune, NC 28547-2521 (910) 000-0000 ext 0000 TBD Lejeune_PWD_GIS@usmc.mil
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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-11 Closeout Submittals

GIS Data Deliverables; G

1.3 GOVERNMENT GEOSPATIAL DATA, SCHEMA, AND DOMAINS

Geo-spatial data is based on the Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE) GEOFidelis Data Model. Because there are recurring business driven modifications and or adaptations within the SDSFIE schema, provide all spatial and non-spatial data in the most current version by the USMC utilized at the time of delivery.

1.3.1 Data Request Package Requirements

Request the existing GIS Data, Schema and Domain Properties by utilizing a Data Request Package (DRP), which is supplied via the government sponsor.

- a. The DRP should be submitted prior to the start of data collection efforts and again 4 weeks prior to data delivery to ensure that GIS

data has been created and will be delivered utilizing the most up to date SDSFIE schema.

1.3.1.1 Instruction for submitting a Geospatial DRP to the CM or the Project Manager (PM)

- a. Each CM or PM will provide DRP forms upon request from the contractor. Complete the request and include all information as instructed on the data request form.
- b. Request only GIS data, schema and domains for feature classes that are relevant to the contract and within the boundary of project area and provide justifications as necessary.
- c. Attach the Scope of Work, which is defined by this GIS DATA DELIVERABLES section for each DPR submittal.
- d. Return the DRP to the CM or PM for sponsorship and submittal as instructed with required attachments and justifications for submittal.
- e. Incomplete forms may delay receipt of the requested GIS data.
- f. GIS data deliverables do not supplement or replace as-built drawings.

1.3.2 Data Collection and Utility Locates

- a. Utilize the most up to date SDSFIE Schema when delivering GIS Data.
- b. Prior to GPS efforts all underground utilities are to be located utilizing a utility locating service in order to obtain and verify accurate feature locations.
- c. Actual conditions in the field always supersede drawings. Locate and field verify all features to ensure location is correctly recorded.
- d. Data will be created to represent the real world, for example, water, sewer, and transportations systems will be connected. All segments will be created from source to sink in the direction of flow.
- e. Research may be required to collect data. Verification of existing data which is located [in the Technical Records in the Public Works Department at 1005 Michael Street, MCB Camp Lejeune](#).
- f. Infrastructure data, as identified in paragraph "ATTRIBUTE DATA COLLECTION AND GPS REQUIREMENTS FOR SPECIFIC FEATURES" may be collected utilizing Sub-Foot or better GPS data collection methods.
- g. Utility data, as identified in paragraph "ATTRIBUTE DATA COLLECTION AND GPS REQUIREMENTS FOR SPECIFIC FEATURES" will be collected utilizing Survey Grade GPS data collection methods.

1.3.3 Attribute Data Requirements

- a. All attributes will be populated in accordance with paragraph ATTRIBUTE DATA COLLECTION AND GPS REQUIREMENTS FOR SPECIFIC FEATURES and will be obtained via contract specifications, plans and record drawings.
- b. Demolished / Removed Real Property data will be captured, attributed and delivered in the Disposal feature classes which include Disposal

Facility Area, Disposal Facility Line and Disposal Facility Point.

- c. Demolished / Removed UTILITY data will be captured, attributed and delivered by creating a new feature class which will consists of adding DEMO to the feature's naming convention for each feature, such as, but not limited to the following examples; DEMO.WastUtilNode_SPump (point), DEMO.Feat_SwRetentionBasinArea, (polygon), and DEMO.WastUtilSegment (polyline)
 1. The Contractor will be responsible for properly delivering demolished features with the current attributes associated with the feature and additionally updating the new contract number, date of demolition, and optional status.
- d. Spatial and non-spatial data may be copied from existing data, with the exception of specific attributes. Potable water wells are an exception to this rule and shall remain in the feature class and attributed as Removed or AIP.
- e. Abandoned In Place (AIP) utility lines will be located and updated in the current feature data set and be attributed as AIP as required.

1.3.4 GIS Topology Rules for Geospatial Data

All data must be created using GIS topology rules for polygons, points and lines, such as, but not limited to the following examples:

- a. Utility and transportation systems will be created from source to sink.
- b. All utilities shall be drawn in the direction of flow with no breaks in polyline except for fittings, manholes and other features nodes within the feature Dataset.
- c. All utility or infrastructure system data, which is, but is not limited to, transportation system and electrical, water, thermal distribution, and wastewater collection, etc., will be created using GIS spatial connectivity rules which specify that vertex, edge and endpoints be snapped to features within the system.
- d. All polygons will be closed without slivers and be topologically correct.
- e. All polylines will be topologically correct, and should be connected to avoid undershoots, overshoots and dangles and will cross only if they share a point in common, at least one of which is not an endpoint.
- f. For all Polygons, Polylines and points rules; please reference illustrating topology rules in ArcGIS at www.esri.com.

1.3.5 Global Positioning System (GPS) Data Collection

Utilize field survey GPS data collected by means of non-recreational GPS equipment

- a. Only bench marks included in the [North Carolina](#) Geodetic Survey Base Station Network are to be used for GPS data collection.
- b. Mission planning is essential. Utilize the best Position Dilution of Precision (PDOP) values for data accuracy.

- c. Mission planning for GPS collection should be conducted when positional dilution of precision (PDOP) value is 4 or less.
- d. Spatial accuracy requirements
 - 1. Survey and Sub-Foot GPS grade data collection requirements are as follows:
 - i. Sub-Foot requirements:
 - 1) All points shall be within plus or minus 12 inches
 - 2) 95 percent accuracy rate for all points.
 - ii. Survey Grade requirements:
 - 1) All points shall be within plus or minus 1 centimeter
 - 2) 98 percent accuracy rate for all points
- e. Make every effort to capture feature locations without using Offsets. All Offsets will be noted in the Final Report for each feature. Deliver report in PDF format.
 - 1. Resubmittal of data will be required if PDOP planning was not observed per this specification.

1.3.6 Coordinate System Requirements

The data must be collected in the following Spatial Reference / Coordinate System for each feature for all MCB Camp Lejeune and surrounding bases:

- 1. Transverse Mercator (UTM) Zone 18N
 - a. GRS 1980 spheroid
 - b. North American Datum 1983 (NAD83) horizontal datum
 - c. North American Vertical Datum 1988 (NAVD88) vertical datum.
- 2. Domain precision of 1000 which will result in a database accuracy of 1/1000 m

1.3.7 Formats and Version Guidelines

All data deliverables shall be presented in the following formats and/or versions.

- a. GIS data will be provided in an ArcGIS 10.8 or higher if a higher version is being used by the Government at the time of this project. Verify the ArcGIS version, via the CM or PM at the commencement of this contract.
- b. Microsoft Windows 10 operating system, unless otherwise approved by the Government.
- c. All reports and maps will be delivered as a hard copy and in a searchable Adobe Portable Document Format (PDF).

1.3.8 GIS Deliverable Submittal Requirements

All GIS Submittals will be submitted to the CM or PM and then analyzed by Government GIS personnel prior to final approval. Failure to comply with the specifications outlined in this document will result in non-acceptance of GIS data deliverables.

- a. Prior to any spatial and non-spatial development, provide the Government with a technical approach document, in PDF format, for review and approval. The Technical Approach document will describe in detail the Contractor's technical approach for developing GIS data to include utility locating, collecting, and attributing all GIS data.
- b. Provide a GIS deliverable at the end of each phase and at each Beneficial Occupancy Date (BOD) when contracted efforts, studies or construction are delivered in phases.
- c. To ensure specifications compliance and quality a preliminary GIS deliverable shall be provided for review when 25 percent of the data has been collected and updated according to this specification.
- d. Deliver digital geographic maps, GPS collection files and related data. All working text and documents and personal geodatabase will be included for review in the draft and final delivery of data in PDF format.
- e. Do not deliver blank unused schema or feature class data with no attributes. Deliver only data pertinent to the contract that adds value to the Geodatabase per this section.
- f. Do not include existing data in the GIS deliverable.
- g. Spatial and non-spatial GIS data must be provided in a format that does not require translation or pre/post processing.
- h. It is the Contractor's responsibility to perform quality assurance for all data and related materials required in this section prior to submitting product to the Government.
- i. The data will be analyzed for discrepancies in subject content, correct format in accordance with this statement of work, and compatibility with the existing SDSFIE Schema as well as all other specifications included in this section.

1.3.9 GIS Deliverable Package Requirements

All reports must be provided in pdf format. Each GIS deliverable must contain the following information and be in the most up to date SDSFIE format utilized by the USMC at the time of delivery.

- a. Digital and Paper Maps.
 1. All maps of **GIS DATA DELIVERABLES** will be ANSI C size.
 2. Each map will include a project title, contract number, scale, legend, standard symbology, attributes, i.e., building numbers, road names, etc.

3. All utilities will be labeled with direction of flow and segment line size.
 4. Provide paper copy and pdf copies of Maps for project.
 5. Provide a copy of all red-line construction drawings in pdf format.
 6. Communication data will be provided on a separate map.
- b. Provide all spatial and non-spatial data for review and acceptance.
 - c. Provide a report of specific procedures, list GPS equipment, software and versions that were utilized for the GPS data collection and creation of geospatial data.
 - d. Submit all GPS data files collected in the field.
 - e. Provide details on any offsets to include justification as to why offsets were utilized and which features and or points offsets were used.
 - f. Provide the source that was utilized for required attributes, such as redlines drawings and or field notes.
 - g. Summit DD form 1354, Transfer and Acceptance of DOD Real Property.
 - h. Provide a coversheet that specifies the CM / PM, contract number, contract title, point of contract for GIS related questions.
 - i. All geospatial data, pdf reports, spreadsheet, database files, reports, and maps will be submitted on a Digital Versatile Disc (DVD) platform.
 - j. Failure to comply will result in non - compliance and rejection of data.
- 1.3.10 Ownership

All digital files, hardcopy products, GPS raw data, source data acquired for this project, and related materials, including that furnished by the Government, will become the property of the Government and will not be issued, posted, distributed, or published by the Contractor. All documentation will be delivered in the final delivery.

Note: No endorsement of software or hardware is implied.

1.4 ATTRIBUTE DATA COLLECTION AND GPS REQUIREMENTS FOR REAL PROPERTY AND OTHER MISCELLANEOUS FEATURES THAT ARE NOT CONSIDERED A UTILITY

Locate, GPS and collect attribute data as specified for each feature listed with (GPS) accuracy as described in paragraph "Global Positioning System (GPS) Data Collection". Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required. Items in this section that require Survey Grade GPS are property identified in the feature class description.

1.4.1 Feature Dataset CLJN.CL.AccessControl

Locate, GPS and collect attribute data as specified for each feature listed with GPS accuracy as described in paragraph "Global Positioning System

(GPS) Data Collection". Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

CLJN.CL.AccessControlPoint (point) -The location of a feature, manned or unmanned, intended to selectively restrict entrance to or use of a place or other resource.

- a) accessControlType - The type of access control. Domain values, i.e., gate, tireShedder, barricade, etc.
- b) builtDate - The calendar date on which the original construction was completed for a facility.
- c) contractNumber - The contract number associated with the feature.
- d) facilityNumber - Asset number used for visual identification of the facility.
- e) featureDescription - The narrative describing the feature. (Review current data for description)
- f) featureName - The common name of the feature. (Review current data for common name)
- g) gatePurposeType - Purpose that the gate exists and functions under. Domain values i.e., decorative, insternalSecurity, perimaterSecurity, recreation, residential, safely, vehicleBarrier, other, etc.
- h) gateTypeMaterial - The type of material of the gate. Domain values i.e., metal, steel, wood, wroughtiron, etc.
- i) isBaseEntryPoint -The Yes / No indicator of whether or not the location is an entry point for the military installation.
- j) isCheckpoint - Indicator if location is where officials check vehicle contents or personnel. Yes / No
- k) mediaId - gpsDataCollected
- l) MetadataId - metaID000072
- m) isManned - Yes / No
- n) isRangeAccess - Yes / No
- o) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.

CLJN.CL.AccessControlLine (polyline) - The location of a feature, manned or unmanned, intended to selectively restrict entrance to or use of a place or other resource.

- a) accessControlTypeThe type of access control. Domain AccessControlType
- b) builtDate - The calendar date on which the original construction was completed for a facility.
- c) contractNumber- The contract number associated with the feature.
- d) facilityNumber - Asset number used for visual identification of the facility.
- e) featureDescription - The narrative describing the feature. (Review current data for description)
- f) featureName - The common name of the feature. (Review current data for common name)
- g) gatePurposeType- - Purpose that the gate exists and functions under. Domain values i.e., decorative, insternalSecurity, perimaterSecurity, recreation, residential, safely,

- vehicleBarrier, other, etc.
- h) gateTypeMaterial - The type of material of the gate. Domain values i.e., metal, steel, wood, wroughtiron, etc.
- i) gateUse - The type of a gate (or similar route barrier) based on its intended use.
- j) mediaId - gpsDataCollected
- k) MetadataId - metaID000072
- l) isBaseEntryPoint - Yes / No
- m) isCheckpoint - Yes / No
- n) isManned - Yes / No
- o) isRangeAccess - Yes / No
- p) operationalStatus- The state of usability of the feature i.e., inService, notInService, abandoned, etc.

CLJN.CL.BarricadePoint (point) - The coordinated series of obstacles designed or employed to channel, direct, restrict, delay, or stop the movement of personnel, equipment, or an opposing force and to impose additional losses in personnel, time, and equipment on the opposing force. Barricades can exist naturally, be man-made, or a combination of both.

- a) accessControlType - The type of access control. Domain values, i.e., gate, tireShedder, barricade, etc.
- b) builtDate - The calendar date on which the original construction was completed for a facility.
- c) contractNumber - The contract number associated with the feature.
- d) facilityNumber - Asset number used for visual identification of the facility.
- e) featureDescription - The narrative describing the feature. (Review current data for description)
- f) featureName - The common name of the feature. (Review current data for common name)
- g) barricadeType -The type of barricade. Domain values i.e., bollard, bollardPipe, pedestrianBarrier, other, etc.
- h) barricadeUse - The intended use of the barricade Domain values i.e., pedestrianTraffic, security, vehicularTraffic, etc.
- i) gatePurposeType - Purpose that the gate exists and functions under. Domain values i.e., internalSecurity, perimeterSecurity, recreation, residential, safety, vehicleBarrier, etc.
- j) gateTypeMaterial - The type of material of the gate. Domain values i.e., metal, steel, wood, wroughtiron, etc.
- k) gateUse - The type of a gate (or similar route barrier) based on its intended use.
- l) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.

CLJN.CL.BarricadeLine (polyline) - The coordinated series of obstacles designed or employed to channel, direct, restrict, delay, or stop the movement of personnel, equipment, or an opposing force and to impose additional losses in personnel, time, and equipment on the opposing force. Barricades can exist naturally, be man-made, or a combination of both.

- a) accessControlType - The type of access control. Domain

- values, i.e., gate, tireShedder, barricade, etc.
- b) barricadeUse - The intended use of the barricade Domain values i.e., pedestrianTraffic, security, vehicularTraffic, etc.
- c) builtDate - The calendar date on which the original construction was completed for a facility.
- d) contractNumber - The contract number associated with the feature.
- e) facilityNumber - Asset number used for visual identification of the facility.
- f) featureDescription - The narrative describing the feature. (Review current data for description)
- g) featureName - The common name of the feature. (Review current data for common name)
- h) gatePurposeType - Purpose that the gate exists and functions under. Domain values i.e., internalSecurity, perimeterSecurity, recreation, residential, safety, vehicleBarrier, etc.
- i) mediald - gpsDataCollected
- j) MetadataId - metaID000072
- k) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- l) gateTypeMaterial - The type of material of the gate. Domain values i.e., metal, steel, wood, wroughtiron, etc.

1.4.2 Feature Dataset CLJN.CL.CivilWorks

Locate, GPS and collect attribute data as specified for each feature listed with GPS accuracy as described in paragraph "Global Positioning System (GPS) Data Collection". Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

CLJN.CL.PitOrQuarry (Polygon) - The location where material has been or is being excavated or extracted for use at another location.

- a) featureDescription - The narrative describing the feature. (Review current data for description)
- b) featureName - The common name of the feature. (Review current data for common name)
- c) contractNumber - The contract number associated with the feature.
- d) mediald - gpsDataCollected
- e) MetadataId - metaID000072
- f) isWaterFilled - Yes / No
- g) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.

1.4.3 Feature Dataset CLJN.CL.HarbourArea

Locate, GPS and collect attribute data as specified for each feature listed with GPS accuracy as described in paragraph "Global Positioning System (GPS) Data Collection". Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

CLJN.CL.BoatRampPoint - (Point) - The partially submerged hard surfaced or non-hardsurface structure on a shoreline for launching or retrieving vessels or vehicles.

- a) builtDate - The calendar date on which the original construction was completed for a facility.
- b) contractNumber - The contract number associated with the feature.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) isLighted - Yes / No
- g) mediaId - gpsDataCollected
- h) MetadataId - metaID000072
- i) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.

CLJN.CL.DockOrWharf (Polygon) - The location of a manmade water-land interface structure often used for access to boats, ships, or barges.

- a) builtDate - The calendar date on which the original construction was completed for a facility.
- b) contractNumber - The contract number associated with the feature.
- c) dockType - The kind or type of the dock. Domain values i.e., access ramp, pier, slipway, general, etc.
- d) dockUseType - The predominant use. Domain values i.e., fishing, fueling, loading, staging, etc.
- e) facilityNumber - Asset number used for visual identification of the facility.
- f) featureDescription - The narrative describing the feature. (Review current data for description)
- g) featureName - The common name of the feature. (Review current data for common name)
- h) materialType - The material composition of the feature. Domain values i.e., concrete, steel, wood, etc.
- i) mediaId - gpsDataCollected
- j) MetadataId - metaID000072
- k) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- l) owner - The entity that owns the feature. Domain values, i.e., ppv, usmc, usn, leased, federalOther, etc.

CLJN.CL.MarineNavigationAid (Point) - The physical object that serves as an aid to navigation. *Requires Survey Grade GPS.

- a) builtDate - The calendar date on which the original construction was completed for a facility.
- b) contractNumber - The contract number associated with the feature.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature.

- (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
 - f) heightAboveSurfaceLevel - The vertical distance measured from the lowest point of the base of the feature at ground or water level to the tallest point of the feature.
 - g) heightAboveSurfaceLevelUom - The unit of measure Domain values i.e. 0.3048 metres, feet, etc.
 - h) isLighted - Yes / No
 - i) mediald - gpsDataCollected
 - j) MetadataId - metaID000072
 - k) navaidType - Type of the navaid. Domain value i.e., buoyMarkerDangerPoint, buoyMarkerDangerPoint etc.
 - l) operationalStatus - The state of usability of the feature i.e., inService, notInService, closed, abandoned, etc.

1.4.4 Feature Dataset CLJN.CL.RealProperty

Locate, GPS and collect attribute data as specified for each feature listed with GPS accuracy as described in paragraph "Global Positioning System (GPS) Data Collection". Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

Specific instruction for all Disposal polygons, polylines and points. All demolished or removed property shall be accounted for in the following 3 disposal features. A simple copy and paste with the following exceptions as explains in the disposal area, polyline and point may be permitted with the exception of the directions for attribution for each feature as noted. However, under no circumstance should potable water wells be removed from their original feature class. Potable wells are never deleted from their main feature, all that is required is the water wells are attributed in such a way that indicated if they are abandoned in Place (AIP) or Removed.

CLJN.CL.Disposal_FacilityArea (polygon)- The location of a facility asset in the DoD real property inventory for which a disposal action is being or has been taken to physically demolish, remove, or release the DoD of accountability for and control of the asset.

- a) abandonedDate - The date the feature was abandoned. Leave blank if removed.
- b) builtDate - The calendar date on which the original construction was completed for a facility.
- c) contractNumber - The contract number associated with the feature demolition or abandonment.
- d) ClassType - Population is contingent only if data is currently available for feature.
- e) disposalCompletionDate - The actual calendar date of the disposal or abandonment of the asset.
- f) facilityNumber - Asset Identification such as building or structure number.
- g) featureDescription -Population is contingent only if data is currently available for feature.
- h) featureName (Mandatory) - Feature Name and subtype
- i) facilityIdfk - Population is contingent only if data is currently available for feature.
- j) operationalStatus - The state of usability of the feature.

Domain values i.e., removed, abandoned, etc.

- k) owner - Population is contingent only if data is currently available for feature.
- l) removedDate - The date the feature was removed. Leave blank if abandoned.
- m) realPropertyJurisdictionType - Population is contingent only if data is currently available for feature.
- n) registryIdentifier - Population is contingent only if data is currently available for feature.
- o) sourceFeatureClass (Mandatory) - The feature class containing the polygon feature.

CLJN.CL.Disposal_FacilityLine (polyline) - The location of a personal property asset in the DoD real property inventory for which a disposal action is being or has been taken to physically demolish, remove, or release the DoD of accountability for and control of the asset.

- a) abandonedDate - The date the feature was abandoned. Leave blank if removed.
- b) builtDate - The calendar date on which the original construction was completed for a facility.
- c) contractNumber - The contract number associated with the feature demolition or abandoned.
- d) classType - Population is contingent only if data is currently available for feature.
- e) disposalCompletionDate - The actual calendar date of the disposal or abandonment of the asset.
- f) facilityNumber - Asset Identification RoadName, fence, utility line, fence gate information, etc.
- g) featureDescription - Population is contingent only if data is currently available for feature.
- h) featureName (Mandatory) - Feature Name and subtype
- i) operationalStatus - The state of usability of the feature. Domain values i.e., removed, abandoned, etc.
- j) owner - The entity that owns the feature. Domain values, i.e., ppv, usmc, usn, leased, federalOther, etc.
- k) removedDate - The date the feature was removed. Leave blank if abandoned.
- l) realPropertyJurisdictionType - The type of real property jurisdiction. Domain values i.e., tbd, etc.
- m) registryIdentifier - Population is contingent only if data is currently available for feature.
- n) sdsId - Population is contingent only if data is currently available for feature.
- o) sourceFeatureClass (Mandatory) - The feature class containing the line feature.

CLJN.CL.Disposal_FacilityPoint (point) - The location of a personal property asset in the DoD real property inventory for which a disposal action is being or has been taken to physically demolish, remove, or release the DoD of accountability for and control of the asset.

- a) abandonedDate - The date the feature was abandoned. Leave blank if removed.
- b) builtDate - The calendar date on which the original construction was completed for a facility.
- c) contractNumber - The contract number associated with the

- feature demolition or abandoned.
- d) ClassType - Population is contingent only if data is currently available for feature.
 - e) disposalCompletionDate - The actual calendar date of the disposal or abandonment of the asset.
 - f) facilityNumber - Asset Identification such as generator, ows, towers, etc.
 - g) featureDescription - Population is contingent only if data is currently available for feature.
 - h) featureName (Mandatory) - Feature Name and subtype
 - i) facilityIdfk - Population is contingent only if data is currently available for feature.
 - j) operationalStatus - The state of usability of the feature. Domain values i.e., removed, abandoned, etc.
 - k) owner - The entity that owns the feature. Domain values, i.e., ppv, usmc, usn, leased, federalOther, etc.
 - l) removedDate - The date the feature was removed. Leave blank if abandoned.
 - m) realPropertyJurisdictionType - The type of real property jurisdiction. Domain values i.e., tbd, etc.
 - n) registryIdentifier - Population is contingent only if data is currently available for feature.
 - o) sdsId - Population is contingent only if data is currently available for feature.
 - p) sourceFeatureClass (Mandatory) - The feature class containing the point feature.

CLJN.CL.Bridge - Bridge (polygon) - The structure erected over a depression or an obstacle such as a body of water, railroad, etc., to provide a pathway for vehicles, rail services, pedestrians or to carry utility services.

- a) builtDate - The calendar date on which the original construction was completed for a facility.
- b) contractNumber - The contract number associated with the
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) contractNumber - The contract number associated with the feature.
- e) featureDescription - The narrative describing the feature. Value Base Area or Road Name Crossing
- f) featureName - The common name of the feature. Pedestrian, Railroad, Road, other, etc.
- g) heightAboveSurfaceLevel - The vertical distance measured from the lowest point of the base of the feature at ground or water level to the tallest point of the feature.
- h) heightUom - The unit of measure Domain values i.e. 0.3048 metres, feet, etc.
- i) mediald - gpsDataCollected
- j) MetadataId - metaID000072
- k) isFixed - Indicator of whether the bridge cannot be opened for navigation or other purposes. Yes / No
- l) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.

CLJN.CL.Building - Building (polygon) - The roofed and floored facility enclosed by exterior walls and consisting of one or more levels.

- a) `builtDate` - The calendar date on which the original construction was completed for a facility.
- b) `contractNumber` - The contract number associated with the feature.
- c) `facilityNumber` - Asset number used for visual identification of the facility.
- d) `featureDescription` - The narrative describing the feature if feature function does not accurately address the description of building.
- e) `featureName` - The common name of the feature. (Review current data for common name)
- f) `featureFunction` - The purpose(s) of, or intended role(s) served by, the feature. Domain values i.e., Fishing (3), Aircraft Repair (341), Motor Vehicle Repair (343), Utilities (350), Water Treatment (362), Water Distribution (363), Residence (563), Guard (781), Government (811), Recreation (921) etc.
- g) `floorCount` - The number of floors
- h) `mediaId` - `gpsDataCollected`
- i) `MetadataId` - `metaID000072`
- j) `operationalStatus` - The state of usability of the feature i.e., `inService`, `notInService`, `abandoned`, etc.

CLJN.CL.Fence (polyline) - The freestanding structure designed to restrict or prevent movement across a boundary.

- a) `builtDate` - The calendar date on which the original construction was completed for a facility.
- b) `contractNumber` - The contract number associated with the feature.
- c) `facilityNumber` - Asset number used for visual identification of the facility.
- d) `featureDescription` - The narrative describing the feature. (Review current data for description)
- e) `featureName` - FENCE or GATE.
- f) `FenceDesignType` - The configuration of fabricated fence materials in a particular manner to build a fence. This may or may not include specifications of the post type(s). Domain values i.e., `cross`, `postAndFrame`, `metalRail`, `postAndFrame`, etc.
- g) `fenceFabricatedMaterialType` - The fabricated material of the fence. Domain values i.e., `barbedWire`, `chainLink`, `wroughtIron`, `metalOther`, `steel`, `wood`, etc.
- h) `fencePrimaryMaterialType` - The fundamental or raw substance of the fence. Domain values i.e., `jute`, `metalOther`, `steel`, `wood`, `wroughtIron`, etc.
- i) `fenceTopType` - The fabricated material used as an upper barrier on the fence. Domain values i.e., `spiked`, `electricfiedWire`, etc.
- j) `fenceUseType` - The purpose that the fence serves. Domain values, i.e., `internalSecurity`, `perimeterSecurity`, `recreation`, `residential`, `safety`, `vehicleBarrier`, etc.
- k) `heightAboveSurfaceLevel` - The vertical distance measurement in feet.
- l) `heightUom` - The unit of measure for the height measurement. Domain values `0.3048 metres` or `feet`, etc.
- m) `mediaId` - `gpsDataCollected`

- n) MetadataId - metaID000072
- o) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.

CLJN.CL.Gate (polyline) - A movable barrier that closes an opening in a fence, wall, or other enclosure or enclosure.

- a) accessControlType - The type of access control. Domain values, i.e., gate etc.
- b) builtDate - The calendar date on which the original construction was completed for a facility.
- c) contractNumber - The contract number associated with the feature.
- d) facilityNumber - Asset number used for visual identification of the facility.
- e) featureDescription - The narrative describing the feature. (Review current data for description)
- f) featureName - The common name of the feature. (Review current data for common name)
- g) gateTypeMaterial - The type of material of the gate. Domain values i.e., metal, steel, wood, wroughtiron, etc.
- h) gatePurposeType - Purpose that the gate exists and functions under. Domain values i.e., decorative, insternalSecurity, perimeterSecurity, recreation, residential, safely, vehicleBarrier, other, etc.
- i) gateTopType - The fabricated material used as an upper barrier on the fence. Domain values i.e., spiked,
- j) isBaseEntryPoint - Yes or No
- k) isCheckpoint - Yes or No
- l) isManned - Yes or No
- m) isPortable - Yes or No
- n) isRangeAccess - Yes or No
- o) mediaId - gpsDataCollected
- p) metadataId - metaID000072
- q) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.

CLJN.CL.RecreationBoundary (polygon) - The area designated for recreational purposes.

- a) builtDate - The calendar date on which the original construction was completed for a facility.
- b) contractNumber - The contract number associated with the feature.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) isFormallyDelineated Yes / No
- g) isHandicappedAccessible Yes / No
- h) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.

CLJN.CL.OpenStorage - Open Storage (polygon) - The non-covered and/or

covered storage areas, paved or otherwise established, for the storage of general supply materials or the receipt, processing, staging and issue of materials.

- a) `builtDate` - The calendar date on which the original construction was completed for a facility.
- b) `contractNumber` - The contract number associated with the feature.
- c) `facilityNumber` - Asset number used for visual identification of the facility.
- d) `featureDescription` - The narrative describing the feature. (Review current data for description)
- e) `featureName` - The common name of the feature. (Review current data for common name)
- f) `mediald` - `gpsDataCollected`
- g) `MetadataId` - `metaID000072`
- h) `operationalStatus` - The state of usability of the feature i.e., `inService`, `notInService`, `abandoned`, etc.

`CLJN.CL.PavementSectionAirfieldArea` - Pavement Section Airfield (polygon) - The location of a surface feature that comprises a section of a military airfield area. *Requires Survey Grade GPS.

- a) `builtDate` - The calendar date on which the original construction was completed for a facility.
- b) `contractNumber` - The contract number associated with the feature.
- c) `facilityNumber` - Asset number used for visual identification of the facility.
- d) `airfieldPavementUse` - The use of the airfield. Domain values i.e., `apron`, `fueling area`, `helipad`, `runway`, `taxiway`, etc.
- e) `featureDescription` - The narrative describing the feature. Values should include Area i.e., `MCAS NEW RIVER`, `HADNOT POINT`, `RIFLE RANGE`, `MCOLF CAMP DAVIS`, `GSRA`, `HOSPITAL`, etc.
- f) `featureName` - The common name of the feature. (Review current data for common name)
- g) `highestElevation` - The elevation from a specified vertical datum to the highest point on a feature.
- h) `highestElevationUom` - The unit of measure Domain values i.e. `0.3048 metres`, `feet`, etc.
- i) `isLighted` - Yes / No
- j) `isPaved` - Yes / No
- k) `mediald` - `gpsDataCollected`
- l) `MetadataId` - `metaID000072`
- m) `operationalStatus` - The state of usability of the feature i.e., `inService`, `notInService`, `abandoned`, etc.
- n) `owner` - The entity that owns the feature. Domain values, i.e., `ppv`, `usmc`, `usn`, `leased`, `federalOther`, etc.
- o) `runwayClassification` - Classification of the runway. Domain values i.e., `classA`, `classB`, `rotary`, `olf`, etc.

`CLJN.CL.PavementSectionParkingArea` (polygon) - The area used for parking vehicles not including residential streets and driveways.

- a) `builtDate` - The calendar date on which the original construction was completed for a facility.
- b) `contractNumber` - The contract number associated with the

- feature.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) isLighted - Yes / No
- g) mediald - gpsDataCollected
- h) MetadataId - metaID000072
- i) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- j) owner - The entity that owns the feature. Domain values, i.e., ppv, usmc, usn, leased, federalOther, etc.
- k) pavementSurfaceType - The type of material used to construct the surface of the pavement feature. Domain values i.e., asphalt, gravel, asphaltOverAsphaltConcrete, portlandCementConcrete, etc.
- l) vehicleType - The type of vehicle permitted on the pavement section. Domain value i.e., all, gov, mil, pov, etc.

CLJN.CL.PavementSectionRoadway (polygon) - The surface area that comprise a road area, upon which vehicles drive and park.

- a) builtDate - The calendar date on which the original construction was completed for a facility.
- b) contractNumber - The contract number associated with the feature.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - FULL Road Name All Capital Letters, i.e., D STREET, SIXTH STREET, FOSTER BOULEVARD, PORTLAND COURT
- f) isPaved - Yes / No
- g) mediald - gpsDataCollected
- h) MetadataId - metaID000072
- i) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- j) owner - The entity that owns the feature. Domain values, i.e., ppv, usmc, usn, leased, federalOther, etc.
- k) pavementSurfaceType - The type of material used to construct the surface of the pavement feature. Domain values i.e., gravel, asphalt, asphaltOverAsphaltConcrete, portlandCementConcrete, etc.
- l) roadSectionType - The type of road asset represented by this section. Domain values i.e., roadway, stagingArea, etc.
- m) vehicleType - The type of vehicle permitted on the pavement section. Domain value i.e., all, gov, mil, pov, etc.

CLJN.CL.PavementSection - Pavement Section (polygon) - The portion of a pavement branch that differs in some aspect from other sections such that further segmentation is required to uniquely identify that section.

- a) builtDate - The calendar date on which the original construction was completed for a facility.
- b) contractNumber - The contract number associated with the

- feature.
- c) facilityNumber - Asset number used for visual identification of the facility.
 - d) featureDescription - The narrative describing the feature. Value i.e., GENERATOR PAD, TRANSFORMER PAD, DUMPSTER PAD, BLEACHER PAD, UTILITY PANEL PAD, etc.
 - e) FeatureName - Slab.
 - f) featureName - The common name of the feature. (Review current data for common name)
 - g) mediaId - gpsDataCollected
 - h) MetadataId - metaID000072
 - i) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
 - j) owner - The entity that owns the feature. Domain values, i.e., ppv, usmc, usn, leased, federalOther, etc.

CLJN.CL.PavementSectionSidewalk (polygon) - The paved pedestrian walkway prepared to facilitate travel on foot. It may or may not be adjacent to a street/road.

- a) builtDate - The calendar date on which the original construction was completed for a facility.
- b) contractNumber - The contract number associated with the feature.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) isLighted - Yes / No
- g) isPaved - Yes / No
- h) materialType - The material composition of the feature. Domain values i.e., asphalt, concrete, etc.
- i) mediaId - gpsDataCollected
- j) MetadataId - metaID000072
- k) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- l) owner - The entity that owns the feature. Domain values, i.e., ppv, usmc, usn, leased, federalOther, etc.

CLJN.CL.StructureArea - Structure (polygon) - The facility, other than a building or linear structure, which is constructed on or in the land.

- a) builtDate - The calendar date on which the original construction was completed for a facility.
- b) contractNumber - The contract number associated with the feature.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. Values i.e., Picnic Pavilion, Gazebo, Postal Shelter, Buss Stop, Golf Shelter, Vehicle Wash Platform, Outdoor Classroom,
- e) featureName - The common name of the feature. Values i.e., CANOPY, PLATFORM, PAVILLION, RAMP, WEIGH STATION, etc.
- f) mediaId - gpsDataCollected
- g) MetadataId - metaID000072

- h) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.

CLJN.CL.TowerPoint (point) - The vertical projection, higher than its diameter, generally used for observation, etc.

- a) builtDate - The calendar date on which the original construction was completed for a facility.
- b) contractNumber - The contract number associated with the feature.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. I.e., Range, Observation, Cell, etc.
- e) featureName - Common name utilized for Range Area name.
- f) heightMax - Maximum height of structure in feet.
- g) heightUom - The unit of measure for the height measurement. Domain values .3048 metres or feet, etc.
- h) mediald - gpsDataCollected
- i) MetadataId - metaID000072
- j) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- k) towerUseType - The primary operational use of the tower. Domain values, i.e., fire, observation, communication, training, etc.

CLJN.CL.TrafficControlLight (point) - A feature used to represent traffic lights.

- a) builtDate - The calendar date on which the original construction was completed for a facility.
- b) contractNumber - The contract number associated with the feature.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) heightAboveSurfaceLevel - Maximum height of structure in feet.
- g) heightAboveSurfaceLevelUom - The unit of measure for the height measurement. Domain values .3048 metres or feet, etc.
- h) mediald - gpsDataCollected
- i) MetadataId - metaID000072
- j) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.

CLJN.CL.WallLine - Wall - The linear feature used for separation of facilities, ornamental decoration, or structural reinforcement.

- a) builtDate - The calendar date on which the original construction was completed for a facility.
- b) contractNumber - The contract number associated with the feature.
- c) facilityNumber - Asset number used for visual identification of the facility.

- d) featureDescription - The narrative describing the feature. Values i.e., BENCH, DUMSPETER ENCLOSURE, UTILITY ENCLOSURE, RETAINING WALL, BLAST PROTECTION, BAFFLE WALL, MECHANICAL YARD, etc.
- e) featureName - The common name of the feature. (Review current data for common name)
- f) height - The height of the feature in feet.
- g) heightUom - The unit of measure for the height measurement. Domain values .3048 metres or feet, etc.
- h) mediaId - gpsDataCollected
- i) MetadataId - metaID000072
- j) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- k) wallMaterialType - The material from which the majority of the wall is constructed. Domain values i.e., brick, cinderblock, grass, glassBlock, masonry, wood, etc.

1.4.5 Feature Dataset CLJN.CL.Recreation

Locate, GPS and collect attribute data as specified for each feature listed with (GPS) accuracy as described in paragraph "Global Positioning System (GPS) Data Collection". Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

CLJN.CL.RecreationTrail - Recreation Trail (Polyline) - The path or walkway providing opportunity for physical activities.

- a) builtDate - The calendar date on which the original construction was completed for a facility.
- b) contractNumber - The contract number associated with the feature.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature area. Values i.e., HADNOT POINT, FRECH CREEK, WALLAS CREEK, MCAS, etc.
- e) featureName - The common name of the feature such as common trail name. Values, i.e., GREENWAY, MCAS, KNOX, etc.
- f) MediaId - gpsDataCollected
- g) MetadataId - metaID000072
- h) materialType - The material composition of the feature. Domain values i.e., asphalt, concrete, etc.
- i) officialLength - The officially reported length of the feature in feet.
- j) officialLengthUom - The official length. Domain values i.e. 0.3048 metres, feet, etc.
- k) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.

CLJN.CL.Playground - Playground (Polygon) The area designed for children to play outdoors.

- a) builtDate - The calendar date on which the original construction was completed for a facility.
- b) contractNumber - The contract number associated with the

- feature.
- c) featureDescription - The narrative describing the feature. (Review current data for description).
 - d) featureName - The common name of the feature. (Review current data for common name)
 - e) featureName - The common name of the feature such as common trail name.
 - f) isHandicappedAccessible - Yes / No
 - g) MediaId - gpsDataCollected
 - h) MetadataId - metaID000072
 - i) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
 - j) owner - The entity that owns the feature. Domain values, i.e., ppv, usmc, usn, leased, federalOther, etc.
 - k) isHandicappedAccessible - Yes / No
 - l) playgroundCategory - Playground categorization by physical location on the installation. Domain values i.e., childDevCenter, generalPurpose, housingArea, school, etc.
 - m) playgroundMaterial - The primary material that the play pieces are constructed from. Domain values i.e., paintedMetal, plastic, vinylCoatedMetal, wood, etc.
 - n) recreationFeatureType - The type of recreation feature. Domain values i.e., paintball, playground, obstacleCourse, picnicSite, tennisCourt, volleyballCourt, swimmingPool, etc.
 - o) heightAboveSurfaceLevel - The vertical distance measured from the lowest point of the base of the feature at ground or water level to the tallest point of the feature.
 - p) heightAboveSurfaceLevelUom - The unit of measure Domain values i.e. 0.3048 metres, feet, etc.

CLJN.CL.RecreationFeatureArea - Recreation Feature Area (Polygon) - The location of an object or other physical asset associated with a recreation site. - Recreation area, i.e., swimming pool, basketball, tennis, baseball, football, and other recreation features.

- a) builtDate - The calendar date on which the original construction was completed for a facility.
- b) facilityNumber - Asset number used for visual identification of the facility.
- c) contractNumber - The contract number associated with the feature.
- d) featureDescription - The narrative describing the feature.
- e) featureName - The common name of the feature if not addressed in RecreationFeatureType field.
- f) mediaId - gpsDataCollected
- g) MetadataId - metaID000072
- h) heightAboveSurfaceLevel - The vertical distance measured from the lowest point of the base of the feature at ground or water level to the tallest point of the feature.
- i) heightAboveSurfaceLevelUom - The unit of measure Domain values i.e. 0.3048 metres, feet, etc.
- j) isHandicappedAccessible - Recreation Area has a formal designation. Yes / No
- k) isIndoor - Yes or No
- l) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- m) owner - The entity that owns the feature. Domain values, i.e., ppv, usmc, usn, leased, federalOther, etc.

- n) RecreationFeatureType - The type of recreation feature. Domain values. i.e., athleticCourt, athleticField, basketballCourt, climbingStructure, dugout, exerciseStation, footballField, picnicSite, recreationalFirearmsRange, volleyballCourt, etc.

1.4.6 Feature Dataset CLJN.CL.Transportation

Locate, GPS and collect attribute data as specified for each feature listed with (GPS) accuracy as described in paragraph "Global Positioning System (GPS) Data Collection". Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

CLJN.CL.Sign - Sign (point) - The structure that conveys directional, warning, or other information.

- a) builtDate - The calendar date on which the original construction was completed for a facility.
- b) contractNumber - The contract number associated with the feature.
- c) mediald - gpsDataCollected
- d) MetadataId - metaID000072
- e) heightAboveSurfaceLevel - The vertical distance measured from the lowest point of the base of the feature at ground or water level to the tallest point of the feature.
- f) heightAboveSurfaceLevelUom - The unit of measure Domain values i.e. 0.3048 metres, feet, etc.
- g) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- h) signAssemblyType - The type of sign assembly material. Domain values i.e., IBeamSteelBreakaway, PedestrialPole, SignalMastArm, signalPole, fire, safety, etc.
- i) signText - The text displayed on the sign.
- j) signType - The type of sign. Domain values i.e., regulatory, school, warning, etc.
- k) owner - The entity that owns the feature. Domain values, i.e., ppv, usmc, usn, leased, federalOther, etc.

CLJN.CL.RoadCenterline - The center of a roadway, as measured from the edge of the navigable road with the paved or unpaved surface. Polyline is to be drawn in direction of flow with no breaks except where naturally occurring such as intersections and crossings.

- a) dataSource - The agency that last updated the record.
- b) dateUpdated - The date the record was created or last modified.
- c) elevationFrom - Elevation value at start of segment.
- d) elevationTo - Elevation value at end of segment.
- e) featureDescription - The narrative describing the feature.
- f) featureName - the common name of the feature.
- g) fullStreetName - The combined full street name.
- h) isPaved - The yes or no indicator of whether the feature has a paved surface. Domain values i.e., yes, no.
- i) mediald - gpsDataCollected
- j) MetadataId - metaID000072

- k) numLanes - The number of traffic lanes throughout the length of the centerline.
- l) oneWayDirection - The one-way road directionality. Domain values i.e. ft, tf, b, etc.
- m) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- n) owner - The entity that owns the feature. Domain values, i.e., usmc, ncdot, etc.
- o) roadClass - The general description of the type of road, based on the US Census MAF/TIGER Feature Classification Codes (MTFCC). Domain values i.e., primary, secondary, local, etc.
- p) roadWidth - The width of the feature.
- q) roadWidthUom - The width unit of measure in feet
- r) Domain: GsipLengthUom (i.e. usSurveyFoot, metre, etc.)
- s) speedLimit - The posted speed limit in MPH.
- t) verticalDatum - The vertical reference datum for the z location value. Domain values i.e. navd88, etc.
- u) verticalEpoch - The time period epoch to which the elevation measurement is referenced. Domain values i.e., opus, etc.

1.4.7 Attribute Data Collection and GPS Requirements for Utilities

Locate, GPS and collect attribute data as specified for each feature listed with (Survey Grade GPS) accuracy as described in paragraph "Global Positioning System (GPS) Data Collection". Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

1.4.8 Feature Dataset CLJN.CL.Telecommunication

Locate, GPS and collect attribute data as specified for each feature listed with (GPS) accuracy as described in paragraph "Global Positioning System (GPS) Data Collection". Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

CLJN.CL.CommUtilSegment (polyline) - The location of a feature used for destruction in a communication network, particularly a cable for the transmission of a signal.

- a) availableStrands - A list of fiber strands that are available.
- b) cableCount - The number of copper pairs or fiber strands dedicated at a given location.
- c) cableId - The cable identifier. (Review current data for description)
- d) cableInstaller - The name of the group responsible for installation of the cable feature.
- e) cableInstallType - The type of installation of the cables. Domain values i.e., aeria, directBuried, tunnel, underground, etc.
- f) cableInsulation - The material composition of the insulation of the cable. Domain values i.e., pvc, xlpe, etc.
- g) cableMaterial - The material composition of the cable. Domain values i.e., fiberOpt, cu, etc.
- h) cableRoute - The start and end points of a cable section. (Review current data for description)

- i) cableSheathing - The type of sheathing or insulation of the cable. Domain values i.e., bp, cpnm, cj, etc.
- j) communicationsSegmentType - The type of communications network segment that this feature represents. Domain values i.e., cCoaxial, cFiberOptic, etc.
- k) contractNumber - The contract number associated with the feature.
- l) dateInService - The date the utility equipment was put in service.
- m) featureDescription - The narrative describing the feature. (Review current data for description)
- n) featureName - The common name of the feature. (Review current data for naming convention)
- o) numberOfPairs - The number of wire pairs in the cable.
- p) numberOfSingleModeStrands - The number of single-mode fiber strands.
- q) numberOfStrands -The total number of fiber strands in the cable.
- r) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- s) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- t) wireGauge - The gauge of the wire.

CLJN.CL.Feat_CUGEnclosureAccess (point) - The location of a communication access point to the related communication underground enclosure.

- a) commUtilityFeatureType - Type of communication feature, i.e., CUGEnclosureAccess
- b) contractNumber- The contract number associated with the feature.
- c) dateInService - The date the utility equipment was put in service.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for naming convention)
- f) groundConfiguration - The configuration of the asset in relationship to the ground. Domain values i.e., elevated, semiBuried, underground, etc.
- g) mediaId - gpsDataCollected
- h) MetadataId - metaID000072
- i) networkType - The primary type of utility network to which this feature relates. Domain values, i.e., communications.
- j) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- k) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- l) utilityNetworkSubtype - The primary subtype of utility to which this feature relates. Domain values i.e., communications, etc.

CLJN.CL.Feat_CPedestal (point) - The location of an above-ground enclosed structure that provides access to buried plant and a place to house utility features.

- a) commUtilityFeatureType - Type of communication feature, i.e.,

- cPedestal
- b) contractNumber- The contract number associated with the feature.
 - c) dateInService - The date the utility equipment was put in service.
 - d) featureDescription - The narrative describing the feature. (Review current data for description)
 - e) featureName - The common name of the feature. (Review current data for naming convention)
 - f) groundConfiguration - The configuration of the asset in relationship to the ground. Domain values i.e., elevated, semiBuried, underground, etc.
 - g) mediald - gpsDataCollected
 - h) MetadataId - metaID000072
 - i) networkType - The primary type of utility network to which this feature relates. Domain values, i.e., communications.
 - j) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
 - k) ownerName - The name of the item owner, i.e., MCB CL, MCCS, PPV, Company Name, etc.

CLJN.CL.CommUtilNode_CAntenna (point) - A device that can transmit or receive radio frequency signals.

- a) communicationsNodeType - Type of communication node, i.e., cAntenna
- b) contractNumber- The contract number associated with the feature.
- c) dateInService - The date the utility equipment was put in service.
- d) facilityNumber - Asset number used for visual identification of the facility.
- e) featureDescription - The narrative describing the feature. (Review current data for description)
- f) featureName - The common name of the feature. (Review current data for naming convention)
- g) mediald - gpsDataCollected
- h) MetadataId - metaID000072
- i) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- j) ownerName - The name of the item owner, i.e., MCB CL, MCCS, PPV, Company Name, etc.

CLJN.CL.Feat_CDuctBank (polyline) - The location of one or more ducts routed in parallel between two nodes.

- a) commUtilityFeatureType - Type of communication feature, i.e., cDuctBank, etc.
- b) contractNumber- The contract number associated with the feature.
- c) dateInService - The date the utility equipment was put in service.
- d) ductDiameterUom - - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- e) ductMaterial - The material composition of the feature. Domain values i.e., cooper, carbonSteel, etc.
- f) featureDescription - The narrative describing the feature.

- (Review current data for description)
- g) featureName - The common name of the feature. (Review current data for naming convention)
 - h) mediaId - gpsDataCollected
 - i) MetadataId - metaID000072
 - j) networkType - The primary type of utility network to which this feature relates. Domain values, i.e., communications.
 - k) NumberOfDucts
 - l) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
 - m) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
 - n) utilityNetworkSubtype - The primary subtype of utility to which this feature relates. Domain values i.e., communications, etc.

1.4.9 Feature Dataset CLJN.CL.Utilities_Electrical Class

Locate, GPS and collect attribute data as specified for each feature listed with (GPS) accuracy as described in paragraph "Global Positioning System (GPS) Data Collection". Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

CLJN.CL.AlternativeEnergyArea (polygon) - The apparatus or device used for the production of energy from a renewable resource.

- a) alternativeEnergyType - The type of alternative energy that the feature represents. Domain values i.e., photovoltaic, windTurbine, tbd, etc.
- b) contractNumber - The contract number associated with the feature.
- c) dateInService - The date the utility equipment was put in service.
- d) expansionDistributionNetwork - An indication of the distribution network interconnection an alternative energy feature uses to supply renewable energy. Domain values i.e., partOfElectricalNetwork, etc.
- e) facilityNumber - Asset number used for visual identification of the facility.
- f) featureDescription - The narrative describing the feature. (Review current data for description)
- g) featureName - The common name of the feature. (Review current data for common name)
- h) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, recreational, tbd, etc.
- i) groundConfiguration - The configuration of the asset in relationship to the ground. Domain values i.e., aboveground, elevated, semiBuried, underground, etc.
- j) hasInverter - Yes / No
- k) isMetered - Yes / No
- l) mediaId - gpsDataCollected
- m) MetadataId - metaID000072
- n) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- o) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.

- p) panelType - The type of panel present.
- q) systemCapacityDc - The system capacity for the DC current produced by the solar photovoltaic array, preferably measured in kilowatts.

CLJN.CL.ElecUtilNode_EFuse (point) - The location of a device used to protect electric distribution devices from dangerously high currents, and reduce risk of severe injury for personnel.

- a) circuitId - An operator generated identifier locally used to reference a specific electrical circuit. (Data can be found in Geodatabase, i.e., RG2, FC1, CHB, IND, etc. or contact PWD GIS Office)
- b) alternativeEnergyType - The type of alternative energy that the feature represents. Domain values i.e., photovoltaic, windTurbine, tbd, etc.
- c) contractNumber - The contract number associated with the feature.
- d) dateInService - The date the utility equipment was put in service.
- e) electricalNodeType - The type of electrical network node that this feature represents. Domain values consist of electrical nodes, i.e., efuse.
- f) facilityNumber - Asset number used for visual identification of the facility.
- g) featureDescription - The narrative describing the feature. (Review current data for description)
- h) featureName - The common name of the feature. (Review current data for common name)
- i) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, recreational, etc.
- j) mediaId - gpsDataCollected
- k) MetadataId - metaID000071
- l) numberOfPhases - Number of phases. Domain values i.e., one, two, three, etc.
- m) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- n) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.

CLJN.CL.ElecUtilNode_EGenerator (point) - The location of an available kinetic power source providing electricity.

- a) circuitId - An operator generated identifier locally used to reference a specific electrical circuit. (Data can be found in Geodatabase, i.e., RG2, FC1, CHB, IND, etc. or contact PWD GIS Office)
- b) contractNumber - The contract number associated with the feature.
- c) dateInService - The date the utility equipment was put in service.
- d) electricalNodeType - The type of electrical network node that this feature represents. Domain values consist of electrical nodes, i.e., eGenerator.
- e) facilityNumber - Asset number used for visual identification of the facility.
- f) featureDescription - The narrative describing the feature.

- (Review current data for description)
- g) featureName - The common name of the feature. (Review current data for common name)
 - h) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
 - i) generatorPowerSource - The power source of the generator. Domain values, i.e., gas, natural gas, propane, solarPower, etc.
 - j) generatorType - The type of electrical generator. Domain values i.e., emergency, primary, standby, etc.
 - k) isPortable - Yes / No
 - l) kvaRate - The rating of the complex power that the generator creates.
 - m) kwRate - The rating of the real power that the generator creates.
 - n) Manufacturer - The name of the manufacturer of the feature.
 - o) mediaId - gpsDataCollected
 - p) MetadataId - metaID000072
 - q) modelNumber - The model, product, catalog, or item number for the feature item.
 - r) numberOfPhases - Number of phases. Domain values i.e., one, two, three, etc.
 - s) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
 - t) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
 - u) serialNumber - The manufacturer serial or unique identification number for the feature item.
 - v) voltage - The system voltage applied to the subject item. Domain value i.e., 120V, 480V, 480Yto277V etc.

CLJN.CL.ElecUtilNode_EMeter (point) - The location of a device that measures the amount of electric energy consumed by the power user.

- a) circuitId - An operator generated identifier locally used to reference a specific electrical circuit. (Data can be found in Geodatabase, i.e., RG2, FC1, CHB, IND, etc. or contact PWD GIS Office)
- b) contractNumber - The contract number associated with the feature.
- c) dateInService - The date the utility equipment was put in service.
- d) electricalNodeType - The type of electrical network node that this feature represents. Domain values consist of electrical nodes, i.e., eMeter.
- e) energySource - Indicates if the meter is measuring a standard power source or an alternative energy source. Domain values i.e., standardPowerSource, alternativeEnergySource, tbd, etc.
- f) facilityNumber - Asset number used for visual identification of the facility.
- g) featureDescription - The narrative describing the feature. (Review current data for description)
- h) featureName - The common name of the feature. (Review current data for common name)
- i) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.

- j) isAmi - An indicator of whether or not the meter is an AMI or smart meter. Yes / No
- k) mediaId - gpsDataCollected
- l) MetadataId - metaID000072
- m) meterType - The type of meter. Domain values i.e., diaphragm, orifice, rotary, other, tbd, etc.
- n) meterUse - An indication of the type of service the meter is monitoring. Domain values eleMeter, generator, loadPoint, commercial, etc.
- o) mountingType - The type of mounting for the subject item. Domain values electrical, pole, pad, transformer, wall, etc.
- p) numberOfPhases - Number of phases. Domain values i.e., one, two, three, etc.
- q) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- r) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- s) transformerKva - The kva rate for the transformer.
- t) voltage - The system voltage applied to the subject item. Domain value i.e., 120V, 480V, 480Yto277V etc.

CLJN.CL.ElecUtilNode_ECircuitBreaker (point) - The location of a circuit breaker, an automatically operated electrical switch designed to protect an electrical circuit from damage caused by excess current from an overload or short circuit.

- a) circuitId - An operator generated identifier locally used to reference a specific electrical circuit. (Data can be found in Geodatabase, i.e., RG2, FC1, CHB, IND, etc. or contact PWD GIS Office)
- b) contractNumber - The contract number associated with the feature.
- c) dateInService - The date the utility equipment was put in service.
- d) electricalNodeType - The type of electrical network node that this feature represents. Domain values consist of electrical nodes, i.e., eCircuitBreaker.
- e) facilityNumber - Asset number used for visual identification of the facility.
- f) featureDescription - The narrative describing the feature. (Review current data for description)
- g) featureName - The common name of the feature. (Review current data for common name)
- h) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- i) mediaId - gpsDataCollected
- j) MetadataId - metaID000072
- k) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- l) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.

CLJN.CL.ElecUtilNode_EExteriorLight (point) - The location of a lighting device that is supplied by local distribution systems and is generally the only service for which the electric utility installs, operates and maintains utilization equipment.

- a) circuitId - An operator generated identifier locally used to reference a specific electrical circuit. (Data can be found in Geodatabase, i.e., RG2, FC1, CHB, IND, etc. or contact PWD GIS Office)
- b) contractNumber - The contract number associated with the feature.
- c) dateInService - The date the utility equipment was put in service.
- d) electricalNodeType - The type of electrical network node that this feature represents. Domain values consist of electrical nodes, i.e., eExteriorLight.
- e) facilityNumber - Asset number used for visual identification of the facility.
- f) exteriorLightType - The type of exterior light. Domain i.e., landscapelight, parkingLotLight, pedestrianLight, recreationFieldLight, securityLight, streetlight, sidewalkLight, etc.
- g) featureDescription - The narrative describing the feature. (Review current data for description)
- h) featureName - The common name of the feature. (Review current data for common name)
- i) feederId - The Feeder Manager identifier assigned to electric feeders and devices that participate in a specific distribution circuit. (Data can be found in Geodatabase, i.e., RG2, FC1, CHB, IND, etc. or contact PWD GIS Office)
- j) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- k) hasSensor - Yes / No
- l) heightAboveSurfaceLevel - The vertical distance measured from the lowest point of the base of the feature at ground or water level to the tallest point of the feature.
- m) heightAboveSurfaceLevelUom - The unit of measure Domain values i.e. 0.3048 metres, feet, etc.
- n) isSolar - Yes / No
- o) lampType - The type of lamp per fixture. Domain i.e., led, hps, mh, etc.
- p) mediald - gpsDataCollected
- q) MetadataId - metaID000072
- r) mountingType - The type of mounting for the subject item. Domain values i.e., pole, pad, transformer, wall, ground, etc.
- s) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- t) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- u) voltage - The system voltage applied to the subject item. Domain value i.e., 120V, 480V, 480YTo277V etc.

CLJN.CL.ElecUtilNode_EAirfieldLight (point) - The location of an electrical device used to illuminate runways, taxiways, helipads, aprons, and any other aircraft movement area, as well as to guide ground traffic.

- a) airfieldLightType - The type of lighting present on the airfield. Domain value i.e., runwayLight, taxiwayLight, apron, helipadLight, approachLight, etc.
- b) circuitId - An operator generated identifier locally used to

- reference a specific electrical circuit. (Data can be found in Geodatabase, i.e., RG2, FC1, CHB, IND, etc. or contact PWD GIS Office)
- c) contractNumber - The contract number associated with the feature.
 - d) dateInService - The date the utility equipment was put in service
 - e) electricalNodeType - The type of electrical network node that this feature represents. Domain values consist of electrical nodes, i.e., eAirfieldLight.
 - f) facilityNumber - Asset number used for visual identification of the facility.
 - g) featureDescription - The narrative describing the feature. (Review current data for description)
 - h) featureName - The common name of the feature. (Review current data for common name)
 - i) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
 - j) mediald - gpsDataCollected
 - k) MetadataId - metaID000072
 - l) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
 - m) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
 - n) voltage - The system voltage applied to the subject item. Domain value i.e., 120V, 480V, 480YTo277V etc.

CLJN.CL.ElecUtilNode_EEnergyStorage - The location of energy storage device or natural system capable of capture of energy produced at one time for use at a later time, within the relative span of a human lifetime.

- a) circuitId - An operator generated identifier locally used to reference a specific electrical circuit. (Data can be found in Geodatabase, i.e., RG2, FC1, CHB, IND, etc. or contact PWD GIS Office)
- b) contractNumber - The contract number associated with the feature.
- c) dateInService - The date the utility equipment was put in service.
- d) electricalNodeType - The type of electrical network node that this feature represents. Domain values consist of electrical nodes, i.e., eEnergyStorage.
- e) featureDescription - The narrative describing the feature. (Review current data for description)
- f) featureName - The narrative describing the feature. (Review current data for description)
- g) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- h) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- i) ownerName - The name of the item owner, i.e., MCB CL, Company Name, etc.

CLJN.CL.ElecUtilNode_ESubstation (point) - A substation is a part of an

electrical generation, transmission, and distribution system. Substations transform voltage from high to low, or the reverse, or perform any of several other important functions. Between the generating station and consumer, electric power may flow through several substations at different voltage levels.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) electricalNodeType - The type of electrical network node that this feature represents. Domain values consist of electrical nodes, i.e., eSubstation
- d) facilityNumber - Asset number used for visual identification of the facility.-
- e) featureDescription - The narrative describing the feature. (Review current data for description)
- f) featureName - The common name of the feature. (Review current data for common name)
- g) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- h) mediaId - gpsDataCollected
- i) MetadataId - metaID000072
- j) numberOfAvailableBays - The number of available bays at the substation.
- k) numberOfCircuits - The number of circuits present at the substation.
- l) numberOfSpareBreakers - The number of Spare Breakers in the substation.
- m) numberOfTransformers - The number of transformers present.
- n) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- o) ownerName - The name of the item owner, i.e., MCB CL, Company Name, etc.
- p) voltageIn - The line-to-line voltage of the transmission line that is the source for the substation. Domain value i.e., 120V, 480V, 480YTo277V etc.
- q) voltageOut - The line-to-line output voltage of the substation. Domain value i.e., 120V, 480V, 480YTo277V etc.

CLJN.CL.Feat_ESubstation (Polygon) - The location of a facility in an electrical system where the voltage is reduced from transmission levels to distribution levels.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) electricalUtilityFeatureType - The type of electrical utility feature. Domain value, i.e., eSubstation.
- d) FacilityNumber - Asset number used for visual identification of the facility.
- e) featureDescription - The narrative describing the feature. (Review current data for description)
- f) featureName - The common name of the feature. (Review current data for common name)
- g) functionalArea - The principle activity within a landuse

- area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- h) groundConfiguration - The configuration of the asset in relationship to the ground. Domain values i.e., aboveground, elevated, semiBuried, underground, etc.
 - i) mediaId - gpsDataCollected
 - j) MetadataId - metaID000072
 - k) networkType - The primary type of utility network to which this feature relates. Domain values i.e., electrical, etc.
 - l) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
 - m) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
 - n) utilityNetworkSubtype - The primary subtype of utility to which this feature relates. Domain values i.e., electrical, etc.

CLJN.CL.ElecUtilNode_EVoltageRegulator (point) - Current Regulators are different that Voltage Regulators and are used on the airfield lighting systems.

- a) circuitId - An operator generated identifier locally used to reference a specific electrical circuit. (Data can be found in Geodatabase, i.e., RG2, FC1, CHB, IND, etc. or contact PWD GIS Office)
- b) contractNumber - The contract number associated with the feature.
- c) dateInService - The date the utility equipment was put in service.
- d) electricalNodeType - The type of electrical network node that this feature represents. Domain values consist of electrical nodes, i.e., ecurrentRegulator.
- e) facilityNumber - Asset number used for visual identification of the facility.
- f) featureDescription - The narrative describing the feature. (Review current data for description)
- g) featureName - The common name of the feature. (Review current data for common name)
- h) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- i) mediaId - gpsDataCollected
- j) MetadataId - metaID000072
- k) numberOfPhases - Number of phases. Domain values i.e., one, two, three, etc.
- l) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- m) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.

CLJN.CL.ElecUtilNode_ESwitchingStation (point) - A Switching Station is an electrical substation with only one voltage level, whose only function are switching actions.

- a) circuitId - An operator generated identifier locally used to reference a specific electrical circuit. (Data can be found in Geodatabase, i.e., RG2, FC1, CHB, IND, etc. or contact PWD

- GIS Office)
- b) contractNumber - The contract number associated with the feature.
- c) dateInService - The date the utility equipment was put in service.
- d) electricalNodeType - The type of electrical network node that this feature represents. Domain values consist of electrical nodes, i.e., eSwitchingStation.
- e) facilityNumber - Asset number used for visual identification of the facility.
- f) featureDescription - Number of Switches.
- g) featureName - The common name of the feature. (Review current data for common name)
- h) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- i) mediaId- gpsDataCollected
- j) MetadataId - metaID000072
- k) numberOfSwitches -The number of switches present.
- l) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- m) ownerName - The name of the item owner, i.e., MCB CL, MCCS, PPV, Company Name, etc.

CLJN.CL.ElecUtilNode_ESwitch (point) - The location of a device throughout distribution feeder circuits to redirect power flows to balance loads or for sectionalizing to allow repair of damaged lines or equipment.

- a) circuitId - An operator generated identifier locally used to reference a specific electrical circuit. (Data can be found in Geodatabase, i.e., RG2, FC1, CHB, IND, etc. or contact PWD GIS Office)
- b) contractNumber - The contract number associated with the feature.
- c) dateInService - The date the utility equipment was put in service.
- d) electricalNodeType - The type of electrical network node that this feature represents. Domain values consist of electrical nodes, i.e., eSwitch.
- e) electricalSwitchInstallation - The mounting/installation style of the electrical switch. Domain values buildingMounted, padMounted, poleMounted, electricalPanel, etc.
- f) electricalSwitchType - The type or style of electrical switch. Domain values circuitBrkr, disconnect, fuseCutout, gangDisc, hdSaftly, iso, reclosure, etc.
- g) facilityNumber - Asset number used for visual identification of the facility.
- h) featureDescription - The narrative describing the feature. (Review current data for description)
- i) featureName - The common name of the feature. (Review current data for common name)
- j) feederId - The Feeder Manager identifier assigned to electric feeders and devices that participate in a specific distribution circuit, utilize (tbd) if unknown.
- k) feederId2 - The feeder Manager Identifier assigned if the electric device is supplied by second feeder, utilize. (Data

- can be found in Geodatabase, i.e., RG2, FC1, CHB, IND, etc. or contact PWD GIS Office)
- l) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
 - m) mediaId - gpsDataCollected
 - n) MetadataId - metaID000072
 - o) numberOfPhases - Number of phases. Domain values i.e., one, two, three, etc.
 - p) numberOfSwitches - The number of switches present, i.e.,
 - q) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
 - r) ownerName - The name of the item owner, i.e., MCB CL, M CCS, PPV, Company Name, etc.
 - s) switchPosition - Code indicating normal position of switch, per phase. Domain value closed, closedOpen, open, openClosed, unknown, tbd, etc.
 - t) voltage - The system voltage applied to the subject item. Domain value i.e., 120V, 480V, 480YTo277V etc.

CLJN.CL.Feat_EPedestal (point) An aboveground service entrance, allowing maintenance access to the specific utility, usually electric or communications.

- a) circuitId - An operator generated identifier locally used to reference a specific electrical circuit. (Data can be found in Geodatabase, i.e., RG2, FC1, CHB, IND, etc. or contact PWD GIS Office)
- b) bcontractNumber - The contract number associated with the feature.
- c) cdateInService - The date the utility equipment was put in service.
- d) electricalUtilityFeatureType - The type of electrical utility feature, i.e., ePedestal
- e) facilityNumber - Asset number used for visual identification of the facility.
- f) featureDescription - The narrative describing the feature. (Review current data for description)
- g) featureName - The common name of the feature. (Review current data for common name)
- h) featureName - The common name of the feature. (Review current data for common name)
- i) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- j) groundConfiguration - The configuration of the asset in relationship to the ground. Domain values i.e., aboveground, elevated, semiBuried, underground, etc.
- k) mediaId - gpsDataCollected
- l) MetadataId - metaID000072
- m) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- n) ownerName - The name of the item owner, i.e., MCB CL, M CCS, PPV, Company Name, etc.
- o) utilityNetworkSubtype - The primary subtype of utility to which this feature relates. Domain values i.e., electrical, etc.

ElecUtilNode_ETransformer - Electrical Utility Node - Transformer
(point) - The location of an electric distribution or power transformer.

- a) circuitId - An operator generated identifier locally used to reference a specific electrical circuit. (Data can be found in Geodatabase, i.e., RG2, FC1, CHB, IND, etc. or contact PWD GIS Office)
- b) contractNumber - The contract number associated with the feature.
- c) dateInService - The date the utility equipment was put in service.
- d) electricalNodeType - The type of electrical network node that this feature represents. Domain values consist of electrical nodes i.e., eTransformer.
- e) facilityNumber - Asset number used for visual identification of the facility.
- f) featureDescription - The narrative describing the feature. (Review current data for description)
- g) featureName - The common name of the feature. (Review current data for common name)
- h) feederId - The Feeder Manager identifier assigned to electric feeders and devices that participate in a specific distribution circuit, utilize (tbd) if unknown.
- i) feederId2 - The feeder Manager Identifier assigned if the electric device is supplied by second feeder, utilize (tbd) if unknown.
- j) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- k) mediaId - gpsDataCollected
- l) MetadataId - metaID000072
- m) Manufacture - The name of the manufacturer of the feature.
- n) modelNumber - The model, product, catalog, or item number for the feature item.
- o) mountingType - The type of mounting for the subject item. Domain value ground, pad, pole, transformer, wall, tbd, etc.
- p) numberOfPhases - Number of phases. Domain values i.e., one, two, three, etc.
- q) numberOfTransformers - The number of transformers present.
- r) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- s) ownerName - The name of the item owner, i.e., MCB CL, MCCS, PPV, Company Name, etc.
- t) primaryVoltage - The voltage on the source side of the regulator with the associated units given. Domain value i.e., 120V, 480V, 480YTo277V etc.
- u) secondaryVoltage - The voltage on the load side of the regulator with the associated units given. Domain value i.e., 120V, 480V, 480YTo277V etc.
- v) totalKva - The total kva rate.
- w) transformerType - The type of transformer. Domain values i.e., inverter, isolation, stepDown, stepUp, vault, etc.

CLJN.CL.ElecUtilSegment (polyline) - The location of a linear feature, particularly a cable that transmits, distributes or connects customers to electricity. All polylines shall be drawn in the direction of flow with no breaks except for what is naturally occurring such at nodes,

etc.

- a) `ElectricalSegmentType` - The identifier for Primary or Secondary line segments within an electrical distribution system.
- b) `cableInsultaion` - The material composition of the insulation of the cable. Domain value, i.e., ip, epr, pe, pvc, rubber, xipe, tdb, unknow, etc.
- c) `cableMaterial` - The material composition of the cable. Domain value, i.e., ac, al, copper, fiberOpt, steel, steelGalv, etc.
- d) `cableSheathing` - The type of sheathing or insulation of the cable. Domain value, i.e., shielded, weatherProof, asbestos, cellulose, tapeArmor, tbd, etc.
- e) `circuitId` - An operator generated identifier locally used to reference a specific electrical circuit. (Data can be found in Geodatabase, i.e., RG2, FC1, CHB, IND, etc. or contact PWD GIS Office)
- f) `conductorSize` - The size of the conductor.
- g) `contractNumber` - The contract number associated with the feature.
- h) `dateInService` - The date the utility equipment was put in service.
- i) `facilityNumber` - Asset number used for visual identification of the facility.
- j) `featureDescription` - The narrative describing the feature. (Review current data for description)
- k) `featureName` - The common name of the feature. (Review current data for common name)
- l) `feederId` - The Feeder Manager identifier assigned to electric feeders and devices that participate in a specific distribution circuit, utilize (tbd) if unknown.
- m) `feederId2` - The feeder Manager identifier assigned if the electric device is supplied by second feeder, utilize. (Data can be found in Geodatabase, i.e., RG2, FC1, CHB, IND, etc. or contact PWD GIS Office)
- n) `functionalArea` - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- o) `groundConfiguration` - The configuration of the asset in relationship to the ground. Domain values i.e., aboveground, elevated, semiBuried, underground, etc.
- p) `mediaId` - `gpsDataCollected`
- q) `MetadataId` - metaID000072
- r) `neutralSize` - The size of a single neutral conductor. Domain value i.e., .5, .75, 1, 1.25, 2, 4, etc.
- s) `numberOfPhases` - Number of phases. Value, i.e., 1, 2, 3, 4, etc.
- t) `operationalStatus` - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- u) `ownerName` - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- v) `voltage` - The system voltage applied to the subject item. Domain value i.e., 120V, 480V, 480YTo277V etc.

`CLJN.CL.Feat_EScadaSensor` (point) - The location of a device that is used to remotely measure the status of electrical network components as part of a Supervisory Control and Data Acquisition (SCADA) system.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) electricalUtilityFeatureType - The type of electrical utility feature, i.e., eScadaSensor
- d) FacilityNumber - Asset number used for visual identification of the facility.
- e) featureDescription - The narrative describing the feature. (Review current data for description)
- f) featureName - The common name of the feature. (Review current data for common name)
- g) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- h) groundConfiguration - The configuration of the asset in relationship to the ground. Domain values i.e., aboveground, elevated, semiBuried, underground, etc.
- i) mediaId - gpsDataCollected
- j) MetadataId - metaID000072
- k) networkType - The primary type of utility network to which this feature relates. Domain values, i.e., electrical.
- l) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- m) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- n) utilityNetworkSubtype - The primary subtype of utility to which this feature relates. Domain values i.e., electrical, etc.

CLJN.CL.Feat_EDemarcationPoint (point) - The location where the electrical service provider ownership ends, and the customer ownership begins.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) electricalUtilityFeatureType - The type of electrical utility feature, i.e., eDemarcationPoint.
- d) facilityNumber - Asset number used for visual identification of the facility.
- e) featureDescription - The narrative describing the feature. (Review current data for description)
- f) featureName - The common name of the feature. (Review current data for common name)
- g) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- h) groundConfiguration - The configuration of the asset in relationship to the ground. Domain values i.e., aboveground, elevated, semiBuried, underground, etc.
- i) mediaId - gpsDataCollected
- j) MetadataId - metaID000072
- k) networkType - The primary type of utility network to which this feature relates. Domain values, i.e., electrical.
- l) operationalStatus - The state of usability of the feature

- i.e., inService, notInService, abandoned, etc.
- m) outsideProvider - The name of the outside provider for the Utility Feature. Value, i.e., owner of point may be 3rd party company.
 - n) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
 - o) utilityNetworkSubtype - The primary subtype of utility to which this feature relates. Domain values i.e., electrical, etc.

CLJN.CL.Feat_ESupportStructure (point) - The location of a structural framework that holds electric devices in an elevated position.

- a) circuitId - An operator generated identifier locally used to reference a specific electrical circuit. (Data can be found in Geodatabase, i.e., RG2, FC1, CHB, IND, etc. or contact PWD GIS Office)
- b) configurationType - The cable mounting configuration on the pole or tower. Domain value, i.e, armless, crossarmEqual, crossarmUnequal, shortArm, vertical, other, tbd, unknown, etc.
- c) contractNumber - The contract number associated with the feature.
- d) dateInService - The date the utility equipment was put in service.
- e) electricalUtilityFeatureType - The type of electrical utility feature i.e., eSupportStructure.
- f) facilityNumber - Asset number used for visual identification of the facility.
- g) featureDescription - The narrative describing the feature. (Review current data for description)
- h) featureName - The common name of the feature. (Review current data for common name)
- i) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- j) groundConfiguration - The configuration of the asset in relationship to the ground. Domain values i.e., aboveground, elevated, semiBuried, underground, etc.
- k) heightAboveSurfaceLevel - The vertical distance measured from the lowest point of the base of the feature at ground or water level to the tallest point of the feature in feet.
- l) heightAboveSurfaceLevelUom - The unit of measure Domain values i.e. 0.3048 metres, feet, etc.
- m) materialType - The material composition of the feature. Domain value, i.e., cement, fiberglass, log, metal, steel, wood, etc.
- n) networkType - The primary type of utility network to which this feature relates. Domain values, i.e., electrical.
- o) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- p) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- q) serialNumber - Physical ID on pole that is a unique identifier added to pole on label by contractor/shop.
- r) utilityNetworkSubtype - The primary subtype of utility to which this feature relates. Domain values i.e., electrical, etc.

CLJN.CL.Feat_ESurfaceStructure - The location of a structural framework that holds electric devices in a position at or near the ground surface.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) electricalStructureType - The type of electrical feature. Domain values i.e., electricalCabinet, handHole, junctionBox, manhole, etc.
- d) electricalUtilityFeatureType - The type of electrical utility feature i.e., eSurfaceStructure.
- e) facilityNumber - Asset number used for visual identification of the facility.
- f) featureDescription - The narrative describing the feature. (Review current data for description)
- g) featureName - The common name of the feature. (Review current data for common name)
- h) functionalArea - The common name of the feature. (Review current data for common name)
- i) groundConfiguration - The configuration of the asset in relationship to the ground. Domain values i.e., aboveground, elevated, semiBuried, underground, etc.
- j) mediaId - gpsDataCollected
- k) MetadataId - metaID000072
- l) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- m) ownerName - The name of the item owner, i.e., MCB CL, MCCS, PPV, Company Name, etc. utilityNetworkSubtype

CLJN.CL.Feat_EAnchorGuy (point) - The location of a wire or set of wires running from the top of the pole to an anchor installed in the ground and consist of wires, appropriate fastenings and the anchor.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) electricalUtilityFeatureType - The type of electrical utility feature, i.e., eAnchorGuy.
- d) facilityNumber - Asset number used for visual identification of the facility.
- e) featureDescription - The narrative describing the feature. (Review current data for description)
- f) featureName - The common name of the feature. (Review current data for common name)
- g) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- h) groundConfiguration - The configuration of the asset in relationship to the ground. Domain values i.e., aboveground, elevated, semiBuried, underground, etc.
- i) mediaId - gpsDataCollected
- j) MetadataId - metaID000072
- k) networkType - The primary type of utility network to which this feature relates. Domain values, i.e., electrical.
- l) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.

- m) `ownerName` - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- n) `utilityNetworkSubtype` - The primary subtype of utility to which this feature relates. Domain values i.e., electrical, etc.

`CLJN.CL.Feat_EUgEnclosureAccess` (point) - The location of an electrical access point to the related electrical underground enclosure.

- a) `contractNumber` - The contract number associated with the feature.
- b) `dateInService` - The date the utility equipment was put in service.
- c) `electricalUtilityFeatureType` - The type of electrical utility feature i.e., `eUgEnclosureAccess`.
- d) `facilityNumber` - Asset number used for visual identification of the facility.
- e) `featureDescription` - The narrative describing the feature. (Review current data for description)
- f) `featureName` - The common name of the feature. (Review current data for common name)
- g) `functionalArea` - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- h) `groundConfiguration` - The configuration of the asset in relationship to the ground. Domain values i.e., aboveground, elevated, semiBuried, underground, etc.
- i) `mediald` - `gpsDataCollected`
- j) `MetadataId` - `metaID000072`
- k) `networkType` - The primary type of utility network to which this feature relates. Domain values, i.e., electrical.
- l) `operationalStatus` - The state of usability of the feature i.e., `inService`, `notInService`, `abandoned`, etc.
- m) `ownerName` - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- n) `utilityNetworkSubtype` - The primary subtype of utility to which this feature relates. Domain values i.e., electrical, etc.

1.4.10 Feature Dataset `CLJN.CL.Utilities_Pol`

Locate, GPS and collect attribute data as specified for each feature listed with (GPS) accuracy as described in paragraph "Global Positioning System (GPS) Data Collection". Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

`CLJN.CL.PolUtilNode_OOwsSystem` (point) - A filtering device placed in the fuel stream specifically to remove oil and water from the fuel.

- a) `contractNumber` - The contract number associated with the feature.
- b) `dateInService` - The date the utility equipment was put in service.
- c) `facilityNumber` - Asset number used for visual identification of the facility.

- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- g) mediaId - gpsDataCollected
- h) MetadataId - metaID000072
- i) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- j) polNetworkSubType - The subtype of POL network in which this feature participates. Domain values i.e., contaminatedMedia, b5, automotiveDiesel, etc.
- k) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.

CLJN.CL.PolUtilNode_OValve (point) -The location of a network component used to control flow, pressure, and level within fueling systems.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) depth - The distance, measured vertically downward to the base in inches.
- d) depthUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- e) Diameter - The diameter of the feature in inches. Domain value i.e., .5, .75, 1, 1.25, 1.5, 1.75, 2, etc.
- f) diameterUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- g) facilityNumber - Asset number used for visual identification of the facility.
- h) featureDescription - The narrative describing the feature. (Review current data for description)
- i) featureName - The common name of the feature. (Review current data for common name)
- j) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- k) mediaId - gpsDataCollected
- l) MetadataId - metaID000072
- m) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- n) polNetworkSubType - The subtype of POL network in which this feature participates. Domain values i.e., jetA, kerosene, marineDiesel, jp5, automotiveDiesel, etc.
- o) polNodeType - The type of POL network node that this feature represents i.e., oValve, etc.
- p) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- q) valveMaterial - The material composition of the valve. Domain values, i.e., ductileIron, carbonSteel, etc.
- r) valveType - The normal status or operating position of the valve. Domain values i.e., check, gate, etc.

CLJN.CL.PolUtilNode_OMeter (point) - The location of a device that measures the volumetric flow rate of fuel passing through the meter.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- g) isAmi - Description of meter - meter is an AMI or smart meter. Yes / No
- h) mediaId - gpsDataCollected
- i) MetadataId - metaID000072
- j) meterType - The type of meter. Domain values i.e., diaphragm, orifice, rotary, other, tbd, etc.
- k) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- l) ownerName - The name of the item owner, i.e., MCB CL, AmeriGas, etc., etc.
- m) polNetworkSubType - The subtype of POL network in which this feature participates. Domain values i.e., jetA, kerosene, marineDiesel, jp5, automotiveDiesel, contaminatedMedia, etc.
- n) polNodeType - The type of POL network node that this feature represents i.e., oMeter

CLJN.CL.PolUtilNode_OTank (point) -The location of a container for storage of POL products at atmospheric pressure.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- g) groundConfiguration - The configuration of the asset in relationship to the ground. Domain values i.e., aboveground, elevated, semiBuried, underground, etc.
- h) locatedUnderground - Yes / No
- i) mediaId - gpsDataCollected
- j) MetadataId - metaID000072
- k) nominalCapacity - The numeric volume of the feature when filled to its design capacity.
- l) nominalCapacityUom - The unit of measure of the like named value. Domain values i.e., usgallon

- m) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- n) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- o) polNetworkSubType - The subtype of POL network in which this feature participates. Domain values i.e., jetA, kerosene, marineDiesel, jp5, automotiveDiesel, contaminatedMedia, etc.
- p) secondaryContainment - Indicates the storage tank has a secondary containment area that contains spills. Domain values i.e., concreteVault, doubleBottom, plasticPanSystem, other, etc.
- q) polNodeType - The type of POL network node that this feature represents. Domain values, i.e., (oTank)
- r) secondaryContainment - Indicates the storage tank has a secondary containment area that contains spills, i.e., spillPan, etc.
- s) storageTankProduct - The product contained in the storage tank. Domain values i.e., automotiveDiesel, bf5, dielectricOil, diesel, ethanol, gasoline, heatingOilUnspecified, jp, marineDiesel, propane, reclaimedFuel, usedCookingOil, usedFuel, usedOil, etc.
- t) tankTopHeight - The top of the tank reservoir measured from the lowest point of the base of the feature at ground or water level to the tallest point of the feature.
- u) tankTopHeightUom - The unit of measure Domain values i.e. 0.3048 metres, feet, etc.

CLJN.CL.PolUtilNode_ODispenser (point) - The location of a machine at a fueling station that is used to pump fuel into vehicles or Aerospace Ground Equipment (AGE).w

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. Type of dispenser i.e., Marine, Aircraft, Automobile, HeavyEquipment, POV, GOV, etc.
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- g) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- h) mediaId - gpsDataCollected
- i) MetadataId - metaID000072
- j) networkType - The primary type of utility network to which this feature relates. Domain values i.e., (pol)
- k) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- l) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- m) polNetworkSubType - The subtype of POL network in which this

- feature participates. Domain values i.e., jetA, kerosene, marineDiesel, jp5, automotiveDiesel, contaminatedMedia, etc.
- n) polNodeType - The type of POL network node that this feature represents i.e., oDispenser

CLJN.CL.PolUtilSegment (polyline) - The location of a linear feature, particularly a pipeline, used for the conveyance of petroleum, oil, and lubricants (POL) product. All polylines shall be drawn in the direction of flow with no breaks except for what is naturally occurring such as nodes, etc.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) depth - The distance, measured vertically downward to the base in inches.
- d) depthUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- e) Diameter - The diameter of the feature in inches. Domain value i.e., .5, .75, 1, 1.25, 1.5, 1.75, 2, etc.
- f) diameterUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- g) facilityNumber - Asset number used for visual identification of the facility.
- h) featureDescription - The narrative describing the feature. (Review current data for description)
- i) featureName - The common name of the feature. (Review current data for common name)
- j) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- k) groundConfiguration - The configuration of the asset in relationship to the ground. Domain values i.e., aboveground, elevated, semiBuried, underground, etc.
- l) materialType - The material composition of the feature. Domain values i.e., cooper, carbonSteel, etc.
- m) mediald - gpsDataCollected
- n) MetadataId - metaID000072
- o) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- p) ownerName - The name of the item owner, i.e., MCB CL, MCCS, PPV, Company Name, etc.
- q) polNetworkSubType - The subtype of POL network in which this feature participates. Domain values i.e., jetA, kerosene, marineDiesel, jp5, automotiveDiesel, contaminatedMedia, etc.

1.4.11 Feature Dataset CLJN.CL.Utilities_Sewer

Locate, GPS and collect attribute data as specified for each feature listed with (GPS) accuracy as described in paragraph "Global Positioning System (GPS) Data Collection". Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

CLJN.CL.Feat_SDemarcationPoint (point) - The location where the

wastewater service provider ownership ends, and the customer ownership begins.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- g) groundConfiguration - The configuration of the asset in relationship to the ground. Domain values i.e., aboveground, elevated, semiBuried, underground, etc.
- h) mediaId - gpsDataCollected
- i) MetadataId - metaID000072
- j) networkType - The primary type of utility network to which this feature relates. Domain values i.e., wastewater, etc.
- k) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- l) outsideProvider - The name of the outside provider for the Utility Feature. Value, i.e., owner of point may be 3rd party company.
- m) owner - The entity that owns the feature. Domain values, i.e., ppv, usmc, usn, leased, federalOther, etc.
- n) wastewaterNetworkSubType - The subtype of wastewater network in which this feature participates. Domain values i.e., domesticSewage, oilyWaste, industrialWaste, etc.
- o) wastewaterNodeType - The type of water utility feature i.e., sDemarcationPoint.

CLJN.CL.WastUtilNode_SMeter (point) - The location of a device or set of devices used to measure the flow of wastewater.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- g) isAmi - An indicator of whether or not the meter is an AMI or smart meter. Yes / No
- h) Manufacturer - The name of the manufacturer of the feature.
- i) mediaId - gpsDataCollected
- j) MetadataId - metaID000072
- k) meterType - The type of meter. Domain valves i.e.,

- diaphragm, orifice, rotary, other, tbd, etc.
- l) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
 - m) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
 - n) wastewaterNetworkSubType - The subtype of wastewater network in which this feature participates. Domain values i.e., domesticSewage, oilyWaste, industrialWaste, etc.
 - o) wastewaterNodeType - The type of wastewater network node that this feature represents i.e., smeter.

CLJN.CL.Feat_SScadaSensor (point) - The location of a device that is used to remotely measure the status of wastewater network components as part of a Supervisory Control and Data Acquisition (SCADA) system.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- g) mediaId - gpsDataCollected
- h) MetadataId - metaID000072
- i) networkType - The primary type of utility network to which this feature relates. Domain values, i.e., wastewater, etc.
- j) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- k) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- l) utilityNetworkSubType - The subtype of wastewater network in which this feature participates. Domain values i.e., domesticSewage, etc.
- m) wastewaterUtilityFeatureType - The type of water utility feature i.e., sScadaSensor

CLJN.CL.Feat_SUGenclosureAccess (point) -The location of a wastewater access point to the related wastewater underground enclosure.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing,

- recreational, training, water, etc.
- g) Diameter - The diameter of the feature in inches. Domain value i.e., .5, .75, 1, 1.25, 1.5, 1.75, 2, etc.
- h) diameterUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- i) invertElevation - The elevation of the bottom of the feature in inches.
- j) invertElevationUom - The invert elevation. Domain values, i.e., length equal to .0254, inch, etc.
- k) numberOfPipes - The number of pipes connecting to the manhole.
- l) mediaId - gpsDataCollected
- m) MetadataId - metaID000072
- n) networkType - The primary type of utility network to which this feature relates. Domain values, i.e., wastewater.
- o) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- p) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- q) rimElevation - The elevation at the top of the feature in feet.
- r) rimElevationUom - The unit of measure for rim elevation. Domain values i.e. measurement equal to 0.3048 metres, etc.
- s) utilityNetworkSubtype - The primary subtype of utility to which this feature relates. Domain values i.e., wastewater, etc.
- t) wastewaterUtilityFeatureType - The type of water utility feature i.e., sUgEnclosureAccess.

CLJN.CL.WastUtilNode_SCleanOut (point) - The location of a wastewater device access point in a lateral used for maintenance purposes.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) Diameter - The diameter of the feature in inches. Domain value i.e., .5, .75, 1, 1.25, 1.5, 1.75, 2, etc.
- g) diameterUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- h) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- i) mediaId - gpsDataCollected
- j) MetadataId - metaID000072
- k) materialType - The material composition of the feature. Domain values i.e., copper, ductileIron, fiber, fiberglassReinforcedPolyester, galvanizedIron, galvanizedSteel, PVC, terracotta, etc.
- l) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- m) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.

- n) wastewaterNetworkSubType - The subtype of wastewater network in which this feature participates, i.e., domesticSewage, etc.
- o) wastewaterNodeType - The type of wastewater network node that this feature represents. i.e., scleanOut.

CLJN.CL.WastUtilNode_SFitting (point) - The location of a mechanical device on the wastewater system that caps or plugs a single pipe, or connects two or more pipes.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) Diameter - The diameter of the feature in inches. Domain value i.e., .5, .75, 1, 1.25, 1.5, 1.75, 2, etc.
- d) diameterUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- e) facilityNumber - Asset number used for visual identification of the facility.
- f) featureDescription - The narrative describing the feature. (Review current data for description)
- g) featureName - The common name of the feature. (Review current data for common name)
- h) fittingMaterial - The material of the pipe fitting. Domain values i.e., copper, ductileIron, fiber, fiberglassReinforcedPolyester, galvanizedIron, galvanizedSteel, PVC, steel, etc.
- i) fittingType - The type of pipe fitting. Domain values, i.e., bend, reducer, tee, plug, etc.
- j) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- k) mediaId - digitized
- l) MetadataId - metaID000071
- m) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- n) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- o) wastewaterNetworkSubType - The subtype of wastewater network in which this feature participates, i.e., domesticSewage, etc.
- p) wastewaterNodeType - The type of wastewater network node that this feature represents. i.e., sFitting.

CLJN.CL.WastUtilNode_SSystemValve (point) - The location of a device that regulates, directs, or controls the flow of wastewater.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) Diameter - The diameter of the feature in inches. Domain value i.e., .5, .75, 1, 1.25, 1.5, 1.75, 2, etc.
- d) diameterUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- e) facilityNumber - Asset number used for visual identification of the facility.
- f) featureDescription - The narrative describing the feature.

- (Review current data for description)
- g) featureName - The common name of the feature. (Review current data for common name)
 - h) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
 - i) mediaId - gpsDataCollected
 - j) MetadataId - metaID000072
 - k) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
 - l) ownerName - The name of the item owner, i.e., MCB CL, M CCS, PPV, Company Name, etc.
 - m) valveMaterial - The material composition of the valve. Domain values, i.e., ductileIron, carbonSteel, etc.
 - n) valvePosition - The normal status or operating position of the valve. Domain values i.e., normallyClosed, normallyOpen, other, tbd, unknown.
 - o) valveType - The normal status or operating position of the valve. Domain values i.e., flowControl, butterfly, check, gate, postIndicator, etc.
 - p) wastewaterNetworkSubType - The subtype of wastewater network in which this feature participates, i.e., domesticSewage, etc.
 - q) wastewaterNodeType - The type of wastewater network node that this feature represents. i.e., sSystemValve.

CLJN.CL.WastUtilNode_SReleaseValve (point) - The location of a wastewater device used to purge air from a force main.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) Diameter - The diameter of the feature in inches. Domain value i.e., .5, .75, 1, 1.25, 1.5, 1.75, 2, etc.
- d) diameterUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- e) facilityNumber - Asset number used for visual identification of the facility.
- f) featureDescription - The narrative describing the feature. (Review current data for description)
- g) featureName - The common name of the feature. (Review current data for common name)
- h) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- i) mediaId - gpsDataCollected
- j) MetadataId - metaID000072
- k) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- l) ownerName - The name of the item owner, i.e., MCB CL, M CCS, PPV, Company Name, etc.
- m) valveMaterial - The material composition of the valve. Domain values, i.e., ductileIron, carbonSteel, etc.
- n) valveType - The normal status or operating position of the valve. Domain values i.e., airRelease.
- o) wastewaterNetworkSubType - The subtype of wastewater network in which this feature participates, i.e., domesticSewage, etc.
- p) wastewaterNodeType - The type of wastewater network node that

this feature represents. i.e., sReleaseValve.

CLJN.CL.WastUtilNode_SGreaseTrap (point) - The location of a tank which separates grease from water, collects the grease for removal, and allows the water to exit.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- g) mediaId - gpsDataCollected
- h) MetadataId - metaID000072
- i) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- j) ownerName - The name of the item owner, i.e., MCB CL, MCCS, PPV, Company Name, etc.
- k) wastewaterNetworkSubType - The subtype of wastewater network in which this feature participates, i.e., domesticSewage, etc.
- l) wastewaterNodeType - The type of wastewater network node that this feature represents. i.e., sGreaseTrap.

CLJN.CL.WastUtilNode_STank (point) - The location of a container for storage of products associated with the wastewater network.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) diameter - Diameter - The diameter of the feature in inches. Domain value i.e., .5, .75, 1, 1.5, 1.75, 2, etc.
- d) diameterUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- e) facilityNumber - Asset number used for visual identification of the facility.
- f) featureDescription- The narrative describing the feature. (Review current data for description)
- g) featureName - The common name of the feature. (Review current data for common name)
- h) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- i) groundConfiguration - The configuration of the asset in relationship to the ground. Domain values i.e., aboveground, elevated, semiBuried, underground, etc.
- j) hasSecondaryContainment - Yes / No
- k) materialType - The material composition of the feature. Domain values i.e., concrete, etc.
- l) nominalCapacity - The unit total numeric capacity in gallons.

- m) nominalCapacityUom - The unit of measure of the like named value i.e., usGallon
- n) mediaId - gpsDataCollected
- o) MetadataId - metaID000072
- p) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- q) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc
- r) storageTankProduct - The product contained in the storage tank. Domain values i.e., oilyWastewater, rawWater, wasteFuel.
- s) volume - The volumetric capacity of the feature
- t) volumeUom - The unit of measure of the like named value i.e., usGallon
- u) wastewaterNetworkSubType - The subtype of wastewater network in which this feature participates, i.e., domesticSewage, oilyWaste, etc.
- v) wastewaterNodeType - The type of wastewater network node that this feature represents. i.e.,stank.
- w) width - The dimension of a feature in feet.
- x) widthUom - The unit of measure Domain values i.e. 0.3048 metres, feet, etc.

CLJN.CL.WastUtilNode_SOilWateSeparator (point) - The location of a device or structure placed in the wastewater stream to separate water from oil products.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- g) mediaId - gpsDataCollected
- h) MetadataId - metaID000072
- i) nominalCapacity - The unit total numeric capacity in gallons.
- j) nominalCapacityUom - The unit of measure of the like named value i.e., usGallon
- k) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- l) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- m) wastewaterNetworkSubType - The subtype of wastewater network in which this feature participates, i.e., domesticSewage, oilyWaste, etc.
- n) wastewaterNodeType - The type of wastewater network node that this feature represents. i.e., sOilWaterSeparator.

CLJN.CL.WastUtilNode_SPump (point) - The location of a piece of wastewater equipment that adds energy to a fluid being conveyed through

a pipe or other closed conduit.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- g) mediaId - gpsDataCollected
- h) MetadataId - metaID000072
- i) isMainPump - Yes / No
- j) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- k) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- l) pumpType - Type of pump. Domain values i.e., liftstation, booster, submersible, grinder, etc.
- m) ratedFlow - The common rate of flow of each pump.
- n) ratedFlowUom - The rate of flow for each pump. Domain value i.e., galMin
- o) wastewaterNetworkSubType - The subtype of wastewater network in which this feature participates, i.e., domesticSewage, etc.
- p) wastewaterNodeType - The type of wastewater network node that this feature represents. i.e., sPump.

CLJN.CL.Feat_SPumpStation (polygon) - The location of a facility that collects and discharges wastewater via pumps.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature.
- e) featureDescription - The narrative describing the feature. (Review current data for description)
- f) featureName - The common name of the feature. (Review current data for common name)
- g) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- h) hasGeneratorBackup - Yes / No
- i) mediaId - gpsDataCollected
- j) MetadataId - metaID000072
- k) isMainPump - Yes / No
- l) nominalCapacity - The station total capacity in gallons.
- m) nominalCapacityUom - The unit of measure of the like named value i.e., usGallon
- n) numberOfPumps - The number of pumps in the feature.
- o) operationalStatus - The state of usability of the feature

- i.e., inService, notInService, abandoned, etc.
- p) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
 - q) pumpStationType - Type of pumping station. Domain value i.e., pumpingStation, ejectorStation, liftStation, etc.
 - r) wastewaterNetworkSubType - The subtype of wastewater network in which this feature participates, i.e., domesticSewage, etc.
 - s) wastewaterNodeType - The type of wastewater network node that this feature represents. i.e., sPumpStation.

CLJN.CL.Feat_SSepticTankPoint (point) - The location of a small-scale anaerobic digester and leach field designed to treat wastewater from an individual facility, and is not connected to the wastewater collection system.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- g) materialType - The material composition of the feature. Domain values i.e., plastic, concrete, fiberglass, etc.
- h) mediaId - gpsDataCollected
- i) MetadataId - metaID000072
- j) networkType - The primary type of utility network to which this feature relates. Domain values, i.e., wastewater.
- k) nominalCapacity - The unit total numeric capacity in gallons.
- l) nominalCapacityUom - The unit of measure of the like named value i.e., usGallon
- m) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- n) secondaryContainment - Indicates the storage tank has a secondary containment area that contains spills. Domain values i.e., concreteVault, doubleBottom, plasticPanSystem, other, etc.
- o) septicTankType - The type of septic tank. Domain values, i.e., mound, septicTank, etc.
- p) utilityNetworkSubtype - The primary subtype of utility to which this feature relates. Domain values i.e., domesticSewage, etc.
- q) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- r) wastewaterNetworkSubType - The subtype of wastewater network in which this feature participates, i.e., domesticSewage, oilyWaste, etc.
- s) wastewaterNodeType - The type of wastewater network node that this feature represents. i.e., tbd

CLJN.CL.WastUtilSegment (polyline) - The location of a feature used for

the conveyance of wastewater. All polylines shall be drawn in the direction of flow with no breaks except for what is naturally occurring such at nodes, etc.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) Diameter - The diameter of the feature in inches. Domain value i.e., .5, .75, 1, 1.25, 1.5, 1.75, 2, etc.
- d) diameterUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- e) facilityNumber - Asset number used for visual identification of the facility.
- f) featureDescription - The narrative describing the feature. (Review current data for description)
- g) featureName - The common name of the feature. (Review current data for common name)
- h) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- i) materialType - The material composition of the feature. Domain values i.e., asbestosCement, pvc, etc.
- j) invertElevationDownstream - Numeric number of the elevation downstream invert in inches.
- k) invertElevationDownstreamUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, etc.
- l) invertElevationUpstream - Numeric number of the elevation upstream invert in inches.
- m) invertElevationUpstreamUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, etc.
- n) isLined - Yes / No
- o) mediaId - gpsDataCollected
- p) MetadataId - metaID000072
- q) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- r) ownerName - The name of the item owner, i.e., MCB CL, MCCS, PPV, Company Name, etc.
- s) pipeType - The type of pipe used. Domain values i.e., box, circular, pipArch, tbd, etc.
- t) slope - The slope of the bottom of the subject item expressed as a percentage.
- u) wastewaterNetworkSubType - The subtype of wastewater network in which this feature participates, i.e., domesticSewage, etc.
- v) wastewaterSegmentType - The type of wastewater network segment that this feature represents. Domain values i.e., sForceMain, sGravityMain, sLateralLine, sPressurizedServiceLine, etc.

1.4.12 Feature Dataset CLJN.CL.Utilities_Stormwater

Locate, GPS and collect attribute data as specified for each feature listed with (GPS) accuracy as described in paragraph "Global Positioning System (GPS) Data Collection". Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

CLJN.CL.StormUtilNode_SwInlet (point) - The location where stormwater is collected and received into the utility system.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. Values i.e., CATCHBASIN, ENDWALL, HEADWALL, INLET, ETC.
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- g) inletCoverType - The type of inlet cover. Domain values i.e., Domain values i.e., concrete, metalGate, etc.
- h) inletDiameter - The diameter of the feature in inches. Domain value i.e., .5, .75, 1, 1.5, 1, 4, etc.
- i) inletDiameterUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- j) inletOpeningSize - The size of the inlet opening in inches.
- k) inletOpeningSizeUom - The unit of measure for the inlet opening size. Domain values, i.e., 0.0254 metres, inches etc.
- l) invertElevation - The elevation of the bottom of the feature in inches.
- m) invertElevationUom - The invert elevation. Domain values, i.e., length equal to .0254, inch, etc.
- n) materialType - The material composition of the feature. Domain values i.e., concrete, steel, pvc, etc.
- o) mediald - gpsDataCollected
- p) MetadataId - metaID000072
- q) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- r) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- s) rimElevation - The elevation at the top of the feature in feet.
- t) rimElevationUom - The unit of measure for rim elevation. Domain values i.e. measurement equal to 0.3048 metres, etc.
- u) stormwaterInletType - The type of stormwater inlet feature. Domain values i.e., catch basin, curbinlet, grateInlet, weirInlet, etc.
- v) stormwaterNodeType - The type of stormwater network node that this feature represents. Domain values i.e., swCatchBasin, swCleanout, swDownspout, swInlet, swInfall, etc.

CLJN.CL.Feat_SwUgEnclosureAccess (point) - The location of a Stormwater access point to the related Stormwater underground enclosure.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) diameter - The diameter of the feature in inches. Domain value i.e., .5, .75, 1, 1.25, 1.5, 1.75, 2, etc.
- d) diameterUom- The diameter unit of measure. Domain values,

- i.e., 0.0254 metres, inches etc.
- e) facilityNumber - Asset number used for visual identification of the facility.
 - f) featureDescription - The narrative describing the feature. (Review current data for description)
 - g) featureName - The common name of the feature. Values i.e., swManhole, etc.
 - h) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
 - i) invertElevation - The elevation of the bottom of the feature in inches.
 - j) invertElevationUom - The invert elevation. Domain values, i.e., length equal to .0254, inch, etc.
 - k) mediaId - gpsDataCollected
 - l) MetadataId - metaID000072
 - m) networkType - The type of stormwater network node that this feature represents. Domain values i.e., stormwater.
 - n) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
 - o) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
 - p) rimElevation - The elevation at the top of the feature in feet.
 - q) rimElevationUom - The unit of measure for rim elevation. Domain values i.e. measurement equal to 0.3048 metres, etc.
 - r) stormwaterUtilityFeatureType - The type of stormwater utility feature, i.e., swUgEnclosureAccess
 - s) utilityNetworkSubtype - The primary subtype of utility to which this feature relates. Domain values i.e., stormwater, etc.

CLJN.CL.StormUtilSeg (polyline) - The location of a feature used for the conveyance of stormwater. For example, a pipeline, culvert, or ditch. All polylines shall be drawn in the direction of flow with no breaks except for what is naturally occurring such at nodes, etc.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) Diameter - The diameter of the feature in inches. Domain value i.e., .5, .75, 1, 1.25, 1.5, 1.75, 2, etc.
- d) diameterUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- e) facilityNumber - Asset number used for visual identification of the facility.
- f) featureDescription - The narrative describing the feature. (Review current data for description)
- g) featureName - The common name of the feature. (Review current data for common name)
- h) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- i) invertElevation - The elevation of the bottom of the feature in inches.
- j) invertElevationUom - The invert elevation. Domain values, i.e., length equal to .0254, inch, etc.

- k) invertElevationDownstream - Numeric number of the elevation downstream invert in inches.
- l) invertElevationDownstreamUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, etc.
- m) invertElevationUpstream - Numeric number of the elevation upstream invert in inches.
- n) invertElevationUpstreamUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, etc.
- o) mediaId - gpsDataCollected
- p) MetadataId - metaID000072
- q) openDrainSurface - The surface material of the drain, typically at the bottom of the structure.
- r) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- s) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- t) percentSlope - The slope of the bottom of the subject item expressed as a percentage.
- u) pipeType - The type of pipe used. Domain values i.e., box, circular, pipArch, tbd, etc.
- v) stormwaterSegmentType - The type of stormwater network segment that this feature represents. Domain values i.e., swCulvert, swForceMain, swGravityMain, swLateralLine, swOpenDrain, swSwale, swTrenchDrain, tbd.

CLJN.CL.StormUtilNode_SwOilWateSepa (point) - The location of a device or structure placed in the stormwater stream to separate water from oil products.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service degradationIndex
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- g) groundConfiguration - The configuration of the asset in relationship to the ground. Domain values i.e., aboveground, elevated, semiBuried, underground, etc.
- h) isCovered - Yes / No
- i) nominalCapacity - The numeric volume of the feature when filled to its design capacity.
- j) nominalCapacityUom - The unit of measure of the like named value. Domain values i.e., usgallon
- k) operationalStatus - The state of usability of the feature i.e., inService, abandoned, etc.
- l) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- m) stormwaterNodeType - The type of stormwater network node that this feature represents. Domain values i.e., swCatchBasin, swCleanout, swDownspout, swInlet, swInfall, etc.

CLJN.CL.Feat_SwRetentionBasinArea (polygon) - The location of a human-created area installed to improve water quality by permanently storing runoff.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- g) mediaId - gpsDataCollected
- h) MetadataId - metaID000072
- i) networkType - The type of stormwater network node that this feature represents. Domain values i.e., stormwater.
- j) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- k) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- l) stormwaterUtilityFeatureType - The type of stormwater utility feature, i.e. swRetentionBasinArea
- m) utilityNetworkSubtype - The primary subtype of utility to which this feature relates. Domain values i.e., stormwater, etc.

1.4.13 Feature Dataset CLJN.CL.Utilities_Thermal

Locate, GPS and collect attribute data as specified for each feature listed with (GPS) accuracy as described in paragraph "Global Positioning System (GPS) Data Collection". Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

CLJN.CL.TherUtilNode_TPump (point) - The location of a facility that operates to maintain flow at adequate pressure for the thermal system.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.

- g) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- h) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- i) pumpElevation - The elevation of the pump feature in feet.
- j) pumpElevationUom - The unit of measure Domain values i.e. 0.3048 metres, feet, etc.
- k) pumpType - The type of pump.
- l) ratedFlow - The numeric flow rating of the pump.
- m) ratedFlowUom - The rate of flow for each pump. Domain value i.e., galMin
- n) thermalNodeType - The type of thermal network node that this feature represents, tPump.

CLJN.CL.TherUtilNode_TProdStruc (point) - The location of a facility which produce steam, high-temperature water, low-temperature water, dual-temperature water or chilled water.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- g) heightAboveSurfaceLevel - The vertical distance measured from the lowest point of the base of the feature at ground or water level to the tallest point of the feature in feet.
- h) heightAboveSurfaceLevelUom - The unit of measure Domain values i.e. 0.3048 metres, feet, etc.
- i) mediaId - gpsDataCollected
- j) MetadataId - metaID000072
- k) nominalCapacity - The numeric volume of the feature when filled to its design capacity
- l) nominalCapacityUom - The unit of measure for nominal capacity. Domain value i.e., tons, btu, etc.
- m) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- n) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- o) thermalNetworkSubType - The subtype of thermal network in which this feature participates. Domain values i.e., steamSupply, otherSupply, geothermalSupply (well), highTemperatureHotWaterSupply, etc.
- p) thermalNodeType - The type of thermal network node that this feature represents, tProductionStructure.
- q) thermalProdStrucType - The type of production structure based upon various classifications including methods of transferring heat, piping arrangement, pumping arrangement, or the relative temperature of transferred media. Examples include Boilers, Chillers, Cooling Towers, Heat Pumps, Single/Double pipe systems, Low/Medium/High Temperatures

systems, etc.

- r) volume - The volumetric capacity of the feature
- s) volumeUom - Rate of flow in tons, btu, etc.

CLJN.CL.TherUtilNode_TCondCollector (point) - The location of a thermal related well or a tank that collects condensation.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- g) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- h) ownerName - The name of the item owner, i.e., MCB CL, MCCS, PPV, Company Name, etc.
- i) thermalNetworkSubType - The subtype of thermal network in which this feature participates. Domain values i.e., chilledWaterReturn, dualTemperatureWaterSupply, geothermalReturn, highTemperatureHotWaterSupply, lowTemperatureHotWaterSupply, steamSupply, etc.
- j) thermalNodeType - The type of thermal network node that this feature represents, tCondCollector.

CLJN.CL.TherUtilNode_TSystemValve (point) - The location of a device that regulates, directs, or controls the flow of steam or water.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- g) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- h) ownerName - The name of the item owner, i.e., MCB CL, MCCS, PPV, Company Name, etc.
- i) thermalNetworkSubType - The subtype of thermal network in which this feature participates. Domain values i.e., chilledWaterReturn, dualTemperatureWaterSupply, geothermalReturn, highTemperatureHotWaterSupply, lowTemperatureHotWaterSupply, steamSupply, etc.

- j) thermalNodeType - The type of thermal network node that this feature represents, tSystemValve
- k) valveMaterial - The material composition of the valve. Domain values i.e., steel, etc.
- l) valvePosition - The normal status or operating position of the valve. Domain value i.e., normallyClose, normallyOpen, other, tbd, unknown.
- m) valveType - The normal status or operating position of the valve. Domain values i.e., reliefValve, flowControl, gate, pressureRegulator, pressureReducing, etc.

CLJN.CL.Feat_TUGEnclosureAccess (point) - The location of a thermal access point to the related thermal underground enclosure.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- g) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- h) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- i) groundConfiguration - The configuration of the asset in relationship to the ground. Domain values i.e., aboveground, elevated, semiBuried, underground, etc.
- j) networkType - The primary type of utility network to which this feature relates. Domain values i.e., thermal.
- k) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- l) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- m) thermalUtilityFeatureType - The type of thermal utility feature tUgEnclosureAccess.
- n) thermalNetworkSubType - The subtype of thermal network in which this feature participates. Domain values i.e., steamSupply, otherSupply, geothermalSupply, highTemperatureHotWaterSupply, etc.

ThermalUtilitySegment (polyline) - The location of a feature used for the conveyance of steam, high-temperature water, low-temperature water, or chilled water. All polylines shall be drawn in the direction of flow with no breaks except for what is naturally occurring such at nodes, etc.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.

- c) depth - The distance, measured vertically downward to the base in inches.
- d) depthUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- e) Diameter - The diameter of the feature in inches. Domain value i.e., .5, .75, 1, 1.25, 1.5, 1.75, 2, etc.
- f) diameterUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- g) facilityNumber - Asset number used for visual identification of the facility.
- h) featureDescription - The narrative describing the feature. (Review current data for description)
- i) featureName - The common name of the feature. (Review current data for common name)
- j) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- k) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- l) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- m) groundConfiguration - The configuration of the asset in relationship to the ground. Domain values i.e., aboveground, elevated, semiBuried, underground, etc.
- n) materialType - Type of segment material. Domain values i.e., steel, castiron, etc.
- o) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- p) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- q) pipeType - The type of pipe used. Domain values i.e., box, circular, pipArch, tbd, etc.
- r) thermalNetworkSubType - The subtype of thermal network in which this feature participates. Domain values i.e., steamSupply, otherSupply, geothermalSupply, highTemperatureHotWaterSupply, etc.
- s) thermalSegmentType - The type of thermal network segment that this feature represents. Domain values i.e., tMainLine, tService Line.

1.4.14 Feature Dataset CLJN.CL.Utilities_Water

Locate, GPS and collect attribute data as specified for each feature listed with (GPS) accuracy as described in paragraph "Global Positioning System (GPS) Data Collection". Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

CLJN.CL.WateUtilNode_WSystemValve (point) - The location of a device that regulates, directs, or controls the flow of water.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) depth - The distance, measured vertically downward to the base in inches.

- d) depthUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- e) Diameter - The diameter of the feature in inches. Domain value i.e., .5, .75, 1, 1.25, 1.5, 1.75, 2, etc.
- f) diameterUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- g) facilityNumber - Asset number used for visual identification of the facility.
- h) featureDescription - Utilize CLJN.CL.Feat_WUtilityArea to use Service Area Values i.e., Stone Bay, Onslow Beach, Handnot Point, etc.
- i) featureName - The common name of the feature. (Review current data for common name)
- j) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- k) mediaId - gpsDataCollected
- l) MetadataId - metaID000072
- m) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- n) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- o) turnDirectionToClose - The turn direction to close the valve. Domain values i.e., leftToClose, rightToClose, other, na, tbd, unknown, etc.
- p) valveMaterial - The material composition of the valve. Domain values i.e., ductileIron, steel, pvc, etc.
- q) valvePosition - The normal status or operating position of the valve. Domain value i.e., normallyClose, normallyOpen, other, tbd, unknown.
- r) valveType - The subtype of water network in which this feature participates. Domain values i.e., ball, gate, postIndicator, waterServiceValve, postIndicator, fireHydrantValve, etc.
- s) waterNetworkSubType - The subtype of water network in which this feature participates. Domain values i.e., fireProtectionWater, nonPotableWater, potableWater, rawWater, saltWater, etc.
- t) waterNodeType - The type of water network node that this feature represents. Domain values i.e., wAirGap, wControlValve, wFireHydrant, wFitting, wFlushingStation, wHydrant, wMeter, etc.

CLJN.CL.WateUtilNode_WReliefValve (point) - The location of a water related device designed to release when the set pressure is exceeded.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) depth - The distance, measured vertically downward to the base in inches.
- d) depthUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- e) Diameter - The diameter of the feature in inches. Domain value i.e., .5, .75, 1, 1.25, 1.5, 1.75, 2, etc.
- f) diameterUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.

- g) facilityNumber - Asset number used for visual identification of the facility.
- h) featureDescription - The common name of the feature. (Review current data for common name)
- i) featureName - The common name of the feature. (Review current data for common name)
- j) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- k) mediaId - gpsDataCollected
- l) MetadataId - metaID000072
- m) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- n) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- o) valveMaterial - The material composition of the valve. Domain values i.e., steel, pvc, etc.
- p) valveType - The subtype of water network in which this feature participates. Domain values i.e., wReliefValve.
- q) waterNetworkSubType - The subtype of water network in which this feature participates. Domain values i.e., fireProtectionWater, nonPotableWater, potableWater, rawWater, saltWater.
- r) waterNodeType - The type of water network node that this feature represents. Domain values i.e., wReliefValve

CLJN.CL.WateUtilNode_WPressReduStation (point) - The location of a feature which reduces the pressure from line pressure to the desired operating pressure and can switch from low to high pressure for flushing.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) featureDescription - The common name of the feature. (Review current data for common name)
- d) featureName - The common name of the feature. (Review current data for common name)
- e) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- f) mediaId - gpsDataCollected
- g) MetadataId - metaID000072
- h) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- i) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- j) waterNetworkSubType - The subtype of water network in which this feature participates. Domain values i.e., fireProtectionWater, nonPotableWater, potableWater, rawWater, saltWater.
- k) waterNodeType - The type of water network node that this feature represents. Domain values i.e., wPressureReducingStation.

CLJN.CL.WateUtilNode_WBackPrevDevice (point) - The location of a

feature that is used to protect water supplies from contamination or pollution.

- a) bfpType - Backflow prevention device type. Domain values i.e., ag, avb, dcva, pvb, rpz, spvb, etc.
- b) contractNumber - The contract number associated with the feature.
- c) dateInService - The date the utility equipment was put in service.
- d) Diameter - The diameter of the feature in inches. Domain value i.e., .5, .75, 1, 1.25, 1.75, 2, etc.
- e) diameterUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- f) featureDescription - The common name of the feature. (Review current data for common name)
- g) featureName - The common name of the feature. (Review current data for common name)
- h) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- i) mediaId - gpsDataCollected
- j) MetadataId - metaID000072
- k) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- l) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- m) waterNetworkSubType - The subtype of water network in which this feature participates. Domain values i.e., fireProtectionWater, nonPotableWater, potableWater, rawWater, saltWater.
- n) waterNodeType - The type of water network node that this feature represents. Domain values i.e., wBackflowPreventionDevice.

CLJN.CL.WateUtilNode_WMeter (point) - The location of a device used to measure the quantity and/or rate of water flowing through a pipe, which may be the amount of water used by the customer.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) Diameter - The diameter of the feature in inches. Domain value i.e., .5, .75, 1, 1.25, 1.75, 2, etc.
- d) diameterUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- e) facilityNumber - Asset number used for visual identification of the facility.
- f) featureDescription - The common name of the feature. (Review current data for common name)
- g) featureName - The common name of the feature. (Review current data for common name)
- h) fittingType - The type of pipe fitting. Domain values i.e., bend, tap, cap, other, tbd, etc.
- i) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- j) isAmi - The yes or no indicator of whether or not the meter

- is an AMI or smart meter.
- k) mediaId - gpsDataCollected
 - l) MetadataId - metaID000072
 - m) meterType - The type of meter. Domain values i.e., turbine, rotary, etc.
 - n) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
 - o) ownerName - The name of the item owner, i.e., MCB CL, MCCS, PPV, Company Name, etc.
 - p) waterNetworkSubType - The subtype of water network in which this feature participates. Domain values i.e., fireProtectionWater, nonPotableWater, potableWater, rawWater, saltWater.
 - q) waterNodeType - The type of water network node that this feature represents, wMeter.

CLJN.CL.WateUtilNode_WHydrant (point) - Hydrants not exclusively used for firefighting. Secondary uses are flushing main lines and laterals, filling tank trucks, and providing a temporary water source for construction jobs.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The common name of the feature. (Review current data for common name)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- g) HydrantPurpose - The purpose of the Hydrant. Values i.e., fireHydrant, flushedFDC, YardHydrant, etc.
- h) mediaId - gpsDataCollected
- i) MetadataId - metaID000072
- j) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- k) ownerName - The name of the item owner, i.e., MCB CL, MCCS, PPV, Company Name, etc.
- l) waterNetworkSubType - The subtype of water network in which this feature participates. Domain values i.e., fireProtectionWater, nonPotableWater, potableWater, rawWater, saltWater.
- m) waterNodeType - The type of water network node that this feature represents. Domain values i.e., whHydrant.

CLJN.CL.WateUtilNode_WFireHydrant (point) a valve connection on a water supply system having one or more outlets and that is used in firefighting to supply hose and fire department pumpers with water.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.

- c) Diameter - The diameter of the feature in inches. Domain value i.e., .5, .75, 1, 1.5, 1.75, 2, etc.
- d) diameter1 - The diameter of the outlet.
- e) diameter2 - The diameter of the outlet.
- f) diameter3 - The diameter of the outlet.
- g) diameterUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- h) facilityNumber - Asset number used for visual identification of the facility.
- i) featureDescription - The common name of the feature. (Review current data for common name)
- j) featureName - The common name of the feature. (Review current data for common name)
- k) fireConnectionType - The yes or no indicator of whether or not the fire hydrant is a fire protection connection. Yes or No
- l) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- m) hydrantNumber - The equipment number as designated by the fire department that is primarily responsible for the fire hydrants operation and maintenance.
- n) inletDiameter - The diameter of the inlet.
- o) inletDiameterUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- p) mediald - gpsDataCollected
- q) MetadataId - metaID000072
- r) isFireConnection - The yes or no indicator of whether or not the fire hydrant is a fire protection connection. Yes or No
- s) outletDiameter - The diameter of the outlet.
- t) outletDiameter1 - The diameter of the outlet.
- u) outletDiameter2 - The diameter of the outlet.
- v) outletDiameter3 - The diameter of the outlet.
- w) outletDiameterUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- x) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- y) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- z) waterNodeType - The type of water network node that this feature represents, wFireHydrant.

CLJN.CL.WateUtilNode_WFitting (point) - The location of a mechanical device that connects two or more pipes, or caps or plugs a single pipe, on the water system.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) Diameter - The diameter of the feature in inches. Domain value i.e., .5, 1, 1.25, 1.5, 1.75, 2, etc.
- d) diameter1 - The diameter of the outlet.
- e) diameter2 - The diameter of the outlet.
- f) diameter3 - The diameter of the outlet.
- g) diameter4 - The diameter of the outlet.
- h) diameterUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.

- i) facilityNumber - Asset number used for visual identification of the facility.
- j) featureDescription - The common name of the feature. (Review current data for common name)
- k) featureName - The common name of the feature. (Review current data for common name)
- l) fittingType - The type of pipe fitting. Domain values i.e., bend, cap, tee, etc.
- m) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- n) mediaId - digitized
- o) MetadataId - metaID000071
- p) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- q) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- r) waterNodeType - The type of water network node that this feature represents. Domain values i.e., wfitting.
- s) waterNetworkSubType - The subtype of water network in which this feature participates. Domain values i.e., fireProtectionWater, nonPotableWater, potableWater, rawWater, saltWater.

CLJN.CL.WateUtilNode_WPump (point) - The location of a water related piece of equipment that adds energy to a fluid, such as water, being conveyed through a pipe or other closed conduit.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The common name of the feature. (Review current data for common name)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- g) mediaId - gpsDataCollected
- h) MetadataId - metaID000072
- i) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- j) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- k) pumpType - Type of pump. Domain values i.e., booster, submersible, etc.
- l) ratedFlow - The common rate of flow of each pump.
- m) ratedFlowUom - The rate of flow for each pump. Domain value i.e., galMin
- n) waterNodeType - The type of water network node that this feature represents. Domain values i.e., wpump.
- o) waterNetworkSubType - The subtype of water network in which this feature participates. Domain values i.e., fireProtectionWater, nonPotableWater, potableWater, rawWater, saltWater.

CLJN.CL.WateUtilNode_WStorageStructure (point) - The location of a facility that store large volumes of water.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) Elevation - The elevation from a specified vertical datum to the highest point on a feature.
- d) elevationUom - The unit of measure Domain values i.e. 0.3048 metres, feet, etc.
- e) facilityNumber - Asset number used for visual identification of the facility.
- f) featureDescription - The common name of the feature. (Review current data for common name)
- g) featureName - The common name of the feature. (Review current data for common name)
- h) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- i) groundConfiguration - The configuration of the asset in relationship to the ground. Domain values i.e., aboveground, elevated, semiBuried, underground, etc.
- j) groundElevation - The elevation of the ground at the location of the item in feet.
- k) invertElevation - The elevation of the bottom of the feature in feet.
- l) mediaId - gpsDataCollected
- m) MetadataId - metaID000072
- n) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- o) overflowElevation - The elevation of the overflow device (i.e., pipe invert).
- p) ownerName - The name of the item owner, i.e., MCB CL, MCCS, PPV, Company Name, etc.
- q) secondaryContainment - Indicates the storage tank has a secondary containment area that contains spills. Domain values i.e., concreteVault, doubleBottom, plasticPanSystem, other, etc.
- r) storageTankProduct - The product contained in the storage tank.
- s) storageTankType - The primary type of storage tank.
- t) topElevation - The elevation at the top of the feature.
- u) topElevationUom - The unit of measure Domain values i.e. 0.3048 metres, feet, etc.
- v) volume - The volumetric capacity of the feature in usgallons.
- w) volumeUom - Unit of measure in usgallons
- x) waterNetworkSubType - The subtype of water network in which this feature participates. Domain values i.e., fireProtectionWater, nonPotableWater, potableWater, rawWater, saltWater.
- y) waterNodeType - The type of water network node that this feature represents. Domain values i.e., wstorageStructure.
- z) width - The dimension of a feature in feet.
- aa) widthUom - The unit of measure Domain values i.e. 0.3048 metres, feet, etc.

CLJN.CL.Feat_WUgEnclosureAccess (point) - The location of a water access point to the related water underground enclosure.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) Diameter - The diameter of the feature in inches. Domain value i.e., .5, .75, 1, 1.5, 1.75, 2, etc.
- d) diameterUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- e) facilityNumber - Asset number used for visual identification of the facility.
- f) featureDescription - The common name of the feature. (Review current data for common name)
- g) featureName - The common name of the feature. (Review current data for common name)
- h) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- i) groundConfiguration - The configuration of the asset in relationship to the ground. Domain values i.e., aboveground, elevated, semiBuried, underground, etc.
- j) lidDiameter - Diameter of the lid or cover that allows access to the manhole.
- k) lidDiameterUom - The diameter of the feature in inches. Domain value i.e., .5, .75, 1, 1.25, 1.5, 2, etc.
- l) lidMaterial - Material type of the manhole access lid or cover.
- m) mediaId - gpsDataCollected
- n) MetadataId - metaID000072
- o) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- p) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
- q) waterNetworkSubType - The subtype of water network in which this feature participates. Domain values i.e., fireProtectionWater, nonPotableWater, potableWater, rawWater, saltWater.
- r) waterUtilityFeatureType - The type of water utility feature i.e., wUgEnclosureAccess.

WateUtilNode_WSource(point) - A source of water intake to the water system including reservoirs, natural water bodies, wells, and/or feeds from external water networks. Do not delete potable from any feature class, please attribute as removed or AIP.

- a) abandonedDate - The date the feature was abandoned - see feature name to add contract number for abandoned.
- b) contractNumber - The contract number associated with the original construction of this feature.
- c) dateInService - The date the utility equipment was put in service.
- d) facilityNumber - Asset number used for visual identification of the facility.
- e) featureDescription - The common name of the feature. (Review current data for common name)

- f) featureName - The common name of the feature. Until such a time that the well is abandoned or removed. (Add contract number associated with removal or abandonment of water well)
- g) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- h) mediaId - gpsDataCollected
- i) MetadataId - metaID000072
- j) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- k) ownerName - The name of the item owner, i.e., MCB CL, MCCS, PPV, Company Name, etc.
- l) waterNetworkSubType - The subtype of water network in which this feature participates. Domain values i.e., fireProtectionWater, nonPotableWater, potableWater, rawWater, saltWater.
- m) removedDate - Enter Remove date; however, do not delete water well from well feature class. (Attribute contract number to remove well in featureName)
- n) waterNetworkSubType - The subtype of water network in which this feature participates. Domain values i.e., fireProtectionWater, nonPotableWater, potableWater, rawWater, saltWater.
- o) waterNodeType - The type of water network node that this feature represents. Domain values i.e., wSource.
- p) waterSourceType - Source of water, well.

CLJN.CL.Feat_WScadaSensor (point) - The location of a device that is used to remotely measure the status of water network components as part of a Supervisory Control and Data Acquisition (SCADA) system.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The common name of the feature. (Review current data for common name)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities,
- g) familyHousing, recreational, training, water, etc.
- h) groundConfiguration - The configuration of the asset in relationship to the ground. Domain values i.e., aboveground, elevated, semiBuried, underground, etc.
- i) mediaId - gpsDataCollected
- j) MetadataId - metaID000072
- k) networkType - The primary type of utility network to which this feature relates. Domain values, i.e., water.
- l) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- m) ownerName - The name of the item owner, i.e., MCB CL, MCCS, PPV, Company Name, etc.
- n) utilityNetworkSubtype - The primary subtype of utility to which this feature relates. Domain values i.e., water, etc.
- o) waterUtilityFeatureType - The type of water utility feature

is wScadaSensor.

CLJN.CL.Feat_WDemarcationPoint (point) - The location where the water service provider ownership ends, and the customer ownership begins.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The common name of the feature. (Review current data for common name)
- e) featureName - The common name of the feature. (Review current data for common name)
- f) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
- g) groundConfiguration - The configuration of the asset in relationship to the ground. Domain values i.e., aboveground, elevated, semiBuried, underground, etc.
- h) mediaId - gpsDataCollected
- i) MetadataId - metaID000072
- j) networkType - The primary type of utility network to which this feature relates. Domain values, i.e., water.
- k) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
- l) outsideProvider - The name of the outside provider for the Utility Feature.
- m) ownerName - The name of the item owner, i.e., MCB CL, MCCS, PPV, Company Name, etc.
- n) utilityNetworkSubtype - The primary subtype of utility to which this feature relates. Domain values i.e., water, etc.
- o) waterUtilityFeatureType - The type of water utility feature is wDemarcationPoint.

CLJN.CL.WaterUtilitySegment (polyline) - The location of a feature used for the conveyance of water.

- a) contractNumber - The contract number associated with the feature.
- b) dateInService - The date the utility equipment was put in service.
- c) depth - The distance, measured vertically downward to the base in inches.
- d) depthUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- e) Diameter - The diameter of the feature in inches. Domain value i.e., .5, .75, 1, 1.5, 1.75, 2, etc.
- f) diameterUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- g) elevation - The elevation at the top of the feature.
- h) elevationUom - The elevation unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
- i) facilityNumber - Asset number used for visual identification of the facility.
- j) featureDescription - The narrative describing the feature.

- (Review current data for description)
- k) featureName - The common name of the feature. (Review current data for common name)
 - l) functionalArea - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
 - m) groundConfiguration - The configuration of the asset in relationship to the ground. Domain values i.e., aboveground, elevated, semiBuried, underground, etc.
 - n) invertElevationDownstream - Numeric number of the elevation downstream invert in inches.
 - o) invertElevationDownstreamUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, etc.
 - p) invertElevationUpstream - Numeric number of the elevation upstream invert in inches.
 - q) invertElevationUpstreamUom - The diameter unit of measure. Domain values, i.e., 0.0254 metres, etc.
 - r) lateralSegmentType - The type of lateral water network segment that this feature represents. Domain values i.e., wDomesticLateral, wFireProtectionLateral, wHydrantLateral, wInlineStorageLateral, wIrrigationLateral, wTransportPipeLateral, etc.
 - s) materialType - The material composition of the feature. Domain values i.e., pvc, tbd, etc.
 - t) mediaId - gpsDataCollected
 - u) MetadataId - metaID000072
 - v) operationalStatus - The state of usability of the feature i.e., inService, notInService, abandoned, etc.
 - w) ownerName - The name of the item owner, i.e., MCB CL, MCCA, PPV, Company Name, etc.
 - x) waterNetworkSubType - The subtype of water network in which this feature participates. Domain values i.e., fireProtectionWater, nonPotableWater, potableWater, rawWater, saltWater.
 - y) waterSegmentType - The type of wastewater network segment that this feature represents. Domain values i.e., wDistributionMain, wGravityMain, wLateral, wTransmissionMain

1.4.15 Feature Dataset CLJN.CL.Wells

Locate, GPS and collect attribute data as specified for each feature listed with (GPS) accuracy as described in paragraph "Global Positioning System (GPS) Data Collection". Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

CLJN.CL.WellPoint - (point) - The man-made vertical excavation penetrating the surface of the Earth used collect environmental samples or monitor fluid or gas characteristics, inject fluids, gases or thermal energy into the subsurface, or extract contamination or other impurities from the subsurface. (*Potable Water Wells used for water distribution are not to be deleted from the this feature class, if they are demolished or AIP, the contract number utilize to make any changes should be attributed in featureName and the operation status should be changed to removed*)

- a) abandonedDate - The date the feature was abandoned - see

- feature name to add contract number for abandoned.
- b) `builtDate` - The calendar date on which the original construction was completed for a facility.
 - c) `contractNumber` - The contract number associated with the original construction of this feature.
 - d) `depth` - The distance, measured vertically downward to the base in inches.
 - e) `depthUom` - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
 - f) `Diameter` - The diameter of the feature in inches. Domain value i.e., .5, .75, 1, 1.25, 1.5, 2, 3, etc.
 - g) `diameterUom` - The diameter unit of measure. Domain values, i.e., 0.0254 metres, inches etc.
 - h) `facilityNumber` - Asset number used for visual identification of the facility.
 - i) `featureDescription` - Utilize `CLJN.CL.Feat_WUtilityArea` to use Service Area Values i.e., Stone Bay, Onslow Beach, Handnot Point, etc.
 - j) `featureName` - The common name of the feature. Until such a time that the well is abandoned or removed. (Add contract number associated with removal or abandonment of water well)
 - k) `functionalArea` - The principle activity within a landuse area. Domain values i.e., utilities, familyHousing, recreational, training, water, etc.
 - l) `locationAccuracy` - The location accuracy for the data that was collected and verified i.e., Survey Grade GPS
 - m) `mediald` - `gpsDataCollected`
 - n) `MetadataId` - `metaID000072`
 - o) `operationalStatus` - The state of usability of the feature i.e., `inService`, `notInService`, `removed`, etc.
 - p) `ownerName` - The name of the item owner, i.e., MCB CL, MCCS, PPV, Company Name, etc.
 - q) `removedDate` - Enter Remove date; however, do not delete water well from well feature class. (*Attribute contract number to remove well in featureName*)
 - r) `wellCapacity` - The total capacity in gallons.
 - s) `wellCapacityUom` - The unit of measure of the like named value i.e., `usGallon`
 - t) `wellPurposeType` - The purpose of the well. Domain values extraction.
 - u) `wellResourceType` - The resource type which is being extracted, i.e. `waterNonPotable`.

1.4.16 Feature Dataset `CLJN.CL.CadFloorPlan`

All new and renovated buildings or structures shall be required to have a linear representation, "clean floor plan", for each floor. A polyline for each level will include exterior and interior walls, doors and windows, exits and stairwells, etc. No nonpermanent fixtures, such as furniture, shall be included. Please note the dataset/feature name may change, however, the attribution requirements will remain the same.

`CLJN.CL.CadFloorPlan` (polyline) A linear representation of the floor plan representing the outer and inner walls, doors and windows of a building or structure that has been exported into a GIS Feature. (Note - Naming convention may change in the future)

This feature will present all levels, entry, exits, windows,

stairwells. No none permanent fixtures, such as furniture should be included.

- a) contractNumber - The contract number associated with the feature.
- b) builtDate - The date the utility equipment was put in service.
- c) facilityNumber - Asset number used for visual identification of the facility.
- d) featureDescription - The narrative describing the feature. (Review current data for description)
- e) featureName - The narrative describing the feature. (Review current data for description)
- f) florid - Floor Level
- g) mediald - digitized
- h) MetadataId - metaID000071
- i) operationalStatus - The state of usability of the feature i.e., inService, notInService, removed, etc.
- j) ownerName - The name of the item owner, i.e., MCB CL, MCCS, PPV, Company

1.4.17 Non-Compliance

Failure to follow the specification outlined in this document will result in non-acceptance of data deliverable.

Note: Geospatial data delivery does not replace record drawing requirements.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

SECTION 02 82 16

REMOVAL AND DISPOSAL OF ASBESTOS MATERIALS
(CAMP LEJEUNE COMPLEX)

03/10

SECTION 02 82 16

REMOVAL AND DISPOSAL OF ASBESTOS MATERIALS
(CAMP LEJEUNE COMPLEX)

03/10

PART 1 GENERAL

1.1 APPLICABLE NORTH CAROLINA LAW

North Carolina State General Statutes 130A, Article 19-444-452 and 10A North Carolina Administrative Chapter (NCAC) 41C .0600 through .0611.

1.1.1 N.C. (DHHS-HHCU) Asbestos Accreditation

All personnel involved in asbestos removal shall be currently accredited for asbestos removal by N.C. (DHHS-HHCU). An application for accreditation may be requested from the State of North Carolina, Health Hazards Control Unit, Department of Health and Human Services, Division of Public Health, ; 1912 Mail Service Center, Raleigh, NC 27699-1912; (919) 707-5950. Out of State accreditation will not be accepted.

1.2 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z88.2 (1992) Respiratory Protection

ASTM INTERNATIONAL (ASTM)

ASTM C 732 (1995) Aging Effects of Artificial Weathering on Latex Sealants

ASTM D 1331 (1989; R 1995) Surface and Interfacial Tension of Solutions of Surface-Active Agents

ASTM E 84 (2000a) Surface Burning Characteristics of Building Materials

ASTM E96/E96M (2016) Standard Test Methods for Water Vapor Transmission of Materials

ASTM E 119 (1998) Fire Tests of Building Construction and Materials

ASTM E 736 (1992) Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members

ASTM E 1368 (1997) Visual Inspection of Asbestos Abatement Projects

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

29 CFR 1910.103	Respiratory Protection
29 CFR 1926.59	Hazard Communication
29 CFR 1926.1101	Asbestos
40 CFR 61, SUBPART A	General Provisions
40 CFR 61, SUBPART M	National Emission Standard for Hazardous Air Pollutants

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 560/5-85-024	(1985) Guidance for Controlling Asbestos Containing Materials in Buildings
EPA SW-846	(Third Edition; Update IV) Test Methods for Evaluating Solid Waste: Physical/Chemical Methods

UNDERWRITERS LABORATORIES (UL)

UL 586	(1996; Rev thru Aug 1999) High-Efficiency, Particulate, Air Filter Units
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1.3 DEFINITIONS

1.3.1 Asbestos Containing Material (ACM)

All building materials that have more than 1% of chrysotile, amosite, crocidolite, tremolite, anthophyllite, or any other form of asbestos in the serpentine or anthobole class.

1.3.2 Action Level/Permissive Exposure Limit (PEL)

An airborne concentration of asbestos fibers, in the breathing zone of a worker equaling 0.1 fibers per cubic centimeter of air calculated as an 8-hour time weighted average.

1.3.3 Amended Water

Water containing a wetting agent or surfactant with a surface tension of 29 dynes per square centimeter when tested in accordance with ASTM D 1331 shall be utilized. In the event where wetting operations are suspended due to freezing temperatures, the operator or abatement contractor shall record the temperature on Form DHHS 3787..

1.3.4 Area Sampling

Sampling of asbestos fiber concentrations within the asbestos control area and outside the asbestos control area which approximates the concentrations of asbestos in the theoretical breathing zone but is not actually collected in the breathing zone of an employee.

1.3.5 Asbestos

The term asbestos includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite and any of these minerals that has been chemically treated or altered. Materials are considered to contain asbestos if the asbestos content is more than 1% of the material by area.

1.3.6 Asbestos Control Area

That area where asbestos removal operations are performed which is isolated by physical boundaries which assist in the prevention of the uncontrolled release of asbestos dust, fibers, or debris. Two examples of an asbestos control area are: a full containment and a "glovebag."

1.3.7 Asbestos Fibers

Those fibers having an aspect ratio of at least 3:1 and longer than 5 micrometers as determined by National Institute for Occupational Safety and Health (NIOSH) Method 7400.

1.3.8 Asbestos Permissible Exposure Limit

0.1 fibers per cubic centimeter of air as an 8-hour time weighted average as defined by 29 CFR 1926.1101 or other federal legislation having legal jurisdiction for the protection of workers health.

1.3.9 Background

Normal airborne asbestos concentration in an area similar to the asbestos abatement area but in an uncontaminated (with asbestos) state.

1.3.10 Contractor

The Contractor is that individual, or entity under contract to the Navy to perform the herein listed work.

1.3.11 Encapsulants

Specific materials in various forms used to chemically entrap asbestos fibers in various configurations to prevent these fibers from becoming airborne. There are four types of encapsulants as follows which must comply with performance requirements as specified herein.

- a. Removal Encapsulant (can be used as a wetting agent)
- b. Bridging Encapsulant (used to provide a tough, durable surface coating to asbestos containing material)
- c. Penetrating Encapsulant (used to penetrate the asbestos containing material down to substrate, encapsulating all asbestos fibers)
- d. Lock-Down Encapsulant (used to seal off or "lock-down" minute asbestos fibers left on surfaces from which asbestos containing material has been removed)

1.3.12 Friable Asbestos Material

Material that contains more than 1% asbestos by area and that can be crumbled, pulverized, or reduced to powder by hand pressure when dry.

1.3.13 Full Containment

Those engineering control techniques described in [29 CFR 1926.1101](#) for major asbestos removal, renovation and demolition operations.

1.3.14 Glovebag Technique

Those asbestos removal and control techniques put forth in [29 CFR 1926.1101](#).

1.3.15 HEPA Filter Equipment

High efficiency particulate air (HEPA) filtered vacuum and/or exhaust ventilation equipment with a filter system capable of collecting and retaining asbestos fibers. Filters shall retain 99.97 percent of particles 0.3 microns or larger as indicated in [UL 586](#).

1.3.16 Navy Industrial Hygienist (NIH)

That industrial hygienist employed by the Navy to monitor, sample, and/or inspect the work separate from the original construction contract. The NIH can be either a Federal civil servant or a private consultant as determined by the Navy. In some instances the NIH shall perform assigned duties vicariously through a trained subordinate but only with the specific consent of the Contracting Officer.

1.3.17 Nonfriable Asbestos Material

Material that contains asbestos in which the fibers have been temporarily locked in by a bonding agent, coating, binder, or other material so that the asbestos is well bound and will not normally release asbestos fibers during any appropriate use, handling, storage or transportation. It is understood that asbestos fibers will be released under other conditions such as demolition or removal.

1.3.18 PCM - Phased Contrast Microscopy

A method of analyzing air samples for fibers using a light microscope.

1.3.19 PLM - Polarized Light Microscopy

A method of analyzing bulk samples for asbestos in which the sample is illuminated with polarized light (light which vibrates in only one plane) and viewed under a light microscope.

1.3.20 Personal Sampling

Air sampling to determine asbestos fiber concentrations within the breathing zone of a specific employee, performed in accordance with [29 CFR 1926.1101](#).

1.3.21 Supervising Air Monitor (SAM)

That supervising air monitor hired by the Contractor to perform the herein listed industrial hygiene tasks. In some instances, the SAM can perform this role vicariously through a trained subordinate, but only with the specific consent of the Contracting Officer. Under N.C. Statute, the SAM must make a site visit on any project exceeding 10 days and once every 30 days thereafter.

1.3.22 TEM

Refers to Transmission Electron Microscopy (TEM). Technique whereby a beam of electrons is transmitted through an ultra thin specimen, interacting with the specimen as it passes through. An image is formed from the interaction of the electrons transmitted through the specimen; the image is magnified and focused onto an imaging device, such as a fluorescent screen, on a layer of photographic film, or to be detected by a sensor such as a CCB camera.

1.3.23 Time Weighted Average (TWA)

The TWA is an 8-hour time weighted average airborne concentration of asbestos fibers. At least three full shift samples per person are required to establish that person's TWA exposure.

1.3.24 Wetting Agent

That specific agent used to reduce airborne asbestos levels by physically bonding asbestos fibers to material to be removed. An equivalent wetting agent must have a surface tension of at least 29 dynes per square centimeter as tested in accordance with [ASTM D 1331](#). In the event where wetting operations are suspended due to freezing temperatures, the operator or abatement contractor shall record the temperature on Form DHHS 3787.

1.3.25 Project Design Survey

The Project Design Survey is used to provide information to the Project Designer for prepping abatement plans and specifications. Destructive testing is required for a Project Design Survey in order to identify suspect materials. The presence of asbestos in suspect materials are confirmed in a Project Design Survey. A Project Design Survey is required prior to any building renovation or demolition project.

1.4 REQUIREMENTS

1.4.1 Description of Work

The work covered by this section includes the handling of asbestos containing materials which are encountered during repair, construction and demolition projects and describes some of the resultant procedures and equipment required to protect workers and occupants of the building or area, or both, from contact with airborne asbestos fibers. The work also includes the disposal of the generated asbestos containing materials. The asbestos work includes the demolition and removal of [asbestos containing material located in identified areas in Part 6](#). Under normal conditions non-friable or chemically bound materials containing asbestos would not be considered hazardous; however, this material will release airborne asbestos fibers during demolition and removal and therefore must be handled in accordance with North Carolina Regulations.

1.4.2 N. C. (DHHS-HHCU) North Carolina Department of Health and Human Services - Health Hazards Control Unit

Obtain necessary permits in conjunction with asbestos removal, hauling, and disposition, and furnish timely notification of such actions required by federal, state, regional, and local authorities. A permit is only required when you will be abating more than 260 linear feet, 160 square feet, or 35

cubic feet of an asbestos-containing building material. Also, if mechanical means of removing non-friable asbestos is utilized the contractor will need to provide permit. Notify the N.C. (DHHS-HHCU) and the Contracting Officer in writing 10 days prior to the commencement of work. Submit a copy of the permit to the Contracting Officer.

1.4.2.1 N.C. (DHHS-HHCU) mailing address is:

Health Hazards Control Unit
N.C. Department of Health and Human Services
Division of Public Health
1912 Mail Service Center
Raleigh, NC 27699-1912
Phone: (919) 733-0820

1.4.2.2 Changes in Work

Changes in Work which affect items on the attached form shall be covered by an amended form submitted to the same address.

1.4.3 Safety and Health Compliance

In addition to detailed requirements of this specification, comply with those applicable laws, ordinances, criteria, rules, and regulations of federal, state, regional, and local authorities regarding handling, storing, transporting, and disposing of asbestos waste materials. Comply with the applicable requirements of the current issue of 29 CFR 1926.1101, 40 CFR 61, SUBPART A, 40 CFR 61, SUBPART M. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting the work. Where the requirements of this specification, applicable laws, rules, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirement as defined by the Contracting Officer shall apply.

1.4.4 Respiratory Protection Program

Establish and implement a respirator program as required by ANSI Z88.2 and 29 CFR 1910.103.

1.4.5 Supervising Air Monitor (SAM)

Conduct personal area/environmental air sampling and training under the direction of a North Carolina accredited supervising air monitor. For the purpose of this contract, the Contractor shall retain the services of a SAM to perform the Contractor's industrial hygiene tasks.

1.5 SUBMITTALS

Submit 4 copies of the following in accordance with Section 01 33 00.05 20, "Construction Submittal Procedures."

SD-06 Test Reports

Air sampling results

Pressure differential recordings for local exhaust system

Clearance sampling

SD-07 Certificates

Asbestos hazard abatement plan (Abatement Design)

SD-11 Closeout Submittals

Asbestos Waste Shipment Record N.C. (DHHS-HHCU) Form 3787

Daily log

North Carolina permit

Modifications to the North Carolina permit

Asbestos Inspection Reporting Form

Closeout submittals shall be submitted within 60 days of asbestos activity completion.

1.5.1 Asbestos Hazard Abatement Plan (NC Abatement Design)

An asbestos abatement design shall be prepared by a N.C. accredited asbestos abatement designer for each individually permitted removal of more than 260 linear feet, 160 square feet, or 35 cubic feet of regulated asbestos containing materials. The plan shall be prepared, signed, and sealed, including accreditation number and date, by an accredited abatement designer. The respirator program and air monitoring strategies portion of this plan shall be prepared by the supervising air monitor. Such plan shall include but not be limited to the precise personal protective equipment to be used, the location of asbestos control areas including clean and dirty areas, buffer zones, showers, storage areas, change rooms, removal method, interface of trades involved in the construction, sequencing of asbestos related work, disposal plan, type of wetting agent and asbestos sealer to be used, locations of local exhaust equipment, planned air monitoring strategies, and a detailed description of the method to be employed in order to control pollution. The plan shall also include (both fire and medical emergency) response plans. The Contractor and designer shall meet with the Contracting Officer prior to beginning work, to discuss in detail the asbestos plan, including work procedures and safety precautions. The plan will be enforced as if an addition to the specification. Any changes required in the specification as a result of the plan shall be identified specifically in the plan. The plan shall comply with all federal and state requirements and this specification, and shall serve as the North Carolina Abatement Design. Submit a copy of plan to the Contracting Officer.

1.5.2 Air Sampling Results

Complete fiber counting and provide results to the SAM for review within 16 hours. Notify the Contracting Officer immediately of any airborne levels of asbestos fibers in excess of the acceptable limits. Submit sampling results to the Contracting Officer and the affected Contractor employees within 3 working days, signed by the employee performing air sampling, the employee that analyzed the sample, and the SAM.

1.5.3 Pressure Differential Recordings for Local Exhaust System

Provide a local exhaust system that creates a negative pressure of at least 0.02 inches of water relative to the pressure external of the enclosure and operate it continuously, 24 hours a day, until the enclosure of the asbestos control area is removed. Provide continuous 24-hour per day monitoring of the pressure differential with a pressure differential automatic recording instrument. Submit pressure differential recordings for each work day to the SAM for review and to the Contracting Officer within 24 hours from the end of each work day. Notify the Contractor and the Contracting Officer immediately of any variance in the pressure differential which could cause adjacent unsealed areas to have asbestos fiber concentrations in excess of 0.01 fibers per cubic centimeter or background whichever is higher. In no circumstance shall levels exceed 0.1 fibers per cubic centimeter.

1.5.4 Asbestos Waste Shipment Record N.C. (DHHS-HHCU) Form 3787

Record and report, to the Contracting Officer, the amount of asbestos containing material removed and released for disposal. Deliver the report for the previous day at the beginning of each day shift with amounts of material removed during the previous day reported in linear feet or square feet as described initially in this specification and in cubic feet for the amount of asbestos containing material released for disposal. Use "Asbestos Waste Shipment Record N.C. (DHHS-HHCU) Form 3787 for this report. A copy of the (DHHS-HHCU) Form 3787 must accompany any asbestos waste shipment to the Base sanitary landfill.

1.5.5 Daily Log

A daily log documenting work practices, sample locations, and all other asbestos related job conditions shall be maintained, by the testing lab and be available for Government examination throughout the course of work. At the completion of testing, a copy of this log shall be immediately delivered to the Government.

1.5.6 North Carolina Permit

Submit one copy of the North Carolina Permit before beginning abatement activities to the Contracting Officer.

1.5.7 Modifications to the North Carolina Permit

Submit a copy of all permit modifications to the Contracting Officer. These must be received before they become effective. The Contractor is responsible for proper permit modification notification to the State. Modifications may be delivered to the Contracts Office or transmitted by facsimile to (910) 411-5899.

1.5.8 Asbestos Inspection Reporting Form

This Asbestos Inspection Reporting Form is included at the end of this section and shows the homogeneous areas involved with this project. The Contractor shall mark the line "confirmed ACM from this HA:" as either "Abated" or "Managed in Place." Abated shall be defined as removed. If an HA is partially abated, approximate the percentage of asbestos removed and mark in the comments area. Provide any other descriptive data, such as rooms/areas removed or rooms/areas where asbestos not removed. The intent of this requirement is to report "as built" conditions. The Contractor is

not required to perform any additional asbestos surveys or inspections as a result of this paragraph. Include this report with drawing of abated areas with other closeout documentation.

1.6 PRE-ABATEMENT MEETING

The Contractor and designer shall meet with the Contracting Officer prior to beginning work, to discuss in detail the asbestos plan, including work procedures and safety precautions.

1.7 ASBESTOS INSPECTION REPORTING FORM AND ASBESTOS SAMPLE REPORTING FORM

These two forms are included at the end of this section for informational purposes. They do not define or modify the scope of work.

PART 2 PRODUCTS

2.1 ENCAPSULANTS

Shall conform to current USEPA requirements, shall contain no toxic or hazardous substances as defined in 29 CFR 1926.59, and shall conform to the following performance requirements. Use of encapsulants is generally restricted to the surface of the temporary enclosure and to areas that are not to be refinished such as attics and crawlspaces. The proposed use of encapsulants shall be included in the abatement design.

2.1.1 Removal Encapsulants

<u>Requirement</u>	<u>Test Standard</u>
Flame Spread - 25, Smoke Emission - 50	ASTM E 84
Life Expectancy - 20 years	ASTM C 732, Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E96/E96M

2.1.2 Lock-down Encapsulant

<u>Requirement</u>	<u>Test Standard</u>
Flame Spread - 25, Smoke Emission - 50	ASTM E 84
Life Expectancy - 20 years	ASTM C 732 Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E96/E96M
Fire Resistance - Negligible affect on fire resistance rating over 3 hour test (Tested with fireproofing over encapsulant applied directly to steel member)	ASTM E 119
Bond Strength - 100 pounds of force/foot (Tests compatibility with	ASTM E 736

Requirement

Test Standard

cementitious and fibrous
fire-proofing)

2.1.3 Plastic Sheet

Plastic sheet, polyethylene, 6 mil minimum thickness, unless otherwise specified, in sizes to minimize the frequency of joints. All asbestos material or debris will be at least double bagged or wrapped in two layers of 6 mil poly sheeting.

2.1.4 Tape

Capable of sealing joints of adjacent sheets or plastic sheets and for attachment of plastic sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under dry and wet conditions, including use of amended water.

2.1.5 Disposal Bags

Bags shall be a minimum of 6 mil thick polyethylene. Affix a warning and Department of Transportation (DOT) label to each bag or use bags with the approved warnings and DOT labeling preprinted on the bag.

2.1.6 Warning Labels

Provide labels conforming to 29 CFR 1926.1101 of sufficient size to be clearly legible, displaying the following legend:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD
BREATHING ASBESTOS DUST MAY
CAUSE SERIOUS BODILY HARM

PART 3 EXECUTION

3.1 DISPOSAL SITE

CAMP LEJEUNE SANITARY LANDFILL
982 PINEY GREEN ROAD
CAMP LEJEUNE, NC 28542
(910) 451-5011

Base Sanitary Landfill shall be used for disposal of all asbestos waste. The Base Sanitary Landfill is approved and is available for use by the Contractor providing the following requirements are satisfied:

- a. The Contracting Officer must be informed at least five working days in advance of the anticipated delivery date of the asbestos material to the Landfill. On larger projects, the notification should be accompanied by a cubic yard estimate of the anticipated volume, updated weekly if the disposal period extends for more than one week. The Government will be responsible for digging the trenches and covering the debris at the end of the working day. Debris will not be accepted before 8:00 AM or after 10:00 AM, except in an emergency situation.

- b. Asbestos will be accepted only if adequately wet and double bagged in heavy-duty 6 mil plastic bags which are clearly marked "Asbestos." If a Contractor desires to handle the asbestos in a manner other than double-bagged, written application, along with a description of the proposed deviation, must be submitted to the OICC and Landfill Manager for approval.
- c. Asbestos insulated piping with the asbestos insulation intact will be accepted if the following requirements are met:
 - 1. The pipe is cut in eight foot or shorter lengths
 - 2. Each section of pipe is double wrapped, sealed, and labeled as asbestos.
 - 3. All pipe is palletized on a 7/8-inch, 4- by 8-foot sheet of plywood. The whole pallet is banded with a minimum of three 1-inch wide metal bands with the coupling on top and wrapped with 6-mil plastic. The pallet is not higher than 3-inches.
- d. All asbestos, except palletized pipe will be off loaded and placed in the trench pipe hand.
- e. Asbestos disposal is restricted to one designated location in the Landfill and the landfill operators must be informed of and direct each delivery. Asbestos shall be disposed of from 0800 to 1000 hours daily, except holidays and weekends. Trucks hauling asbestos must be properly covered with tarpaulins or equivalent. Trucks not covered properly must be parked until the Contracting Officer approves corrective actions.
- f. The Contractor will ensure asbestos contaminated material delivered to the Base Sanitary Landfill contain no free liquids. Free liquids are defined as material which fails the EPA SW-846 free liquids test.
- g. The Contractor will include all asbestos waste shipment records (DHHS-HHCU Form 3787) that are filled out completely with the correct information, to the project manager after abatement job is completed.

3.2 EQUIPMENT

Make available to the Contracting Officer or the Contracting Officer's Representative, two complete sets of personal protective equipment as required herein for entry to the asbestos control area at all times for inspection of the asbestos control area. Provide equivalent training to the Contracting Officer or a designated representative as provided to Contractor employees in the use of the required personal protective equipment. Provide manufacturer's certificate of compliance for all equipment required to contain airborne asbestos fibers.

3.2.1 Respirators

Comply with 29 CFR 1926.1101.

3.3 WORK PROCEDURE

Remove all friable and non-friable ACM in accordance with all Federal, State, and local Marine Corps regulations. Ensure that the asbestos abatement plan is followed throughout all aspects of the abatement process.

3.3.1 Furnishings

Furniture and equipment will be removed from the area of work by either the Government or the contractor before asbestos work begins. Refer to RFP documents for additional information.

3.3.2 Pipe Insulation

Pipe may be removed with the asbestos insulation in place by wrapping the entire length of pipe and associated insulation with double thickness 6 mil plastic secured with duct tape. Mechanically cutting of asbestos containing insulation is prohibited. When using the "candy-stripe" method the abatement contractor must use glovebag operations to establish an "asbestos free" area to cut the pipe into appropriate lengths. Cut piping simultaneously into lengths suitable for transportation to disposal area, but no greater than 8 feet in length. Continuously wet the cutting site during the process. As soon as a length of pipe is completely cut loose, cover exposed ends with double thickness 6 mil plastic secured with duct tape. If the pipe is to remain in service, the removed pipe must be replaced in accordance with this Specification, with a pipe of the same size that is removed.

3.3.2.1 Attic Insulation

In those buildings indicated on the drawings, attic insulation consisting of any combination of blown-in or batt fiberglass or rockwool material, has been contaminated with asbestos materials, and is to be removed as contaminated asbestos material. The insulation material shall be wet with a fine mist of amended water. The material shall be placed immediately in double thickness 6 mil plastic bags for disposal as asbestos waste.

3.3.2.2 Contaminated Soil

In those buildings so indicated on the drawings, asbestos materials are located in the building crawl spaces and deterioration of the asbestos material has resulted in contamination of the soil under the building. Under the indicated area of these buildings, asbestos material and 2 inches of soil shall be removed and one sheet of plastic, 6 mils thick, spread over the area with seams lapped a minimum of 4 inches. Sand shall be placed a minimum of 2 inches thick over the plastic. Removal shall occur just prior to clean-up operations. All debris in the crawl space shall be disposed of with the soil as asbestos materials. Workers shall be equipped with respirators and protective clothing during the removal of soil and debris.

3.3.2.3 Non-Organic Bound (NOB) Asbestos Materials

These kind of materials include floor tile, mastic, caulking, roofing material, and other non-friable material. Materials are to be adequately wet before removal and double bagged with a 6 mil poly bag. Ensure that bags have been labeled properly before they are taken to the Base Landfill.

3.3.3 Air Sampling

Sampling of airborne concentrations of asbestos fibers shall be performed in accordance with 29 CFR 1926.1101 and as specified herein. Sampling performed in accordance with 29 CFR 1926.1101 shall be performed by the SAM. Sampling performed for environmental and quality control reasons shall be performed by the SAM. Unless otherwise specified, use NIOSH Method 7400 for sampling and analysis. Monitoring may be duplicated by the Government at the discretion of the Contracting Officer. If the air sampling results obtained by the Government differ from those results obtained by the Contractor, the Government results shall prevail.

3.3.3.1 Sampling During Asbestos Work

The SAM shall provide personal and area sampling as indicated in 29 CFR 1926.1101 and governing environmental regulations. Thereafter, provided the same type of work is being performed, provide area sampling at least once every work shift close to the work inside the containment, outside the clean room entrance to the containment, and at the exhaust opening of the local exhaust system. Also, where an enclosure is not provided, conduct area monitoring of airborne asbestos fibers during the work shift at the designated limits of the asbestos work area at such frequency as recommended by the SAM and conduct personal samples of each worker engaged in asbestos handling (removal, disposal, transport and other associated work). If the quantity of airborne asbestos fibers monitored at the breathing zone of the workers or designated limits at any time exceeds background or 0.01 fibers per cubic centimeter whichever is lesser outside of the containment area, stop work, evacuate personnel in adjacent areas or provide personnel with approved protective equipment at the discretion of the Contracting Officer. This sampling may be duplicated by the government at the discretion of the Contracting Officer. If the air sampling results obtained by the government differ from those obtained by the Contractor, the government results shall prevail. If adjacent areas are contaminated as determined by the Contracting Officer, clean the contaminated areas, monitor, and visually inspect the area as specified herein. If sampling outside the containment shows airborne levels have exceeded background or 0.01 fibers per cubic centimeter, whichever is greater, stop all work, correct the condition(s) causing the increase, and notify the Contracting Officer immediately. In areas where the construction of a containment is not required, after initial TWAs are established and provided the same type of work is being performed, provide sampling at the designated limits of the asbestos work area at such frequency as recommended by the SAM. Where glovebag methods are used, perform personal and area air sampling at locations and frequencies that will accurately characterize the evolving airborne asbestos levels.

3.3.3.2 Sampling After Final Clean-Up (Clearance Sampling) For All Areas Unless Noted Otherwise

Provide area sampling of asbestos fibers using aggressive air sampling techniques as defined in the EPA 560/5-85-024 and establish an air borne asbestos concentration of less than 70 structures per square millimeter after final clean-up but before removal of the containment or the asbestos work control area. After final cleanup and the asbestos control area is

dry but prior to clearance sampling, the SAM shall perform a visual inspection, in accordance with [ASTM E 1368](#), to insure that the asbestos control and work area is free of any accumulations of dirt, dust, or debris. Use transmission electron microscopy (TEM) to analyze clearance samples and report the results in accordance with current NIOSH criteria. The asbestos fiber counts from these samples shall be less than 70 structures per square millimeter or be not greater than the background, whichever is greater. Should any of the final samples indicate a higher value, the Contractor shall take appropriate actions to re-clean the area and shall repeat the sampling and TEM analysis at the Contractor's expense.

3.3.3.3 Sampling After Final Clean-Up (Clearance Sampling)

Refer to [PART 6 Asbestos Reports for sampling areas](#). Provide area sampling of asbestos fibers using aggressive air sampling techniques as defined in the EPA 560/5-85-024 and establish an air borne asbestos concentration of less than 0.01 fibers per cubic centimeter after final clean-up but before removal of the containment or the asbestos work control area. After final clean-up and the asbestos control area is dry but prior to clearance sampling, the SAM shall perform a visual inspection, in accordance with [ASTM E 1368](#), to insure that the asbestos control and work area is free of any accumulations of dirt, dust, or debris. Should any of the final samples indicate a higher value, the Contractor shall take appropriate actions to re-clean the area and shall repeat the sampling and analysis at the Contractor's expense.

3.3.4 Lock Down

Prior to removal of plastic barriers and after pre-clearance clean up of gross contamination, a visual inspection by the SAM, of all areas affected by the removal of the asbestos contaminated materials for any visible fibers, shall be conducted and approved by the SAM. A post removal (lock down) encapsulant shall then be spray applied to ceiling, walls, floors and other areas exposed in the removal area. The exposed area shall include but not be limited to plastic barriers, furnishings and articles to be discarded as well as dirty change room, air locks for bag removal and decon chambers.

3.3.5 Site Inspection

While performing asbestos removal work, the Contractor shall be subject to on-site inspection by the Contracting Officer who may be assisted by or represented by safety or industrial hygiene personnel. If the work is found to be in violation of this specification, the Contracting Officer or his representative will issue a stop work order to be in effect immediately and until the violation is resolved. Standby time required to resolve the violation shall be at the Contractor's expense.

3.4 CLEAN-UP AND DISPOSAL

3.4.1 Housekeeping

Essential parts of asbestos dust control are housekeeping and clean-up procedures. Maintain surfaces of the asbestos control area free of accumulations of asbestos fibers. Give meticulous attention to restricting the spread of dust and debris; keep waste from being distributed over the general area. Use HEPA filtered vacuum cleaners. Do not blow down the space with compressed air. When asbestos removal is complete, all asbestos waste is removed from the work-site, final clean-up is completed, and final

air sampling results are reported, the SAM will certify the area as safe and the Contracting Officer will approve the abatement completion, before the signs can be removed. After final clean-up and acceptable airborne concentrations are attained but before the HEPA unit is turned off and the containment removed, remove all pre-filters on the building HVAC system and provide new pre-filters. Dispose of filters as asbestos-contaminated materials. Reestablish HVAC mechanical, and electrical systems in proper work ing order. The Contracting Officer will visually inspect all surfaces within the containment for residual material or accumulated dust or debris. The Contractor shall re-clean all areas showing dust or residual materials. If re-cleaning is required, air sample and establish an acceptable asbestos airborne concentration after re-cleaning. The SAM will provide written certification that the work area is safe within all standards as referenced within this contract before unrestricted entry is permitted. The Government shall have the option to perform monitoring to certify the areas are safe before entry is permitted.

3.4.2 Title to Materials

All materials resulting from demolition work, except as specified otherwise, shall become the property of the Contractor and shall be disposed of as specified in applicable local, state, and Federal regulations and herein. All building materials that are cross contaminated must be disposed of as an ACM at Base Landfill.

3.4.3 Disposal of Asbestos

3.4.3.1 Procedure for Disposal

Collect asbestos waste, asbestos contaminated water, scrap, debris, bags, containers, equipment, and asbestos contaminated clothing which may produce airborne concentrations of asbestos fibers and place in sealed fiberproof, waterproof, non-returnable containers (e.g. double plastic bags 6 mils thick, cartons, drums or cans). Wastes within the containers must be wetted to insure the security of the material in case of container breaching. Affix a warning and Department of Transportation (DOT) label to each bag or use at least 6 mil thick bags with the approved warnings and DOT labeling preprinted on the bag. For temporary storage, store sealed impermeable bags in asbestos waste drums or skids. An area for interim storage of asbestos waste-containing drums or skids will be assigned by the Contracting Officer or his authorized representative. Procedure for hauling and disposal shall comply with 40 CFR 61, SUBPART M, state, regional, and local standards.

3.4.3.2 Disposal Material Shall Contain No Free Liquid

The Contractor will ensure asbestos contaminated material delivered to the Base Sanitary Landfill contain no free liquids. Free liquids are defined as material which fails the EPA SW-846 Free Liquids Test.

-- End of Section --

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

02/19

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 CONCRETE INSTITUTE (ACI)

- ACI 117 (2010; Errata 2011) Specifications for Tolerances for Concrete Construction and Materials and Commentary
- ACI 121R (2008) Guide for Concrete Construction Quality Systems in Conformance with ISO 9001
- ACI 301 (2016) Specifications for Structural Concrete
- ACI 302.1R (2015) Guide for Concrete Floor and Slab Construction
- ACI 304.2R (2017) Guide to Placing Concrete by Pumping Methods
- ACI 304R (2000; R 2009) Guide for Measuring, Mixing, Transporting, and Placing Concrete
- ACI 305R (2010) Guide to Hot Weather Concreting
- ACI 308.1 (2011) Specification for Curing Concrete
- ACI SP-2 (2007; Abstract: 10th Edition) ACI Manual of Concrete Inspection
- ACI SP-15 (2011) Field Reference Manual: Standard Specifications for Structural Concrete ACI 301-05 with Selected ACI References

AMERICAN WELDING SOCIETY (AWS)

- AWS D1.4/D1.4M (2011) Structural Welding Code - Reinforcing Steel

ASTM INTERNATIONAL (ASTM)

- ASTM A780/A780M (2009; R 2015) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
- ASTM A934/A934M (2016) Standard Specification for

Epoxy-Coated Prefabricated Steel
Reinforcing Bars

ASTM A1060/A1060M	(2016b) Standard Specification for Zinc-Coated (Galvanized) Steel Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A1064/A1064M	(2017) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C31/C31M	(2019) Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33/C33M	(2018) Standard Specification for Concrete Aggregates
ASTM C78/C78M	(2018) Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C94/C94M	(2018) Standard Specification for Ready-Mixed Concrete
ASTM C143/C143M	(2015) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150/C150M	(2018) Standard Specification for Portland Cement
ASTM C172/C172M	(2017) Standard Practice for Sampling Freshly Mixed Concrete
ASTM C260/C260M	(2010a; R 2016) Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C330/C330M	(2017a) Standard Specification for Lightweight Aggregates for Structural Concrete
ASTM C494/C494M	(2017) Standard Specification for Chemical Admixtures for Concrete
ASTM C595/C595M	(2018) Standard Specification for Blended Hydraulic Cements
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM C1017/C1017M	(2013; E 2015) Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1077	(2017) Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation

ASTM C1107/C1107M	(2017) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C1116/C1116M	(2010a; R 2015) Standard Specification for Fiber-Reinforced Concrete
ASTM C1157/C1157M	(2017) Standard Performance Specification for Hydraulic Cement
ASTM C1218/C1218M	(2017) Standard Test Method for Water-Soluble Chloride in Mortar and Concrete
ASTM C1260	(2014) Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1293	(2008; R 2015) Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction
ASTM C1567	(2013) Standard Test Method for Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
ASTM C1602/C1602M	(2018) Standard Specification for Mixing Water Used in Production of Hydraulic Cement Concrete
ASTM C1778	(2016) Standard Guide for Reducing the Risk of Deleterious Alkali-Aggregate Reaction in Concrete
ASTM D1752	(2018) Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D3042	(2017) Standard Test Method for Insoluble Residue in Carbonate Aggregates
ASTM D6690	(2015) Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM E96/E96M	(2016) Standard Test Methods for Water Vapor Transmission of Materials
ASTM E329	(2018) Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
ASTM E1643	(2018a) Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs

ASTM E1745 (2017) Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

CRSI 10MSP (2009; 28th Ed; Errata) Manual of Standard Practice

CRSI RB4.1 (2016) Supports for Reinforcement Used in Concrete

1.2 DEFINITIONS

- a. "Cementitious material" as used herein must include all portland cement, pozzolan, fly ash, slag cement, 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. "Supplementary cementing materials" (SCM) include coal fly ash, silica fume, slag cement, natural or calcined pozzolans, and ultra-fine coal ash when used in such proportions to replace the portland cement that result in improvement to sustainability and durability and reduced cost.
- e. "Design strength" (f'c) is the specified compressive strength of concrete at time(s) specified in this section to meet structural design criteria.
- f. "Mass Concrete" is any concrete system that approaches a maximum temperature of 158 degrees F within the first 72 hours of placement. In addition, it includes all concrete elements with a section thickness of 3 feet or more regardless of temperature.
- g. "Mixture proportioning" is the process of designing concrete mixture proportions to enable it to meet the strength, service life and constructability requirements of the project while minimizing the initial and life-cycle cost.
- h. "Mixture proportions" are the masses or volumes of individual ingredients used to make a unit measure (cubic meter or cubic yard) of concrete.
- i. "Pozzolan" is a siliceous or siliceous and aluminous material, which in itself possesses little or no cementitious value but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementitious properties.
- j. "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 Contractor Quality Control approval. 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-01 Preconstruction Submittals

Concrete Curing Plan

Quality Control Plan; G

Quality Control Personnel Certifications; G

Quality Control Organizational Chart

Laboratory Accreditation; G

Maturity Method Data

SD-02 Shop Drawings

Complete colored concrete flooring system

SD-03 Product Data

Joint Sealants; G

Concrete bonding agent; G

Cementitious Materials; G

Vapor Barrier; G

Concrete Curing Materials; G

Liquid Chemical Floor Hardeners and Sealers; G

Admixtures; G

Reinforcing Fibers; G

Pumping Concrete

Finishing Plan; G

Nonshrink Grout; G

SD-04 Samples, Mock-Ups

Slab Finish Sample, G

Surface Finish Samples; G

Mock-Ups; G

SD-05 Design Data

Concrete Mix Design; G

SD-06 Test Reports

Concrete Mix Design; G

Slag Cement

Aggregates

Fiber-Reinforced Concrete; G

Compressive Strength Tests; G

Unit Weight of Structural Concrete

Chloride Ion Concentration

Air Content

Slump Tests

Water

SD-07 Certificates

VOC Content for Form Release Agents, Curing Compounds, and
Concrete Penetrating Sealers

Safety Data Sheets

Field Testing Technician and Testing Agency

SD-08 Manufacturer's Instructions

Liquid Chemical Floor Hardeners and Sealers

Joint Sealants;

Curing Compound

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

Follow ACI 301, ACI 304R and ASTM A934/A934M requirements and recommendations. Do not deliver concrete until vapor retarder, vapor barrier, forms, reinforcement, embedded items, and chamfer strips are in place and ready for concrete placement. 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.

1.6 QUALITY ASSURANCE

1.6.1 Design Data

1.6.1.1 Concrete Mix Design

Sixty 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, supplementary cementitious materials, fibers, and admixtures; and applicable reference specifications. Submit mill test and all other test for cement, supplementary cementitious materials, aggregates, and admixtures. Provide documentation of maximum nominal aggregate size, gradation analysis, percentage retained and passing sieve, and a graph of percentage retained verses sieve size. Provide mix proportion data using at least three different water-cementitious material ratios for each type of mixture, which produce a range of strength encompassing those required for each 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. Resubmit data on concrete components if the qualities or source of components changes. For previously approved concrete mix designs used within the past twelve months, the previous mix design may be re-submitted without further trial batch testing if accompanied by material test data conducted within the last six months. Obtain mix design approval from the contracting officer prior to concrete placement.

Concrete mix design containing flash ash and concrete slag are not allowed.

1.6.1.2 Color Additives, Curing products, cleaning agents, and surface retarders.

Submit a complete list of materials including type; brand; data sheets; and applicable reference specifications.

1.6.2 Shop Drawings

1.6.2.1 Complete colored flooring system

Must include overall floor plans at 1/8" per foot or larger scale as required to show the extent of work, indicating design, color patterns, aggregate and pigment selection, et. Provide large scale detailing for drainage devices, expansion joints, control joints, transition to existing floor conditions, threshold types, bonding agents applied to the existing concrete substrate, base concrete layer with wire mesh, toppings, strip molding, etc..

1.6.3.1 Concrete Curing Plan

Submit proposed materials, methods and duration for curing concrete elements in accordance with [ACI 308.1](#).

1.6.3.2 Pumping Concrete

Submit proposed materials and methods for pumping concrete. Submittal must include mix designs, pumping equipment including type of pump and size and material for pipe, and maximum length and height concrete is to be pumped.

1.6.3.3 Silica Fume Manufacturer's Representative

The manufacturer's representative must be present at mix plant to ensure proper mix, including high range water reducer, and batching methods during the first 3 days of concrete mix preparation and placement. After which the manufacturer's representative must designate a representative at the concrete producer's plant to ensure the concrete mix procedures meet the silica fume manufacturer's recommendations.

1.6.3.4 Finishing Plan

Submit proposed material and procedures to be used in obtaining the finish for each floor condition. .

1.6.3.5 VOC Content for form release agents, curing compounds, and concrete penetrating sealers

Submit certification for the form release agent, curing compounds, and concrete penetrating sealers that indicate the VOC content of each product.

1.6.3.6 Safety Data Sheets

Submit Safety Data Sheets (SDS) for all materials that are regulated for hazardous health effects. SDS must be readily accessible during each work shift to employees when they are at the construction site.

1.6.4 Test Reports

1.6.4.1 Fly Ash Silica Fume, and Pozzolan

Not allowed.

1.6.4.2 Slag Cement

Not allowed.

1.6.4.3 Aggregates

Submit test results in accordance with ASTM C33/C33M, or ASTM C330/C330M for lightweight aggregate, and ASTM C1293 or ASTM C1567 as required in the paragraph titled ALKALI-AGGREGATE REACTION.

1.6.4.4 Fiber-Reinforced Concrete

Test to determine flexural toughness index I5 in accordance with ASTM C1116/C1116M.

1.6.5 Samples and Mock Ups

1.6.5.1 Slab Finish Sample

Finish types and colors:

a- Knock-down finish: Slip resistant for all areas as indicated in drawings. Samples must match existing pool deck texture finish as found in Marine Corps Base Camp Lejeune Building 236, D Street. The Government will select one color for the slip resistant type.

The color for each of the finish types will be selected by the Government from actual colored concrete samples supplied by the Contractor.

Once the Government selects the colors, provide a minimum of three 12" x 12" samples for each finish type for preliminary approval of finish type and colors.

Based on the preliminary approved samples, install mock-up with minimum dimensions of 3 foot by 3 foot slab for each finish type and color.

Provide additional 3 foot by 3 foot slab samples as necessary until the desired finish type and colors is obtained.

Mock-ups must not be part of the final project. Accepted mock-ups will provide visual standard for work performed in the contract. Mock-ups must remain on site until the contract work is completed. All mock-ups must be removed from the site when no longer required for comparison with finished work. The mock-ups must be disposed by the contractor, and the site restored to its original condition.

Provide concentrated pigments specially processed for mixing into concrete and complying with ASTM C979.

Color additives containing carbon black are not acceptable.

1.6.6 Quality Control Plan

Develop and submit for approval a concrete quality control program in accordance with the guidelines of ACI 121R and as specified herein. The plan must include approved laboratories. Provide direct oversight for the concrete qualification program inclusive of associated sampling and testing. All quality control reports must be provided to the Contracting Officer, Quality Manager and Concrete Supplier. Maintain a copy of ACI SP-15 and CRSI 10MSP at project site.

1.6.7 Quality Control Personnel Certifications

The Contractor must submit for approval the responsibilities of the various quality control personnel, including the names and qualifications of the individuals in those positions and a quality control organizational chart defining the quality control hierarchy and the responsibility of the various positions. Quality control personnel must be employed by the Contractor.

Submit American Concrete Institute certification for the following:

- a. CQC personnel responsible for inspection of concrete operations.
- b. Lead Foreman or Journeyman of the Concrete Placing, Finishing, and Curing Crews.
- c. Field Testing Technicians: ACI Concrete Field Testing Technician, Grade I.

1.6.7.1 Quality Manager Qualifications

The quality manager must hold a current license as a professional engineer in a U.S. state or territory with experience on at least five similar projects. Evidence of extraordinary proven experience may be considered by the Contracting Officer as sufficient to act as the Quality Manager.

1.6.7.2 Field Testing Technician and Testing Agency

Submit data on qualifications of proposed testing agency and technicians for approval by the Contracting Officer prior to performing testing on concrete.

- a. Work on concrete under this contract must be performed by an ACI Concrete Field Testing Technician Grade 1 qualified in accordance with [ACI SP-2](#) or equivalent. Equivalent certification programs must include requirements for written and performance examinations as stipulated in [ACI SP-2](#).
- b. Testing agencies that perform testing services on reinforcing steel must meet the requirements of [ASTM E329](#).
- c. Testing agencies that perform testing services on concrete materials must meet the requirements of [ASTM C1077](#).

1.6.8 Laboratory Qualifications for Concrete Qualification Testing

The concrete testing laboratory must have the necessary equipment and experience to accomplish required testing. The laboratory must meet the requirements of [ASTM C1077](#) and be Cement and Concrete Reference Laboratory (CCRL) inspected.

1.6.9 Laboratory Accreditation

Laboratory and testing facilities must be provided by and at the expense of the Contractor. The laboratories performing the tests must be accredited in accordance with [ASTM C1077](#), including [ASTM C78/C78M](#) and [ASTM C1260](#). The accreditation must be current and must include the required test methods, as specified. Furthermore, the testing must comply with the following requirements:

- a. Aggregate Testing and Mix Proportioning: Aggregate testing and mixture proportioning studies must be performed by an accredited laboratory and under the direction of a registered professional engineer in a U.S. state or territory competent in concrete materials who is competent in concrete materials and must sign all reports and designs.
- b. Acceptance Testing: Furnish all materials, labor, and facilities required for molding, curing, testing, and protecting test specimens at the site and in the laboratory. Furnish and maintain boxes or other facilities suitable for storing and curing the specimens at the site while in the mold within the temperature range stipulated by [ASTM C31/C31M](#).
- c. Contractor Quality Control: All sampling and testing must be performed by an approved, onsite, independent, accredited laboratory.

1.7 ENVIRONMENTAL REQUIREMENTS

Provide space ventilation according to material manufacturer recommendations, at a minimum, during and following installation of concrete curing compound and sealer. Maintain one of the following ventilation conditions during the curing period or for 72 hours after installation:

- a. Supply 100 percent outside air 24 hours a day.
- b. Supply airflow at a rate of 6 air changes per hour, when outside temperatures are between 55 degrees F and 84 degrees F and humidity is between 30 percent and 60 percent.
- c. Supply airflow at a rate of 1.5 air changes per hour, when outside air conditions are not within the range stipulated above.

1.7.1 Submittals for Environmental Performance

- a. Provide data indication the percentage of post-industrial pozzolan (fly ash, slag cement) cement substitution as a percentage of the full product composite by weight.
- b. Provide data indicating the percentage of post-industrial and post-consumer recycled content aggregate.
- c. Provide product data indicating the percentage of post-consumer recycled steel content in each type of steel reinforcement as a percentage of the full product composite by weight.
- d. Provide product data stating the location where all products were manufactured
- e. For projects using FSC certified formwork, provide chain-of-custody documentation for all certified wood products.
- f. For projects using reusable formwork, provide data showing how formwork is reused.
- g. Provide SDS product information data showing that form release agents meet any environmental performance goals such as using vegetable and soy based products.
- h. Provide SDS product information data showing that concrete adhesives meet any environmental performance goals including low emitting, low volatile organic compound products.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

2.1.1 Cementitious Materials

2.1.1.1 Portland Cement

- a. Unless otherwise specified, provide cement that conforms to ASTM C150/C150M Type I
- b. Use one brand and type of cement.

- c. Submit information along with evidence demonstrating compliance with referenced standards. Submittals must include types of cementitious materials, manufacturing locations, shipping locations, and certificates showing compliance.
- d. Cementitious materials must be stored and kept dry and free from contaminants.

2.1.1.2 Resurface Concrete

- a. Single component, self-bonding white portland cementitious overlayment for knock-down texture and finish.
 - b. Application technique to match slip resistant finish as found in Marine Corps Base Camp Lejeune Building 236, D Street.
 - c. Surface preparation existing concrete: Remove all loose and spalling conditions, glues, sealers, rust, mildew and any other foreign matter that may serve as a bond breaker. Shot-blast all surfaces and any additional procedure per the manufacturer's recommendations.
 - d. Surface preparation new concrete: Must be properly cured to have sufficient hydration between 7 and 14 days depending on the atmospheric conditions.
 - e. Two-coat system application: base and finish coat applied by trowel, squeegee, or spray
 - f. Sealing: Apply sealer compatible with the used system
 - g. Mock up: Per SOW
 - h. Density: 126.1 pounds/Ft³
 - i. Compressive Strength: ASTM C-109, 28 days 4,278 PSI
 - j. Flexural Strength: ASTM C-348, 28 days 995 PSI
 - k. Tensile Strength: ASTM C-190, 28 days 440 PSI
 - l. Abrasion Resistance: ASTM D-4060, 28 days < 0.50%
 - m. Mosaic Shear: ANSI A-118.4 28 days 280 PSI

2.1.1.3 Sand

Provide sand conforming to ASTM C33/C33M for fine aggregate.

2.1.1.4 Marble Chips for Colored Concrete Floors

Provide marble chips of domestic origin of sizes and colors required as shown in drawings. Marble chips must have an abrasive hardness of not less than 10 when tested in accordance with ASTM C241/C241M; contain no deleterious or foreign matter; and less than one percent by weight dust content.

2.1.1.5 Pigments for Colored Concrete Floors

Provide pigments to comply with ASTM C979/C979M-16.

2.1.1.6 Divider Strips for Colored Concrete Floors

Provide brass divider strips as shown in drawings. Heavy-top strips may be either one- or two-piece strips with a solid top section, not less than 6 mm 1/4 inch nor more than 10 mm 3/8 inch in depth and not less than 6 mm 1/4 inch thick. Submit two 150 mm 6 inch lengths of each type divider.

2.1.2 Water

- a. Water or ice must comply with the requirements of ASTM C1602/C1602M.
- b. Minimize the amount of water in the mix. Improve workability by adjusting the grading of the aggregate and using admixture rather than by adding water.
- c. Water must be potable; free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances deleterious to concrete.
- d. Protect mixing water and ice from contamination during storage and delivery.
- e. Submit test report showing water complies with ASTM C1602/C1602M.

2.1.3 Aggregate

2.1.3.1 Normal-Weight Aggregate

- a. Aggregates must conform to ASTM C33/C33M unless otherwise specified in the Contract Documents or approved by the contracting officer.
- b. Aggregates used in concrete must be obtained from the same sources and have the same size range as aggregates used in concrete represented by submitted field test records or used in trial mixtures.
- c. Provide sand that is at least 50 percent acid insoluble based on ASTM D3042. Provide sand that is at least 50 percent natural sand.
- d. Store and handle aggregate in a manner that will avoid segregation and prevents contamination by other materials or other sizes of aggregates. Store aggregates in locations that will permit them to drain freely. Do not use aggregates that contain frozen lumps.
- e. Submit types, pit or quarry locations, producers' names, aggregate supplier statement of compliance with ASTM C33/C33M, and ASTM C1293 expansion data not more than 18 months old.

2.1.4 Admixtures

- a. Coloring Admixture Type: Provide concentrated pigments specially processed for mixing into concrete and complying with ASTM C979. Color additives containing carbon black are not acceptable.
- b. Chemical admixtures must conform to ASTM C494/C494M.

- c. Air-entraining admixtures must conform to [ASTM C260/C260M](#).
- d. Chemical admixtures for use in producing flowing concrete must conform to [ASTM C1017/C1017M](#).
- e. Do not use calcium chloride admixtures.
- f. Admixtures used in concrete must be the same as those used in the concrete represented by submitted field test records or used in trial mixtures.
- g. Protect stored admixtures against contamination, evaporation, or damage.
- h. To ensure uniform distribution of constituents, provide agitating equipment for admixtures used in the form of suspensions or unstable solutions. Protect liquid admixtures from freezing and from temperature changes that would adversely affect their characteristics.
- i. Submit types, brand names, producers' names, manufacturer's technical data sheets, and certificates showing compliance with standards required herein.

2.2 MISCELLANEOUS MATERIALS

2.2.1 [Concrete Curing Materials](#)

Liquid Membrane-Forming Curing Compound: Liquid-type membrane-forming curing compound complying with ASTM C309-98a, Type I, Class B and approved by color additive manufacturer for use with colored concrete. Provide curing compounds specifically recommended for colored concrete. Provide clear or semi-transparent color coating to obtain uniform appearance.

Submit product data for concrete [curing compounds](#). Submit manufactures instructions for placement of curing compound.

2.2.2 [Nonshrink Grout](#)

Nonshrink grout in accordance with [ASTM C1107/C1107M](#).

2.2.3 [Floor Finish Materials](#)

2.2.3.1 [Liquid Chemical Floor Hardeners and Sealers for Colored Concrete Floors](#)

- a. Hardener must be a colorless aqueous solution containing a blend of inorganic silicate or siliconate material and proprietary components combined with a wetting agent; that penetrates, hardens, and densifies concrete surfaces. Submit manufactures instructions for placement of liquid chemical floor hardener.
- b. Use concrete penetrating sealers with a low (maximum 100 grams/liter, less water and less exempt compounds) VOC content. Submit manufactures instructions for placement of sealers.
- c. The Government will select either matte or satin finish from actual samples provided by the manufacturer.

2.2.3.2 Non-slip Aggregate Finish

Provide aggregate to match slip resistant finish as found in Marine Corps Base Camp Lejeune Building 236, D Street.

2.2.3.3 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.

2.2.3.4 Densifiers for Colored Polished Concrete Floors

Provide densifiers compatible with the Polished Concrete Floors manufacturer system that could be applied during or after the polishing phase. Acceptable densifier chemistries are sodium silicate, potassium silicate, lithium silicate, colloidal silica or hibrid of these.

Provide densifiers:

- a. To increase performance and durability.
- b. To fill pores and increase surface density.
- c. To increase concrete surface hardness, improve stain resistance, durability and polished aesthetic longevity.
- d. To reduce permeability, dusting, and wear and tear.

2.2.3.5 Stain Protection for Colored Polished Concrete Floors.

Provide breathable polymer layer compatible with the Polished Concrete Floors manufacturer system.

2.2.4 Expansion/Contraction Joint Filler

ASTM D1752 Type I.

2.2.5 Joint Sealants

2.2.5.1 Horizontal Surfaces, 3 Percent Slope, Maximum

ASTM D6690 or ASTM C920, Type M, Class 25, Use T.

2.2.6 Vapor Barrier

ASTM E1745 Class A polyethylene sheeting, maximum of 0.1 perms, minimum 45 lb/in tensile strength, 2200 grams puncture resistance ASTM E96/E96M.

2.3 CONCRETE MIX DESIGN

2.3.1 Properties and Requirements

- a. Use materials and material combinations listed in this section and the contract documents.

- b. Cementitious material content must be adequate for concrete to satisfy the specified requirements for strength, w/cm, durability, and finishability described in this section and the contract documents.
- c. Selected target slump must meet the requirements this section, the contract documents, and must not exceed 4 in. Concrete must not show visible signs of segregation.
- d. The target slump must be enforced for the duration of the project. Determine the slump by ASTM C143/C143M. Slump tolerances must meet the requirements of ACI 117.
- e. The nominal maximum size of coarse aggregate for a mixture must not exceed three-fourths of the minimum clear spacing between reinforcement, one-fifth of the narrowest dimension between sides of forms, or one-third of the thickness of slabs or toppings.
- f. Concrete must be minimum of 4,000 psi.

2.3.2 Durability

2.3.2.1 Alkali-Aggregate Reaction

Do not use any aggregate susceptible to alkali-carbonate reaction (ACR). Use one of the three options below for qualifying concrete mixtures to reduce the potential of alkali-silica reaction (ASR):

- a. For each aggregate used in concrete, the expansion result determined in accordance with ASTM C1293 must not exceed 0.04 percent at one year.
- b. For each aggregate used in concrete, the expansion result of the aggregate and cementitious materials combination determined in accordance with ASTM C1567 must not exceed 0.10 percent at an age of 16 days.
- c. Alkali content in concrete (LBA) must be per manufacturer recommendations to minimize the alteration of the pigments in the appearance of the finish product. Reactivity must be determined by testing in accordance with ASTM C1293 and categorized in accordance with ASTM C1778. Alkali content is calculated as follows:
$$\text{LBA} = (\text{cement content, pounds per cubic yard}) \times (\text{equivalent alkali content of portland cement in percent}/100 \text{ percent})$$

2.3.2.2 Corrosion and Chloride Content

- a. Provide concrete meeting the requirements of the following table based on the exposure class assigned to members requiring protection against reinforcement corrosion in Contract Documents.
- b. Submit documentation verifying compliance with specified requirements.
- c. Water-soluble chloride ion content contributed from constituents including water, aggregates, cementitious materials, and admixtures must be determined for the concrete mixture by ASTM C1218/C1218M at age between 28 and 42 days.
- d. The maximum water-soluble chloride ion (Cl-) content in concrete, percent by mass of cement is as follows:

Exposure class	Maximum w/cm*	Minimum f'c, psi	Maximum water-soluble chloride ion (CL-) content in concrete, percent by mass of cement
Reinforced concrete			
C1	N/A	17 2500	0.30

*The maximum w/cm limits do not apply to lightweight concrete.

2.3.2.3 Sulfate Resistance

- a. Provide concrete meeting the requirements of the following table based on the exposure class assigned to members for sulfate exposure.

Exposure class	Maximum w/cm	Minimum f'c, psi	Required cementitious materials-types			Calcium chloride admixture
			ASTM C150/C150M	ASTM C595/C595M	ASTM C1157/C1157M	
S0	N/A	2500	N/A	N/A	N/A	No restrictions

2.3.2.4 Concrete Temperature

The temperature of concrete as delivered must not exceed 95°F.

2.3.2.5 Concrete permeability

- a. Provide concrete meeting the requirements of the following table based on exposure class assigned to members requiring low permeability in the Contract Documents.

Exposure	Maximum	Minimum f'c,	Additional
W1	0.5	4000	None

*The maximum w/cm limits do not apply to lightweight concrete.

- b. Submit documentation verifying compliance with specified requirements.

2.3.3 Trial Mixtures

Trial mixtures must be in accordance to **ACI 301**.

2.3.4 Ready-Mix Concrete

Provide concrete that meets the requirements of **ASTM C94/C94M**.

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 C94/C94M](#):

- a. Type and brand cement
- b. Cement and supplementary cementitious materials content in 94-pound bags per cubic yard of concrete
- c. Maximum size of aggregate
- d. Amount and brand name of admixtures
- e. Total water content expressed by water cementitious material ratio

2.4 REINFORCEMENT

- a. Bend reinforcement cold. Fabricate reinforcement in accordance with fabricating tolerances of [ACI 117](#).
- b. When handling and storing coated reinforcement, use equipment and methods that do not damage the coating. If stored outdoors for more than 2 months, cover coated reinforcement with opaque protective material.
- c. Submit manufacturer's certified test report for reinforcement.
- d. Submit placing drawings showing fabrication dimensions and placement locations of reinforcement and reinforcement supports. Placing drawings must indicate locations of splices, lengths of lap splices, and details of mechanical and welded splices.

2.4.1 Welded wire reinforcement

- a. Use welded wire reinforcement specified in Contract Documents and conforming to one or more of the specifications given herein.
- b. Plain welded wire reinforcement must conform to [ASTM A1064/A1064M](#), with welded intersections spaced no greater than 12 in. apart in direction of principal reinforcement.
- c. Deformed welded wire reinforcement must conform to [ASTM A1064/A1064M](#), with welded intersections spaced no greater than 16 in. apart in direction of principal reinforcement. d. Zinc-coated (galvanized) welded wire reinforcement must conform to [ASTM A1060/A1060M](#). Coating damage incurred during shipment, storage, handling, and placing of zinc-coated (galvanized) welded wire reinforcement must be repaired in accordance with [ASTM A780/A780M](#). If damaged area exceeds 2 percent of surface area in each linear foot of each wire or welded wire reinforcement, the sheet containing the damaged area must not be used. The 2 percent limit on damaged coating area shall include repaired areas damaged before shipment as required by [ASTM A1060/A1060M](#).

2.4.2 Reinforcing Bar Supports

- a. Provide reinforcement support types within structure as required by Contract Documents. Reinforcement supports must conform to [CRSI RB4.1](#). Submit description of reinforcement supports and materials for fastening coated reinforcement if not in conformance with [CRSI RB4.1](#).
- b. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar support. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer coated wire

bar supports.

PART 3 EXECUTION

3.1 EXAMINATION

- a. Do not begin installation until substrates have been properly constructed; verify that substrates are level.
- b. Check field dimensions before beginning installation. If dimensions vary too much from design dimensions for proper installation, notify Contracting Officer 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

- a. 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.
- b. 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 Slabs on Ground

- a. Before construction of slabs on ground, have underground work on pipes and conduits completed and approved.
- b. Previously constructed subgrade or fill must be cleaned of foreign materials
- c. Finish surface of capillary water barrier 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.
- d. 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.

3.2.3 Edge Forms and Screed Strips for Slabs

- a. 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.
- b. Align concrete surface to elevation of screed strips by use of strike-off templates or approved compacting-type screeds.

3.2.4 Reinforcement and Other Embedded Items

- a. Secure reinforcement, joint materials, and other embedded materials in position, inspected, and approved before start of concrete placing.
- b. When concrete is placed, reinforcement must be free of materials deleterious to bond. Reinforcement with rust, mill scale, or a combination of both will be considered satisfactory, provided minimum nominal dimensions, nominal weight, and minimum average height of deformations of a hand-wire-brushed test specimen are not less than applicable ASTM specification requirements.

3.3 PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS

- a. Unless otherwise specified, placing reinforcement and miscellaneous materials must be in accordance to **ACI 301**. Provide bars, welded wire reinforcement, wire ties, supports, and other devices necessary to install and secure reinforcement.
- b. 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.
- c. Nonprestressed cast-in-place concrete members must have concrete cover for reinforcement given in the following table:

Concrete Exposure	Member	Reinforcement	Specified cover, in.
Cast against and permanently in contact with ground	All	All	3
Exposed to weather or in contact with ground	All	No. 6 through No. 18 bars	2
		No. 5 bar, W31 or D31 wire, and smaller	1-1/2

Concrete Exposure	Member	Reinforcement	Specified cover, in.
Not exposed to weather or in contact with ground	Slabs, joists, and walls	No. 14 and No. 18 bars	1-1/2
		No. 11 bar and smaller	3/4
	Beams, columns, pedestals, and tension ties	Primary reinforcement, stirrups, ties, spirals, and hoops	1-1/2

3.3.1 General

Provide details of reinforcement that are in accordance with the Contract Documents.

3.3.2 Vapor Barrier

- a. Install in accordance with **ASTM E1643**. 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** and tape.
- b. 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. Place a **2 inch** layer of clean concrete sand on vapor barrier before placing concrete.

3.3.3 Setting Miscellaneous Material

Place and secure anchors and bolts, pipe sleeves, conduits, and other such items in position before concrete placement and support against displacement. Plumb anchor bolts and check location and elevation. Temporarily fill voids in sleeves with readily removable material to prevent the entry of concrete.

3.3.4 Placing Reinforcement

Place reinforcement in accordance with **ACI 301**.

Provide reinforcement that is supported and secured together to prevent displacement by construction loads or by placing of wet concrete, and as follows:

- a. Provide supports for reinforcing bars that are sufficient in number and have sufficient strength to carry the reinforcement they support, and in accordance with **ACI 301** and **CRSI 10MSP**. Do not use supports to support runways for concrete conveying equipment and similar construction loads.
- b. Equip supports on ground and similar surfaces with sand-plates.

- c. Support welded wire reinforcement as required for reinforcing bars.
- d. Secure reinforcements to supports by means of tie wire. Wire must be black, soft iron wire, not less than 16 gage.
- e. Reinforcement must be accurately placed, securely tied at intersections, 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 the Contract Documents.
- f. Bending of reinforcing bars partially embedded in concrete is permitted only as specified in the Contract Documents.

3.3.5 Concrete Protection for Reinforcement

Additional concrete protection must be in accordance with the Contract Documents.

3.3.6 Welding

Welding must be in accordance with AWS D1.4/D1.4M.

3.4 BATCHING, MEASURING, MIXING, AND TRANSPORTING CONCRETE

In accordance with ASTM C94/C94M, ACI 301, ACI 302.1R and ACI 304R, 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.

3.4.1 Measuring

Make measurements at intervals as specified in paragraphs SAMPLING and TESTING.

3.4.2 Mixing

- a. Mix concrete in accordance with ASTM C94/C94M, ACI 301 and ACI 304R.
- b. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Place concrete within 90 minutes of either addition of mixing water to cement and aggregates or addition of cement to aggregates if the air temperature is less than 84 degrees F.
- c. 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 submitted water-cementitious material ratio are not exceeded and the required concrete strength is still met. When additional water is added, an additional 30 revolutions of the mixer at mixing speed is required.
- d. If the entrained air content falls below the specified limit, add a sufficient quantity of admixture to bring the entrained air content within the specified limits.]Dissolve admixtures in the mixing water

and mix in the drum to uniformly distribute the admixture throughout the batch. Do not reconstitute concrete that has begun to solidify.

- e. When fibers are used, add fibers together with the aggregates and never as the first component in the mixer. Fibers must be dispensed into the mixing system using appropriate dispensing equipment and procedure as recommended by the manufacturer.

3.4.3 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.

3.5 PLACING CONCRETE

Place concrete in accordance with [ACI 301](#) Section 5.

3.5.1 Pumping

[ACI 304R](#) and [ACI 304.2R](#). Pumping must not result in separation or loss of materials nor cause interruptions sufficient to permit loss of plasticity between successive increments. Loss of slump in pumping equipment must not exceed [2 inches](#) at discharge/placement. Do not convey concrete through pipe made of aluminum or aluminum alloy. Avoid rapid changes in pipe sizes. Limit maximum size of coarse aggregate to 33 percent of the diameter of the pipe. Limit maximum size of well-rounded aggregate to 40 percent of the pipe diameter. Take samples for testing at both the point of delivery to the pump and at the discharge end.

3.5.2 Cold Weather

Cold weather concrete must meet the requirements of [ACI 301](#) unless otherwise specified. 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.

3.5.3 Hot Weather

Hot weather concrete must meet the requirements of [ACI 301](#) unless otherwise specified. Maintain required concrete temperature using Figure 4.2 in [ACI 305R](#) 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.

3.5.4 Bonding

Surfaces of set concrete at joints, 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:

- a. 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.
- b. 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.
- c. Provide cement grout that consists of equal parts of portland cement and fine aggregate by weight with not more than 6 gallons 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.

3.6 WASTE MANAGEMENT

Provide as specified in the Waste Management Plan and as follows.

3.6.1 Mixing Equipment

Before concrete pours, designate Contractor-owned site meeting environmental standards for cleaning out concrete mixing trucks. Minimize water used to wash equipment.

3.6.2 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. Institute deconstruction and construction waste separation and recycling for use in manufacturer's programs. When such a program is not available, seek local recyclers to reclaim the materials.

3.7 FLOOR, SLAB, AND PAVEMENT FINISHES AND MISCELLANEOUS CONSTRUCTION

In accordance with ACI 301 and ACI 302.1R, unless otherwise specified. Slope floors uniformly to drains where drains are provided.

3.7.1 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.

3.7.1.1 Colored Wear-Resistant Finish

- a. Give finish to monolithic slab surfaces where indicated.
- b. Apply dry shake materials for colored wear-resistant finish at the rate of 60 pounds per 100 square feet of surface.
- c. Immediately following first floating operation, approximately two-thirds of specified weight of dry shake material must be uniformly distributed over surface and embedded by means of power floating. After first dry-shake application has been embedded, uniformly distribute remainder of dry-shake material over surface at right angles to first dry-shake application and embed by means of power floating. Trueness of surface and other requirements for floating operations not specified in this paragraph must be as specified for float finish.
- d. After completion of float finish, apply a trowel finish as specified.

3.8 CURING AND PROTECTION

Curing and protection in accordance with ACI 301 Section 5, 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. Allow curing compound/sealer installations to cure prior to the installation of materials that adsorb VOCs.

3.8.1 Curing Periods

ACI 301 Section 5. 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.

3.8.2 Curing Unformed Surfaces

- a. Accomplish initial curing of unformed surfaces, such as monolithic slabs, floor topping, and other flat surfaces, by membrane curing.

3.8.3 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.

3.8.4 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.

3.8.5 Protection After Curing

Protect finished concrete surfaces from damage by construction operations.

3.9 FIELD QUALITY CONTROL

3.9.1 Sampling

ASTM C172/C172M. Collect samples of fresh concrete to perform tests specified. ASTM C31/C31M for making test specimens.

3.9.2 Testing

3.9.2.1 Slump Tests

ASTM C143/C143M. Take concrete samples during concrete placement/discharge. The maximum slump may be increased as specified with the addition of an approved admixture provided that the water-cementitious material 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.

3.9.2.2 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.

3.9.2.3 Non-Conforming Materials

Factors that indicate that there are non-conforming materials include (but not limited to) excessive compressive strength, inadequate compressive strength, excessive slump, excessive voids and honeycombing, concrete delivery records that indicate excessive time between mixing and placement,

or excessive water was added to the mixture during delivery and placement. Any of these indicators alone are sufficient reason for the Contracting Officer to request additional sampling and testing.

Investigations into non-conforming materials must be conducted at the Contractor's expense. The Contractor must be responsible for the investigation and must make written recommendations to adequately mitigate or remediate the non-conforming material. The Contracting Officer may accept, accept with reduced payment, require mitigation, or require removal and replacement of non-conforming material at no additional cost to the Government.

3.10 REPAIR, REHABILITATION AND REMOVAL

Before the Contracting Officer accepts the structure the Contractor must inspect the structure for cracks, damage and substandard concrete placements that may adversely affect the service life of the structure. A report documenting these defects must be prepared which includes recommendations for repair, removal or remediation must be submitted to the Contracting Officer for approval before any corrective work is accomplished.

3.10.1 Crack Repair

Not allowed. Replace entire sections between joints.

3.10.2 Repair of Weak Surfaces

Weak surfaces are defined as mortar-rich, rain-damaged, uncured, or containing exposed voids or deleterious materials. Not allowed. Replace entire sections between joints.

3.10.3 Failure of Quality Assurance Test Results

Proposed mitigation efforts by the Contractor must be approved by the Contracting Officer prior to proceeding.

-- End of Section --

SECTION 07 22 00

ROOF AND DECK INSULATION
02/16, CHG 3: 11/18

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 C1177/C1177M (2017) Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing

ASTM C1289 (2020) Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board

ASTM E84 (2020) Standard Test Method for Surface Burning Characteristics of Building Materials

FM GLOBAL (FM)

FM 4450 (1989) Approval Standard for Class 1 Insulated Steel Deck Roofs

FM 4470 (2016) Single-Ply, Polymer-Modified Bitumen Sheet, Built-up Roof (BUR), and Liquid Applied Roof Assemblies for Use in Class 1 and Noncombustible Roof Deck Construction

FM APP GUIDE (updated on-line) Approval Guide
<http://www.approvalguide.com/>

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC (2021) International Building Code

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS SCS Global Services (SCS) Indoor Advantage

UNDERWRITERS LABORATORIES (UL)

UL 1256 (2002; Reprint Jul 2013) Fire Test of Roof Deck Constructions

UL 2818 (2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification.

Submit the following in accordance with Section 01 33 00 SUBMITTAL

PROCEDURES:

SD-02 Shop Drawings

Insulation Board Layout and Attachment; G

Verification of Existing Conditions; G

SD-03 Product Data

Insulation; G

Cover Board; G

Fasteners; G

Sheathing Paper; G

Moisture Control; G

Asphalt Products; G

Recycled Content For Insulation

SD-06 Test Reports

Flame Spread Rating; G

SD-07 Certificates

Installer Qualifications; G

Certificates Of Compliance For Felt Materials; G

Indoor Air Quality For Insulation

SD-08 Manufacturer's Instructions

Nails and Fasteners; G

Roof Insulation; G

1.3 SHOP DRAWINGS

Submit insulation board layout and attachment indicating methods of attachment and spacing, transitions, tapered components, thicknesses of materials, and closure and termination conditions. Show locations of ridges, valleys, crickets, interface with, and slope to, roof drains. Base shop drawings on verified field measurements and include verification of existing conditions. Show wood nailers. Show location and spacing of wood nailers required for securing of insulation and backnailing of roofing felts.

1.4 PRODUCT DATA

Include data for material descriptions, recommendations for product shelf

life, requirements for [cover board](#) or coatings, and precautions for flammability and toxicity. Include data to verify compatibility of sealants with insulation.

1.5 MANUFACTURER'S INSTRUCTIONS

Include field of roof and perimeter attachment requirements.

Provide a complete description of installation sequencing for each phase of the roofing system. Include weatherproofing procedures.

1.6 QUALITY CONTROL

Provide certification of [installer qualifications](#) from the insulation manufacturer confirming the specific installer has the required qualifications for installing the specific roof insulation system(s) indicated.

Provide [certificates of compliance for felt materials](#).

1.7 FM APPROVAL REQUIREMENTS

Provide fastening patterns in accordance with FM 1-120 for insulation on steel decks.

1.8 FIRE PERFORMANCE REQUIREMENTS

1.8.1 Insulation in Roof Systems

Comply with the requirements of [ICC IBC](#) or [UL 1256](#) or [UL P533](#). Roof insulation to have a [flame spread rating](#) of 75 or less when tested in accordance with [ASTM E84](#). Additional documentation of compliance with flame spread rating is not required when insulation of the type used for this project as part of the specific roof assembly is listed and labeled as FM Class 1 approved. Only roof assemblies that pass [FM 4450](#) may be used.

1.8.2 Thermal Barrier Requirements

Separate [polyurethane] [or] [polystyrene] insulation from a [combustible] [steel] deck with a thermal barrier of glass mat gypsum roof board or other approved barrier material in accordance with the requirements of the [ICC IBC](#) [or [FM 4450](#)] [or [FM 4470](#)] [or [UL 1256](#)]. [Only roof assemblies that pass [FM 4450](#) may be used.]

1.8.3 Fire Resistance Ratings for Roofs

Provide in accordance with [ICC IBC](#) Chapter 7 and Table 721.1(3) Min [Fire and Smoke] Protection For Floor and Roof Systems.

1.9 CERTIFICATIONS

Provide products certified to meet indoor air quality requirements by [UL 2818](#) (Greenguard) Gold, [SCS](#) Global Services Indoor Advantage Gold or provide certification by other third-party programs. Provide current product certification documentation from certification body.

1.10 DELIVERY, STORAGE, AND HANDLING

1.10.1 Delivery

Deliver materials to the project site in manufacturer's unopened and undamaged standard commercial containers bearing the following legible information:

- a. Name of manufacturer
- b. Brand designation
- c. Specification number, type, and class, as applicable, where materials are covered by a referenced specification
- d. **Asphalt** flashpoint (FP), equiviscous temperature (EVT), and finished blowing temperature (FBT).

Deliver materials in sufficient quantity to allow continuity of the work.

1.10.2 Storage and Handling

Store and handle materials in accordance with manufacturer's printed instructions. Protect from damage, exposure to open flame or other ignition sources, wetting, condensation, and moisture absorption. Keep materials wrapped and separated from off-gassing materials (such as drying paints and adhesives). Do not use materials that have visible moisture or biological growth. Store in an enclosed building or trailer that provides a dry, adequately ventilated environment. Replace damaged material with new material.

1.11 ENVIRONMENTAL CONDITIONS

Do not install roof insulation during inclement weather or when air temperature is below **40 degrees F** and interior humidity is 45 percent or greater, or when there is visible ice, frost, or moisture on the roof deck.

PART 2 PRODUCTS

2.1 INSULATION

2.1.1 Insulation Types

Provide the following roof insulation materials. Provide roof insulation that is compatible with attachment methods for the specified insulation and roof membrane.

- a. Polyisocyanurate Board: Provide in accordance with **ASTM C1289** REV A Type II, fibrous felt or glass mat membrane both sides, except minimum compressive strength of **40 pounds per square inch (psi)**, **25 R-Value (Minimum)**.

2.1.2 Recycled Materials

Provide thermal insulation materials containing recycled content. Unless specified otherwise, the minimum required recycled content for listed

materials are:

Polyisocyanurate/polyurethane:	9 percent recovered material
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Provide data identifying percentage of [recycled content for insulation](#).

2.1.3 Indoor Air Quality

Provide certification of [indoor air quality for insulation](#).

2.1.4 Insulation Thickness

As necessary to provide the thermal resistance (R-value) indicated. Base calculation on the R-value for aged insulation.

2.2 COVER BOARD

2.2.1 Glass Mat Gypsum Roof Board

[ASTM C1177/C1177M](#), 0 Flame Spread and 0 Smoke Developed when tested in accordance with [ASTM E84](#), 500 psi, Class A, non-combustible, [5/8 inch](#) thick, [4 by 8 feet](#) board size.

2.3 SHEATHING PAPER FOR WOOD DECKS

Rosin-sized building paper or unsaturated felt weighing not less than 5 pounds per 100 square feet.

2.4 MOISTURE CONTROL

2.4.1 Vapor Retarder

Self-adhering rubberized asphaltic membrane, a minimum of 1 mm 40 mils thick, high temperature as recommended by the recommended by the shingle manufacturer for use over entire roof and flashing conditions. Products shall meet or exceed the performance criteria of [ASTM D1970/D197M](#).

[2.5 FASTENERS

Provide flush-driven fasteners through flat round or hexagonal steel or plastic plates. Provide zinc-coated steel plates, flat round not less than [1 3/8 inch](#) diameter, hexagonal not less than [28 gage](#). Provide high-density plastic plates, molded thermoplastic with smooth top surface, reinforcing ribs and not less than [3 inches](#) in diameter. Fully recess fastener head into plastic plate after it is driven. Form plates to prevent dishing. Do not use bell or cup shaped plates. Provide fasteners in accordance with insulation manufacturer's recommendations for holding power when driven, or a minimum of [120 pounds](#) each in steel deck, whichever is the higher minimum. Refer to [Aluminum Standin Seam Roofinf Spec Section for other requierements](#).

2.6 WOOD NAILERS

Pressure-preservative treated as specified in Section [06 10 00 ROUGH CARPENTRY](#).

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

3.1.1 Surface Inspection

Ensure surfaces are clean, smooth, and dry prior to application. [Ensure surfaces receiving vapor retarder are free of projections that might puncture the vapor retarder. Check roof deck surfaces, including surfaces sloped to roof drains and outlets, for defects before starting work.

The Contracting Officer will inspect and approve the surfaces immediately before starting installation. Prior to installing vapor retarder and insulation, perform the following:

- a. Examine **substrate** to ascertain that deck boards have been properly **fastened** and that exposed nail heads have been set.
- b. Examine **substrate** to ensure that **all items** are properly secured to structural members and to each other and that surfaces of top flanges are flat or slightly convex.

3.1.2 Surface Preparation

Correct defects and inaccuracies in roof deck surface to eliminate poor drainage from hollow or low spots, perform the following:

- a. Provide wood nailers of the same thickness as the insulation at eaves, edges, curbs, walls, and roof openings for securing of cant strips, gravel stops, gutters, and flashing flanges. On decks with slopes of one in 12 (**1 inch per foot**) or more, install wood nailers perpendicular to slope for securing insulation [and for backnailing of roofing felts]. Space nailers in accordance with approved shop drawings.
- b. Fill or cover cracks or knot holes larger than **1/2 inch** in diameter in wood decks as necessary to form an unyielding surface.
- c. Cover wood decks with a layer of rosin-sized building paper or unsaturated felt. Lap sides and ends not less than **3 inches**. Nail sufficiently to prevent tearing or buckling during installation.
- d. Cover steel decks with a layer of insulation board of sufficient width to span the width of a deck rib opening, and in accordance with fire safety requirements. Secure with piercing or self-drilling, self-tapping fasteners of quantity and placement in accordance with **FM APP GUIDE**. Locate insulation joints parallel to ribs of deck on solid bearing surfaces only, not over open ribs.

3.2 INSTALLATION OF VAPOR RETARDER

Install vapor retarder in direct contact with roof deck surface insulation.

Lay vapor retarder at right angles to direction of slope. Use thermometers to check temperatures during heating and application. Completely seal side and end laps. Lay plies free of wrinkles, buckles, creases or fishmouths. Press out air bubbles to obtain complete adhesion

between surfaces. At walls, eaves, rakes, and other vertical surfaces, extend vapor retarder organic felts or separate plies 9 inches, with not less than 9 inches on the substrate, and the extended portion turned back and mopped in over the top of the insulation. At roof penetrations other than walls, eaves and rakes, and vertical surfaces, extend vapor retarder or separate plies 9 inches to form a lap folded back over the edge of the insulation. Provide asphalt roof cement under the vapor retarder for at least 9 inches from walls, eaves, rakes and other penetrations.

3.2.1 Vapor Retarder on Wood Decks

Lay first ply of two-ply system dry with each sheet lapping 2 inches over the preceding sheet. Lap ends not less than 4 inches. Stagger laps a minimum of 12 inches. Nail felt at 6 inch intervals along side laps and install two rows of nails approximately 11 inches apart down longitudinal center of each sheet, with nails staggered at 18 inches on center. [For vapor retarder consisting of one layer of asphalt base sheet, lap each sheet 4 inches over the preceding sheet. Provide end laps not less than 4 inches and stagger laps a minimum of 12 inches.] Cement side and end laps together with solid mopping of asphalt or heavy coat of asphalt roof cement. Nail side laps at 6 inch intervals. Apply asphalt mopping at a rate of 20 to 35 lbs per 100 square feet. Install two rows of nails approximately 11 inches apart down longitudinal center of each sheet, with nails staggered at 18 inches on center.

3.3 INSULATION INSTALLATION

Apply insulation in two layers with staggered joints when total required thickness of insulation exceeds 1/2 inch. Lay insulation so that continuous longitudinal joints are perpendicular to direction of roofing, as specified in Section 07 61 15.00 20 ALUMINUM STAND SEAM, and end joints of each course are staggered with those of adjoining courses. When using multiple layers of insulation, provide joints of each succeeding layer that are parallel and offset in both directions with respect to the layer below. Keep insulation 1/2 inch clear of vertical surfaces penetrating and projecting from roof surface. Verify required slopes to each roof drain.

3.3.1 Installation Using Only Mechanical Fasteners

Secure total thickness of insulation with penetrating type fasteners.

3.3.2 Special Precautions for Installation of Foam Insulation

3.3.2.1 Polyisocyanurate Insulation

Where polyisocyanurate foam board insulation is provided, install 1/2 inch thick wood fiberboard, glass mat gypsum roof board, or 3/4 inch thick expanded perlite board insulation over top surface of foam board insulation. Stagger joints of insulation with respect to foam board insulation below.

3.4 PROTECTION

3.4.1 Protection of Applied Insulation

Completely cover each day's installation of insulation with finished roofing on same day. Phased construction is not permitted. Protect open spaces between insulation and parapets or other walls and spaces at curbs, scuttles, and expansion joints, until permanent roofing and flashing are

applied. Storing, walking, wheeling, or trucking directly on insulation or on roofed surfaces is not permitted. Provide smooth, clean board or plank walkways, runways, and platforms near supports, as necessary, to distribute weight in accordance with **current code** live load limits of roof construction. Protect exposed edges of insulation with cutoffs at the end of each work day or whenever precipitation is imminent. Fill all profile voids in cutoffs to prevent trapping moisture below the membrane. Remove cutoffs when work resumes.

3.4.2 Damaged Work and Materials

Restore work and materials that become damaged during construction to original condition or replace with new materials.

3.5 INSPECTION

Establish and maintain inspection procedures to assure compliance of the installed roof insulation with contract requirements. Remove, replace, correct in an approved manner, any work found not in compliance. Quality control must include, but is not limited to, the following:

- a. Observation of environmental conditions; number and skill level of insulation workers; start and end time of work.
- b. Verification of certification, listing or label compliance with FM Data Sheets. (<https://www.fmglobal.com/fmglobalregistration/Downloads.aspx>)
- c. Verification of proper storage and handling of insulation and vapor retarder materials before, during, and after installation.
- d. Inspection of vapor retarder application, including edge envelopes and mechanical fastening.
- e. Inspection of mechanical fasteners; type, number, length, and spacing.
- f. Coordination with other materials, cants, sleepers, and nailing strips.
- g. Inspection of insulation joint orientation and laps between layers, joint width and bearing of edges of insulation on deck.
- h. Installation of cutoffs and proper joining of work on subsequent days.
- i. Continuation of complete roofing system installation to cover insulation installed same day.
- j. Verification of required slope to each roof drain.

-- End of Section --

SECTION 07 27 10.00 10

BUILDING AIR BARRIER SYSTEM
08/19

PART 1 GENERAL

1.1 SUMMARY

This Section specifies the construction and quality control of the installation of an air barrier system. Construct the air barrier system indicated, taking responsibility for the means, methods, and workmanship of the installation of the air barrier system. The air barrier must be contiguous and connected across all surfaces of the enclosed air barrier envelope indicated. The maximum leakage requirements of individual air barrier components and materials are specified in the other specification sections covering these items.

This section also defines the maximum allowable leakage of the final air barrier system. The workmanship must be adequate to meet the maximum allowable leakage requirements of this specification.

1.2 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM D4541 (2017) Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

ASTM E96/E96M (2016) Standard Test Methods for Water Vapor Transmission of Materials

ASTM E2178 (2013) Standard Test Method for Air Permeance of Building Materials

ASTM E2357 (2017) Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 285 (2012) Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

1.3 DEFINITIONS

The following terms as they apply to this section:

1.3.1 Air Barrier Accessory

Products designated to maintain air tightness between air barrier materials, air barrier assemblies and air barrier components, to fasten them to the structure of the building, or both (e.g., sealants, tapes, backer rods, transition membranes, fasteners, strapping, primers).

1.3.2 Air Barrier Assembly

The combination of air barrier materials and air barrier accessories that are designated and designed within the environmental separator to act as a continuous barrier to the movement of air through the environmental separator.

1.3.3 Air Barrier Component

Pre-manufactured elements such as windows, doors, dampers and service elements that are installed in the environmental separator.

1.3.4 Air Barrier Envelope

The combination of air barrier assemblies and air barrier components, connected by air barrier accessories that are designed to provide a continuous barrier to the movement of air through an environmental separator. There may be more than one air barrier envelope in a single building. Also known as Air Barrier System.

1.3.5 Air Barrier Material

A building material that is designed, tested and/or produced to provide the primary resistance to airflow through an air barrier assembly of a wall system.

1.3.6 Air Barrier System

Same as AIR BARRIER ENVELOPE.

1.3.7 Air Leakage Rate

The rate of airflow (CFM) driven through a unit surface area (sq.ft.) of an assembly or system by a unit static pressure difference (Pa) across the assembly. (example: 0.25 CFM/sq.ft. @ 75 Pa)

1.3.8 Air Leakage

The total airflow (CFM) driven through the air barrier system by a unit static pressure difference (Pa) across the air barrier envelope. (example: 6500 CFM @ 75 Pa)

1.3.9 Air Permeance

The tested rate of airflow (CFM) through a unit area (sq.ft.) of a material driven by unit static pressure difference (Pa) across the material (example: 0.004 CFM/sq.ft. @ 75 Pa) as established by ASTM E2178.

1.3.10 Environmental Separator

The parts of a building that separate the controlled interior environment from the uncontrolled exterior environment, or that separate spaces within

a building that have dissimilar environments. Also known as the Control Layer.

1.3.11 Vapor Permeance

Vapor permeance is separated into three classes based on the water vapor permeance of a material as tested via [ASTM E96/E96M](#)

Class I Vapor Barrier/Retarder	0.1 perm or less
Class II Vapor Barrier/Retarder	0.1 perm to 1.0 perm
Class III Vapor Barrier/Retarder	1.0 perm to 10 perm

1.4 PREPARATORY PHASE OR PRECONSTRUCTION CONFERENCE

Organize pre-construction conferences between the air barrier inspector and the sub-contractors involved in the construction of or penetration of the air barrier system to discuss where the work of each sub-contractor begins and ends, the sequence of installation, and each sub-contractor's responsibility to ensure airtight joints, junctures, penetrations and transitions between materials. Discuss the products, and assemblies of products specified in the different sections to be installed by the different sub-contractors.

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. [Submit non-G submittals to the Government for their record. The Government reserves the right to provide additional comments, request resubmittal, rejection and re-submittal to all the non-G submittals.](#) 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](#)

[Air Barrier System Shop Drawings; G, Manufacturer produced warranted air barrier system](#)

[SD-03 Product Data](#)

[Air Barrier System Product Data; G](#)

[SD-04 Samples](#)

[Mock-Up; G](#)
[Material Samples For Air Barrier System; G](#)

[SD-05 Design Data](#)

[Design Data And Calculations For The Air Barrier System; G, Manufacturer produced warranted air barrier system](#)

[SD-06 Test Reports](#)

[Design Review Report; G](#)

Testing and Inspection; G

SD-07 Certificates

Air Barrier Inspector; G

1.6 AIR BARRIER ENVELOPE SURFACE AREA AND LEAKAGE REQUIREMENTS

The building air barrier systems must meet the following leakage requirements. The allowable leakage rate and the maximum leakage are at a differential test pressure of 75 Pa.

Air Barrier Envelope 1	
Surface Area	As indicated on the drawings.
Architectural Only Test:	
Allowable leakage rate	0.30 CFM/sq.ft

1.7 AIR BARRIER INSPECTOR

Employ a designated Air Barrier Inspector on this project. The Air Barrier Inspector performs a Design Review, oversees quality control testing specified in these specifications, performs quality control air barrier inspection as specified, interfaces with the designer and product manufacturer's representatives to assure all installation requirements are met, and verifies that the constructed work is in accordance with both the manufacturer's recommendations for products used, the content of this specification and other contract drawings or documents. Qualification for the Air Barrier Inspector are as follows:

- a. Training and certification as an Air Barrier Auditor from the Air Barrier Association of America (ABAA) or other third party air barrier association.
- b. Or, provide documentation in resume format that demonstrates that the individual proposed has the experience, knowledge, skills and abilities to fulfill the above stated duties as the air barrier inspector.
- c. It is acceptable that this individual be employed by the firm who will be performing the building pressurization test or another independent third party entity, provided they meet the above requirements but shall not be a member of the installing contractor or firm.

Provide copies of Air Barrier Inspector qualifications 30 days after Notice

to Proceed.

1.8 DESIGN REVIEW

Review the Contract Plans and Specifications and advise the Contracting Officer of any deficiencies that would prevent the construction of an effective air barrier system. Provide a [Design Review Report](#) individually listing each deficiency and the corresponding proposed corrective action necessary for proper air barrier system. Provide copies of the Design Review Report not later than 14 days after approval of the Air Barrier Inspector Qualifications. Submit [design data and calculations for the Air Barrier System](#) for a manufacturer produced warranted air barrier system.

PART 2 PRODUCTS

2.1 AIR BARRIER

Provide air barrier system of compatible parts from one or several manufacturers coordinated by the contractor or provide a single warranted system provided by a primary manufacturer. The air barrier system as part of a tested exterior wall assembly must meet the conditions of acceptance as tested in accordance with [NFPA 285](#). Materials used for roof assembly air barrier must conform to the appropriate UL and FM wind and fire requirements for the specified roof assemblies.

If a complete air barrier system from a single manufacturer is utilized, weather warranted or not warranted, the air barrier system must conform to [ASTM E2357](#).

Materials in the following categories as used in the air barrier system or assembly of the exterior wall system are tested and are required to conform to [ASTM E2178](#): Self-adhered sheet membranes, fluid applied membranes, spray polyurethane foam, mechanically fastened commercial building wrap, factory bonded membranes to sheathing, and adhesive backed commercial building wrap and accessory products.

Other materials used as an air barrier such as concrete, glass, wood, metal or gypsum board may or may not conform to [ASTM E2178](#) but are acceptable provided that when integrated into the air barrier system or assemblies that they are not subject to material or environmental induced degradation in their final produced state and once incorporated in the permanent construction.

All materials used must be identifiable through manufacturer testing data and/or literature to be compatible with all the attached or adjoining materials or substrates used in the system.

Provide [Air Barrier System Shop Drawings](#), [Material Samples for Air Barrier System](#) and [Air Barrier System Product Data](#).

PART 3 EXECUTION

3.1 QUALITY CONTROL

3.1.1 Documentation and Reporting

Document the entire installation process on daily job site reports. These reports include information on the Installer, substrates, substrate preparation, products used, ambient and substrate temperature, the location

of the air barrier installation, the results of the quality control procedures, and testing results.

3.1.2 Construction [Mock-Up](#)

Build mock-up prior to building envelope construction.

- a. Prepare a construction mock-up to demonstrate proper installation of the air barrier assemblies and components. Include air barrier system connections between floor and wall, wall and window, wall and roof. Also, include the sealing method between membrane joints at transitions from one material or component to another, at pipe or conduit penetrations of the wall and roof, and at duct penetration of the wall and roof. Work will not begin until the mock-up is satisfactory to the Contracting Officer.
- b. Size the mock-up to approximately [8 feet long by 8 feet high](#). The mock-up must be representative of primary exterior wall assemblies and glazing components including backup wall and typical penetrations as acceptable to the Contracting Officer. A corner of the actual building may be used as the mock-up.

3.1.3 Quality Control [Testing And Inspection](#)

Conduct the following tests and inspections as applicable in the presence of the Contracting Officer during installation of the air barrier system, and submit quality control reports as indicated below.

- a. Provide a Daily Report of Observations with a copy to the Contracting Officer.
- b. Inspect to assure continuity of the air barrier system throughout the building enclosure and that all gaps are covered, the covering is structurally sound, and all penetrations are sealed allowing for no infiltration or exfiltration through the air barrier system.
- c. Inspect to assure structural support of the air barrier system to withstand design air pressures.
- d. Inspect to assure masonry surfaces receiving air barrier materials are smooth, clean, and free of cavities, protrusions and mortar droppings, with mortar joints struck flush or as required by the manufacturer of the air barrier material.
- e. Inspect and test to assure site conditions for application temperature, and dryness of substrates are within guidelines.
- f. Inspect to assure substrate surfaces are properly primed if applicable and in accordance with manufacturer's instructions. Priming must extend at least [2 inches](#) beyond the air barrier material to make it obvious that the primer was applied to the substrate before the air barrier material.
- g. Inspect to assure laps in materials are at least a [2-inch](#) minimum, shingled in the correct direction or mastic applied in accordance with manufacturer's recommendations, and with no fishmouths.
- h. Inspect to assure that a roller has been used to enhance adhesion.

Identify any defects such as fishmouths, wrinkles, areas of lost adhesion, and improper curing. Note the intended remedy for the deficiencies.

- i. Measure application thickness of liquid applied materials to assure that manufacturer's specifications for the specific substrate are met.
- j. Inspect to assure that the correct materials are installed for compatibility.
- k. Inspect to assure proper transitions for change in direction and structural support at gaps.
- l. Inspect to assure proper connection between assemblies (membrane and sealants) for cleaning, preparation and priming of surfaces, structural support, integrity and continuity of seal.
- m. Perform adhesion tests for fluid-applied and self-adhered air barrier membranes to assure that the manufacturer's specified adhesion strength properties are met. Determine the bond strength of coatings to substrate in accordance with [ASTM D4541](#).
- n. Provide cohesion tests for spray polyurethane foam (SPF). Perform the tests in accordance with the specification sections which specify these materials.
 - o. Provide written test reports of all tests performed.

3.2 REPAIR AND PROTECTION

Upon completion of inspection, testing, sample removal and similar services, repair damaged construction and restore substrates, coatings and finishes. Protect construction exposed by or for quality control service activities, and protect repaired construction.

-- End of Section --

SECTION 07 27 19.01

SELF-ADHERING AIR BARRIERS

05/17

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 BARRIER ASSOCIATION OF AMERICA (ABAA)

ABAA Accreditation

Accreditation

ABAA QAP

Quality Assurance Program

ASTM INTERNATIONAL (ASTM)

ASTM D146/D146M

(2004; E 2012; R 2012) Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing

ASTM D412

(2016) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension

ASTM D570

(1998; E 2010; R 2010) Standard Test Method for Water Absorption of Plastics

ASTM D903

(1998; R 2017) Standard Test Method for Peel or Stripping Strength of Adhesive Bonds

ASTM D1876

(2008; R 2015; E 2015) Standard Test Method for Peel Resistance of Adhesives (T-Peel Test)

ASTM D4263

(1983; R 2018) Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method

ASTM D4541

(2017) Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

ASTM E84

(2020) Standard Test Method for Surface Burning Characteristics of Building Materials

ASTM E154/E154M

(2008a; R 2013; E 2013) Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

ASTM E283

(2019) Standard Test Method for

Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

ASTM E331

(2000; R 2016) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

ASTM E2178

(2013) Standard Test Method for Air Permeance of Building Materials

ASTM E2357

(2017) Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 285

(2012) Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

1.2 RELATED REQUIREMENTS

Submit all materials, components, and assemblies of the air barrier system together as one complete submittal package.

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. Submit non-G submittals to the Government for their record. the Government reserves the right to provide additional comments, request resubmittal, rejection and re-submittal to all the non-G submittals. 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-01 Preconstruction Submittals

Qualifications of Manufacturer; G

Qualifications of Installer; G

SD-02 Shop Drawings

Self-adhering Air Barrier; G

SD-03 Product Data

Self-adhering Air Barrier; G

Primers, Adhesives, and Mastics; G

Safety Data Sheets; G

SD-04 Samples

Self-adhering Air Barrier Mockup; G

SD-06 Test Reports

Field Peel Adhesion Test; G

Flame Propagation of Wall Assemblies; G

Flame Spread and Smoke Developed Index Ratings; G

Site Inspections and Testing; G

SD-07 Certificates

Self-adhering Air Barrier; G

SD-08 Manufacturer's Instructions

Self-adhering Air Barrier; G

Primers, Adhesives, and Mastics; G

1.4 MISCELLANEOUS REQUIREMENTS

For [self-adhering air barrier](#) provide the following:

1.4.1 Shop Drawings

Submit self-adhering air barrier shop drawings showing locations and extent of air barrier assemblies and details of all typical conditions, intersections with other building enclosure assemblies and materials, and membrane counterflashings. Show details for bridging of gaps in construction, treatment of inside and outside corners, expansion joints, methods of attachment of materials covering the self-adhered barrier without compromising the barrier. Indicate how miscellaneous penetrations such as conduit, pipes, electric boxes, brick ties, and similar items will be sealed.

1.4.2 Product Data

Submit manufacturer's technical data indicating compliance with performance and environmental requirements, manufacturer's printed instructions for evaluating, preparing, and treating substrates, temperature and other limitations of installation conditions, safety requirements for installation, and [Safety Data Sheets](#). Indicate flame and smoke spread ratings for all products.

1.4.3 Mockup

Provide a mockup of the self-adhering air barrier system specified. Apply product in an area designated by the Contracting Officer. Apply an area of not less than [54 square feet](#). Include all components specified as representative of the complete system. Notify the Contracting Officer a minimum of 48 hours prior to the test application. Select a test area representative of conditions to be covered including window or door openings, wall to ceiling transitions, flashings, and penetrations, as applicable.

1.4.4 Test Reports

Submit test reports indicating that field peel-adhesion tests on all materials have been performed and the changes made, if required, in order to achieve successful and lasting adhesion. Submit test reports for [flame propagation of wall assemblies](#) tested in accordance with [NFPA 285](#). Submit test reports for [flame spread and smoke developed index ratings](#) of barrier system materials tested in accordance with [ASTM E84](#).

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery

Deliver and store materials in sufficient quantity to allow for uninterrupted flow of work. Inspect materials delivered to the site for damage and store out of weather. Deliver materials to the jobsite in their original unopened packages, clearly marked with the manufacturer's name, brand designation, description of contents, and shelf life of containerized materials. Store and handle to protect from damage.

1.5.2 Storage

Inspect materials delivered to the site for damage; unload and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling. Protect stored materials from direct sunlight. Keep materials sealed and separated from absorptive materials, such as wood and insulation.

1.6 FIELD PEEL ADHESION TEST

Perform a [field peel-adhesion test](#) on the construction mockup. Test the self-adhering air barrier for adhesion in accordance with [ASTM D4541](#) using a Type II pull tester except use a disk that is 4 inches in diameter and cut through the membrane to separate the material attached to the dish from the surrounding material. Perform test after curing period in accordance with manufacturer's written recommendations. Record mode of failure and area which failed in accordance with [ASTM D4541](#). Compare adhesion values with the manufacturer's established minimum values for the particular combination of material and substrate. Indicate on the inspection report whether the manufacturer's requirement has been met. Where the manufacturer has not declared a minimum adhesion value for their product and substrate combination, the inspector must record actual values.

1.7 QUALITY ASSURANCE

1.7.1 [Qualifications of Manufacturer](#)

Submit documentation verifying that the manufacturer of the self-adhering air barrier is currently accredited by Air Barrier Association of America ([ABAA Accreditation <https://www.airbarrier.org/>](#)).

1.7.2 [Qualifications of Installer](#)

Submit documentation verifying that installers of the self-adhering air barrier are currently certified in accordance with the [ABAA QAP](#) Quality Assurance Program ([https://www.airbarrier.org/qap/](#)).

1.8 PRECONSTRUCTION MEETING

Conduct a preconstruction meeting a minimum of two weeks prior to commencing work specified in this Section. Agenda must include, at a minimum, construction and testing of mockup, sequence of construction, coordination with substrate preparation, materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, and details of construction. Attendance is required by representatives of related trades including covering materials, substrate materials, adjacent materials, and materials and components of the air barrier system.

1.9 ENVIRONMENTAL CONDITIONS

1.9.1 Temperature

Install air barrier within the range of ambient and substrate temperatures as recommended in writing by the air barrier manufacturer. Verify that the surface to receive self-adhering air barrier is dry for a minimum of 48 hours prior to the installation of the barrier. Do not apply air barrier to damp or wet substrates. Do not apply during inclement weather or when ice, frost, surface moisture, or visible dampness is present on surfaces to be covered, or when precipitation is imminent.

1.9.2 Exposure to Weather and Ultraviolet Light

Protect air barrier products from direct exposure to rain, snow, sunlight, mist, and other extreme weather conditions. Replace, at no additional cost to the government, barrier products that have been exposed to ultraviolet (sun)light longer than allowed by manufacturer's written requirements.

PART 2 PRODUCTS

2.1 SELF ADHERING AIR BARRIER

Provide minimum 0.040 inch thick self-adhering, vapor retarding, air barrier membrane consisting of a cross-laminated high density polyethylene (HDPE) film, fully coated with rubberized asphalt adhesive. Provide membrane in rolls of various widths interleaved with disposable silicone release paper. Self-adhering air barrier must exhibit no visible water leakage when tested in accordance with ASTM E331 and must perform as a liquid water drainage plane flashed to discharge to the exterior any incidental condensation or water penetration. Use regular or low temperature formulation depending on site conditions, within temperature ranges specified by manufacturer.

2.1.1 Physical Properties

- a. Air Permeance (ASTM E2178): In accordance with Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM
- b. Air Leakage (ASTM E2357, ASTM E283): In accordance with Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM.
- c. Tensile Strength (ASTM D412 die C modified): Not less than 400 psi.
- d. Tensile Elongation (ASTM D412 die C modified): Not less than 200 percent.

- e. Puncture Resistance (ASTM E154/E154M): Not less than 40 lbs.
- f. Pliability (ASTM D146/D146M): Unaffected at minus 25 degrees F, 0.063 inch mandrel.
- g. Lap Adhesion (ASTM D1876 modified): Not less than 4.0 lbs per inch.
- h. Peel Adhesion (ASTM D903): Not less than 5.0 lbs per inch.
- j. Water Absorption (ASTM D570): Not to exceed 0.12 percent by weight.
- k. Flame propagation of wall assemblies (NFPA 285): Pass
- l. Surface Burning Characteristics (ASTM E84):
 - (1) Flame Spread Index Rating not higher than 75.
 - (2) Smoke Developed Index Rating not higher than 150.

2.2 PRIMERS, ADHESIVES, AND MASTICS

Provide primers, adhesives, mastics and other accessory materials as recommended in writing by the manufacturer of the self-adhering air barrier for adequate bonding to each type of substrate.

2.3 SHEET METAL FLASHING

Provide as specified in Section 07 60 00 FLASHING AND SHEET METAL.

2.4 JOINT SEALANTS

Provide as specified in Section 07 92 00 JOINT SEALANTS. Verify compatibility with adjacent products that are or will be in contact with one another.

PART 3 EXECUTION

3.1 EXAMINATION

Before installing air barrier, examine substrates, areas, and conditions under which air barrier assemblies will be applied, with Installer present, for compliance with requirements. Ensure the following conditions are met:

- a. Surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants.
- b. Concrete surfaces are cured and dry, smooth without large voids, spalled areas or sharp protrusions.
- c. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method in accordance with ASTM D4263 and take suitable measures until substrate passes moisture test.
- d. Verify sealants used in sheathing are compatible with membrane proposed for use. Perform field peel adhesion test on materials to which sealants are adhered.

3.2 PREPARATION

Clean, prepare, and treat substrate in accordance with manufacturer's written instructions. Ensure clean, dust-free, and dry substrate for air barrier application.

- a. Prime masonry and concrete substrates with conditioning primer.
- b. Prime gypsum sheathing an adequate number of coats to achieve required bond, with adequate drying time between coats.
- c. Prime wood, metal, and painted substrates with primer.
- d. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through air barrier and at protrusions.

3.3 INSTALLATION

3.3.1 Installation of Self-adhering Air Barrier

Install materials in accordance with manufacturer's recommendations and the following:

- a. Apply primer at rate recommended by manufacturer prior to membrane installation. Allow primer to dry completely before membrane application. Apply as many coats as necessary for proper adhesion.
- b. When membrane is properly positioned, press into place and roll membrane with roller immediately after placement.
- c. Apply membrane sheets to shed water naturally without interception by a sheet edge, unless that edge is sealed with permanently flexible termination mastic.
- d. Position subsequent sheets of membrane applied above so that membrane overlaps the membrane sheet below by a minimum of **2-1/2 inches**, unless greater overlap is recommended by manufacturer. Roll into place with roller.
- e. Make all side laps a minimum of **2-1/2 inches** and all end laps a minimum of **5 inches**, unless greater overlap is recommended by manufacturer. Roll seams with roller.
- f. Roll membrane to adhere to substrate. Cover corners and joints with two layers of reinforcement by first applying a **12 inch** width of membrane centered along the axis. Flash drains and projections with a second ply of membrane for a distance of **6 inches** from the drain or projection.
- g. Seal around all penetrations through the air barrier resulting from pipes, vents, conduit, electrical fixtures, structural members, or other construction passing through it. Seal with termination mastic, extruded silicone sealant, membrane counterflashing or other sealing methods in accordance with manufacturer's written recommendations.
- h. Continuously connect the air barrier between walls, roof, floor and below grade assemblies to form a continuous integrated air barrier system around the entire building enclosure. Extend the air barrier membrane into rough openings such as doors, windows, louvers, and other

exterior penetrations. Seal edges of barrier at junctures with rough openings.

- i. At changes in substrate plane, provide transition material (e.g. bead of sealant, mastic, extruded silicone sealant, membrane counterflashing or other material recommended by manufacturer) under membrane to eliminate all sharp 90 degree inside corners and to make a smooth transition from one plane to another.
- j. Provide mechanically fastened non-corrosive metal sheet to span gaps in substrate plane and to make a smooth transition from one plane to the other. Continuously support membrane with substrate.
- k. At deflection and control joints, provide backup for the membrane to accommodate anticipated movement.
- l. At expansion and seismic joints provide transition to the joint assemblies.
- m. Apply a bead or trowel coat of mastic along membrane seams at reverse lapped seams, rough cuts, and as recommended by the manufacturer.
- n. At end of each working day, seal top edge of membrane to substrate with termination mastic.
- o. Do not allow materials to come in contact with chemically incompatible materials.
- p. Counterflash upper edge of thru-wall flashing and air barrier. Counter flashing and thru-wall flashing are specified in Section 07 60 00 FLASHING AND SHEET METAL.

3.4 FIELD QUALITY CONTROL

3.4.1 Site Inspections and Testing

Provide site inspections and testing in accordance with ABAA protocol to verify conformance with the manufacturer's instructions, the ABAA QAP Quality Assurance Program (<https://www.airbarrier.org/qap/>), Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM, and this section.

- a. Conduct inspections and testing at 5, 50, and 95 percent completion of this scope of work. Forward written site inspections reports to the Contracting Officer within five working days of the inspection and test being performed.
- b. If inspections reveal any defects, promptly remove and replace defective work at no additional expense to the Government.

3.5 FIELD PEEL ADHESION TEST

Conduct in accordance with test protocol indicated in Part 1, paragraph FIELD PEEL ADHESION TEST.

3.6 PROTECTION AND CLEANING

3.6.1 Protection

3.6.1.1 Adjacent Surfaces

Protect exposed adjacent surfaces that could be damaged by primers and adhesives associated with air barrier membrane. Provide protection during application and the remainder of construction in accordance with manufacturer's written instructions.

3.6.1.2 The Air Barrier Assembly

Protect finished portions of the air barrier assembly from damage during ongoing application and throughout the remainder of the construction period in accordance with manufacturer's written instructions. Coordinate timing of installation of materials that will cover the air barrier membrane to ensure the exposure period does not exceed that recommended by the air barrier manufacturer's written installation instructions. Remove and replace, at no additional cost to the government, membrane products that exceed the manufacturer's allowed exposure limits.

3.6.2 Cleaning

Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction and as acceptable to the primary material manufacturer.

-- End of Section --

SECTION 07 27 36

SPRAY FOAM AIR BARRIERS

05/17

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 BARRIER ASSOCIATION OF AMERICA (ABAA)

ABAA Accreditation

Accreditation

ABAA QAP

Quality Assurance Program

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP Z9.2

(2018) Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems

ASSP Z88.2

(2015) American National Standard Practices for Respiratory Protection

ASTM INTERNATIONAL (ASTM)

ASTM C518

(2017) Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

ASTM C1029

(2015) Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation

ASTM C1303/C1303M

(2015) Standard Test Method for Predicting Long-Term Thermal Resistance of Closed-Cell Foam Insulation

ASTM C1338

(2014) Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings

ASTM D1621

(2016) Standard Test Method for Compressive Properties of Rigid Cellular Plastics

ASTM D1622

(2014) Apparent Density of Rigid Cellular Plastics

ASTM D1623

(2017) Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics

ASTM D2126	(2009) Response of Rigid Cellular Plastics to Thermal and Humid Aging
ASTM D2842	(2012) Water Absorption of Rigid Cellular Plastics
ASTM D4541	(2017) Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM D6226	(2015) Standard Test Method for Open Cell Content of Rigid Cellular Plastics
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E96/E96M	(2016) Standard Test Methods for Water Vapor Transmission of Materials
ASTM E283	(2019) Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E736	(2000; R 2011) Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
ASTM E2178	(2013) Standard Test Method for Air Permeance of Building Materials
ASTM E2357	(2017) Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
ICC EVALUATION SERVICE, INC. (ICC-ES)	
ICC-ES AC377	(2016) Acceptance Criteria for Spray-Applied Foam Plastic Insulation
INTERNATIONAL CODE COUNCIL (ICC)	
ICC IBC	(2018) International Building Code
ICC IECC	(2015) International Energy Conservation Code
INTERNATIONAL SAFETY EQUIPMENT ASSOCIATION (ISEA)	
ANSI/ISEA Z87.1	(2020) Occupational and Educational Personal Eye and Face Protection Devices
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)	
NFPA 10	(2018; ERTA 1-2 2018) Standard for Portable Fire Extinguishers

NFPA 275 (2017) Standard Method of Fire Tests for the Evaluation of Thermal Barriers

NFPA 285 (2012) Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

SPRAY POLYURETHANE FOAM ALLIANCE (SPFA)

SPFA TechDocs (2015) SPFA Technical Documents Library, four categories: General, Insulation, Roofing, Specialty

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-600-01 (2016; with Change 3, 2019) Fire Protection Engineering for Facilities

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

29 CFR 1910.132 Personal Protective Equipment

29 CFR 1910.133 Eye and Face Protection

29 CFR 1910.134 Respiratory Protection

UNDERWRITERS LABORATORIES OF CANADA (ULC)

ULC S705.2 (2005) Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Application

1.2 RELATED REQUIREMENTS

Coordinate the requirements of Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM, Section 07 27 19.01 SELF-ADHERING AIR BARRIERS, and other building envelope sections to provide a complete air barrier system. Submit all materials, components, and assemblies of the air barrier system together as one complete submittal package.

1.3 DEFINITIONS

1.3.1 Long Term Thermal Resistance (LTTR)

The thermal resistance value of a closed cell foam insulation product measured using accelerated aging ASTM C1303/C1303M equivalent to the time-weighted average thermal resistance value over 15 years. Loss in thermal resistance is attributable to changes in cell gas composition caused by diffusion of air into and blowing agent out of the foam cells.

1.3.2 SPFA TechDocs

Reformatted documents, named SPFA TechDocs (<http://www.sprayfoam.org/technical/spfa-technical-documents>), places each document in one of four categories for easy reference and identification: Roofing, Insulation, Specialty and General.

Spray Polyurethane Foam: Thermal and air/vapor barrier system consisting of sprayed polyurethane foam (SPF).

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. Submit non-G submittals to the Government for their record. The Government reserves the right to provide additional comments, request resubmittal, rejection and re-submittal to all the non-G submittals. 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-01 Preconstruction Submittals

Qualification of Manufacturer; G

Qualification of Installer; G

Quality Control Plan; G

Safety Plan; G

Fire Prevention Plan; G

Respirator Plan; G

SD-02 Shop Drawings

Spray Foam Air Barrier System

Foam Air Barrier System; G

Fire-Rated Assemblies; G

SD-03 Product Data

Closed Cell SPF; G

Transition Membrane; G

Primers, Adhesives, and Mastics; G

Sealants; G

Safety Data Sheets; G

Thermal Barrier Materials; G

Ignition Barrier Coatings; G

Accessories; G

SD-04 Samples

Spray Foam Air Barrier Mockup; G

SD-06 Test Reports

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Closed cell SPF; G

Transition Membrane; G

Indoor Air Quality for Spray Foam Air Barrier; G

SD-08 Manufacturer's Instructions

SPF Handling, Storage, and Spray Procedures; G

Substrate Preparation; G

Thermal Barrier; G

Ignition Barrier; G

Transition Membrane; G

Primers, Adhesives, and Mastics; G

SD-09 Manufacturer's Field Reports

Core Samples; G

Daily Work Record; G

1.5 MISCELLANEOUS REQUIREMENTS

For the [spray foam air barrier](#) system provide the following:

1.5.1 Shop Drawings

Submit spray foam air barrier shop drawings showing locations, detailing, and extent of spray foam air barrier assemblies. Provide details of all typical conditions, intersections with other envelope assemblies and materials, membrane counter-flashings. Provide details for [fire-rated assemblies](#) and indicate materials for [thermal barriers](#). Show details for bridging of gaps in construction, treatment of inside and outside corners, expansion joints, methods of attachment of materials covering the SPF without compromising the barrier. Indicate how miscellaneous penetrations such as conduit, pipes, electric boxes, brick ties, and similar items will be sealed.

1.5.2 Product Data

Submit manufacturer's technical data indicating compliance with performance and environmental requirements, manufacturer's printed instructions for evaluating, preparing, and treating substrates, temperature and other limitations of installation conditions, safety requirements for installation, and [Safety Data Sheets](#). Indicate flame and smoke spread ratings for all products. Submit thermal barrier literature including material description, physical properties, and fire-ratings.

1.5.3 Mockup

Provide a mockup of each foam system specified. Apply foam in an area designated by the Contracting Officer. Apply an area of not less than 50 square feet. Include all components specified for the finished assembly including primers, support components, expansion and contraction joints, thermal barriers, and other accessories as representative of the complete system. Isolate the area and protect workers as required by 29 CFR 1910.132, 29 CFR 1910.133 and 29 CFR 1910.134. Notify the Contracting Officer a minimum of 48 hours prior to the test application. Select a test area representative of conditions to be sprayed including window or door openings, wall to ceiling transitions, flashings, and penetrations, as applicable.

1.5.4 Test Reports

Submit test reports indicating that field peel adhesion tests on all materials have been performed and the changes made, if required, in order to achieve successful and lasting adhesion. Submit test reports for flame spread and smoke developed index ratings of SPF products tested in accordance with ASTM E84. Submit test reports for flame propagation of wall assemblies tested in accordance with NFPA 285. Submit test reports for fire-ratings of thermal barrier materials tested in accordance with ASTM E84.

1.6 DELIVERY, STORAGE, AND HANDLING

1.6.1 Delivery

Deliver and store materials in sufficient quantity to allow for uninterrupted flow of work. Inspect materials delivered to the site for damage; unload and store out of weather. Deliver materials to the jobsite in their original unopened packages, clearly marked with the manufacturer's name, brand designation, description of contents, and shelf life of containerized materials. Store and handle to protect from damage. Submit SPF Handling, Storage, and Spray Procedures in accordance with submittal procedures.

1.6.2 Storage

Store materials in clean, dry areas, away from excessive heat, sparks, and open flame. Maintain temperatures in the storage area below the materials' flash point(s) and within limits recommended by the manufacturer's printed instructions. Provide ventilation in accordance with ASSP Z9.2 to prevent build-up of flammable gases. Store MDI (A-side) drums in locations that limit the risk of contact with water, acids, caustics (such as lye), alcohols, and strong oxidizing and reducing agents.

1.6.3 Handling

Handle materials and containers safely and in accordance with manufacturer's recommendations. Store liquids in airtight containers and keep containers closed except when removing materials. Do not use equipment or containers containing remains of dissimilar materials. Do not expose foam component containers to direct sunlight. Do not use materials from containers with content temperatures in excess of 80 degrees F.

Containers exposed to long periods of cold may also exhibit separation and poor performance. Do not use materials exposed to temperature ranges

outside of manufacturer's instructions for exposure limits.

Mark and remove from job site materials which have been exposed to moisture, that exceed shelf life limits, or that have been exposed to temperature extremes.

1.6.3.1 Venting and Handling of Material Containers

Partially unscrew material container and drum caps to gradually vent the containers prior to opening. Do not inhale vapors. Decontaminate empty component containers by filling with water and allowing to stand for 48 hours with bung caps removed. Do not, under any circumstances seal, stop, or close containers which have been emptied of foam components.

1.7 FIELD PEEL ADHESION TEST

Perform a field peel adhesion test on the construction mockup. Test the SPF for adhesion in accordance with [ASTM D4541](#) using a Type II pull tester except use a disk that is [4 inches](#) in diameter and cut through the membrane to separate the material attached to the dish from the surrounding material. Perform test after curing period in accordance with manufacturer's written recommendations. Record mode of failure and area which failed in accordance with [ASTM D4541](#). Compare adhesion values with the manufacturer's established minimum values for the particular combination of material and substrate. Indicate on the inspection report whether the manufacturer's requirement has been met. Where the manufacturer has not declared a minimum adhesion value for their product and substrate combination, the inspector must record actual values.

1.8 AIR BARRIER TESTING

Perform air barrier testing in accordance with Section [07 27 10.00 10](#) BUILDING AIR BARRIER SYSTEM.

1.9 SAFETY PROVISIONS

1.9.1 Fire Prevention

Provide a written [fire prevention plan](#) for the SPF application. Address specific fire hazards such as spontaneous combustion from exothermic heat build-up of SPF components during curing. Provide a continuous fire watch during mixing and spraying of SPF and for a minimum of two hours after completion of work at the end of each day. Maintain fire watch for additional time as required to ensure no potential ignition conditions exist.

1.9.1.1 Fire Extinguishers

Furnish two fire extinguishers of minimum [15 pounds](#) capacity each, in accordance with [NFPA 10](#), in the immediate vicinity of the work. CAUTION: Do not discharge high pressure carbon dioxide extinguishers where explosive vapors exist since the discharge can cause a spark which will ignite the vapors.

1.9.2 Respirator Plan

Provide a written respirator plan in accordance with OSHA regulations that protects installers during application and addresses separation of the area to prevent other workers from entering the work area during spraying.

1.9.3 Isolation

Isolate the work area as recommended by spray foam manufacturer's written requirements. Prevent workers without respiratory, skin, and eye Personal Protective Equipment (PPE) or training from entering the work area or otherwise being exposed to off-gassing of the insulation in excess of permissible exposure limits.

1.9.4 Respirators and Eye Protection

Respiratory protective devices (respirators) must meet the requirements of [ASSP Z88.2](#). Eye and face protective equipment must meet the requirements of [ANSI/ISEA Z87.1](#). Additionally, sprayers and workers in the immediate vicinity of the spray must wear NIOSH-approved, full-face, supplied air respirators (SAR) operated in positive pressure or continuous flow mode. Workers not in the immediate vicinity of the sprayer must wear air purifying respirators (APR) with an organic gas / P100 particulate cartridge. Instruct personnel in the use of devices. Maintain such equipment and inspect regularly. All workers are required to have undergone pulmonary function testing and fit testing and must provide certification that they have done so. Change APR cartridges in accordance with manufacturer's written recommendations.

1.9.5 Clothing and Gloves

Sprayers and workers must wear protective clothing and gloves in accordance with OSHA requirements during materials application. Disposable coveralls must be worn and must cover all exposed skin. Sprayers and workers must wear fabric gloves coated with nitrile, neoprene, butyl or PVC.

1.9.6 Additional Requirements

Require personnel to review the Health, Safety and Environmental Aspects of Spray Polyurethane Foam and Coverings published by the Spray Polyurethane Foam Alliance (SPFA). Verify compliance prior to allowing personnel on site for installation work. <http://www.sprayfoam.org>.

1.10 QUALITY ASSURANCE

1.10.1 Qualification of Manufacturer

Submit documentation verifying that the manufacturer of the SPF is currently accredited by the Air Barrier Association of America ([ABAA Accreditation https://www.airbarrier.org/](https://www.airbarrier.org/)) and by the Spray Polyurethane Foam Alliance (SPFA).

1.10.2 Qualification of Installer

Submit documentation verifying that installers of the spray foam air barrier are currently certified by ABAA/BPQI (Building Performance Quality Institute) or and by the Spray Polyurethane Foam Alliance (SPFA) Professional Certification Program (PCP). Installers must provide photo identification certification cards for inspection upon request.

1.10.3 General Quality Requirements

Provide all products and installation in accordance with [SPFA TechDocs](http://www.sprayfoam.org/technical/spfa-technical-documents) requirements (<http://www.sprayfoam.org/technical/spfa-technical-documents>)

and documented best practices.

1.11 PRECONSTRUCTION MEETING

Conduct a preconstruction meeting after approval of submittals and a minimum of two weeks prior to commencing work specified in this Section. Attendance is required by the Contracting Officer's designated personnel, Contractor, and representatives of related trades including covering materials, substrate materials, adjacent materials, and materials and components of the air/vapor/thermal barrier system. Agenda must include, at a minimum, the following items:

- a. Drawings, specifications and submittals related to the SPF work;
- b. Sequence of construction;
- c. Coordination with substrate preparation work and responsibility of repairing defects in substrates. Determine method of ensuring SPF work does not begin until substrates have been inspected and accepted;
- d. Compatibility of materials;
- e. Construction and testing of construction mockup;
- f. Application of self-adhering air barrier transitions strips and primer as required for sealing the spray foam air barrier system at openings including but not limited to windows, doors and louvers;
- g. Spray foam air barrier system installation; including methods to be used to provide a continuous barrier at thru-wall flashing, penetrations, and covering of embed items;
- h. Quality control plan including methods of applying the product so that a consistent thickness across the face of the substrate is achieved.
- i. Procedures for SPF manufacturer's technical representative's onsite inspection and acceptance of substrates, contact info for the representative, frequency of visits, and distribution of copies of inspection reports. Determine where core samples will be taken and review procedures for daily documentation of SPF application.
- j. Property protection measures, including isolation of the work, and prevention of overspray and clean-up should overspray occur.
- k. Safety requirements, including review of PPE, fire prevention, safety plan, respirator plan, ventilation and separation of the work area, fall protection, and posting of warning signs. Provide a complete schedule and a detailed, written fire protection plan including temporary isolation of the product and the work area until permanent isolation or thermal barrier is in place.

1.12 ENVIRONMENTAL CONDITIONS

1.12.1 Temperature and Weather

Install SPF within the range of ambient and substrate surface temperatures in accordance with manufacturer's written instructions. Do not apply SPF to damp or wet substrates. Do not apply SPF during inclement weather or when ice, frost, surface moisture, or visible dampness is present on

surfaces to be covered, or when precipitation is imminent. Do not apply SPF to exterior building surfaces when wind speeds exceed 25 miles per hour. Use moisture measuring methods and equipment to verify that the moisture conditions of substrate surfaces are in accordance with SPF manufacturer requirements prior to application. Substrate temperatures must be within limits recommended by the manufacturer's printed instructions.

1.12.2 Conditions for Primers

Follow manufacturer's printed application and curing instructions. Do not apply primer when ambient temperature is below 40 degrees F or when ambient temperature is expected to fall below 35 degrees F for the duration of the drying or curing period.

1.12.3 Conditions for Ignition Barriers

Ensure that sprayed surfaces comply with manufacturer's written requirements for application coverage, thickness, and curing prior to application of ignition barrier coatings.

1.12.4 Temporary Ventilation

Provide temporary ventilation for work of this section in accordance with manufacturer's written instructions and with OSHA requirements for this type of application.

1.13 FOAM SPRAY EQUIPMENT

1.13.1 Applicator

Use an air purge foam spray gun.

1.13.2 Equipment Calibration

Fully calibrate the foam metering equipment to monitor each liquid component to within 2 percent of the SPF manufacturer's required metering ratio. Calibrate spray equipment each day at the start of operations, after each restart if spraying operations have been terminated for more than one hour, whenever there is a change in fan pattern or pressure, whenever slow curing areas are noticed, whenever a change is made in hose length or working height, and after changeover between materials. Calibration consists of demonstrating that the equipment is adjusted to deliver components in proper mix and proportion. Conduct calibration tests on cardboard or plywood on a wall adjacent to the area to be sprayed.

1.13.3 Metering Equipment Requirements

Use foam metering equipment capable of developing and maintaining the SPF manufacturer's required liquid component pressures and temperatures. Foam metering equipment must have gages for visual monitoring. Equipment must provide temperature control of foam components to within the temperature ranges recommended by the foam manufacturer's printed instructions.

1.13.4 Moisture Protection

Protect surfaces of supply containers and tanks used to feed foam metering equipment from moisture.

1.13.5 Compressed Air

Supply compressed air that is in contact with SPF during mixing or atomization through moisture traps that are continuously bled.

1.13.6 Dispense Excess Materials

Do not deposit materials used for cleaning of equipment or materials dispensed for calibration purposes and establishment of spray gun pattern onto the ground. Dispense such materials into scrap containers or onto plastic film, or cardboard, and dispose of in accordance with safety requirements and jobsite regulations.

PART 2 PRODUCTS

2.1 SPRAY FOAM AIR BARRIER

2.1.1 General

Provide a closed cell, sprayed in place, SPF that forms a continuous air /vapor/thermal barrier at the building enclosure. Provide in accordance with [ASTM C1029](#), with the requirements of [UFC 3-600-01](#), [ICC IBC](#) Chapter 26, [ICC-ES AC377](#), and [NFPA 285](#). In the event of a conflict, the most stringent requirement applies. Provide all system components necessary for a complete, code compliant installation, whether indicated or not, including material support components, expansion and contraction joints, [thermal barrier materials](#), and accessories.

2.1.2 Physical Properties

Provide a [closed cell](#) product with the following characteristics:

- a. Density ([ASTM D1622](#)): 2.0 lb per cf, nominal
- b. Thermal Resistance ([ASTM C518](#))
 - (1) Initial R-value per inch thickness: 7 sf·degrees F h per Btu
 - (2) Aged R-value per inch thickness (180 days at 76 degrees F): 6.6 sf·degrees F·h per Btu
- c. Air Permeance ([ASTM E2178](#)): In accordance with Section [07 27 10.00 10 BUILDING AIR BARRIER SYSTEM](#)
- d. Air Leakage ([ASTM E2357](#), [ASTM E283](#)): In accordance with Section [07 27 10.00 10 BUILDING AIR BARRIER SYSTEM](#).
- e. Compressive Strength ([ASTM D1621](#)): Minimum 28.3 psi
- f. Tensile Strength ([ASTM D1623](#))
 - (1) Medium density: 15 psi
 - (2) Roofing: 40 psi
- h. Vapor Retarder ([ICC IBC](#), [ICC IECC](#)) Class I
- i. Surface Burning Characteristics ([ASTM E84](#)) 3 inch thickness:

- (1) Flame Spread (FS) Index Rating less than 75.
- (2) Smoke Developed (SD) Index Rating less than 150. SPF with an SD rating greater than 150 but less than 450 may be used when fully encapsulated. Approval of SPF product is contingent upon approval of encapsulation products and assemblies.
- j. Closed Cell Content (ASTM D6226): 90 percent
- k. Dimensional Stability (Humid Aging) (ASTM D2126): 15 percent at 28 days at 158 degrees F with 97 percent relative humidity.
- l. Water Absorption (ASTM D2842): Maximum 1.0 per volume
- m. Fungi Resistance (ASTM C1338): Pass, with no growth
- n. Recycled Content: Minimum 9 percent (pre- and post-consumer). Provide data identifying percentage of recycled content for closed cell spray foam air barrier.
- c. Air Permeance (ASTM E2178): In accordance with Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM.
- d. Air Leakage (ASTM E2357, ASTM E283): In accordance with Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM.
- e. AC377 Compressive Strength (ASTM D1621): 3-5 psi
- f. Tensile Strength (ASTM D1623): 3-5 psi
- g. Water Vapor Permeance (ASTM E96/E96M, water method): Maximum 22 Perms at 2 inch thickness
- h. Surface Burning Characteristics (ASTM E84) 3 inch thickness:
 - (1) Flame Spread (FS) Index Rating less than 75.
 - (2) Smoke Developed (SD) Index Rating less than 150. SPF with an SD rating greater than 150 but less than 450 may be used when fully encapsulated. Approval of SPF product is contingent upon approval of encapsulation products and assemblies.
- i. Open Cell Content (ASTMD6226): Greater than 92 percent
- j. Fungi Resistance (ASTM C1338): Pass, with no growth
- k. Recycled Content: minimum 9 percent (pre- and post-consumer).

2.1.3 Expansion and Contraction

Provide an assembly that allows for relative movement due to temperature, moisture, and air pressure changes. Provide expansion and contraction measures as required by the manufacturer's written recommendations.

2.1.4 Fire-ratings, Flame Spread and Smoke Developed Index Ratings

Where fire-rated materials are indicated, provide products with the appropriate markings of a qualified testing agency. Submit fire-rating test reports. Submit flame spread (FS) and smoke developed (SD) index

data. Where FS and SD values of foam products do not meet requirements, provide corresponding ignition thermal barrier products or assemblies and verify complete encapsulation of the spray foam air barrier through product data or on shop drawings. Submit for approval in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

2.1.5 Prohibited Materials

Products that contain hexabromocyclododecane (HBCD) flame retardants are prohibited. Products that contain hydrochlorofluorocarbons (HCFCs), chlorofluorocarbons (CFCs), or other high ozone depleting blowing agents, are prohibited. For a list of acceptable substitute foam blowing agents see <https://www.epa.gov/snap/foam-blowing-agents>. Provide validation of indoor air quality for spray foam air barrier that no prohibited materials are used.

2.1.6 Thermal Ignition Barrier

Provide a thermal ignition barrier in locations where SPF is exposed to the interior of the building. Provide thermal ignition barriers in accordance with ICC IBC Chapter 26 "Plastics," with ICC-ES AC377, ASTM E736, and NFPA 275.

2.2 TRANSITION MEMBRANE

Provide as specified in Section 07 27 19.01 SELF-ADHERING AIR BARRIERS.

2.3 PRIMERS, ADHESIVES, AND MASTICS

Provide primers, adhesives, mastics and other accessory materials as recommended by spray foam manufacturer's printed literature.

2.4 FLASHING

As specified in Section 07 60 00 FLASHING AND SHEET METAL.

2.5 JOINT SEALANTS

As specified in Section 07 92 00 JOINT SEALANTS. Verify compatibility with other system products.

PART 3 EXECUTION

3.1 EXAMINATION

Before installing the spray foam air barrier and with the installer present, examine substrates, areas, and conditions under which SPF will be applied, for compliance with requirements. Ensure that surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants. Ensure that concrete surfaces are cured and dry, smooth without large voids, spalled areas or sharp protrusions. Correct defects that adversely affect the spray foam application or performance. Verify that work by other trades is in place and complete prior to application of spray foam.

3.2 PREPARATION

3.2.1 Substrate Preparation

Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for spray foam application.

- a. Prepare surfaces by brushing, scrubbing, scraping, or grinding to remove loose mortar, dust, oil, grease, oxidation, mill scale and other contaminants which will affect adhesion of the SPF.
- b. Wipe down metal surfaces to remove release agents or other non-compatible coatings, using clean sponges or rags soaked in a solvent compatible with the SPF.

3.2.2 Protection

Protect adjacent areas and surfaces from spray applied materials in accordance with the following:

- a. Mask and cover adjacent areas to protect from over spray.
- b. Ensure required foam stops and back up materials are in place to achieve a complete seal.
- c. Seal off ventilation equipment. Install temporary ducting and fans to provide required exhaust of spray fumes. Provide make-up air as required.
- d. Erect barriers, isolate area, and post warning signs to notify non-protected personnel of the requirement to avoid the spray area.

3.2.3 Fire and Explosion Hazards

Prohibit open flames, sparks, welding, and smoking in the application area. Provide and maintain fire extinguishers of appropriate type, size and distance, as required by NFPA, in the application area. Mix batches in small enough quantities to avoid spontaneous combustion from exothermic heat build-up of SPF components during curing.

3.2.4 Warning Signs

Post warning signs at ground level adjacent to the work area and a minimum of 150 feet from the application area stating the area is off limits to unauthorized persons and warning of potential hazards. Place clearly visible and legible warning sign at entrance to primary road leading to the project facility warning of presence of flammable materials, irritating fumes, and potential of overspray damage.

3.2.5 Prime Substrate

Provide as recommended by the manufacturer for each substrate to be primed. Use primers at full strength. Do not dilute primers unless required and as recommended in writing by the manufacturer. Do not use cleaning solvents for thinning primers or other materials. Ensure that diluted primer(s) meet VOC requirements.

3.3 INSTALLATION

3.3.1 Sequencing and Coordination

Sequence the work so as to prevent access to the work area by other trades during foam application and curing. Limit access of non-essential workers during application. Notify the Contracting Officer 24 hours in advance of spraying operations. Sequence spray foam work with other trades to permit continuous self-flashing of the spray foam air barrier. Ensure expansion and control joints are provided as detailed on the manufacturer's shop drawings to accommodate the expansion of each layer of the air/vapor/thermal envelope. Provide temporary fire protection of uncured foam, and isolate the work area, until foam application is isolated with a permanent thermal or ignition barrier.

3.3.2 Installation of Transition Membrane

Install transition membrane materials in accordance with the details on the drawings, Section 07 27 19.01 SELF-ADHERING AIR BARRIERS, and the following:

- a. Install transition membrane at all required locations prior to installation of other -applied membrane air/vapor barriers.
- b. Verify transition membrane is fully adhered to substrate and that its surface is clean, dry and wrinkle free prior to installation of the fluid-applied membrane air/vapor barrier.
- c. Verify transition membrane completely covers all transition areas and will provide continuity of the finished SPF air/vapor barrier without gaps or cracks.

3.3.3 Installation of Spray Foam Air Barrier

Install materials in accordance with paragraph SAFETY PROVISIONS, in accordance with manufacturer's recommendations, ULC S705.2 [Installation Standard] and in accordance with the following:

- a. Use spray equipment that complies with foam manufacturer's recommendations for the specific type of application, and as specified herein. Record equipment settings on the Daily Work Record. Each proportioned unit can supply only one spray gun.
- b. Apply only when surfaces and environmental conditions are within limits prescribed by the material manufacturer.
- c. Continuously connect the spray foam air barrier between walls, roof, floor, and below grade assemblies to form a continuous integrated air barrier system around the entire building enclosure. Extend the spray foam air barrier into rough openings such as doors, windows, louvers, and other exterior penetrations. Use self-adhering air barrier transition strips if necessary to achieve full extension and continuity of the barrier at these locations. Seal edges of barrier at junctures with rough openings.
- d. Install within manufacturer's tolerances, but not more than minus 1/4 inch or plus 1/2 inch.
- e. Sequence work so as to completely seal all penetrations resulting from pipes, vents, wires, conduit, electrical fixtures, structural members,

or other construction. If penetrations through the spray foam air barrier are made after the initial SPF application, reapply in accordance with manufacturer's written instructions for such remedial work.

- f. Do not install SPF within 3 inches of heat emitting devices such as light fixtures and chimneys.
- g. Finished surface of SPF must be free of voids and embedded foreign objects.
- h. Remove masking materials and over spray from adjacent areas immediately after foam surface has hardened. Ensure cleaning methods do not damage work performed by other sections.
- i. Trim, as required, any excess thickness that would interfere with the application of cladding and covering system by other trades.
- j. Clean and restore surfaces soiled or damaged by work of other trades. Before cleaning and restoring damaged work, consult with other trades for appropriate and approved methods for cleaning and restoration to prevent further damage.
- k. Complete connections to other components and repair any gaps, holes or other damage using material approved by the manufacturer.
- l. Provide expansion joints in the SPF application aligned with expansion joints in the building enclosure, where substrate materials change, and in accordance with manufacturer's recommendations.
- m. Provide a continuous fire watch in accordance with paragraph SAFETY PROVISIONS.

3.4 FIELD QUALITY CONTROL

3.4.1 General Site Inspections and Testing

Provide site inspections and testing in accordance with ABAA protocol to verify conformance with the manufacturer's instructions, the ABAA QAP Quality Assurance Program (<https://www.airbarrier.org/qap/>), Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM, and this section.

- a. Conduct inspections and testing at 5, 50, and 95 percent of completion of this scope of work. Forward written inspection reports to the Contracting Officer within 5 working days of the inspection and test being performed.
- b. If inspections reveal any defects, promptly remove and replace defective work at no additional expense to the Government.

3.4.2 Manufacturer Site Inspections

Manufacturer's technical representative must visit the site during the installation process to ensure the SPF and accessories are being applied in compliance with requirements. At a minimum, manufacturer's technical representative must be present at work startup and perform field inspection of the first day's completed application and at substantial completion, prior to demobilization. After each inspection, submit an inspection report signed by the manufacturer's technical representative, to the

Contracting Officer within five working days. The inspection report must note overall quality of work, deficiencies, and recommended corrective actions in detail. Notify the Contracting Officer a minimum of two working days prior to site visits by manufacturer's technical representative.

3.4.3 Contractor's Site Inspections

Establish and maintain an inspection procedure to ensure compliance of the foam installation with contract requirements. Conduct inspections and testing at 5, 50, and 95 percent completion of application. Forward written inspection reports to the Contracting Officer within five working days of the inspection and test being performed. Work not in compliance must be promptly removed and replaced or corrected, in an approved manner, at no additional cost to the Government. Quality control must include, but is not limited to, the following:

- a. Observation of environmental conditions; number and skill level of insulation workers.
- b. Verification of certification, listing, or label.
- c. Verification of proper storage and handling of materials before, during, and after installation.
- d. Inspection of SPF, support structure, primer, expansion joints, ignition barrier, thermal barrier, vapor retarder, and accessories.

3.5 CORRECTION OF DEFICIENCIES

Upon completion of inspection, testing, or sample taking, repair damaged construction, restore substrates and finishes, and protect repaired construction. Deficiencies found during inspection must be corrected within 48 hours following notification.

3.6 CLEANUP OF SPILLS

Conduct cleanup of uncured product spillage in accordance with paragraph SAFETY PROVISIONS and the manufacturer's written safe handling instructions. In the event of a conflict, the most stringent requirement governs.

3.7 PROTECTION AND CLEANING

3.7.1 Protection of Installed Work

Protect SPF installation from damage during application and remainder of construction period in accordance with manufacturer's written instructions. Repair damaged areas to new condition.

3.7.2 Cleaning of Adjacent Surfaces

Clean overspray from adjacent construction using cleaning agents and procedures as recommended in writing by the manufacturer of each type of affected construction and as acceptable to same.

-- End of Section --

SECTION 07 60 00

FLASHING AND SHEET METAL
05/17

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WELDING SOCIETY (AWS)

AWS D1.2/D1.2M (2014; Errata 1 2014; Errata 2 2020)
Structural Welding Code - Aluminum

ASTM INTERNATIONAL (ASTM)

ASTM A480/A480M (2020a) Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip

ASTM A653/A653M (2020) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM B32 (2008; R 2014) Standard Specification for Solder Metal

ASTM B209 (2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

ASTM B221 (2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

ASTM B370 (2012; R 2019) Standard Specification for Copper Sheet and Strip for Building Construction

ASTM D41/D41M (2011; R 2016) Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing

ASTM D1784 (2020) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

ASTM D4586/D4586M (2007; E 2012; R 2012) Asphalt Roof Cement, Asbestos-Free

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

SMACNA 1793

(2012) Architectural Sheet Metal Manual,
7th Edition

SINGLE PLY ROOFING INDUSTRY (SPRI)

ANSI/SPRI RD-1

(2014) Performance Standard for Retrofit
Drains

1.2 GENERAL REQUIREMENTS

Finished sheet metal assemblies must form a weathertight enclosure without waves, warps, buckles, fastening stresses or distortion, while allowing for expansion and contraction without damage to the system. The sheet metal installer is responsible for cutting, fitting, drilling, and other operations in connection with sheet metal modifications required to accommodate the work of other trades. Coordinate installation of sheet metal items used in conjunction with roofing, openings (Windows, Louvers, Doors, roof and wall penetrations, curbs, expansion joints, etc.) work to permit continuous, uninterrupted building operations.

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. Submit non-G submittals to the Government for their record. The Government reserves the right to provide additional comments, request resubmittal, rejection and re-submittal to all the non-G submittals. 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

Exposed Sheet Metal Coverings; G

Gutters; G

Downspouts; G

Expansion Joints; G

Gravel Stops and fascia; G

Splash Pans; G

Flashing for Roof Drains; G

Base Flashing; G

Counterflashing; G

Flashing at Roof Penetrations and Equipment Supports; G

Reglets; G

Scuppers; G

Copings; G

Drip Edges; G

Conductor Heads; G

Open Valley Flashing; G

Eave Flashing; G

One-piece window and louver Flashing; G

Exterior walls through flashings; G

SD-03 Product Data

Materials Data; G

SD-04 Samples

Finish Samples for color selection; G

SD-08 Manufacturer's Instructions

Instructions for Installation; G

Quality Control Plan; G

SD-10 Operation and Maintenance Data

Cleaning and Maintenance; G

1.4 MISCELLANEOUS REQUIREMENTS

1.4.1 Product Data

Indicate thicknesses, dimensions, fastenings, anchoring methods, expansion joints, and other provisions necessary for thermal expansion and contraction. Scaled manufacturer's catalog data may be submitted for factory fabricated items.

1.4.2 Finish Samples

Submit two color charts and two finish sample chips from manufacturer's standard color and finish options for each type of finish indicated.

1.4.3 Operation and Maintenance Data

Submit detailed instructions for installation and quality control during installation, cleaning and maintenance, for each type of assembly indicated.

1.5 DELIVERY, HANDLING, AND STORAGE

Package and protect materials during shipment. Uncrate and inspect materials for damage, dampness, and wet-storage stains upon delivery to the job site. Remove from the site and replace damaged materials that cannot

be restored to like-new condition. Handle sheet metal items to avoid damage to surfaces, edges, and ends. Store materials in dry, weather-tight, ventilated areas until installation.

PART 2 PRODUCTS

2.1 RECYCLED CONTENT

Provide products with recycled content. Provide data for each product with recycled content, identifying percentage of recycled content.

2.2 MATERIALS

Do not use lead, lead-coated metal, or galvanized steel. Use any metal listed by [SMACNA 1793](#) for a particular item, unless otherwise indicated. Provide materials, thicknesses, and configurations in accordance with [SMACNA 1793](#) for each material. Contact between dissimilar metals must be avoided.

Furnish sheet metal items in 8 to 10 foot lengths. Single pieces less than 8 feet long may be used to connect to factory-fabricated inside and outside corners, and at ends of runs. Factory fabricate corner pieces with minimum 12 inch legs. Provide accessories and other items essential to complete the sheet metal installation. Provide accessories made of the same or compatible materials as the items to which they are applied. Fabricate sheet metal items of the materials specified below and to the gage, thickness, or weight shown in Table I at the end of this section. Provide sheet metal items with mill finish unless specified otherwise. Where more than one material is listed for a particular item in Table I, each is acceptable and may be used, except as follows:

2.2.1 Exposed Sheet Metal Items

Must be of the same material. Consider the following as exposed sheet metal: gutters, including hangers; downspouts; gravel stops and fascia; cap, valley, steeped, base, eave flashings, through wall penetrations, flashing for openings (head, jambs and sill), penetration hoods, etc. and related accessories.

2.2.2 Drainage

Do not use copper for an exposed item if drainage from that item will pass over exposed masonry, stonework or other metal surfaces. In addition to the metals listed in Table I, lead-coated copper may be used for such items.

2.2.3 Copper, Sheet and Strip

Provide in accordance with [ASTM B370](#), cold-rolled temper, H 00 (standard).

2.2.4 Steel Sheet, Zinc-Coated (Galvanized)

Provide in accordance with [ASTM A653/A653M](#).

2.2.5 Stainless Steel

Provide in accordance with [ASTM A480/A480M](#), Type 302 or 304, 2D Finish, fully annealed, dead-soft temper.

2.2.6 Aluminum Alloy Sheet and Plate

Provide in accordance with [ASTM B209](#) anodized color as selected by the Architect from the manufacturer's standard color wheel form alloy, and temper appropriate for use. Provide material not less than [0.032-in](#)] in thickness.

2.2.6.1 Alclad

When fabricated of aluminum, fabricate the following items with Alclad 3003, Alclad 3004, or Alclad 3005, clad on both sides unless otherwise indicated.

- a. Gutters, downspouts, and hangers
- b. Gravel stops and fascia
- c. Flashing

2.2.7 Finishes

Provide exposed exterior sheet metal and aluminum with a baked on, factory applied color coating of polyvinylidene fluoride (PVF2) or approved equal fluorocarbon coating. Dry film thickness of coatings must be [0.8 to 1.3 mils](#). Color to be selected from manufacturer's standard range of color choices manufacturer's full range of color choices. Field applications of color coatings are prohibited and will be rejected.

2.2.8 Aluminum Alloy, Extruded Bars, Rods, Shapes, and Tubes

[ASTM B221](#).

2.2.9 Solder

Provide in accordance with [ASTM B32](#), 95-5 tin-antimony.

2.2.10 Reglets

2.2.10.1 Polyvinyl Chloride Reglets

Provide in accordance with [ASTM D1784](#), Type II, Grade 1, Class 14333-D, [0.075 inch](#) minimum thickness.

2.2.10.2 Metal Reglets

Provide factory fabricated caulked type or friction type reglets with a minimum opening of [1/4 inch](#) and a depth of [1-1/4 inch](#), as approved.

2.2.10.2.1 Caulked Reglets

Provide with rounded edges, temporary reinforcing cores, and accessories as required for securing to adjacent construction. Provide built-up mitered corner pieces for inside and outside corners.

2.2.10.2.2 Friction Reglets

Provide with flashing receiving slots not less than [5/8 inch](#) deep, [one inch](#) jointing tongues, and upper and lower anchoring flanges installed at [24 inch](#) maximum snap-lock type receiver.

2.2.11 Conductor Heads

Provide conductor heads and screens in the same material as downspouts. Provide outlet tubes not less than 4 inches long.

2.2.12 Splash Pans

Provide splash pans where downspouts discharge onto roof surfaces and at locations indicated. Unless otherwise indicated, provide pans not less than 24 inches long by 18 inches wide with metal ribs across bottoms of pans. Provide sides of pans with vertical baffles not less than one inch high in the front, and 4 inches high in the back.

2.2.13 Copings

Unless otherwise indicated, provide copings in copper sheets, 8 or 10 feet long, joined by a 3/4 inch locked and soldered seam.

2.2.14 Bituminous Plastic Cement

Provide in accordance with ASTM D4586/D4586M, Type I.

2.2.15 Asphalt Primer

Provide in accordance with ASTM D41/D41M.

2.2.16 Fasteners

Use the same metal as, or a metal compatible with the item fastened. Use stainless steel fasteners to fasten. Confirm compatibility of fasteners and items to be fastened to avoid galvanic corrosion due to dissimilar materials.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Workmanship

Make lines and angles sharp and true. Free exposed surfaces from visible wave, warp, buckle, and tool marks. Fold back exposed edges neatly to form a 1/2 inch hem on the concealed side. Make sheet metal exposed to the weather watertight with provisions for expansion and contraction.

Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry, and free of defects and projections. For installation of items not shown in detail or not covered by specifications conform to the applicable requirements of SMACNA 1793, Architectural Sheet Metal Manual. Provide sheet metal flashing in the angles formed where roof decks abut walls, curbs, ventilators, pipes, or other vertical surfaces and wherever indicated and necessary to make the work watertight. Join sheet metal items together as shown in Table II.

3.1.2 Cleats

Provide cleats for sheet metal 18 inches and over in width. Space cleats evenly not over 12 inches on center unless otherwise specified or indicated. Unless otherwise specified, provide cleats of 2 inches wide by

3 inches long and of the same material and thickness as the sheet metal being installed. Secure one end of the cleat with two nails and the cleat folded back over the nailheads. Lock the other end into the seam. Where the fastening is to be made to concrete or masonry, use screws and drive in expansion shields set in concrete or masonry. Pre-tin cleats for soldered seams.

3.1.3 Bolts, Rivets, and Screws

Install bolts, rivets, and screws where indicated or required. Provide compatible washers where required to protect surface of sheet metal and to provide a watertight connection. Provide mechanically formed joints in aluminum sheets 0.040 inches or less in thickness.

3.1.4 Seams

Straight and uniform in width and height with no solder showing on the face.

3.1.4.1 Lap Seams

Finish soldered seams not less than one inch wide. Overlap seams not soldered, not less than 3 inches.

3.1.4.2 Loose-Lock Expansion Seams

Not less than 3 inches wide; provide minimum one inch movement within the joint. Completely fill the joints with the specified sealant, applied at not less than 1/8 inch thick bed.

3.1.5 Soldering

Where soldering is specified, apply to copper, terne-coated stainless steel, zinc-coated steel, and stainless steel items. Pre-tin edges of sheet metal before soldering is begun. Seal the joints in aluminum sheets of 0.040 inch or less in thickness with specified sealants. Do not solder aluminum.

3.1.5.1 Edges

Scrape or wire-brush the edges of lead-coated material to be soldered to produce a bright surface. Flux brush the seams in before soldering. Treat with soldering acid flux the edges of stainless steel to be pre-tinned. Seal the joints in aluminum sheets of 0.040 inch or less in thickness with specified sealants. Do not solder aluminum.

3.1.6 Welding and Mechanical Fastening

Use welding for aluminum of thickness greater than 0.040 inch. Aluminum 0.040 inch or less in thickness must be butted and the space backed with formed flashing plate; or lock joined, mechanically fastened, and filled with sealant as recommended by the aluminum manufacturer.

3.1.6.1 Welding of Aluminum

Use welding of the inert gas, shield-arc type. For procedures, appearance and quality of welds, and the methods used in correcting welding work, conform to AWS D1.2/D1.2M.

3.1.6.2 Mechanical Fastening of Aluminum

Use No. 12, aluminum alloy, sheet metal screws or other suitable aluminum alloy or stainless steel fasteners. Drive fasteners in holes made with a No. 26 drill in securing side laps, end laps, and flashings. Space fasteners 12 inches maximum on center. Where end lap fasteners are required to improve closure, locate the end lap fasteners not more than 2 inches from the end of the overlapping sheet.

3.1.7 Protection from Contact with Dissimilar Materials

3.1.7.1 Copper or Copper-bearing Alloys

Paint with heavy-bodied bituminous paint surfaces in contact with dissimilar metal, or separate the surfaces by means of moistureproof building felts.

3.1.7.2 Aluminum

Do not allow aluminum surfaces in direct contact with other metals except stainless steel, zinc, or zinc coating. Where aluminum contacts another metal, paint the dissimilar metal with a primer followed by two coats of aluminum paint. Where drainage from a dissimilar metal passes over aluminum, paint the dissimilar metal with a non-lead pigmented paint.

3.1.7.3 Metal Surfaces

Paint surfaces in contact with mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.

3.1.7.4 Wood or Other Absorptive Materials

Paint surfaces that may become repeatedly wet and in contact with metal with two coats of aluminum paint or a coat of heavy-bodied bituminous paint.

3.1.8 Expansion and Contraction

Provide expansion and contraction joints at not more than 32 foot intervals for aluminum and at not more than 40 foot intervals for other metals. Provide an additional joint where the distance between the last expansion joint and the end of the continuous run is more than half the required interval. Space joints evenly. Join extruded aluminum gravel stops and fascia by expansion and contraction joints spaced not more than 12 feet apart.

3.1.9 Base Flashing

Lay the base flashings with each course of the roof covering, shingle fashion, where practicable, where sloped roofs abut chimneys, curbs, walls, or other vertical surfaces. Extend up vertical surfaces of the flashing not less than 8 inches and not less than 4 inches under the roof covering. Where finish wall coverings form a counterflashing, extend the vertical leg of the flashing up behind the applied wall covering not less than 6 inches. Overlap the flashing strips with the previously laid flashing not less than 3 inches. Fasten the strips at their upper edge to the deck. Horizontal flashing at vertical surfaces must extend vertically above the roof surface and fastened at their upper edge to the deck a minimum of 6 inches on center with large headed stainless steel screws a minimum of 2 inch lap of any surface. Solder end laps and provide for expansion and contraction.

Extend the metal flashing over crickets at the up-slope side of curbs, and similar vertical surfaces extending through sloping roofs, the metal flashings. Extend the metal flashings onto the roof covering not less than 4.5 inches at the lower side of vertical surfaces extending through the roof decks. Install and fit the flashings so as to be completely weathertight. Provide factory-fabricated base flashing for interior and exterior corners.

3.1.10 Counterflashing

Except where indicated or specified otherwise, insert counterflashing in reglets located from 9 to 10 inches above roof decks, extend down vertical surfaces over upturned vertical leg of base flashings not less than 3 inches. Fold the exposed edges of counterflashings 1/2 inch. Where stepped counterflashings are required, they may be installed in short lengths a minimum 8 inches by 8 inches or may be of the preformed single piece type. Provide end laps in counterflashings not less than 3 inches and make it weathertight with plastic cement. Do not make lengths of metal counterflashings exceed 10 feet. Form flashings to the required shapes before installation. Factory form corners not less than 12 inches from the angle. Secure the flashings in the reglets with lead wedges and space not more than 18 inches apart; short runs, place wedges closer together. Fill caulked-type reglets or raked joints which receive counterflashing with caulking compound. Turn up the concealed edge of counterflashings built into masonry or concrete walls not less than 1/4 inch and extend not less than 2 inches into the walls. Install counterflashing to provide a spring action against base flashing. Where bituminous base flashings are provided, extend down the counter flashing as close as practicable to the top of the cant strip. Factory form counter flashing to provide spring action against the base flashing.

3.1.11 Metal Reglets

Keep temporary cores in place during installation. Ensure factory fabricated caulked type or friction type, reglets have a minimum opening of 1/4 inch and a minimum depth of 1-1/4 inch, when installed.

3.1.11.1 Caulked Reglets

Wedge flashing in reglets with lead wedges every 18 inches, caulked full and solid with an approved compound.

3.1.11.2 Friction Reglets

Install flashing snap lock receivers at 24 inches on center maximum. When flashing has been inserted the full depth of the slot, caulk the slot, lock , and fill with sealant.

3.1.12 Polyvinyl Chloride Reglets for Temporary Construction

Rigid polyvinyl chloride reglets may be provided in lieu of metal reglets for temporary construction.

3.1.13 Gravel Stops and fascia

Prefabricate in the shapes and sizes indicated and in lengths not less than 8 feet. Extend flange at least 4 inches onto roofing. Provide prefabricated, mitered corners internal and external corners. Install gravel stops and fascia after all plies of the roofing membrane have been

applied, but before the flood coat of bitumen is applied. Prime roof flange of gravel stops and fascia on both sides with an asphalt primer. After primer has dried, set flange on roofing membrane and strip-in. Nail flange securely to wood nailer with large-head, barbed-shank roofing nails 1.5 inch long spaced not more than 3 inches on center, in two staggered rows.

3.1.13.1 Edge Strip

Hook the lower edge of fascia at least 3/4 inch over a continuous strip of the same material bent outward at an angle not more than 45 degrees to form a drip. Nail hook strip to a wood nailer at 6 inches maximum on center. Where fastening is made to concrete or masonry, use screws spaced 12 inches on center driven in expansion shields set in the concrete or masonry. Where horizontal wood nailers are slotted to provide for insulation venting, install strips to prevent obstruction of vent slots. Where necessary, install strips over 1/16 inch thick compatible spacer or washers.

3.1.13.2 Joints

Leave open the section ends of gravel stops and fascia 1/4 inch and backed with a formed flashing plate, mechanically fastened in place and lapping each section end a minimum of 4 inches set laps in plastic cement. Face nailing will not be permitted. Install prefabricated aluminum gravel stops and fascia in accordance with the manufacturer's printed instructions and details.

3.1.14 Metal Drip Edges

Provide a metal drip edge, designed to allow water run-off to drip free of underlying construction, at eaves and rakes prior to the application of roofing shingles. Apply directly on the wood deck at the eaves and over the underlay along the rakes. Extend back from the edge of the deck not more than 3 inches and secure with compatible nails spaced not more than 10 inches on center along upper edge.

3.1.15 Gutters

The hung type of shape indicated and supported on underside by brackets that permit free thermal movement of the gutter. Provide gutters in sizes indicated complete with mitered corners, end caps, outlets, brackets, and other accessories necessary for installation. Bead with hemmed edge or reinforce the outer edge of gutter with a stiffening bar not less than 3/4 by 3/16 inch of material compatible with gutter. Fabricate gutters in sections not less than 8 feet. Lap the sections a minimum of one inch in the direction of flow or provide with concealed splice plate 6 inches minimum. Join the gutters, other than aluminum, by riveted and soldered joints. Join aluminum gutters with riveted sealed joints. Provide expansion-type slip joints midway between outlets. Install gutters below slope line of the roof so that snow and ice can slide clear. Support gutters on adjustable hangers spaced not more than 30 inches on center by continuous cleats and or by cleats spaced not less than 36 inches apart. Adjust gutters to slope uniformly to outlets, with high points occurring midway between outlets. Fabricate hangers and fastenings from compatible metals.

3.1.16 Downspouts

Space supports for downspouts according to the manufacturer's

recommendation for the substrate. Types, shapes and sizes are indicated. Provide complete including elbows and offsets. Provide downspouts in approximately 10 foot lengths. Provide end joints to telescope not less than 1/2 inch and lock longitudinal joints. Provide gutter outlets with wire ball strainers for each outlet. Provide strainers to fit tightly into outlets and be of the same material used for gutters. Keep downspouts not less than one inch away from walls. Fasten to the walls at top, bottom, and at an intermediate point not to exceed 5 feet on center with leader straps or concealed rack-and-pin type fasteners. Form straps and fasteners of metal compatible with the downspouts.

3.1.16.1 Terminations

Neatly fit into the drainage connection the downspouts terminating in drainage lines and fill the joints with a portland cement mortar cap sloped away from the downspout. Provide downspouts terminating in splash blocks with elbow-type fittings. Provide splash pans as specified.

3.1.17 Flashing for Roof Drains

Provide a 30 inches square sheet indicated. Taper insulation to drain from 24 inches out. Set flashing on finished felts in a full bed of asphalt roof cement, ASTM D4586/D4586M. Heavily coat the drain flashing ring with asphalt roof cement. Clamp the roof membrane, flashing sheet, and stripping felt in the drain clamping ring. Secure clamps so that felts and drain flashing are free of wrinkles and folds. Retrofit roof drains must conform to ANSI/SPRI RD-1.

3.1.18 Conductor Heads

Set the depth of the top opening equal to two-thirds of the width or the conductor head. Flat-lock solder seams. Where conductor heads are used in conjunction with scuppers, set the conductor a minimum of 2 inches wider than the scupper. Attach conductor heads to the wall with masonry fasteners. Securely fasten screens to heads.

3.1.19 Splash Pans

Install splash pans lapped with horizontal roof flanges not less than 4 inches wide to form a continuous surface. Bend the rear flange of the pan to contour of can't strip and extend up 6 inches under the side wall covering or to height of base flashing under counterflashing. Bed the pans and roof flanges in plastic bituminous cement and strip-flash as specified.

3.1.20 Eave Flashing

One piece in width, applied in 8 to 10 foot lengths with expansion joints spaced as specified in paragraph EXPANSION AND CONTRACTION. Provide a 3/4 inch continuous fold in the upper edge of the sheet to engage cleats spaced not more than 10 inches on center. Locate the upper edge of flashing not less than 18 inches from the outside face of the building, measured along the roof slope. Fold lower edge of the flashing over and loose-lock into a continuous edge strip on the fascia. Where eave flashing intersects metal valley flashing, secure with one inch flat locked joints with cleats that are 10 inches on center.

3.1.21 Sheet Metal Covering on Flat, Sloped, or Curved Surfaces

Except as specified or indicated otherwise, cover and flash all minor flat,

sloped, or curved surfaces such as crickets, bulkheads, dormers and small decks with metal sheets of the material used for flashing; maximum size of sheets, **16 by 18 inches**. Fasten sheets to sheathing with metal cleats. Lock seams and solder. Lock aluminum seams as recommended by aluminum manufacturer. Provide an underlayment of roofing felt for all sheet metal covering.

3.1.22 Expansion Joints

Provide expansion joints as indicated. Provide expansion joints in continuous sheet metal **to match existing conditions**.

3.1.22.1 Roof Expansion Joints

Consist of curb with wood nailing members on each side of joint, bituminous base flashing, metal counterflashing, and metal joint cover. Bituminous base flashing is specified in Roofing Section. Provide counterflashing as specified in paragraph COUNTERFLASHING, except as follows: Provide counterflashing with vertical leg of suitable depth to enable forming into a horizontal continuous cleat. Secure the inner edge to the nailing member. Make the outer edge projection not less than **one inch** for flashing on one side of the expansion joint and be less than the width of the expansion joint plus **one inch** for flashing on the other side of the joint. Hook the expansion joint cover over the projecting outer edges of counterflashing. Provide roof joint with a joint cover of the width indicated. Hook and lock one edge of the joint cover over the shorter projecting flange of the continuous cleat, and the other edge hooked over and loose locked with the longer projecting flange. Joints are specified in Table II.

3.1.23 Flashing at Roof Penetrations and Equipment Supports

Provide metal flashing for all **structural components**, pipes, ducts, **expansion joints**, **vents**, **equipment curbs**, and conduits projecting through the roof surface and for equipment supports, guy wire anchors, and similar items supported by or attached to the roof deck. Goose-necks, rain hoods, power roof ventilators, and , **as indicated**.

3.1.24 Single Pipe Vents

See Table I, footnote (d). Set flange of sleeve in bituminous plastic cement and nail **3 inches** on center. Bend the top of sleeve over and extend down into the vent pipe a minimum of **2 inches**. For long runs or long rises above the deck, where it is impractical to cover the vent pipe with lead, use a two-piece formed metal housing. Set metal housing with a metal sleeve having a **4 inches** roof flange in bituminous plastic cement and nailed **3 inches** on center. Extend sleeve a minimum of **8 inches** above the roof deck and lapped a minimum of **3 inches** by a metal hood secured to the vent pipe by a draw band. Seal the area of hood in contact with vent pipe with an approved sealant.

3.1.25 Stepped Flashing

Provide stepped flashing where sloping roofs surfaced with shingles abut vertical surfaces. Place separate pieces of base flashing in alternate shingle courses.

3.2 PAINTING

Touch ups in the field may be applied only after metal substrates have been cleaned and pretreated in accordance with manufacturer's written instructions and products.

Field-paint sheet metal for separation of dissimilar materials.

3.2.1 Aluminum Surfaces

Clean with solvent and apply one coat of zinc-molybdate primer and one coat of aluminum paint.

3.3 CLEANING

Clean exposed sheet metal work at completion of installation. Remove grease and oil films, handling marks, contamination from steel wool, fittings and drilling debris, and scrub-clean. Free the exposed metal surfaces of dents, creases, waves, scratch marks, and solder or weld marks.

3.4 REPAIRS TO FINISH

Scratches, abrasions, and minor surface defects of finish may be repaired in accordance with the manufacturer's printed instructions and as approved. Repair damaged surfaces caused by scratches, blemishes, and variations of color and surface texture. Replace items which cannot be repaired.

3.5 FIELD QUALITY CONTROL

Establish and maintain a [Quality Control Plan](#) for sheet metal used in conjunction with roofing to assure compliance of the installed sheet metalwork with the contract requirements. Remove work that is not in compliance with the contract and replace or correct. Include quality control, but not be limited to, the following:

- a. Observation of environmental conditions; number and skill level of sheet metal workers; condition of substrate.
- b. Verification that specified material is provided and installed.
- c. Inspection of sheet metalwork, for proper size(s) and thickness(es), fastening and joining, and proper installation.

3.5.1 Procedure

Submit for approval prior to start of roofing work. Include a checklist of points to be observed. Document the actual quality control observations and inspections. Furnish a copy of the documentation to the Contracting Officer at the end of each day.

TABLE I. SHEET METAL WEIGHTS, THICKNESSES, AND GAGES					
Sheet Metal Items	Copper kilograms per square foot	Aluminum, inch	Stainless Steel, inch	Terne-Coated Stainless Steel, inch	
Building Expansion Joints					
Cover	16	.032	.015	.015	24
Waterstop-bellow or flanged, U-type.	16	-	.015	.015	-
Covering on minor flat, pitched or curved surfaces	20	.040	.018	.018	-
Downspouts and leaders	16	.032	.015	.015	24
Downspout clips and anchors	-	.040 clip .125 anchor	-	-	-
Downspout straps, 2-inch	48 (a)	.060	.050	-	-
Conductor heads	16	.032	.015	.015	-
	20	.032	.015	.015	-
	No. 9 gage	.144 diameter	.109 diameter	-	
Flashings:					
Base	20	.040	.018	.018	24
Cap (Counter-flashing)	16	.032	.015	.015	26
Eave	16	-	.015	.015	24
	10	-	.010	.010	-
Bond barrier	16	-	.015	.015	-
Stepped	16	.032	.015	.015	-
	16	.032	.015	.015	-

TABLE I. SHEET METAL WEIGHTS, THICKNESSES, AND GAGES					
Sheet Metal Items	Copper kilograms per square foot	Aluminum, inch	Stainless Steel, inch	Terne-Coated Stainless Steel, inch	
Roof drain	16 (b)				
Pipe vent sleeve (d)					
	16	-	-	-	-
Extrusions					
	-	.075	-	-	-
Sheets, corrugated	16	.032	.015	.015	-
Sheets, smooth	20	.050	.018	.018	24
Edge strip	24	.050	.025	-	-
Gutters:					
Gutter section	16	.032	.015	.015	24
Continuous cleat	16	.032	.015	.015	24
Hangers, dimensions	1 inch by 1/8 inch (a)	1 inch by .080 inch (c)	1 inch by inch	-	-
Joint Cover plates (See Table II)	16	.032	.015	.015	24
Reglets (c)	10	-	.010	.010	-
Splash pans	16	.040	.018	.018	-
(a) Brass.					
(b) May be lead weighing 4 pounds per square foot.					
(c) May be polyvinyl chloride.					

TABLE I. SHEET METAL WEIGHTS, THICKNESSES, AND GAGES						
Sheet Metal Items	Copper kilograms per square foot	Aluminum, inch	Stainless Steel, inch	Terne-Coated Stainless Steel, inch		
(d) 2.5 pound minimum lead sleeve with 4 inch flange. Where lead sleeve is impractical, refer to paragraph SINGLE PIPE VENTS for optional material.						

TABLE II. SHEET METAL JOINTS			
TYPE OF JOINT			
Item Designation	Copper, Terne-Coated Stainless Steel, Zinc-Coated Steel and Stainless Steel	Aluminum	Remarks
Joint cap for building expansion seam, cleated joint at roof	1.25 inch single lock, standing seam, cleated	1.25 inch single lock, standing	--
Flashings			
Base	One inch 3 inch lap for expansion joint	One inch flat locked, soldered; sealed; 3 inch lap for expansion joint	Aluminum manufacturer's recommended hard setting sealant for locked aluminum joints. Fill each metal expansion joint with a joint sealing compound.
Cap-in reglet	3 inch lap	3 inch lap	Seal groove with joint sealing compound.

TABLE II. SHEET METAL JOINTS			
TYPE OF JOINT			
Item Designation	Copper, Terne-Coated Stainless Steel, Zinc-Coated Steel and Stainless Steel	Aluminum	Remarks
Reglets	Butt joint	--	Seal reglet groove with joint sealing compound.
Eave	One inch flat locked, cleated. One inch loose locked, sealed expansion joint, cleated.	One inch flat locked, locked, cleated one inch loose locked, sealed expansion joints, cleated	Same as base flashing.
Stepped	3 inch lap	3 inch lap	--
Valley	6 inch lap cleated	6 inch lap cleated	--
Edge strip	Butt	Butt	--
Gravel stops:			
Extrusions	--	Butt with 1/2 inch space	Use sheet flashing beneath and a cover plate
Sheet, smooth	Butt with 1/4 inch space	Butt with 1/4 inch space	Use sheet flashing backup plate.
Sheet, corrugated	Butt with 1/4 inch space	Butt with 1/4 inch space	Use sheet flashing beneath and a cover plate or a combination unit
Gutters	1.5 inch lap, riveted and soldered	One inch flat locked riveted and sealed	Aluminum producers recommended hard setting sealant for locked aluminum joints.
(a) Provide a 3 inch lap elastomeric flashing with manufacturer's recommended sealant.			
(b) Seal Polyvinyl chloride reglet with manufacturer's recommended sealant.			

] -- End of Section --

SECTION 07 61 15.00 20

ALUMINUM STANDING SEAM ROOFING

08 March 2021

PART 1 GENERAL

1.1 REFERENCES

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

ALUMINUM ASSOCIATION (AA)

AA ADM-105 (2005; Errata 2005) Aluminum Design Manual

AA ASM-35 (2000) Specifications for Aluminum Sheet Metal Work in Building Construction, Construction Manual Series Section 5

AMERICAN FOREST & PAPER ASSOCIATION (AF&PA)

AF&PA T101 (2005) National Design Specification (NDS) for Wood Construction

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG03-3 (2002; Suppl 2001-2004; R 2008) Cold-Formed Steel Design Manual Set

ASTM INTERNATIONAL (ASTM)

ASTM B117 (2011) Standard Practice for Operating Salt Spray (Fog) Apparatus

ASTM D1654 (2008) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments

ASTM D2247 (2011) Testing Water Resistance of Coatings in 100% Relative Humidity

ASTM D2565 (1999; R 2008) Xenon Arc Exposure of Plastics Intended for Outdoor Applications

ASTM D4214 (2007) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films

ASTM D522 (1993a; R 2008) Mandrel Bend Test of Attached Organic Coatings

ASTM D523 (2008) Standard Test Method for Specular Gloss

ASTM D714 (2002; R 2009) Evaluating Degree of Blistering of Paints

- ASTM D968 (2005; R 2010) Abrasion Resistance of Organic Coatings by Falling Abrasive
- ASTM E84 (2012) Standard Test Method for Surface Burning Characteristics of Building Materials
- ASTM G152 (2006) Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
- ASTM G153 (2004; R 2010) Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)

- NRCA Details (2003) NRCA Roof Perimeter Flashing Systems Construction Details for Class 1 Roof Construction

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

- SMACNA 1013 (2012) Architectural Sheet Metal Manual, 7th Edition

METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)

NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)
PORCELAIN ENAMEL INSTITUTE (PEI)

UNDERWRITERS LABORATORIES (UL)

FM GLOBAL (FM)

1.2 DEFINITIONS

1.2.1 Roof Truss system Type A

Building has roof trusses built out of wood. Typical spacing of trusses is 24" OC. Field verify.

1.2.2 Roof Truss system Type B

Building has trusses made of light gage steel c-channels spot welded back to back. Original decking was attached by nails driven into the gap of the back to back channels. Typical spacing is 24" OC. Field verify.

1.2.3 Roof Truss system Type C

Building has trusses made of a single light gage steel C-channel. The decking is attached by driving a nail into a nailing slot in the flange of the channel. Typical spacing is 24" OC but this has not been observed to be consistent. Field verify

1.2.4 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. Provide continuous length panels with no joints or seams, except where indicated. Individual panels shall be removable for replacement of damaged material.
- b. There shall be no exposed or penetrating fasteners except where shown on the approved shop drawings. Fasteners shall be of materials compatible with aluminum as recommended by the manufacturer. Length and diameter of screws shall be sufficient to meet the design loads with a suitable factor of safety for the material to which the roofing components are attached. Calculate fastener capacity in accordance with AISI SG03-3, AA ADM-105 or AF&PA T101 as applicable.
- c. Roof panel standing seam shall include a capillary break and be mechanically locked closed by the manufacturer's locking tool. The seam shall include a continuous sealant when required by the manufacturer to withstand the rainfall and wind specified in paragraph entitled "Manufacturer's Requirements."
- d. Roof panel anchor clips shall be concealed and designed to allow for thermal movement of the panels, except where specific fixed points are indicated.
- e. The system shall resist the positive and negative loads specified herein in accordance with "Sheet Building Sheathing Design Guide" of the AA ADM-105.
- f. Panels shall support walking loads without excessive distortion or telegraphing of the structural supports. Panels shall support a 250 pound load concentrated on a four square inch area at the center of the panel without buckling or permanent distortion.

1.3.2 Performance Requirements

1.3.2.1 Static pressure air infiltration (Roof panels)

Pressure Leakage Rate per ASTM E1680:

- a. 1.57 PSF 0.0012 cfm/ sq. ft.
- b. 6.24 PSF 0.0001 cfm/ sq. ft.
- c. 20.0 PSF 0.0011 cfm/ sq. ft.

1.3.2.2 Static pressure water infiltration (Roof panels)

Text Pressure Result per ASTM E1646:

- a. 5 Gal. / Hr. per S.F. and Static NO LEAKAGE
- b. Pressure of 20.0 PSF for 15 Minutes NO LEAKAGE

1.3.2.3 Tests

Capacities for gauge, span or loading other than those tested may be determined by interpolation of test results within the range or test data. Extrapolations for conditions outside test range are not acceptable.

1.3.2.4 Water penetration (dynamic pressure):

No water penetration, other than condensation, when exposed to dynamic rain and 70 mph wind velocities for not less than five minutes duration, when tested in accord with principles of AAMA 501.1.

1.3.2.5 Wind and wind driven rain resistance

No water penetration, other than condensation, when exposed to dynamic rain and 70 mph wind velocities for not less than five minutes duration, when tested in accord with principles of AAMA 501.1.

1.3.2.6 Roof pressures

The installed roof system assembly shall show that it can resist the calculated roof pressure in section 1.11.B in accordance with the test results of TAS 125.

1.3.2.7 Water penetration in low slope application

No water penetration or panel movement when subject to 6" head of water for 6 hours when tested in accordance with the ASTM E2140 and when subject to 6" head of water for 7 days when tested in accordance with the TAS 114 appendix

1.3.2.8 Hydrostatic Head Resistance

No water penetration when tested according to ASTM E2140. Submit Leakage test report upon completion of installation with submittal data.

1.3.2.9 Wind Uplift Resistance

Provide metal roof panel system that conform to the requirements of ASTM E1592 and UL580. Uplift force due to wind action governs the design for panels. Submit wind uplift test report prior to commencing installation. Submit licensed Wind uplift calculations engineer's and substantiating data to validate any non-rated roof system. Base wind uplift measurements on a design wind speed of 209 km/h 150mph in accordance with ASCE 7 and/or other applicable building code requirements. Metal roof panels and component materials must also comply with the requirements in FM4471 as part of a panel roofing system as listed in Factory Mutual Guide (FMG) "Approval Guide" for class 1 or noncombustible construction, as applicable. Identify all materials with FMG Markings.

1.3.2.10 Standing Seam Water - Stop test:

Comply with ASTM E1680, ASTM E1646, AAMA 501.1, and ASTM E2140.

1.3.2.11 Fire Test

When required comply with ASTM E108 or UL 790.

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-02 Shop Drawings

Roofing Panels; G

Gutter/Downspout System; G

Submit drawings as necessary 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. Show typical and special conditions including flashings, accessory installation, materials and thicknesses, all dimensions, anchoring methods, sealant locations, sealant tape locations, fastener layout, sizes, spacing, provisions for thermal movement, terminations, penetrations, and attachments. Details of installation shall be in accordance with the manufacturer's Standard Instructions and details or the SMACNA 1013. The manufacturer's technical engineering department shall approve the drawings before they are submitted.

SD-03 Product Data

Roofing Panels; G

Attachment Clips; G

Closures

Accessories

Underlayment

Fasteners

Sealant Tape

Gaskets

Sealant

Sealing Compounds

Sample Warranty Certificate; G

Submit for all materials to be provided. Submit data sufficient to indicate conformance to specified requirements.

SD-04 Samples

Roofing panels

Submit a 12 inch long section of typical panel in color selected.

When colors are not indicated, submit samples of not less than six different manufacturer's standard colors for selection.

Accessories

Submit each type of accessory item used in the project including, but not limited to: each type of anchor clip, closures, fasteners and leg clamps.

SD-05 Design Data

Load calculations; G

SD-06 Test Reports

Structural performance; G

Panel Finish (Color); G

Leakage Test Report

Wind Uplift Test Report

Factory Finish And Color Performance Requirements

Submit reports of the tests required by this section.

Manufacturer's field inspection; G

Submit manufacturer's technical representative's inspection reports as required in paragraph entitled "Manufacturer's Field Inspection."

SD-07 Certificates

Technical representative

Qualification of Installer

Submit documentation proving the installer is factory-trained, has the specified experience and is authorized by the manufacturer to install the products specified.

Coil stock compatibility

Provide certification of coil compatibility with roll forming machinery to be used for forming panels without warping, waviness, and rippling not part of panel profile; to be done without damage, abrasion or marking of finish coating.

Qualification of Manufacturer

Qualifications of Applicator

SD-08 Manufacturer's Instructions

Sealant

Submit manufacturer's sealant requirements for making the standing seam watertight when subjected to 5 inches of rainfall per hour simultaneous with 124 mph winds.

Installation manual

Submit manufacturer's 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 LOAD CALCULATIONS

Submit load calculations for the following by a structural engineer registered as a Professional Engineer in any jurisdiction verifying that the system supplied meets the design loads indicated. Coordinate calculations with manufacturer's test results.

- a. Wind load uplift design pressure at roof locations specified in paragraph entitled "Wind Loads."
- b. Clip spacing and allowable load per clip calculations.
- c. The fastening of clips to structure or intermediate support spacing.
- d. Intermediate support spacing and fastening to structure when required.
- e. Allowable panel span at anchorage spacing indicated.
- f. Safety factor used in determining loading.

1.6 QUALITY ASSURANCE

1.6.1 Preroofing Conference

After submittals are received and approved but before roofing and insulation work, including associated work, is performed, the Contractor shall 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 prerooting conference shall be attended by the Contractor and personnel directly responsible for the roofing and insulation installation, mechanical and electrical work, and the roofing manufacturer's technical representative. Conflicts among those attending the prerooting conference shall be resolved and confirmed in writing before roofing work, including associated work, is begun. Prepare written minutes of the prerooting conference and submit to the Contracting Officer.

1.6.2 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.

When the project is in progress, the roofing system manufacturer shall provide the following:

1.6.2.1 [Work Progress](#)

Keep the Owner informed as to the progress and quality of the work as observed. Photographic Inspection Report to be turned in on a weekly basis to the Owner.

1.6.2.2 [Inspections](#)

Provide job site inspections a minimum of THREE days a week.

1.6.2.3 [Reports](#)

Report to the Owner in writing any failure or refusal of the Contractor to correct unacceptable practices called to the Contractor's attention.

1.6.2.4 [Confirmation of work done](#)

Confirm after completion that manufacturer has observed no application procedures in conflict with the specifications other than those that may have been previously reported and corrected.

1.6.2.5 [Annual Inspection](#)

The roofing manufacturer must inspect the roof on an annual basis and submit an annual inspection report to Public Works at MC Base Camp Lejeune and MCAS New River.

1.6.2.6 [Manufacturer Inspector](#)

The manufacturer's inspector must be a full time employee of the manufacturer with a minimum 5 years experience inspecting the specified roof system. A signed copy to attest to the full time employ and tenure of the inspector by the president of the manufacturing company will accompany submittals.

1.6.3 Qualification of Installer

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 five (5) years experience as an approved applicator with that manufacturer. The applicator shall have applied five installations of similar size and scope to this project within the previous 3 years.

1.6.4 Single Source

Provide roofing panels, clips, closures and other accessories from a single manufacturer. Provide the most recent design of the manufacturer to operate as a complete system for the intended use.

1.6.5 Manufacturer

The SSMRS shall be the product of a metal roofing industry recognized SSMRS 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.

1.6.6 Qualifications for Welding Work

Welding procedures must conform to AWS D1.1/D1.1M for steel or AWS D1.2/D1.2M for aluminum.

Operators are permitted to make only those types of weldments for which each is specifically qualified.

1.6.7 Field Verification

Prior to the preparation of drawings and fabrication, verify location of roof framing, roof openings and penetrations, and any other special conditions. Indicate all special conditions and measurements on final shop drawings.

1.7 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.

1.7.1 Delivery

Provide adequate packaging to protect materials during shipment. Do not uncrate materials until ready for use except for inspection. Immediately upon arrival of materials at jobsite, inspect materials for damage, dampness, and staining. Replace damaged or permanently stained materials that cannot be restored to like-new condition with new material. If materials are wet, remove moisture, restack and protect panels until used.

1.7.2 Handling

Handle material carefully to avoid damage to surfaces, edges and ends.

1.7.3 Storage

Stack materials stored on the site on platforms or pallets and cover with tarpaulins or other suitable weathertight coverings which prevent water trapping or condensation. Store panels 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 Warranty

Furnish manufacturer's no dollar limit materials and workmanship warranty for the roofing system. The warranty period shall be not less than 30 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, peeling paint, rupture or excess weathering due to deterioration of the roofing system resulting from defective materials or 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 and contractor as described herewith. Contractor shall also provide a 2 year contractor installation warranty during which time the materials are covered by the manufacturer per the warranty period described above. Provide coverage for damage to the roofing system caused by sustained winds having a velocity up to and including 130 mph.

Applications over existing structures: Up to and including 130 mph.

New Construction: Up to and including 150 mph.

PART 2 PRODUCTS

2.1 ROOFING PANELS

2.1.1 Material

3004 aluminum, ASTM B209 and AA ADM1.

All products must be American made and manufactured in a plant owned and operated by the roofing manufacturer listed in the submittals. Product re-labeling will not be acceptable.

2.1.1.1 Thickness

0.040 inch minimum.

2.1.1.2 Finish

Exposed Coil-Coated Finish: 2-Coat Fluoropolymer. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Manufacturers' approved applicator to prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions. Coating system shall provide nominal 1.0 mil (0.025 mm) dry film thickness, consisting of primer and color coat.

Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.1.1.3 Texture

Smooth with raised intermediate ribs for added stiffness.

2.1.1.4 Color

As selected from the Manufacturer full array of offered colors and textures.

2.1.1.5 Configuration

a. Provide panels of continuous lengths from ridge to eaves or from top to eaves on shed roof designs. Panels from coil stock shall be formed without warping, waviness or ripples not a part of the panel profile, and shall be free of damage to the finish coating system.

b. Provide panels with UNLIMITED thermal movement.

c. Profile: 2 3/8" high seam at 16" o.c.; mechanically seamed "T" seam; continuous length, no splicing; Concealed 16 GA one piece stainless steel clip not to come in contact with seam sealant.

d. Panel/Cap configuration must have a total of four (4) layers of aluminum surrounding anchor clip for prevention of water infiltration and increased system strength designed to limit potential for panel blow-off.

e. Profile of panel shall have mesas every two (2) inches on center continuous throughout the panel which are a minimum of one and one half (1-1/2) inches wide.

f. Seam must be two and three-eighths (2 3/8) inches minimum height for added upward pressures and aesthetic appeal. Seam shall have continuous anchor reveals to allow anchor clips to resist positive and negative loading and allow unlimited expansion and contraction of panels due to thermal changes. Integral (not mechanically sealed) seams are unacceptable.

g. Seam cap: Snap on cap shall be a minimum of 1" wide "T" shaped of continuous length up to forty five (45) feet according to job conditions and field seamed by means of manufacturer's standard seaming machine.

h. Cap shall be designed to receive two (2) beads of continuous gasketing sealant, which will be applied independent of of anchor clip, to allow unlimited thermal movement of panel without serious damage to cap sealant.

i. Stiffening ribs : Located in flat of panel to minimize oil canning and telegraphing of structural members.

j. Replaceability: Panels shall be of a symmetrical design with snap on, mechanically seamed cap configuration such that individual panels may be removable for replacement without removing adjacent panels and uncrimping the existing seam (Panels will be removed by replacing the batten seam cap only to maintain the structural integrity of the panel and seam. Uncrimping and retrimming a mechanical seam is unacceptable.

k. Panel ends shall be panned at ridge, headwall, and hip conditions, or where applicable.

l. Panel length: Full length without joints, including bends.

2.2 ATTACHMENT CLIPS

Provide one-piece clips of compatible materials to aluminum roof panels. Size, shape, thickness and capacity must meet the thickness and design load criteria specified. Two piece clips are not acceptable.

2.3 ACCESSORIES

Sheet metal flashings, trim, moldings, closure strips, caps, preformed crickets, equipment curbs, gutters, down spouts, and other similar sheet metal accessories provided in conjunction with preformed metal panels shall be of the same material and finish as panels, except that such items which will be concealed after installation may be provided without the finish if they are aluminum or stainless steel. Provide ridge and rib closures, as specified. Metal shall be of thickness not less than that of panels. Molded closure strips shall be closed-cell synthetic rubber, neoprene, or polyvinyl chloride premolded to match configurations of preformed metal panels. Thermal spacer blocks and other thermal barriers at concealed fasteners shall be as recommended by the roofing panel manufacturer.

2.3.1 Closures

2.3.1.1 Ridge Closure

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.

2.3.1.2 Rib Closure

Aluminum, 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.

2.3.2 Fasteners

Series 300 stainless steel with composite metal and neoprene composition washers. Fasteners for attachment to structural supports and fasteners for attachment of panels shall be as approved and in accordance with manufacturer's recommendation. Unless specified otherwise herein, fasteners shall be either self-tapping screws, bolts and nuts, or self-locking bolts. Design fastening system to withstand design loads indicated. Fasteners shall not be over-torqued and shall develop full capacity of attachment clips.

2.3.2.1 Screws

Concealed fasteners: Corrosion resistant steel screws, #10 minimum diameter x length appropriate for substrate, hex washer head or pancake head. Use self-drilling, self-tapping for metal substrate or A-point for plywood substrate.

Exposed fasteners: 3xx series stainless steel screws (cadmium or zinc coatings are not acceptable) with neoprene sealing washer, or 1/8-inch- (3-mm-) diameter stainless steel rivets.

2.3.2.2 Bolts

Provide not less than 1/4 inch diameter, shouldered or plain shank as

required, with proper nuts.

2.3.2.3 Automatic End-Welded Studs

Provide shouldered type with a shank diameter of not less than $3/16$ inch and cap or nut for holding covering against the shoulder.

2.3.2.4 Explosive Driven Fasteners

Provide fasteners to be driven with explosive actuated tools and with a shank diameter of not less than $1/2$ inch for fastening to steel and not less than one inch for fastening to concrete.

2.3.2.5 Rivets

Blind rivets shall be aluminum with $3/16$ inch nominal diameter shank or stainless steel with $1/8$ inch nominal diameter shank. Rivets shall be threaded stem type if used for other than fastening trim. Rivets with hollow stems shall have closed ends.

2.3.3 Sealant

Provide manufacturer's recommended elastomeric exposed sealant. Provide non-hardening, non-shrinking concealed sealants. Silicone-based sealants shall not be used in contact with finished metal panels and components unless approved otherwise by the Contracting Officer.

2.3.4 Sealant Tape

Polyvinyl chloride closed cell foam tape or composed of 99 percent solids in a base of butyl polyisobutylene rubber with the following properties and characteristics:

- a. Webbing and Elongation: 100 percent minimum at 77 degrees F
- b. Adhesion: Excellent to surfaces used
- c. U-V light exposure: No effect
- d. Ozone: No effect
- e. Weathering: 1000 hours in QUV Test Apparatus - Excellent, no cracking, bleeding, or significant changes.
- f. Moisture Transmission: 0.05 to 0.15 grams per 100 square inches in 24 hours.
- g. Service Temperature Tests: Bending over $1/2$ inch mandrel at minus 60 degrees F with no cracking. Expose sealed typical metal lap joint to plus 350 degrees F for 24 hours with no significant loss of original properties.
- h. Reaction to Metals: Non-corrosive to metals

2.4 UNDERLAYMENT FOR WOOD SUBSTRATES

Apply Self-adhering rubberized asphaltic membrane over the entire roof area. Minimum of 1 mm 40 mils thick, high temperature as recommended by the standing seam manufacturer for use over entire roof and flashing

conditions. Products shall meet or exceed the performance criteria of ASTM D1970/D197M. For areas subjected to excessive humidity generated by building equipment or occupant usage (such as swimming pools, locker rooms, etc), submit a synthetic, vapor permeable, UV-resistant membrane for approval.

2.5 LABORATORY TESTS FOR PANEL FINISH

Previously manufactured panels of the same type and finish as proposed for the project shall have been tested by an approved testing laboratory to ensure conformance to specifications. The term "appearance of base metal" refers to the aluminum base metal. Panels shall meet the following test requirements.

2.5.1 Salt Spray Test

Panels shall withstand a salt spray test for a minimum of 1000 hours in accordance with ASTM B117, including the scribe requirement in the test. Immediately upon removal of the panel from the test, coating shall receive a rating of 10, no blistering, as determined by ASTM D714; and a rating of 7, 1/16 inch failure at scribe, as determined by ASTM D1654, Rating Schedule No. 1.

2.5.2 Formability Test

For formability test, when subjected to a 180 degree bend over a 1/8 inch diameter mandrel in accordance with ASTM D522, exterior coating film shall show only microchecking of the exterior film and there shall be no loss of adhesion.

2.5.3 Accelerated Weathering Test

Panels shall withstand an accelerated weathering test for a minimum of 2000 hours in accordance with ASTM G152, ASTM G153 or ASTM D2565 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.

2.5.4 Chalking Resistance

After the 2000-hour weatherometer test, exterior coating shall not chalk greater than No. 8 rating when measured in accordance with ASTM D4214 test procedures.

2.5.5 Abrasion Resistance Test for Color Coating

When subjected to the falling sand test in accordance with ASTM D968, coating system shall withstand a minimum of 100 liters of sand per mil of coating thickness before appearance of base metal.

2.5.6 Humidity Test

When subjected to a humidity cabinet test in accordance with ASTM D2247 for 1000 hours, a scored panel shall show no signs of blistering, cracking, creepage, or corrosion.

2.5.7 Fire Hazard

The finish on factory-fabricated panels shall have a flame spread rating of not more than 25 when tested in accordance with [ASTM E84](#).

2.5.8 Gloss

The gloss of the finish shall be 30 plus or minus 5 at an angle of 60 degrees, when measured in accordance with [ASTM D523](#).

2.5.9 Glare Resistance

Surfaces of panels that will be exposed to the exterior shall have a specular reflectance of not more than 10 when measured in accordance with [ASTM D523](#) at an angle of 85 degrees. Requirements specified under "Formability Test" will be waived if necessary to conform to this requirement.

2.6 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.

2.7 Retrofit Framing Over Existing Roofs

2.7.1 Shop Drawings

Show roof framing system with accessories in plan, sections and details. Include complete drawing/description of each framing component and fastener, including metal thickness and finishes, connection details, anchorage details, and special fabrication provisions. Indicate relationships with adjacent and interfacing work. Indicate fastener types and spacing; and provide fastener pullout values.

2.7.2 Product Data

Include manufacturer's detailed material and system description, engineering performance data and finish specifications. Indicate fastener types and spacing; and required fastener pullout values.

2.7.3 Design Loads

Submit copy of manufacturer's minimum design load calculations according to ASCE 7. All loading types shall be considered: dead, live, snow, wind, and seismic.

2.7.4 System Certification

Provide statement certifying the proposed system's capacity to safely resist the calculated design loads. Statement shall be provided by a registered professional engineer and co-signed by an officer of the manufacturing company.

2.7.5 Warranties

Owner shall receive one (1) warranty from manufacturer of each roof framing system covering all of the following criteria. Ten (10) year material coverage. Warranty shall commence on date of substantial completion.

Owner shall receive one (1) warranty from the installer of the roof framing systems covering installation and workmanship for a period of three (3) years from date of substantial completion.

2.7.6 Notched Purlin Type Framing System

Shall be 16 gauge minimum galvanized steel meeting all requirements of STM A653, Grade 33 (minimum) with a hot dipped galvanized coating per ASTM A924, class G90.

Notched purlin profile shall be a stiffened zee shape with notched bottom flange and web to match the profile of the existing metal panel. The top flange shall be one and three quarters (1 ¾) inch wide (minimum) to provide for attachment of the standing seam panel clips.

The web height of the notched purlin shall be as required for installation over the existing metal panels, and to accomplish the panel lap detail for replacement standing seam roof panels as detailed on drawings.t

2.7.7 Framing System Installation

Install notched purlin type framing system over existing standing seam roof panels. Locate new framing directly above existing purlin locations, per manufacturer's recommendations.

All details will be shown on manufacturer's shop drawings; install framing system in accordance with approved shop drawings and manufacturer's product data, within specified erection tolerances.

Isolate dissimilar metals and masonry or concrete from metals with bituminous coating. Use gasketed fasteners where required to prevent corrosive action between fastener, substrate, and components.

Limit exposed fasteners to extent indicated on shop drawings.

Attach framing system to existing roof structure using fasteners of size and spacing as determined by manufacturer's design analysis to resist all specified design loads.

Installed system shall be true to line and plane and free of dents, and physical defects.

Maximum variation from true planes or lines shall be one quarter (1/4) inch in twenty (20) feet and three eighths (3/8) inch in forty (40) feet or more. Remove damaged work and replace with new, undamaged components.

Touch up exposed fasteners using paint furnished by roofing panel manufacturer and matching exposed panel surface finish. Remove all miscellaneous materials and debris from roof.

2.8 Standing Seam System over existing Roof Shingles

2.8.1 Demolition

Demolish all the roofing system to the existing substrate, including but not limited to shingles, asphalt paper, flashing, ridge caps, gutters, downspouts, soffits, fascia, etc.

2.8.2 Repair existing substrate

Remove all substrate items (Tongue and groove wood boards - Field Verify) that are damaged and / or are not structurally sound. Match existing materials, shapes and thicknesses.

2.8.3 Re-Deck

Install over the entire existing substrate one layer of 5/8" thick CDX plywood. Fasten as necessary per design described below. Note: Where

existing decking consists of 5/8" (or thicker) CDX plywood, additional CDX overlay is not required. In such case, remove any damaged or rotted CDX material and replace with new before installation of self-adhering membrane and metal roofing components over existing CDX plywood decking.

Type A - Wood. Overlay CDX plywood on existing roof surface using APA fastening pattern for wind uplift resistance based on 150 mph winds.

Type B - Steel Double C-Channel. Fasten CDX plywood to double C-Channel by using #12 self-drilling screws at 6" OC. Ensure self-drilling screws penetrate flange of C-Channel. Do not drive self-drilling screws between steel C-channels as weld may break. Ensure self-drilling screws penetrate C-channel flanges only (either flange is satisfactory). Alternative approach: Install 2x4 nailers under decking and C-channel flange parallel to upper chord of truss. Fasten with #12 x 2 1/2" deck screws at 6" on center.

Type C - Steel Single C-Channel. Fasten CDX plywood to single C-channel by using #12 self-drilling screws at 6" on center. Ensure self-drilling screws penetrate C-channel flanges only.

2.8.4 Re-Deck (complete replacement of existing deck)

Note: Applies only to conditions where existing wood roof decking is called for to be completely demolished and replaced with metal pan: Install new metal pan deck over existing roof structure to conform with ASTM A792/A792M or ASTM A1008/A1008M for metal deck. Fabricate zinc-coated metal in conformance with ASTM A653/A653M, Z275 G90 coating class roof deck. Deck profile, thickness, and fastening to be designed by a registered structural engineer to accommodate allowable deflection under applicable dead and live load criteria.

2.8.5 Roof Board over metal deck:

Note: Applies only to conditions where metal pan decking is installed per Paragraph 2.8.4 above: Install 1/2" Roof Board fire barrier with moisture resistant, non-combustible Gypsum core and with fiberglass matts. Flame spread 0, smoke developed 0, when tested in accordance with ASTM E84 or CAN/ULC-S102. Noncombustible when tested in accordance with ASTM E136.

PART 3 EXECUTION

3.1 EXAMINATION

Examine surfaces to receive standing seam metal roofing and flashing. Provide plumb and true surfaces, clean, even, smooth and as dry as possible. Ensure that surfaces are free from defects and projections which might affect the installation. Report unsuitable conditions to Contracting Officer.

3.2 PROTECTION OF DISSIMILAR METALS

Where an aluminum component is in contact with, fastened to, or contacted by drainage from dissimilar metals other than stainless steel, give such dissimilar metals one of the following treatments:

- a. A heavy brush coat of primer followed by two coats of aluminum metal

and masonry paint.

- b. A heavy coat of alkali-resistant bituminous paint.
- c. Separate contact surfaces with non-absorptive tape or gasket.

3.2.1 Contact with Masonry

Where aluminum is in contact with masonry, concrete, or plaster, apply a heavy coat of alkali-resistant bituminous paint.

3.2.2 Contact with Wood

Where aluminum is in contact with wood or other absorptive material subject to wetting, or with wood treated with a preservative not compatible with aluminum, seal joints with sealing compound and apply one heavy brushcoat of aluminum pigmented bituminous paint.

3.3 INSTALLATION

Install in accordance with approved manufacturer's erection instructions shop drawings, and diagrams, except as specified otherwise herein. Provide panels in full and firm contact with clips. Obtain approval prior to installation on prefinished panels cut in the field, and factory applied coverings or coatings that were repaired after being abraded or damaged during handling or installation. Make repairs with material of same color as weather coating. Completely seal openings through panels. Correct defects or errors in materials in an approved manner. Replace materials which cannot be corrected in an approved manner with new materials. Provide molded closure strips where indicated and where necessary for weathertight construction. Use shims as required to ensure clip line is true. Use a spacing gage at each row of panels to ensure that panel width is not stretched or shortened. Provide one layer of synthetic underlayment with side laps down slope. Overlap side end laps 3 inches.

3.3.1 Roof Panels

Apply roofing panels with standing seams parallel to slope of roof. Provide roofing panels in full 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. Form interlocking rib type panel seams in the field with an automatic mechanical seamer approved by the manufacturer. Attach panels to structure with concealed clips which are incorporated into the panel seams. Clip attachment shall allow roof to move freely and independently of the structure, except at fixed points as indicated.

All "Curving, S-Curbing, and Tapering" shall be mechanically done only. Curved panels must be mechanically factory curved to the exact radius of each curved roof area. Tapered panels must be formed from a single piece of metal. Performance tests must be applicable for the greatest panel width. Any other method shall not be allowed.

Provide Manufacturer's methods for lifting of large panels to prevent panel deformation during its installation. Use manufacturer's spreader bar where applicable to prevent kinking and damage to panels. Field formed panels shall be done with the same factory machinery and methods. Field form machinery must be calibrated daily. For field forming of panels, the manufacturer must use the same equipment used in the factory to form the panels onsite. Manufacturer must engage a factory authorized service representative to form the panels on site and comply with the following:

- a. Roll form operator is to be factory trained and authorized to provide job site operations of the panel forming process with quality control standards.
- b. The panel profile shall be checked and verified to be within acceptable forming tolerances as called for under the factory defined panel quality control fabrication standards (Quality control sheets). These standards define the upper and lower acceptable forming tolerances. The actual forming dimensions shall be on or within these acceptable standards.
- c. Dimensional checks shall be conducted at the beginning of the operation and at the beginning of each new slit coil. This process ensures proper panel profile is being produced with each new slit coil and consistency throughout the project.
- d. These panel dimensions shall be recorded on site in the Daily Report and returned to the factory for quality control review.
- e. Panels shall be formed on heavy duty factory type roll former with no fewer than 16 forming stations to improve quality and minimize oil canning.
- f. Panels shall be of identical profile and characteristics as factory formed panels and specimens used as the basis of performance tests.
- g. Sealant shall be factory applied in a separate factory formed snap on cap. Site/field applied seam sealant is unacceptable. Seam caps may be shipped in 45 feet (11.4 m) or less length and lap spliced over full length panels in accordance with manufacturer's system details.
- h. Site roll-forming equipment shall be owned and maintained by the panel manufacturer and operated by the panel manufacturer's trained full-time experienced technician. The installer must provide additional personnel to handle raw materials and finished product as necessary.

3.3.2 Flashings

Provide flashing and related closures and accessories in connection with preformed metal panels as indicated and as necessary to provide a weathertight installation. Install flashing to ensure positive water drainage away from roof penetrations. Flash and seal roof at ridge, eaves and rakes, at projections through roof, and elsewhere as necessary. Accomplish placement of closure strips, flashing, and sealing material in an approved manner that will ensure complete weathertightness. Details of installation which are not indicated shall be in accordance with the [NRCA Details](#), [SMACNA 1793](#), [AA ASM-35](#), panel manufacturer's printed instructions and details of the approved shop drawings. Installation shall 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 indicated design loads. 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 tapes. 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 Closure/Closure Strips

Set closure/closure strips in joint sealant material.

3.4 CLEANING

Clean exposed sheet metal work at completion of installation. Remove metal shavings, filings, nails, bolts, and wires from roofs on completion to prevent discoloration and harm to the panels and flashing. 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, and solder or weld marks.

3.5 MANUFACTURER'S FIELD INSPECTION

Manufacturer's technical representative shall visit the site as necessary but not less than three (3) days a week during the installation process to assure panels, flashings, and other components are being installed in a satisfactory manner. Refer to 1.6.2.6 for Manufacturer's technical representative field inspections and at substantial completion prior to issuance of warranty. 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.

3.6 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.

3.7 INFORMATION CARD

For each roof, provide a typewritten card, laminated in plastic and framed for interior display or a photoengraved 0.032 inch thick 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 LANTNAVFACENCOM, Code 1613, 1510 Gilbert Street, Norfolk, VA 23511-2699 .

3.8 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 --

SECTION 07 92 00

JOINT SEALANTS

08/16

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 C834	(2017) Standard Specification for Latex Sealants
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM C1193	(2013) Standard Guide for Use of Joint Sealants
ASTM C1521	(2013) Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints
ASTM D2452	(2015; R 2019) Standard Test Method for Extrudability of Oil- and Resin-Base Caulking Compounds
ASTM D2453	(2015; R 2020; E 2020) Standard Test Method for Shrinkage and Tenacity of Oil- and Resin-Base Caulking Compounds

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers
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SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage
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SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications
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UNDERWRITERS LABORATORIES (UL)

UL 2818	(2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings
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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 non-G submittals to the Government for their record. The Government reserves the right to provide additional comments, request resubmittal, rejection and re-submittal to all the non-G submittals. 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-03 Product Data

Sealants; G

Primers; G

Bond Breakers; G

Backstops; G

SD-06 Test Reports

Field Adhesion; G

SD-07 Certificates

Indoor Air Quality For Interior Sealants; S

Indoor Air Quality For Interior Floor Joint Sealants; S

Indoor Air Quality For Interior Acoustical Sealants; S

Indoor Air Quality For Interior Caulking; S

1.3 PRODUCT DATA

Include storage requirements, shelf life, curing time, instructions for mixing and application, and accessories. Provide manufacturer's Safety Data Sheets (SDS) for each solvent, primer and sealant material proposed.

1.4 CERTIFICATIONS

1.4.1 Indoor Air Quality Certifications

Submit required indoor air quality certifications in one submittal package.

1.4.1.1 Adhesives and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party program that products meet the requirements of this Section. Provide current product certification documentation from certification body.. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

]1.5 ENVIRONMENTAL CONDITIONS

Apply sealant when the ambient temperature is between 40 and 90 degrees F.

1.6 DELIVERY AND STORAGE

Deliver materials to the jobsite in unopened manufacturers' sealed shipping containers, with brand name, date of manufacture, color, and material designation clearly marked thereon. Label elastomeric sealant containers to identify type, class, grade, and use. Handle and store materials in accordance with manufacturer's printed instructions. Prevent exposure to foreign materials or subjection to sustained temperatures exceeding 90 degrees F or lower than 0 degrees F. Keep materials and containers closed and separated from absorptive materials such as wood and insulation.

1.7 QUALITY ASSURANCE

1.7.1 Compatibility with Substrate

Verify that each sealant is compatible for use with each joint substrate in accordance with sealant manufacturer's printed recommendations for each application.

1.7.2 Joint Tolerance

Provide joint tolerances in accordance with manufacturer's printed instructions.

1.7.3 Mock-Up

Provide a mock-up of each type of sealant using materials, colors, and techniques approved for use on the project. Approved mock-ups may be incorporated into the Work.

1.7.4 Adhesion

Provide in accordance with ASTM C1193 or ASTM C1521.

PART 2 PRODUCTS

2.1 SEALANTS

Provide sealant products that have been tested, found suitable, and documented as such by the manufacturer for the particular substrates to which they will be applied.

In areas with ambient temperatures that exceed 110 degrees F, do not use polybutene, bituminous, acrylic-latex, polyvinyl acetate latex sealants, polychloroprene (neoprene), polyvinyl chloride (PVC), and polyurethane foams, and neoprene, PVC, and styrene butadiene rubber extruded seals and closure strips due to these materials having maximum recommended surface temperature ranges from 130 to 180 degrees F.

2.1.1 Interior Sealants

Provide ASTM C834 Provide sealant products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content

requirements of **SCAQMD Rule 1168**. Provide certification or validation of **indoor air quality for interior sealants**. Location(s) and color(s) of sealant for the following. Note, color "as selected" refers to manufacturer's full range of color options

LOCATION	COLOR
a. Perimeter of frames at doors, windows, and access panels which adjoin exposed interior concrete and masonry surfaces.	As selected
b. Joints of interior masonry walls and partitions which adjoin columns, pilasters, concrete walls, and exterior walls unless otherwise detailed.	As selected
c. Joints between edge members for acoustical tile and adjoining vertical surfaces.	As selected
d. Interior locations, not otherwise indicated or specified, where small voids exist between materials specified to be painted.	As selected

2.1.2 Exterior Sealants

For joints in vertical surfaces, provide **ASTM C920**, Type S or M, Grade NS, Class 25, Use NT. For joints in horizontal surfaces, provide **ASTM C920**, Type S or M, Grade P, Class 25, Use T. Provide location(s) and color(s) of sealant as follows. Note, color "as selected" refers to manufacturer's full range of color options:

a. As selected from manufacturer's recommended products compatible with system provided.

2.2 PRIMERS

Non-staining, quick drying type and consistency as recommended by the sealant manufacturer for the particular application. Provide primers for interior applications that meet the indoor air quality requirements of the paragraph SEALANTS above.

2.3 BOND BREAKERS

Type and consistency as recommended by the sealant manufacturer to prevent adhesion of the sealant to the backing or to the bottom of the joint. Provide bond breakers for interior applications that meet the indoor air quality requirements of the paragraph SEALANTS above.

2.4 BACKSTOPS

Provide glass fiber roving, neoprene, butyl, polyurethane, or polyethylene foams free from oil or other staining elements as recommended by sealant

manufacturer. Provide 25 to 33 percent oversized backing for closed cell and 40 to 50 percent oversized backing for open cell material, unless otherwise indicated. Provide backstop material that is compatible with sealant. Do not use oakum or other types of absorptive materials as backstops. Type, Class, Grade, and configuration compatible with the system provided. Provide manufacturer's data sheets with tested product.

2.4.1 Rubber

Provide in accordance with ASTM D1056., Type, Class, Grade, and configuration compatible with the system provided. Provide manufacturer's data sheets with tested product.

2.4.2 PVC

Provide in accordance with ASTM D1667.

2.4.3 Synthetic Rubber

Provide in accordance with ASTM C509.

2.4.4 Neoprene

Provide in accordance with ASTM D1056.

2.4.5 Butyl Rubber Based

Provide in accordance with ASTM C1311.

2.4.6 Silicone Rubber Base

Provide in accordance with ASTM C920.

2.5 CAULKING

For interior use and only where there is little or no anticipated joint movement. Provide in accordance with ASTM D2452 and ASTM D2453, Types for each application. Provide products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for interior caulking.

2.6 CLEANING SOLVENTS

Provide type(s) recommended by the sealant manufacturer and in accordance with environmental requirements herein. Protect adjacent aluminum and bronze surfaces from solvents. Provide solvents for interior applications that meet the indoor air quality requirements of the paragraph SEALANTS above.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

Perform a field adhesion test in accordance with manufacturer's instructions and ASTM C1193, Method A or ASTM C1521, Method A, Tail Procedure. Remove sealants that fail adhesion testing; clean substrates,

reapply sealants, and re-test. Test sealants adjacent to failed sealants. Submit [field adhesion](#) test report indicating tests, locations, dates, results, and remedial actions taken.

3.2 SURFACE PREPARATION

Prepare surfaces according to manufacturer's printed installation instructions. Clean surfaces from dirt, frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter that would destroy or impair adhesion. Remove oil and grease with solvent; thoroughly remove solvents prior to sealant installation. Wipe surfaces dry with clean cloths. When resealing an existing joint, remove existing caulk or sealant prior to applying new sealant. For surface types not listed below, provide in accordance with sealant manufacturer's printed instructions for each specific surface.

3.2.1 Steel Surfaces

Remove loose mill scale by sandblasting or, if sandblasting is impractical or would damage finished work, scraping and wire brushing. Remove protective coatings by sandblasting or using a residue free solvent. Remove resulting debris and solvent residue prior to sealant installation.

3.2.2 Aluminum or Bronze Surfaces

Remove temporary protective coatings from surfaces that will be in contact with sealant. When masking tape is used as a protective coating, remove tape and any residual adhesive prior to sealant application. For removing protective coatings and final cleaning, use non-staining solvents recommended by the manufacturer of the item(s) containing aluminum or bronze surfaces.

3.2.3 Concrete and Masonry Surfaces

Where surfaces have been treated with curing compounds, oil, or other such materials, remove materials by sandblasting or wire brushing. Remove laitance, efflorescence and loose mortar from the joint cavity. Remove resulting debris prior to sealant installation.

3.2.4 Wood Surfaces

Ensure wood surfaces that will be in contact with sealants are free of splinters, sawdust and other loose particles.

3.2.5 Removing Existing Hazardous Sealants

For sealants applied prior to 1979, or that have been tested and found to contain polychlorinated biphenyls (PCBs), remove and dispose of these sealants in accordance with Section [02 84 33](#) REMOVAL AND DISPOSAL OF POLYCHLORINATED BIPHENYLS (PCBs).

3.3 SEALANT PREPARATION

Do not add liquids, solvents, or powders to sealants. Mix multicomponent elastomeric sealants in accordance with manufacturer's printed instructions.

3.4 APPLICATION

3.4.1 Joint Width-To-Depth Ratios

Acceptable Ratios:

<u>JOINT WIDTH</u>	<u>JOINT DEPTH</u>	
	Minimum	Maximum
For metal, glass, or other nonporous surfaces:		
1/4 inch (minimum)	1/4 inch	1/4 inch
over 1/4 inch	1/2 of width	Equal to width
For wood, concrete, masonry, stone:		
1/4 inch (minimum)	1/4 inch	1/4 inch
over 1/4 inch to 1/2 inch	1/4 inch	Equal to width
over 1/2 inch to 1 inch	1/2 inch	5/8 inch
Over 1 inch	prohibited	

Unacceptable Ratios: Where joints of acceptable width-to-depth ratios have not been provided, clean out joints to acceptable depths and grind or cut to acceptable widths without damage to the adjoining work. Grinding is prohibited at metal surfaces.

3.4.2 Unacceptable Sealant Use

Do not install sealants in lieu of other required building enclosure weatherproofing components such as flashing, drainage components, and joint closure accessories, or to close gaps between walls, floors, roofs, windows, and doors, that exceed acceptable installation tolerances. Remove sealants that have been used in an unacceptable manner and correct building enclosure deficiencies to comply with contract documents requirements.

3.4.3 Masking Tape

Place masking tape on the finished surface on one or both sides of joint cavities to protect adjacent finished surfaces from primer or sealant smears. Remove masking tape within 10 minutes of joint filling and tooling.

3.4.4 Backstops

Provide backstops dry and free of tears or holes. Tightly pack the back or bottom of joint cavities with backstop material to provide joints in specified depths. Provide backstops where indicated and where backstops are not indicated but joint cavities exceed the acceptable maximum depths specified in JOINT WIDTH-TO-DEPTH RATIOS Table.

3.4.5 Primer

Clean out loose particles from joints immediately prior to application of.

Apply primer to joints in concrete masonry units, wood, and other porous surfaces in accordance with sealant manufacturer's printed instructions. Do not apply primer to exposed finished surfaces.

3.4.6 Bond Breaker

Provide bond breakers to surfaces not intended to bond in accordance with, sealant manufacturer's printed instructions for each type of surface and sealant combination specified.

3.4.7 Sealants

Provide sealants compatible with the material(s) to which they are applied. Do not use a sealant that has exceeded its shelf life or has jelled and cannot be discharged in a continuous flow from the sealant gun. Apply sealants in accordance with the manufacturer's printed instructions with a gun having a nozzle that fits the joint width. Work sealant into joints so as to fill the joints solidly without air pockets. Tool sealant after application to ensure adhesion. Apply sealant uniformly smooth and free of wrinkles. Upon completion of sealant application, roughen partially filled or unfilled joints, apply additional sealant, and tool smooth as specified. Apply sealer over sealants in accordance with the sealant manufacturer's printed instructions.

3.5 PROTECTION AND CLEANING

3.5.1 Protection

Protect areas adjacent to joints from sealant smears. Masking tape may be used for this purpose if removed 5 to 10 minutes after the joint is filled and no residual tape marks remain.

3.5.2 Final Cleaning

Upon completion of sealant application, remove remaining smears and stains and leave the work in a clean and neat condition.

- a. Masonry and Other Porous Surfaces: Immediately remove fresh sealant that has been smeared on adjacent masonry, rub clean with a solvent, and remove solvent residue, in accordance with sealant manufacturer's printed instructions. Allow excess sealant to cure for 24 hour then remove by wire brushing or sanding. Remove resulting debris.
- b. Metal and Other Non-Porous Surfaces: Remove excess sealant with a solvent moistened cloth. Remove solvent residue in accordance with solvent manufacturer's printed instructions.

-- End of Section --

SECTION 08 11 13

STEEL DOORS AND FRAMES

08/20

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2020) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A653/A653M (2020) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A924/A924M (2020) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

ASTM C578 (2019) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation

ASTM C591 (2020) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation

ASTM C612 (2014; R 2019) Standard Specification for Mineral Fiber Block and Board Thermal Insulation

ASTM D2863 (2019) Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)

ASTM F2247 (2018) Standard Test Method for Metal Doors Used in Blast Resistant Applications (Equivalent Static Load Method)

ASTM F2927 (2012) Standard Test Method for Door Systems Subject to Airblast Loadings

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.115 (2016) Hardware Preparation in Steel Doors and Steel Frames

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR 111	(2009) Recommended Details for Standard Steel Doors, Frames, and Accessories and Related Components
SDI/DOOR 113	(2013; R2018) Standard Practice for Determining the Steady-State Thermal Transmittance of Steel Door and Frame Assemblies
SDI/DOOR A250.4	(2018) Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors
SDI/DOOR A250.6	(2015) Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames
SDI/DOOR A250.8	(2017) Specifications for Standard Steel Doors and Frames
SDI/DOOR A250.11	(2012) Recommended Erection Instructions for Steel Frames

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 4-010-01	(2018) DoD Minimum Antiterrorism Standards for Buildings
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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 non-G submittals to the Government for their record. The Government reserves the right to provide additional comments, request resubmittal, rejection and re-submittal to all the non-G submittals.* 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

Doors; G
Frames and Flashing; G
Accessories
Schedule of Doors; G
Schedule of Frames; G

SD-03 Product Data

Doors; G
Frames; G

Accessories

]1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors, frames, and accessories undamaged and with protective wrappings or packaging. Provide temporary steel spreaders securely fastened to the bottom of each welded frame. Store doors and frames on platforms under cover in clean, dry, ventilated, and accessible locations, with 1/4 inch airspace between doors. Remove damp or wet packaging immediately and wipe affected surfaces dry. Replace damaged materials with new.

PART 2 PRODUCTS

2.1 STANDARD STEEL DOORS

SDI/DOOR A250.8, except as specified otherwise. Prepare doors to receive door hardware as specified in Section 08 71 00 DOOR HARDWARE. Undercut where indicated. Provide exterior doors with top edge closed flush and sealed to prevent water intrusion. Provide doors at 1-3/4 inch thick, unless otherwise indicated. Provide door material that uses a minimum of 25 percent recycled content. Provide data indicating percentage of recycled content for steel door product. Exterior doors must be tested in accordance with ASTM F2247 or ASTM F2927 to meet requirements of UFC 4-010-01.

2.1.1 Classification - Level, Performance, Model

2.1.1.1 Maximum Duty Doors

SDI/DOOR A250.8, Level 4, physical performance Level A, Model 2 with core construction as required by the manufacturer for indicated exterior doors, of size(s) and design(s) indicated. Where vertical stiffener cores are required, the space between the stiffeners must be filled with board insulation.

2.2 INSULATED STEEL DOOR SYSTEMS

Provide insulated steel doors and frames in accordance with SDI/DOOR 113 at entrances to dwelling units and where indicated. Meet energy requirements including Solar Heat Gain Coefficient (SHGC) and U-factor. Provide insulated steel doors with a core of polyurethane foam; face sheets, edges, and frames of galvanized steel not lighter than 23 gage, 16 gage, and 16 gage respectively; magnetic weatherstripping; nonremovable-pin hinges; thermal-break aluminum threshold; and vinyl door bottom. Provide to doors and frames a phosphate treatment, rust-inhibitive primer, and baked acrylic enamel finish. Test doors in accordance with SDI/DOOR A250.4 and meet the requirements for Level C. Prepare doors to receive specified hardware. Provide doors 1-3/4 inch thick.

2.3 INSULATION CORES

Provide insulating cores at all exterior doors provide an apparent U-factor of .48 in accordance with SDI/DOOR 113 and conforming to:

- a. Rigid Cellular Polyisocyanurate Foam: ASTM C591, Type I or II, foamed-in-place or in board form, with oxygen index of not less than 22 percent when tested in accordance with ASTM D2863; or

- b. Rigid Polystyrene Foam Board: [ASTM C578](#), Type I or II; or
- c. Mineral board: [ASTM C612](#), Type I.

2.4 STANDARD STEEL FRAMES

[SDI/DOOR A250.8](#), Level 4. Form frames to sizes and shapes indicated, with welded corners.

2.4.1 Welded Frames

Continuously weld frame faces at corner joints. Mechanically interlock or continuously weld stops and rabbets. Grind welds smooth.

Weld frames in accordance with the recommended practice of the Structural Welding Code Sections 1 through 6, [AWS D1.1/D1.1M](#) and in accordance with the practice specified by the producer of the metal being welded.

2.4.2 Anchors

Provide anchors to secure the frame to adjoining construction. Provide steel anchors, zinc-coated not lighter than 18 gage.

2.4.2.1 Wall Anchors

Provide at least three anchors for each jamb. For frames which are more than 7.5 feet in height, provide one additional anchor for each jamb for each additional 2.5 feet or fraction thereof.

- a. Completed openings: Secure frames to previously placed concrete or masonry with expansion bolts in accordance with [SDI/DOOR 111](#); and

2.4.2.2 Floor Anchors

Provide floor anchors drilled for 3/8 inch anchor bolts at bottom of each jamb member.

2.5 EXTERIOR FRAMES

Provide thermal insulation in all exterior frames. Provide frames of a minimum Level 4, with frames of a minimum thickness of 0.067 inch, 14 gage. [Frame grouting will not be acceptable.](#)

2.6 HARDWARE PREPARATION

Drill and tap doors and frames to receive finish hardware. Prepare doors and frames for hardware in accordance with the applicable requirements of [SDI/DOOR A250.8](#) and [SDI/DOOR A250.6](#). For additional requirements refer to [ANSI/BHMA A156.115](#). Drill and tap for surface-applied hardware at the project site. Build additional reinforcing for surface-applied hardware into the door at the factory. Punch door frames, with the exception of frames that will have weatherstripping to receive a minimum of two rubber or vinyl door silencers on lock side of single doors and one silencer for each leaf at heads of double doors. Set lock strikes out to provide clearance for silencers.

2.7 FINISHES

2.7.1 Hot-Dip Zinc-Coated and Factory-Primed Finish

Fabricate exterior doors and frames from hot dipped zinc coated steel, alloyed type, that complies with [ASTM A924/A924M](#) and [ASTM A653/A653M](#). The coating weight must meet or exceed the minimum requirements for coatings having [0.4 ounces per square foot](#), total both sides, i.e., [A40](#). Repair damaged zinc-coated surfaces by the application of zinc dust paint. Thoroughly clean and chemically treat to insure maximum paint adhesion. Factory prime as specified in [SDI/DOOR A250.8](#).

2.8 FABRICATION AND WORKMANSHIP

Provide finished doors and frames that are strong and rigid, neat in appearance, and free from defects, waves, scratches, cuts, dents, ridges, holes, warp, and buckle. Provide molded members that are clean cut, straight, and true, with joints coped or mitered, well formed, and in true alignment. Dress exposed welded and soldered joints smooth. Design door frame sections for use with the wall construction indicated. Corner joints must be well formed and in true alignment. Conceal fastenings where practicable.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Frames

Set frames in accordance with [SDI/DOOR A250.11](#). Plumb, align, and brace securely until permanent anchors are set. Anchor bottoms of frames with expansion bolts or powder-actuated fasteners. Build in or secure wall anchors to adjoining construction.

3.1.2 Doors

Hang doors in accordance with clearances specified in [SDI/DOOR A250.8](#). After erection and glazing, clean and adjust hardware.

3.2 PROTECTION

Protect doors and frames from damage. Repair damaged doors and frames prior to completion and acceptance of the project or replace with new, as directed. Wire brush rusted frames until rust is removed. Clean thoroughly. Apply an all-over coat of rust-inhibitive paint of the same type used for shop coat.

3.3 CLEANING

Upon completion, clean exposed surfaces of doors and frames thoroughly. Remove mastic smears and other unsightly marks.

-- End of Section --

SECTION 08 51 13

ALUMINUM WINDOWS

05/19

PART 1 GENERAL

1.1 REFERENCES

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

ALUMINUM ASSOCIATION (AA)

AA DAF45 (2003; Reaffirmed 2009) Designation System for Aluminum Finishes

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 611 (2014) Voluntary Specification for Anodized Architectural Aluminum

AAMA 701/702 (2011) Voluntary Specification for Pile Weatherstripping and Replaceable Fenestration Weatherseals

AAMA 907 (2015) Voluntary Specification for Corrosion Resistant Coatings on Carbon Steel Components Used in Windows, Doors and Skylights

AAMA 1503 (2009) Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections

AAMA/WDMA/CSA 101/I.S.2/A440 (2017) North American Fenestration Standard/Specification for Windows, Doors, and Skylights

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

ASHRAE 169 (2013) Climate Data for Building Design Standards

ASTM INTERNATIONAL (ASTM)

ASTM E90 (2009; R2016) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

ASTM E413 (2016) Classification for Rating Sound Insulation

ASTM E1300 (2016) Standard Practice for Determining Load Resistance of Glass in Buildings

ASTM E1332	(2016) Standard Classification for Rating Outdoor-Indoor Sound Attenuation
ASTM E1886	(2019) Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
ASTM E1996	(2017) Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes
ASTM F2248	(2012) Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

NFRC 100	(2017) Procedure for Determining Fenestration Product U-Factors
NFRC 200	(2017) Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

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 non-G submittals to the Government for their record. The Government reserves the right to provide additional comments, request resubmittal, rejection and re-submittal to all the non-G submittals.* Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Windows; G

Fabrication Drawings

SD-03 Product Data

Windows; G

Hardware; G

Fasteners; G

Window Performance; G

Thermal-Barrier Windows; G

Mullions; G

Screens; G

Weatherstripping; G

Accessories; G

Adhesives

Thermal Performance; G

SD-04 Samples

Finish Sample for color selection

Window Mock-Ups including Flashing; G

SD-05 Design Data

Structural Calculations for Deflection; G

Design Analysis; G

SD-06 Test Reports

Minimum Condensation Resistance Factor

Standard Airblast Test; G

Windborne-Debris-Impact Performance

SD-10 Operation and Maintenance Data

Windows, Data Package 1; G

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.3 QUALITY ASSURANCE

1.3.1 Qualification of Manufacturer

Window manufacturer must specialize in designing and manufacturing the type of aluminum windows specified in this section, and have a minimum of 5 years of documented successful experience. Manufacturer must have the facilities capable of meeting contract requirements, single-source responsibility and warranty.

1.3.2 Shop Drawing Requirements

Take field measurements prior to preparation of drawings and fabrications. Provide drawings that indicate elevations of windows, full-size sections, thickness and gages of metal, fastenings, proposed method of anchoring, size and spacing of anchors, details of construction, method of glazing, details of operating hardware, method and materials for weatherstripping, method of attaching screens, material and method of attaching subframes, stools, casings, sills, trim, flashing at Jambs, sill and head, installation

details, and other related items.

1.3.3 Sample Requirements

1.3.3.1 Finish Sample Requirements

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

1.3.3.2 Window Sample Requirements

Submit one full-size window of each type proposed for use, complete with AAMA Label, glazing, hardware, anchors, and other accessories. Where screens or weatherstripping is required, fit sample windows with such items that are to be used. After approval, install each sample in work, clearly identified, and record its location.

1.3.3.3 Mock-Ups

Before fabrication, full-size mock-up of each type of aluminum window complete with glass and AAMA certification label for structural purposes and NFRC Temporary and Permanent Label for certification of thermal performance rating will be required for review of window construction and quality of hardware operation. Must provide all flashing conditions (sill, jambs and head) in such a way where each item will not be concealed.

1.3.4 Test Report Requirements

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

1.4 DELIVERY AND STORAGE

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

1.5 PERFORMANCE REQUIREMENTS

1.5.1 Wind Loading Design Pressure

Design window components, including mullions, hardware, and anchors, to withstand a wind-loading design pressure as follows: Determine the wind pressure on the building by converting the ASCE-7 basic wind speed to wind pressure and find the corresponding structural test pressure in the AAMA specific requirements or optional performance tables. Provide for exterior windows.

Windows must support a pressure of 69 PSF acting towards the interior spaces and 73 PSF acting away from the interior spaces.

Windows must have impact resistant glazing that is in compliance with ASTM E1996 and ASTM E1886 to protect against wind borne debris.

1.5.2 Tests

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

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

1.6 DRAWINGS

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

1.7 WINDOW PERFORMANCE

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

1.7.1 Structural Performance

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

1.7.2 Air Infiltration

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

1.7.3 Water Penetration

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

1.7.4 Thermal Performance

Windows (including frames and glass) will be independently tested and certified with a Solar Heat Gain Coefficient (SHGC) determined according to NFRC 200 procedures and a whole window U-factor determined in accordance with NFRC 100 within the ranges as indicated below according to the ASHRAE 169 Climate Zone of the project location. Provide visual Transmittance (VT) of 0.5 or greater.

1.7.5 Sound Attenuation

When tested in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 or the

following below, provide a minimum Sound Transmission Class (STC) of 35 in accordance with ASTM E90 and as determined by ASTM E413 or Outside-Indoor Transmission Class (OITC) of 25 in accordance with ASTM E1332 and as determined by ASTM E413 with the window glazed with 1/2 inch air space between two pieces of 1/4 inch.

1.7.6 Windborne-Debris-Impact Performance

Exterior window system including glazing must comply with indicated basis or enhanced protection testing requirements in ASTM E1996 for the MC New River Base Wind Zone when tested according to ASTM E1886. Test specimens must be no smaller in width and length than glazing indicated for use on Project and must be installed in same manner as glazing indicated for use on Project.

1.8 WARRANTY

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

PART 2 PRODUCTS

2.1 WINDOWS

Provide prime windows that comply with AAMA/WDMA/CSA 101/I.S.2/A440 and the requirements specified herein. In addition to compliance with AAMA/WDMA/CSA 101/I.S.2/A440, window framing members for each individual light of glass must not deflect to the extent that deflection perpendicular to the glass light exceeds L/175 of the glass edge length when subjected to uniform loads at specified design pressures. Provide Structural calculations for deflection to substantiate compliance with deflection requirements. Provide windows of types, performance classes, performance grades, combinations, and sizes indicated or specified. Provide aluminum window frames with a minimum recycled content of 20 percent. Provide data identifying percentage of recycled content of aluminum windows. Design windows to accommodate hardware, glass, weatherstripping, screens, and accessories to be furnished. Each window must be a complete factory assembled unit with or without glass installed. Dimensions shown are minimum. Provide windows with insulating glass and thermal break necessary to achieve a minimum Condensation Resistance Factor (CRF) to meet ASHRAE 90.1 U-Factor. when tested in accordance with AAMA 1503. Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.

2.1.1 Fixed Windows (F)

Type F (Fixed); Performance Class AW40.

2.1.2 Glass and Glazing

Materials are specified in Section 08 81 00 GLAZING.

2.1.3 Caulking and Sealing

Are specified in Section 07 92 00 JOINT SEALANTS.

2.1.4 Weatherstripping

AAMA/WDMA/CSA 101/I.S.2/A440. Provide for all ventilating (operable) sash for all windows. Provide woven wool pile weatherstripping 0.210 inch thick, conforming to AAMA 701/702, or polypropylene multifilament fiber weatherstripping installed in an integral weatherstripping groove in the sash or frame, and flexible polyvinylchloride weatherstripping installed in the sill member.

2.2 FABRICATION

Fabrication of window units must comply with AAMA/WDMA/CSA 101/I.S.2/A440.

2.2.1 Provisions for Glazing

Design windows and rabbets suitable for glass thickness specified. Design sash for inside double glazing and for securing glass with glazing channels.

2.2.2 Fasteners

Use window manufacturer's standard for windows, trim, and accessories in compliance with ASTM E1996 for Wind Region of 150 mile/Hr; Wind Zone 3. Self-tapping sheet-metal screws are not acceptable for material more than 1/16 inch thick.

2.2.3 Adhesives

Provide joint sealants as specified in Section 07 92 00 JOINT SEALANTS. For interior application of joint sealants, comply with applicable regulations regarding reduced VOC's, and as specified in Section 07 92 00 JOINT SEALANTS.

2.2.4 Drips and Weep Holes

Provide continuous drips over heads of top ventilators. Where fixed windows adjoin ventilators, drips must be continuous across tops of fixed windows. Provide drips and weep holes as required to return water to the outside. Weep holes if provided must not replace one-piece sill flashing.

2.2.5 Mullions and Transom Bars

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

2.2.6 Accessories

Provide windows complete with necessary hardware, fastenings, clips, fins, anchors, glazing beads, and other appurtenances necessary for complete installation and proper operation. Furnish extruded aluminum subframe receptors and subsill with each window unit. Provide one-piece sill flashing as shown in drawings.

2.2.6.1 Hardware

AAMA/WDMA/CSA 101/I.S.2/A440. The item, type, and functional characteristics must be the manufacturer's standard for the particular window type. Provide stainless steel hardware of suitable design and of sufficient strength to perform the function for which it is used. Equip all operating ventilators with a lock or latching device which can be secured from the inside.

2.2.6.2 Fasteners

Provide concealed anchors of the type recommended by the window manufacturer for the specific type of construction in compliance with ASTM E1996 for Wind Region of 150 mile/Hr; Wind Zone 3. Anchors and fasteners must be compatible with the window and the adjoining construction. Provide a minimum of three anchors for each jamb located approximately 6 inches from each end and at midpoint.

2.2.7 Finishes

Exposed aluminum surfaces must be factory finished with an anodic / duronodic coating. Color must be comply with the BEAP and as selected by the Architect from the manufacturer's standard colors.

2.2.7.1 Anodic Coating

Clean exposed aluminum surfaces and provide an anodized finish conforming to AA DAF45 and AAMA 611. Finish must be:

- a. Architectural Class I (0.7 mil or thicker), designation AA-M10-C22-, integral coloranodized.

2.3 THERMAL-BARRIER WINDOWS

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

Specify material and construction except as follows:

- a. Aluminum alloy must be 6063-T6.
- b. Frame construction, including operable sash, must be factory-assembled and factory-sealed inner and outer aluminum completely separated from metal-to-metal contact. Join assembly by a continuous, concealed, low conductance divider housed in an interlocking extrusion of the inner frame. Metal fasteners, straps, or anchors must not bridge the connection between the inner and outer frame.
- c. Operating hardware for each sash must consist of spring-loaded nylon cushion blocks and pin locks designed to lock in predetermined locations.
- d. Sash must be completely separated from metal-to-metal contact by means of woven-pile weatherstripping, plastic, or elastomeric separation members.
- e. Operating and storm sash must be factory-glazed with the type of glass indicated and of the quality specified in Section 08 81 00 GLAZING.

2.4 MULLIONS

Provide [thermal-barrier](#) mullions between multiple-window units where indicated.

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

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

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

Mullion reinforcing members must be fabricated of the materials specified in [AAMA/WDMA/CSA 101/I.S.2/A440](#) and meet the specified design loading.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Method of Installation

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

Any materials that show visual evidence of biological growth due to the presence of moisture must not be installed on the building project.

3.1.2 Dissimilar Materials

Where aluminum surfaces are in contact with, or fastened to masonry, concrete, wood, or dissimilar metals, except stainless steel or zinc, protect the aluminum surface from dissimilar materials as recommended in the Appendix to [AAMA/WDMA/CSA 101/I.S.2/A440](#). Do not coat surfaces in contact with sealants after installation with any type of protective material. Do not apply coatings or lacquers to surfaces to which caulking and glazing components must adhere.

3.1.3 Anchors and Fastenings

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

3.1.4 Adjustments After Installation

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

3.2 CLEANING

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

-- End of Section --

SECTION 08 71 00

DOOR HARDWARE
02/16, CHG 3: 08/20

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 E283 (2019) Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.1 (2016) Butts and Hinges
ANSI/BHMA A156.2 (2017) Bored and Preassembled Locks and Latches
ANSI/BHMA A156.3 (2020) Exit Devices
ANSI/BHMA A156.4 (2013) Door Controls - Closers
ANSI/BHMA A156.6 (2015) Architectural Door Trim
ANSI/BHMA A156.7 (2016) Template Hinge Dimensions
ANSI/BHMA A156.8 (2015) Door Controls - Overhead Stops and Holders
ANSI/BHMA A156.13 (2017) Mortise Locks & Latches Series 1000
ANSI/BHMA A156.16 (2018) Auxiliary Hardware
ANSI/BHMA A156.18 (2020) Materials and Finishes
ANSI/BHMA A156.21 (2019) Thresholds
ANSI/BHMA A156.22 (2017) Door Gasketing and Edge Seal Systems

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 72 (2019; TIA 19-1; ERTA 1 2019) National Fire Alarm and Signaling Code
NFPA 80 (2019) Standard for Fire Doors and Other Opening Protectives

NFPA 101	(2021) Life Safety Code
NFPA 252	(2017) Standard Methods of Fire Tests of Door Assemblies
STEEL DOOR INSTITUTE (SDI/DOOR)	
SDI/DOOR A250.8	(2017) Specifications for Standard Steel Doors and Frames
U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)	
36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines
UNDERWRITERS LABORATORIES (UL)	
UL Bld Mat Dir	(updated continuously online) Building Materials Directory

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. **Submit non-G submittals to the Government for their record. The Government reserves the right to provide additional comments, request resubmittal, rejection and re-submittal to all the non-G submittals.**

When used, a code following the "G" classification 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

Manufacturer's Detail Drawings; G

Verification of Existing Conditions; G

Hardware Schedule; G

Keying System; G

SD-03 Product Data

Hardware Items; G

SD-08 Manufacturer's Instructions

Installation

SD-10 Operation and Maintenance Data

Hardware Schedule Items, Data Package 1; G

SD-11 Closeout Submittals

Key Bitting

1.3 SHOP DRAWINGS

Submit **manufacturer's detail drawings** indicating all hardware assembly components and interface with adjacent construction. Base shop drawings on verified field measurements and include **verification of existing conditions**.

1.4 PRODUCT DATA

Indicate fire-ratings at applicable components. Provide documentation of ABA/ADA accessibility compliance of applicable components, as required by **36 CFR 1191** Appendix D - Technical.

1.5 **HARDWARE SCHEDULE**

Prepare and submit hardware schedule in the following form:

Hardware Item	Quantity	Size	Reference Publication Type No.	Finish	Mfr Name and Catalog No.	Key Control Symbols	UL Mark (If fire-rated and listed)	BHMA Finish Designation

In addition, submit hardware schedule data package 1 in accordance with Section **01 78 23** OPERATION AND MAINTENANCE DATA.

1.6 KEY BITTING CHART REQUIREMENTS

1.6.1 Requirements

Submit **key bitting** charts to the Contracting Officer prior to completion of the work. Include:

- a. Complete listing of all keys (e.g. AA1 and AA2).
- b. Complete listing of all key cuts (AA1-123456, AA2-123458).
- c. Tabulation showing which key fits which door.
- d. Copy of floor plan showing doors and door numbers.
- e. Listing of 20 percent more key cuts than are presently required in each master system.

1.7 QUALITY ASSURANCE

1.7.1 Hardware Manufacturers and Modifications

Provide, as far as feasible, locks, hinges, and closers of one lock, hinge, or closer manufacturer's make. Modify hardware as necessary to provide features indicated or specified.

1.7.2 Key Shop Drawings Coordination Meeting

Prior to the submission of the key shop drawing, the Contracting Officer, Contractor, Door Hardware Subcontractor, using Activity and Base Locksmith

must meet to discuss and coordinate key requirements for the facility.

1.8 DELIVERY, STORAGE, AND HANDLING

Deliver hardware in original individual containers, complete with necessary appurtenances including fasteners and instructions. Mark each individual container with item number as shown on hardware schedule. Deliver permanent keys and removable cores to the Contracting Officer, either directly or by certified mail. Deliver construction master keys with the locks.

PART 2 PRODUCTS

2.1 TEMPLATE HARDWARE

Hardware applied to metal or to prefinished doors must be manufactured using a template. Provide templates to door and frame manufacturers in accordance with ANSI/BHMA A156.7 for template hinges. Coordinate hardware items to prevent interference with other hardware.

2.2 HARDWARE FOR FIRE DOORS AND EXIT DOORS

Provide all hardware necessary to meet the requirements of NFPA 72 for door alarms, NFPA 80 for fire doors, NFPA 101 for exit doors, NFPA 252 for fire tests of door assemblies, ABA/ADA accessibility requirements, and all other requirements indicated, even if such hardware is not specifically mentioned in paragraph HARDWARE SCHEDULE. Provide Underwriters Laboratories, Inc. labels for such hardware in accordance with UL Bld Mat Dir or equivalent labels in accordance with another testing laboratory approved in writing by the Contracting Officer.

2.3 HARDWARE ITEMS

Clearly and permanently mark with the manufacturer's name or trademark, hinges, locks, latches, exit devices, bolts and closers where the identifying mark is visible after the item is installed. For closers with covers, the name or trademark may be beneath the cover.

2.3.1 Hinges

Provide in accordance with ANSI/BHMA A156.1. Provide hinges that are 4-1/2 by 4-1/2 inch unless otherwise indicated. Construct loose pin hinges for interior doors and reverse-bevel exterior doors so that pins are non-removable when door is closed. Other anti-friction bearing hinges may be provided in lieu of ball bearing hinges.

2.3.2 Locks and Latches

- a. At exterior locations provide locksets of full stainless steel type 302 or 304 construction including fronts, strike, escutcheons, knobs, bolts and all interior working parts. Marine Grade I, fully non-ferrous.
- b. In non-air-conditioned interior environments or humid interior environments, provide interior locksets on the same Marine Grade I, fully non-ferrous as exterior locksets.

2.3.2.1 Mortise Locks and Latches

Provide in accordance with ANSI/BHMA A156.13, Series 1000, Operational Grade 1, Security Grade 2. Cut escutcheons to fit cylinders and provide trim items with straight, beveled, or smoothly rounded sides, corners, and edges. Provide knobs and roses of mortise locks with screwless shanks and no exposed screws.

2.3.3 Cylinders and Cores

Provide cylinders and cores for new locks, including locks provided under other sections of this specification. Provide cylinders and cores with seven pin tumblers. Provide cylinders from the products of one manufacturer, and provide cores from the products of one manufacturer. Rim cylinders, mortise cylinders, and knobs of bored locksets have interchangeable cores which are removable by special control keys. Stamp each interchangeable core with a key control symbol in a concealed place on the core.

2.3.4 Keying System

Provide a master keying system an extension of the existing keying system.

2.3.5 Lock Trim

Provide cast, forged, or heavy wrought construction and commercial plain design for lock trim.

2.3.5.1 Knobs and Roses

Provide in accordance with ANSI/BHMA A156.2 and ANSI/BHMA A156.13 for knobs, roses, and escutcheons. For unreinforced knobs, roses, and escutcheons, provide a 0.050 inch thickness. For reinforced knobs, roses, and escutcheons, provide an outer shell thickness of 0.035 inch and a combined total thickness of 0.070 inch, except at knob shanks. Provide knob shanks 0.060 inch thick.

2.3.5.2 Lever Handles

Provide lever handles where indicated in the Hardware Schedule. Provide in accordance with ANSI/BHMA A156.3 for mortise locks of lever handles for exit devices. Provide lever handle locks with a breakaway feature (such as a weakened spindle or a shear key) to prevent irreparable damage to the lock when force in excess of that specified in ANSI/BHMA A156.13 is applied to the lever handle. Provide lever handles return to within 1/2 inch of the door face.

2.3.5.3 Texture

Provide knurled or abrasive coated lever handles doors.

2.3.6 Keys

Provide one file key, one duplicate key, and one working key for each key change keying system.

2.3.7 Closers

Provide in accordance with ANSI/BHMA A156.4, Series C02000, Grade 1, with PT 4C. Provide with brackets, arms, mounting devices, fasteners, full size covers and other features necessary for the particular application. Size closers in accordance with manufacturer's printed recommendations, or provide multi-size closers, Sizes 1 through 6, and list sizes in the Hardware Schedule. Provide manufacturer's 10 year warranty.

Use stainless steel inside bracketed or door mounted closers on exterior doors. Non-ferrous closers, such as aluminum or cast bronze, are permissible where door utilization is minimal. On interior doors use closers of 302 or 304 stainless steel or non-ferrous materials. On surface-mounted closers use or apply rust inhibiting finish on all ferrous parts. Also apply this finish on concealed closers.

2.3.7.1 Identification Marking

Engrave each closer with manufacturer's name or trademark, date of manufacture, and manufacturer's size designation in locations that will be visible after installation.

2.3.8 Overhead Holders

Provide in accordance with ANSI/BHMA A156.8.

2.3.9 Door Protection Plates

Provide in accordance with ANSI/BHMA A156.6.2.3.9.1 Sizes of Armor and Kick Plates

2 inch less than door width for single doors. Provide 10 inch kick plates for flush doors. Provide armor plates for flush doors as indicated in the construction documents. 2.3.10 Door Stops and Silencers

Provide in accordance with ANSI/BHMA A156.16. Silencers Type L03011. Provide three silencers for each single door, two for each pair.

2.3.11 Thresholds

Provide in accordance with ANSI/BHMA A156.21. Use J35100, with vinyl or silicone rubber insert in face of stop, for exterior doors opening out, unless specified otherwise.

2.3.12 Weatherstripping Gasketing

Provide in accordance with ANSI/BHMA A156.22. Provide the type and function designation where specified in paragraph HARDWARE SCHEDULE. Provide a set to include head and jamb seals, sweep strips, and, for pairs of doors, astragals. Air leakage of weatherstripped doors not to exceed 0.5 cubic feet per minute of air per square foot of door area when tested in accordance with ASTM E283. Provide weatherstripping with one of the following:

2.3.12.1 Extruded Aluminum Retainers

Extruded aluminum retainers not less than 0.050 inch wall thickness with vinyl, neoprene, silicone rubber, or polyurethane inserts. Provide anodized aluminum.

2.3.12.2 Interlocking Type

Zinc or bronze not less than 0.018 inch thick.

2.3.13 Rain Drips

Provide in accordance with ANSI/BHMA A156.22. Provide extruded aluminum rain drips, not less than 0.08 inch thick, anodized factory painted finish. Provide the manufacturer's full range of color choices to the Contracting Officer for color selection. Provide rain drips with a 4 inch overlap on each side of each exterior door that is not protected by an awning, roof, eave or other horizontal projection. Set drips in sealant and fasten with stainless steel screws.

2.3.13.1 Door Rain Drips

Approximately 1-1/2 inch high by 5/8 inch projection. Align bottom with bottom edge of door.

2.3.13.2 Overhead Rain Drips

Approximately 1-1/2 inch high by 2-1/2 inch projection. Align bottom with door frame rabbet.

2.3.14 Special Tools

Provide special tools, such as spanner and socket wrenches and dogging keys, as required to service and adjust hardware items.

2.4 FASTENERS

Provide fasteners of type, quality, size, and quantity appropriate to the specific application. Fastener finish to match hardware. Provide stainless steel or nonferrous metal fasteners in locations exposed to weather. Verify metals in contact with one another are compatible and will avoid galvanic corrosion when exposed to weather.

2.5 FINISHES

Provide in accordance with ANSI/BHMA A156.18. Provide hardware in BHMA 630 finish (satin stainless steel), unless specified otherwise. Provide hinges for exterior doors in stainless steel with BHMA 630 finish. Furnish exit devices in BHMA 626 finish in lieu of BHMA 630 finish. Match exposed parts of concealed closers to lock and door trim.

PART 3 EXECUTION

3.1 INSTALLATION

Provide hardware in accordance with manufacturers' printed installation instructions. Fasten hardware to wood surfaces with full-threaded wood screws or sheet metal screws. Provide machine screws set in expansion shields for fastening hardware to solid concrete and masonry surfaces. Provide toggle bolts where required for fastening to hollow core construction. Provide through bolts where necessary for satisfactory installation.

3.1.1 Weatherstripping Installation

Provide full contact, weathertight seals that allow operation of doors without binding the weatherstripping.

3.1.1.1 Stop Applied Weatherstripping

Fasten in place with color matched sheet metal screws not more than 9 inch on center after doors and frames have been finish painted.

3.1.1.2 Interlocking Type Weatherstripping

Provide interlocking, self adjusting type on heads and jambs and flexible hook type at sills. Nail weatherstripping to door 1 inch on center and to heads and jambs at 4 inch on center.

3.1.1.3 Spring Tension Type Weatherstripping

Provide spring tension type on heads and jambs. Provide bronze nails with bronze. Provide stainless steel nails with stainless steel. Space nails not more than 1-1/2 inch on center.

3.1.2 Threshold Installation

Extend thresholds the full width of the opening and notch end for jamb stops. Set thresholds in a full bed of sealant and anchor to floor with cadmium-plated, countersunk, steel screws in expansion sleeves. For aluminum thresholds placed on top of concrete surfaces, coat the underside surfaces that are in contact with the concrete with fluid applied waterproofing as a separation measure prior to placement.

3.2 FIRE DOORS AND EXIT DOORS

Provide hardware in accordance with NFPA 72 for door alarms, NFPA 80 for fire doors, NFPA 101 for exit doors, and NFPA 252 for fire tests of door assemblies.

3.3 HARDWARE LOCATIONS

Provide in accordance with SDI/DOOR A250.8, unless indicated or specified otherwise.

- a. Kick and Armor Plates: Push side of single-acting doors.
- b. Mop Plates: Bottom flush with bottom of door.

3.4 FIELD QUALITY CONTROL

After installation, protect hardware from paint, stains, blemishes, and other damage until acceptance of work. Submit notice of testing 15 days before scheduled, so that testing can be witnessed by the Contracting Officer. Adjust hinges, locks, latches, bolts, holders, closers, and other items to operate properly. Demonstrate that permanent keys operate respective locks, and give keys to the Contracting Officer. Correct, repair, and finish, errors in cutting and fitting and damage to adjoining work.

3.5 HARDWARE SETS

HARDWARE SET No. 1

3 HINGES BB1199 4 1/2 X 4 1/2 NRP US32D HA
1 RIM CYLINDER 1E-72 STD US26D BE
1 EXIT DEVICE 98NL X 992L-NL US32D VO
1 CLOSER UNI-7500-H SN-134 689 NO
1 SADDLE THRESHOLD 424 X DW AL NGP
1 GASKETING 127 NA 1 X DW + 2 X DH NGP
1 DOOR BOTTOM 319 VA X DW NGP
110 degree swing

Manufacturers List Code Manufacturers Name:

BE Best Lock
IV H.B. Ives
KA Kawneer
MC McKinney
NGP National Guard
NO Norton
RO Rockwood
RX Rixson
HA Hagar
TR Trimco
VO Von Duprin

-- End of Section --

SECTION 08 81 00

GLAZING
05/19

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 800 (2016) Voluntary Specifications and Test Methods for Sealants

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1 (2015) Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

ASTM INTERNATIONAL (ASTM)

ASTM C509 (2006; R 2015) Elastomeric Cellular Preformed Gasket and Sealing Material

ASTM C864 (2005; R 2015) Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers

ASTM C920 (2018) Standard Specification for Elastomeric Joint Sealants

ASTM C1021 (2008; R 2014) Standard Practice for Laboratories Engaged in Testing of Building Sealants

ASTM C1036 (2016) Standard Specification for Flat Glass

ASTM C1048 (2018) Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass

ASTM C1087 (2016) Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems

ASTM C1184 (2014) Standard Specification for Structural Silicone Sealants

ASTM C1281 (2016) Standard Specification for Preformed Tape Sealants for Glazing Applications

ASTM D395	(2016; E 2017) Standard Test Methods for Rubber Property - Compression Set
ASTM D2287	(2019) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
ASTM E1300	(2016) Standard Practice for Determining Load Resistance of Glass in Buildings
ASTM E2190	(2010) Standard Specification for Insulating Glass Unit Performance and Evaluation

GLASS ASSOCIATION OF NORTH AMERICA (GANA)

GANA Glazing Manual	(2008) Glazing Manual
GANA Sealant Manual	(2008) Sealant Manual

INSULATING GLASS MANUFACTURERS ALLIANCE (IGMA)

IGMA TB-1200	(1983; R 2016) Guidelines for Insulating Glass Dimensional Tolerances
IGMA TB-3001	(2001) Guidelines for Sloped Glazing
IGMA TM-3000	(1990; R 2016) North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

NFRC 100	(2017) Procedure for Determining Fenestration Product U-Factors
NFRC 200	(2017) Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

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

16 CFR 1201	Safety Standard for Architectural Glazing Materials
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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 non-G submittals to the Government for their record. The Government reserves the right to provide additional comments, request resubmittal, rejection and re-submittal to all the non-G submittals.** 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-03 Product Data

Insulating Glass

Glazing Accessories

Sealants

Joint Backer

SD-04 Samples

Insulating Glass

Glazing Compound

Glazing Tape

Sealing Tapes

SD-07 Certificates

Insulating Glass

SD-08 Manufacturer's Instructions

Setting and Sealing Materials

Glass Setting

SD-11 Closeout Submittals

Warranty for Insulated Glass Units

1.3 SYSTEM DESCRIPTION

Fabricate and install watertight and airtight glazing systems to withstand thermal movement and wind loading without glass breakage, gasket failure, deterioration of [glazing accessories](#), or defects in the work. Glazed panels must comply with the safety standards, in accordance with [ANSI Z97.1](#), and comply with indicated wind/snow loading in accordance with [ASTM E1300](#).

1.4 QUALITY CONTROL

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

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver products to the site in unopened containers, labeled plainly with manufacturers' names and brands. Store glass and setting materials in safe, enclosed dry locations and do not unpack until needed for installation. Handle and install materials in a manner that will protect them from damage.

1.6 ENVIRONMENTAL REQUIREMENTS

Do not start glazing work until the outdoor temperature is above 40 degrees F and rising, unless procedures recommended by the glass manufacturer and approved by the Contracting Officer are made to warm the glass and rabbet surfaces. Provide ventilation to prevent condensation of moisture on glazing work during installation. Do not perform glazing work during damp or rainy weather.

1.7 WARRANTY

1.7.1 Warranty for Insulated Glass Units

Warranty insulating glass units against development of material obstruction to vision (such as dust, fogging, or film formation on the inner glass surfaces) caused by failure of the hermetic seal, other than through glass breakage, for a 10-year period following acceptance of the work. Provide new units for any units failing to comply with terms of this warranty within 45 working days after receipt of notice from the Government.

PART 2 PRODUCTS

2.1 PRODUCT SUSTAINABILITY CRITERIA

2.2 GLASS

ASTM C1036, unless specified otherwise. In doors and sidelights, provide safety glazing material conforming to 16 CFR 1201.

2.3 INSULATING GLASS UNITS

Two panes of glass separated by a dehydrated airspace, filled with argon gas, or filled with krypton gas, or filled with aerogel and hermetically sealed, conforming to ASTM E2190. Submit performance and compliance documentation for each type of insulating glass.

Insulated glass units must have a Solar Heat Gain Coefficient (SHGC) maximum of 0.24 determined according to NFRC 200 and a U-factor maximum of 0.24 Btu per square foot by hr by degree F in accordance with NFRC 100. Glazing must meet or exceed a luminous efficacy of 1.0. Glazed panels must be rated for not less than 26 Sound Transmission Class (STC) when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E413.

Dimensional tolerances must be as specified in IGMA TB-1200. Spacer must be black, roll-formed, thermally broken aluminum with bent or tightly welded or keyed and sealed joints to completely seal the spacer periphery and eliminate moisture and hydrocarbon vapor transmission into airspace through the corners. Primary seal must be compressed polyisobutylene and the secondary seal must be a specially formulated silicone.

The inner light must be ASTM C1036, Type I, Class 1, Quality q4, 1/4 inch thick.

The outer light must be ASTM C1036, Type I, Class 2 (solar-reflective), Quality q4, 1/4" inch thick

2.3.1 Low Emissivity Coatings

Interior and exterior glass panes for Low-E insulating units must be Type I annealed flat glass, Class 1-clear with anti-reflective low-emissivity coating or heat-strengthened or fully tempered glass complying with [ASTM C1048](#), Condition C on No. 2 surface (inside surface of exterior pane) Quality q3 - glazing select, conforming to [ASTM C1036](#). Glass performance must be U value maximum of 0.54Btu/hr-ft²-F, Solar Heat Gain Coefficient (SHGC) maximum of 0.24.

2.4 SETTING AND SEALING MATERIALS

Provide as specified in the [GANA Glazing Manual](#), [IGMA TM-3000](#), [IGMA TB-3001](#), and manufacturer's recommendations, unless specified otherwise herein. Do not use metal sash putty, nonskinning compounds, nonresilient preformed sealers, or impregnated preformed gaskets. Materials exposed to view and unpainted must be gray or neutral color. Sealant testing must be performed by a testing agency qualified according to [ASTM C1021](#).

Submit glass manufacturer's recommendations for setting and sealing materials and for installation of each type of glazing material specified.

2.4.1 Putty and Glazing Compound

Provide glazing compound as recommended by manufacturer for face-glazing metal sash. Putty must be linseed oil type. Do not use putty and glazing compounds with insulating glass or laminated glass.

2.4.2 Glazing Compound

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

2.4.3 Sealants

Provide elastomeric sealants.

2.4.3.1 Elastomeric Sealant

[ASTM C920](#), Type S, Grade NS, Class 12.5, Use G. Use for channel or stop glazing wood and metal sash. [Sealants](#) must be chemically compatible with setting blocks, edge blocks, and sealing tapes, with sealants used in manufacture of insulating glass units. Color of sealant must be white.

2.4.3.2 Structural Sealant

[ASTM C1184](#), Type S.

2.4.4 Joint Backer

Joint backer must have a diameter size at least 25 percent larger than joint width; type and material as recommended in writing by glass and sealant manufacturer.

2.4.5 Glazing Tapes

2.4.5.1 Back-Bedding Mastic Glazing Tapes

Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining

and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with [ASTM C1281](#) and [AAMA 800](#) for products indicated below:

- a. AAMA 804.3 tape, where indicated.
- b. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
- c. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.4.5.2 Expanded Cellular Glazing Tapes

Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with [AAMA 800](#) for the following types:

- a. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
- b. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.4.6 Sealing Tapes

Preformed, semisolid, PVC-based material of proper size and compressibility for the particular condition, complying with [ASTM D2287](#). Use only where glazing rabbet is designed for tape and [tape](#) is recommended by the glass or sealant manufacturer. Provide spacer shims for use with compressible tapes. Tapes must be chemically compatible with the product being set.

2.4.7 Setting Blocks and Edge Blocks

Closed-cell neoprene setting blocks must be dense extruded type conforming to [ASTM C509](#) and [ASTM D395](#), Method B, Shore A durometer between 70 and 90. Edge blocking must be Shore A durometer of 50 (plus or minus 5). Provide silicone setting blocks when blocks are in contact with silicone sealant. Profiles, lengths and locations must be as required and recommended in writing by glass manufacturer. Block color must be black.

2.4.8 Glazing Gaskets

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

2.4.8.1 Fixed Glazing Gaskets

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

2.4.8.2 Wedge Glazing Gaskets

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

2.4.8.3 Aluminum Framing Glazing Gaskets

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

2.4.9 Accessories

Provide as required for a complete installation, including glazing points, clips, shims, angles, beads, and spacer strips. Provide noncorroding metal accessories. Provide primer-sealers and cleaners as recommended by the glass and sealant manufacturers. Use [ASTM C1087](#) to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to surface.

PART 3 EXECUTION

Any materials that show visual evidence of biological growth due to the presence of moisture must not be installed on the building project.

3.1 PREPARATION

Preparation, unless otherwise specified or approved, must conform to applicable recommendations in the [GANA Glazing Manual](#), [GANA Sealant Manual](#), [IGMA TB-3001](#), [IGMA TM-3000](#), and manufacturer's recommendations. Determine the sizes to provide the required edge clearances by measuring the actual opening to receive the glass. Grind smooth in the shop glass edges that will be exposed in finish work. Leave labels in place until the installation is approved, except remove applied labels on heat-absorbing glass and on insulating glass units as soon as glass is installed. Securely fix movable items or keep in a closed and locked position until glazing compound has thoroughly set.

3.2 GLASS SETTING

Shop glaze or field glaze items to be glazed using glass of the quality and thickness specified or indicated. Glazing, unless otherwise specified or approved, must conform to applicable recommendations in the [GANA Glazing Manual](#), [GANA Sealant Manual](#), [IGMA TB-3001](#), [IGMA TM-3000](#), and manufacturer's recommendations. Aluminum windows, wood doors, and wood windows may be glazed in conformance with one of the glazing methods described in the standards under which they are produced, except that face puttying with no bedding will not be permitted. Handle and install glazing materials in accordance with manufacturer's instructions. Use beads or stops which are furnished with items to be glazed to secure the glass in place. Verify products are properly installed, connected, and adjusted.

3.2.1 Sheet Glass

Cut and set with the visible lines or waves horizontal.

3.2.2 Insulating Glass Units

Do not grind, nip, or cut edges or corners of units after the units have

left the factory. Springing, forcing, or twisting of units during setting will not be permitted. Handle units so as not to strike frames or other objects. Installation must conform to applicable recommendations of IGMA TB-3001 and IGMA TM-3000.

3.2.3 Installation of Laminated Glass

Sashes which are to receive laminated glass must be weeped to the outside to allow water drainage into the channel.

3.3 CLEANING

Clean glass surfaces and remove labels, paint spots, putty, and other defacement as required to prevent staining. Glass must be clean at the time the work is accepted.

3.4 PROTECTION

Protect glass work immediately after installation. Identify glazed openings with suitable warning tapes, cloth or paper flags, attached with non-staining adhesives. Protect reflective glass with a protective material to eliminate any contamination of the reflective coating. Place protective material far enough away from the coated glass to allow air to circulate to reduce heat buildup and moisture accumulation on the glass. Upon removal, separate protective materials for reuse or recycling. Remove and replace glass units which are broken, chipped, cracked, abraded, or otherwise damaged during construction activities with new units.

-- End of Section --

SECTION 09 30 10

CERAMIC, QUARRY, AND GLASS TILING
08/20

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI A108/A118/A136.1 (2019) American National Standard Specifications for the Installation of Ceramic Tile
- ANSI A137.1 (2019) American National Standards Specifications for Ceramic Tile
- ANSI A137.3/A108.19 (2017) American National Standard Specifications for Gauged Porcelain Tile and Gauged Porcelain Tile Panels/Slabs

ASTM INTERNATIONAL (ASTM)

- ASTM A1064/A1064M (2022) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
- ASTM C33/C33M (2018) Standard Specification for Concrete Aggregates
- ASTM C144 (2018) Standard Specification for Aggregate for Masonry Mortar
- ASTM C150/C150M (2022) Standard Specification for Portland Cement
- ASTM C206 (2014; R 2022) Standard Specification for Finishing Hydrated Lime
- ASTM C207 (2018) Standard Specification for Hydrated Lime for Masonry Purposes
- ASTM C373 (2018) Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products
- ASTM C648 (2020) Standard Test Method for Breaking Strength of Ceramic Tile

- ASTM C847** (2014a) Standard Specification for Metal Lath
- ASTM C1026** (2013; R 2018) Standard Test Method for Measuring the Resistance of Ceramic and Glass Tile to Freeze-Thaw Cycling
- ASTM C1027** (2009; R 2017) Standard Test Method for Determining Visible Abrasion Resistance of Glazed Ceramic Tile

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

- CDPH SECTION 01350** (2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

GREEN SEAL (GS)

- GS-36** (2013) Adhesives for Commercial Use

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

- SCS** SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

- SCAQMD Rule 1168** (2017) Adhesive and Sealant Applications

TILE COUNCIL OF NORTH AMERICA (TCNA)

- TCNA Hdbk** (2017) Handbook for Ceramic, Glass, and Stone Tile Installation

UNDERWRITERS LABORATORIES (UL)

- UL 2818** (2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Detail Drawings; G

SD-03 Product Data

Porcelain Tile; G

Gauged Porcelain Tile; G

Quarry Tile; G

Mosaic Tile; G

Large Format Glass Tile; G
Glazed Ceramic Wall Tile; G
Transition Strips; G
Metal Strips; G
Setting-Bed; G
Mortar, Grout, and Adhesive; G
Reinforcing Wire Fabric
Waterproof Membrane; G
Crack Isolation Membrane; G

SD-04 Samples

Tile; G
Accessories; G
Transition Strips; G
Metal Strips; G
Grout; G

SD-07 Certificates

SD-08 Manufacturer's Instructions

Manufacturer's Approved Cleaning Instructions

SD-10 Operation and Maintenance Data

Gauged Porcelain Tile, Data Package 1; G
Porcelain Tile, Data Package 1; G
Quarry Tile, Data Package 1; G
Mosaic Tile, Data Package 1; G
Large Format Glass Tile, Data Package 1; G
Glazed Ceramic Wall Tile, Data Package 1; G
Transition Strips, Data Package 1; G
Metal Strips, Data Package 1; G

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality Certifications

Provide products certified to meet indoor air quality requirements by [UL 2818](#) (Greenguard) Gold, [SCS](#) Global Services Indoor Advantage Gold or provide certification or validation by other third-party programs that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited in this Section.

1.3.2 [Water Absorption Rates](#) Certification

Provide certification for each tile type indicating compliance with the following water absorption (wa) rates per [ANSI A137.1](#) criteria as tested per [ASTM C373](#) requirements.

- a. Porcelain Tile (Impervious): Provide water absorption (wa) of 0.5 percent or less.

1.4 QUALITY ASSURANCE

Provide installers having a minimum of two years of experience with a company specializing in performing the type of work described. Each type and color of tile to be provided from a single source. Each type and color of mortar, adhesive, and grout to be provided from the same source.

1.5 DELIVERY, STORAGE, AND HANDLING

Ship tiles in sealed packages and clearly marked with the grade, type of tile, producer identification, and country of origin. Deliver materials to the project site in manufacturer's original unopened containers with seals unbroken and labels and hallmarks intact. Protect materials from weather, and store them under cover in accordance with manufacturer's printed instructions. Store and handle tiles per manufacturer's instructions for gauged porcelain tile and gauged porcelain tile panels/slabs.

1.6 ENVIRONMENTAL REQUIREMENTS

Do not perform ceramic tile work unless the substrate and ambient temperature is at least [50 degrees F](#) and rising. Maintain temperature above [50 degrees F](#) while the work is being performed and for at least 7 days after completion of the work. When temporary heaters are used, ventilate the area to the outside to avoid carbon dioxide damage to new tilework.

1.7 WARRANTY

Provide manufacturer's warranty to repair or replace defective tiling materials and workmanship, including tile, mortar and grout products and installation as a system, for a period of one year from date of final acceptance of the work..

1.8 EXTRA MATERIALS

Supply an extra 5 percent of each type tile used in clean and marked cartons.

PART 2 PRODUCTS

2.1 TILE

Provide tiles that comply with ANSI A137.1 and are standard grade tiles. Provide a minimum breaking strength of 125 lbs. for wall tile and 250 lbs. for floor tile in accordance with ASTM C648. Provide exterior building tile for cold climate projects that is approved by the manufacturer for exterior use when tested in accordance with ASTM C1026. Provide floor tiles with a minimum wet dynamic coefficient of friction (DCOF) value of 0.42 when tested in accordance with ANSI A137.1 requirements. Provide glazed floor tile with a Class IV-Commercial classification as rated by the manufacturer when tested in accordance with ASTM C1027 for visible abrasion resistance as related to foot traffic. For materials like tile, accessories, and transition strips submit samples of sufficient size to show color range, pattern, type and joints.

Submit manufacturers' descriptive product data for each type of ceramic, quarry and glass tiling indicated. Include manufacturers' literature, finishes, profiles and thicknesses of materials.

Submit manufacturers' operations and maintenance data for each type of ceramic, quarry and glass tiling indicated in accordance with Section 01 78 23 OPERATIONS AND MAINTENANCE DATA.

2.1.1 Porcelain Tile

Provide porcelain color body tile that meets the basis of design provided in design drawings, porcelain tile and cove base and trim pieces. Provide tile with a V3 aesthetic classification. Blend tiles in factory and in a packages to have same color range and continuous blend for installation. Provide nominal tile size(s) of 12 by 24 inch and 5/16 inch thick and 2x2 Mosaic mesh mounted, 5/16th inches thick.

Provide porcelain tiling materials that contain a minimum of 10 percent recycled content. Provide data identifying percentage of recycled content for porcelain tile.

2.2 SETTING-BED

Submit manufacturer's catalog data. Compose the setting-bed of the following materials:

2.2.1 Aggregate for Concrete Fill

Conform to ASTM C33/C33M for aggregate fill. Do not exceed one-half the thickness of concrete fill for maximum size of coarse aggregate.

2.2.2 Portland Cement

Conform to ASTM C150/C150M for cement, Type I, white for wall mortar and gray for other uses.

2.2.3 Sand

Conform to ASTM C144 for sand.

2.2.4 Hydrated Lime

Conform to [ASTM C206](#) for hydrated lime, Type S or [ASTM C207](#), Type S.

2.2.5 Metal Lath

Conform to [ASTM C847](#) for flat expanded type metal lath, and weighing a minimum 2.5 pound/square yard.

2.2.6 Reinforcing Wire Fabric

Conform to [ASTM A1064/A1064M](#) for wire fabric. Provide .

2.3 WATER

Provide potable water.

2.4 MORTAR, GROUT, AND ADHESIVE

Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of [CDPH SECTION 01350](#) (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of [SCAQMD Rule 1168](#). Provide aerosol adhesives used on the interior of the building meeting either emissions requirements of [CDPH SECTION 01350](#) (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of [GS-36](#). For products located on the interior of the building (inside of the weatherproofing system, provide certification or validation of [indoor air quality for adhesives](#). Provide bond coat, mortar, and grout supplied from the same manufacturer.

2.4.1 Dry-Set Portland Cement Mortar

[TCNA Hdbk.](#)

2.4.2 Furan Mortar

[TCNA Hdbk.](#)

2.4.3 Latex-Portland Cement Mortar

[TCNA Hdbk.](#)

2.4.4 Ceramic Tile Grout

[TCNA Hdbk](#); petroleum-free and plastic-free .

2.4.5 Organic Adhesive

[TCNA Hdbk](#), Type I. Water-resistant. Comply with [ANSI A108/A118/A136.1](#).

2.4.6 Epoxy Resin Grout

[TCNA Hdbk](#). Water cleanable epoxy conforming to [ANSI A108/A118/A136.1](#); provide manufacturer proportioned and packaged kit having hardener, resin and colored filler and horizontal and vertical grade products as applicable. Provide antimicrobial additive designed for prevention of mold and mildew.

2.4.7 Furan Resin Grout

TCNA Hdbk; chemical resistant furan conforming to ANSI A108/A118/A136.1; and consist of an intimate mixture of furfuryl-alcohol resin with carbon filler and catalyst. Prohibited unless specifically indicated otherwise.

2.4.8 Urethane Grout

TCNA Hdbk; premixed, urethane, water-based grout with color consistency and antimicrobial protection; no color fading, streaking or shading, chemical and stain resistant; and UV stable.

2.4.9 Sealants

Comply with applicable regulations regarding toxic and hazardous materials and as specified. Provide sealant that does not change the color or alter the appearance of the grout. Refer to Section 07 92 00 JOINT SEALANTS.

2.5 MISCELLANEOUS TRIMS

2.5.1 Metal Strips

Provide Cove trim shapes, height to match tile and setting thickness, designed specifically for flooring, and wall applications. Provide stainless steel cove strip where floor tile abuts wall tile for sanitary transition and elimination of cove tile base.

2.6 WATERPROOF MEMBRANE

2.6.1 General

Manufacturer's standard product that complies with ANSI A108/A118/A136.1 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

PART 3 EXECUTION

3.1 PREPARATORY WORK AND WORKMANSHIP

Inspect surface to receive tile in conformance to the requirements of TCNA Hdbk for surface conditions for the type setting bed specified and for workmanship. Provide variations of tiled surfaces that fall within maximum values shown below:

TYPE	WALLS	FLOORS
Dry-Set Mortar	1/8 inch in 8 ft.	1/8 inch in 10 ft.
Organic Adhesives	1/8 inch in 8 ft.	1/16 inch in 3 ft.
Latex-Portland Cement Mortar	1/8 inch in 8 ft.	1/8 inch in 10 ft.
Epoxy	1/8 inch in 8 ft.	1/8 inch in 10 ft.

3.2 GENERAL INSTALLATION REQUIREMENTS

Do not start tile work until roughing in for mechanical and electrical work

has been completed and tested, and built-in items requiring membrane waterproofing have been installed and tested. Close space, in which tile is being set, to traffic and other work. Keep closed until tile is firmly set. Do not start floor tile installation in spaces requiring wall tile until after wall tile has been installed. Apply tile in colors and patterns indicated in the area shown on the drawings. Install tile with the respective surfaces in true even planes to the elevations and grades shown. Provide special shapes as required for sills, jambs, recesses, offsets, external corners, and other conditions to provide a complete and neatly finished installation. Solidly back tile bases and coves with mortar. Do not walk or work on newly tiled floors without using kneeling boards or equivalent protection of the tiled surface. Keep traffic off horizontal portland cement mortar installations for at least 72 hours. Keep all traffic off epoxy installed floors for at least 40 hours after grouting, and heavy traffic off for at least 7 days, unless otherwise specifically authorized by manufacturer. Dimension and draw [detail drawings](#) at a minimum scale of 1/4 inch = 1 foot. Include drawings of pattern at inside corners, outside corners, termination points and location of all equipment items such as thermostats, switch plates, mirrors and toilet accessories mounted on surface. Submit drawings showing ceramic tile pattern elevations and floor plans. Submit manufacturer's preprinted installation instructions.

Do not install building construction materials that show visual evidence of biological growth.

3.3 INSTALLATION OF SUBSTRATES

3.3.1 [Enter Appropriate Subpart Title Here]

Install in accordance with manufacturer's written instructions.

3.4 INSTALLATION OF WALL TILE

Install wall tile in accordance with the [TCNA Hdbk](#) and with grout joints as recommended by the manufacturer for the type of tile.

3.4.1 Installation of Gauged Porcelain Tile

Install gauged porcelain tile in accordance with [TCNA Hdbk](#) method.

3.4.2 Workable or Cured Mortar Bed

Install tile over workable mortar bed or a cured mortar bed at the option of the Contractor. Install a 4 mil polyethylene membrane, metal lath, and scratch coat. Conform to [TCNA Hdbk](#) method [_____] for workable mortar bed, materials, and installation of tile. Conform to [TCNA Hdbk](#) method [_____] for cured mortar bed and materials.

3.4.3 Dry-Set Mortar and Latex-Portland Cement Mortar

Use [dry-set] [or] [latex-portland cement] to install tile in accordance with [TCNA Hdbk](#) method [_____] . Use latex-portland cement when installing porcelain ceramic tile.

3.4.4 Organic Adhesive

Comply with the requirements of [TCNA Hdbk](#) method [_____] for organic adhesive installation of ceramic tile.

3.4.5 Furan Mortar and Grout

Comply with the requirements of **TCNA Hdbk** method [_____] for furan mortar and grout installation.

3.4.6 Ceramic Tile Grout

Prepare and install ceramic tile grout in accordance with **TCNA Hdbk** method [_____] . [Provide and apply manufacturer's standard [_____] product for sealing grout joints in accordance with manufacturer's recommendations.]

3.4.7 Epoxy Resin Grout

Prepare and install epoxy resin grout in accordance with **TCNA Hdbk** method [_____] .

3.4.8 Urethane Grout

Prepare and install urethane grout in accordance with **TCNA Hdbk** method [_____] .

3.5 INSTALLATION OF FLOOR TILE

Install floor tile in accordance with **TCNA Hdbk** method [specified herein] [_____] and with grout joints [as recommended by the manufacturer for the type of tile] [of [_____] inch] . Install shower receptors in accordance with **TCNA Hdbk** method [B414] [B415] [_____] .

3.5.1 Installation of Gauged [Porcelain Tile] [Porcelain Tile Panels/Slabs]

Install gauged [porcelain tile] [porcelain tile panels/slabs] in accordance with **TCNA Hdbk** method [_____] and **ANSI A137.3/A108.19** for thin-bed method bonded with modified dry-set cement mortar over improved modified dry-set cement mortar.

3.5.2 Workable or Cured Mortar Bed

Install floor tile over a workable mortar bed or a cured mortar bed at the option of the Contractor. Conform to **TCNA Hdbk** method [_____] for workable mortar bed materials and installation. Conform to **TCNA Hdbk** method [_____] for cured mortar bed materials and installation. Provide minimum 1/4 inch to maximum 3/8 inch joints in uniformed width.

3.5.3 Dry-Set and Latex-Portland Cement

Use [dry-set] [or] [latex-portland cement] mortar to install tile directly over properly cured, plane, clean concrete slabs in accordance with **TCNA Hdbk** method [_____] . Use latex-portland cement when installing porcelain ceramic tile.

3.5.4 Ceramic Tile Grout

Prepare and install ceramic tile grout in accordance with **TCNA Hdbk** method [_____] . Provide and apply manufacturer's standard [_____] product for sealing grout joints in accordance with manufacturer's recommendations.

3.5.5 Waterproof and Crack Isolation Membranes

Install as indicated in accordance with manufacturer's written instructions.

3.5.6 Concrete Fill

3.6 INSTALLATION OF MISCELLANEOUS TRIMS

3.6.1 Transition Strips

Install transition strips where indicated, in a manner similar to that of the ceramic tile floor and as recommended by the manufacturer. Provide thresholds full width of the opening. Install head joints at ends not exceeding 1/4 inch in width and grouted full.

3.6.2 Metal Trims

Install trim where indicated. Embed anchoring leg in setting mortar in accordance with manufacturer's instructions. During grouting of tile joints, immediately wipe grout from finish surface.

3.7 EXPANSION JOINTS

Form and seal joints as specified in Section 07 92 00 JOINT SEALANTS.

3.7.1 Walls

Provide expansion joints at control joints in backing material. Wherever backing material changes, install an expansion joint to separate the different materials.

3.7.2 Floors

Provide expansion joints over construction joints, control joints, and expansion joints in concrete slabs in accordance with TCNA Hdbk method [_____] EJ171 type to suit conditions. Provide expansion joints where tile abuts restraining surfaces such as perimeter walls, curbs and columns and at intervals of 20 to 25 feet each way in large interior floor areas[.][and 8 to 12 feet each way in large exterior areas or areas exposed to direct sunlight or moisture.] Extend expansion joints through setting-beds and fill.

3.8 CLEANING AND PROTECTING

Upon completion, thoroughly clean tile surfaces in accordance with manufacturer's approved cleaning instructions. Do not use acid for cleaning glazed tile. Clean floor tile with resinous grout or with factory mixed grout in accordance with printed instructions of the grout manufacturer. After the grout has set, provide a protective coat of a noncorrosive soap or other approved method of protection for tile wall surfaces. Cover tiled floor areas with building paper before foot traffic is permitted over the finished tile floors. Provide board walkways on tiled floors that are to be continuously used as passageways by workmen. Replace damaged or defective tiles.

-- End of Section --

SECTION 09 67 23.13

STANDARD RESINOUS FLOORING

27SEP2018

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 D4259

(1988; R 2012) Standard Practice for
Abrading Concrete

1.2 ADMINISTRATIVE REQUIREMENTS

1.2.1 Product Data

Within 30 days of contract award, submit [manufacturer's catalog data](#)

1.2.2 Design Mix Data

Within 30 days of contract award, submit [design mix data](#) including a complete list of ingredients and admixtures:

Ensure applicable test reports verify the mix has been successfully tested and meets design requirements.

1.3 SUBMITTALS

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

[SD-03 Product Data](#)

[Manufacturer's Catalog Data](#)

[SD-04 Samples](#)

[Hardboard Mounted](#)

[SD-05 Design Data](#)

[Design Mix Data](#)

[SD-07 Certificates](#)

[Listing of Product Installations](#)

[Referenced Standards Certificates](#)

[SD-11 Closeout Submittals](#)

[Warranty](#)

1.4 DELIVERY, STORAGE, AND HANDLING

Protect materials from weather, soil, and damage during delivery, storage, and construction. Deliver materials in original packages, containers, or bundles bearing brand name and name of material.

Maintain materials used in the installation of floor topping at a temperature between 65 and 85 degrees F.

1.5 QUALITY CONTROL

Prior to commencement of work, submit [referenced standards certificates](#) for the following, showing conformance with the referenced standards contained in this section

1.5.1 Qualifications

Submit a [listing of product installations](#) for [resinous](#) flooring including identification of at least 5 units, similar to those proposed for use, that have been in successful service for a minimum period of 5 years. Identify purchaser, address of installation, service organization, and date of installation.

1.5.2 Sampling

Submit [hardboard mounted](#) samples not less than 12-inch square for each required color.

Provide panels showing nominal thickness of finished toppings, color, and texture of finished surfaces. Finished floor toppings and the approved samples are to match in color and texture.

1.6 WARRANTY

Submit a 2 year written [warranty](#) for all materials and installation work.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Monolithic, multi-component urethane chemistry resinous flooring system. Urethane Primer with urethane troweled mortar, High performance multi-component solvent free epoxy undercoat, Vinyl chip flake broadcast media in 1/16" flake size. High performance multi component urethane sealers. Overall system thickness, 3/16".

2.2 MATERIALS

2.2.1 Primer

- a. Resin: urethane.
- b. Formulation Description: Multiple component high solids.
- c. Application Method: squeegee, back roll.
- d. Thickness of coat(s): 2-3mil.
- e. Number of Coats: One.

- 2.2.2 Mortar (body coat)
 - a. Resin: Urethane.
 - b. Formulation Description: Pigmented (4)four part troweled mortar.
 - c. Application Method: Steel Trowel/Power Trowel.
 - f. Thickness of coat(s): 1/8"
 - g. Number of Coats: One.

- 2.2.3 Undercoat (body coat)
 - a. Resin: Epoxy.
 - b. Formulation Description: Pigmented multi-component, high solids.
 - c. Application Method: Notched squeegee and Back roll
 - d. Number of Coats: One.
 - e. Aggregates: vinyl chip flake broadcast into wet Undercoat to refusal.
 - f. Thickness of coat(s): 40-50mil.
 - g. Number of Coats: One.

- 2.2.4 Sealer coat
 - a. Resin: Urethane.
 - b. Formulation Description: Two-component UV resistant.
 - c. Type/Finsh: Clear Gloss.
 - d. Thickness of coat(s): 2-3mil.
 - e. Number of Coats: (2) two.
 - f. Application: Squeegee and finish roll.

2.3 Physical Properties

Provide flooring system in which physical properties of topping including aggregate, when tested in accordance with standards or procedures referenced below, are as follows:

1. Tensile Strength: 1,000 psi per ASTM D-638
2. Flexural Strength: 2,000 psi per ASTM D-790
3. VOC limits: less than 115 g/l
4. Water Absorvtion: 0.056% per ASTM C-413
5. Coefficient of friction: >.79 dry >.65 wet per ASTM D204
6. Bond strength: >300 psi 100% concrete failure per ASTM D-7234
7. Hardness: 80 per ASTM D-2240
8. Compressive strength: 5,000 psi per ASTM C-579
9. Linear Coefficient of Thermal Expansion: 17×10^{-6} in./in. per ASTM C-531
10. Impact Resistance: Exceeds 160 in.-lbs. per ASTM D-4226
11. Abrasion resistance: 0.03 gm max. weight loss per ASTM D-4060 CS-17
12. Flammability: Class I per ASTM E-648

Cure Rate: 4 hours for foot traffic, 12 hours for normal operations

PART 3 EXECUTION

3.1 PREPARATION

Prior to applying resinous flooring material, inspect substrate and immediately report any unsatisfactory conditions that exist and repair.

3.1.1 Safety Precautions

Prior to application in confined spaces of toppings and coatings containing

flammable or toxic properties, institute safety precautions and provide forced ventilation to ensure that vapor concentration is kept at acceptable limits as recommended by the manufacturer of the product.

Erect "NO SMOKING" signs, and prohibit smoking or use of spark- or flame-producing devices within 50 feet of any mixing or placing operation involving flammable materials.

Provide personnel required to handle, mix, or apply toppings containing toxic or flammable properties with such items of personal protective equipment and apparel for eye, skin, and respiratory protection as are recommended by the manufacturer of the product. Ensure all personnel are trained in the appropriate use and wearing of personal protection equipment.

Accomplish sand blasting under approved controlled conditions with respect to sand and dust control to prevent damage to personnel and facility.

3.1.2 Protection of Adjacent Surfaces

In addition to the protection of adjacent surfaces during installation, provide areas used to store and mix materials with a protective covering under the materials. After application of the sealer coats, protect finished flooring during the remainder of the construction period. In areas of expected minimum or moderate traffic, cover floors with 70-pound kraft paper, with strips taped together and edges secured to prevent roll-up. Place vegetable fiberboard, plywood, or other suitable material that does not mar the flooring over the paper to protect areas used as passages by workmen and areas subject to floor damage because of subsequent building operations. Upon completion of construction, remove the protection, clean flooring and, where necessary, repair, reseal, or both, at no additional cost to the Government.

3.1.3 Concrete Subfloor

3.1.3.1 Existing Concrete Floors

Clean existing concrete floors, by mechanical means to remove hard troweled or contaminated areas in conformance with ASTM D4259, and ensure concrete is free of all paint, sealers, curing agents, oil, grease, moisture, dirt, laitance or any other contaminants. Remove any loose or corroded segments of existing concrete and patch with a grouting compound as recommended by the resinous flooring manufacturer. Fill all cracks with an elastomeric jointing compound compatible with the resinous flooring system used.

3.1.4 Mixing Of Materials

Use mechanical equipment for mixing of materials in accordance with the manufacturer's instructions.

3.2 APPLICATION

3.2.1 Areas of Application

Remove equipment prior to installation of material unless directed otherwise by the Contracting Officer. Cover and/or mask surfaces not to receive the epoxy floor topping, such as equipment or cabinets installed prior to surface-preparation efforts and adjacent to the flooring installation. Apply in a uniform, uninterrupted surface except at joints if indicated.

3.2.2 Application

Install all coatings and aggregate in strict accordance with manufacturer's requirements, including temperature and humidity.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.
 - a. Apply joint sealant to comply with manufacturer's written recommendations.

Apply Primer: over prepared substrate at manufacturer's recommended spreading rate.

Trowel mortar base: Mix mortar material according to manufacturer's recommended procedures. Climatic and non-climatic resinous flooring systems may vary slightly on mode of application. Application should be based upon the following: Uniformly spread mortar over substrate using a specially designed screed box adjusted to manufacturer's recommended height. Metal trowel (hand or power) single mortar coat in thickness indicated for flooring system, grout to fill substrate voids. When cured, sand to remove trowel marks and roughness.

Under Coat: Mix base material according to manufacturer's recommended procedures. Uniformly spread mixed material over previously primed substrate using manufacturer's installation tool. Roll material with strict adherence to manufacturer's installation procedures and coverage rates.

Broadcast: Immediately broadcast vinyl flakes into the body coat. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.

First Sealer: Remove excess un-bonded flakes by lightly brushing and vacuuming the floor surface. Mix and apply sealer with strict adherence to manufacturer's installation procedures.

Second Sealer: Lightly sand first sealer coat. Mix and apply second sealer coat with strict adherence to manufacturer's installation procedures.

3.3 FIELD QUALITY CONTROL

3.3.1 Tolerance

From line of plane: Maximum 1/8 inch (3.18 mm) in total distance of flooring and base. Broadcast resinous flooring system will contour substrate. Deviation and tolerance are subject to concrete tolerance

3.3.2 Curing, Protection and Cleaning

A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process.

B. Close area of application for a minimum of 24 hours.

C. Protect resinous flooring materials from damage and wear during construction operation. Cover flooring with kraft type paper. In high traffic areas use 6 mm (1/4 inch) thick hardboard, plywood, or particle board.

D. Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

3.3.3 Repairing

Remove and replace damaged or unacceptable portions of completed work with new work to match adjacent surfaces at no additional cost to the Government.

3.4 ADJUSTING AND CLEANING

Clean surfaces of the new work, and adjacent surfaces soiled as a result of the work. Remove all equipment, surplus materials, and rubbish associated with the work from the site.

-- End of Section --

SECTION 09 90 00

PAINTS AND COATINGS

02/21

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

1.1.1 Painting Included

Where a space or surface is indicated to be painted, include the following unless indicated otherwise.

- a. Surfaces behind portable objects and surface mounted articles readily detachable by removal of fasteners, such as screws and bolts.
- b. New factory finished surfaces that require identification or color coding and factory finished surfaces that are damaged during performance of the work.
- c. Existing coated surfaces that are damaged during performance of the work.

1.1.1.1 Exterior Painting

Includes new surfaces, existing coated surfaces, and existing uncoated surfaces, of the building and appurtenances. Also included are existing coated surfaces made bare by cleaning operations.

1.1.1.2 Interior Painting

Includes new surfaces, existing uncoated surfaces, and existing coated surfaces of the building and appurtenances as indicated and existing coated surfaces made bare by cleaning operations. Where a space or surface is indicated to be painted, include the following items, unless indicated otherwise.

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 CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH 0100 (2017; Suppl 2020) Documentation of the Threshold Limit Values and Biological Exposure Indices

ASTM INTERNATIONAL (ASTM)

ASTM C920 (2018) Standard Specification for Elastomeric Joint Sealants

ASTM D235 (2002; R 2012) Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)

- ASTM D523 (2014; R 2018) Standard Test Method for Specular Gloss
- ASTM D2824/D2824M (2018) Standard Specification for Aluminum-Pigmented Asphalt Roof Coatings, Non-Fibered, and Fibered without Asbestos
- ASTM D4214 (2007; R 2015) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films
- ASTM D4263 (1983; R 2018) Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
- ASTM D4444 (2013; R 2018) Standard Test Method for Laboratory Standardization and Calibration of Hand-Held Moisture Meters
- ASTM D6386 (2016a) Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting
- ASTM F1869 (2016a) Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC)

- Intelligence Bulletin 65 (2013) Occupational Exposure to Carbon Nanotubes and Nanofibers

MASTER PAINTERS INSTITUTE (MPI)

- MPI 1 (2012) Aluminum Paint
- MPI 2 (2012) Aluminum Heat Resistant Enamel (up to 427 C and 800 F)
- MPI 3 (2016) Primer, Alkali Resistant, Water Based
- MPI 4 (2016) Interior/Exterior Latex Block Filler
- MPI 5 (2015) Primer, Exterior Alkyd Wood
- MPI 6 (2015) Primer, Exterior Latex Wood
- MPI 8 (2016) Alkyd, Exterior Flat (MPI Gloss Level I)
- MPI 9 (2016) Alkyd, Exterior Gloss (MPI Gloss Level 6)
- MPI 10 (2016) Latex, Exterior Flat (MPI Gloss Level 1)
- MPI 11 (2016) Latex, Exterior Semi-Gloss, MPI

	Gloss Level 5
MPI 13	(2016) Stain, Exterior Solvent-Based, Semi-Transparent
MPI 16	(2016) Stain, Exterior, Water Based, Solid Hide
MPI 17	(2016) Primer, Bonding, Water Based
MPI 19	(2012) Primer, Zinc Rich, Inorganic
MPI 21	(2012) Heat Resistant Coating, (Up to 205°C/402°F), MPI Gloss Level 6
MPI 22	(2012) Aluminum Paint, High Heat (up to 590° C/1100° F)
MPI 23	(2015) Primer, Metal, Surface Tolerant
MPI 27	(2016) Floor Enamel, Alkyd, Gloss (MPI Gloss Level 6)
MPI 31	(2012) Varnish, Polyurethane, Moisture Cured, Gloss (MPI Gloss Level 6)
MPI 38	(2016) Elastomeric Coating, Exterior, Water Based, Non-Flat
MPI 39	(2018) Primer, Latex, for Interior Wood
MPI 42	(2012) Textured Coating, Latex, Flat
MPI 44	(2016) Latex, Interior, (MPI Gloss Level 2)
MPI 45	(2016) Primer Sealer, Interior Alkyd
MPI 46	(2016) Undercoat, Enamel, Interior
MPI 47	(2016) Alkyd, Interior, Semi-Gloss (MPI Gloss Level 5)
MPI 48	(2016) Alkyd, Interior, Gloss (MPI Gloss Level 6-7)
MPI 49	(2015) Alkyd, Interior, Flat (MPI Gloss Level 1)
MPI 50	(2015) Primer Sealer, Latex, Interior
MPI 51	(2016) Alkyd, Interior, (MPI Gloss Level 3)2
MPI 52	(2016) Latex, Interior, (MPI Gloss Level 3)
MPI 54	(2016) Latex, Interior, Semi-Gloss (MPI Gloss Level 5)
MPI 56	(2012) Varnish, Interior, Polyurethane,

Oil Modified, Gloss

MPI 57 (2012) Varnish, Interior, Polyurethane, Oil Modified, Satin

MPI 59 (2016) Floor Paint, Alkyd, Low Gloss

MPI 60 (2016) Floor Paint, Latex, Low Gloss

MPI 68 (2016) Floor Paint, Latex, Gloss

MPI 71 (2012) Varnish, Polyurethane, Moisture Cured, Flat (MPI Gloss Level 1)

MPI 72 (2016) Polyurethane, Two-Component, Pigmented, Gloss (MPI Gloss Level 6-7)

MPI 76 (2016) Primer, Alkyd, Quick Dry, for Metal

MPI 77 (2015) Epoxy, Gloss

MPI 79 (2016) Primer, Alkyd, Anti-Corrosive for Metal

MPI 90 (2012) Stain, Semi-Transparent, for Interior Wood

MPI 94 (2016) Alkyd, Exterior, Semi-Gloss (MPI Gloss Level 5)

MPI 95 (2015) Primer, Quick Dry, for Aluminum

MPI 101 (2016) Primer, Epoxy, Anti-Corrosive, for Metal

MPI 107 (2016) Primer, Rust-Inhibitive, Water Based

MPI 108 (2015) Epoxy, High Build, Low Gloss

MPI 113 (2018) Elastomeric, Pigmented, Exterior, Water Based, Flat

MPI 116 (2012) Block Filler, Epoxy

MPI 119 (2016) Latex, Exterior, Gloss (MPI Gloss Level 6)

MPI 120 (2020) Epoxy, High Build, Self Priming, Low Gloss

MPI 134 (2015) Primer, Galvanized, Water Based

MPI 138 (2016) Latex, Interior, High Performance Architectural, (MPI Gloss Level 2)

MPI 139 (2016) Latex, Interior, High Performance Architectural, (MPI Gloss Level 3)

MPI 140 (2016) Latex, Interior, High Performance

	Architectural, (MPI Gloss Level 4)
MPI 141	(2016) Latex, Interior, High Performance Architectural, Semi-Gloss (MPI Gloss Level 5)
MPI 144	(2016) Latex, Interior, Institutional Low Odor/VOC, (MPI Gloss Level 2)
MPI 145	(2016) Latex, Interior, Institutional Low Odor/VOC, (MPI Gloss Level 3)
MPI 146	(2016) Latex, Interior, Institutional Low Odor/VOC, (MPI Gloss Level 4)
MPI 147	(May 2016) Latex, Interior, Institutional Low Odor/VOC, Semi-Gloss (MPI Gloss Level 5)
MPI 149	(2016) Primer Sealer, Interior, Institutional Low Odor/VOC
MPI 151	(2016) Light Industrial Coating, Interior, Water Based (MPI Gloss Level 3)
MPI 153	(2016) Light Industrial Coating, Interior, Water Based, Semi-Gloss (MPI Gloss Level 5)
MPI 154	(2016) Light Industrial Coating, Interior, Water Based, Gloss (MPI Gloss Level 6)
MPI 161	(2016) Light Industrial Coating, Exterior, Water Based (MPI Gloss Level 3)
MPI 163	(2016) Light Industrial Coating, Exterior, Water Based, Semi-Gloss (MPI Gloss Level 5)
MPI 164	(2016) Light Industrial Coating, Exterior, Water Based, Gloss (MPI Gloss Level 6)
MPI 177	(2020) Epoxy, Semi-Gloss (MPI Gloss Level 5)
MPI 214	(2016) Latex, Exterior (MPI Gloss Level 2)
MPI ASM	(2019) Architectural Painting Specification Manual
MPI GPS-1-14	(2014) Green Performance Standard GPS-1-14
MPI GPS-2-14	(2014) Green Performance Standard GPS-2-14
MPI MRM	(2015) Maintenance Repainting Manual
SOCIETY FOR PROTECTIVE COATINGS (SSPC)	
SSPC 7/NACE No.4	(2007) Brush-Off Blast Cleaning
SSPC Glossary	(2011) SSPC Protective Coatings Glossary

SSPC Guide 6	(2015) Guide for Containing Surface Preparation Debris Generated During Paint Removal Operations
SSPC Guide 7	(2015) Guide to the Disposal of Lead-Contaminated Surface Preparation Debris
SSPC PA 1	(2016) Shop, Field, and Maintenance Coating of Metals
SSPC SP 1	(2015) Solvent Cleaning
SSPC SP 2	(2018) Hand Tool Cleaning
SSPC SP 3	(2018) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning
SSPC SP 10/NACE No. 2	(2007) Near-White Blast Cleaning
SSPC VIS 1	(2002; E 2004) Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
SSPC VIS 3	(2004) Guide and Reference Photographs for Steel Surfaces Prepared by Hand and Power Tool Cleaning
SSPC VIS 4/NACE VIS 7	(1998; E 2000; E 2004) Guide and Reference Photographs for Steel Surfaces Prepared by Waterjetting
SSPC-SP WJ-1/NACE WJ-1	(2012) Clean to Bare Substrate, Waterjet Cleaning of Metals
SSPC-SP WJ-2/NACE WJ-2	(2012) Very Thorough Cleaning, Waterjet Cleaning of Metals
SSPC-SP WJ-3/NACE WJ-3	(2012) Thorough Cleaning, Waterjet Cleaning of Metals
SSPC-SP WJ-4/NACE WJ-4	(2012) Light Cleaning, Waterjet Cleaning of Metals
U.S. ARMY CORPS OF ENGINEERS (USACE)	
EM 385-1-1	(2014) Safety and Health Requirements Manual
U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)	
EPA Method 24	(2000) Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD-313 (2018) Material Safety Data,
Transportation Data and Disposal Data for
Hazardous Materials Furnished to
Government Activities

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

29 CFR 1910.1000 Air Contaminants
29 CFR 1910.1001 Asbestos
29 CFR 1910.1025 Lead
29 CFR 1926.62 Lead

1.3 DEFINITIONS

1.3.1 Qualification Testing

Qualification testing is the performance of all test requirements listed in the product specification. This testing is accomplished by MPI to qualify each product for the MPI Approved Product List, and may also be accomplished by Contractor's third-party testing lab if an alternative to Batch Quality Conformance Testing by MPI is desired.

1.3.2 Batch Quality Conformance Testing

Batch quality conformance testing determines that the product provided is the same as the product qualified to the appropriate product specification. This testing must be accomplished by an MPI testing lab.

1.3.3 Coating

SSPC Glossary; (1) A liquid, liquefiable, or mastic composition that is converted to a solid protective, decorative, or functional adherent film after application as a thin layer; (2) Generic term for paint, lacquer, enamel.

1.3.4 DFT or dft

Dry film thickness, the film thickness of the fully cured, dry paint or coating.

1.3.5 DSD

Degree of Surface Degradation, the MPI system of defining degree of surface degradation. Five levels are generically defined under the Assessment sections in the MPI MRM, MPI Maintenance Repainting Manual.

1.3.6 EXT

MPI short term designation for an exterior coating system.

1.3.7 INT

MPI short term designation for an interior coating system.

1.3.8 Loose Paint

Paint or coating that can be removed with a dull putty knife.

1.3.9 mil / mils

The English measurement for 0.001 in or one one-thousandth of an inch.

1.3.10 MPI Gloss Levels

MPI system of defining gloss. Seven gloss levels (G1 to G7) are generically defined under the Evaluation sections of the MPI Manuals. Traditionally, Flat refers to G1/G2, Eggshell refers to G3, Semigloss refers to G5, and Gloss refers to G6.

Gloss levels are defined by MPI as follows:

Gloss Level	Description	Units at 60 degree angle	Units at 80 degree angle
G1	Matte or Flat	0 to 5	10 max
G2	Velvet	0 to 10	10 to 35
G3	Eggshell	10 to 25	10 to 35
G4	Satin	20 to 35	35 min
G5	Semi-Gloss	35 to 70	
G6	Gloss	70 to 85	
G7	High Gloss		

Gloss is tested in accordance with [ASTM D523](#). Historically, the Government has used Flat (G1 / G2), Eggshell (G3), Semi-Gloss (G5), and Gloss (G6).

1.3.11 MPI System Number

The MPI coating system number in each MPI Division found in either the MPI Architectural Painting Specification Manual or the Maintenance Repainting Manual and defined as an exterior (EXT/REX) or interior system (INT/RIN).

1.3.12 Paint

[SSPC Glossary](#); (1) Any pigmented liquid, liquefiable, or mastic composition designed for application to a substrate in a thin layer that is converted to an opaque solid film after application. Used for protection, decoration, identification, or to serve some other functional purposes; (2) Application of a coating material.

1.3.13 REX

MPI short term designation for an exterior coating system used in repainting projects or over existing coating systems.

1.3.14 RIN

MPI short term designation for an interior coating system used in repainting projects or over existing coating systems.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submit non-G submittals to the Government for their record. The Government reserves the right to provide additional comments, request resubmittal, rejection and re-submittal to all the non-G submittals.

When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Samples of specified materials may be taken and tested for compliance with specification requirements.

SD-02 Shop Drawings

Piping Identification

SD-03 Product Data

Coating; G

Product Data Sheets

Sealant

SD-04 Samples

Color; G

SD-07 Certificates

Indoor Air Quality for Paints and Primers

Indoor Air Quality for Consolidated Latex Paints

SD-08 Manufacturer's Instructions

Application Instructions

Mixing

Manufacturer's Safety Data Sheets

SD-10 Operation and Maintenance Data

Coatings, Data Package 1; G

1.5 QUALITY ASSURANCE

1.5.1 Regulatory Requirements

1.5.1.1 Environmental Protection

In addition to requirements specified elsewhere for environmental protection, provide coating materials that conform to the restrictions of

the local Air Pollution Control District and regional jurisdiction. Notify Contracting Officer of any paint specified herein which fails to conform.

1.5.1.2 Lead Content

Do not use coatings having a lead content over 0.06 percent by weight of nonvolatile content.

1.5.1.3 Chromate Content

Do not use coatings containing zinc-chromate or strontium-chromate.

1.5.1.4 Asbestos Content

Provide asbestos-free materials.

1.5.1.5 Mercury Content

Provide materials free of mercury or mercury compounds.

1.5.1.6 Silica

Provide abrasive blast media containing no free crystalline silica.

1.5.1.7 Human Carcinogens

Provide materials that do not contain [ACGIH 0100](#) confirmed human carcinogens (A1) or suspected human carcinogens (A2).

1.5.1.8 Carbon Based Fibers / Tubes

Materials must not contain carbon based fibers such as carbon nanotubes or carbon nanofibers. [Intelligence Bulletin 65](#) ranks toxicity of carbon nanotubes on a par with asbestos.

1.5.2 Approved Products List

The current MPI, "Approved Product List" which lists paint by brand, label, product name and product code as of the date of Contract award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use a subsequent MPI "Approved Product List", however, only one list may be used for the entire Contract and each coating system is to be from a single manufacturer. Provide all coats on a particular substrate from a single manufacturer. No variation from the MPI Approved Products List is acceptable.

1.5.3 Paints and Coatings Indoor Air Quality Certifications

Provide paint and coating products certified to meet indoor air quality requirements by [MPI GPS-1-14](#), [MPI GPS-2-14](#) or provide certification by other third-party programs. Provide current product certification documentation from certification body.

Provide certification of [Indoor Air Quality for Paints and Primers](#). Submit required indoor air quality certifications in one submittal package.

1.5.4 Field Samples and Tests

The Contracting Officer may choose up to two coatings that have been

delivered to the site to be tested at no cost to the Government. Take samples of each chosen product as specified in the paragraph SAMPLING PROCEDURE. Test each chosen product as specified in the paragraph TESTING PROCEDURE. Remove products from the job site which do not conform, and replace with new products that conform to the referenced specification. Test replacement products that failed initial testing as specified in the paragraph TESTING PROCEDURE at no cost to the Government.

1.5.4.1 Sampling Procedure

Select paint at random from the products that have been delivered to the job site for sample testing. The Contractor must provide **one quart** samples of the selected paint materials. Take samples in the presence of the Contracting Officer, and label, and identify each sample. Provide labels in accordance with the paragraph PACKAGING, LABELING, AND STORAGE.

1.5.4.2 Testing Procedure

Provide Batch Quality Conformance Testing for specified products, as defined by and performed by MPI. As an alternative to Batch Quality Conformance Testing, the Contractor may provide **Qualification Testing** for specified products above to the appropriate MPI product specification, using the third-party laboratory approved under the paragraph QUALIFICATION TESTING laboratory for coatings. Include the backup data and summary of the test results within the qualification testing lab report. Provide a summary listing of all the reference specification requirements and the result of each test. Clearly indicate in the summary whether the tested paint meets each test requirement. Note that Qualification Testing may take 4 to 6 weeks to perform, due to the extent of testing required.

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 employees performing testing are qualified. If MPI is chosen to perform the Batch Quality Conformance testing, the above submittal information is not required, only a letter is required from the Contractor stating that MPI will perform the testing.

1.6 PACKAGING, LABELING, AND STORAGE

Provide paints in sealed containers that legibly show the Contract specification number, designation name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name and address of manufacturer. Furnish pigmented paints in containers not larger than **5 gallons**. Store paints and thinners in accordance with the manufacturer's written directions, and as a minimum, stored off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors, and at temperatures between **40 to 95 degrees F**. **Do not store paint, polyurethane, varnish, or wood stain products with materials that have a high capacity to absorb VOC emissions. Do not store paint, polyurethane, varnish, or wood stain products in occupied spaces.**

1.7 SAFETY AND HEALTH

Comply with applicable Federal, State, and local laws and regulations, and

with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis as specified in Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS and in Appendix A of EM 385-1-1. Include in the Activity Hazard Analysis the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.

1.7.1 Toxic Materials

To protect personnel from overexposure to toxic materials, conform to the most stringent guidance of:

- a. The applicable manufacturer's Safety Data Sheets (SDS) or local regulation.
- b. 29 CFR 1910.1000.
- c. ACGIH 0100, threshold limit values.
- d. The appropriate OSHA standard in 29 CFR 1910.1025 and 29 CFR 1926.62 for surface preparation on painted surfaces containing lead. Removal and disposal of coatings which contain lead is specified in Section 02 83 00 LEAD REMEDIATION. Additional guidance is given in SSPC Guide 6 and SSPC Guide 7. Refer to drawings for list of hazardous materials located on this project. Coordinate paint preparation activities with this specification section.
- e. The appropriate OSHA standards in 29 CFR 1910.1001 for surface preparation of painted surfaces containing asbestos. Removal and disposal of coatings which contain asbestos materials is specified in Section 02 82 00 ASBESTOS REMEDIATION. Refer to drawings for list of hazardous materials located on this project. Coordinate paint preparation activities with this specification section.

Submit manufacturer's Safety Data Sheets for coatings, solvents, and other potentially hazardous materials, as defined in FED-STD-313.

1.8 ENVIRONMENTAL REQUIREMENTS

Comply, at minimum, with manufacturer recommendations for space ventilation during and after installation.

1.8.1 Coatings

Do not apply coating when air or substrate conditions are:

- a. Less than 5 degrees F above dew point;
- b. Below 50 degrees F or over 95 degrees F, unless specifically pre-approved by the Contracting Officer and the product manufacturer. Do not, under any circumstances, violate the manufacturer's application recommendations.

1.8.2 Post-Application

Vacate space for as long as possible after application. Wait a minimum of 48 hours before occupying freshly painted rooms. Maintain one of the following ventilation conditions during the curing period, or for 72 hours after application:

- a. Supply 100 percent outside air 24 hours a day.
- b. Supply airflow at a rate of 6 air changes per hour, when outside temperatures are between 55 degrees F and 85 degrees F and humidity is between 30 percent and 60 percent.
- c. Supply airflow at a rate of 1.5 air changes per hour, when outside air conditions are not within the range stipulated above.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to the [coating](#) specifications and standards referenced in PART 3. Submit [Product Data Sheets](#) for specified [coatings](#) and solvents. Provide preprinted cleaning and maintenance instructions for all coating systems. Submit Manufacturer's Instructions on [Mixing](#): Detailed mixing instructions, minimum and maximum application temperature and humidity, pot life, and curing and drying times between coats.

2.2 COLOR SELECTION OF FINISH COATS

Provide colors of finish coats as indicated or specified. Allow Contracting Officer to select colors not indicated or specified. Manufacturers' names and color identification are used for the purpose of color identification only. Named products are acceptable for use only if they conform to specified requirements. Products of other manufacturers are acceptable if the colors are approximately the colors indicated and the product conforms to specified requirements.

Provide color, texture, and pattern of wall coating systems as indicated. Submit manufacturer's samples of paint colors. Cross reference color samples to color scheme as indicated. Submit color stencil codes. Tint each coat progressively darker to enable confirmation of the number of coats.

PART 3 EXECUTION

3.1 PROTECTION OF AREAS AND SPACES NOT TO BE PAINTED

Prior to surface preparation and coating applications, remove, mask, or otherwise protect hardware, hardware accessories, machined surfaces, radiator covers, plates, lighting fixtures, public and private property, and other such items not to be coated that are in contact with surfaces to be coated. Following completion of painting, reinstall removed items by workmen skilled in the trades. Restore surfaces contaminated by coating materials, to original condition and repair damaged items.

3.2 RESEALING OF EXISTING EXTERIOR JOINTS

3.2.1 Surface Condition

Begin with surfaces that are clean, dry to the touch, and free from frost and moisture; remove grease, oil, wax, lacquer, paint, defective backstop, or other foreign matter that would prevent or impair adhesion. Where adequate grooves have not been provided, clean out to a depth of 1/2 inch and grind to a minimum width of 1/4 inch without damage to adjoining work. Grinding is not required on metal surfaces.

3.2.2 Backstops

In joints more than 1/2 inch deep, install glass fiber roving or neoprene, butyl, polyurethane, or polyethylene foams free of oil or other staining elements as recommended by sealant manufacturer. Provide backstop material compatible with sealant. Do not use oakum and other types of absorptive materials as backstops.

3.2.3 Primer and Bond Breaker

Install the type recommended by the sealant manufacturer.

3.2.4 Ambient Temperature

Between 38 degrees F and 95 degrees F when applying sealant.

3.2.5 Exterior Sealant

For joints in vertical surfaces, provide ASTM C920, Type S or M, Grade NS, Class 25, Use NT. For joints in horizontal surfaces, provide ASTM C920, Type S or M, Grade P, Class 25, Use T. Color(s) will be selected by the Contracting Officer. Apply the sealant in accordance with the manufacturer's printed instructions. Force sealant into joints with sufficient pressure to fill the joints solidly. Apply sealant uniformly smooth and free of wrinkles.

3.2.6 Cleaning

Immediately remove fresh sealant from adjacent areas using a solvent recommended by the sealant manufacturer. Upon completion of sealant application, remove remaining smears and stains and leave the work in a clean condition. Allow sealant time to cure, in accordance with manufacturer's recommendations, prior to coating.

3.3 SURFACE PREPARATION

Remove dirt, splinters, loose particles, grease, oil, disintegrated coatings, and other foreign matter and substances deleterious to coating performance as specified for each substrate before application of paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Schedule cleaning so that dust and other contaminants will not fall on wet, newly painted surfaces. Spot-prime exposed ferrous metals such as nail heads on or in contact with surfaces to be painted with water-thinned paints, with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas. Refer to MPI ASM and MPI MRM for additional more specific substrate preparation requirements.

3.3.1 Additional Requirements for Preparation of Surfaces With Existing Coatings

Before application of coatings, perform the following on surfaces covered by soundly-adhered coatings, defined as those which cannot be removed with a putty knife:

- a. Test existing finishes for lead before sanding, scraping, or removing. If lead is present, refer to paragraph Toxic Materials.
- b. Wipe previously painted surfaces to receive solvent-based coatings,

except stucco and similarly rough surfaces clean with a clean, dry cloth saturated with mineral spirits, [ASTM D235](#) or as specified in [MPI MRM](#). Wipe the surfaces dry with a clean, dry, lint free cloth. Wipe immediately preceding the application of the first coat of any coating, unless specified otherwise.

- c. Sand existing glossy surfaces to be painted to reduce gloss. Brush, and wipe clean with a damp cloth to remove dust.
- d. The requirements specified are minimum. Comply also with the [application instructions](#) of the paint manufacturer and specific surface preparation requirements as outlined in [MPI MRM Exterior Surface Preparation and Interior Surface Preparation](#).
- e. Thoroughly clean previously painted surfaces specified to be repainted damaged during construction of all grease, dirt, dust or other foreign matter.
- f. Remove blistering, cracking, flaking and peeling or otherwise deteriorated coatings.
- g. Remove chalk so that when tested in accordance with [ASTM D4214](#), the chalk resistance rating is no less than 8.
- h. Roughen slick surfaces. Repair damaged areas such as, but not limited to, nail holes, cracks, chips, and spalls with suitable material to match adjacent undamaged areas.
- i. Feather and sand smooth edges of chipped paint.
- j. Clean rusty metal surfaces in accordance with SSPC requirements. Use solvent, mechanical, or chemical cleaning methods to provide surfaces suitable for painting.
- k. Provide new, proposed coatings that are compatible with existing coatings.

3.3.2 Existing Coated Surfaces with Minor Defects

Sand, spackle, and treat minor defects to render them smooth. Minor defects are defined as scratches, nicks, cracks, gouges, spalls, alligatoring, chalking, and irregularities due to partial peeling of previous coatings. Remove chalking by sanding or blasting so that when tested in accordance with [ASTM D4214](#), the chalk rating is not less than 8.

3.3.3 Removal of Existing Coatings

Remove existing coatings from the following surfaces:

- a. [All surfaces previously painted.](#)

3.3.4 Substrate Repair

- a. Repair substrate surface damaged during coating removal;
- b. Sand edges of adjacent soundly-adhered existing coatings so they are tapered as smooth as practical to areas involved with coating removal; and

- c. Clean and prime the substrate as specified.

3.4 PREPARATION OF METAL SURFACES

3.4.1 Existing and New Ferrous Surfaces

- a. Ferrous Surfaces including Shop-coated Surfaces and Small Areas That Contain Rust, Mill Scale and Other Foreign Substances: Solvent clean in accordance with [SSPC SP 1](#) to remove oil and grease. Where shop coat is missing or damaged, clean according to [SSPC SP 2](#), [SSPC SP 3](#), [SSPC SP 6/NACE No.3](#), or [SSPC SP 10/NACE No. 2](#). Brush-off blast remaining surface in accordance with [SSPC 7/NACE No.4](#)]; Water jetting to [SSPC-SP WJ-4/NACE WJ-4](#) may be used to remove loose coating and other loose materials. Use inhibitor as recommended by coating manufacturer to prevent premature rusting. Protect shop-coated ferrous surfaces from corrosion by treating and touching up corroded areas immediately upon detection.

3.4.2 Final Ferrous Surface Condition:

3.4.2.1 Tool Cleaned Surfaces

Comply with [SSPC SP 2](#) and [SSPC SP 3](#). Use as a visual reference, photographs in [SSPC VIS 3](#) for the appearance of cleaned surfaces.

3.4.2.2 Abrasive Blast Cleaned Surfaces

Comply with [SSPC 7/NACE No.4](#), [SSPC SP 6/NACE No.3](#), and [SSPC SP 10/NACE No. 2](#). Use as a visual reference, photographs in [SSPC VIS 1](#) for the appearance of cleaned surfaces.

3.4.2.3 Waterjet Cleaned Surfaces

Comply with [SSPC-SP WJ-1/NACE WJ-1](#), [SSPC-SP WJ-2/NACE WJ-2](#), [SSPC-SP WJ-3/NACE WJ-3](#) or [SSPC-SP WJ-4/NACE WJ-4](#). Use as a visual reference, photographs in [SSPC VIS 4/NACE VIS 7](#) for the appearance of cleaned surfaces.

3.4.3 Galvanized Surfaces

- a. New or Existing Galvanized Surfaces With Only Dirt and Zinc Oxidation Products: Clean with solvent, or non-alkaline detergent solution in accordance with [SSPC SP1](#). Completely remove coating by brush-off abrasive blast if the galvanized metal has been passivated or stabilized. Do not "passivate" or "stabilize" new galvanized steel to be coated. If the absence of hexavalent stain inhibitors is not documented, test as described in [ASTM D6386](#), Appendix X2, and remove by one of the methods described therein.
- b. Galvanized with Slight Coating Deterioration or with Little or No Rusting: Water jetting to [SSPC-SP WJ-3/NACE WJ-3](#) to remove loose coating from surfaces with less than 20 percent coating deterioration and no blistering, peeling, or cracking. Use inhibitor as recommended by the coating manufacturer to prevent rusting.

3.4.4 Non-Ferrous Metallic Surfaces

Aluminum and aluminum-alloy, lead, copper, and other nonferrous metal

surfaces.

Surface Cleaning: Solvent clean in accordance with [SSPC SP 1](#) and wash with mild non-alkaline detergent to remove dirt and water soluble contaminants.

3.4.5 Existing Surfaces with a Bituminous or Mastic-Type Coating

Remove chalk, mildew, and other loose material by washing with a solution of [1/2 cup](#) trisodium phosphate, [1/4 cup](#) household detergent, [one quart](#) 5 percent sodium hypochlorite solution and [3 quarts](#) of warm water.

3.5 PREPARATION OF CONCRETE AND CEMENTITIOUS SURFACE

3.5.1 Concrete and Masonry

- a. Curing: Allow concrete, stucco and masonry surfaces to cure at least 30 days before painting, and concrete slab on grade to cure at least 90 days before painting.
- b. Surface Cleaning: Remove the following deleterious substances.
 - (1) Dirt, Chalking, Grease, and Oil: Wash new and existing surfaces with a solution composed of [1/2 cup](#) trisodium phosphate, [1/4 cup](#) household detergent, and [4 quarts](#) of warm water. Then rinse thoroughly with fresh water. Wash existing coated surfaces with a suitable detergent and rinse thoroughly. For large areas, water blasting may be used.
 - (2) Fungus and Mold: Wash surfaces with a solution composed of [1/2 cup](#) trisodium phosphate, [1/4 cup](#) household detergent, [one quart](#) 5 percent sodium hypochlorite solution and [3 quarts](#) of warm water. Rinse thoroughly with fresh water.
 - (3) Paint and Loose Particles: Remove by wire brushing.
 - (4) Efflorescence: Remove by scraping or wire brushing followed by washing with a 5 to 10 percent by weight aqueous solution of hydrochloric (muriatic) acid. Do not allow acid to remain on the surface for more than five minutes before rinsing with fresh water. Do not acid clean more than [4 square feet](#) of surface, per workman, at one time.
- c. Cosmetic Repair of Minor Defects: Repair or fill mortar joints and minor defects, including but not limited to spalls, in accordance with manufacturer's recommendations and prior to coating application.
- d. Allowable Moisture Content: Latex coatings may be applied to damp surfaces, but not to surfaces with droplets of water. Do not apply epoxies to damp vertical surfaces as determined by [ASTM D4263](#) or horizontal surfaces that exceed [3 lbs of moisture per 1000 square feet in 24 hours](#) as determined by [ASTM F1869](#). In all cases follow manufacturer's recommendations. Allow surfaces to cure a minimum of 30 days before painting.

3.5.2 Gypsum Board, Plaster, and Stucco

3.5.2.1 Surface Cleaning

Verify that plaster and stucco surfaces are free from loose matter and that

gypsum board is dry. Remove loose dirt and dust by brushing with a soft brush, rubbing with a dry cloth, or vacuum-cleaning prior to application of the first coat material. A damp cloth or sponge may be used if paint is water-based.

3.5.2.2 Repair of Minor Defects

Prior to painting, repair joints, cracks, holes, surface irregularities, and other minor defects with patching plaster or spackling compound and sand smooth.

3.5.2.3 Allowable Moisture Content

Latex coatings may be applied to damp surfaces, but not surfaces with droplets of water. Do not apply epoxies to damp surfaces as determined by [ASTM D4263](#). Verify that new plaster to be coated has a maximum moisture content of 8 percent, when measured in accordance with [ASTM D4444](#), Method A, unless otherwise authorized. In addition to moisture content requirements, allow new plaster to age a minimum of 30 days before preparation for painting.

3.6 APPLICATION

3.6.1 Coating Application

- a. Comply with applicable federal, state and local laws enacted to ensure compliance with Federal Clean Air Standards. Apply coating materials in accordance with [SSPC PA 1](#). [SSPC PA 1](#) methods are applicable to all substrates, except as modified herein.
- b. At the time of application, paint must show no signs of deterioration. Maintain uniform suspension of pigments during application.
- c. Unless otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. Use trigger operated spray nozzles for water hoses. Use rollers for applying paints and enamels of a type designed for the coating to be applied and the surface to be coated. Wear protective clothing and respirators when applying oil-based paints or using spray equipment with any paints.
- d. Only apply paints, except water-thinned types, to surfaces that are completely free of moisture as determined by sight or touch.
- e. Thoroughly work coating materials into joints, crevices, and open spaces. Pay special attention to ensure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces.
- f. Apply each coat of paint so that dry film is of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Completely hide all blemishes.
- g. Touch up damaged coatings before applying subsequent coats. Broom clean and clear dust from interior areas before and during the application of coating material.
- h. Drying Time: Allow time between coats, as recommended by the coating manufacturer, to permit thorough drying, but not to present topcoat

adhesion problems. Provide each coat in specified condition to receive next coat.

- i. Primers, and Intermediate Coats: Do not allow primers or intermediate coats to dry more than 30 days, or longer than recommended by manufacturer, before applying subsequent coats. Follow manufacturer's recommendations for surface preparation if primers or intermediate coats are allowed to dry longer than recommended by manufacturers of subsequent coatings. Cover each preceding coat or surface completely by ensuring visually perceptible difference in shades of successive coats.
- j. Finished Surfaces: Provide finished surfaces free from runs, drops, ridges, waves, laps, brush marks, and variations in colors.
- kp. Thermosetting Paints: Apply topcoats over thermosetting paints (epoxies and urethanes) within the overcoat window recommended by the manufacturer.

3.6.2 Mixing and Thinning of Paints

Reduce paints to proper consistency by adding fresh paint, except when thinning is mandatory to suit surface, temperature, weather conditions, application methods, or for the type of paint being used. Obtain written permission from the Contracting Officer to use thinners. Verify that the written permission includes quantities and types of thinners to use.

When thinning is allowed, thin paints immediately prior to application with not more than **one pint** of suitable thinner per **gallon**. The use of thinner does not relieve the Contractor from obtaining complete hiding, full film thickness, or required gloss. Thinning cannot cause the paint to exceed limits on volatile organic compounds. Do not mix paints of different manufacturers.

3.6.3 Two-Component Systems

Mix two-component systems in accordance with manufacturer's instructions. Follow recommendation by the manufacturer for any thinning of the first coat to ensure proper penetration and sealing for each type of substrate.

3.6.4 Coating Systems

- a. Systems by Substrates: Apply coatings that conform to the respective specifications listed in the following Tables:

Table for Exterior Applications	
MPI Division	Substrate Application
MPI Division 3	Exterior Concrete Paint Table
MPI Division 4	Exterior Concrete Masonry Units Paint Table
MPI Division 5	Exterior Metal, Ferrous and Non-Ferrous Paint Table

Table for Exterior Applications	
MPI Division 6	Exterior Wood; Dressed Lumber, Paneling, Decking, Shingles Paint Table
MPI Division 9	Exterior Stucco Paint Table
MPI Division 10	Exterior Cloth Coverings and Bituminous Coated Surfaces Paint Table
Table for Interior Applications	
MPI Division	Substrate Application
MPI Division 3	Interior Concrete Paint Table
MPI Division 4	Interior Concrete Masonry Units Paint Table
MPI Division 5	Interior Metal, Ferrous and Non-Ferrous Paint Table
MPI Division 6	Interior Wood Paint Table
MPI Division 9	Interior Plaster, Gypsum Board, Textured Surfaces Paint Table

- b. Minimum Dry Film Thickness (DFT): Apply paints, primers, varnishes, enamels, undercoats, and other coatings to a minimum dry film thickness of 1.5 mil each coat unless specified otherwise in the Tables. Coating thickness, where specified, refers to the minimum dry film thickness.
- c. Coatings for Surfaces Not Specified Otherwise: Coat unspecified surfaces the same as surfaces having similar conditions of exposure.
- d. Existing Surfaces Damaged During Performance of the Work, Including New Patches In Existing Surfaces: Coat surfaces with the following:
 - (1) One coat of primer.
 - (2) One coat of undercoat or intermediate coat.
 - (3) One topcoat to match adjacent surfaces.
- e. Existing Coated Surfaces To Be Painted: Apply coatings conforming to the respective specifications listed in the Tables herein, except that pretreatments, sealers and fillers need not be provided on surfaces where existing coatings are soundly adhered and in good condition. Do not omit undercoats or primers.

3.7 COATING SYSTEMS FOR METAL

Apply coatings of Tables in MPI Division 5 for Exterior and Interior.

- a. Apply specified ferrous metal primer to steel surfaces on the same day that surface is cleaned, to surfaces that meet all specified surface preparation requirements at time of application.
- b. Inaccessible Surfaces: Prior to erection, use one coat of specified

primer on metal surfaces that will be inaccessible after erection.

- c. Shop-primed Surfaces: Touch up exposed substrates and damaged coatings to protect from rusting prior to applying field primer.
- d. Surface Previously Coated with Epoxy or Urethane: Apply MPI 101, 1.5 mils DFT immediately prior to application of epoxy or urethane coatings.
- e. Pipes and Tubing: The semitransparent film applied to some pipes and tubing at the mill is not to be considered a shop coat. Overcoat these items with the specified ferrous-metal primer prior to application of finish coats.
- f. Exposed Nails, Screws, Fasteners, and Miscellaneous Ferrous Surfaces. On surfaces to be coated with water thinned coatings, spot prime exposed nails and other ferrous metal with latex primer MPI 107.

3.8 COATING SYSTEMS FOR CONCRETE AND CEMENTITIOUS SUBSTRATES

Apply coatings of Tables in MPI Division 3, 4 and 9 for Exterior and Interior.

3.9 COATING SYSTEMS FOR WOOD AND PLYWOOD

- a. Apply coatings of Tables in MPI Division 6 for Exterior and Interior.
- b. Prior to erection, apply two coats of specified primer to treat and prime wood and plywood surfaces which will be inaccessible after erection.
- c. Apply stains in accordance with manufacturer's printed instructions.

3.10 INSPECTION AND ACCEPTANCE

In addition to meeting previously specified requirements, demonstrate mobility of moving components, including swinging and sliding doors, cabinets, and windows with operable sash, for inspection by the Contracting Officer. Perform this demonstration after appropriate curing and drying times of coatings have elapsed and prior to invoicing for final payment.

3.11 WASTE MANAGEMENT

As specified in the Waste Management Plan and as follows. Do not use kerosene or any such organic solvents to clean up water based paints. Properly dispose of paints or solvents in designated containers. Close and seal partially used containers of paint to maintain quality as necessary for reuse. Store in protected, well-ventilated, fire-safe area at moderate temperature. Place materials defined as hazardous or toxic waste in designated containers. Set aside extra paint for future color matches or reuse by the Government.

3.12 PAINT TABLES

All DFT's are minimum values. Use only materials with a MPI GPS-1-14 green check mark having a minimum MPI "Environmentally Friendly" E1 E2 E3 rating based on VOC (EPA Method 24) content levels. Acceptable products are listed in the MPI Green Approved Products List, available at <http://www.specifygreen.com/APL/ProductIdxByMPIInum.asp>.

3.12.1 Exterior Paint Tables

3.12.1.1 MPI Division 3: Exterior Concrete Paint Table

A. Concrete; Vertical Surfaces, Undersides of Balconies and Soffits

(1) New and uncoated existing and Existing, previously painted concrete; vertical surfaces, including undersides of balconies and soffits but excluding tops of slabs

Latex					
New and uncoated existing	Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI EXT 3.1A-G1 (Flat)	MPI REX 3.1A-G1 (Flat)	MPI 3	MPI 10	MPI 10	3.5 mils
MPI EXT 3.1A-G2 (Velvet)	MPI REX 3.1A-G2 (Velvet)	MPI 3	MPI 214	MPI 214	3.5 mils
MPI EXT 3.1A-G5 (Semigloss)	MPI REX 3.1A-G5 (Semigloss)	MPI 3	MPI 11	MPI 11	3.5 mils
MPI EXT 3.1A-G6 (Gloss)	MPI REX 3.1A-G6 (Gloss)	MPI 3	MPI 119	MPI 119	3.5 mils
Primer as recommended by manufacturer. Topcoat: Coating to match adjacent surfaces.					

(2) New and uncoated existing and Existing, previously painted concrete, textured system; vertical surfaces, including undersides of balconies and soffits but excluding tops of slabs

Latex Aggregate					
New and uncoated existing	Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI EXT 3.1B-G2 (Flat)	MPI REX 3.1A-G1 (Flat)	MPI 42	MPI 10	MPI 10	N/A
MPI EXT 3.1B-G5 (Semigloss)	MPI REX 3.1A-G5 (Semigloss)	MPI 42	MPI 11	MPI 11	N/A
MPI EXT 3.1B-G6 (Gloss)	MPI REX 3.1A-G6 (Gloss)	MPI 42	MPI 119	MPI 119	N/A
Texture - Fine Surface preparation and number of coats in accordance with manufacturer's instructions. Topcoat: Coating to match adjacent surfaces.					

(3) New and uncoated existing and Existing, previously painted concrete,

elastomeric system; vertical surfaces, including undersides of balconies and soffits but excluding tops of slabs

Elastomeric Coating					
New and uncoated existing	Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI EXT 3.1F-G1 (Flat)	MPI REX 3.1F-G1 (Flat)	Per Manufacturer	MPI 113	MPI 113	16 mils
MPI EXT 3.1F-G2/3 (Velvet)	MPI REX 3.1F-G2/3 (Velvet)	Per Manufacturer	MPI 38	MPI 38	16 mils
Primer as recommended by manufacturer. Topcoat: Coating to match adjacent surfaces. Surface preparation and number of coats in accordance with manufacturer's instructions. NOTE: Apply sufficient coats to achieve a minimum dry film thickness of 16 mils.					

3.12.1.2 MPI Division 4: Exterior Concrete Masonry Units Paint Table

A. New and Existing concrete masonry on uncoated surface

Latex						
New	Existing	Block Filler	Primer	Intermediate	Topcoat	System DFT
MPI EXT 4.2A-G1 (Flat)	MPI REX 4.2A-G1 (Flat)	MPI 4	N/A	MPI 10	MPI 10	11 mils
MPI EXT 4.2A-G5 (Semigloss)	MPI REX 4.2A-G5 (Semigloss)	MPI 4	N/A	MPI 11	MPI 11	11 mils
MPI EXT 4.2A-G6 (Gloss)	MPI REX 4.2A-G6 (Gloss)	MPI 4	N/A	MPI 119	MPI 119	11 mils
Topcoat: Coating to match adjacent surfaces.						

B. New and Existing concrete masonry, textured system; on uncoated surface

Latex Aggregate					
New	Existing	Primer	Intermediate	Topcoat	System DFT
MPI EXT 4.2B-G1 (Flat)	MPI REX 3.1A-G1 (Flat)	MPI 42	MPI 42	MPI 10	N/A

MPI EXT 4.2B-G5 (Semigloss)	MPI REX 3.1A-G5 (Semigloss)	MPI 42	MPI 42	MPI 11	N/A
MPI EXT 4.2B-G6 (Gloss)	MPI REX 3.1A-G6 (Gloss)	MPI 42	MPI 42	MPI 119	N/A
Texture - Fine Medium Coarse. Surface preparation and number of coats in accordance with manufacturer's instructions. Topcoat: Coating to match adjacent surfaces.					

C. New and Existing concrete masonry, elastomeric system; on uncoated surfaces

Elastomeric Coating					
New and uncoated existing	Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI EXT 3.1F-G1 (Flat)	MPI REX 3.1F-G1 (Flat)	Per Manufacturer	MPI 113	MPI 113	16 mils
Primer as recommended by manufacturer. Topcoat: Coating to match adjacent surfaces. Surface preparation and number of coats in accordance with manufacturer's instructions. NOTE: Apply sufficient coats of MPI 113 to achieve a minimum dry film thickness of 16 mils.					

3.12.1.3 MPI Division 5: Exterior Metal, Ferrous and Non-Ferrous Paint Table

A. Steel / Ferrous Surfaces

(1) New Steel that has been hand or power tool cleaned to SSPC SP 2 or SSPC SP 3

Alkyd					
New	Existing, uncoated	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.1Q-G5 (Semigloss)	MPI REX 5.1D-G5 (Semigloss)	MPI 23	MPI 94	MPI 94	5.25 mils
MPI EXT 5.1Q-G6 (Gloss)	MPI REX 5.1D-G6 (Gloss)	MPI 23	MPI 9	MPI 9	5.25 mils
Topcoat: Coating to match adjacent surfaces.					

(2) New Steel that has been blast-cleaned to SSPC SP 6/NACE No.3

Alkyd					
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New	Existing, uncoated	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.1D-G5 (Semigloss)	MPI REX 5.1D-G5 (Semigloss)	MPI 79	MPI 94	MPI 94	5.25 mils
MPI EXT 5.1D-G6 (Gloss)	MPI REX 5.1D-G6 (Gloss)	MPI 79	MPI 9	MPI 9	5.25 mils
Topcoat: Coating to match adjacent surfaces.					

(3) Existing steel that has been spot-blasted to SSPC SP 6/NACE No.3

(a) Surface previously coated with alkyd or latex

Waterborne Light Industrial Coating				
Existing, previously coated with alkyd or latex	Primer	Intermediate	Topcoat	System DFT
MPI REX 5.1C-G5 (Semigloss)	MPI 79	MPI 163	MPI 163	5 mils
MPI REX 5.1C-G6 (Gloss)	MPI 79	MPI 164	MPI 164	5 mils
Topcoat: Coating to match adjacent surfaces.				

(b) Surfaces previously coated with epoxy

Waterborne Light Industrial Coating				
Existing, previously coated with epoxy	Primer	Intermediate	Topcoat	System DFT
MPI REX 5.1L-G5 (Semigloss)	MPI 101	MPI 163	MPI 163	5 mils
MPI REX 5.1L-G6 (Gloss)	MPI 101	MPI 164	MPI 164	5 mils
Topcoat: Coating to match adjacent surfaces.				

Pigmented Polyurethane				
Existing, previously coated with epoxy	Primer	Intermediate	Topcoat	System DFT

MPI REX 5.1H-G6 (Gloss)	MPI 101	MPI 108	MPI 72	8.5 mils
Topcoat: Coating to match adjacent surfaces.				

(4) New and existing steel blast cleaned to SSPC SP 10/NACE No. 2

Waterborne Light Industrial					
New	Existing	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.1R-G5 (Semigloss)	MPI EXT 5.1R-G5 (Semigloss)	MPI 101	MPI 108	MPI 163	8.5 mils
MPI EXT 5.1R-G6 (Gloss)	MPI EXT 5.1R-G6 (Gloss)	MPI 101	MPI 108	MPI 164	8.5 mils
Topcoat: Coating to match adjacent surfaces.					

Pigmented Polyurethane					
New	Existing	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.1J-G6 (Gloss)	MPI EXT 5.1J-G6 (Gloss)	MPI 101	MPI 108	MPI 72	8.5 mils
Topcoat: Coating to match adjacent surfaces.					

(5) Metal floors (non-shop-primed surfaces or non-slip deck surfaces) with non-skid additive (NSA), load at manufacturer's recommendations

Epoxy					
New	Existing	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.1S-G5 (Semi Gloss)	MPI EXT 5.1S-G5 (Semi Gloss)	MPI 120	MPI 177	MPI 177	5.25 mils
MPI EXT 5.1S-G6 (Gloss)	MPI EXT 5.1S-G6 (Gloss)	MPI 120	MPI 77	MPI 77	5.25 mils
Topcoat: Coating to match adjacent surfaces. Load Non-Skid Additive at manufacturer's recommendations.					

B. Exterior Galvanized Surfaces

(1) New Galvanized surfaces

Waterborne Primer / Latex				
New Galvanized Surfaces	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.3H-G1 (Flat)	MPI 134	MPI 10	MPI 10	4.5 mils
EXT 5.3H-G5 (Semigloss)	MPI 134	MPI 11	MPI 11	4.5 mils
MPI EXT 5.3H-G6 (Gloss)	MPI 134	MPI 119	MPI 119	4.5 mils
Topcoat: Coating to match adjacent surfaces.				

Waterborne Primer / Waterborne Light Industrial Coating				
New Galvanized Surfaces	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.3J-G5 (Semigloss)	MPI 134	MPI 163	MPI 163	4.5 mils
MPI EXT 5.3J-G6 (Gloss)	MPI 134	MPI 164	MPI 164	4.5 mils
Topcoat: Coating to match adjacent surfaces.				

Epoxy Primer / Waterborne Light Industrial Coating				
New Galvanized Surfaces	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.3K-G5 (Semigloss)	MPI 101	MPI 163	MPI 163	5 mils
MPI EXT 5.3K-G6 (Gloss)	MPI 101	MPI 164	MPI 164	5 mils
Topcoat: Coating to match adjacent surfaces.				

Pigmented Polyurethane				
New Galvanized Surfaces	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.3L-G6 (Gloss)	MPI 101	N/A	MPI 72	5 mils

Topcoat: Coating to match adjacent surfaces.

(2) Galvanized surfaces with slight coating deterioration; little or no rusting

Waterborne Light Industrial Coating				
Galvanized Surfaces with slight coating deterioration	Primer	Intermediate	Topcoat	System DFT
MPI REX 5.3J-G5 (Semigloss)	MPI 134	N/A	MPI 163	4.5 mils
Topcoat: Coating to match adjacent surfaces.				

Pigmented Polyurethane				
Galvanized Surfaces with slight coating deterioration	Primer	Intermediate	Topcoat	System DFT
MPI REX 5.3D-G6 (Gloss)	MPI 101	N/A	MPI 72	5 mils
Topcoat: Coating to match adjacent surfaces.				

(3) Galvanized surfaces with severely deteriorated coating or rusting

Waterborne Light Industrial Coating				
Galvanized surfaces with severely deteriorated coating or rusting	Primer	Intermediate	Topcoat	System DFT
MPI REX 5.3L-G5 (Semigloss)	MPI 101	MPI 108	MPI 163	8.5 mils
MPI REX 5.3L-G6 (Gloss)	MPI 101	MPI 108	MPI 164	8.5 mils
Topcoat: Coating to match adjacent surfaces.				

Pigmented Polyurethane

Galvanized surfaces with severely deteriorated coating or rusting	Primer	Intermediate	Topcoat	System DFT
MPI REX 5.3D-G6 (Gloss)	MPI 101	MPI 72	MPI 72	5 mils
Topcoat: Coating to match adjacent surfaces.				

C. Exterior Surfaces, Other Metals (Non-Ferrous)

(1) Aluminum, aluminum alloy and other miscellaneous non-ferrous metal items not otherwise specified except hot metal surfaces, roof surfaces, and new prefinished equipment

Alkyd				
New Galvanized Surfaces	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.4F-G1 (Flat)	MPI 95	MPI 8	MPI 8	5 mils
MPI EXT 5.4F-G5 (Semigloss)	MPI 95	MPI 94	MPI 94	5 mils
MPI EXT 5.4F-G6 (Gloss)	MPI 95	MPI 9	MPI 9	5 mils
Topcoat: Coating to match adjacent surfaces.				

Waterborne Light Industrial Coating				
New Galvanized Surfaces	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.4F-G1 (Flat)	MPI 95	MPI 161	MPI 161	5 mils
MPI EXT 5.4F-G5 (Semigloss)	MPI 95	MPI 163	MPI 163	5 mils
MPI EXT 5.4F-G6 (Gloss)	MPI 95	MPI 164	MPI 164	5 mils
Topcoat: Coating to match adjacent surfaces.				

(2) Existing roof surfaces previously coated

Aluminum Pigmented Asphalt Roof Coating				
Existing roof surfaces previously coated	Primer	Intermediate	Topcoat	System DFT
Non-MPI System	ASTM D2824/D2835	N/A	N/A	8 mils
Sufficient coats to provide not less than 8 mils of finished coating system (without asbestos fibers).				

Aluminum Paint				
Existing roof surfaces previously coated	Primer	Intermediate	Topcoat	System DFT
MPI REX 10.2D	MPI 107	MPI 1	MPI 1	3.5 mils
Topcoat: Coating to match adjacent surfaces.				

(3) Surfaces adjacent to painted surfaces; Mechanical, Electrical, Fire extinguishing sprinkler systems including valves, conduit, hangers, supports, exposed copper piping, and miscellaneous metal items not otherwise specified except floors, hot metal surfaces, and new prefinished equipment

Alkyd				
New	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.1D-G1 (Flat)	MPI 79	MPI 8	MPI 8	5.25 mils
MPI EXT 5.1D-G5 (Semigloss)	MPI 79	MPI 94	MPI 94	5.25 mils
MPI EXT 5.1D-G6 (Gloss)	MPI 79	MPI 9	MPI 9	5.25 mils
Topcoat: Coating to match adjacent surfaces.				

Waterborne Light Industrial Coating				
New	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.1C-G3 (Eggshell)	MPI 79	MPI 161	MPI 161	5 mils

MPI EXT 5.1C-G5 (Semigloss)	MPI 79	MPI 163	MPI 163	5 mils
MPI EXT 5.1C-G6 (Gloss)	MPI 79	MPI 164	MPI 164	5 mils
Primer as recommended by manufacturer. Topcoat: Coating to match adjacent surfaces.				

D. Exterior Hot Surfaces

(1) Hot metal surfaces subject to temperatures up to 400 degrees F

Heat Resistant Enamel				
New	N/A	Intermediate	Topcoat	System DFT
MPI EXT 5.2A	MPI 21	N/A	N/A	Per Manufacturer
Surface preparation and number of coats per manufacturer's instructions.				

(2) Ferrous metal subject to high temperature, up to 750 degrees F

Inorganic Zinc Rich Coating				
New	N/A	Intermediate	Topcoat	System DFT
MPI EXT 5.2C	MPI 19	N/A	N/A	Per Manufacturer
Surface preparation and number of coats per manufacturer's instructions.				

Heat Resistant Aluminum Enamel				
New	N/A	Intermediate	Topcoat	System DFT
MPI EXT 5.2B	MPI 2	N/A	N/A	Per Manufacturer
Surface preparation and number of coats per manufacturer's instructions.				

(3) New surfaces and Existing surfaces made bare subject to temperatures up to 1100 degrees F

(1) New surfaces and Existing surfaces made bare cleaning to SSPC SP 10/NACE No. 2 subject to temperatures up to 1100 degrees F

Heat Resistant Coating					
New	Existing	N/A	Intermediate	Topcoat	System DFT
MPI EXT 5.2D	MPI REX 5.2D	MPI 22	N/A	N/A	Per Manufacturer
Surface preparation and number of coats per manufacturer's instructions.					

3.12.1.4 MPI Division 6: Exterior Wood; Dressed Lumber, Paneling, Decking, Shingles Paint Table

A. New and Existing, uncoated Dressed lumber, Wood and plywood, trim, including top, bottom and edges of doors not otherwise specified

Alkyd					
New	Existing, uncoated	Primer	Intermediate	Topcoat	System DFT
MPI EXT 6.3B-G5 (Semigloss)	MPI EXT 6.3B-G5 (Semigloss)	MPI 5	MPI 94	MPI 94	5 mils
MPI EXT 6.3B-G6 (Gloss)	MPI EXT 6.3B-G6 (Gloss)	MPI 5	MPI 9	MPI 9	5 mils
Topcoat: Coating to match adjacent surfaces.					

Latex					
New	Existing, uncoated	Primer	Intermediate	Topcoat	System DFT
MPI EXT 6.3A-G1 (Flat)	MPI EXT 6.3A-G1 (Flat)	MPI 5	MPI 10	MPI 10	5 mils
MPI EXT 6.3A-G5 (Semigloss)	MPI EXT 6.3B-G5 (Semigloss)	MPI 5	MPI 11	MPI 11	5 mils
MPI EXT 6.3A-G6 (Gloss)	MPI EXT 6.3B-G6 (Gloss)	MPI 5	MPI 119	MPI 119	5 mils
Topcoat: Coating to match adjacent surfaces.					

Waterborne Solid Color Stain					
New	Existing, uncoated	Primer	Intermediate	Topcoat	System DFT
MPI EXT 6.3K	MPI EXT 6.3K	MPI 5	MPI 16	MPI 16	4.25 mils
Topcoat: Coating to match adjacent surfaces.					

B. Existing, dressed lumber, Wood and plywood, trim, including top, bottom and edges of doors previously coated with an alkyd / oil based finish coat not otherwise specified

Alkyd				
Existing, previously coated	Primer	Intermediate	Topcoat	System DFT
MPI REX 6.3B-G5 (Semigloss)	MPI 5	MPI 94	MPI 94	5 mils
MPI REX 6.3B-G6 (Gloss)	MPI 5	MPI 9	MPI 9	5 mils

Latex				
Existing, previously coated	Primer	Intermediate	Topcoat	System DFT
MPI REX 6.3A-G1 (Flat)	MPI 5	MPI 10	MPI 10	5 mils
MPI REX 6.3B-G5 (Semigloss)	MPI 5	MPI 11	MPI 11	5 mils
MPI REX 6.3B-G6 (Gloss)	MPI 5	MPI 119	MPI 119	5 mils

C. Existing, dressed lumber, Wood and plywood, trim, including top, bottom and edges of doors previously coated with a latex / waterborne finish coat not otherwise specified

Latex				
Existing, previously coated	Primer	Intermediate	Topcoat	System DFT
MPI REX 6.3L-G1 (Flat)	MPI 6	MPI 10	MPI 10	4.5 mils
MPI REX 6.3L-G5 (Semigloss)	MPI 6	MPI 11	MPI 11	4.5 mils
MPI REX 6.3L-G6 (Gloss)	MPI 6	MPI 119	MPI 119	4.5 mils

Topcoat: Coating to match adjacent surfaces.

Waterborne Solid Color Stain				
Existing, previously coated	Primer	Intermediate	Topcoat	System DFT
MPI EXT 6.3K	MPI 6	MPI 16	MPI 16	4 mils

Topcoat: Coating to match adjacent surfaces.

D. Wood Siding

- (1) New, Uncoated wood siding

Semi-Transparent Stain				
New	Primer	Intermediate	Topcoat	System DFT
MPI EXT 6.3D	N/A	MPI 13	MPI 13	N/A
Topcoat: Coating to match adjacent surfaces.				

(2) Existing, previously stained wood siding

Latex				
Existing, previously stained	Primer	Intermediate	Topcoat	System DFT
MPI REX 6.2K-G1 (Flat)	MPI 5	MPI 10	MPI 10	4.5 mils
MPI REX 6.2K-G5 (Semigloss)	MPI 5	MPI 11	MPI 11	4.5 mils
Topcoat: Coating to match adjacent surfaces.				

(3) Existing Uncoated or previously semitransparent stained wood siding

Semi-Transparent Stain				
Existing	Primer	Intermediate	Topcoat	System DFT
MPI REX 6.3D	N/A	MPI 13	MPI 13	Per Manufacturer
Topcoat: Coating to match adjacent surfaces.				

E. Wood:

Latex Floor Paint				
New	Primer	Intermediate	Topcoat	System DFT
MPI EXT 6.5A-G2 (Flat)	MPI 5	MPI 60 plus NSA	MPI 60 plus NSA	4.5 mils
MPI EXT 6.5A-G6 (Gloss)	MPI 5	MPI 68 plus NSA	MPI 68 plus NSA	4.5 mils
Topcoat: Coating to match adjacent surfaces. Load non-skid additive (NSA) at manufacturer's recommendations.				

Alkyd Floor Paint

New	Primer	Intermediate	Topcoat	System DFT
MPI EXT 6.5B-G2 (Flat)	MPI 59	MPI 59 plus NSA	MPI 59 plus NSA	5 mils
MPI EXT 6.5B-G6 (Gloss)	MPI 27	MPI 27 plus NSA	MPI 27 plus NSA	5 mils
Topcoat: Coating to match adjacent surfaces. Load non-skid additive (NSA) at manufacturer's recommendations.				

3.12.1.5 MPI Division 9: Exterior Stucco Paint Table

A. New and Existing stucco

Latex					
New	Existing	Primer	Intermediate	Topcoat	System DFT
MPI EXT 9.1A-G1 (Flat)	MPI REX 9.1A-G2 (Flat)	MPI 10	MPI 10	MPI 10	4.5 mils
MPI EXT 9.1A-G5 (Semigloss)	MPI REX 9.1A-G5 (Semigloss)	MPI 11	MPI 11	MPI 11	4.5 mils
MPI EXT 9.1A-G6 (Gloss)	MPI REX 9.1A-G6 (Gloss)	MPI 119	MPI 119	MPI 119	4.5 mils
Primer as recommended by manufacturer. Topcoat: Coating to match adjacent surfaces. On existing stucco, apply primer based on surface condition.					

B. New and Existing stucco, elastomeric system

Elastomeric Coating					
New	Existing	Primer	Intermediate	Topcoat	System DFT
MPI EXT 9.1C-G1 (Flat)	MPI REX 9.1C-G1 (Flat)	N/A	MPI 113	MPI 113	16 mils
Primer as recommended by manufacturer. Topcoat: Coating to match adjacent surfaces. Surface preparation and number of coats in accordance with manufacturer's instructions Apply sufficient coats of MPI 113 to achieve a minimum dry film thickness of 16 mils.					

3.12.1.6 MPI Division 10: Exterior Cloth Coverings and Bituminous Coated Surfaces Paint Table

A. Insulation and surfaces of insulation coverings (canvas, cloth, paper):
 (Interior and Exterior Applications)

Latex				
New	Primer	Intermediate	Topcoat	System DFT
MPI EXT 10.1A-G1 (Flat)	N/A	MPI 10	MPI 10	3.2 mils
MPI EXT 10.1A-G5 (Semigloss)	N/A	MPI 11	MPI 11	3.2 mils
MPI EXT 10.1A-G6 (Gloss)	N/A	MPI 119	MPI 119	3.2 mils
Topcoat: Coating to match adjacent surfaces.				

3.12.2 Interior Paint Tables

3.12.2.1 MPI Division 3: Interior Concrete Paint Table

A. New and uncoated existing and Existing, previously painted Concrete, vertical surfaces, not specified otherwise

Latex					
New, uncoated Existing	Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI INT 3.1A-G2 (Flat)	MPI RIN 3.1A-G2 (Flat)	MPI 3	MPI 44	MPI 44	4 mils
MPI INT 3.1A-G3 (Eggshell)	MPI RIN 3.1A-G3 (Eggshell)	MPI 3	MPI 52	MPI 52	4 mils
MPI INT 3.1A-G5	MPI RIN 3.1A-G5 (Semigloss)	MPI 3	MPI 54	MPI 54	4 mils
Topcoat: Coating to match adjacent surfaces.					

High Performance Architectural Latex					
New, uncoated Existing	Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI INT 3.1C-G2 (Flat)	MPI RIN 3.1J-G2 (Flat)	MPI 3	MPI 138	MPI 138	4 mils
MPI INT 3.1C-G3 (Eggshell)	MPI RIN 3.1J-G3 (Eggshell)	MPI 3	MPI 139	MPI 139	4 mils
MPI INT 3.1C-G4 (satin)	MPI RIN 3.1J-G4	MPI 3	MPI 140	MPI 140	4 mils

MPI INT 3.1C-G5 (Semigloss)	MPI RIN 3.1J-G5 (Semigloss)	MPI 3	MPI 141	MPI 141	4 mils
Topcoat: Coating to match adjacent surfaces.					

Institutional Low Odor / Low VOC Latex					
New, uncoated Existing	Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI INT 3.1M-G2 (Flat)	MPI RIN 3.1L-G2 (Flat)	MPI 149	MPI 144	MPI 144	4 mils
MPI INT 3.1M-G3 (Eggshell)	MPI RIN 3.1L-G3 (Eggshell)	MPI 149	MPI 145	MPI 145	4 mils
MPI INT 3.1M-G4 (satin)	MPI RIN 3.1L-G4	MPI 149	MPI 146	MPI 146	4 mils
MPI INT 3.1M-G5 (Semigloss)	MPI RIN 3.1L-G5 (Semigloss)	MPI 149	MPI 147	MPI 147	4 mils
Topcoat: Coating to match adjacent surfaces.					

B. Concrete Ceilings, Uncoated

Latex Aggregate					
New, uncoated	Primer	Intermediate	Topcoat	System DFT	
MPI INT 3.1N-G1 (Flat)	N/A	N/A	MPI 42	Per Manufacturer	
Texture - Fine Medium Coarse. Surface preparation, number of coats, and primer in accordance with manufacturer's instructions. Topcoat: Coating to match adjacent surfaces.					

C. New and uncoated existing and Existing, previously painted Concrete in not otherwise specified except floors

Waterborne Light Industrial Coating					
New, uncoated Existing	Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI INT 3.1L-G3 (Eggshell)	MPI RIN 3.1C-G3 (Eggshell)	MPI 3	MPI 151	MPI 151	4.8 mils

MPI INT 3.1L-G5 (Semigloss)	MPI RIN 3.1C-G5 (Semigloss)	MPI 3	MPI 153	MPI 153	4.8 mils
MPI INT 3.1L-G6 (Gloss)	MPI RIN 3.1C-G6 (Gloss)	MPI 3	MPI 154	MPI 154	4.8 mils
Topcoat: Coating to match adjacent surfaces.					

Alkyd					
New, uncoated Existing	Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI INT 3.1D-G3 (Eggshell)	MPI RIN 3.1D-G3 (Eggshell)	MPI 3	MPI 51	MPI 51	4.5 mils
MPI INT 3.1D-G5 (Semigloss)	MPI RIN 3.1D-G5 (Semigloss)	MPI 3	MPI 47	MPI 47	4.5 mils
MPI INT 3.1D-G6 (Gloss)	MPI RIN 3.1D-G6 (Gloss)	MPI 3	MPI 48	MPI 48	4.5 mils
Topcoat: Coating to match adjacent surfaces.					

Epoxy					
New, uncoated Existing	Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI INT 3.1F-G6 (Gloss)	MPI RIN 3.1E-G6 (Gloss)	MPI 77	MPI 77	MPI 77	4 mils
Note: Primer may be reduced for penetration per manufacturer's					

D. New and uncoated existing and Existing, previously painted concrete walls and bottom of swimming pools

Chlorinated Rubber					
New and uncoated existing	Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
Chlorinated Rubber	Per Manufacturer	Per Manufacturer	Per Manufacturer	Per Manufacturer	Per Manufacturer
Note: Primer may be reduced for penetration per manufacturer's instructions.					

Epoxy

New, uncoated Existing	Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI INT 3.1F	MPI RIN 3.1E	MPI 77	MPI 77	MPI 77	4 mils
Note: Primer may be reduced for penetration per manufacturer's instructions.					

E. New and uncoated existing and Existing, previously painted concrete floors in following areas

Latex Floor Paint					
New, uncoated Existing	Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI INT	MPI RIN	MPI 60	MPI 60	MPI 60	5 mils

Alkyd Floor Paint					
New, uncoated Existing	Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI INT 3.2B-G2 (Flat)	MPI RIN 3.2B-G2 (Flat)	MPI 59	MPI 59	MPI 59	5 mils
Note: Primer may be reduced for penetration per manufacturer's instructions.					

Epoxy					
New, uncoated Existing	Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI INT 3.2C-G6 (Gloss)	MPI RIN 3.2C-G6 (Gloss)	MPI 77	MPI 77	MPI 77	5 mils
Note: Primer may be reduced for penetration per manufacturer's instructions.					

3.12.2.2 MPI Division 4: Interior Concrete Masonry Units Paint Table

A. New and uncoated Existing Concrete Masonry

High Performance Architectural Latex					
New, uncoated Existing	Filler	Primer	Intermediate	Topcoat	System DFT
MPI INT 4.2D-G2 (Flat)	MPI 4	N/A	MPI 139	MPI 138	11 mils

MPI INT 4.2D-G3 (Eggshell)	MPI 4	N/A	MPI 139	MPI 139	11 mils
MPI INT 4.2D-G4 (Satin)	MPI 4	N/A	MPI 140	MPI 140	11 mils
MPI INT 4.2D-G5 (Semigloss)	MPI 4	N/A	MPI 141	MPI 141	11 mils
Fill all holes in masonry surface					

Institutional Low Odor / Low VOC Latex					
New, uncoated Existing	Filler	Primer	Intermediate	Topcoat	System DFT
MPI INT 4.2E-G2 (Flat)	MPI 4	N/A	MPI 144	MPI 144	4 mils
MPI INT 4.2E-G3 (Eggshell)	MPI 4	N/A	MPI 145	MPI 145	4 mils
MPI INT 4.2E-G4 (Satin)	MPI 4	N/A	MPI 146	MPI 146	4 mils
MPI INT 4.2E-G5 (Semigloss)	MPI 4	N/A	MPI 147	MPI 147	4 mils
Fill all holes in masonry surface					

B. Existing, Previously Painted Concrete Masonry

High Performance Architectural Latex					
Existing, previously painted	Filler	Primer	Intermediate	Topcoat	System DFT
MPI RIN 4.2K-G2 (Flat)	N/A	MPI 138	MPI 138	MPI 138	4.5 mils
MPI RIN 4.2K-G3 (Eggshell)	N/A	MPI 139	MPI 139	MPI 139	4.5 mils
MPI RIN 4.2K-G4	N/A	MPI 140	MPI 140	MPI 140	4.5 mils
MPI RIN 4.2K-G5 (Semigloss)	N/A	MPI 141	MPI 141	MPI 141	4.5 mils

Institutional Low Odor / Low VOC Latex					
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Existing, previously painted	Filler	Primer	Intermediate	Topcoat	System DFT
MPI RIN 4.2L-G2 (Flat)	N/A	MPI 144	MPI 144	MPI 144	4 mils
MPI RIN 4.2L-G3 (Eggshell)	N/A	MPI 145	MPI 145	MPI 145	4 mils
MPI RIN 4.2L-G4 (Satin)	N/A	MPI 146	MPI 146	MPI 146	4 mils
MPI RIN 4.2L-G5 (Semigloss)	N/A	MPI 147	MPI 147	MPI 147	4 mils

C. New and uncoated Existing Concrete masonry units in unless otherwise specified

Waterborne Light Industrial Coating					
New, uncoated Existing	Filler	Primer	Intermediate	Topcoat	System DFT
MPI INT 4.2K-G3 (Eggshell)	MPI 4	N/A	MPI 151	MPI 151	11 mils
MPI INT 4.2K-G5 (Semigloss)	MPI 4	N/A	MPI 153	MPI 153	11 mils
MPI INT 4.2K-G6 (Gloss)	MPI 4	N/A	MPI 154	MPI 154	11 mils
Fill all holes in masonry surface					

Alkyd					
New, uncoated Existing	Filler	Primer	Intermediate	Topcoat	System DFT
MPI INT 4.2K-G3 (Eggshell)	MPI 4	MPI 50	MPI 51	MPI 51	12 mils
MPI INT 4.2K-G5 (Semigloss)	MPI 4	MPI 50	MPI 47	MPI 47	12 mils
MPI INT 4.2K-G6 (Gloss)	MPI 4	MPI 50	MPI 48	MPI 48	12 mils
Fill all holes in masonry surface					

Epoxy					

New, uncoated Existing	Filler	Primer	Intermediate	Topcoat	System DFT
MPI INT 4.2G-G6 (Gloss)	MPI 116	N/A	MPI 77	MPI 77	10 mils
Fill all holes in masonry surface					

D. Existing, previously painted, concrete masonry units in unless otherwise specified

Waterborne Light Industrial Coating					
Existing, previously painted	Filler	Primer	Intermediate	Topcoat	System DFT
MPI RIN 4.2G-G3 (Eggshell)	N/A	MPI 151	MPI 151	MPI 151	4.5 mils
MPI RIN 4.2G-G5 (Semigloss)	N/A	MPI 153	MPI 153	MPI 153	4.5 mils
MPI RIN 4.2G-G6 (Gloss)	N/A	MPI 154	MPI 154	MPI 154	4.5 mils

Alkyd					
Existing, previously painted	Filler	Primer	Intermediate	Topcoat	System DFT
MPI RIN 4.2C-G3 (Eggshell)	N/A	MPI 17	MPI 51	MPI 51	4.5 mils
MPI RIN 4.2C-G5 (Semigloss)	N/A	MPI 17	MPI 47	MPI 47	4.5 mils
MPI RIN 4.2C-G6 (Gloss)	N/A	MPI 17	MPI 48	MPI 48	4.5 mils

Epoxy					
Existing, previously painted	Filler	Primer	Intermediate	Topcoat	System DFT
MPI RIN 4.2D-G6	N/A	MPI 77	MPI 77	MPI 77	5 mils

3.12.2.3 MPI Division 5: Interior Metal, Ferrous and Non-Ferrous Paint Table

A. Interior Steel / Ferrous Surfaces

(1) Metal, not otherwise specified except floors, hot metal surfaces, and new prefinished equipment

High Performance Architectural Latex				
New, uncoated Existing	Primer	Intermediate	Topcoat	System DFT
MPI INT 5.1R-G2 (Flat)	MPI 76	MPI 138	MPI 138	5 mils
MPI INT 5.1R-G3 (Eggshell)	MPI 76	MPI 139	MPI 139	5 mils
MPI INT 5.1R-G5 (Semigloss)	MPI 76	MPI 141	MPI 141	5 mils
Topcoat: Coating to match adjacent surfaces.				

Alkyd				
New, uncoated Existing	Primer	Intermediate	Topcoat	System DFT
MPI INT 5.1E-G2 (Flat)	MPI 76	MPI 49	MPI 49	5.25 mils
MPI INT 5.1E-G3 (Eggshell)	MPI 76	MPI 51	MPI 51	5.25 mils
MPI INT 5.1E-G5 (Semigloss)	MPI 76	MPI 47	MPI 47	5.25 mils
MPI INT 5.1E-G6 (Gloss)	MPI 76	MPI 48	MPI 48	5.25 mils
Topcoat: Coating to match adjacent surfaces.				

(2) Metal floors (non-shop-primed surfaces or non-slip deck surfaces) with non-skid additive (NSA), load at manufacturer's recommendations

Alkyd (over q.d. Alkyd Primer)				
New, uncoated Existing	Primer	Intermediate	Topcoat	System DFT
MPI INT 5.1E-G5 (Semi-Gloss)	MPI 76	MPI 47	MPI 47	5.25 mils
Topcoat: Coating to match adjacent surfaces.				

Epoxy				
New, uncoated Existing	Primer	Intermediate	Topcoat	System DFT

MPI INT 5.1L-G6 (Gloss)	MPI 101	MPI 101	MPI 101	5.25 mils
Topcoat: Coating to match adjacent surfaces.				

(3) Metal in not otherwise specified except floors, hot metal surfaces, and new prefinished equipment

Alkyd				
New, uncoated Existing	Primer	Intermediate	Topcoat	System DFT
MPI INT 5.1E-G3 (Eggshell)	MPI 76	MPI 51	MPI 51	5.25 mils
MPI INT 5.1E-G5 (Semigloss)	MPI 76	MPI 47	MPI 47	5.25 mils
MPI INT 5.1E-G6 (Gloss)	MPI 76	MPI 48	MPI 48	5.25 mils
Topcoat: Coating to match adjacent surfaces.				

Alkyd; For Hand Tool Cleaning				
New, uncoated Existing	Primer	Intermediate	Topcoat	System DFT
MPI INT 5.1T-G3 (Eggshell)	MPI 23	MPI 51	MPI 51	5.25 mils
MPI INT 5.1T-G5 (Semigloss)	MPI 23	MPI 47	MPI 47	5.25 mils
MPI INT 5.1T-G6 (Gloss)	MPI 23	MPI 48	MPI 48	5.25 mils
Topcoat: Coating to match adjacent surfaces.				

(4) Ferrous metal in concealed damp spaces or in exposed areas having unpainted adjacent surfaces as follows:

Aluminum Paint				
New, uncoated Existing	Primer	Intermediate	Topcoat	System DFT
MPI INT 5.1M	MPI 76	MPI 1	MPI 1	4.25 mils
Topcoat: Coating to match adjacent surfaces.				

(5) Miscellaneous non-ferrous metal items not otherwise specified except

floors, hot metal surfaces, and new prefinished equipment. Match surrounding finish

High Performance Architectural Latex				
New, uncoated Existing	Primer	Intermediate	Topcoat	System DFT
MPI INT 5.4F-G2 (Flat)	MPI 95	MPI 138	MPI 138	5 mils
MPI INT 5.4F-G3 (Eggshell)	MPI 95	MPI 139	MPI 139	5 mils
MPI INT 5.4F-G4 (Satin)	MPI 95	MPI 140	MPI 140	5 mils
MPI INT 5.4F-G5 (Semigloss)	MPI 95	MPI 141	MPI 141	5 mils
Topcoat: Coating to match adjacent surfaces.				

Alkyd				
New, uncoated Existing	Primer	Intermediate	Topcoat	System DFT
MPI INT 5.4J-G2 (Flat)	MPI 95	MPI 49	MPI 49	5 mils
MPI INT 5.4J-G3 (Eggshell)	MPI 95	MPI 51	MPI 51	5 mils
MPI INT 5.4J-G5 (Semigloss)	MPI 95	MPI 47	MPI 47	5 mils
MPI INT 5.4J-G6 (Gloss)	MPI 95	MPI 48	MPI 48	5 mils
Topcoat: Coating to match adjacent surfaces.				

B. Hot Surfaces

(1) Hot metal surfaces subject to temperatures up to 400 degrees F

Heat Resistant Enamel				
New	N/A	Intermediate	Topcoat	System DFT
MPI INT 5.2A	MPI 21	N/A	N/A	Per Manufacturer

Surface preparation and number of coats per manufacturer's instructions.

(2) Ferrous metal subject to high temperature, up to 750 degrees F

Inorganic Zinc Rich Coating				
New	N/A	Intermediate	Topcoat	System DFT
MPI INT 5.2C	MPI 19	N/A	N/A	Per Manufacturer
Surface preparation and number of coats per manufacturer's instructions.				

Heat Resistant Aluminum Enamel				
New	N/A	Intermediate	Topcoat	System DFT
MPI INT 5.2B (Aluminum Finish)	MPI 2	N/A	N/A	Per Manufacturer
Surface preparation and number of coats per manufacturer's instructions.				

(3) New and Existing Surfaces made bare subject to temperatures up to 1100 degrees F

(1) New surfaces and Existing surfaces made bare cleaning to SSPC SP 10/NACE No. 2 subject to temperatures up to 1100 degrees F:

Heat Resistant Coating					
New	Existing	N/A	Intermediate	Topcoat	System DFT
MPI INT 5.2D	MPI RIN 5.2D	MPI 22	N/A	N/A	Per Manufacturer
Surface preparation and number of coats per manufacturer's instructions.					

3.12.2.4 MPI Division 6: Interior Wood Paint Table

A. Interior Wood and Plywood

(1) New and Existing, uncoated Wood and plywood not otherwise specified

High Performance Architectural Latex				
New, uncoated Existing	Primer	Intermediate	Topcoat	System DFT

MPI INT 6.4S-G3 (Eggshell)	MPI 39	MPI 139	MPI 139	4.5 mils
MPI INT 6.4S-G4 (Satin)	MPI 39	MPI 140	MPI 140	4.5 mils
MPI INT 6.4S-G5 (Semigloss)	MPI 39	MPI 141	MPI 141	4.5 mils
Topcoat: Coating to match adjacent surfaces.				

Alkyd				
New, uncoated Existing	Primer	Intermediate	Topcoat	System DFT
MPI INT 6.4B-G3 (Eggshell)	MPI 45	MPI 51	MPI 51	4.5 mils
MPI INT 6.4B-G5 (Semigloss)	MPI 45	MPI 47	MPI 47	4.5 mils
MPI INT 6.4B-G6 (Gloss)	MPI 45	MPI 48	MPI 48	4.5 mils
Topcoat: Coating to match adjacent surfaces.				

Institutional Low Odor / Low VOC Latex				
New, uncoated Existing	Primer	Intermediate	Topcoat	System DFT
MPI INT 6.3V-G2 (Flat)	MPI 39	MPI 144	MPI 144	4 mils
MPI INT 6.3V-G3 (Eggshell)	MPI 39	MPI 145	MPI 145	4 mils
MPI INT 6.3V-G4 (Satin)	MPI 39	MPI 146	MPI 146	4 mils
MPI INT 6.3V-G5 (Semigloss)	MPI 39	MPI 147	MPI 147	4 mils

(2) Existing, previously painted Wood and plywood not otherwise specified

High Performance Architectural Latex				
Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI RIN 6.4B-G3 (Eggshell)	MPI 39	MPI 139	MPI 139	4.5 mils

MPI RIN 6.4B-G4 (Satin)	MPI 39	MPI 140	MPI 140	4.5 mils
MPI RIN 6.4B-G5 (Semigloss)	MPI 39	MPI 141	MPI 141	4.5 mils
Topcoat: Coating to match adjacent surfaces.				

Alkyd				
Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI RIN 6.4C-G3 (Eggshell)	MPI 46	MPI 51	MPI 51	4.5 mils
MPI RIN 6.4C-G5 (Semigloss)	MPI 46	MPI 47	MPI 47	4.5 mils
MPI RIN 6.4C-G6 (Gloss)	MPI 46	MPI 48	MPI 48	4.5 mils
Topcoat: Coating to match adjacent surfaces.				

Institutional Low Odor / Low VOC Latex				
Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI RIN 6.4D-G2 (Flat)	MPI 39	MPI 144	MPI 144	4 mils
MPI RIN 6.4D-G3 (Eggshell)	MPI 39	MPI 145	MPI 145	4 mils
MPI RIN 6.4D-G4 (Satin)	MPI 39	MPI 146	MPI 146	4 mils
MPI RIN 6.4D-G5 (Semigloss)	MPI 39	MPI 147	MPI 147	4 mils

B. Interior New and Existing, previously finished or stained Wood and Plywood, except floors; natural finish or stained

Natural finish, oil-modified polyurethane					
New	Existing	Primer	Intermediate	Topcoat	System DFT
MPI INT 6.4J-G4	MPI RIN 6.4L-G4	MPI 57	MPI 57	MPI 57	4 mils
MPI INT 6.4J-G6 (Gloss)	MPI RIN 6.4L-G6 (Gloss)	MPI 56	MPI 56	MPI 56	4 mils

Stained, oil-modified polyurethane						
New	Existing	Stain	Primer	Intermediate	Topcoat	System DFT
MPI INT 6.4E-G4	MPI RIN 6.4G-G4	MPI 90	MPI 57	MPI 57	MPI 57	4 mils
MPI INT 6.4E-G6 (Gloss)	MPI RIN 6.4G-G6 (Gloss)	MPI 90	MPI 56	MPI 56	MPI 56	4 mils

Stained, Moisture Cured Urethane						
New	Existing	Stain	Primer	Intermediate	Topcoat	System DFT
MPI INT 6.4V-G2 (Flat)	MPI RIN 6.4V-G2 (Flat)	MPI 90	MPI 71	MPI 71	MPI 71	4 mils
MPI INT 6.4V-G6 (Gloss)	MPI RIN 6.4V-G6 (Gloss)	MPI 90	MPI 31	MPI 31	MPI 31	4 mils

C. Interior New and Existing, previously finished or stained Wood Floors;
 Natural finish or stained

Natural finish, oil-modified polyurethane						
New	Existing, previously finished or stained	Primer	Intermediate	Topcoat	System DFT	
MPI INT 6.5C-G6 (Gloss)	MPI RIN 6.5C-G6 (Gloss)	MPI 56	MPI 56	MPI 56	4 mils	

Natural finish, Moisture Cured Polyurethane						
New	Existing, previously finished or stained	Primer	Intermediate	Topcoat	System DFT	
MPI INT 6.5K-G6 (Gloss)	MPI RIN 6.5D-G6 (Gloss)	MPI 31	MPI 31	MPI 31	4 mils	

Stained, oil-modified polyurethane						
New	Existing, previously finished or stained	Stain	Primer	Intermediate	Topcoat	System DFT

MPI INT 6.5B-G6 (Gloss)	MPI RIN 6.5B-G6 (Gloss)	MPI 90	MPI 56	MPI 56	MPI 56	4 mils
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Stained, Moisture Cured Urethane

New	Existing, previously finished or stained	Stain	Primer	Intermediate	Topcoat	System DFT
MPI INT 6.4V-G6 (Gloss)	MPI RIN 6.4V-G6 (Gloss)	MPI 90	MPI 31	MPI 31	MPI 31	4 mils

D. New and Existing, previously coated Wood floors; pigmented finish

Latex Floor Paint

New	Existing, previously finished	Primer	Intermediate	Topcoat	System DFT
MPI INT 6.5G-G2 (Flat)	MPI RIN 6.5J-G2 (Flat)	MPI 45	MPI 60	MPI 60	4.5 mils
MPI INT 6.5G-G6 (Gloss)	MPI RIN 6.5J-G6 (Gloss)	MPI 45	MPI 68	MPI 68	4.5 mils

Topcoat: Coating to match adjacent surfaces.

Alkyd Floor Paint

New	Existing, previously finished	Primer	Intermediate	Topcoat	System DFT
MPI INT 6.5A-G2 (Flat)	MPI RIN 6.5A-G2 (Flat)	MPI 59	MPI 59	MPI 59	4.5 mils
MPI INT 6.5A-G6 (Gloss)	MPI RIN 6.5A-G6 (Gloss)	MPI 27	MPI 27	MPI 27	4.5 mils

Topcoat: Coating to match adjacent surfaces.

E. Interior New and Existing, uncoated wood surfaces in not otherwise specified

High-Build Glaze Coatings				
As specified in Section 09 96 59 HIGH-BUILD GLAZE COATINGS.				

Waterborne Light Industrial				
New, uncoated Existing	Primer	Intermediate	Topcoat	System DFT
MPI INT 6.3P-G5 (Semigloss)	MPI 45	MPI 153	MPI 153	4.5 mils
MPI INT 6.3P-G6 (Gloss)	MPI 45	MPI 154	MPI 154	4.5 mils
Topcoat: Coating to match adjacent surfaces.				

Alkyd				
New, uncoated Existing	Primer	Intermediate	Topcoat	System DFT
MPI INT 6.3B-G5 (Semigloss)	MPI 45	MPI 47	MPI 47	4.5 mils
MPI INT 6.3B-G6 (Gloss)	MPI 45	MPI 48	MPI 48	4.5 mils
Topcoat: Coating to match adjacent surfaces.				

F. Existing, previously painted wood surfaces in not otherwise specified

High-Build Glaze Coatings				
As specified in Section 09 96 59 HIGH-BUILD GLAZE COATINGS.				

Waterborne Light Industrial				
Existing, previously finished	Primer	Intermediate	Topcoat	System DFT
MPI RIN 6.3P-G5 (Semigloss)	MPI 39	MPI 153	MPI 153	4.5 mils
MPI RIN 6.3P-G6 (Gloss)	MPI 39	MPI 154	MPI 154	4.5 mils
Topcoat: Coating to match adjacent surfaces.				

Alkyd				
Existing, previously finished	Primer	Intermediate	Topcoat	System DFT

MPI RIN 6.3B-G5 (Semigloss)	MPI 46	MPI 47	MPI 47	4.5 mils
MPI RIN 6.3B-G6 (Gloss)	MPI 46	MPI 48	MPI 48	4.5 mils
Topcoat: Coating to match adjacent surfaces.				

G. Interior New and Existing, previously finished or stained Wood Doors;
 Natural Finish or Stained

Natural finish, oil-modified polyurethane					
New	Existing, previously finished or stained	Primer	Intermediate	Topcoat	System DFT
MPI INT 6.3K-G4	MPI RIN 6.3K-G4	MPI 57	MPI 57	MPI 57	4 mils
MPI INT 6.3K-G6 (Gloss)	MPI RIN 6.3K-G6 (Gloss)	MPI 56	MPI 56	MPI 56	4 mils
Note: Sand between all coats per manufacturers recommendations.					

Stained, oil-modified polyurethane						
New	Existing, previously finished or stained	Stain	Primer	Intermediate	Topcoat	System DFT
MPI INT 6.3E-G4	MPI RIN 6.3E-G4	MPI 90	MPI 57	MPI 57	MPI 57	4 mils
MPI INT 6.5B-G6 (Gloss)	MPI RIN 6.5B-G6 (Gloss)	MPI 90	MPI 56	MPI 56	MPI 56	4 mils
Note: Sand between all coats per manufacturers recommendations.						

Stained, Moisture Cured Urethane						
New	Existing, previously finished or stained	Stain	Primer	Intermediate	Topcoat	System DFT
MPI INT 6.4V-G2 (Flat)	MPI RIN 6.4V-G2 (Flat)	MPI 90	MPI 71	MPI 71	MPI 71	4 mils
MPI INT 6.4V-G6 (Gloss)	MPI RIN 6.4V-G6 (Gloss)	MPI 90	MPI 31	MPI 31	MPI 31	4 mils
Note: Sand between all coats per manufacturers recommendations.						

H. New and Existing, uncoated Wood Doors; Pigmented finish

Alkyd				
New, uncoated Existing	Primer	Intermediate	Topcoat	System DFT
MPI INT 6.3B-G5 (Semigloss)	MPI 45	MPI 47	MPI 47	4.5 mils
MPI INT 6.3B-G6 (Gloss)	MPI 45	MPI 48	MPI 48	4.5 mils
Note: Sand between all coats per manufacturers recommendations.				

Pigmented Polyurethane				
New, uncoated Existing	Primer	Intermediate	Topcoat	System DFT
MPI INT 6.1E-G6 (Gloss)	MPI 72	MPI 72	MPI 72	4.5 mils
Note: Sand between all coats per manufacturers recommendations.				

I. Existing, previously painted Wood Doors; Pigmented finish

Alkyd				
Existing, previously finished	Primer	Intermediate	Topcoat	System DFT
MPI RIN 6.3B-G5 (Semigloss)	MPI 46	MPI 47	MPI 47	4.5 mils
MPI RIN 6.3B-G6 (Gloss)	MPI 46	MPI 48	MPI 48	4.5 mils
Note: Sand between all coats per manufacturers recommendations.				

3.12.2.5 MPI Division 9: Interior Plaster, Gypsum Board, Textured Surfaces
 Paint Table

A. Interior New and Existing, previously painted Plaster and Wallboard not
 otherwise specified

Latex					
New	Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI INT 9.2A-G2 (Flat)	RIN 9.2A-G2 (Flat)	MPI 50	MPI 44	MPI 44	4 mils

MPI INT 9.2A-G3 (Eggshell)	RIN 9.2A-G3 (Eggshell)	MPI 50	MPI 52	MPI 52	4 mils
MPI INT 9.2A-G5 (Semigloss)	RIN 9.2A-G5 (Semigloss)	MPI 50	MPI 54	MPI 54	4 mils
Topcoat: Coating to match adjacent surfaces.					

High Performance Architectural Latex - High Traffic Areas					
New	Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI INT 9.2B-G2 (Flat)	MPI RIN 9.2B-G2 (Flat)	MPI 50	MPI 138	MPI 138	4 mils
MPI INT 9.2B-G3 (Eggshell)	MPI RIN 9.2B-G3 (Eggshell)	MPI 50	MPI 139	MPI 139	4 mils
MPI INT 9.2B-G5 (Semigloss)	MPI RIN 9.2B-G5 (Semigloss)	MPI 50	MPI 141	MPI 141	4 mils
Topcoat: Coating to match adjacent surfaces.					

Institutional Low Odor / Low VOC Latex, New

Institutional Low Odor / Low VOC Latex				
New	Primer	Intermediate	Topcoat	System DFT
MPI INT 9.2M-G2 (Flat)	MPI 149	MPI 144	MPI 144	4 mils
MPI INT 9.2M-G3 (Eggshell)	MPI 149	MPI 145	MPI 145	4 mils
MPI INT 9.2M-G4 (Satin)	MPI 149	MPI 146	MPI 146	4 mils
MPI INT 9.2M-G5 (Semigloss)	MPI 149	MPI 147	MPI 147	4 mils
Topcoat: Coating to match adjacent surfaces.				

Institutional Low Odor / Low VOC Latex, Existing, previously painted

Institutional Low Odor / Low VOC Latex				
Existing, previously painted	Primer	Intermediate	Topcoat	System DFT

MPI RIN 9.2M-G2 (Flat)	MPI 144	MPI 144	MPI 144	4 mils
MPI RIN 9.2M-G3 (Eggshell)	MPI 144	MPI 145	MPI 145	4 mils
MPI RIN 9.2M-G4 (Satin)	MPI 144	MPI 146	MPI 146	4 mils
MPI RIN 9.2M-G5 (Semigloss)	MPI 144	MPI 147	MPI 147	4 mils
Topcoat: Coating to match adjacent surfaces.				

B. Interior New and Existing, previously painted Plaster and Wallboard in not otherwise specified

Waterborne Light Industrial Coating					
New, uncoated Existing	Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI INT 9.2L-G5 (Semigloss)	MPI RIN 9.2L-G5 (Semigloss)	MPI 50	MPI 153	MPI 153	4 mils
Topcoat: Coating to match adjacent surfaces.					

Alkyd					
New, uncoated Existing	Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI INT 9.2C-G5 (Semigloss)	MPI RIN 9.2C-G5 (Semigloss)	MPI 50	MPI 47	MPI 47	4 mils
Topcoat: Coating to match adjacent surfaces.					

Epoxy, New, uncoated Existing

Epoxy				
New, uncoated Existing	Primer	Intermediate	Topcoat	System DFT
MPI INT 9.2E-G6 (Gloss)	MPI 50	MPI 77	MPI 77	4 mils
Topcoat: Coating to match adjacent surfaces.				

Epoxy, Existing, previously painted

Epoxy				
Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI RIN 9.2D-G6 (Gloss)	MPI 17	MPI 77	MPI 77	4 mils
Topcoat: Coating to match adjacent surfaces.				

-- End of Section --

SECTION 10 28 13

TOILET ACCESSORIES
08/20

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 Z535.4 (2011) Product Safety Signs and Labels

ASTM INTERNATIONAL (ASTM)

ASTM F2285 (2004; R 2016; E 2016) Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use

ASTM G21 (2015) Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-1691 (1994; Rev F) Construction and Material Schedule for Military Medical and Dental Facilities

1.2 SUBMITTALS

Government approval is required for submittals with a "G" . Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Product Schedule; G

Submit product Schedule indicating types, quantities, sizes, and installation locations by room for each toilet accessory item required. Identify locations using room designations indicated on the drawings.

SD-03 Product Data

Item A4995 Table, Diaper Changing, Wall Mounted; G

Item A5030 Bench, Stall, Shower, Built In; G

Item A50001A Mirror G

Item A5080 Dispenser, Paper Towel, SS, Surface Mounted; G

Item A5082 Dispenser, Paper Towel, Sensor, Hands Free; G

Item A5109 Grab Bar, 1-1/2 inch Dia., SS, 2 Wall, W/C Accessible; G

Item A5110 Grab Bar, 1-1/2 inch Dia., SS, 3 Wall, Shower Use; G

Item A5140 Hook, Garment, Security; G

Item A5170 Rod, Shower Curtain, 1 inch Diameter, W/Curtain & Hooks; G

Item A5200 Dispenser, Toilet Tissue, SS, 2-Roll, Surface Mntd; G

Item A5205 Bar, Towel, 1 inch Diameter, SS, Surface Mounted; G

Submit catalog numbers, literature, data sheets, construction details, profiles, anchoring and mounting requirements, including cutouts in other work and substrate preparation, and other pertinent data for each toilet accessory item to evaluate function, materials, dimensions and appearance.

SD-07 Certificates

Baby Changing Stations

1.3 CERTIFICATIONS

1.3.1 Baby Changing Stations

Provide certification that baby changing stations meet the performance criteria of [ASTM F2285](#).

Provide certification that baby changing stations meet the requirements of [ANSI Z535.4](#) Product Safety Signs and Labels.

Provide certification that baby changing stations meet the requirements of [ASTM G21](#) Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

1.4 DELIVERY, STORAGE, AND HANDLING

Wrap toilet accessories for shipment and storage, then deliver to the jobsite in manufacturer's original packaging, and store in a clean, dry area protected from construction damage and vandalism.

1.5 WARRANTY

Provide manufacturer's warranty to repair or replace defective materials and workmanship for a period of one year from date of final acceptance of the work.

PART 2 PRODUCTS

2.1 ACCESSORY ITEMS

Provide toilet accessories where indicated in accordance with Contractor-provided [product schedule](#). Conform to the requirements for accessory items specified herein which are based on [MIL-STD-1691](#) Joint Schedule Numbers (JSN). Provide each accessory item complete with the

necessary mounting plates of sturdy construction with corrosion resistant surface.

Provide stainless steel products listed herein manufactured from materials containing a minimum of 50 percent recycled content. Provide data identifying percentage of [recycled content for stainless steel toilet accessories](#).

2.1.1 Anchors and Fasteners

Provide corrosion-resistant anchors and fasteners capable of developing a restraining force commensurate with the strength of the accessory to be mounted and suited for use with the supporting construction. Provide tamperproof design exposed fasteners with finish to match the accessory. Provide fasteners proposed for use for each type of wall construction and mounting.

2.1.2 Finishes

Except where noted otherwise, provide the following finishes on metal:
Exposed Stainless Steel

2.1.3 [Item A4995](#) Table, Diaper Changing, Wall Mounted

Wall mounted diaper changing table. Construct unit of high density polyethylene plastic impervious to odors, mold and mildew; support a static load of minimum 300 pounds. Provide unit to project out from wall approximately 4-1/2 inches when in closed position. Provide contour shaped unit with safety strap. Mounting hardware included.

Approximate open dimensions: 20 inches wide by 36 inches long by 5 inches deep. Approximate closed dimensions: 4 inches deep by 36 inches long by 21 inches high.

2.1.4 [Item A5030](#) Bench, Stall, Shower, Built-In

Wall mounted [reversible](#) shower seat. Frame made of 18-8 gauge, type 304 stainless steel with satin finish. Seat made of one piece of 1/2 inch thick nonporous solid phenolic with slots to permit water to drain, secured to frame with stainless steel carriage bolts and acorn nuts. Mounting hardware ([Flanges \(2\)](#), [Base Plate](#), [Spring](#), and [Guide Bracket](#)) included, made of 18-8 gauge, type 304 stainless steel with satin finish. Seat to support a minimum static load of 250 pounds. Hinge seat to fold up when not in use. Seat complies with ADA guidelines.

Approximate size: 34/14 inches wide by 22/15 inches deep by 1/2 inch thick.

2.1.5 [Item A50001A](#) Mirror

[Mirror](#) made of 18-8 gauge, type 304 stainless steel with satin finish constructed of heavy gauge stainless steel, 3/4' x 3/4" angles with [verycal grain satin finish](#). One-piece, roll-formed construction forms continuous integral stiffener all sides. Bevel design on front of angle. Mirror is 1/4 inch thick [laminated glass](#) electrolytically copper-plated and guaranteed against silver spoilage for 15 years. Unit has concealed mounting holes. Mounting hardware included. [Mirror complies with ADA guidelines](#)

Approximate size: 17 inches wide by 25 inches high by 4 inches deep.

2.1.6 [Item A5080](#) Dispenser, Paper Towel, SS, Surface Mounted

Surface mounted unit constructed of stainless steel with satin finish, welded construction, and have full length piano hinge, tumbler lock, refill indicator. Unit has smooth corners, free of burrs and sharp edges. Unit has a capacity of 400 single fold paper towels.

Approximate size: 11 inches wide by 8 inches high by 6 inches deep.

2.1.7 [Enter Appropriate Subpart Title Here] 2.1.8 [Item A5082](#) Dispenser, Paper Towel, Sensor, Hands Free

Surface mounted paper towel dispenser with hands free operation. Unit made of high impact plastic in a dark translucent color. Unit has the capacity of one standard 8 inch wide by 8 inch diameter 800 ft roll with optional paper length settings. Unit is battery operated by four "D" size alkaline batteries, and have low battery indicator light, or optional AC power adapter. Unit has keyed lock.

Approximate size: 12 inches wide by 15 inches high by 10 inches deep.

2.1.9 [Item A5109](#) Grab Bar, 1-1/4 Inch Diameter, SS, 2 Wall, W/C Accessible

Grab bar of 1-1/4 inch diameter satin finish stainless steel with peened gripping surface for use in toilet stall/room. Snap-on flange covers for concealed mounting are stainless steel and equipped with two screw holes for attachment to wall. Grab bars designed to meet and exceed ADA requirements for structural strength. Grab bars designed to withstand loads of 900 pounds when properly installed. Clearance from wall to grab bar is 1-1/2 inches to meet ADA and ANSI codes.

2.1.10 [Item A5110](#) Grab Bar, 1-1/4 Inch Diameter, SS, 3 Wall, Shower Use

Grab bar of 1-1/4 inch diameter satin finish stainless steel with peened gripping surface. Snap-on flange covers for concealed mounting stainless steel. Bent ends of tubing pass through the flanges and are Heliarc welded for maximum strength. Grab bars designed to meet and exceed ADA requirements for structural strength. Grab bars designed to withstand loads of 900 pounds when properly installed. Clearance from wall to grab bar is 1-1/2 inches to meet ADA and ANSI codes.

2.1.11 [Item A5140](#) Hook, Garment, Security

Surface mounted safety hook made of stainless steel and secured to wall with tamper resistant mounting screws, exposed mounting. Mounting hardware to be included. Hook designed to snap down when it exceeds load limit.

2.1.12 [Item A5170](#) Rod, Shower Curtain, 1 Inch Diameter, W/Curtain & Hooks

Shower Curtain Rod with concealed mounting. Shower curtain rod made of satin finish stainless steel, 1 inch diameter, with flanges included, and have white vinyl shower curtain, 72 inches high, and stainless steel curtain hooks. Shower curtain has corrosion resistant grommets, reinforced heading, and treated with antibacterial and flame retardant agents. Shower hooks are stainless steel. Length as indicated on drawings.

2.1.13 Item A5200 Dispenser, Toilet Tissue, SS, 2-Roll, Surface Mounted

Concealed surface mounted, double roll, toilet tissue dispenser of stainless steel. Unit holds and dispenses two standard 5-1/4 inch diameter rolls of toilet tissue. Spindles are free-spinning for non-controlled delivery, chrome-plated plastic equipped with heavy-duty internal springs.

Approximate size: 7 inches diameter by 4 inches deep.

2.1.14 Item A5205 Bar, Towel, 25 mm (1 inch) Diameter, SS, Surface Mounted

Surface mounted satin finish stainless steel towel bar of 1 inch diameter. Support posts fabricated of heavy solid cast brass with satin finish. Stainless steel set screw keeps bar from rotating in posts. Clearance between towel bar and wall is 1-1/2 inches.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install items that show visual evidence of biological growth. Provide the same finish for the surfaces of fastening devices exposed after installation as the attached accessory. Provide oval exposed screw heads. Install accessories at the location and height indicated. Protect exposed surfaces of accessories with strippable plastic or by other means until the installation is accepted. After acceptance of accessories, remove and dispose of strippable plastic protection. Coordinate accessory manufacturer's mounting details with other trades as their work progresses. Use sealants for brackets, plates, anchoring devices and similar items in showers (a silicone sealant specified in Section 07 92 00 JOINT SEALANTS) as they are set to provide a watertight installation. After installation, thoroughly clean exposed surfaces and restore damaged work to its original condition or replace with new work.

3.1.1 Recessed Accessories

Fasten accessories with wood screws to studs, blocking or rough frame in wood construction. Set anchors in mortar in masonry construction. Fasten to metal studs or framing with sheet metal screws in metal construction.

3.1.2 Surface Mounted Accessories

Mount on concealed backplates, unless specified otherwise. Conceal fasteners on accessories without backplates. Install accessories with corrosion-resistant fasteners as required by the construction. Install backplates in the same manner, or provide with lugs or anchors set in mortar, as required by the construction. Fasten accessories mounted on gypsum board and plaster walls without solid backing into the metal or wood studs, or to backplates secured to metal studs.

3.2 CLEANING

Clean material in accordance with manufacturer's recommendations. Do not use alkaline or abrasive agents. Take precautions to avoid scratching or marring exposed surfaces.

-- End of Section --

SECTION 11 24 24

PERMANENT HORIZONTAL FALL PROTECTION, METAL ROOFING
08/20

PART 1 GENERAL

1.1 DESCRIPTION

Standing Seam Metal Roofing (SSMR) fall protection to be used in all SSMRs with slopes greater than 3/12.

1.2 DEFINITIONS

Roof sloping (#/12) refers to the number of inches a roof rises in height for every 12 inches, as measured horizontally from the edge of the roof to the centerline.

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

SD-02 Shop Drawings

For fabrication showing the complete fall protection system. Layout drawings of each system in relation to the supporting structure indicating the locations of properly labeled components.

SD-03 Product Data

Manufacturer's data and product information indicating the sizes, descriptions, capacities, test certifications, and other descriptive data showing in sufficient detail that the product complies with the contract requirements.

SD-07 Certificates

Installer's Certification

SD-08 Manufacturer's Instructions

Maintenance Procedures: Including parts list and maintenance requirements for all equipment.

Operation Procedures: Indicating proper use of equipment for safe operation of the systems.

1.4 QUALITY CONTROL

After fall protection system is installed, the manufacturer's authorized representative shall inspect and operate the system and make any final adjustments. The manufacturer's authorized representative shall issue a certificate attesting to the system's design and installation, and formally submit to the USG

1.5 QUALIFICATIONS

- a. Furnish proof of installer's certification approval by manufacturer in the form of the installer's current certificate issued by the manufacturer.
- b. Provide a designer's qualification statement.

1.6 WARRANTY

- a. Provide lifetime manufacturer warranty
- b. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Design, furnish, install, and certify a complete and useable permanent fall protection system, inclusive of all components, appurtenances, fasteners, end stops, carriages, and equipment necessary for safety of maintenance workers.

Submit horizontal life line and anchorage connector systems for approval by the designer of record and the installation public works group's cognizant architect or designated fall protection expert. The chosen fall protection system must be compatible with the Base Exterior Architectural Plan, low-maintenance, designed for service in harsh coastal conditions, and compliant with ANSI/ASSP Z359 requirements. The following proprietary systems would meet government requirements, but other options may be proposed by the contractor, subject to final approval by the government:

- 1) 3M Capital Safety Roofsafe Rail System
- 2) Miller ShockFusion Horizontal Lifeline Roof System
- 3) Kee Safety KeeLine Engineered Lifeline Solution

2.1.1 Design Requirements

- a. Design must be performed, signed, and sealed by a Professional Engineer from the manufacturer experienced in the design of horizontal lifeline fall arrest systems. Submit qualifications of engineer.
- b. Design must provide for access from the roof hatch (where provided) to the roof ridge, allowing for continuous worker tie off to reach the ridge line. For buildings without a roof hatch, design must provide for access from the roof eave (at an acceptable location) to the roof ridge, allowing continuous worker tie off to reach the ridge line. D-rings are acceptable for ascent and descent parallel to standing seams, or propose alternative method.
- c. Low profile and architecturally pleasing systems are preferred, and will be evaluated higher than more obtrusive designs.
- d. Concealed fasteners are preferred.

2.1.2 Performance Requirements

- a. System must be able to accommodate three (3) users at a time.
- b. All fall protection anchorages must be designed for a minimum 3,100 lb nominal live load capacity. Anchorages, including any supporting structure, must be designed to allow future replacement of the horizontal lifeline system or anchorage connectors regardless of the required capacity of the chosen horizontal lifeline system or anchorage connectors. Anchorages that support two or more independent horizontal life line spans at a single point must be designed for the combined load effects of the horizontal life line systems in accordance with ANSI/ASSP Z359.6.

2.2 FINISHES

- a. Choice of finishes in powder coated or anodized aluminum alloy are preferred.
- b. Color must comply with the MCBCL Base Exterior Architectural Plan (BEAP) and the USG Architect. Submit color samples for approval.

2.3 TESTS, INSPECTIONS, AND VERIFICATIONS

After fall protection system is installed, the manufacturer's authorized representative shall inspect and operate the system and make any final adjustments. The manufacturer's authorized representative shall issue a certificate attesting to the system's design and installation, and formally submit to the USG.

PART 3 EXECUTION

3.1 INSTALLATION

Fall protection system shall be installed under the direction of manufacturer's authorized trained personnel.

3.2 INSPECTION

The manufacturer's authorized representative shall inspect and operate the system and make any final adjustments.

3.3 CLOSEOUT ACTIVITIES

3.3.1 Demonstration

The manufacturer's authorized representative shall issue a certificate attesting to the system's design and installation, and formally submit to the USG.

3.3.2 Training

Train designated US Government personnel on-site regarding proper use of system.

-- End of Section --

SECTION 22 00 00

PLUMBING, GENERAL PURPOSE

07/21

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 Z21.22/CSA 4.4 (2015; R 2020) Relief Valves for Hot Water Supply Systems
- ANSI Z21.10.3/CSA 4.3 (2019) Gas-Fired Water Heaters Vol.III, Storage Water Heaters With Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous
- ANSI Z21.56-2017/CSA 4.7-2017 (2017) Gas-fired pool heaters, 6th Edition

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

- ASHRAE 90.1 - IP (2019; Errata 1 2019; Errata 2-5 2020; Addenda BY-CP 2020; Addenda AF-DB 2020; Addenda A-G 2020; Addenda F-Y 2021; Errata 6-8 2021; Interpretation 1-4 2020; Interpretation 5-8 2021 Addenda AS-AQ 2022) Energy Standard for Buildings Except Low-Rise Residential Buildings

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

- ASSE 1001 (2021) Performance Requirements for Atmospheric Type Vacuum Breakers
- ASSE 1010 (2021) Performance Requirements for Water Hammer Arresters
- ASSE 1011 (2017) Performance Requirements for Hose Connection Vacuum Breakers
- ASSE 1012 (2021) Performance Requirements for Backflow Preventer with an Intermediate Atmospheric Vent
- ASSE 1013 (2021) Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies
- ASSE 1018 (2001; R 2021) Performance Requirements

for Trap Seal Primer Valves - Potable
Water Supplied (ANSI Approved 2002

ASSE 1020

(2020) Performance Requirements for
Pressure Vacuum Breaker Assemblies

ASSE 1037

(2015; R 2020) Performance Requirements
for Pressurized Flushing Devices for
Plumbing Fixtures

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA 10084

(2017) Standard Methods for the
Examination of Water and Wastewater

AWWA B300

(2018) Hypochlorites

AWWA B301

(2018) Liquid Chlorine

AWWA C203

(2020) Coal-Tar Protective Coatings and
Linings for Steel Water Pipelines - Enamel
and Tape - Hot-Applied

AWWA C606

(2015) Grooved and Shouldered Joints

AWWA C651

(2014) Standard for Disinfecting Water
Mains

AWWA C652

(2019) Disinfection of Water-Storage
Facilities

AWWA C700

(2020) Cold-Water Meters - Displacement
Type, Metal Alloy Main Case

AWWA C701

(2019) Cold-Water Meters - Turbine Type
for Customer Service

AMERICAN WELDING SOCIETY (AWS)

AWS A5.8/A5.8M

(2019) Specification for Filler Metals for
Brazing and Braze Welding

AWS B2.2/B2.2M

(2016) Specification for Brazing Procedure
and Performance Qualification

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME A112.1.2

(2012; R 2017; R 2022) Air Gaps in
Plumbing Systems (For Plumbing Fixtures
and Water-Connected Receptors)

ASME A112.14.1

(2003; R 2017; R 2022) Backwater Valves

ASME A112.19.2/CSA B45.1

(2018; ERTA 2018) Standard for Vitreous
China Plumbing Fixtures and Hydraulic
Requirements for Water Closets and Urinals

ASME A112.19.3/CSA B45.4

(2017; Errata 2017) Stainless Steel
Plumbing Fixtures

ASME A112.36.2M	(1991; R 2017) Cleanouts
ASME A112.6.1M	(1997; R 2017) Floor Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use
ASME A112.6.3	(2019) Standard for Floor and Trench Drains
ASME B1.20.1	(2013; R 2018) Pipe Threads, General Purpose (Inch)
ASME B16.12	(2019) Cast Iron Threaded Drainage Fittings
ASME B16.15	(2018) Cast Copper Alloy Threaded Fittings Classes 125 and 250
ASME B16.18	(2021) Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.21	(2021) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.22	(2021) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.23	(2021) Cast Copper Alloy Solder Joint Drainage Fittings - DWV
ASME B16.24	(2022) Cast Copper Alloy Pipe Flanges, Flanged Fittings, and Valves Classes 150, 300, 600, 900, 1500, and 2500
ASME B16.29	(2017) Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings - DWV
ASME B16.3	(2021) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.34	(2021) Valves - Flanged, Threaded and Welding End
ASME B16.39	(2020) Standard for Malleable Iron Threaded Pipe Unions; Classes 150, 250, and 300
ASME B16.4	(2021) Gray Iron Threaded Fittings; Classes 125 and 250
ASME B16.5	(2020) Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard
ASME B16.50	(2021) Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings
ASME B31.1	(2020) Power Piping
ASME B31.5	(2020) Refrigeration Piping and Heat Transfer Components

ASME B40.100	(2013) Pressure Gauges and Gauge Attachments
ASME BPVC SEC IX	(2017; Errata 2018) BPVC Section IX-Welding, Brazing and Fusing Qualifications
ASME INTERNATIONAL (ASME)	
ASME A112.18.1/CSA B125.1	(2012) Plumbing Supply Fittings
ASTM INTERNATIONAL (ASTM)	
ASTM A105/A105M	(2021) Standard Specification for Carbon Steel Forgings for Piping Applications
ASTM A193/A193M	(2020) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications
ASTM A515/A515M	(2017) Standard Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service
ASTM A516/A516M	(2017) Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service
ASTM A518/A518M	(1999; R 2018) Standard Specification for Corrosion-Resistant High-Silicon Iron Castings
ASTM A53/A53M	(2022) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A733	(2016) Standard Specification for Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples
ASTM A74	(2021) Standard Specification for Cast Iron Soil Pipe and Fittings
ASTM A888	(2021a) Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
ASTM B117	(2019) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B32	(2020) Standard Specification for Solder Metal
ASTM B370	(2022) Standard Specification for Copper Sheet and Strip for Building Construction

ASTM B42	(2020) Standard Specification for Seamless Copper Pipe, Standard Sizes
ASTM B813	(2016) Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube
ASTM B828	(2016) Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings
ASTM B88	(2020) Standard Specification for Seamless Copper Water Tube
ASTM C564	(2020a) Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM D1004	(2021) Initial Tear Resistance of Plastic Film and Sheeting
ASTM D2564	(2012) Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D2665	(2014) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D2855	(2015) Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
ASTM D3139	(2019) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D3212	(2020) Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D3311	(2017) Standard Specification for Drain, Waste, and Vent (DWV) Plastic Fittings Patterns
ASTM D4551	(2017) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Flexible Concealed Water-Containment Membrane
ASTM D638	(2014) Standard Test Method for Tensile Properties of Plastics
ASTM E1	(2014) Standard Specification for ASTM Liquid-in-Glass Thermometers

- ASTM E96/E96M (2022) Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
- ASTM F409 (2017) Standard Specification for Thermoplastic Accessible and Replaceable Plastic Tube and Tubular Fittings
- ASTM F477 (2014; R 2021) Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- ASTM F877 (2022) Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems

CAST IRON SOIL PIPE INSTITUTE (CISPI)

- CISPI 301 (2018) Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
- CISPI 310 (2012) Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications

COPPER DEVELOPMENT ASSOCIATION (CDA)

- CDA A4015 (2016; 14/17) Copper Tube Handbook

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

- FCCCHR Manual (10th Edition) Manual of Cross-Connection Control

INTERNATIONAL CODE COUNCIL (ICC)

- ICC A117.1 COMM (2017) Standard And Commentary Accessible and Usable Buildings and Facilities
- ICC IPC (2021) International Plumbing Code

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

- MSS SP-110 (2010) Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends
- MSS SP-25 (2018) Standard Marking System for Valves, Fittings, Flanges and Unions
- MSS SP-58 (2018) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation
- MSS SP-67 (2022) Butterfly Valves

- MSS SP-69 (2003; Notice 2012) Pipe Hangers and Supports - Selection and Application (ANSI Approved American National Standard)
- MSS SP-70 (2011) Gray Iron Gate Valves, Flanged and Threaded Ends
- MSS SP-71 (2018) Gray Iron Swing Check Valves, Flanged and Threaded Ends
- MSS SP-72 (2010a) Ball Valves with Flanged or Butt-Welding Ends for General Service
- MSS SP-78 (2011) Cast Iron Plug Valves, Flanged and Threaded Ends
- MSS SP-80 (2019) Bronze Gate, Globe, Angle and Check Valves
- MSS SP-83 (2014) Class 3000 Steel Pipe Unions Socket Welding and Threaded
- MSS SP-85 (2011) Gray Iron Globe & Angle Valves Flanged and Threaded Ends

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 31 (2020) Standard for the Installation of Oil-Burning Equipment
- NFPA 54 (2021) National Fuel Gas Code
- NFPA 90A (2021) Standard for the Installation of Air Conditioning and Ventilating Systems

NSF INTERNATIONAL (NSF)

- NSF 372 (2011) Drinking Water System Components - Lead Content
- NSF/ANSI 14 (2021) Plastics Piping System Components and Related Materials
- NSF/ANSI 61 (2022) Drinking Water System Components - Health Effects

PLASTIC PIPE AND FITTINGS ASSOCIATION (PPFA)

- PPFA Fire Man (2016) Firestopping: Plastic Pipe in Fire Resistive Construction

PLUMBING AND DRAINAGE INSTITUTE (PDI)

- PDI WH 201 (2010) Water Hammer Arresters Standard

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

- SAE J1508 (2009) Hose Clamp Specifications

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

PL 93-523 (1974; A 1999) Safe Drinking Water Act

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

10 CFR 430 Energy Conservation Program for Consumer Products

PL 102-486 (1992) Residential Energy Efficiency Ratings

UNDERWRITERS LABORATORIES (UL)

UL 174 (2004; Reprint Dec 2021) UL Standard for Safety Household Electric Storage Tank Water Heaters

UL 1951 (2011; Reprint Jun 2020) UL Standard for Safety Electric Plumbing Accessories

1.2 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. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Plumbing System; G

Detail drawings consisting of schedules, performance charts, instructions, diagrams, and other information to illustrate the requirements and operations of systems that are not covered by the Plumbing Code.. Detail drawings for the complete plumbing system including piping layouts and locations of connections; dimensions for roughing-in, foundation, and support points; schematic diagrams and wiring diagrams or connection and interconnection diagrams. Detail drawings shall indicate clearances required for maintenance and operation. Where piping and equipment are to be supported other than as indicated, details shall include loadings and proposed support methods. Mechanical drawing plans, elevations, views, and details, shall be drawn to scale.

SD-03 Product Data

Fixtures

List of installed fixtures with manufacturer, model, and flow rate.

Drinking-water coolers; G

Water heaters; G

Backflow prevention assemblies; G

Shower Faucets; G

Automatic Controls; G

Laundry Sink/Utility Tub; G

Outdoor Service Sink; G

Countertop Lavatories; G

Flush Valve Urinals; G

Flush Valve Water Closets; G

Outdoor Drinking Fountain; G

Yard Hydrant; G

Floor And Shower Drains; G

Backflow Device Enclosure; G

SD-06 Test Reports

Tests, Flushing and Disinfection

Test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, completion and testing of the installed system. Each test report shall indicate the final position of controls.

Test of Backflow Prevention Assemblies; G.

Certification of proper operation shall be as accomplished in accordance with state regulations by an individual certified by the state to perform such tests. If no state requirement exists, the Contractor shall have the manufacturer's representative test the device, to ensure the unit is properly installed and performing as intended. The Contractor shall provide written documentation of the tests performed and signed by the individual performing the tests.

SD-07 Certificates

Materials and Equipment

Where equipment is specified to conform to requirements of the ASME Boiler and Pressure Vessel Code, the design, fabrication, and installation shall conform to the code.

Bolts

Written certification by the bolt manufacturer that the bolts furnished comply with the specified requirements.

SD-10 Operation and Maintenance Data

Plumbing System; G.

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

Outdoor Drinking Fountain

1.3 STANDARD PRODUCTS

Specified materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacture of such products. Specified equipment shall essentially duplicate equipment that has performed satisfactorily at least two years prior to bid opening. Standard products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2 year period.

1.3.1 Alternative Qualifications

Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.

1.3.2 Service Support

The equipment items shall be supported by service organizations. Submit a certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. These service organizations shall be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.3.3 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.3.4 Modification of References

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction", or words of similar meaning, to mean the Contracting Officer.

1.3.4.1 Definitions

For the International Code Council (ICC) Codes referenced in the contract documents, advisory provisions shall be considered mandatory, the word "should" shall be interpreted as "shall." Reference to the "code official" shall be interpreted to mean the "Contracting Officer." For Navy owned property, references to the "owner" shall be interpreted to mean the "Contracting Officer." For leased facilities, references to the "owner" shall be interpreted to mean the "lessor." References to the "permit holder" shall be interpreted to mean the "Contractor."

1.3.4.2 Administrative Interpretations

For ICC Codes referenced in the contract documents, the provisions of Chapter 1, "Administrator," do not apply. These administrative requirements are covered by the applicable Federal Acquisition Regulations (FAR) included in this contract and by the authority granted to the Officer in Charge of Construction to administer the construction of this project. References in the ICC Codes to sections of Chapter 1, shall be applied appropriately by the Contracting Officer as authorized by his administrative cognizance and the FAR.

1.4 DELIVERY, STORAGE, AND HANDLING

Handle, store, and protect equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.

1.5 PERFORMANCE REQUIREMENTS

1.5.1 [Welding](#)

[Piping shall be welded in accordance with qualified procedures using performance-qualified welders and welding operators.](#) Procedures and welders shall be qualified in accordance with [ASME BPVC SEC IX](#). Welding procedures qualified by others, and welders and welding operators 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 tests shall be performed at the work site if practicable. Welders or welding operators shall apply their assigned symbols near each weld they make as a permanent record.

1.5.2 Plumbing Fixtures

Water flow and consumption rates shall at a minimum comply with requirements in [PL 102-486](#).

1.6 REGULATORY REQUIREMENTS

Unless otherwise required herein, plumbing work shall be in accordance with [ICC IPC](#).

1.7 PROJECT/SITE CONDITIONS

The Contractor shall become familiar with details of the work, verify dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

1.8 INSTRUCTION TO GOVERNMENT PERSONNEL

When specified in other sections, furnish the services of competent instructors to give full instruction to the designated Government personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the specified equipment or system. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work.

Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section. When more than 4 man-days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for instruction with the equipment or system.

When significant changes or modifications in the equipment or system are made under the terms of the contract, provide additional instruction to acquaint the operating personnel with the changes or modifications.

1.9 ACCESSIBILITY OF EQUIPMENT

Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install concealed valves, expansion joints, controls, dampers, and equipment requiring access, in locations freely accessible through access doors.

PART 2 PRODUCTS

2.1 MATERIALS

Materials for various services shall be in accordance with TABLES I and II. Pipe schedules shall be selected based on service requirements. Pipe fittings shall be compatible with the applicable pipe materials. Plastic pipe, fittings, and solvent cement shall meet NSF/ANSI 14 and shall be NSF listed for the service intended. Plastic pipe, fittings, and solvent cement used for potable hot and cold water service shall bear the NSF seal "NSF-PW." Pipe threads (except dry seal) shall conform to ASME B1.20.1. Material or equipment containing lead shall not be used in any potable water system. In line devices such as water meters, building valves, check valves, meter stops, valves, fittings and back flow preventers shall comply with PL 93-523 and NSF/ANSI 61, Section 8. End point devices such as drinking water fountains, lavatory faucets, kitchen and bar faucets, residential ice makers, supply stops and end point control valves used to dispense water for drinking must meet the requirements of NSF/ANSI 61, Section 9. Hubless cast-iron soil pipe shall not be installed underground, under concrete floor slabs, or in crawl spaces below kitchen floors. Plastic pipe shall not be installed in air plenums.

2.1.1 Pipe Joint Materials

Hubless cast-iron soil pipe shall not be used under ground. Solder containing lead shall not be used with copper pipe. Cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Institute. Joints and gasket materials shall conform to the following:

- a. Coupling for Cast-Iron Pipe: for hub and spigot type ASTM A74, AWWA C606. For hubless type: CISPI 310

- b. Coupling for Steel Pipe: AWWA C606.
- c. Flange Gaskets: Gaskets shall be made of non-asbestos material in accordance with ASME B16.21. Gaskets shall be flat, 1/16 inch thick, and contain Aramid fibers bonded with Styrene Butadiene Rubber (SBR) or Nitro Butadiene Rubber (NBR). Gaskets shall be the full face or self centering flat ring type. Gaskets used for hydrocarbon service shall be bonded with NBR.
- d. Brazing Material: Brazing material shall conform to AWS A5.8/A5.8M, BCuP-5.
- e. Brazing Flux: Flux shall be in paste or liquid form appropriate for use with brazing material. Flux shall be as follows: lead-free; have a 100 percent flushable residue; contain slightly acidic reagents; contain potassium borides; and contain fluorides.
- f. Solder Material: Solder metal shall conform to ASTM B32.
- g. Solder Flux: Flux shall be liquid form, non-corrosive, and conform to ASTM B813, Standard Test 1.
- h. PTFE Tape: PTFE Tape, for use with Threaded Metal or Plastic Pipe.
- i. Rubber Gaskets for Cast-Iron Soil-Pipe and Fittings (hub and spigot type and hubless type): ASTM C564.
- j. Flexible Elastomeric Seals: ASTM D3139, ASTM D3212 or ASTM F477.
- k. Plastic Solvent Cement for PVC Plastic Pipe: ASTM D2564 and ASTM D2855.
- l. Flanged fittings including flanges, bolts, nuts, bolt patterns, etc., shall be in accordance with ASME B16.5 class 150 and shall have the manufacturer's trademark affixed in accordance with MSS SP-25. Flange material shall conform to ASTM A105/A105M. Blind flange material shall conform to ASTM A516/A516M cold service and ASTM A515/A515M for hot service. Bolts shall be high strength or intermediate strength with material conforming to ASTM A193/A193M.

2.1.2 Miscellaneous Materials

Miscellaneous materials shall conform to the following:

- a. Water Hammer Arrester: PDI WH 201. Water hammer arrester shall be piston type.
- b. Copper, Sheet and Strip for Building Construction: ASTM B370.
- c. Asphalt Roof Cement:
- d. Hose Clamps: SAE J1508.
- e. Supports for Off-The-Floor Plumbing Fixtures: ASME A112.6.1M.
- f. Metallic Cleanouts: ASME A112.36.2M.

- g. Plumbing Fixture Setting Compound: A preformed flexible ring seal molded from hydrocarbon wax material. The seal material shall be nonvolatile nonasphaltic and contain germicide and provide watertight, gastight, odorproof and verminproof properties.
- h. Coal-Tar Protective Coatings and Linings for Steel Water Pipelines: AWWA C203.
- i. Hypochlorites: AWWA B300.
- j. Liquid Chlorine: AWWA B301.
- k. Gauges - Pressure and Vacuum Indicating Dial Type - Elastic Element: ASME B40.100.
- l. Thermometers: ASTM E1. Mercury shall not be used in thermometers.

2.1.3 Pipe Insulation Material

Insulation shall be as specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

2.2 PIPE HANGERS, INSERTS, AND SUPPORTS

Pipe hangers, inserts, and supports shall conform to MSS SP-58 and MSS SP-69.

2.3 VALVES

Valves shall be provided on supplies to equipment and fixtures. Valves 2-1/2 inches and smaller shall be bronze with threaded bodies for pipe and solder-type connections for tubing. Valves 3 inches and larger shall have flanged iron bodies and bronze trim. Pressure ratings shall be based upon the application. Valves shall conform to the following standards:

Description	Standard
Butterfly Valves	MSS SP-67
Cast-Iron Gate Valves, Flanged and Threaded Ends	MSS SP-70
Cast-Iron Swing Check Valves, Flanged and Threaded Ends	MSS SP-71
Ball Valves with Flanged Butt-Welding Ends for General Service	MSS SP-72
Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends	MSS SP-110
Cast-Iron Plug Valves, Flanged and Threaded Ends	MSS SP-78
Bronze Gate, Globe, Angle, and Check Valves	MSS SP-80
Steel Valves, Socket Welding and Threaded Ends	ASME B16.34
Cast-Iron Globe and Angle Valves, Flanged and Threaded Ends	MSS SP-85

Description	Standard
Backwater Valves	ASME A112.14.1
Vacuum Relief Valves	ANSI Z21.22/CSA 4.4
Trap Seal Primer Valves	ASSE 1018

2.3.1 Backwater Valves

Backwater valves shall be either separate from the floor drain or a combination floor drain, P-trap, and backwater valve, as shown. Valves shall have cast-iron bodies with cleanouts large enough to permit removal of interior parts. Valves shall be of the flap type, hinged or pivoted, with revolving disks. Hinge pivots, disks, and seats shall be nonferrous metal. Disks shall be slightly open in a no-flow no-backwater condition. Cleanouts shall extend to finished floor and be fitted with threaded countersunk plugs.

2.3.2 Wall Faucets

Wall faucets with vacuum-breaker backflow preventer shall be brass with 3/4 inch male inlet threads, hexagon shoulder, and 3/4 inch hose connection. Faucet handle shall be securely attached to stem. Faucet must be able to be operated without tools or keys.

2.3.3 Yard Hydrant

Outdoor freezless yard hydrant with 3/4" brass hose nozzle and 3/4" NPT female inlet. Water shall automatically and completely drain from the riser pipe to below the frost line when hydrant is closed. Riser pipe to be stainless steel. Hydrant bury depth shall be no less than two feet. Provide removable concrete collar around riser pipe. Yard hydrant must be able to be operated without tools or keys.

2.3.4 Relief Valves

Water heaters and hot water storage tanks shall have a combination pressure and temperature (P&T) relief valve. The pressure relief element of a P&T relief valve shall have adequate capacity to prevent excessive pressure buildup in the system when the system is operating at the maximum rate of heat input. The temperature element of a P&T relief valve shall have a relieving capacity which is at least equal to the total input of the heaters when operating at their maximum capacity. Relief valves shall be rated according to ANSI Z21.22/CSA 4.4. Relief valves for systems where the maximum rate of heat input is less than 200,000 Btuh shall have 3/4 inch minimum inlets, and 3/4 inch outlets. Relief valves for systems where the maximum rate of heat input is greater than 200,000 Btuh shall have 1 inch minimum inlets, and 1 inch outlets. The discharge pipe from the relief valve shall be the size of the valve outlet.

2.3.5 Thermostatic Mixing Valves

Provide thermostatic mixing valve for lavatory faucets. Mixing valves, thermostatic type, pressure-balanced or combination thermostatic and pressure-balanced shall be line size and shall be constructed with rough or finish bodies either with or without plating. Each valve shall be constructed to control the mixing of hot and cold water and to deliver water at a desired temperature regardless of pressure or input temperature changes. The control element shall be of an approved type. The body shall be of heavy cast bronze, and interior parts shall be brass, bronze, corrosion-resisting steel or copper. The valve shall be equipped with necessary stops, check valves, unions, and sediment strainers on the inlets. Mixing valves shall maintain water temperature within 5 degrees F of any setting.

2.4 FIXTURES

Fixtures shall be water conservation type, in accordance with ICC IPC. Fixtures for use by the physically handicapped shall be in accordance with ICC A117.1 COMM. Vitreous china, nonabsorbent, hard-burned, and vitrified throughout the body shall be provided. Porcelain enameled ware shall have specially selected, clear white, acid-resisting enamel coating evenly applied on surfaces. No fixture will be accepted that shows cracks, crazes, blisters, thin spots, or other flaws. Fixtures shall be equipped with appurtenances such as traps, faucets, stop valves, and drain fittings. Each fixture and piece of equipment requiring connections to the drainage system, except grease interceptors, shall be equipped with a trap. Brass expansion or toggle bolts capped with acorn nuts shall be provided for supports, and polished chromium-plated pipe, valves, and fittings shall be provided where exposed to view. Fixtures with the supply discharge below the rim shall be equipped with backflow preventers. Internal parts of flush and/or flushometer valves, shower mixing valves, shower head face plates, pop-up stoppers of lavatory waste drains, and pop-up stoppers and overflow tees and shoes of bathtub waste drains may contain acetal resin, fluorocarbon, nylon, acrylonitrile-butadiene-styrene (ABS) or other plastic material, if the material has provided satisfactory service under actual commercial or industrial operating conditions for not less than 2 years. Plastic in contact with hot water shall be suitable for 180 degrees F water temperature.

2.4.1 Automatic Controls

Provide automatic, sensor operated faucets and flush valves to comply with ASSE 1037 and UL 1951 for lavatory faucets, urinals, and water closets. Flushing and faucet systems shall consist of solenoid-activated valves with light beam sensors. Flush valve for water closet shall include an override pushbutton. Flushing devices shall be provided as described in paragraph FIXTURES AND FIXTURE TRIMMINGS.

2.4.2 Flush Valve Water Closets

ASME A112.19.2/CSA B45.1, white vitreous china, siphon jet, elongated bowl, floor-mounted, floor outlet. Top of toilet seat height above floor shall be 14 to 15 inches, except 17 to 19 inches for accessible water closets. Provide wax bowl ring including plastic sleeve. Water flushing volume of the water closet and flush valve combination shall not exceed 1.6 gallons per flush. Provide white solid plastic elongated open-front seat. Provide large diameter flush valve including angle control-stop valve, vacuum breaker, tail pieces, slip nuts, and wall plates; exposed to view

components shall be chromium-plated or polished stainless steel. Flush valves shall be nonhold-open type. Mount flush valves not less than 11 inches above the fixture. Mounted height of flush valve shall not interfere with the hand rail in ADA stalls.

2.4.3 Flush Valve Urinals

ASME A112.19.2/CSA B45.1, white vitreous china, wall-mounted, wall outlet, integral trap, and extended side shields. Water flushing volume of the urinal and flush valve combination shall not exceed 1.0 gallon per flush. Provide ASME A112.6.1M concealed chair carriers with vertical steel pipe supports. Provide large diameter flush valve including angle control-stop valve, vacuum breaker, tail pieces, slip nuts, and wall plates; exposed to view components shall be chromium-plated or polished stainless steel. Flush valves shall be nonhold-open type. Mount flush valves not less than 11 inches above the fixture.

2.4.4 Countertop Lavatories

ASME A112.18.1/CSA B125.1, solid surface non-porous resin, minimum dimensions of 19 inches wide by 17 inches front to rear, with supply openings for use with top mounted centerset faucets and integral undermount oval bowl. Furnish template and mounting kit by lavatory manufacturer. Provide aerator with faucet. Water flow rate shall not exceed 0.5 gpm when measured at a flowing water pressure of 60 psi. Mount counter with the top surface 34 inches above floor and with 27 inches minimum clearance from bottom of the counter face to floor. Provide top mounted washerless centerset lavatory faucets.

2.4.5 Laundry Sink/Utility Tub

Freestanding 304 stainless steel single compartment sink with minimum 12 inch deep bowl and 9 inch backsplash. Legs to be stainless or galvanized steel. Faucet to be 8 inch tall gooseneck with wrist blade handles for hot and cold water. Working height to be 34 inches.

2.4.6 Outdoor Service Sink

16 gauge 304 stainless steel dishtable with single compartment 72 inches long, 30 inches wide, and mounted at a height of 42-3/4 inches. Bowl depth to be at least 6 inches. Backsplash height to be at least 8 inches. Provide NSF 372 lead free overhead, hot and cold, self-draining, and frost-proof wall hydrant.

2.4.7 Outdoor Drinking Fountain

ASME A112.19.3/CSA B45.4 outdoor rated, stainless steel, non-refrigerated, freeze resistant, wall mounted, bi-level fountain. Bubbler to be manually-activated and vandal resistant. Provide with freeze resistant accessories.

2.5 BACKFLOW PREVENTION ASSEMBLIES

Backflow preventers shall be approved and listed by the Foundation For Cross-Connection Control & Hydraulic Research. Reduced pressure principle assemblies, double check valve assemblies, atmospheric (nonpressure) type vacuum breakers, and pressure type vacuum breakers shall be tested, approved, and listed in accordance with FCCCHR Manual. Backflow preventers with intermediate atmospheric vent shall conform to ASSE 1012. Reduced

pressure principle backflow preventers shall conform to ASSE 1013. Hose connection vacuum breakers shall conform to ASSE 1011. Pipe applied atmospheric type vacuum breakers shall conform to ASSE 1001. Pressure vacuum breaker assembly shall conform to ASSE 1020. Air gaps in plumbing systems shall conform to ASME A112.1.2.

2.5.1 Backflow Device Enclosure

Minimum R8 insulated and heated fiberglass enclosure with drainports. Enclosure to have heater listed for damp or wet locations and be capable of maintaining 40 degree F internal enclosure temperature.

2.6 DRAINS

2.6.1 Floor and Shower Drains

Floor and shower drains shall consist of a galvanized body, integral seepage pan, and adjustable perforated or slotted chromium-plated bronze, nickel-bronze, or nickel-brass strainer, consisting of grate and threaded collar. Floor drains shall be cast iron except where metallic waterproofing membrane is installed. Drains shall be of double drainage pattern for embedding in the floor construction. The seepage pan shall have weep holes or channels for drainage to the drainpipe. The strainer shall be adjustable to floor thickness. A clamping device for attaching flashing or waterproofing membrane to the seepage pan without damaging the flashing or waterproofing membrane shall be provided when required. Drains shall be provided with threaded connection. Between the drain outlet and waste pipe, a neoprene rubber gasket conforming to ASTM C564 may be installed, provided that the drain is specifically designed for the rubber gasket compression type joint. Floor and shower drains shall conform to ASME A112.6.3. Provide drain with trap primer connection, trap primer, and connection piping where noted on the drawings. Primer shall meet ASSE 1018.

2.6.1.1 Drains and Backwater Valves

Drains and backwater valves installed in connection with waterproofed floors or shower pans shall be equipped with bolted-type device to securely clamp flashing.

2.7 SHOWER PAN

Shower pan must be nonmetallic material.

2.7.1 Plasticized Polyvinyl Chloride Shower Pan Material

Material shall be sheet form. The material shall be 0.040 inch minimum thickness of plasticized polyvinyl chloride or chlorinated polyethylene and shall be in accordance with ASTM D4551.

2.7.2 Nonplasticized Polyvinyl Chloride (PVC) Shower Pan Material

Material shall consist of a plastic waterproofing membrane in sheet form. The material shall be 0.040 inch minimum thickness of nonplasticized PVC and shall have the following minimum properties:

a. or ASTM D638:

Ultimate Tensile Strength:	2600 psi
Ultimate Elongation:	398 percent

- 100 Percent Modulus: 445 psi
- b. ASTM D1004:
 - Tear Strength: 300 pounds per inch
- c. ASTM E96/E96M:
 - Permeance: 0.008 perms
- d. Other Properties:
 - Specific Gravity: 1.29
 - PVC Solvent: Weldable
 - Cold Crack: minus -53 degrees F
 - Dimensional stability,
212 degrees F minus 2.5 percent
 - Hardness, Shore A: 89

2.8 TRAPS

Unless otherwise specified, traps shall be plastic per ASTM F409. Traps shall be without a cleanout. The depth of the water seal shall be not less than 2 inches. The interior diameter shall be not more than 1/8 inch over or under the nominal size, and interior surfaces shall be reasonably smooth throughout.

2.9 WATER HEATERS

Water heater types and capacities shall be as indicated. Each water heater shall have replaceable anodes. Each primary water heater shall have controls with an adjustable range that includes 90 to 160 degrees F. Each gas-fired water heater and booster water heater shall have controls with an adjustable range that includes 120 to 180 degrees F. Hot water systems utilizing recirculation systems shall be tied into building off-hour controls. The thermal efficiencies and standby heat losses shall conform to TABLE III for each type of water heater specified. The only exception is that storage water heaters and hot water storage tanks having more than 500 gallons storage capacity need not meet the standard loss requirement if the tank surface area is insulated to R-12.5 and if a standing light is not used. Plastic materials polyetherimide (PEI) and polyethersulfone (PES) are forbidden to be used for vent piping of combustion gases. A factory pre-charged expansion tank shall be installed on the cold water supply to each water heater. Expansion tanks shall be specifically designed for use on potable water systems and shall be rated for 200 degrees F water temperature and 150 psi working pressure. The expansion tank size and acceptance volume shall be as indicated.

2.9.1 Automatic Storage Type

Heaters shall be complete with control system and shall have ASME rated combination pressure and temperature relief valve.

2.9.1.1 Electric Type

Electric type water heaters shall conform to UL 174. Unless noted otherwise, heaters shall have dual heating elements.

2.10 DOMESTIC WATER SERVICE METER

Cold water meters 2 inches and smaller shall be positive displacement type conforming to AWWA C700. Cold water meters 2-1/2 inches and larger shall be turbine type conforming to AWWA C701. Meter register shall be indicating, round or straight reading type. Meter shall be provided with a pulse generator, remote readout register and all necessary wiring and accessories.

2.11 ELECTRICAL WORK

Provide electrical motor driven equipment specified complete with motors, motor starters, and controls as specified herein and in Section 26 20 00, INTERIOR DISTRIBUTION SYSTEM. Provide internal wiring for components of packaged equipment as an integral part of the equipment. Provide high efficiency type, single-phase, fractional-horsepower alternating-current motors, including motors that are part of a system, corresponding to the applications in accordance with NEMA MG 11. Where indicated on drawings, provide polyphase, squirrel-cage medium induction motors with continuous ratings, including motors that are part of a system, that meet the efficiency ratings for premium efficiency motors in accordance with NEMA MG 1. Provide motors in accordance with NEMA MG 1 and of sufficient size to drive the load at the specified capacity without exceeding the nameplate rating of the motor.

Motors shall be rated for continuous duty with the enclosure specified. Motor duty requirements shall allow for maximum frequency start-stop operation and minimum encountered interval between start and stop. Motor torque shall be capable of accelerating the connected load within 20 seconds with 80 percent of the rated voltage maintained at motor terminals during one starting period.

Controllers and contactors shall have auxiliary contacts for use with the controls provided. Manual or automatic control and protective or signal devices required for the operation specified and any control wiring required for controls and devices specified, but not shown, shall be provided. For packaged equipment, the manufacturer shall provide controllers, including the required monitors and timed restart.

Power wiring and conduit for field installed equipment shall be provided under and conform to the requirements of Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

2.12 MISCELLANEOUS PIPING ITEMS

2.12.1 Escutcheon Plates

Provide one piece or split hinge metal plates for piping entering floors, walls, and ceilings in exposed spaces. Provide chromium-plated on copper alloy plates or polished stainless steel finish in finished spaces. Provide paint finish on plates in unfinished spaces.

2.12.2 Pipe Sleeves

Provide where piping passes entirely through walls, ceilings, roofs, and floors. Secure sleeves in position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, ceilings, roofs, and floors. Provide one inch minimum clearance between exterior of piping or pipe insulation, and interior of sleeve or

core-drilled hole. Firmly pack space with mineral wool insulation. Seal space at both ends of sleeve or core-drilled hole with plastic waterproof cement which will dry to a firm but pliable mass, or provide a mechanically adjustable segmented elastomeric seal. In fire walls and fire floors, seal both ends of sleeves or core-drilled holes with UL listed fill, void, or cavity material.

2.12.2.1 Sleeves in Masonry and Concrete

Provide steel pipe sleeves or schedule 40 PVC plastic pipe sleeves. Sleeves are not required where drain, waste, and vent (DWV) piping passes through concrete floor slabs located on grade. Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in the core-drilled hole are completely grouted smooth.

2.12.3 Sleeves Not in Masonry and Concrete

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

2.12.4 Pipe Hangers (Supports)

Provide **MSS SP-58** and **MSS SP-69**, Type 1 with adjustable type steel support rods, except as specified or indicated otherwise. Attach to steel joists with Type 19 or 23 clamps and retaining straps. Attach to Steel W or S beams with Type 21, 28, 29, or 30 clamps. Attach to steel angles and vertical web steel channels with Type 20 clamp with beam clamp channel adapter. Attach to horizontal web steel channel and wood with drilled hole on centerline and double nut and washer. Attach to concrete with Type 18 insert or drilled expansion anchor. Provide Type 40 insulation protection shield for insulated piping.

2.12.5 Nameplates

Provide **0.125 inch** thick melamine laminated plastic nameplates, black matte finish with white center core, for equipment, gages, thermometers, and valves; valves in supplies to faucets will not require nameplates. Accurately align lettering and engrave minimum of **0.25 inch** high normal block lettering into the white core. Minimum size of nameplates shall be **1.0 by 2.5 inches**. Key nameplates to a chart and schedule for each system. Frame charts and schedules under glass and place where directed near each system. Furnish two copies of each chart and schedule.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Piping located in air plenums shall conform to **NFPA 90A** requirements. Plastic pipe shall not be installed in air plenums. Piping located in shafts that constitute air ducts or that enclose air ducts shall be noncombustible in accordance with **NFPA 90A**. Installation of plastic pipe where in compliance with **NFPA** may be installed in accordance with **PPFA Fire Man**. The plumbing system shall be installed complete with necessary fixtures, fittings, traps, valves, and accessories. Water and drainage piping shall be extended **5 feet** outside the building, unless otherwise indicated. A gate valve or full port ball valve and drain shall be installed on the water service line inside the building approximately **6 inches** above the floor from point of entry. Piping shall be connected to the exterior service lines or capped or plugged if the exterior service is not in place. Sewer and water pipes shall be laid in separate trenches,

except as allowed by NCPC. Exterior underground utilities shall be at least 12 inches below the finish grade or as indicated on the drawings. If trenches are closed or the pipes are otherwise covered before being connected to the service lines, the location of the end of each plumbing utility shall be marked with a stake or other acceptable means. Valves shall be installed with control no lower than the valve body.

3.1.1 Water Pipe, Fittings, and Connections

3.1.1.1 Utilities

The piping shall be extended to fixtures, outlets, and equipment. The hot-water and cold-water piping system shall be arranged and installed to permit draining. The supply line to each item of equipment or fixture, except faucets, flush valves, or other control valves which are supplied with integral stops, shall be equipped with a shutoff valve to enable isolation of the item for repair and maintenance without interfering with operation of other equipment or fixtures. Supply piping to fixtures, faucets, hydrants, shower heads, and flushing devices shall be anchored to prevent movement.

3.1.1.2 Cutting and Repairing

The work shall be carefully laid out in advance, and unnecessary cutting of construction shall be avoided. Damage to building, piping, wiring, or equipment as a result of cutting shall be repaired by mechanics skilled in the trade involved.

3.1.1.3 Protection of Fixtures, Materials, and Equipment

Pipe openings shall be closed with caps or plugs during installation. Fixtures and equipment shall be tightly covered and protected against dirt, water, chemicals, and mechanical injury. Upon completion of the work, the fixtures, materials, and equipment shall be thoroughly cleaned, adjusted, and operated. Safety guards shall be provided for exposed rotating equipment.

3.1.1.4 Mains, Branches, and Runouts

Piping shall be installed as indicated. Pipe shall be accurately cut and worked into place without springing or forcing. Structural portions of the building shall not be weakened. Aboveground piping shall run parallel with the lines of the building, unless otherwise indicated. Branch pipes from service lines may be taken from top, bottom, or side of main, using crossover fittings required by structural or installation conditions. Supply pipes, valves, and fittings shall be kept a sufficient distance from other work and other services to permit not less than 1/2 inch between finished covering on the different services. Bare and insulated water lines shall not bear directly against building structural elements so as to transmit sound to the structure or to prevent flexible movement of the lines. Water pipe shall not be buried in or under floors unless specifically indicated or approved. Changes in pipe sizes shall be made with reducing fittings. Use of bushings will not be permitted except for use in situations in which standard factory fabricated components are furnished to accommodate specific accepted installation practice. Change in direction shall be made with fittings, except that bending of pipe 4 inches and smaller will be permitted, provided a pipe bender is used and wide sweep bends are formed. The center-line radius of bends shall be not less than six diameters of the pipe. Bent pipe showing kinks, wrinkles,

flattening, or other malformations will not be acceptable.

3.1.1.5 Pipe Drains

Pipe drains indicated shall consist of 3/4 inch hose bibb with renewable seat and ball valve ahead of hose bibb. At other low points, 3/4 inch brass plugs or caps shall be provided. Disconnection of the supply piping at the fixture is an acceptable drain.

3.1.1.6 Expansion and Contraction of Piping

Allowance shall be made throughout for expansion and contraction of water pipe. Each hot-water and hot-water circulation riser shall have expansion loops or other provisions such as offsets, changes in direction, etc., where indicated and/or required. Risers shall be securely anchored as required or where indicated to force expansion to loops. Branch connections from risers shall be made with ample swing or offset to avoid undue strain on fittings or short pipe lengths. Horizontal runs of pipe over 50 feet in length shall be anchored to the wall or the supporting construction about midway on the run to force expansion, evenly divided, toward the ends. Sufficient flexibility shall be provided on branch runouts from mains and risers to provide for expansion and contraction of piping. Flexibility shall be provided by installing one or more turns in the line so that piping will spring enough to allow for expansion without straining.

3.1.1.7 Thrust Restraint

Plugs, caps, tees, valves and bends deflecting 11.25 degrees or more, either vertically or horizontally, in waterlines 4 inches in diameter or larger shall be provided with thrust blocks, where indicated, to prevent movement. Thrust blocking shall be concrete of a mix not leaner than: 1 cement, 2-1/2 sand, 5 gravel; and having a compressive strength of not less than 2000 psi after 28 days. Blocking shall be placed between solid ground and the fitting to be anchored. Unless otherwise indicated or directed, the base and thrust bearing sides of the thrust block shall be poured against undisturbed earth. The side of the thrust block not subject to thrust shall be poured against forms. The area of bearing will be as shown. Blocking shall be placed so that the joints of the fitting are accessible for repair. Steel rods and clamps, protected by galvanizing or by coating with bituminous paint, shall be used to anchor vertical down bends into gravity thrust blocks.

3.1.1.8 Commercial-Type Water Hammer Arresters

Commercial-type water hammer arresters shall be provided on hot- and cold-water supplies and shall be located as generally indicated, with precise location and sizing to be in accordance with PDI WH 201. Water hammer arresters, where concealed, shall be accessible by means of access doors or removable panels. Commercial-type water hammer arresters shall conform to ASSE 1010. Vertical capped pipe columns will not be permitted.

3.1.2 Joints

Installation of pipe and fittings shall be made in accordance with the manufacturer's recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Joints shall be made up with fittings of compatible material and made for the specific purpose intended.

3.1.2.1 Threaded

Threaded joints shall have American Standard taper pipe threads conforming to ASME B1.20.1. Only male pipe threads shall be coated with graphite or with an approved graphite compound, or with an inert filler and oil, or shall have a polytetrafluoroethylene tape applied.

3.1.2.2 Unions and Flanges

Unions, flanges and mechanical couplings shall not be concealed in walls, ceilings, or partitions. Unions shall be used on pipe sizes 2-1/2 inches and smaller; flanges shall be used on pipe sizes 3 inches and larger.

3.1.2.3 Cast Iron Soil, Waste and Vent Pipe

Bell and spigot compression and hubless gasketed clamp joints for soil, waste and vent piping shall be installed per the manufacturer's recommendations.

3.1.2.4 Copper Tube and Pipe

- a. Brazed. Brazed joints shall be made in conformance with AWS B2.2/B2.2M, ASME B16.50, and CDA A4015 with flux and are acceptable for all pipe sizes. Copper to copper joints shall include the use of copper-phosphorus or copper-phosphorus-silver brazing metal without flux. Brazing of dissimilar metals (copper to bronze or brass) shall include the use of flux with either a copper-phosphorus, copper-phosphorus-silver or a silver brazing filler metal.
- b. Soldered. Soldered joints shall be made with flux and are only acceptable for piping 2 inches and smaller. Soldered joints shall conform to ASME B31.5 and CDA A4015. Soldered joints shall not be used in compressed air piping between the air compressor and the receiver.

3.1.2.5 Plastic Pipe

PVC pipe shall have joints made with solvent cement elastomeric, threading, (threading of Schedule 80 Pipe is allowed only where required for disconnection and inspection; threading of Schedule 40 Pipe is not allowed), or mated flanged.

3.1.3 Dissimilar Pipe Materials

Connections between ferrous and non-ferrous copper water pipe shall be made with dielectric unions or flange waterways. Dielectric waterways shall have temperature and pressure rating equal to or greater than that specified for the connecting piping. Waterways shall have metal connections on both ends suited to match connecting piping. Dielectric waterways shall be internally lined with an insulator specifically designed to prevent current flow between dissimilar metals. Dielectric flanges shall meet the performance requirements described herein for dielectric waterways. Connecting joints between plastic and metallic pipe shall be made with transition fitting for the specific purpose.

3.1.4 Pipe Sleeves and Flashing

Pipe sleeves shall be furnished and set in their proper and permanent location.

3.1.4.1 Sleeve Requirements

Pipes passing through concrete or masonry walls or concrete floors or roofs shall be provided with pipe sleeves fitted into place at the time of construction. Sleeves are not required for supply, drainage, waste and vent pipe passing through concrete slab on grade, except where penetrating a membrane waterproof floor. A modular mechanical type sealing assembly may be installed in lieu of a waterproofing clamping flange and caulking and sealing of annular space between pipe and sleeve. The seals shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve using galvanized steel bolts, nuts, and pressure plates. The links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and each nut. After the seal assembly is properly positioned in the sleeve, tightening of the bolt shall cause the rubber sealing elements to expand and provide a watertight seal between the pipe and the sleeve. Each seal assembly shall be sized as recommended by the manufacturer to fit the pipe and sleeve involved. Sleeves shall not be installed in structural members, except where indicated or approved. Rectangular and square openings shall be as detailed. Each sleeve shall extend through its respective floor, or roof, and shall be cut flush with each surface, except for special circumstances. Pipe sleeves passing through floors in wet areas such as mechanical equipment rooms, lavatories, kitchens, and other plumbing fixture areas shall extend a minimum of 4 inches above the finished floor. Unless otherwise indicated, sleeves shall be of a size to provide a minimum of 1/4 inch clearance between bare pipe or insulation and inside of sleeve or between insulation and inside of sleeve. Sleeves in bearing walls and concrete slab on grade floors shall be steel pipe or cast-iron pipe. Sleeves in nonbearing walls or ceilings may be steel pipe, cast-iron pipe, galvanized sheet metal with lock-type longitudinal seam, or plastic. Except as otherwise specified, the annular space between pipe and sleeve, or between jacket over insulation and sleeve, shall be sealed as indicated with sealants conforming to ASTM C920 and with a primer, backstop material and surface preparation as specified in Section 07 92 00 JOINT SEALANTS. The annular space between pipe and sleeve, between bare insulation and sleeve or between jacket over insulation and sleeve shall not be sealed for interior walls which are not designated as fire rated. Sleeves through below-grade walls in contact with earth shall be recessed 1/2 inch from wall surfaces on both sides. Annular space between pipe and sleeve shall be filled with backing material and sealants in the joint between the pipe and wall as specified above. Sealant selected for the earth side of the wall shall be compatible with dampproofing/waterproofing materials that are to be applied over the joint sealant.

3.1.4.2 Flashing Requirements

Pipes passing through roof shall be installed through a 16 ounce copper flashing, each within an integral skirt or flange. Flashing shall be suitably formed, and the skirt or flange shall extend not less than 8 inches from the pipe and shall be set over the roof or floor membrane in a solid coating of bituminous cement. The flashing shall extend up the pipe a minimum of 10 inches. For cleanouts, the flashing shall be turned down into the hub and caulked after placing the ferrule. Pipes passing through

pitched roofs shall be flashed, using lead or copper flashing, with an adjustable integral flange of adequate size to extend not less than 8 inches from the pipe in all directions and lapped into the roofing to provide a watertight seal. The annular space between the flashing and the bare pipe or between the flashing and the metal-jacket-covered insulation shall be sealed as indicated. Flashing for dry vents shall be turned down into the pipe to form a waterproof joint. Pipes, up to and including 10 inches in diameter, passing through roof or floor waterproofing membrane may be installed through a cast-iron sleeve with caulking recess, anchor lugs, flashing-clamp device, and pressure ring with brass bolts. Flashing shield shall be fitted into the sleeve clamping device. Pipes passing through wall waterproofing membrane shall be sleeved as described above. A waterproofing clamping flange shall be installed.

3.1.4.3 Waterproofing

Waterproofing at floor-mounted water closets shall be accomplished by forming a flashing guard from soft-tempered sheet copper. The center of the sheet shall be perforated and turned down approximately 1-1/2 inches to fit between the outside diameter of the drainpipe and the inside diameter of the cast-iron or steel pipe sleeve. The turned-down portion of the flashing guard shall be embedded in sealant to a depth of approximately 1-1/2 inches; then the sealant shall be finished off flush to floor level between the flashing guard and drainpipe. The flashing guard of sheet copper shall extend not less than 8 inches from the drainpipe and shall be lapped between the floor membrane in a solid coating of bituminous cement. If cast-iron water closet floor flanges are used, the space between the pipe sleeve and drainpipe shall be sealed with sealant and the flashing guard shall be upturned approximately 1-1/2 inches to fit the outside diameter of the drainpipe and the inside diameter of the water closet floor flange. The upturned portion of the sheet fitted into the floor flange shall be sealed.

3.1.4.4 Optional Counterflashing

Instead of turning the flashing down into a dry vent pipe, or caulking and sealing the annular space between the pipe and flashing or metal-jacket-covered insulation and flashing, counterflashing may be accomplished by utilizing the following:

- a. A standard roof coupling for threaded pipe up to 6 inches in diameter.
- b. A tack-welded or banded-metal rain shield around the pipe.

3.1.4.5 Pipe Penetrations of Slab on Grade Floors

Where pipes, fixture drains, floor drains, cleanouts or similar items penetrate slab on grade floors, except at penetrations of floors with waterproofing membrane as specified in paragraphs Flashing Requirements and Waterproofing, a groove 1/4 to 1/2 inch wide by 1/4 to 3/8 inch deep shall be formed around the pipe, fitting or drain. The groove shall be filled with a sealant as specified in Section 07 92 00 JOINT SEALANTS.

3.1.4.6 Pipe Penetrations

Provide sealants for all pipe penetrations. All pipe penetrations shall be sealed to prevent infiltration of air, insects, and vermin.

3.1.5 Supports

3.1.5.1 General

Hangers used to support piping 2 inches and larger shall be fabricated to permit adequate adjustment after erection while still supporting the load. Pipe guides and anchors shall be installed to keep pipes in accurate alignment, to direct the expansion movement, and to prevent buckling, swaying, and undue strain. Piping subjected to vertical movement when operating temperatures exceed ambient temperatures shall be supported by variable spring hangers and supports or by constant support hangers. In the support of multiple pipe runs on a common base member, a clip or clamp shall be used where each pipe crosses the base support member. Spacing of the base support members shall not exceed the hanger and support spacing required for an individual pipe in the multiple pipe run. Threaded sections of rods shall not be formed or bent.

3.1.5.2 Pipe Hangers, Inserts, and Supports

Installation of pipe hangers, inserts and supports shall conform to MSS SP-58 and MSS SP-69, except as modified herein.

- a. Types 5, 12, and 26 shall not be used.
- b. Type 3 shall not be used on insulated pipe.
- c. Type 18 inserts shall be secured to concrete forms before concrete is placed. Continuous inserts which allow more adjustment may be used if they otherwise meet the requirements for type 18 inserts.
- d. Type 19 and 23 C-clamps shall be torqued per MSS SP-69 and shall have both locknuts and retaining devices furnished by the manufacturer. Field-fabricated C-clamp bodies or retaining devices are not acceptable.
- e. Type 20 attachments used on angles and channels shall be furnished with an added malleable-iron heel plate or adapter.
- f. Type 24 may be used only on trapeze hanger systems or on fabricated frames.
- g. Type 39 saddles shall be used on insulated pipe 4 inches and larger when the temperature of the medium is 60 degrees F or higher. Type 39 saddles shall be welded to the pipe.
- h. Type 40 shields shall:
 - (1) Be used on insulated pipe less than 4 inches.
 - (2) Be used on insulated pipe 4 inches and larger when the temperature of the medium is 60 degrees F or less.
 - (3) Have a high density insert for all pipe sizes. High density inserts shall have a density of 8 pcf or greater.
- i. Horizontal pipe supports shall be spaced as specified in MSS SP-69 and a support shall be installed not over 1 foot from the pipe fitting joint at each change in direction of the piping. Pipe supports shall be spaced not over 5 feet apart at valves.

Operating temperatures in determining hanger spacing for PVC or CPVC pipe shall be 120 degrees F for PVC and 180 degrees F for CPVC. Horizontal pipe runs shall include allowances for expansion and contraction.

- j. Vertical pipe shall be supported at each floor, except at slab-on-grade, at intervals of not more than 15 feet nor more than 8 feet from end of risers, and at vent terminations. Vertical pipe risers shall include allowances for expansion and contraction.
- k. Type 35 guides using steel, reinforced polytetrafluoroethylene (PTFE) or graphite slides shall be provided to allow longitudinal pipe movement. Slide materials shall be suitable for the system operating temperatures, atmospheric conditions, and bearing loads encountered. Lateral restraints shall be provided as needed. Where steel slides do not require provisions for lateral restraint the following may be used:
 - (1) On pipe 4 inches and larger when the temperature of the medium is 60 degrees F or higher, a Type 39 saddle, welded to the pipe, may freely rest on a steel plate.
 - (2) On pipe less than 4 inches a Type 40 shield, attached to the pipe or insulation, may freely rest on a steel plate.
 - (3) On pipe 4 inches and larger carrying medium less than 60 degrees F a Type 40 shield, attached to the pipe or insulation, may freely rest on a steel plate.
- l. Pipe hangers on horizontal insulated pipe shall be the size of the outside diameter of the insulation. The insulation shall be continuous through the hanger on all pipe sizes and applications.
- m. Where there are high system temperatures and welding to piping is not desirable, the type 35 guide shall include a pipe cradle, welded to the guide structure and strapped securely to the pipe. The pipe shall be separated from the slide material by at least 4 inches or by an amount adequate for the insulation, whichever is greater.
- n. Hangers and supports for plastic pipe shall not compress, distort, cut or abrade the piping, and shall allow free movement of pipe except where otherwise required in the control of expansion/contraction.

3.1.5.3 Structural Attachments

Attachment to building structure concrete and masonry shall be by cast-in concrete inserts, built-in anchors, or masonry anchor devices. Inserts and anchors shall be applied with a safety factor not less than 5. Supports shall not be attached to metal decking. Supports shall not be attached to the underside of concrete filled floor or concrete roof decks unless approved by the Contracting Officer. Masonry anchors for overhead applications shall be constructed of ferrous materials only.

3.1.6 Welded Installation

Plumbing pipe weldments shall be as indicated. Changes in direction of piping shall be made with welding fittings only; mitering or notching pipe

to form elbows and tees or other similar type construction will not be permitted. Branch connection may be made with either welding tees or forged branch outlet fittings. Branch outlet fittings shall be forged, flared for improvement of flow where attached to the run, and reinforced against external strains. Beveling, alignment, heat treatment, and inspection of weld shall conform to ASME B31.1. Weld defects shall be removed and repairs made to the weld, or the weld joints shall be entirely removed and rewelded. After filler metal has been removed from its original package, it shall be protected or stored so that its characteristics or welding properties are not affected. Electrodes that have been wetted or that have lost any of their coating shall not be used.

3.1.7 Pipe Cleanouts

Pipe cleanouts shall be the same size as the pipe except that cleanout plugs larger than 4 inches will not be required. A cleanout installed in connection with cast-iron soil pipe shall consist of a long-sweep 1/4 bend or one or two 1/8 bends extended to the place shown. An extra-heavy cast-brass or cast-iron ferrule with countersunk cast-brass head screw plug shall be caulked into the hub of the fitting and shall be flush with the floor. Cleanouts in connection with other pipe, where indicated, shall be T-pattern, 90-degree branch drainage fittings with cast-brass screw plugs, except plastic plugs shall be installed in plastic pipe. Plugs shall be the same size as the pipe up to and including soil and waste stacks, at the foot of interior downspouts, on each connection to building storm drain where interior downspouts are indicated, and on each building drain outside the building. Cleanout tee branches may be omitted on stacks in single story buildings with slab-on-grade construction or where less than 18 inches of crawl space is provided under the floor. Cleanouts on pipe concealed in partitions shall be provided with chromium plated bronze, nickel bronze, nickel brass or stainless steel flush type access cover plates. Round access covers shall be provided and secured to plugs with securing screw. Square access covers may be provided with matching frames, anchoring lugs and cover screws. Cleanouts in finished walls shall have access covers and frames installed flush with the finished wall. Cleanouts installed in finished floors subject to foot traffic shall be provided with a chrome-plated cast brass, nickel brass, or nickel bronze cover secured to the plug or cover frame and set flush with the finished floor. Heads of fastening screws shall not project above the cover surface. Where cleanouts are provided with adjustable heads, the heads shall be cast iron or plastic.

3.2 WATER HEATERS AND HOT WATER STORAGE TANKS

3.2.1 Relief Valves

No valves shall be installed between a relief valve and its water heater or storage tank. The P&T relief valve shall be installed where the valve actuator comes in contact with the hottest water in the heater. Whenever possible, the relief valve shall be installed directly in a tapping in the tank or heater; otherwise, the P&T valve shall be installed in the hot-water outlet piping. A vacuum relief valve shall be provided on the cold water supply line to the hot-water storage tank or water heater and mounted above and within 6 inches above the top of the tank or water heater.

3.2.2 Installation of Gas- and Oil-Fired Water Heater

Installation shall conform to NFPA 54 for gas fired and NFPA 31 for oil fired.

3.2.3 Heat Traps

Provide integral, factory manufactured or piping arranged heat traps on piping to and from each water heater and hot water storage tank on both hot and cold water connection. Piping arranged heat trap shall incorporate a minimum 12 inch deep loop to restrict natural tendency of hot water to rise during standby periods.

3.2.4 Connections to Water Heaters

Connections of metallic pipe to water heaters shall be made with dielectric unions or flanges.

3.2.5 Expansion Tank

A pre-charged expansion tank shall be installed on the cold water supply between the water heater inlet and the cold water supply shut-off valve. The Contractor shall adjust the expansion tank air pressure, as recommended by the tank manufacturer, to match incoming water pressure.

3.2.6 Direct Fired and Domestic Water Heaters

Notify the Contracting Officer when any direct fired domestic water heater over 117,124.2 Watts (400,000 BTU/hour) is operational and ready to be inspected and certified.

3.3 FIXTURES AND FIXTURE TRIMMINGS

Polished chromium-plated pipe, valves, and fittings shall be provided where exposed to view. Angle stops, straight stops, stops integral with the faucets, or concealed type of lock-shield, and loose-key pattern stops for supplies with threaded, sweat or solvent weld inlets shall be furnished and installed with fixtures. Where connections between copper tubing and faucets are made by rubber compression fittings, a beading tool shall be used to mechanically deform the tubing above the compression fitting. Exposed traps and supply pipes for fixtures and equipment shall be connected to the rough piping systems at the wall, unless otherwise specified under the item. Floor and wall escutcheons shall be as specified. Drain lines and hot water lines of fixtures for handicapped personnel shall be insulated and do not require polished chrome finish. Plumbing fixtures and accessories shall be installed within the space shown.

3.3.1 Fixture Connections

Where space limitations prohibit standard fittings in conjunction with the cast-iron floor flange, special short-radius fittings shall be provided. Connections between earthenware fixtures and flanges on soil pipe shall be made gastight and watertight with a closet-setting compound or neoprene gasket and seal. Use of natural rubber gaskets or putty will not be permitted. Fixtures with outlet flanges shall be set the proper distance from floor or wall to make a first-class joint with the closet-setting compound or gasket and fixture used.

3.3.2 Flushometer Valves

Flushometer valves shall be secured to prevent movement by anchoring the long finished top spud connecting tube to wall adjacent to valve with approved metal bracket. Flushometer valves for water closets shall be

installed 39 inches above the floor, except at water closets intended for use by the physically handicapped where flushometer valves shall be mounted at approximately 30 inches above the floor and arranged to avoid interference with grab bars. In addition, for water closets intended for handicap use, the flush valve handle shall be installed on the wide side of the enclosure.

3.3.3 Shower Bath Outfits

The area around the water supply piping to the mixing valves and behind the escutcheon plate shall be made watertight by caulking or gasketing.

3.3.4 Fixture Supports

Fixture supports for off-the-floor lavatories, urinals, water closets, and other fixtures of similar size, design, and use, shall be of the chair-carrier type. The carrier shall provide the necessary means of mounting the fixture, with a foot or feet to anchor the assembly to the floor slab. Adjustability shall be provided to locate the fixture at the desired height and in proper relation to the wall. Support plates, in lieu of chair carrier, shall be fastened to the wall structure only where it is not possible to anchor a floor-mounted chair carrier to the floor slab.

3.3.4.1 Support for Solid Masonry Construction

Chair carrier shall be anchored to the floor slab. Where a floor-anchored chair carrier cannot be used, a suitable wall plate shall be imbedded in the masonry wall.

3.3.4.2 Support for Concrete-Masonry Wall Construction

Chair carrier shall be anchored to floor slab. Where a floor-anchored chair carrier cannot be used, a suitable wall plate shall be fastened to the concrete wall using through bolts and a back-up plate.

3.3.4.3 Support for Steel Stud Frame Partitions

Chair carrier shall be used. The anchor feet and tubular uprights shall be of the heavy duty design; and feet (bases) shall be steel and welded to a square or rectangular steel tube upright. Wall plates, in lieu of floor-anchored chair carriers, shall be used only if adjoining steel partition studs are suitably reinforced to support a wall plate bolted to these studs.

3.3.4.4 Support for Wood Stud Construction

Where floor is a concrete slab, a floor-anchored chair carrier shall be used. Where entire construction is wood, wood crosspieces shall be installed. Fixture hanger plates, supports, brackets, or mounting lugs shall be fastened with not less than No. 10 wood screws, 1/4 inch thick minimum steel hanger, or toggle bolts with nut. The wood crosspieces shall extend the full width of the fixture and shall be securely supported.

3.3.4.5 Wall-Mounted Water Closet Gaskets

Where wall-mounted water closets are provided, reinforced wax, treated felt, or neoprene gaskets shall be provided. The type of gasket furnished shall be as recommended by the chair-carrier manufacturer.

3.3.5 Backflow Prevention Devices

Plumbing fixtures, equipment, and pipe connections shall not cross connect or interconnect between a potable water supply and any source of nonpotable water. Backflow preventers shall be installed where indicated and in accordance with at all other locations necessary to preclude a cross-connect or interconnect between a potable water supply and any nonpotable substance. In addition backflow preventers shall be installed at all locations where the potable water outlet is below the flood level of the equipment, or where the potable water outlet will be located below the level of the nonpotable substance. Backflow preventers shall be located so that no part of the device will be submerged. Backflow preventers shall be of sufficient size to allow unrestricted flow of water to the equipment, and preclude the backflow of any nonpotable substance into the potable water system. Bypass piping shall not be provided around backflow preventers. Access shall be provided for maintenance and testing. Each device shall be a standard commercial unit.

3.3.6 Access Panels

Access panels shall be provided for concealed valves and controls, or any item requiring inspection or maintenance. Access panels shall be of sufficient size and located so that the concealed items may be serviced, maintained, or replaced.

3.3.7 Sight Drains

Sight drains shall be installed so that the indirect waste will terminate 2 inches above the flood rim of the funnel to provide an acceptable air gap.

3.3.8 Traps

Each trap shall be placed as near the fixture as possible, and no fixture shall be double-trapped. Traps installed on cast-iron soil pipe shall be cast iron. Traps installed on steel pipe or copper tubing shall be recess-drainage pattern, or brass-tube type. Traps installed on plastic pipe may be plastic conforming to ASTM D3311. Traps for acid-resisting waste shall be of the same material as the pipe.

3.3.9 Shower Pans

Before installing shower pan, subfloor shall be free of projections such as nail heads or rough edges of aggregate. Drain shall be a bolt-down, clamping-ring type with weepholes, installed so the lip of the subdrain is flush with subfloor.

3.3.9.1 General

The floor of each individual shower, the shower-area portion of combination shower and drying room, and the entire shower and drying room where the two are not separated by curb or partition, shall be made watertight with a shower pan fabricated in place. The shower pan material shall be cut to size and shape of the area indicated, in one piece to the maximum extent practicable, allowing a minimum of 6 inches for turnup on walls or partitions, and shall be folded over the curb with an approximate return of 1/4 of curb height. The upstands shall be placed behind any wall or partition finish. Subflooring shall be smooth and clean, with nailheads driven flush with surface, and shall be sloped to drain. Shower pans shall be clamped to drains with the drain clamping ring.

3.3.9.2 Metal Shower Pans

When a shower pan of required size cannot be furnished in one piece, metal pieces shall be joined with a flatlock seam and soldered or burned. The corners shall be folded, not cut, and the corner seam shall be soldered or burned. Pans, including upstands, shall be coated on all surfaces with one brush coat of asphalt. Asphalt shall be applied evenly at not less than 1 gallon per 50 square feet. A layer of felt covered with building paper shall be placed between shower pans and wood floors. The joining surfaces of metal pan and drain shall be given a brush coat of asphalt after the pan is connected to the drain.

3.3.9.3 Nonplasticized Chlorinated Polyethylene Shower Pans

Corners of nonplasticized chlorinated polyethylene shower pans shall be folded against the upstand by making a pig-ear fold. Hot-air gun or heat lamp shall be used in making corner folds. Each pig-ear corner fold shall be nailed or stapled 1/2 inch from the upper edge to hold it in place. Nails shall be galvanized large-head roofing nails. On metal framing or studs, approved duct tape shall be used to secure pig-ear fold and membrane. Where no backing is provided between the studs, the membrane slack shall be taken up by pleating and stapling or nailing to studding 1/2 inch from upper edge. To adhere the membrane to vertical surfaces, the back of the membrane and the surface to which it will be applied shall be coated with adhesive that becomes dry to the touch in 5 to 10 minutes, after which the membrane shall be pressed into place. Surfaces to be solvent-welded shall be clean. Surfaces to be joined with xylene shall be initially sprayed and vigorously cleaned with a cotton cloth, followed by final coating of xylene and the joining of the surfaces by roller or equivalent means. If ambient or membrane temperatures are below 40 degrees F the membrane and the joint shall be heated prior to application of xylene. Heat may be applied with hot-air gun or heat lamp, taking precautions not to scorch the membrane. Adequate ventilation and wearing of gloves are required when working with xylene. Membrane shall be pressed into position on the drain body, and shall be cut and fit to match so that membrane can be properly clamped and an effective gasket-type seal provided. On wood subflooring, two layers of 15 pound dry felt shall be installed prior to installation of shower pan to ensure a smooth surface for installation.

3.3.9.4 Nonplasticized Polyvinyl Chloride (PVC) Shower Pans

Nonplasticized PVC shall be turned up behind walls or wall surfaces a distance of not less than 6 inches in room areas and 3 inches above curb level in curbed spaces with sufficient material to fold over and fasten to outside face of curb. Corners shall be pig-ear type and folded between pan and studs. Only top 1 inch of upstand shall be nailed to hold in place. Nails shall be galvanized large-head roofing type. Approved duct tape shall be used on metal framing or studs to secure pig-ear fold and membrane. Where no backing is provided between studs, the membrane slack shall be taken up by pleating and stapling or nailing to studding at top inch of upstand. To adhere the membrane to vertical surfaces, the back of the membrane and the surface to which it is to be applied shall be coated with adhesive that becomes dry to the touch in 5 to 10 minutes, after which the membrane shall be pressed into place. Trim for drain shall be exactly the size of drain opening. Bolt holes shall be pierced to accommodate bolts with a tight fit. Adhesive shall be used between pan and subdrain. Clamping ring shall be bolted firmly. A small amount of gravel or porous

materials shall be placed at weepholes so that holes remain clear when setting bed is poured. Membrane shall be solvent welded with PVC solvent cement. Surfaces to be solvent welded shall be clean (free of grease and grime). Sheets shall be laid on a flat surface with an overlap of about 2 inches. Top edge shall be folded back and surface primed with a PVC primer. PVC cement shall be applied and surfaces immediately placed together, while still wet. Joint shall be lightly rolled with a paint roller, then as the joint sets shall be rolled firmly but not so hard as to distort the material. In long lengths, about 2 or 3 feet at a time shall be welded. On wood subflooring, two layers of 15 pound felt shall be installed prior to installation of shower pan to ensure a smooth surface installation.

3.4 VIBRATION-ABSORBING FEATURES

Mechanical equipment, , shall be isolated from the building structure by approved vibration-absorbing features, unless otherwise shown. Each foundation shall include an adequate number of standard isolation units. Each unit shall consist of machine and floor or foundation fastening, together with intermediate isolation material, and shall be a standard product with printed load rating. Piping connected to mechanical equipment shall be provided with flexible connectors. Isolation unit installation shall limit vibration to 25 percent of the lowest equipment rpm.

3.5 WATER METER REMOTE READOUT REGISTER

The remote readout register shall be mounted at the location indicated or as directed by the Contracting Officer.

3.6 IDENTIFICATION SYSTEMS

3.6.1 Identification Tags

Identification tags made of brass, engraved laminated plastic, or engraved anodized aluminum, indicating service and valve number shall be installed on valves, except those valves installed on supplies at plumbing fixtures. Tags shall be 1-3/8 inch minimum diameter, and marking shall be stamped or engraved. Indentations shall be black, for reading clarity. Tags shall be attached to valves with No. 12 AWG, copper wire, chrome-plated beaded chain, or plastic straps designed for that purpose.

3.7 ESCUTCHEONS

Escutcheons shall be provided at finished surfaces where bare or insulated piping, exposed to view, passes through floors, walls, or ceilings, except in boiler, utility, or equipment rooms. Escutcheons shall be fastened securely to pipe or pipe covering and shall be satin-finish, corrosion-resisting steel, polished chromium-plated zinc alloy, or polished chromium-plated copper alloy. Escutcheons shall be either one-piece or split-pattern, held in place by internal spring tension or setscrew.

3.8 PAINTING

Painting of pipes, hangers, supports, and other iron work, either in concealed spaces or exposed spaces, is specified in Section 09 90 00 PAINTS AND COATINGS.

3.8.1 PAINTING OF NEW EQUIPMENT

New equipment painting shall be factory applied or shop applied, and shall be as specified herein, and provided under each individual section.

3.8.1.1 Factory Painting Systems

Manufacturer's standard factory painting systems may be provided subject to certification that the factory painting system applied will withstand 125 hours in a salt-spray fog test, except that equipment located outdoors shall withstand 500 hours in a salt-spray fog test. Salt-spray fog test shall be in accordance with [ASTM B117](#), and for that test the acceptance criteria shall be as follows: immediately after completion of the test, the paint shall show no signs of blistering, wrinkling, or cracking, and no loss of adhesion; and the specimen shall show no signs of rust creepage beyond [0.125 inch](#) on either side of the scratch mark.

The film thickness of the factory painting system applied on the equipment shall not be less than the film thickness used on the test specimen. If manufacturer's standard factory painting system is being proposed for use on surfaces subject to temperatures above [120 degrees F](#), the factory painting system shall be designed for the temperature service.

3.8.1.2 Shop Painting Systems for Metal Surfaces

Clean, pretreat, prime and paint metal surfaces; except aluminum surfaces need not be painted. Apply coatings to clean dry surfaces. Clean the surfaces to remove dust, dirt, rust, oil and grease by wire brushing and solvent degreasing prior to application of paint, except metal surfaces subject to temperatures in excess of [120 degrees F](#) shall be cleaned to bare metal.

Where more than one coat of paint is specified, apply the second coat after the preceding coat is thoroughly dry. Lightly sand damaged painting and retouch before applying the succeeding coat. Color of finish coat shall be aluminum or light gray.

- a. [Temperatures Less Than 120 Degrees F](#): Immediately after cleaning, the metal surfaces subject to temperatures less than [120 degrees F](#) shall receive one coat of pretreatment primer applied to a minimum dry film thickness of [0.3 mil](#), one coat of primer applied to a minimum dry film thickness of [one mil](#); and two coats of enamel applied to a minimum dry film thickness of [one mil per coat](#).
- b. [Temperatures Between 120 and 400 Degrees F](#): Metal surfaces subject to temperatures between [120 and 400 degrees F](#) shall receive two coats of [400 degrees F](#) heat-resisting enamel applied to a total minimum thickness of [2 mils](#).
- c. [Temperatures Greater Than 400 Degrees F](#): Metal surfaces subject to temperatures greater than [400 degrees F](#) shall receive two coats of [600 degrees F](#) heat-resisting paint applied to a total minimum dry film thickness of [2 mils](#).

3.9 TESTS, FLUSHING AND DISINFECTION

3.9.1 Plumbing System

The following tests shall be performed on the plumbing system in accordance

with , except that the drainage and vent system final test shall include the smoke test. The Contractor has the option to perform a peppermint test in lieu of the smoke test. If a peppermint test is chosen, the Contractor must submit a testing procedure to the Contracting Officer for approval.

- a. Drainage and Vent Systems Test. The final test shall include a smoke test.
- b. Building Sewers Tests.
- c. Water Supply Systems Tests. (Pressure tests shall use water - do not use air pressure)

3.9.1.1 Test of Backflow Prevention Assemblies

Backflow prevention assembly shall be tested using gauges specifically designed for the testing of backflow prevention assemblies. Gauges shall be tested annually for accuracy in accordance with the University of Southern California's Foundation of Cross Connection Control and Hydraulic Research or the American Water Works Association Manual of Cross Connection (Manual M-14). Report form for each assembly shall include, as a minimum, the following:

Data on Device	Data on Testing Firm
Type of Assembly	Name
Manufacturer	Address
Model Number	Certified Tester
Serial Number	Certified Tester No.
Size	Date of Test
Location	
Test Pressure Readings	Serial Number and Test Data of
Gauges	

If the unit fails to meet specified requirements, the unit shall be repaired and retested.

3.9.1.2 Unfired Pressure Vessel

All unfired vessels such as air receivers greater than 5 cubic feet (37 gallons) in volume or greater than 250 psig shall be hydrostatically and operationally tested on site in accordance with ASME National Board of Boiler and Pressure Vessel Inspectors Code and NAVFAC MO0324 Inspection and Certification of Boilers and Unfired Pressure Vessels. Hydrastatic and operational test to be witnessed by OICC representative and Camp Lejeune Boiler Inspector. Hydrostatic pressure test shall be at 1.5 times the M.A.W.P. for ASME Div I vessels and 1.25 times the M.A.W.P. for ASME Div II vessels.

3.9.1.3 Shower Pans

After installation of the pan and finished floor, the drain shall be temporarily plugged below the weep holes. The floor area shall be flooded with water to a minimum depth of 1 inch for a period of 24 hours. Any drop in the water level during test, except for evaporation, will be reason for rejection, repair, and retest.

3.9.2 Defective Work

If inspection or test shows defects, such defective work or material shall

be replaced or repaired as necessary and inspection and tests shall be repeated. Repairs to piping shall be made with new materials. Caulking of screwed joints or holes will not be acceptable.

3.9.3 System Flushing

3.9.3.1 During Flushing

Before operational tests or disinfection, potable water piping system shall be flushed with hot potable water. Sufficient water shall be used to produce a water velocity that is capable of entraining and removing debris in all portions of the piping system. This requires simultaneous operation of all fixtures on a common branch or main in order to produce a flushing velocity of approximately 4 fps through all portions of the piping system. In the event that this is impossible due to size of system, the Contracting Officer (or the designated representative) shall specify the number of fixtures to be operated during flushing. Contractor shall provide adequate personnel to monitor the flushing operation and to ensure that drain lines are unobstructed in order to prevent flooding of the facility. Contractor shall be responsible for any flood damage resulting from flushing of the system. Flushing shall be continued until entrained dirt and other foreign materials have been removed and until discharge water shows no discoloration.

3.9.3.2 After Flushing

System shall be drained at low points. Strainer screens shall be removed, cleaned, and replaced. After flushing and cleaning, systems shall be prepared for testing by immediately filling water piping with clean, fresh potable water. Any stoppage, discoloration, or other damage to the finish, furnishings, or parts of the building due to the Contractor's failure to properly clean the piping system shall be repaired by the Contractor. When the system flushing is complete, the hot-water system shall be adjusted for uniform circulation. Flushing devices and automatic control systems shall be adjusted for proper operation according to manufacturer's instructions. Comply with ASHRAE 90.1 - IP for minimum efficiency requirements.

3.9.4 Operational Test

Upon completion of flushing and prior to disinfection procedures, the Contractor shall subject the plumbing system to operating tests to demonstrate satisfactory installation, connections, adjustments, and functional and operational efficiency. Such operating tests shall cover a period of not less than 8 hours for each system and shall include the following information in a report with conclusion as to the adequacy of the system:

- a. Time, date, and duration of test.
- b. Water pressures at the most remote and the highest fixtures.
- c. Operation of each fixture and fixture trim.
- d. Operation of each valve, hydrant, and faucet.
- e. Pump suction and discharge pressures.
- f. Temperature of each domestic hot-water supply.

- g. Operation of each floor and roof drain by flooding with water.
- h. Operation of each vacuum breaker and backflow preventer.
- i. Complete operation of each water pressure booster system, including pump start pressure and stop pressure.

3.9.5 Disinfection

After operational tests are complete, the entire domestic hot- and cold-water distribution system shall be disinfected. System shall be flushed as specified, before introducing chlorinating material. The chlorinating material shall be hypochlorites or liquid chlorine. Except as herein specified, water chlorination procedure shall be in accordance with AWWA C651 and AWWA C652. The chlorinating material shall be fed into the water piping system at a constant rate at a concentration of at least 50 parts per million (ppm). A properly adjusted hypochlorite solution injected into the main with a hypochlorinator, or liquid chlorine injected into the main through a solution-feed chlorinator, shall be used. If after the 24 hour and 6 hour holding periods, the residual solution contains less than 25 ppm and 50 ppm chlorine respectively, flush the piping and tank with potable water, and repeat the above procedures until the required residual chlorine levels are satisfied. The system including the tanks shall then be flushed with clean water until the residual chlorine level is reduced to less than one part per million. During the flushing period each valve and faucet shall be opened and closed several times. Samples of water in disinfected containers shall be obtained from several locations selected by the Contracting Officer. The samples of water shall be tested for total coliform organisms (coliform bacteria, fecal coliform, streptococcal, and other bacteria) in accordance with AWWA 10084. The testing method used shall be either the multiple-tube fermentation technique or the membrane-filter technique. Disinfection shall be repeated until tests indicate the absence of coliform organisms (zero mean coliform density per 100 milliliters) in the samples for at least 2 full days. The system will not be accepted until satisfactory bacteriological results have been obtained.

3.10 WASTE MANAGEMENT

Place materials defined as hazardous or toxic waste in designated containers. Return solvent and oil soaked rags for contaminant recovery and laundering or for proper disposal. Close and seal tightly partly used sealant and adhesive containers and store in protected, well-ventilated, fire-safe area at moderate temperature. Place used sealant and adhesive tubes and containers in areas designated for hazardous waste. Separate copper and ferrous pipe waste in accordance with the Waste Management Plan and place in designated areas for reuse.

3.11 POSTED INSTRUCTIONS

Framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, shall be posted where directed. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system shall be prepared in typed form, framed as specified above for the wiring and control diagrams and posted beside the diagrams. The framed instructions shall be posted before acceptance testing of the systems.

3.12 PERFORMANCE OF WATER HEATING EQUIPMENT

Standard rating condition terms are as follows:

EF = Energy factor, overall efficiency.

ET = Thermal efficiency with 70 degrees F delta T.

EC = Combustion efficiency, 100 percent - flue loss when smoke = 0 (trace is permitted).

SL = Standby loss in W/sq. ft. based on 80 degrees F delta T, or in percent per hour based on nominal 90 degrees F delta T.

HL = Heat loss of tank surface area.

V = Storage volume in liters

3.12.1 Storage Water Heaters

3.12.1.1 Electric

- a. Storage capacity of 120 gallons or less, and input rating of 12 kW or less: minimum energy factor (EF) shall be 0.95-0.00132V per 10 CFR 430.
- b. Storage capacity of more than 120 gallons or input rating more than 12 kW: maximum SL shall be 1.9 W/sq. ft. per ASHRAE 90.1 - IP, Addenda B.

3.13 TABLES

TABLE I
 PIPE AND FITTING MATERIALS FOR
 DRAINAGE, WASTE, AND VENT PIPING SYSTEMS

Item #	Pipe and Fitting Materials	SERVICE					
		A	B	C	D	E	F
1	Cast iron soil pipe and fittings, hub and spigot, ASTM A74 with compression gaskets. Pipe and fittings shall be marked with the CISPI trademark.	X	X	X	X	X	
2	Cast iron soil pipe and fittings hubless, CISPI 301 and ASTM A888. Pipe and fittings shall be marked with the CISPI trademark.		X	X	X	X	
3	Cast iron drainage fittings, threaded, ASME B16.12 for use with Item 10	X		X	X		
4	Cast iron screwed fittings (threaded)				X	X	

TABLE I
 PIPE AND FITTING MATERIALS FOR
 DRAINAGE, WASTE, AND VENT PIPING SYSTEMS

Item #	Pipe and Fitting Materials	SERVICE					
		A	B	C	D	E	F
	ASME B16.4 for use with Item 10						
5	Malleable-iron threaded fittings, galvanized ASME B16.3 for use with Item 10				X	X	
6	Steel pipe, seamless galvanized, ASTM A53/A53M, Type S, Grade B	X			X	X	
7	Bronzed flanged fittings, ASME B16.24 for use with Items 11 and 14				X	X	
8	Cast copper alloy solder joint pressure fittings, ASME B16.18 for use with Item 14				X	X	
9	Seamless copper pipe, ASTM B42				X		
10	Cast bronze threaded fittings, ASME B16.15				X	X	
11	Wrought copper and wrought alloy solder-joint drainage fittings. ASME B16.29	X	X	X	X	X	
12	Cast copper alloy solder joint drainage fittings, DWV, ASME B16.23	X	X	X	X	X	
13	Polyvinyl Chloride plastic drain, waste and vent pipe and fittings, ASTM D2665,	X	X	X	X	X	X
14	High-silicon content cast iron pipe and fittings (hub and spigot, and mechanical joint), ASTM A518/A518M		X			X	X

SERVICE:

- A - Underground Building Soil, Waste and Storm Drain
- B - Aboveground Soil, Waste, Drain In Buildings
- C - Underground Vent
- D - Aboveground Vent
- E - Interior Rainwater Conductors Aboveground
- F - Corrosive Waste And Vent Above And Belowground
- * - Hard Temper

TABLE II
 PIPE AND FITTING MATERIALS FOR PRESSURE PIPING SYSTEMS

Item No.	Pipe and Fitting Materials	SERVICE			
		A	B	C	D
1	Malleable-iron threaded fittings, a. Galvanized, ASME B16.3 for use with Item 4a	X	X	X	X
	b. Same as "a" but not galvanized for use with Item 4b			X	
2	Steel pipe: a. Seamless, galvanized, ASTM A53/A53M, Type S, Grade B	X	X	X	X
	b. Seamless, black, ASTM A53/A53M, Type S, Grade B			X	
3	Bronze flanged fittings, ASME B16.24 for use with Items 5 and 7	X	X		X
4	Seamless copper pipe, ASTM B42	X	X		X
5	Seamless copper water tube, ASTM B88	X**	X**	X**	X***
6	Cast bronze threaded fittings, ASME B16.15 for use with Items 5 and 7	X	X		X
7	Wrought copper and bronze solder-joint pressure fittings, ASME B16.22 for use with Items 5, 7 and 8	X	X	X	X
8	Cast copper alloy solder-joint pressure fittings, ASME B16.18 for use with Item 8	X	X	X	X
9	Fittings: brass or bronze; ASME B16.15, and ASME B16.18 ASTM B828	X	X		
10	Carbon steel pipe unions, socket-welding and threaded, MSS SP-83			X	
11	Malleable-iron threaded pipe unions ASME B16.39			X	

TABLE II
 PIPE AND FITTING MATERIALS FOR PRESSURE PIPING SYSTEMS

Item No.	Pipe and Fitting Materials	SERVICE			
		A	B	C	D
12	Nipples, pipe threaded ASTM A733			X	
13	Crosslinked Polyethylene (PEX) Plastic Pipe ASTM F877.	X*			X*
14	Press Fittings	X	X		

A - Cold Water Service Aboveground
 B - Hot and Cold Water Distribution 180 degrees F Maximum Aboveground
 C - Compressed Air Lubricated
 D - Cold Water Service Belowground

Indicated types are minimum wall thicknesses.

* - PEX shall only be used where called for on the drawings

** - Type L - Hard

*** - Type K - Hard temper with brazed joints only or type K-soft temper without joints in or under floors

**** - In or under slab floors only brazed joints

TABLE III
 STANDARD RATING CONDITIONS AND MINIMUM PERFORMANCE RATINGS FOR WATER HEATING EQUIPMENT

A. STORAGE WATER HEATERS

FUEL	STORAGE CAPACITY GALLONS	INPUT RATING	TEST PROCEDURE	REQUIRED PERFORMANCE
Elect.	120 max.	12 kW max.	10 CFR 430	EF = 0.95-0.00132V minimum
Elect.	120 min. OR	12 kW min.	ASHRAE 90.1 - IP (Addenda B)	SL = 1.9 W/sq. ft. maximum
Gas	100 max.	75,000 Btu/h max.	10 CFR 430	EF = 0.62 -0.0019V minimum
Gas	100 min. OR	75,000 Btu/h	ANSI Z21.10.3/CSA 4.3	ET = 80 percent; SL = 1.3+38/V max.
Oil	50 max.	105,000 Btu/h	10 CFR 430	EF = 0.80-0.0019V minimum
Oil	51 min. OR	105,000 Btu/h	10 CFR 430	EC = 83 percent; SL = 1.3+38/V maximum

TABLE III
 STANDARD RATING CONDITIONS AND MINIMUM PERFORMANCE RATINGS FOR WATER HEATING
 EQUIPMENT

A. STORAGE WATER HEATERS

FUEL	STORAGE CAPACITY GALLONS	INPUT RATING	TEST PROCEDURE	REQUIRED PERFORMANCE
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B. Unfired Hot Water Storage, instantaneous water heater, and pool heater.

Volumes and inputs: maximum HL shall be 6.5 Btu/h/sq. ft.

C. Instantaneous Water Heater

Gas	All	All	ANSI Z21.10.3/CSA 4.3	ET = 80 percent
Oil	All	All	ANSI Z21.10.3/CSA 4.3	EC = 83 percent

D. Pool Heater

Gas or 78 percent Oil	All	All	ANSI Z21.56-2017/CSA 4.7-2017	ET =
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TERMS:

- EF = Energy factor, overall efficiency.
- ET = Thermal efficiency with 70 degrees F delta T.
- EC = Combustion efficiency, 100 percent - flue loss when smoke = 0 (trace is permitted).
- SL = Standby loss in W/sq. ft. based on 80 degrees F delta T, or in percent per hour based on nominal 90 degrees F delta T.
- HL = Heat loss of tank surface area
- V = Storage volume in gallons

-- End of Section --

SECTION 23 03 00.00 20

BASIC MECHANICAL MATERIALS AND METHODS

07/21

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 B117 (2019) Standard Practice for Operating Salt Spray (Fog) Apparatus

INTERNATIONAL CODE COUNCIL (ICC)

ICC IFGC (2021) International Fuel Gas Code

ICC IMC (2021) International Mechanical Code

ICC IPC (2021) International Plumbing Code

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1 (2018) Motors and Generators

NEMA MG 10 (2017) Energy Management Guide for Selection and Use of Fixed Frequency Medium AC Squirrel-Cage Polyphase Induction Motors

NEMA MG 11 (1977; R 2012) Energy Management Guide for Selection and Use of Single Phase Motors

1.2 SUBMITTALS

Government approval is required for all submittals.

1.3 RELATED REQUIREMENTS

This section applies to all sections of Divisions: 21, FIRE SUPPRESSION; 22, PLUMBING; and 23, HEATING, VENTILATING, AND AIR CONDITIONING of this project specification, unless specified otherwise in the individual section.

1.4 QUALITY ASSURANCE

1.4.1 Material and Equipment Qualifications

Provide materials and equipment that are standard products of manufacturers regularly engaged in the manufacture of such products, which are of a similar material, design and workmanship. Standard products must have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use must include applications of equipment and materials under similar circumstances and of similar size. The product

must have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2 year period.

1.4.2 Alternative Qualifications

Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.

1.4.3 Service Support

The equipment items must be supported by service organizations. Submit a certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. These service organizations must be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.4.4 Manufacturer's Nameplate

For each item of equipment, provide a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.4.5 Modification of References

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "must" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction", or words of similar meaning, to mean the Contracting Officer.

1.4.5.1 Definitions

For the International Code Council (ICC) Codes referenced in the contract documents, advisory provisions must be considered mandatory, the word "should" is interpreted as "must." Reference to the "code official" must be interpreted to mean the "Contracting Officer." For Navy owned property, references to the "owner" must be interpreted to mean the "Contracting Officer." For leased facilities, references to the "owner" must be interpreted to mean the "lessor." References to the "permit holder" must be interpreted to mean the "Contractor."

1.4.5.2 Administrative Interpretations

For ICC Codes referenced in the contract documents, the provisions of Chapter 1, "Administrator," do not apply. These administrative requirements are covered by the applicable Federal Acquisition Regulations (FAR) included in this contract and by the authority granted to the Officer in Charge of Construction to administer the construction of this project. References in the ICC Codes to sections of Chapter 1, must be applied appropriately by the Contracting Officer as authorized by his administrative cognizance and the FAR.

1.5 DELIVERY, STORAGE, AND HANDLING

Handle, store, and protect equipment and materials to prevent damage before

and during installation in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.

1.6 ELECTRICAL REQUIREMENTS

Furnish motors, controllers, disconnects and contactors with their respective pieces of equipment. Motors, controllers, disconnects and contactors must conform to and have electrical connections provided under Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Furnish internal wiring for components of packaged equipment as an integral part of the equipment. Controllers and contactors shall have a maximum of 120 volt control circuits, and must have auxiliary contacts for use with the controls furnished. When motors and equipment furnished are larger than sizes indicated, the cost of additional electrical service and related work must be included under the section that specified that motor or equipment. Power wiring and conduit for field installed equipment must be provided under and conform to the requirements of Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

1.6.1 Motor Voltage

Provide motors rated for the voltage supplied. Motors shall be suitable for use at 90% to 110% of the nominal voltage and shall have a service factor of at least 1.1 at that nominal voltage.

1.6.2 Single Phase Motor Efficiency

Unless otherwise specified, single-phase fractional-horsepower alternating-current motors must be high efficiency types corresponding to the applications listed in NEMA MG 11.

1.6.3 Poly Phase Motor Efficiency

Unless other specified polyphase squirrel-cage induction motors must be premium efficiency with continuous ratings that meet or exceed energy efficient ratings in accordance with Table 12-12 of NEMA MG 1 and corresponding to the applications listed in NEMA MG 10

1.6.4 Three-Phase Motor Protection

Provide controllers for motors rated three horsepower and larger with electronic phase-voltage monitors designed to protect motors from phase-loss, undervoltage, and overvoltage. Provide protection for motors from immediate restart by a time adjustable restart relay.

1.7 INSTRUCTION TO GOVERNMENT PERSONNEL

When specified in other sections, furnish the services of competent instructors to give full instruction to the designated Government personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the specified equipment or system. Instructors must be thoroughly familiar with all parts of the installation and must be trained in operating theory as well as practical operation and maintenance work.

Instruction must 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 must be as specified in the individual section. When more than 4 man-days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for instruction with the equipment or system.

When significant changes or modifications in the equipment or system are made under the terms of the contract, provide additional instruction to acquaint the operating personnel with the changes or modifications.

1.8 ACCESSIBILITY

Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install concealed valves, expansion joints, controls, dampers, and equipment requiring access, in locations freely accessible through access doors.

1.9 EQUIPMENT INVENTORY UPDATE

Submit information for each piece of equipment removed and supplied for use of Camp Lejeune to update the Maximo equipment inventory. For the purposes of this paragraph, inventoried equipment is defined as equipment listed on the Maximo Equipment Inventory Update form.

1.9.1 Requirements

The contractor shall prepare and submit one Maximo Equipment Inventory Update form for each individual item of inventoried equipment that is demolished, removed, replaced, or installed. (ex: three new condensing units would require the submission of three Equipment Inventory Update forms. The replacement of two existing air handling units with two new air handling units would require the submission of two Equipment Inventory Update forms). The contractor shall prepare and submit a VAV/TAB Room Number List for each VAV/Tab model installed in a single building. Only one Maximo Equipment Inventory Update form is required for each model of VAV or TAB in a single building.

1.9.1.1 Demolition of all equipment in a structure or facility

When all the inventoried equipment in a building or structure is demolished or removed, and not replaced, an Equipment Inventory Update form is not required.

1.9.2 Standards

The contractor shall provide accurate, complete, and legible information on all required forms. All required forms shall be completed and delivered to the Contracting Officer on or before the Beneficial Occupancy Date. All information on Equipment Inventory Update forms shall be obtained by visual inspection of equipment data plate(s).

1.9.3 Form Preparation

Each required Maximo Equipment Inventory Update form shall contain the following information:

(1) The name and telephone number of an individual who can be contacted for clarification or additional information pertaining to the data on the form.

- (2) The date of data collection
- (3) The building or structure identification number and the specific location of the equipment within the structure (ex: 3d deck mech room)
- (4) A check adjacent to the description of the new or replacement item, and a check adjacent to the supplemental description if applicable (ex: circulating pump and HVAC or steam)
- (5) The Maximo number or serial number of the demolished or removed item, if applicable
- (6) All applicable data from the equipment data plate

Each Room Number List form shall contain the following information:

- (1) The name and telephone number of the individual providing the information
- (2) The date the form was completed
- (3) The building or structure identification number
- (4) A check in the box adjacent to each applicable room number

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 Manufacturer's Recommendations

All material and equipment shall be installed in accordance with the manufacturer's recommendations for the intended purpose. Use the more stringent methods when manufacturer's recommendations, and plan & specification requirements differ. The contractor shall notify the government of any conflicts between manufacturer's recommendations and plans & specification requirements.

3.2 International Construction Codes

All material, equipment and installation shall be in accordance with the ICC IFGC, ICC IPC, and ICC IMC unless noted otherwise on the drawings and/or specifications. The contractor shall notify the government of any conflicts between ICC code requirements and contract requirements.

3.3 PAINTING OF NEW EQUIPMENT

New equipment painting must be factory applied or shop applied, and must be as specified herein, and provided under each individual section.

3.3.1 Factory Painting Systems

Manufacturer's standard factory painting systems may be provided subject to certification that the factory painting system applied will withstand 125 hours in a salt-spray fog test, except that equipment located outdoors must withstand 500 hours in a salt-spray fog test. Salt-spray fog test must be

in accordance with ASTM B117, and for that test the acceptance criteria must be as follows: immediately after completion of the test, the paint must show no signs of blistering, wrinkling, or cracking, and no loss of adhesion; and the specimen must show no signs of rust creepage beyond 0.125 inch on either side of the scratch mark.

The film thickness of the factory painting system applied on the equipment must not be less than the film thickness used on the test specimen. If manufacturer's standard factory painting system is being proposed for use on surfaces subject to temperatures above 120 degrees F, the factory painting system must be designed for the temperature service.

3.3.2 Shop Painting Systems for Metal Surfaces

Clean, pretreat, prime and paint metal surfaces; except aluminum surfaces need not be painted. Apply coatings to clean dry surfaces. Clean the surfaces to remove dust, dirt, rust, oil and grease by wire brushing and solvent degreasing prior to application of paint, except metal surfaces subject to temperatures in excess of 120 degrees F must be cleaned to bare metal.

Where more than one coat of paint is specified, apply the second coat after the preceding coat is thoroughly dry. Lightly sand damaged painting and retouch before applying the succeeding coat. Color of finish coat must be aluminum or light gray.

- a. Temperatures Less Than 120 Degrees F: Immediately after cleaning, the metal surfaces subject to temperatures less than 120 degrees F must receive one coat of pretreatment primer applied to a minimum dry film thickness of 0.3 mil, one coat of primer applied to a minimum dry film thickness of 1 mil; and two coats of enamel applied to a minimum dry film thickness of 1 mil per coat.
- b. Temperatures Between 120 and 400 Degrees F: Metal surfaces subject to temperatures between 120 and 400 degrees F must receive two coats of 400 degrees F heat-resisting enamel applied to a total minimum

thickness of 2 mils.

- c. Temperatures Greater Than 400 Degrees F: Metal surfaces subject to temperatures greater than 400 degrees F must receive two coats of 600 degrees F heat-resisting paint applied to a total minimum dry film thickness of 2 mils.

MAXIMO EQUIPMENT INVENTORY UPDATE

Employee: _____ Phone: _____ Date: ____/____/____

Bldg: _____ Specific Location: _____

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

Demolished/Removed Equipment

Maximo no: _____ or Ser no: _____

New Equipment

Manufacturer: _____

Model no: _____

Ser no: _____

Type: __Elec __Oil __LP Gas __Nat Gas __Steam __Water __Air

Motor Data: HP____ Volts____ Phase____ RLA____ RPM____ Frame____

Tons____ No. of Motors____ no. of Belts____ Belt size(s)____ CFM____

KW____ Refrig type____ Refrig Qty____ Filter Size(s)____

-- End of Section --

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

07/21

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 MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC. (AMCA)

AMCA 203 (1990; R 2011) Field Performance
Measurements of Fan Systems

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

ASHRAE 62.1 (2010) Ventilation for Acceptable Indoor
Air Quality

ASSOCIATED AIR BALANCE COUNCIL (AABC)

AABC MN-1 (2002; 6th ed) National Standards for
Total System Balance

AABC MN-4 (1996) Test and Balance Procedures

NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)

NEBB MASV (2006) Procedural Standards for
Measurements and Assessment of Sound and
Vibration

NEBB PROCEDURAL STANDARDS (2015) Procedural Standards for TAB
(Testing, Adjusting and Balancing)
Environmental Systems

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

SMACNA 1972 CD (2012) HVAC Air Duct Leakage Test Manual -
2nd Edition

SMACNA 1780 (2002) HVAC Systems - Testing, Adjusting
and Balancing, 3rd Edition

SMACNA 1858 (2004) HVAC Sound And Vibration Manual -
First Edition

1.2 DEFINITIONS

- a. AABC: Associated Air Balance Council.

- b. COTR: Contracting Officer's Technical Representative.
- c. DALT: Duct air leakage test
- d. DALT'd: Duct air leakage tested
- e. HVAC: Heating, ventilating, and air conditioning; or heating, ventilating, and cooling.
- f. NEBB: National Environmental Balancing Bureau
- g. Out-of-tolerance data: Pertains only to field acceptance testing of Final DALT or TAB report. When applied to DALT work, this phase means "a leakage rate measured during DALT field acceptance testing which exceeds the leakage rate allowed by Appendix C REQUIREMENTS FOR DUCT AIR LEAK TESTING." When applied to TAB work this phase means "a measurement taken during TAB field acceptance testing which does not fall within the range of plus 5 to minus 5 percent of the design for a specific parameter."
- h. Season of maximum heating load: The time of year when the outdoor temperature at the project site remains below 45 degrees Fahrenheit, throughout the period of TAB data recording.
- i. Season of maximum cooling load: The time of year when the outdoor temperature at the project site remains above 85 degrees Fahrenheit dry bulb and 76 degrees Fahrenheit wet bulb of the project site's summer outdoor design temperature, throughout the period of TAB data recording. The season of maximum cooling load shall fall within June, July, August, or September.
- j. Season 1, Season 2: Depending upon when the project HVAC is completed and ready for TAB, Season 1 is defined, thereby defining Season 2. Season 1 could be the season of maximum heating load, or the season of maximum cooling load.
- k. Sound measurements terminology: Defined in AABC MN-1, NEBB MASV, or SMACNA 1858 (TABB).
- l. TAB: Testing, adjusting, and balancing (of HVAC systems).
- m. TAB'd: HVAC Testing/Adjusting/Balancing procedures performed.
- n. TAB Agency: TAB Firm
- o. TAB team field leader: TAB team field leader
- p. TAB team supervisor: TAB team engineer, TAB specialist.
- q. TAB team technicians: TAB team assistants.
- r. TABB: Testing Adjusting and Balancing Bureau.

1.2.1 Similar Terms

In some instances, terminology differs between the Contract and the TAB Standard primarily because the intent of this Section is to use the industry standards specified, along with additional requirements listed

herein to produce optimal results.

The following table of similar terms is provided for clarification only. Contract requirements take precedent over the corresponding AABC, NEBB, or TABB requirements where differences exist.

SIMILAR TERMS			
Contract Term	AABC Term	NEBB Term	TABB Term
TAB Standard	National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems	Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems	International Standards for Environmental Systems Balance
TAB Specialist	TAB Engineer	TAB Supervisor	TAB Supervisor
Systems Readiness Check	Construction Phase Inspection	Field Readiness Check & Preliminary Field Procedures	Field Readiness Check & Prelim. Field Procedures

1.3 WORK DESCRIPTION

The work includes duct air leakage testing (DALT) and testing, adjusting, and balancing (TAB) of new heating, ventilating, and cooling (HVAC) air distribution systems including equipment and performance data, ducts, and piping which are located within, on, under, between, and adjacent to buildings, including records of existing conditions.

Perform TAB in accordance with the requirements of the TAB procedural standard recommended by the TAB trade association that approved the TAB Firm's qualifications. Comply with requirements of AABC MN-1, NEBB PROCEDURAL STANDARDS, or SMACNA 1780 (TABB) as supplemented and modified by this specification section. All recommendations and suggested practices contained in the TAB procedural standards are considered mandatory.

Conduct DALT and TAB of the indicated existing systems and equipment and submit the specified DALT and TAB reports for approval. Conduct DALT testing in compliance with the requirements specified in SMACNA 1972 CD, except as supplemented and modified by this section. Conduct DALT and TAB work in accordance with the requirements of this section.

1.3.1 Air Distribution Systems

Test, adjust, and balance system (TAB) in compliance with this section. Obtain Contracting Officer's written approval before applying insulation to exterior of air distribution systems as specified under Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

1.3.2 TAB SCHEMATIC DRAWINGS

Show the following information on TAB Schematic Drawings:

1. A unique number or mark for each piece of equipment or terminal.
2. Air quantities at air terminals.
3. Air quantities and temperatures in air handling unit schedules.
4. Water quantities and temperatures in thermal energy transfer equipment schedules.
5. Water quantities and heads in pump schedules.
6. Water flow measurement fittings and balancing fittings.
7. Ductwork Construction and Leakage Testing Table that defines the DALT test requirements, including each applicable HVAC duct system ID or mark, duct pressure class, duct seal class, and duct leakage test pressure. This table is included in the file for Graphics for Unified Facilities Guide Specifications:

<http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/forms-graph>

The Testing, Adjusting, and Balancing (TAB) Specialist must review the Contract Plans and Specifications and advise the Contracting Officer of any deficiencies that would prevent the effective and accurate TAB of the system, including records of existing conditions, and systems readiness check. The TAB Specialist must provide a Design Review Report individually listing each deficiency and the corresponding proposed corrective action necessary for proper system operation.

Submit one copy of the TAB Schematic Drawings and Report Forms to the Contracting Officer, no later than 21 days prior to the start of TAB field measurements.

1.3.3 Related Requirements

Section 23 73 33 HEATING, VENTILATING, AND COOLING SYSTEM applies to work specified in this section.

Specific requirements relating to Reliability Centered Maintenance (RCM) principals and Predictive Testing and Inspection (PTI), by the construction contractor to detect latent manufacturing and installation defects must be followed as part of the Contractor's Quality Control program. Refer to the paragraph titled "Sustainability" for detailed requirements.

Requirements for price breakdown of HVAC TAB work are specified in Section 01 20 00 PRICE AND PAYMENT PROCEDURES.

Requirements for construction scheduling related to HVAC TAB work are specified in Section 01 32 17 NETWORK ANALYSIS SCHEDULES (NAS).

1.4 SUBMITTALS

All submitted documentation must be typed, neat and organized unless otherwise noted. All reports must have a waterproof front and back cover, a title page, a certification page, sequentially numbered pages throughout, and a table of contents. Tables, lists, and diagrams must be titled.

Generate and submit for approval the following documentation:

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

ROICC, Jacksonville, North Carolina Area, 1005 Michael Road, Camp Lejeune, NC 28542-2521

SD-01 Preconstruction Submittals

Records Of Existing Conditions

Independent TAB Agency and Personnel Qualifications

TAB Design Review Report

Pre-Field TAB Engineering Report

DALT and TAB Work Execution Schedule

SD-02 Shop Drawings

TAB Schematic Drawings and Report Forms;

SD-03 Product Data

Equipment and Performance Data;

Tab Verification

SD-06 Test Reports

Pre-Final TAB Report for Proportional Balancing

Final TAB Report for Proportional Balancing;G

Advance Notice Of Final Dalt Field Work

SD-07 Certificates

Independent TAB agency and personnel qualifications;

1.4.1 Pre-Field TAB Engineering Report

Submit report containing the following information:

a. Step-by-step TAB procedure:

- (1) Strategy: Describe the method of approach to the TAB field work from start to finish. Include in this description a complete methodology for accomplishing each seasonal TAB field work session.
- (2) Air System Diagrams: Use the contract drawings and duct fabrication drawings if available to provide air system diagrams in the report showing the location of all terminal outlet supply, return, exhaust and transfer registers, grilles and diffusers. Use a key numbering system on the diagrams which identifies each outlet contained in the outlet airflow report sheets. Show intended locations of all traverses and static pressure readings.

- (3) Procedural steps: Delineate fully the intended procedural steps to be taken by the TAB field team to accomplish the required TAB work of each air distribution system and each water distribution system. Include intended procedural steps for TAB work for subsystems and system components.
- b. Pre-field data: Submit AABC or NEBB or **SMACNA 1780** data report forms with the following pre-field information filled in:
 - (1) Design data obtained from system drawings, specifications, and approved submittals.
 - (2) Notations detailing additional data to be obtained from the contract site by the TAB field team.
 - (3) Designate the actual data to be measured in the TAB field work.
 - (4) Provide a list of the types of instruments, and the measuring range of each, which are anticipated to be used for measuring in the TAB field work. By means of a keying scheme, specify on each TAB data report form submitted, which instruments will be used for measuring each item of TAB data. If the selection of which instrument to use, is to be made in the field, specify from which instruments the choice will be made. Place the instrument key number in the blank space where the measured data would be entered.
 - c. Prerequisite HVAC work checkout list: Provide a list of inspections and work items which are to be completed by the Contractor. This list must be acted upon and completed by the Contractor and then submitted and approved by the Contracting Officer prior to the TAB team coming to the contract site.

At a minimum, a list of the applicable inspections and work items listed in the **NEBB PROCEDURAL STANDARDS**, Section III, "Preliminary TAB Procedures" under paragraphs titled, "Air Distribution System Inspection" and "Hydronic Distribution System Inspection" must be provided for each separate system to be TAB'd.

1.4.2 Work Execution Schedule

Submit a detailed schedule indicating the anticipated calendar date for each submittal and each portion of work required under this section. For each work entry, indicate the support personnel (such as controls provider, HVAC mechanic, etc.) that are needed to accomplish the work. Arrange schedule entries chronologically.

1.4.3 TAB Reports

Submit TAB Report for Proportional Balancing, Season 1, and Season 2 in the following manner:

- a. Procedure Summary: Submit a copy of the approved DALT and TAB Procedures Summary. When applicable, provide notations describing how actual field procedures differed from the procedures listed.
- b. Report format: Submit the completed data forms approved in the pre-field TAB Engineering Report completed by TAB field team, reviewed, approved and signed by the TAB supervisor. Bind the report with a

waterproof front and back cover. Include a table of contents identifying by page number the location of each report. Report forms and report data shall be typewritten for final TAB Report. Handwritten report forms or report data are acceptable for pre-final TAB Report.

- c. Temperatures: On each TAB report form reporting TAB work accomplished on HVAC thermal energy transfer equipment, include the indoor and outdoor dry bulb temperature range and indoor and outdoor wet bulb temperature range within which the TAB data was recorded.
- d. Air System Diagrams: Provided updated diagrams with final installed locations of all terminals and devices, any numbering changes, and actual test locations.
- e. Air Static Pressure Profiles: Report static pressure profiles for air duct systems including: EF1, EF2. Report static pressure data for all supply, return, relief, exhaust and outside air ducts for the systems listed. The static pressure report data shall include, in addition to AABC or NEBB or TABB required data, the following:
 - (1) Report supply fan, return fan, relief fan, and exhaust fan inlet and discharge static pressures.
 - (2) Report static pressure drop across chilled water coils, DX coils, hot water coils, steam coils, electric resistance heating coils and heat reclaim devices installed in unit cabinetry or the system ductwork.
 - (3) Report static pressure drop across outside air, return air, and supply air automatic control dampers, both proportional and two-position, installed in unit cabinetry.
 - (4) Report static pressure drop across air filters, acoustic silencers, moisture eliminators, air flow straighteners, air flow measuring stations or other pressure drop producing specialty items installed in unit cabinetry, or in the system ductwork. Examples of these specialty items are smoke detectors, white sound generators, RF shielding, wave guides, security bars, blast valves, small pipes passing through ductwork, and duct mounted humidifiers.

Do not report static pressure drop across duct fittings provided for the sole purpose of conveying air, such as elbows, transitions, offsets, plenums, manual dampers, and branch takes-offs.

- (5) Report static pressure drop across outside air and relief/exhaust air louvers.
- (6) For air moving systems of 10,000 cfml and larger, report static pressure readings of supply air, return air, exhaust/relief air, and outside air in duct at the point where these ducts connect to each air moving unit and also at the following locations:

Main Duct: Take readings at four locations along the full length of the main duct, 25 percent, 50 percent, 75 percent and 100 percent of the total duct length.

Floor Branch Mains: Take readings at floor branch mains served by a

main duct vertical riser.

Branch Main Ducts: Take readings at branch main ducts.

VAV Terminals: Take readings at inlet static pressure at VAV terminal box primary air branch ducts.

VAV Terminals, Fan Powered: Take readings at fan discharge and inlet static pressures for series and parallel fan powered VAV terminal boxes.

- f. Duct Transverses: Report duct traverses for main supply, return, exhaust, relief and outside air ducts. This shall include all ducts, including those which lack 7 1/2 duct diameters upstream and 2 1/2 duct diameters downstream of straight duct unobstructed by duct fittings/offsets/elbows. The TAB Agency shall evaluate and report findings on the duct traverses taken. Evaluate the suitability of the duct traverse measurement based on satisfying the qualifications for a pitot traverse plane as defined by [AMCA 203](#), "Field Measurements", Section 8, paragraph 8.3, "Location of Traverse Plane".
- g. Instruments: List the types of instruments actually used to measure the tab data. Include in the listing each instrument's unique identification number, calibration date, and calibration expiration date.

Instrumentation, used for taking wet bulb temperature readings shall provide accuracy of plus or minus 5 percent at the measured face velocities. Submit instrument manufacturer's literature to document instrument accuracy performance is in compliance with that specified.

- h. Certification: Include the type name of the TAB supervisor and the dated signature of the TAB supervisor.
- i. Performance Curves: The TAB Supervisor shall include, in the TAB Reports, factory pump curves and fan curves for pumps and fans TAB'd on the job.
- j. Calibration Curves: The TAB Supervisor shall include, in the TAB Reports, a factory calibration curve for installed flow control balancing valves, flow venturi's and flow orifices TAB'd on the job.
- k. Report flow rates through and pressure drops across all contract applicable hydronic components such as: balancing valves, coils, pumps, chillers, condensers, cooling towers, hot water converters, boilers, and flow measuring devices.

1.5 QUALITY ASSURANCE

1.5.1 [Independent TAB Agency and Personnel Qualifications](#)

To secure approval for the proposed agency, submit information certifying that the TAB agency is a first tier subcontractor who is not affiliated with any other company participating in work on this contract, including design, furnishing equipment, construction, or commissioning. Further, submit the following, for the agency, to Contracting Officer for approval:

- a. Independent AABC or NEBB or TABB TAB agency:

TAB agency: AABC registration number and expiration date of current certification; or NEBB certification number and expiration date of current certification; or TABB certification number and expiration date of current certification.

TAB team supervisor: Name and copy of AABC or NEBB or TABB TAB supervisor certificate and expiration date of current certification.

TAB team field leader: Name and documented evidence that the team field leader has satisfactorily performed full-time supervision of TAB work in the field for not less than 3 years immediately preceding this contract's bid opening date.

TAB team field technicians: Names and documented evidence that each field technician has satisfactorily assisted a TAB team field leader in performance of TAB work in the field for not less than one year immediately preceding this contract's bid opening date.

Current certificates: Registrations and certifications are current, and valid for the duration of this contract. Renew Certifications which expire prior to completion of the TAB work, in a timely manner so that there is no lapse in registration or certification. TAB agency or TAB team personnel without a current registration or current certification are not to perform TAB work on this contract.

- b. TAB Team Members: TAB team approved to accomplish work on this contract are full-time employees of the TAB agency. No other personnel is allowed to do TAB work on this contract.
- c. Replacement of TAB team members: Replacement of members may occur if each new member complies with the applicable personnel qualifications and each is approved by the Contracting Officer.

1.5.1.1 TAB Standard

Perform TAB in accordance with the requirements of the standard under which the TAB Firm's qualifications are approved, i.e., AABC MN-1, NEBB PROCEDURAL STANDARDS, or SMACNA 1780 unless otherwise specified herein. All recommendations and suggested practices contained in the TAB Standard are considered mandatory. Use the provisions of the TAB Standard, including checklists, report forms, etc., as nearly as practical, to satisfy the Contract requirements. Use the TAB Standard for all aspects of TAB, including qualifications for the TAB Firm and Specialist and calibration of TAB instruments. Where the instrument manufacturer calibration recommendations are more stringent than those listed in the TAB Standard, adhere to the manufacturer's recommendations.

All quality assurance provisions of the TAB Standard such as performance guarantees are part of this contract. For systems or system components not covered in the TAB Standard, TAB procedures must be developed by the TAB Specialist. Where new procedures, requirements, etc., applicable to the Contract requirements have been published or adopted by the body responsible for the TAB Standard used (AABC, NEBB, or TABB), the requirements and recommendations contained in these procedures and requirements are considered mandatory, including the latest requirements of ASHRAE 62.1.

1.5.1.2 Qualifications

a. Tab Firm

The TAB Firm must be either a member of AABC or certified by the NEBB or the TABB and certified in all categories and functions where measurements or performance are specified on the plans and specifications, including TAB of environmental systems the performance of clean rooms and clean air devices and the measuring of sound and vibration in environmental systems.

Certification must be maintained for the entire duration of duties specified herein. If, for any reason, the firm loses subject certification during this period, the Contractor must immediately notify the Contracting Officer and submit another TAB Firm for approval. Any firm that has been the subject of disciplinary action by either the AABC, the NEBB, or the TABB within the five years preceding Contract Award is not be eligible to perform any duties related to the HVAC systems, including TAB. All work specified in this Section and in other related Sections to be performed by the TAB Firm will be considered invalid if the TAB Firm loses its certification prior to Contract completion and must be performed by an approved successor.

These TAB services are to assist the prime Contractor in performing the quality oversight for which it is responsible. The TAB Firm must be a prime subcontractor of the Contractor and be financially and corporately independent of the mechanical subcontractor, reporting directly to and paid by the Contractor.

b. TAB Specialist

The TAB Specialist must be either a member of AABC, an experienced technician of the Firm certified by the NEBB, or a Supervisor certified by the TABB. The certification must be maintained for the entire duration of duties specified herein. If, for any reason, the Specialist loses subject certification during this period, immediately notify the Contracting Officer and submit another TAB Specialist for approval. Any individual that has been the subject of disciplinary action by either the AABC, the NEBB, or the TABB within the five years preceding Contract Award is not eligible to perform any duties related to the HVAC systems, including TAB. All work specified in this Section and in other related Sections performed by the TAB Specialist will be considered invalid if the TAB Specialist loses its certification prior to Contract completion and must be performed by the approved successor.

c. TAB Related HVAC Submittals

The TAB Specialist must prepare a list of the submittals from the Contract Submittal Register that relate to the successful accomplishment of all HVAC TAB. Accompany the submittals identified on this list with a letter of approval signed and dated by the TAB Specialist when submitted to the Government. Ensure that the location and details of ports, terminals, connections, etc., necessary to perform TAB are identified on the submittals.

1.5.2 Responsibilities

The Contractor is responsible for ensuring compliance with all requirements of this specification section. However, the following delineation of specific work items is provided to facilitate and coordinate execution of the various work efforts by personnel from separate organizations.

1.5.2.1 Contractor

- a. TAB personnel: Ensure that the DALT work and the TAB work is accomplished by a group meeting the requirements specified in paragraph entitled "TAB Personnel Qualification Requirements."
- b. HVAC documentation: Provide pertinent contract documentation to the TAB firm, to include the following: the contract drawings and specifications, copies of the approved submittal data for all HVAC equipment, air distribution devices, and air/water measuring/balancing devices; the construction work schedule; and other applicable documents requested by TAB firm. Provide the TAB Firm copies of contract revisions and modifications as they occur.
- c. Schedules: Ensure the requirements specified under the paragraph "DALT and TAB Schedule" are met.
- d. Pre-DALT and TAB meetings: Arrange and conduct the Pre-DALT and TAB meetings. Ensure that a representative is present for the sheet metal contractor, the mechanical contractor, the electrical contractor, and the automatic temperature controls contractor.
- e. Coordinate Support: Provide and coordinate support personnel required by the TAB Firm in order to accomplish the DALT and TAB field work. Support personnel may include factory representatives, HVAC controls installer, HVAC equipment mechanics, sheet metal workers, pipe fitters, and insulators. Ensure support personnel are present at the work site at the times required.
- f. Correct Deficiencies: Ensure the notifications of Construction Deficiencies are provided as specified herein. Refer to paragraph entitled "Construction Deficiencies." Correct each deficiency as soon as practical with the Contracting Officer, and submit revised schedules and other required documentation.
- g. Prior to the TAB field team's arrival, ensure completion of the applicable inspections and work items listed in the TAB team supervisor's pre-field engineering report. Do not allow the TAB team to commence TAB field work until all of the following are completed.
 - (1) HVAC system installations are fully complete.
 - (2) HVAC prerequisite checkout work lists specified in the paragraph "Pre-Field TAB Engineering Report" are completed, submitted, and approved. At a minimum, complete check out and debugging of HVAC equipment, ducts, and controls prior to the TAB engineer arriving at the project site to begin the TAB work. Debugging includes searching for and eliminating malfunctioning elements in the HVAC system installations, and verifying all adjustable devices are functioning as designed. Ensure that the TAB Agency gets a copy of the approved prerequisite HVAC work checklist.

- (3) DALT field checks for all systems are completed.
 - (4) Provide new throwaway HVAC filters and/or clean washable HVAC filters within seven days before both Season 1 and Season 2 TAB field work.
 - (5) All fan belts on equipment involved in the TAB field work shall be checked, adjusted, and replaced as necessary to bring within the manufacturer's recommended tolerances within seven days before both Season 1 and Season 2 TAB field work.
 - (6) If Season 2 TAB field work is out of compliance, the Contractor shall be responsible for inspecting and cleaning all strainers, hot water, and chilled water coils as necessary, after which Season 2 TAB field work shall be repeated as necessary to prove compliance.
- i. Advance notice: Furnish to the Contracting Officer with advance written notice for the commencement of the DALT field work and for the commencement of the TAB field work.
 - j. Insulation work: For required DALT work, ensure that insulation is not installed on ducts to be DALT'd until DALT work on the subject ducts is complete. Later, ensure that openings in duct and machinery insulation coverings for TAB test ports are marked, closed and sealed.

1.5.2.2 TAB Agency

Provide the services of a TAB team which complies with the requirements of paragraph entitled "Independent TAB Agency Personnel Qualifications". The work to be performed by the TAB agency is limited to testing, adjusting, and balancing of HVAC air and water systems to satisfy the requirements of this specification section.

1.5.2.3 TAB Team Specialist

- a. Overall management: Supervise and manage the overall TAB team work effort, including preliminary and technical DALT and TAB procedures and TAB team field work.
- b. Schedule: Ensure the requirements specified under the paragraph "DALT and TAB Schedule" are met.
- c. Submittals: Provide the submittals specified herein.
- d. Pre-DALT/TAB meeting: Attend meeting with Contractor. Ensure TAB personnel that will be involved in the TAB work under this contract attend the meeting.
- e. Design review report: Submit typed report describing omissions and deficiencies in the HVAC system's design that would preclude the TAB team from accomplishing the duct leakage testing work and the TAB work requirements of this section. Provide a complete explanation including supporting documentation detailing the design deficiency. State that no deficiencies are evident if that is the case.
- f. Support required: Specify the technical support personnel required from the Contractor other than the TAB agency; such as factory representatives for temperature controls or for complex equipment.

Inform the Contractor in writing of the support personnel needed and when they are needed. Furnish the notice as soon as the need is anticipated, either with the design review report, or the pre-field engineering report, the during the DALT or TAB field work.

- g. Ensure all inspections and verifications for the Pre-Final DALT and Pre-TAB Checklists are completely and successfully conducted before DALT and TAB field work is performed.
- h. Advance Notice: Monitor the completion of the duct system installations and provide the Advance Notice for Pre-Final DALT field work as specified herein.
- e. Pre-field DALT preliminary notification: Monitor the completion of the duct installation of each system and provide the necessary written notification to the Contracting Officer.
- f. Pre-field engineering report: Utilizing the following HVAC-related documentation; contract drawings and specifications, approved submittal data for equipment, up-to-date revisions and change orders; prepare this report.
- g. Prerequisite HVAC work checklist: Ensure the Contractor gets a copy of this checklist at the same time as the pre-field engineering report is submitted.
- h. Technical assistance for DALT work.
 - (1) Technical assistance: Provide immediate technical assistance to TAB field team.
 - (2) DALT field visit: Near the end of the DALT field work effort, visit the contract site to inspect the HVAC installation and the progress of the DALT field work. Conduct a site visit to the extent necessary to verify correct procedures are being implemented and to confirm the accuracy of the Pre-final DALT Report data which has been reported. Also, perform sufficient evaluation to allow the TAB supervisor to issue certification of the final report.
- i. Final DALT report: Certify the DALT report. This certification includes the following work:
 - (1) Review: Review the Pre-final DALT report data. From these field reports, prepare the Certified Final DALT report.
 - (2) **TAB Verification**: Verify adherence, by the TAB field team, to the procedures specified in this section.
- j. Technical Assistance for TAB Work: Provide immediate technical assistance to the TAB field team for the TAB work.
 - (1) TAB field visit: Near the end of the TAB field work effort, visit the contract site to inspect the HVAC installation and the progress of the TAB field work. Review the TAB final report data and certify the TAB final report.
- k. Certified TAB report: Certify the TAB report. This certification includes the following work:

- (1) Review: Review the TAB field data report. From this field report, prepare the certified TAB report.
- (2) Verification: Verify adherence, by the TAB field team, to the TAB plan prescribed by the pre-field engineering report and verify adherence to the procedures specified in this section.

1. Design/Construction deficiencies: Within 3 working days after the TAB Agency has encountered any design or construction deficiencies, the TAB Supervisor must submit written notification directly to the Contracting Officer, with a separate copy to the Contractor, of all such deficiencies. Provide in this submittal a complete explanation, including supporting documentation, detailing deficiencies. Where deficiencies are encountered that are believed to adversely impact successful completion of TAB, the TAB Agency must issue notice and request direction in the notification submittal.

1.5.2.4 TAB Team Field Leader

- a. Field manager: Manage, in the field, the accomplishment of the work specified in Part 3, "Execution."
- b. Full time: Be present at the contract site when DALT field work or TAB field work is being performed by the TAB team; ensure day-to-day TAB team work accomplishments are in compliance with this section.
- c. Prerequisite HVAC work: Do not bring the TAB team to the contract site until a copy of the prerequisite HVAC Checklist, with all work items certified by the Contractor to be working as designed, reaches the office of the TAB Agency.

1.6 DALT AND TAB SUBMITTAL AND WORK SCHEDULE

1.6.1 Pre-Construction Submittals

Within 60 calendar days after date of contract award, submit the following:

Independent TAB Agency and Personnel Qualifications and Certificates

TAB Design Review Report

Pre-Field TAB Engineering Report

DALT and TAB Work Execution Schedule

1.6.2 Pre-TAB Preliminary Notification

A minimum of 7 calendar days prior to the start of TAB notify the Contracting Officer in writing of the start of TAB.

1.6.3 HVAC Work Check Out List

Complete HVAC Work Check Out List for proportional balancing and Season 1 thermal performance prior to start of TAB work.

1.6.4 TAB Field Work

Tab Field Work for proportional balancing shall be completed a minimum of 90 calendar days prior to CCD.

1.6.5 Submit Pre-Final TAB for Proportional Balancing Report

Within seven working days after completion of TAB field work.

1.6.6 TAB Field Acceptance Testing for Proportional Balancing

Upon approval of the Pre-Final TAB Report, schedule the TAB work field check with the Contracting Officer. TAB for proportional balancing shall be approved prior to BOD.

1.6.7 Submit Final TAB Report for Proportional Balancing

Within 15 calendar days after completion of successful TAB Work Field Check.

1.6.8 Submit Final TAB Report for Proportional Balancing

Within 15 calendar days after completion of successful TAB Work Field Check.

1.7 WARRANTY

Furnish workmanship and performance warranty for the DALT and TAB system work performed for a period not less than 1 years from the date of Government acceptance of the work; issued directly to the Government. Include provisions that if within the warranty period the system shows evidence of major performance deterioration, or is significantly out of tolerance, resulting from defective TAB or DALT workmanship, the corrective repair or replacement of the defective materials and correction of the defective workmanship is the responsibility of the TAB firm. Perform corrective action that becomes necessary because of defective materials and workmanship while system TAB and DALT is under warranty 7 days after notification, unless additional time is approved by the Contracting Officer. Failure to perform repairs within the specified period of time constitutes grounds for having the corrective action and repairs performed by others and the cost billed to the TAB firm. The Contractor must also provide a 1 year contractor installation warranty.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 WORK DESCRIPTIONS OF PARTICIPANTS

Comply with requirements of this section as specified in Appendix A WORK DESCRIPTIONS OF PARTICIPANTS.

3.2 TAB PROCEDURES

3.2.1 TAB Field Work

Test, adjust, and balance the HVAC systems until measured flow rates (air and water flow) are within plus or minus 5 percent of the design flow rates as specified or indicated on the contract documents. Provide a

proportional balance of air and water flow. Outside air to exhaust air flow ratio shall be balanced to -0/+5% of design.

That is, comply with the the requirements of AABC MN-1 and AABC MN-4, NEBB PROCEDURAL STANDARDS, NEBB MASV, or SMACNA 1780 (TABB) and SMACNA 1858 (TABB), except as supplemented and modified by this section.

Provide instruments and consumables required to accomplish the TAB work. Calibrate and maintain instruments in accordance with manufacturer's written procedures.

Test, adjust, and balance the HVAC systems until measured flow rates (air and water flow) are within plus or minus 5 percent of the design flow rates as specified or indicated on the contract documents. Conduct TAB work, including measurement accuracy, and sound measurement work in conformance with the AABC MN-1 and AABC MN-4, or NEBB TABES and NEBB MASV, or SMACNA 1780 (used by TABB) and SMACNA 1858 sound measurement procedures, except as supplemented and modified by this section.

3.2.2 Preliminary Procedures

Use the approved pre-field engineering report as instructions and procedures for accomplishing TAB field work. TAB engineer is to locate, in the field, test ports required for testing. It is the responsibility of the sheet metal contractor to provide and install test ports as required by the TAB engineer.

3.2.3 TAB Air Distribution Systems

3.2.3.1 Exhaust Fans

Exhaust fan systems including fans, ducts, plenums, grilles, and hoods for exhaust air. TAB exhaust fans in both modes of operation.

3.2.3.2 Unit Heaters

3.2.4 TAB Work on Performance Tests Without Seasonal Limitations

3.2.4.1 Performance Tests

In addition to the TAB proportionate balancing work on the air distribution systems and the water distribution systems, accomplish TAB work on the HVAC systems which directly transfer thermal energy. TAB the operational performance of the heating systems and cooling systems.

3.2.4.2 Ambient Temperatures

On each tab report form used for recording data, record the outdoor and indoor ambient dry bulb temperature range and the outdoor and indoor ambient wet bulb temperature range within which the report form's data was recorded. Record these temperatures at beginning and at the end of data taking.

3.2.5 Workmanship

Conduct TAB work on the HVAC systems until measured flow rates are within specified tolerance. This TAB work includes adjustment of balancing valves, balancing dampers, and sheaves. Further, this TAB work includes changing out fan sheaves and pump impellers if required to obtain air and

water flow rates specified or indicated. The Contractor is responsible for cleaning strainers and coils (interior and exterior as necessary) if required to obtain air and water flow rates specified or indicated. If, with these adjustments and equipment changes, the specified or indicated design flow rates cannot be attained, contact the Contracting Officer for direction.

3.2.6 Deficiencies

Strive to meet the intent of this section to maximize the performance of the equipment as designed and installed. However, if deficiencies in equipment design or installation prevent TAB work from being accomplished within the range of design values specified in the paragraph entitled "Workmanship," provide written notice as soon as possible to the Contractor and the Contracting Officer describing the deficiency and recommended correction.

Responsibility for correction of installation deficiencies is the Contractor's. If a deficiency is in equipment design, call the TAB team supervisor for technical assistance. Responsibility for reporting design deficiencies to Contractor is the TAB team supervisor's.

3.2.7 TAB Reports

After completion of the TAB field work, prepare the Pre-Final TAB Report for TAB supervisor's review and certification, using the reporting forms approved in the pre-field engineering report. Data required by those approved data report forms is to be furnished by the TAB team. Except as approved otherwise in writing by the Contracting Officer, the TAB work and thereby the TAB report is considered incomplete until the TAB work is accomplished to within the accuracy range specified in the paragraph entitled "Workmanship."

3.2.8 Quality Assurance - COTR TAB Field Acceptance Testing

3.2.8.1 TAB Field Acceptance Testing

During the field acceptance testing, verify, in the presence of the COTR, random selections of data (water, air quantities, air motion, [sound level readings]) recorded in the TAB Report. Points and areas for field acceptance testing are to be selected by the COTR. Measurement and test procedures are the same as approved for TAB work for the TAB Report.

Field acceptance testing includes verification of TAB Report data recorded for the following equipment groups:

Group 1: All chillers, boilers, return fans, computer room units, and air handling units (rooftop and central stations).

Group 2: 25 percent of the VAV terminal boxes and associated diffusers and registers.

Group 3: 25 percent of the supply diffusers, registers, grilles associated with constant volume air handling units.

Group 4: 25 percent of the return grilles, return registers, exhaust grilles and exhaust registers.

Group 5: 100 percent of the supply fans, exhaust fans, return fans and

pumps.

If any of the acceptance testing measurements for a given equipment group is found not to fall within the range of plus 5 to minus 5 percent of the Design Value, terminate data verification for all affected data for that group. The affected data for the given group will be disapproved. Make the necessary corrections and prepare a revised TAB Report. Reschedule acceptance testing of the revised report data with the COTR.

Further, if any data on the TAB Report for a given field acceptance test group is out-of-tolerance, then field test data for one additional field test group as specified herein. Continue this increase field test work until out-of-tolerance data ceases to be found. This additional field testing is up and above the original 25 percent of the of reported data entries to be field tested.

If there are no more similar field test groups from which to choose, additional field testing from another, but different, type of field testing group must be tested.

3.2.8.2 Prerequisite for Approval

Compliance with the field acceptance testing requirements of this section is a prerequisite for the final Contracting Officer approval of the TAB Report submitted.

3.2.9 Final TAB Report

After acceptance of the TAB Field Acceptance testing, submit a Final TAB Report including all adjustments/revisions made. The Final Report shall be neat, legible and type written.

3.3 MARKING OF SETTINGS

Upon the final TAB work approval, permanently mark the settings of HVAC adjustment devices including valves, gauges, splitters, and dampers so that adjustment can be restored if disturbed at any time. Provide permanent markings clearly indicating the settings on the adjustment devices which result in the data reported on the submitted TAB report.

3.4 MARKING OF TEST PORTS

The TAB team is to permanently and legibly mark and identify the location points of the duct test ports. If the ducts have exterior insulation, make these markings on the exterior side of the duct insulation. Show the location of test ports on the as-built mechanical drawings with dimensions given where the test port is covered by exterior insulation.

-- End of Section --

SECTION 23 07 00

INSULATION OF MECHANICAL SYSTEMS

03/11

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM A167	(2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A240/A240M	(2018) Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM C177	(2019) Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
ASTM C195	(2007; R 2013) Standard Specification for Mineral Fiber Thermal Insulating Cement
ASTM C533	(2017) Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation
ASTM C534/C534M	(2016) Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
ASTM C547	(2017) Standard Specification for Mineral Fiber Pipe Insulation
ASTM C552	(2017; E 2018) Standard Specification for Cellular Glass Thermal Insulation
ASTM C553	(1992) Mineral Fiber Blanket Thermal

Insulation for Commercial and Industrial Applications

- ASTM C578 (2018) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
- ASTM C591 (2017) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
- ASTM C592 (2016) Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type)
- ASTM C612 (2014) Mineral Fiber Block and Board Thermal Insulation
- ASTM C916 (2014) Standard Specification for Adhesives for Duct Thermal Insulation
- ASTM C1136 (2017a) Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
- ASTM D828 (1993) Tensile Breaking Strength of Paper and Paperboard
- ASTM E84 (2018a) Standard Test Method for Surface Burning Characteristics of Building Materials
- ASTM E96/E96M (2016) Standard Test Methods for Water Vapor Transmission of Materials

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

- FS L-P-535 (Rev. E; Notice 2) Plastic Sheet (Sheeting): Plastic Strip: Poly (Vinyl Chloride) and Poly(Vinyl Chloride-Vinyl Acetate), Rigid

U.S. DEPARTMENT OF DEFENSE (DOD)

- MIL-A-3316 (1987; Rev C; Am 2 1990) Adhesives, Fire-Resistant, Thermal Insulation
- MIL-PRF-19565 (1988; Rev C) Coating Compounds, Thermal Insulation, Fire- and Water-Resistant, Vapor-Barrier
- MIL-C-20079 (Rev. H) Cloth, Glass: Tape, Textile Glass; and Thread, Glass and Wire-Reinforced Glass
- MIL-A-24179 (1969; Rev A; Am 2 1980; Notice 1 1987) Adhesive, Flexible Unicellular-Plastic Thermal Insulation

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 255 (2006; Errata 2006) Standard Method of Test of Surface Burning Characteristics of Building Materials

UNDERWRITERS LABORATORIES (UL)

UL 723 (2018) UL Standard for Safety Test for Surface Burning Characteristics of Building Materials

1.2 SYSTEM DESCRIPTION

Provide field-applied insulation for heating, ventilating, and cooling (HVAC) air distribution systems and piping systems which are located within, on, under, and adjacent to buildings; and for plumbing piping systems.

1.2.1 Air Distribution System

Obtain Contracting Officer's written approval of systems under Section 23 05 92, "Testing/Adjusting/Balancing: Small Heating/Ventilating/Cooling Systems" before applying field-applied insulation to air distribution systems.

1.2.2 Piping Systems

Obtain Contracting Officer's written approval of HVAC water distribution systems under Section 23 05 92, "Testing/Adjusting/Balancing: Small Heating/Ventilating/Cooling Systems" before applying field-applied insulation to HVAC water distribution systems. At the Contractor's option and with Contracting Officer's written approval, the piping systems may be insulated before systems are tested, adjusted, and balanced (TAB'd). Piping insulation shall terminate immediately adjacent to each flow control valve, automatic control valve, or device. For chilled water and chilled-hot water piping, the ends of pipe insulation and the space between ends of pipe insulation and piping shall be sealed with waterproof vapor barrier coating. After systems are TAB'd, the control valves and devices shall be insulated.

1.3 DEFINITIONS

1.3.1 Finished Spaces

Spaces used for habitation or occupancy where rough surfaces are plastered, panelled, or otherwise treated to provide a pleasing appearance.

1.3.2 Unfinished Spaces

Spaces used for storage or work areas where appearance is not a factor, such as unexcavated spaces and crawl space.

1.3.3 Concealed Spaces

Spaces out of sight. For example, above ceilings; below floors; between double walls; furred-in areas; pipe and duct shafts; and similar spaces.

1.3.4 Exposed

Open to view. For example, pipe running through a room and not covered by other construction.

1.3.5 Fugitive Treatments

Treatment subject to deterioration due to aging, moisture, high humidity, oxygen, ozone, and heat. Fugitive materials are entrapped materials that can cause deterioration, such as solvents and water vapor.

1.3.6 Outside

Open to view up to 5 feet beyond the exterior side of walls, above the roof, and unexcavated or crawl spaces.

1.3.7 Conditioned Space

An area, room or space normally occupied and being heated or cooled for human habitation by any equipment.

1.4 SUBMITTALS

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

SD-03 Product Data

Piping insulation

Piping insulation finishes

Heating, ventilating, and air conditioning systems insulation

Duct insulation finishes

Accessory materials

Adhesives, sealants, and coating compounds

1.5 QUALITY ASSURANCE

Every package or standard container of insulation, jackets, cements, adhesives, and coatings delivered to the project site shall have the manufacturer's stamp or label attached giving name of manufacturer, brand and description of material. Insulation packages and containers shall be asbestos-free.

1.6 FLAME-SPREAD AND SMOKE-DEVELOPED RATINGS

In accordance with NFPA 255, ASTM E84 or UL 723, the materials on interior of the building shall have a flame-spread rating of not more than 25 and a smoke-developed rating of not more than 150 interior to the building.

1.6.1 Materials Tests

Test factory-applied materials as assembled. Field-applied materials may

be tested individually. Use no fugitive or corrosive treatments to impart flame resistance. UL label or satisfactory certified test report from a testing laboratory will be required to indicate that fire hazard ratings for materials proposed for use do not exceed those specified. Flame-proofing treatments subject to deterioration due to effects of moisture or high humidity are not acceptable.

1.6.2 Materials Exempt From Fire-Resistant Rating

Nylon anchors.

PART 2 PRODUCTS

2.1 PIPING INSULATION

Piping systems, except buried pipe requiring insulation, types of insulation required, and insulation thickness shall be as listed in Tables I herein. Unless otherwise specified, insulate all fittings, flanges, and valves, except valve stems, hand wheels, and operators. Provide factory premolded, pre-cut, or field-fabricated insulation of the same thickness and conductivity as insulation on adjacent piping. Insulation exterior shall be factory cleanable, grease resistant, non-flaking and non-peeling. Pipe insulation shall conform to the referenced publications.

2.1.1 Buried Water Pipe Insulation

Section 33 61 14, "Exterior Buried Preinsulated Water Piping."

2.1.2 Pipe Insulation Beyond Building Walls

For 5 feet beyond the exterior side of building walls, conform to Section 23 07 00, "Thermal Insulation for Mechanical Systems," in tunnels, in manholes, under and above piers, in trenches on piers, and for aboveground piping.

2.1.3 Flexible Unicellular Insulation

2.1.3.1 Recommended Adhesive

ASTM C534/C534M. Provide adhesive as recommended by insulation manufacturer or conforming with MIL-A-24179, Type II, Class 1.

2.1.3.2 Polyolefin thermoplastic

Polyolefin thermoplastic meets ASTM C534/C534M, except density.

2.1.3.3 Adhesive For Finishing Flexible Unicellular Insulation

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

2.1.3.4 Glass Cloth For Finishing Flexible Unicellular Insulation

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

2.1.4 Polyisocyanurate Insulation

ASTM C591, Type I. Supply the insulation with a factory applied vapor retarder/barrier that complies with Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS. The insulation and all covering must pass the flame

spread index of 25 and the smoke developed index of 50 when tested in accordance with ASTM E84.

2.1.5 Cellular Glass Insulation

ASTM C552, Type II.

2.1.6 Cellular Phenolic Insulation

ASTM C1136.

2.1.7 Mineral Fiber

ASTM C547, Class I.

2.1.8 Calcium Silicate

ASTM C533, Class I.

2.1.9 Cellular Polystyrene

ASTM C578, Expanded Polystyrene (EPS).

2.1.10 Piping Insulation Finishes

2.1.10.1 All-Purpose Jacket

Provide a factory applied all-purpose jacket when field applied jacketing is not specified. All purpose jackets shall include integral vapor barrier as required by service. Provide jackets in exposed locations with a white surface suitable for field painting. Allow a maximum water vapor permeance of 0.05 perm in accordance with ASTM E96/E96M, a puncture resistance of not less than 50 Beach units, and a minimum tensile strength of 35 pounds-force per inch of width in accordance with ASTM D828.

2.1.10.2 Vapor-Barrier Material

ASTM C1136. Resistant to flame, moisture penetration, and mold growth. Provide vapor-barrier material on pipe insulation as required in Table I.

2.1.10.3 Metal Jackets

- a. Aluminum Jackets: ASTM B209, Temper H14, minimum thickness of 27 gage (0.016 inch), with factory-applied polyethylene and kraft paper moisture barrier on inside surface. Provide smooth surface jackets for jacket outside diameters less than 8 inches. Provide corrugated surface jackets for jacket outside diameters 8 inches and larger. Provide stainless steel bands, minimum width of 0.5 inch. Provide factory prefabricated aluminum covers for insulation on fittings, valves and flanges.
- b. Stainless Steel Jackets: ASTM A167 or ASTM A240/A240M; Type 304, minimum thickness of 33 gage (0.010 inch), smooth surface with factory-applied polyethylene and kraft paper moisture barrier on inside surface. Provide stainless steel bands, minimum width of 0.5 inch. Provide factory prefabricated stainless steel covers for insulation on fittings, valves, and flanges.

- c. Piping, Fittings, Flanges, and Valves in Outside Locations:
Finish elbows and curved piping with factory-fabricated metal covers. Finish tees, flanges, and valves with metal covers. Covers shall be same thickness and material as jackets on adjacent piping.

2.2 HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS INSULATION

Provide insulation on ducts and diffusers of Heating, Ventilating and Air Conditioning Systems (HVAC).

2.2.1 Duct Insulation in Concealed Spaces

Blanket flexible mineral fiber insulation conforming to [ASTM C553](#), Type 1, Class B-3, .75 pound per cubic foot nominal, 3.0 inches thick, minimum installed R8. Provide flexible insulation in concealed spaces only.

2.2.2 Duct Insulation Not in Concealed Spaces

Mineral fiber in accordance with [ASTM C612](#), Class 2 (maximum surface temperature 400 degrees F), 6 pcf (pounds per cubic foot) average, 1.5 inch thick.

2.2.3 Exhaust Ductwork

For [exhaust ductwork](#) insulate ductwork with a minimum thickness of 2-inch blocks or boards, either mineral fiber conforming to [ASTM C612](#), Class 5, 20 pcf average or calcium silicate conforming to [ASTM C533](#), Type II.

2.2.4 All Types of Ductwork Located Outside

Provide [ASTM C591](#), polyisocyanurate or polyurethane board insulation, minimum density of 1.7 pcf, 1.5 inch thick, and weatherproof finish.

2.2.5 Acoustically Lined Ducts

For ductwork indicated or specified in Section [23 30 13.00 20](#), "Ductwork and Ductwork Accessories," to be acoustically lined, provide external insulation as specified in paragraph entitled "Duct Insulation Not in Concealed Spaces."

2.2.6 Duct Insulation Finishes

2.2.6.1 All-Purpose Jacket

Provide a factory applied all-purpose jacket with or without integral vapor barrier as required by the service. In exposed locations, provide jackets with a white surface suitable for field painting. All-purpose jacket shall have a maximum water vapor permeance of 0.05 perm per [ASTM E96/E96M](#); a puncture resistance of not less than 50 Beach units; and a tensile strength of not less than 35 pounds-force per inch of width in accordance with [ASTM D828](#).

2.2.6.2 Vapor-Barrier Material

[ASTM C1136](#), for duct in equipment room and exposed areas and Type I or II in remaining areas. Material shall be resistant to flame, moisture penetration, and shall not support mold growth. Provide vapor barrier on

HVAC duct insulation, except insulation for heating only.

2.2.6.3 Metal Jackets

Provide metal jackets with moisture barrier lining for externally insulated ductwork located outside.

- a. Aluminum Jackets: **ASTM B209**, Alloy 3003 or 3004, Temper H14, 0.020- inch thick, smooth.
- b. Stainless Steel Jackets: **ASTM A167**, Type 316, 0.016- inch thick, smooth.

2.3 EQUIPMENT

Insulate all equipment and accessories as specified in Table II. In outside locations, provide insulation one inch thicker than specified. Increase the specified insulation thickness for equipment only where necessary to equal the thickness of angles or other structural members to make a smooth, exterior surface. Factory applied insulation shall meet the flame spread and smoke-developed rating of 25/50.

2.4 ADHESIVES, SEALANTS, AND COATING COMPOUNDS

2.4.1 Insulation and Vapor Barrier Adhesive

Provide **ASTM C916**, Type I or Type II adhesive for securing insulation to metal surfaces and for vapor barrier lap only in building interior. Provide Type I when an adhesive in which the vehicle is nonflammable in the liquid (wet) state and which will pass the edge-burning test is required. Provide Type II when an adhesive in which the vehicle is nonflammable in the liquid (wet) state and which will not pass the edge-burning test is required.

2.4.2 Lagging Adhesive

MIL-A-3316, Class 1, for bonding fibrous glass cloth to unfaced fibrous glass insulation; for bonding cotton brattice cloth to faced and unfaced fibrous glass insulation board; for sealing edges of and bounding fibrous glass tape to joints of fibrous glass board; or for bonding lagging cloth to thermal insulation, or Class 2, for attaching fibrous glass insulation to metal surfaces.

2.4.3 Mineral Fiber Insulation Cement

ASTM C195, thermal conductivity 0.85 maximum at 200 degrees F mean when tested in accordance with **ASTM C177**.

2.4.4 Vapor Barrier Coating

MIL-PRF-19565, Type II, indoor only above surface temperature 60 degrees F, color white.

2.4.5 Weatherproof Coating

For outside applications provide a weatherproof coating recommended by the manufacturer of the insulation and jackets.

2.4.6 Flexible Unicellular Insulation Adhesive

MIL-A-24179, Type II, Class 1 or Type III.

2.5 ACCESSORY MATERIALS

2.5.1 Staples

ASTM A167, Type 316 stainless steel outside-clinch type.

2.5.2 Insulation Bands

1/2 inch wide; 0.24 gage galvanized steel or 0.26 gage stainless steel or 0.24 gage aluminum.

2.5.3 Bands for Metal Jackets

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

2.5.4 Anchor Pins

Provide anchor pins and speed washers recommended by insulation manufacturer.

2.5.5 Glass Cloth and Tape

MIL-C-20079, Type I, Class 1 or Class 3 cloth, and Type II, Class 1 or tape; 20 by 20 maximum size mesh. Tape shall be 4-inch wide rolls. Class 3 tape shall be 4.5 ounces per square yard. In lieu of glass cloth and tape, open weave glass membrane may be provided.

2.5.6 Wire

Soft annealed stainless steel, 0.047-inch nominal diameter.

2.5.7 PVC Pipe Fitting Cover

FS L-P-535, Composition A, Type II, Grade GU, factory premolded, one-piece.

PART 3 EXECUTION

3.1 PREPARATION

Do not insulate materials until system tests have been completed and surfaces to be insulated have been cleaned of dirt, rust, and scale and dried. Insulate return ducts, outside air intakes and supply ducts to the room outlets, flexible runouts, plenums, casings, mixing boxes, filter boxes, coils, fans, and the portion of air terminals not in the conditioned spaces. Ensure full range of motion of equipment actuators. Modify insulation to avoid obstruction with valve handles, safety reliefs, and other such items. Allow adequate space for pipe expansion. Install insulation with jackets drawn tight and cement down on longitudinal and end laps. Do not use scrap pieces where a full length section will fit. Insulation shall be continuous through sleeves, wall and ceiling openings, except at fire dampers in duct systems. Extend surface finishes to protect surfaces, ends, and raw edges of insulation. Apply coatings and adhesives at the manufacturer's recommended coverage per gallon. Individually insulate piping and ductwork. Provide a moisture and vapor seal where

insulation terminates against metal hangers, anchors and other projections through the insulation on surfaces for which a vapor seal is specified. Keep insulation dry during application of finish. Bevel and seal the edges of exposed insulation. Unless otherwise indicated, do not insulate the following:

- a. Factory preinsulated flexible ductwork;
- b. Vertical portion of interior roof drain pipelines, chrome plated pipes, and fire protection pipes;
- c. Vibration isolating connections;
- d. Adjacent insulation;
- e. ASME stamps;
- f. Fan name plates; and
- g. Access plates in fan housings.

3.2 PIPING INSULATION

3.2.1 Mineral Fiber Pipe Insulation

Place sections of insulation around the pipe and joints tightly butted into place. The jacket laps shall be drawn tight and smooth. Secure jacket with fire resistant adhesive factory applied self sealing lap, or stainless steel outward clinching staples spaced not over 4 inches on centers and 1/2 inch minimum from edge of lap. Cover circumferential joints with butt strips, not less than 3 inches wide, of material identical to the jacket material. Overlap longitudinal laps of jacket material not less than 1 1/2 inches. Adhesive used to secure the butt strip shall be the same as used to secure the jacket laps. Apply staples to both edges of the butt strips. Patch damaged jacket material by wrapping a strip of jacket material around the pipe and cementing, stapling, and coating as specified for butt strips. Extend the patch not less than 1 1/2 inches past the break in both directions. At penetrations by pressure gages and thermometers, fill the voids with the vapor barrier coating for outside service. Seal with a brush coat of the same coating. Where penetrating roofs, insulate piping to a point flush with the top of the flashing and seal with the vapor barrier coating. Butt tightly the exterior insulation to the top of the flashing and interior insulation. Extend the exterior metal jacket 2 inches down beyond the end of the insulation. Seal the flashing and counterflashing underneath with the vapor barrier coating.

3.2.2 Flexible Unicellular Insulation

Bond cuts, butt joints, ends, and longitudinal joints with adhesive. Miter 90-degree turns and elbows, tees, and valve insulation. Where pipes penetrate fire walls, provide mineral-fiber insulation inserts and sheet-metal sleeves. Insulate flanges, unions, valves, and fittings in accordance with manufacturer's published instructions. Finish all unicellular insulation as follows:

- (1) Coat entire surface of insulation with MIL-A-3316
- (2) While the adhesive is tacky, apply a layer of MIL-C-20079 glass cloth. Stretch tightly and overlap all joints by a minimum of 2-inches. Glass cloth at elbows and fittings shall be mitered.
- (3) Apply a final coat of MIL-A-3316 adhesive.

3.2.3 Calcium Silicate Pipe Insulation

Secure insulation with stainless steel metal bands on 12-inch maximum centers. Apply a skim coat of hydraulic setting cement directly to the insulation. When dry, apply a flooding coat of adhesive over the hydraulic setting cement. Press a layer of MIL-C-20079 glass cloth or tape into adhesive and seal laps and edges with adhesive. Coat cloth with adhesive cut at a ratio of one part water to five parts adhesive in color other than white for the purpose of visual inspection to ensure sizing of entire surface.

3.2.4 Cellular Glass, Cellular Phenolic, and Polyisocyanurate

Secure outer most layer of insulation with metal bands 12-inch on center. If a factory installed all service jacket is used, the metal bands shall be applied to the outside of the all service jacket. If two or more layers are applied, the inner layers may be secured with fiber reinforced tape. For cold or chilled piping all joints both longitudinal and circumferential shall be sealed. Use the manufacturer's recommended cement or sealant. Apply all-purpose jacket, vapor barrier if required by Table I, and metal jacket if outside. Elbows shall be four piece miter if field fabricated. Pre-manufactured elbows can be held in place with metal bands. All elbows shall be finished as follows: Apply a skim coat of hydraulic setting cement directly to the insulation. When dry, apply a flooding coat of adhesive over the hydraulic setting cement. Press a layer of MIL-C-20079 glass cloth or tape into adhesive and seal laps and edges with adhesive. Coat cloth with adhesive cut at a ratio of one part water to five parts adhesive in color other than white for the purpose of visual inspection to ensure sizing of entire surface. Insulate flexible connection at pumps and other equipment with unicellular plastic insulation, unless otherwise indicated. Factory-fabricated removable and reusable insulated covers shall be provided for all valves, circuit setters, unions and flow control devices. The insulation cover shall be reusable without the need for special material or tools. Insulation shall be two piece molded cellular to fit the valve or device. Flexible unicellular insulation may be used in lieu of molded cellular insulation.

3.2.5 Expanded Cellular Polystyrene

Secure outer most layer of insulation with metal bands 9 inch on center. If a factory installed all service jacket is used, the metal bands shall be applied to the outside of the all service jacket. If two or more layers are applied, the inner layers may be secured with fiber reinforced tape. For cold or chilled piping all joints both longitudinal and circumferential shall be sealed. use the manufacturer's recommended cement or sealant. Apply all-purpose jacket, vapor barrier if required by Table 1, and metal jacket if outside. Elbows shall be four piece miter if field fabricated. Pre-manufactured elbows can be held in place with metal bands. All elbows shall be finished according to manufacturer's recommended method. Insulate flexible connection at pumps and other equipment with unicellular plastic insulation, unless otherwise indicated. Factory-fabricated removable and

reusable insulated covers shall be provided for all valves, circuit setters, unions and flow control devices. The insulation cover shall be reusable without the need for special material or tools. Insulation shall be two piece molded cellular to fit the valve or device. Flexible unicellular insulation may be used in lieu of molded cellular insulation.

3.2.6 Hangers and Anchors

Pipe insulation shall be continuous through pipe hangers. Where pipe is supported by the insulation, provide galvanized steel shields protection saddles. Band and secure insulation protection shields without damaging pipe insulation. Where shields are used on pipes 2 inches and larger, provide insulation inserts at points of hangers and supports. Insulation inserts shall be of calcium silicate, cellular glass (minimum 8 pcf), molded glass fiber (minimum 8 pcf), or other approved material of the same thickness as adjacent insulation. Inserts shall have sufficient compressive strength to adequately support the pipe without compressing the inserts to a thickness less than the adjacent insulation. Insulation inserts shall cover the bottom half of the pipe circumference 180 degrees and be not less in length than the protection shield. Vapor-barrier facing of the insert shall be of the same material as the facing on the adjacent insulation. Seal inserts into the insulation with vapor barrier coating, Type II or for exterior work, manufacturer's recommended weatherproof coating, as applicable. Where protection saddles are used, fill all voids with the same insulation material as used on the adjacent pipe. Where anchors are secured to chilled piping that is to be insulated, insulate the anchors the same as the piping for a distance not less than four times the insulation thickness to prevent condensation. Vapor seal insulation around anchors.

3.2.7 Sleeves and Wall Chases

Where penetrating interior walls, extend a metal jacket 2 inches out on either side of the wall and secure on each end with a band. Where penetrating floors, extend a metal jacket from a point below the back-up material to a point 10 inches above the floor with one band at the floor and one not more than one inch from end of metal jacket. Where penetrating exterior walls, extend the metal jackets through the sleeve to a point 2 inches beyond the interior surface of the wall.

3.2.8 Flanges, Unions, Valves and Fittings for Hot Piping

Flanges, Unions, Valves, and Fittings Insulation (Except Flexible Unicellular) for Hot Piping: Factory fabricated removable and reusable insulation covers may be used. For inside domestic hot water, heating hot water, A/C condensate drains, high temperature hot water, steam and condensate return systems; exposed hot water piping and drains in handicap areas, place factory premolded, precut or field-fabricated segmented insulation of the same thickness and conductivity as the adjoining pipe insulation around the flange, union, valve, and fitting abutting the adjoining pipe insulation. If nesting size insulation is used, overlap 2 inches or one pipe diameter, whichever is larger. Use insulating cement to fill voids. Elbows insulated using segments shall have not less than three segments per elbow. Place and joint the segments with manufacturer's recommended water-vapor resistant, fire retardant, and adhesive appropriate for the temperature limit of the service. Upon completion of installation of insulation, apply two coats lagging adhesive with glass tape embedded between coats. Overlap tape seams one inch. Extend adhesive onto adjoining insulation not less than two inches. The total dry film thickness shall be

not less than 1/16 inch. Where unions are indicated not to be insulated, taper the insulation to the union at a 45 degree angle. Coat the insulation and all purpose jacket with two coats of lagging adhesive and with glass tape embedded between coats. The total dry film thickness shall be not less than 1/16 inch. At the option of the Contractor, factory premolded one-piece PVC fitting covers may be provided in lieu of two coats of adhesive with tape embedded between coats. Factory premolded field-fabricated segment or blanket insert insulation shall be provided under the fitting covers. Install factory premolded one-piece PVC fitting covers over the insulation and secure by stapling, taping with PVC vapor barrier tape, or with metal or plastic tacks made for securing PVC fitting covers. Do not provide PVC fitting covers where exposed to the weather. Provide PVC fitting covers only in ambient temperatures below 150 degrees F.

3.2.9 Piping Exposed to Weather

3.2.9.1 Metal Jackets

Install over the insulation. Metal jackets shall have side and end lap at least 2 inches wide with the cut edge of the side lap turned inside one inch to provide a smooth edge. Overlap the jacket not less than 2 inches at longitudinal and circumferential joints and secure with metal bands at not more than 9-inch centers or with screws at not more than 5-inch centers. Overlap longitudinal joints down to shed water. Seal circumferential joints with a coating recommended by the insulation manufacturer for weatherproofing.

3.2.9.2 Flanges, Unions, Valves, Fittings, and Accessories

Insulate and finish as specified for the applicable service. Apply two coats of an emulsion type weatherproof mastic for hot service and vapor barrier mastic for cold service recommended by the insulation manufacturer. Embed glass tape in the first coat. Overlap tape not less than one inch and the adjoining metal jacket not less than 2 inches. Factory preformed metal jackets may be provided in lieu of the above for hot service.

3.3 DUCTS (HVAC) INSULATION

3.3.1 Rigid Insulation

Secure rigid insulation by impaling over pins or anchors located not more than 3 inches from joint edges of boards, spaced not more than 12 inches on centers and secure with washers and clips. Spot weld anchor pins or attach with a waterproof adhesive especially designed for use on metal surfaces. Apply insulation with joints tightly butted. Neatly bevel insulation around name plates and access plates and doors. Each pin or anchor shall be capable of supporting a 20-pound load. Cut off protruding ends of pins, after clips are sealed with coating compound for inside work or manufacturer's recommended weatherproof coating for outside work, and reinforced with open weave glass membrane.

3.3.2 Flexible Blanket Insulation

Apply insulation with all joints tightly butted. Secure insulation to ductwork with adhesive in 6-inch wide strips on 12-inch centers. Staple laps of jacket with outward clinching staples. Sealing shall be in accordance with paragraph 3.3.3 below. For ductwork over 24 inches on horizontal duct runs, provide pins, washers and clips. Provide pins on

sides of vertical ductwork being insulated. Space pins and clips on 18-inch centers and not more than 18 inches from duct corners. Carry insulation over standing seams and trapeze-type hangers. Install speed washers with pins and pin trimmed to washer. Sagging of flexible duct insulation will not be permitted. Cut off protruding ends of pins after clips are secured and sealed with coating compound for inside work. For warm air ducts, overlap insulation not less than 2 inches at joints and secure the laps with outward clinch staples on 4-inch centers. In cold air ducts, vapor seal all joints and staple as specified.

3.3.3 Insulation Finishes and Joint Sealing

Fill all breaks, punctures, and voids with vapor barrier coating compound for inside work or manufacturer's recommended weatherproof coating for outside service. Vapor seal all joints by embedding a single layer of 3-inch wide open weave glass membrane, 20 by 20 mesh maximum size between two 1/16-inch wet film thickness coats of vapor barrier coating compound. Draw glass fabric smooth and tight with a 1 1/2-inch overlap. At jacket penetrations such as hangers, thermometers, and damper operating rods, fill voids in the insulation with vapor barrier coating. Brush a coat of vapor barrier coating where required on HVAC ducts. Provide vapor barrier jacket continuous across seams, reinforcing, and projections. Where height of projections is greater than insulation thickness, carry insulation and jacket over the projection. For joints for heating only systems, provide insulation with two coats of fire resistant adhesive with glass fabric mesh embedded between coats.

3.3.4 Metal Jackets for Outside Ductwork

Ensure metal-jacket side and end laps at least 2 inches wide, with the cut edge of the side lap turned under one inch to provide a smooth edge. Place horizontal laps to shed water. Seal vertical laps with insulation manufacturer's recommended weatherproof coating. Secure jackets in place with aluminum or stainless steel bands on 9-inch centers aluminum or stainless steel screws on 5-inch centers. Where ducts penetrate exterior walls, continue the increased thickness required for ductwork exposed to weather and the metal jackets through the sleeve to a point 2 inches beyond the interior surface of the wall. Where metal jacket abuts an uninsulated surface, seal joints with a weatherproof mastic recommended by the insulation manufacturer. For rectangular ducts, provide corner angles to exposed corners of the insulation. Apply two coats of weatherproof coating recommended by the insulation manufacturer to the entire surface with a layer of glass cloth embedded between coats. Ensure glass cloth overlaps not less than 2 inches at joints and adjoining surface. Each coat of weatherproof coating shall be 1/16-inch minimum thickness.

3.3.5 Exhaust Duct Insulation

For **exhaust ducts** provide insulation with 3/4-inch wide, minimum 0.15-inch thick galvanized steel bands spaced not over 12 inches on centers; or 16-gage galvanized steel wire with corner clips under the wire; or with heavy welded pins spaced not over 12 inches apart each way. Do not use adhesives.

3.3.6 Access Plates and Doors

On acoustically lined ducts, plenums, and casings, provide insulation on access plates and doors. On externally insulated ducts, plenums, and casings, provide insulation-filled hollow steel panels and doors for access

openings. Bevel insulation around access plates and doors.

3.4 EQUIPMENT INSULATION

3.4.1 General Procedures

Apply equipment insulation suitable for temperature and service in rigid block or semirigid board or flexible form to fit as closely as possible to equipment. Groove or score insulation where necessary to fit the contours of equipment. Stagger end joints where possible. Bevel the edges of the insulation for cylindrical surfaces to provide tight joints. Join sections of cellular glass insulation with bedding compound. After the cellular glass insulation is in place on areas to be insulated, except where metal-encased, fill joints, seams, chipped edges, or depressions with bedding compound to form a smooth surface. Fill mineral fiber joints with insulating cement. Bevel insulation around name plates, ASME and access plates. For insulation on equipment that must be opened periodically for inspection, cleaning, or repair, construct insulation to be removable and replaceable without damage. Protect exposed insulation corners with corner angles under wires and bands.

3.4.2 Heating Equipment (Except Pumps)

Insulate shell and tube heat exchangers for the temperature of the shell medium indicated on the drawings. Insulation on heads of heat exchangers shall be removable. Fabricate a male-female shiplap type joint for the removable section. Use 16-gage galvanized steel stainless steel or copper wire or 3/4-inch wide 20-gage stainless steel bands spaced on 12-inch centers. Seal joints with bedding compound for cellular glass or for mineral fiber with insulating cement and cover insulation with a smoothing coat of insulating cement. Apply two coats of adhesive with a layer of glass cloth embedded between coats. The dry film thickness of the finish shall be 1/32-inch minimum. On cylindrical equipment a metal jacket may be provided instead of the adhesive and glass cloths on the cylinder, ends must have adhesive and glass cloth.

3.4.3 Cold Equipment (Except Pumps)

Secure insulation with 16-gage, galvanized steel or copper clad wire or with 3/4-inch wide 20-gage stainless steel bands spaced on 12-inch centers. Seal joints with joint sealer. Cover non-removable irregular surfaces such as corner angles with a smoothing coat of insulating cement. Provide removable heat exchanger head covers with a male-female shiplap type joint. Apply two coats of vapor barrier coating with a layer of glass cloth embedded between coats. The dry film thickness of the finish shall be 1/32-inch minimum.

3.4.4 Pumps

Insulate pumps used for hot service with 2-inch thick rigid mineral fiber insulation and pumps used for chilled water and brine service with 2-inch thick flexible unicellular sheets as follows: Insulate pumps by forming a box around the pump housing, drive shaft, and piping. Apply insulation to inside surfaces of 20-gage galvanized or stainless steel sheet-metal boxes having openings for drive shaft and pipes. Construct the box by forming the bottom and sides using joints which do not leave raw ends of insulation exposed. Band bottom and sides to form a rigid housing that does not rest

on the pump. Between top cover and sides, fit joints tightly forming a female shiplap joint on the side pieces and a male joint on the top cover to make the top cover removable. Secure insulation to the box with adhesive. Allow clearance for draining and adjustment of pump shaft seal.

3.5 PAINTING AND IDENTIFICATION

Paint in accordance with Section 09 90 00, "Paints and Coatings." Piping identification shall be as specified in other sections.

3.6 REPLACEMENT OF EXISTING ASBESTOS INSULATION

Remove existing asbestos insulation in accordance with Section 02 82 16, "Removal and Disposal of Asbestos Materials". When existing asbestos insulation is to be replaced, provide new asbestos-free insulation. Label or stencil new insulation "Asbestos-Free" after final finishing and painting.

3.7 FIELD INSPECTION

Visually inspect to ensure that materials provided conform to specifications. Inspect installations progressively for compliance with requirements.

TABLE I

Piping Insulation Wall Thickness

<u>Service</u>	<u>Material</u>	<u>Tube And Pipe Size (Inches)</u>				<u>Vapor Barrier Required</u>
		<u>1/4-1 1/4</u>	<u>1 1/2-3</u>	<u>3 1/2-5</u>	<u>6-& Larger</u>	
Domestic Cold Water, Drains and Horizontal Roof Drains	Polyisocyanurate	1	1	1	1	Yes
	Cellular Glass	1.5	1.5	1.5	1.5	Yes
Domestic Hot Water	Polyisocyanurate	1	1	1.5	1.5	No
	Mineral Fiber	1	1	1.5	1.5	No
	Cellular Glass	1.5	1.5	1.5	1.5	No

NOTE: Thickness in parenthesis are for:

- (1) Cold piping - crawl spaces, mechanical rooms, and outside locations
- (2) Hot Piping - outside locations, not including tunnels and crawl spaces.
- (3) NP - Not permitted.

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TABLE II

Insulation For Equipment

<u>Material</u>	<u>Spec</u>	<u>Type</u>	<u>Class</u>	<u>Vapor Barrier Required</u>
Flexible Mineral Fiber,	ASTM C553	I	B-3	Yes*/No
Rigid Mineral Fiber,	ASTM C612		2	Yes*/No
or Cellular Glass	ASTM C552	I		No

*Yes for chilled water and brine service and no for other services.

<u>Equipment</u>	<u>Recommended Wall Thickness</u>	<u>Vapor Barrier Required</u>
Heat Exchangers Systems	2"	For Chilled Water and Brine
Expansion Tanks Systems	2"	For Chilled Water and Brine
Air Separators Systems	2"	For Chilled Water and Brine
All Pumps Systems	2"	For Chilled Water and Brine
Hot Water Storage Tanks	2"	No
Hot Water Heat Exchangers or Steam to Hot Water Convector		
Up to 249	2"	No
250 to 400oF	3-1/2"	No
401 to 600oF	6"	No
Hot Water Duct Mounted Coils	2"	No
Drain Pans	2"	For Chilled Water Systems
Pneumatic Water Tanks	2"	For Chilled Water Systems
Water Boxes and Headers	2"	For Chilled Water Systems

*Exact insulation thickness may be determined by proposed condition of use.

TABLE III

<u>Service And Surface</u> <u>Temperature Range</u> <u>Degrees F)</u>	<u>Material</u>	<u>Insulation Wall Thickness (Inches)</u>				
		<u>Outside Diameter (Inches)</u>				
		<u>1/4-1-1/4</u>	<u>1-1/2-3</u>	<u>3-1/2-5</u>	<u>6-10</u>	<u>11-36</u>
Boiler Breech and Stack (Up to 400 Degrees F)	Mineral Fiber ASTM C553 Class B-3, ASTM C547 Class 1, or ASTM C612 Class 1	NA	NA	2	2	2
	Calcium Silicate ASTM C533 Type 1	NA	NA	2	2	2
Boiler Breech and Stack (401 to 600 Degrees F)	Mineral Fiber ASTM C547, Class 2, ASTM C592 Class 1, or ASTM C612 Class 3	NA	NA	3	3	3
	Calcium Silicate ASTM C533 Type I	NA	NA	3	3	4
Boiler Breech and Stack (601 to 800 Degrees F)	Mineral Fiber ASTM C547 Class 3,\ ASTM C592 Class 1, or ASTM C612 Class 3	NA	NA	4	4	4
	Calcium Silicate ASTM C533 Type I	NA	NA	4	4	4
Diesel Engine Exhaust	Calcium Silicate ASTM C533 Type I	6	6	6	6	6

-- End of Section --

SECTION 23 73 33

HEATING, VENTILATING, AND COOLING SYSTEM

01/07

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z21.22/CSA 4.4 (2015; R 2020) Relief Valves for Hot Water Supply Systems

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B16.18 (2021) Cast Copper Alloy Solder Joint Pressure Fittings

ASME B16.22 (2021) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

ASME B16.23 (2021) Cast Copper Alloy Solder Joint Drainage Fittings - DWV

ASME B16.26 (2018) Standard for Cast Copper Alloy Fittings for Flared Copper Tubes

ASME B31.1 (2020) Power Piping

ASME B31.5 (2020) Refrigeration Piping and Heat Transfer Components

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1003 (2020) Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems - (ANSI approved 2010)

ASTM INTERNATIONAL (ASTM)

ASTM A653/A653M (2020) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM B32	(2020) Standard Specification for Solder Metal
ASTM B42	(2020) Standard Specification for Seamless Copper Pipe, Standard Sizes
ASTM B88	(2020) Standard Specification for Seamless Copper Water Tube
ASTM B280	(2020) Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
ASTM B306	(2020) Standard Specification for Copper Drainage Tube (DWV)

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

FCCCHR List	(continuously updated) List of Approved Backflow Prevention Assemblies
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MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS
INDUSTRY (MSS)

MSS SP-58	(2018) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation
MSS SP-67	(2022) Butterfly Valves
MSS SP-69	(2003; Notice 2012) Pipe Hangers and Supports - Selection and Application (ANSI Approved American National Standard)
MSS SP-70	(2011) Gray Iron Gate Valves, Flanged and Threaded Ends
MSS SP-71	(2018) Gray Iron Swing Check Valves, Flanged and Threaded Ends
MSS SP-80	(2019) Bronze Gate, Globe, Angle and Check Valves
MSS SP-85	(2011) Gray Iron Globe & Angle Valves Flanged and Threaded Ends

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2020; TIA 22-1; ERTA 1 2022) National Electrical Code
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SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION
(SMACNA)

SMACNA 1966	(2020) HVAC Duct Construction Standards Metal and Flexible, 4th Edition
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SMACNA 1972 CD

(2012) HVAC Air Duct Leakage Test Manual -
2nd Edition

UNDERWRITERS LABORATORIES (UL)

UL 507

(2017; Reprint Aug 2018) UL Standard for
Safety Electric Fans

1.2 SYSTEM DESCRIPTION

Provide new heating, ventilating, and cooling (HVAC) systems complete and ready for operation. HVAC systems include equipment, ducts, and piping which is located within, on, under, and adjacent to buildings.

1.3 SUBMITTALS

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

SD-02 Shop Drawings

Temperature control systems

SD-03 Product Data

Exhaust fans

Dampers

Diffusers, registers, and grilles

Cove Unit Heater; G

SD-10 Operation and Maintenance Data

Exhaust fans, Data Package 2

Cove Unit Heater

1.3.1 Temperature Control Systems

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

1.3.2 Equipment layout drawings

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

1.3.3 Installation Manual

Provide for each item of equipment.

1.3.4 Certification of Welders' Qualifications

Submit copy of Welder Qualification Tests (Form QW-482) prior to site welding.

1.3.5 Air Filter Inventory

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

PART 2 PRODUCTS

2.1 EQUIPMENT

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

2.1.1 Cove Unit Heater

Heater to include back shield and wall mounting bracket. Heater to be pre-wired, fully assembled from the factory, and UL listed.

2.1.2 Bathroom Exhaust Fans

UL 507 and UL listed for ceiling installation, HVI (Home Ventilating Institute) certified, with AMCA seal. Unit shall be 9 sones or less at rated cfm and static pressure. Unit shall include backdraft damper and variable speed fan motor.

2.2 ELECTRICAL

2.2.1 Electrical Motors, Controllers, Contactors, and Disconnects

Furnish with respective pieces of equipment. Motors, controllers, contactors, and disconnects shall conform to Section 26 20 00, "Interior Wiring Systems." Provide electrical connections under Section, 26 20 00, "Interior Wiring Systems." Provide controllers and contactors with maximum of 120-volt control circuits, and auxiliary contacts for use with controls furnished. When motors and equipment furnished are larger than sizes indicated, the cost of providing additional electrical service and related work shall be included under this section.

2.2.2 Electrical Work

Provide under Section 26 20 00, "Interior Wiring Systems." Provide control wiring under this section in accordance

with NFPA 70.

2.3 METAL DUCT SYSTEMS

Provide shop-fabricated, zinc-coated steel ducts conforming to ASTM A653/A653M coating designation G60. Fabricate, construct, brace, reinforce, install, support, and seal ducts and accessories, and test ducts in accordance with SMACNA 1966 and SMACNA 1972 CD. Cover duct transverse joints with single component synthetic rubber type compound suitable for use with passivated coating on zinc-coated steel. Lap joints in direction of flow. Provide ducts straight and smooth on inside with neatly finished airtight joints. Provide air supply and return openings in ducts with air diffusers, registers, or grilles.

2.3.1 Flexible Duct Connectors

Provide airtight flexible duct connectors at duct connections to each air-conditioning unit, air-handling unit, exhaust fan, and ventilating fan. Support connectors at each end with metal angle frame bands, securely bolt in place. Provide not less than 20 ounce glass fabric duct connectors coated on both sides with neoprene.

2.3.2 Turning Vanes

Provide fabricated tees and square elbows with turning vanes in accordance with SMACNA 1966 for vanned elbows. Turning vanes shall be single wall with trailing edges.

2.3.3 Dampers

Provide factory manufactured opposed blade adjustable manual dampers where indicated for duct heights of 12 inches and larger. Provide factory manufactured single leaf dampers for duct heights less than 12 inches. Provide damper shafts with 2 inch standoffs to clear 2 inches of duct insulation with bearings at both ends of the shafts. Provide adjustment quadrant with indicator and locking devices. Provide galvanized steel dampers one gage heavier than duct in which dampers are installed.

2.3.4 Diffusers, Registers, and Grilles

Provide factory-fabricated metal units with edges rolled or rounded where exposed to view, and factory primed with white enamel finish. Provide each diffuser and register with factory-fabricated, group-operated, adjustable, opposed-blade, air-volume-control dampers, key or screwdriver operated from the face of unit without the use of a tool. Provide each unit with rubber or plastic installation gaskets. Diffusers in same room shall have same face design.

- a. Diffusers: Provide round, square, or rectangular diffusers as indicated. Ceiling diffusers shall be designed to deliver air in a horizontal direction. Provide baffles or other devices as required for proper air distribution pattern.
- b. Registers: Provide double deflection supply registers arranged to control air direction, throw, and drop. Exhaust and return air registers shall have single set of nondirectional face bars or vanes having the same appearance as supply registers. Provide face

bars or vanes spaced not more than 0.75 inch on center and not less than 0.62 inch depth.

- c. Grilles: Provide as specified for registers without air-volume-control dampers.

2.3.5 Access Doors

Provide for access to volume dampers, fire dampers, plenum chambers, and where indicated. Provide each door with double wall zinc-coated steel construction, gasketed airtight, with continuous hinges and cam latches. Insulate access doors with one-inch thick rigid insulation. Provide 12 inch by 12 inch door, except where larger sizes are indicated, or provide 12 inches by height of duct when duct is less than 12 inches high.

2.4 PIPING SYSTEMS

Provide the following pipe and fittings. Provide dielectric fittings, unions or flanges between steel piping and copper tubing for all piping sizes; except that copper alloy valves and strainers may be used without dielectric fittings, unions or flanges. Water piping sizes 4 inches and smaller shall be copper tubing. Water piping sizes larger than 4 inches shall be copper tubing or steel piping. If steel piping is provided, provide a solids-from-water separator.

2.4.1 Soldered Joint Copper Tubing

Provide ASTM B88, Type L for aboveground piping, Type K for buried piping, with ASME B16.18 or ASME B16.22 solder joint fittings, unions, and flanges; provide adapters as required. Provide ASTM B42 copper pipe nipples with threaded end connections. Provide ASTM B32, 95-5 tin-antimony solder, or provide Plumbing Code approved lead-free solder.

2.4.2 Copper Tubing Piping Systems

Provide copper tubing for the following piping systems, except water piping sizes larger than 4 inches shall be copper tubing or steel piping. Provide manufactured tee for installing flow switches, pressure gauges, thermometers, pressure and temperature ports and similar devices. Sweat or brazed manifolds, T-Drilling and drawn/extruded collars are not permitted to be used.

- a. Chilled water, chilled-hot water, and hot water piping.
- b. Cold drain piping from drain pans.
- c. Fuel oil supply and return piping with ASME B16.26 flared fittings or compression type fittings.

2.4.3 Copper Cold Drain Piping

Provide copper tubing in accordance with paragraph entitled "Copper Tubing" for piping sizes one inch and smaller. Provide ASTM B306 copper tubing and ASME B16.23 solder joint fittings for piping sizes larger than one inch. In lieu of copper tubing, 1.25 inch Schedule 40 polyvinyl chloride (PVC) plastic pipe, fittings, and solvent cement may be provided.

2.4.4 Copper Refrigerant Tubing

Provide [ASTM B280](#), cleaned, dehydrated, and sealed. Provide [ASME B16.22](#) solder joint refrigerant fittings and adapters. Provide silver brazing alloy solder and silver brazing alloy flux. During brazing operations bleed a small amount of dry oil-free nitrogen continuously through the refrigerant tubing. Provide [ASME B16.26](#) flared fittings.

2.4.5 Valves

Valves shall have flanged end connections, except valves smaller than 2.5 inches may have threaded end connections with a union on one side of the valve. Solder end connections may be used for connections between copper alloy valves and copper tubing.

2.4.5.1 Gate Valves

[MSS SP-80](#), Class 125, except sizes 2.5 inches and larger shall conform to [MSS SP-70](#), Class 125.

2.4.5.2 Globe and Angle Valves

[MSS SP-80](#), Class 125, except sizes 2.5 inches and larger shall conform to [MSS SP-85](#), Class 125.

2.4.5.3 Check Valves

[MSS SP-80](#), Class 125, swing check; except sizes 2.5 inches and larger shall conform to [MSS SP-71](#), Class 125.

2.4.5.4 Butterfly Valves

[MSS SP-67](#), except sizes 2.5 inches and larger shall have lugged or wafer body designed for installation between ASME Class 150 flanges. Valves shall have two-position lever handles, except when infinite position lever handles are indicated.

2.4.5.5 Ball Valves

Full port design, copper alloy body, except sizes 2.5 inches and larger shall be cast-iron body. Valves shall have two-position lever handles. Ball valves may be provided in lieu of gate valves.

2.4.5.6 Square Head Cocks

Provide copper alloy or cast-iron body with copper alloy plugs, suitable for 125 psig water working pressure.

2.4.5.7 Air Venting Valves

Provide copper alloy body valves with automatic or manual air vent as indicated.

2.4.5.8 Combination Pressure and Temperature Relief Valves

[ANSI Z21.22/CSA 4.4](#), copper alloy body, automatic reseating, test lever, and discharge capacity based on AGA temperature steam rating.

2.4.5.9 Water Pressure Reducing Valves

ASSE 1003, copper alloy body, automatic reseating, with test lever.

2.4.5.10 Water Temperature Regulating Valves

Provide copper alloy body, direct acting, pilot operated, for the intended service.

2.4.5.11 Backflow Prevention Assemblies

Provide reduced pressure principle type backflow prevention assemblies which are approved by and has a current "Certificate of Approval" from the FCCCHR List. Listing of the particular make, model/design, and size in the current FCCCHR List will be acceptable as the required proof.

2.5 PIPING ACCESSORIES

2.5.1 Pipe Hangers and Supports

Provide MSS SP-58 and MSS SP-69, Type 1 with adjustable type steel support rods, except as specified or indicated otherwise. Attach to steel joists with Type 19 or 23 clamps and retaining straps. Attach to Steel W or S beams with Type 21, 28, 29, or 30 clamps. Attach to steel angles and vertical web steel channels with Type 20 clamp with beam clamp channel adapter. Attach to horizontal web steel channel and wood with drilled hole on centerline and double nut and washer. Attach to concrete with Type 18 insert or drilled expansion anchor. Provide Type 40 insulation protection shield for insulated piping.

2.5.2 Strainers

Pressure and temperature range shall be for the intended service. Provide blowoff outlet with pipe nipple, gate valve, and discharge pipe nipple. Provide stainless steel strainer element with perforations of 0.047 inch for water, 0.031 inch for steam mixed with condensate, and 0.016 inch for steam. Provide copper alloy or cast-iron body strainers in steam and condensate systems up to 100 psig. Provide steel body strainers in steam and condensate systems 100 psig and greater.

2.5.3 Traps

Provide traps of the types indicated with stainless steel internals. Pressure and temperature range shall be for the intended service. Traps for steam at 100 psig and greater shall be minimum of ASME Class 150.

2.5.4 Pressure Gages

Provide single style pressure gage with 4.5-inch dial, brass or aluminum case, bronze tube, gage cock, pressure snubber, and syphon. Provide scale range for intended service.

2.5.5 Thermometers

Provide bi-metal dial type thermometers with stainless steel case, stem, and fixed thread connection; 3 inch diameter dial with glass face gasketed within the case; and accuracy within 2 percent of scale range. Provide scale range for intended service.

2.5.6 Pipe Sleeves

Provide where piping passes entirely through walls, ceilings, roofs, and floors. Secure sleeves in position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, ceilings, roofs, and floors. Provide one-inch minimum clearance between exterior of piping or pipe insulation, and interior of sleeve or core-drilled hole. Firmly pack space with mineral wool insulation. Seal space at both ends of sleeve or core-drilled hole with plastic waterproof cement which will dry to a firm but pliable mass, or provide a mechanically adjustable segmented elastomeric seal. In fire walls and fire floors, seal both ends of sleeves or core-drilled holes with UL listed fill, void, or cavity material.

2.5.6.1 Sleeves in Masonry and Concrete

Provide steel pipe sleeves or schedule 40 PVC plastic pipe sleeves. Sleeves are not required where drain, waste, and vent (DWV) piping passes through concrete floor slabs located on grade. Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in the core-drilled hole are completely grouted smooth.

2.5.6.2 Sleeves not in Masonry and Concrete

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

2.5.7 Flexible Pipe Connectors

Provide flexible bronze or stainless steel piping connectors with single braid where indicated. Connectors shall be suitable for the intended service.

2.5.8 Expansion Tanks

Construct of steel for minimum working pressure of 125 psig. Tank shall be a bladder type expansion tank.

2.5.9 Air Separators

Provide tangential inlet and outlet connections, blowdown connections, and internal perforated stainless steel air collector tube to direct released air to automatic air vent. Construct of steel for minimum working pressure of 125 psig. Design to separate air from water and to direct released air to automatic air vent. Unit shall be of one piece cast-iron construction with internal baffles and two air chambers at top of unit; one air chamber shall have outlet to expansion tank and other air chamber shall be provided with automatic air release device. Unit shall be for minimum working pressure of 125 psig.

2.5.10 Escutcheon Plates

Provide one piece or split hinge metal plates for piping entering floors, walls, and ceilings in exposed spaces. Provide polished stainless steel plates or chromium-plated finish on copper alloy plates in finished spaces. Provide paint finish on metal plates in unfinished spaces.

2.6 ACCESS DOORS FOR VALVES

Provide factory-prefabricated and primed flush face steel access doors

including steel door frame for with continuous hinges and turn-screw-operated latch. Provide door frame installation in plaster and masonry walls. Furnish doors under this section; install doors under appropriate section of this specification.

2.7 PROGRAMMABLE THERMOSTATS

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

- a. Low voltage
- b. Battery backup to maintain programming in the event of power failure
- c. Automatic control of single stage heating and single stage cooling
- d. Minimum 4 temperature settings per day, minimum of separate weekday/weekend day schedule, or 7 day schedules per week
- e. Installation shall include initial programming
- f. Temporary temperature override
- g. Display clock
- h. Display shall prompt for program modifications, or functions of buttons shall be self evident, or instructions shall be permanently mounted on inside of flip down keyboard cover. Thermostat shall be capable of being completely programmed without the use of separate instructions.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 HVAC System

Installation of HVAC system including equipment, materials, installation, workmanship, fabrication, assembly, erection, examination, inspection, and testing shall be in accordance with ASME B31.1, ASME B31.5, NFPA 70, and in accordance with the manufacturer's recommendations.

3.1.2 Connections to Existing Systems

Notify the Contracting Officer in writing at least 15 calendar days prior to the date the connections are required. Obtain approval before interrupting service. Furnish materials required to make connections into existing systems and perform excavating, backfilling, compacting, and other incidental labor as required. Furnish labor and tools for making actual connections to existing systems.

3.2 PIPING

Test, inspect, and approve piping before burying, covering, or concealing. Provide fittings for changes in direction of piping and for connections. Make changes in piping sizes through tapered reducing fittings; bushings will not be permitted. Install valves with stems horizontal or above. Provide flanges or unions at valves, traps, strainers, and connections to

equipment; unions are not required in copper tubing piping systems.

- a. Threaded connections: Provide Teflon pipe thread paste on male threads. Do not thread metal pipe into plastic piping.
- b. Pipe hangers and supports: Provide additional pipe hangers and supports at in-line water pumps and flanged valves.
- c. Piping to receive insulation: Provide temporary wood spacers between the pipe hangers and supports, and the pipe in order to properly slope the piping and establish final elevations. Provide temporary wood spacers of same thickness as insulation to be provided under Section 23 09 00, "Thermal Insulation For Mechanical Systems." Support plastic piping every 4 feet. Support metal piping as follows.

MAXIMUM SPACING (FEET)

Nominal Pipe Size (inches)	One and under	1.25	1.5	2	2.5	3	3.5	4	5	6
Copper Tubing	6	7	8	8	9	10	11	12	13	14
Steel Pipe	7	8	9	10	11	12	13	14	16	17

- d. Cleaning of piping: Keep interior and ends of new piping and existing piping affected by Contractor's operations, cleaned of water and foreign matter during installation by using plugs or other approved methods. When work is not in progress, securely close open ends of pipe and fittings to prevent entry of water and foreign matter. Inspect piping before placing into position.
- e. Demolition: Remove materials so as not to damage materials which are to remain. Replace existing work damaged by Contractor's operations with new work of same construction.
- f. Tee Joints: Extracted tee joints may be made in copper tube. Make joint with an appropriate tool by drilling a pilot hole and drawing out the tube surface to form a collar having a minimum height of three times the thickness of the tube wall. To prevent the branch tube from being inserted beyond the depth of the extracted joint, provide dimpled depth stops. Notch the branch tube for proper penetration into fitting to assure a free flow joint. Braze extracted joints using a copper phosphorous classification brazing filler metal. Soldered joints shall not be permitted.

3.3 FIELD QUALITY CONTROL

3.3.1 Piping Systems Except for Refrigerant Piping

Before insulating, hydrostatically test each new piping system at not less than 188 psig. Maintain pressure for 2 hours with no leakage or reduction in gage pressure. Obtain approval before applying insulation.

3.3.2 Air Ducts

Obtain approval before applying insulation.

3.3.3 Equipment

3.3.3.1 Field Testing

Test each item of equipment in operation for continuous period of not less than 24 hours under every condition of operation in accordance with each equipment manufacturer's recommendation. Verify that the equipment operating parameters are within limits recommended by the manufacturer.

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

<u>Equipment Type</u>	<u>Efficiency</u>	<u>Rating Condition</u>
Air to Air Unitary Air Conditioner (Packaged and Split)		
<65 Mbtu/hr	12.0 SEER	
65-135 Mbtu/hr	11.0 EER 11.4 IPLV	
136-240 Mbtu/hr	10.8 EER 11.2 IPLV	
Air to Air Unitary Heat Pump (Packaged and Split)		
<65 Mbtu/hr	12.0 SEER 7.7 HSPF	
65-135 Mbtu/hr	10.1 EER 10.4 IPLV 3.2 COP	
136-240 Mbut/hr	9.3 EER 9.5 IPLV 3.1 COP	
Air Cooled Water Chiller	1.23 Full Load kW/ton .90 IPLV kW/ton	ARI 550/590-98 ARI 550/590-98
Air Cooled Condensing Units	12.0 SEER 11.0 EER 11.4 IPLV	
Room Air Conditioner (Window, not thru the wall)		
<20,000 btu/hr	10.7 EER	DOE test procedure
=>20,000 btu/hr	9.42 EER	DOE test procedure
Package Terminal F Outdoor	$10 = (.16 \times \text{Cap}/1000) * \text{EER}$	ANSI/AHRI/CSA 310/380 @ 95
Air Conditioner F Outdoor	$12.2 - (.2 \times \text{Cap}/1000) * \text{EER}$	ANSI/AHRI/CSA 310/380 @ 82
Package Terminal F Outdoor	$10 - (.16 \times \text{Cap}/1000) * \text{EER}$	ANSI/AHRI/CSA 310/380 @ 95
Heat Pump F Outdoor	$12.2 - (.2 \times \text{Cap}/1000) * \text{EER}$	ANSI/AHRI/CSA 310/380 @ 82
F Outdoor	$2.9 - (.026 \times \text{Cap}/1000) * \text{COP}$	ANSI/AHRI/CSA 310/380 @ 47

*Capacity is cooling capacity in but/hr. Use 7,000 if cap is less than 7,000, use 15,000 if cap is greater than 15.000.

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

<u>Equipment Type</u>	<u>Efficiency</u>	<u>Rating Condition</u>
Computer Room Air Conditioner	8.9 EER	
Water Source Heat Pump		
Open Loop	16.2 EER	@ 59 F EWT
	3.6 COP	@ 50 F EWT
Closed Loop	14.1 EER	@ 77 F EWT
	3.3 COP	@ 32 F EWT
Oil Fired Heating Boilers		
Water	83% Et	
Steam	83% Et	
Natural Gas Fired Heating Boiler		
Water	80% Et	
Steam		
<2,500,000	79% Et	
=>2,500,000	80% Et	
Direct Vent Gas-Fired Central Furnaces		
<225,000 input	90%	
-- End of Section --		

SECTION 26 20 00

INTERIOR DISTRIBUTION SYSTEM

08/19, CHG 3: 11/21

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 B1 (2013) Standard Specification for Hard-Drawn Copper Wire
- ASTM B8 (2011; R 2017) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
- ASTM D709 (2017) Standard Specification for Laminated Thermosetting Materials

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

- IEEE 81 (2012) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
- IEEE 100 (2000; Archived) The Authoritative Dictionary of IEEE Standards Terms
- IEEE C2 (2023) National Electrical Safety Code

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

- NETA ATS (2021) Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems

NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION (NECA)

- NECA NEIS 1 (2015) Standard for Good Workmanship in Electrical Construction

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- ANSI C80.1 (2020) American National Standard for Electrical Rigid Steel Conduit (ERSC)
- ANSI C80.3 (2020) American National Standard for Electrical Metallic Tubing (EMT)
- ANSI C80.5 (2020) American National Standard for Electrical Rigid Aluminum Conduit

NEMA ICS 6	(1993; R 2016) Industrial Control and Systems: Enclosures
NEMA KS 1	(2013) Enclosed and Miscellaneous Distribution Equipment Switches (600 V Maximum)
NEMA RN 1	(2005; R 2013) Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
NEMA TC 2	(2020) Standard for Electrical Polyvinyl Chloride (PVC) Conduit
NEMA TC 3	(2021) Polyvinyl Chloride (PVC) Fittings for Use With Rigid PVC Conduit and Tubing
NEMA WD 1	(1999; R 2020) Standard for General Color Requirements for Wiring Devices
NEMA WD 6	(2021) Wiring Devices Dimensions Specifications
NEMA Z535.4	(2011; R 2017) Product Safety Signs and Labels

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2023) National Electrical Code
NFPA 70E	(2021) Standard for Electrical Safety in the Workplace

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-607	(2019d) Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
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U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.147	The Control of Hazardous Energy (Lock Out/Tag Out)
29 CFR 1910.303	Electrical, General

UNDERWRITERS LABORATORIES (UL)

UL 1	(2005; Reprint Jan 2020) UL Standard for Safety Flexible Metal Conduit
UL 5	(2016; Reprint Jul 2022) UL Standard for Safety Surface Metal Raceways and Fittings
UL 6	(2022) UL Standard for Safety Electrical Rigid Metal Conduit-Steel
UL 6A	(2008; Reprint Mar 2021) UL Standard for Safety Electrical Rigid Metal Conduit -

	Aluminum, Red Brass, and Stainless Steel
UL 20	(2018; Reprint Jan 2021) UL Standard for Safety General-Use Snap Switches
UL 50	(2015) UL Standard for Safety Enclosures for Electrical Equipment, Non-Environmental Considerations
UL 67	(2018; Reprint Jul 2020) UL Standard for Safety Panelboards
UL 83	(2017; Reprint Mar 2020) UL Standard for Safety Thermoplastic-Insulated Wires and Cables
UL 360	(2013; Reprint Aug 2021) UL Standard for Safety Liquid-Tight Flexible Metal Conduit
UL 467	(2022) UL Standard for Safety Grounding and Bonding Equipment
UL 486A-486B	(2018; Reprint May 2021) UL Standard for Safety Wire Connectors
UL 486C	(2018; Reprint May 2021) UL Standard for Safety Splicing Wire Connectors
UL 489	(2016; Rev 2019) UL Standard for Safety Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
UL 498	(2017) UL Standard for Safety Attachment Plugs and Receptacles
UL 510	(2020) UL Standard for Safety Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape
UL 514A	(2013; Reprint Jun 2022) UL Standard for Safety Metallic Outlet Boxes
UL 514B	(2012; Reprint May 2020) Conduit, Tubing and Cable Fittings
UL 514C	(2014; Reprint Feb 2020) UL Standard for Safety Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL 651	(2011; Reprint May 2022) UL Standard for Safety Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
UL 797	(2007; Reprint Mar 2021) UL Standard for Safety Electrical Metallic Tubing -- Steel
UL 817	(2015; Reprint Sep 2021) UL Standard for Safety Cord Sets and Power-Supply Cords

UL 854	(2020) Standard for Service-Entrance Cables
UL 869A	(2006; Reprint Jun 2020) Reference Standard for Service Equipment
UL 943	(2016; Reprint Feb 2018) UL Standard for Safety Ground-Fault Circuit-Interrupters
UL 1242	(2006; Reprint Apr 2022) UL Standard for Safety Electrical Intermediate Metal Conduit -- Steel
UL 1660	(2019) Liquid-Tight Flexible Nonmetallic Conduit

1.2 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, are as defined in IEEE 100.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification 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

SD-03 Product Data

SD-06 Test Reports

600-volt Wiring Test;

Grounding System Test;

Ground-fault Receptacle Test;

SD-07 Certificates

SD-09 Manufacturer's Field Reports

Transformer Factory Tests

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, "must" 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. Provide equipment, materials, installation, and workmanship in accordance with NFPA 70 unless more stringent requirements are specified or indicated. NECA NEIS 1 shall be considered the minimum standard for workmanship.

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 and:

- a. Have been in satisfactory commercial or industrial use for 2 years prior to bid opening including applications of equipment and materials under similar circumstances and of similar size.
- b. Have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period.
- c. Where two or more items of the same class of equipment are required, provide 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 are not acceptable.

1.5 MAINTENANCE

1.6 WARRANTY

Provide equipment items supported by service organizations that 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

As a minimum, meet requirements of UL, where UL standards are established for those items, and requirements of NFPA 70 for all materials, equipment, and devices.

2.2 CONDUIT AND FITTINGS

Conform to the following:

2.2.1 Rigid Metallic Conduit

2.2.1.1 Rigid, Threaded Zinc-Coated Steel Conduit

ANSI C80.1, UL 6.

2.2.1.2 Rigid Aluminum Conduit

ANSI C80.5, UL 6A.

2.2.2 Rigid Nonmetallic Conduit

PVC Type EPC-40, and EPC-80 in accordance with NEMA TC 2, UL 651.

2.2.3 Intermediate Metal Conduit (IMC)

UL 1242, zinc-coated steel only.

2.2.4 Electrical, Zinc-Coated Steel Metallic Tubing (EMT)

UL 797, ANSI C80.3.

2.2.5 Plastic-Coated Rigid Steel and IMC Conduit

NEMA RN 1, Type 40(40 mils thick).

2.2.6 Flexible Metal Conduit
UL 1, limited to 6 feet.

2.2.6.1 Liquid-Tight Flexible Metal Conduit, Steel

UL 360, limited to 6 feet.

2.2.7 Fittings for Metal Conduit, EMT, and Flexible Metal Conduit

UL 514B. Ferrous fittings: cadmium- or zinc-coated in accordance with UL 514B.

2.2.7.1 Fittings for Rigid Metal Conduit and IMC

Threaded-type. Split couplings unacceptable.

2.2.7.2 Fittings for EMT

Die Cast compression type.

2.2.8 Fittings for Rigid Nonmetallic Conduit

NEMA TC 3 for PVC, and UL 514B.

2.2.9 Liquid-Tight Flexible Nonmetallic Conduit

UL 1660.

2.3 SURFACE RACEWAY

2.3.1 Surface Metal Raceway

UL 5, two-piece painted steel, totally enclosed, snap-cover type. Provide multiple outlet-type raceway with grounding-type receptacle where

indicated. Provide receptacles as specified herein, spaced a minimum of one every 18 inches.

2.4 OUTLET BOXES AND COVERS

UL 514A, cadmium- or zinc-coated, if ferrous metal. UL 514C, if nonmetallic.

2.5 CABINETS, JUNCTION BOXES, AND PULL BOXES

UL 50; volume greater than 100 cubic inches, NEMA Type 1 enclosure; sheet steel, hot-dip, zinc-coated. Where exposed to wet, damp, or corrosive environments, NEMA Type 4X.

2.6 WIRES AND CABLES

Provide wires and cables in accordance applicable requirements of NFPA 70 and UL for type of insulation, jacket, and conductor specified or indicated. Do not use wires and cables manufactured more than 12 months prior to date of delivery to site.

2.6.1 Conductors

Provide the following:

- a. Conductor sizes and capacities shown are based on copper, unless indicated otherwise.
- b. Conductors No. 8 AWG and larger diameter: stranded.
- c. Conductors No. 10 AWG and smaller diameter: solid.
- d. Conductors for remote control, alarm, and signal circuits, classes 1, 2, and 3: stranded unless specifically indicated otherwise.
- e. All conductors: copper.

2.6.1.1 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.

2.6.1.2 Minimum Conductor Sizes

Provide minimum conductor size in accordance with the following:

- a. Branch circuits: No. 12 AWG.
- b. Class 1 remote-control and signal circuits: No. 14 AWG.
- c. Class 2 low-energy, remote-control and signal circuits: No. 16 AWG.
- d. Class 3 low-energy, remote-control, alarm and signal circuits: No. 22 AWG.
- e.

2.6.2 Color Coding

Provide color coding for service, feeder, branch, control, and signaling circuit conductors.

2.6.2.1 Ground and Neutral Conductors

Provide color coding of ground and neutral conductors as follows:

- a. Grounding conductors: Green.
- b. Neutral conductors: White.
- c. Exception, where neutrals of more than one system are installed in same raceway or box, other neutrals color coding: white with a different colored (not green) stripe for each.

2.6.2.2 Ungrounded Conductors

Provide color coding of ungrounded conductors in different voltage systems as follows:

- c. 120/240 volt, single phase: Black and red

2.6.3 Insulation

Unless specified or indicated otherwise or required by [NFPA 70](#), provide power and lighting wires rated for 600-volts, Type THWN/THHN conforming to [UL 83](#), except that grounding wire may be type TW conforming to [UL 83](#); remote-control and signal circuits: Type TW or TF, conforming to [UL 83](#). Where equipment or devices require 90-degree Centigrade (C) conductors, provide only conductors with 90-degree C insulation or better.

2.6.4 Bonding Conductors

[ASTM B1](#), solid bare copper wire for sizes No. 8 AWG and smaller diameter; [ASTM B8](#), Class B, stranded bare copper wire for sizes No. 6 AWG and larger diameter.

2.6.5 Service Entrance Cables

Service Entrance (SE) and Underground Service Entrance (USE) Cables, [UL 854](#).

2.6.6 Cable Tray Cable or Power Limited Tray Cable

UL listed; type TC or PLTC.

2.6.7 Cord Sets and Power-Supply Cords

[UL 817](#).

2.7 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: insulated, pressure-type in accordance with [UL 486A-486B](#) or [UL 486C](#) (twist-on splicing connector). Provide solderless terminal lugs on stranded conductors.

2.8 DEVICE PLATES

Provide the following:

- a. UL listed, one-piece device plates for outlets to suit the devices installed.
- b. For metal outlet boxes, plates on unfinished walls: zinc-coated sheet steel or cast metal having round or beveled edges.
- c. For nonmetallic boxes and fittings, other suitable plates may be provided.
- d. Plates on finished walls: nylon or lexan, minimum 0.03 inch wall thickness and same color as receptacle or toggle switch with which they are mounted.
- e. Plates on finished walls: satin finish stainless steel or brushed-finish aluminum, minimum 0.03 inch thick.
- f. Screws: machine-type with countersunk heads in color to match finish of plate.
- g. Sectional type device plates are not be permitted.
- h. Plates installed in wet locations: gasketed and UL listed for "wet locations."

2.9 SWITCHES

2.9.1 Toggle Switches

NEMA WD 1, UL 20, totally enclosed with bodies of thermoplastic or thermoset plastic and mounting strap with grounding screw. Include the following:

- a. Handles: white thermoplastic.
- b. Wiring terminals: screw-type, side-wired.
- c. Contacts: silver-cadmium and contact arm - one-piece copper alloy.
- d. Switches: rated quiet-type ac only, 120/277 volts, with current rating and number of poles indicated.

2.9.2 Switch with Red Pilot Handle

NEMA WD 1. Provide the following:

- a. Pilot lights that are integrally constructed as a part of the switch's handle.
- b. Pilot light color: red and illuminate whenever the switch is closed or "on".
- c. Pilot lighted switch: rated 20 amps and 120 volts or 277 volts as indicated.
- d. The circuit's neutral conductor to each switch with a pilot light.

2.9.3 Breakers Used as Switches

For 120- and 277-Volt fluorescent fixtures, mark breakers "SWD" in accordance with [UL 489](#).

2.9.4 Disconnect Switches

[NEMA KS 1](#). Provide heavy duty-type switches where indicated, where switches are rated higher than 240 volts, and for double-throw switches. Utilize Class R fuseholders and fuses for fused switches, unless indicated otherwise. Provide horsepower rated for switches serving as the motor-disconnect means. Provide switches in NEMA4X Type 304 stainless steel, enclosure per [NEMA ICS 6](#).

2.10 RECEPTACLES

Provide the following:

- a. [UL 498](#), general purpose specification grade, grounding-type. Residential grade receptacles are not acceptable.
- b. Ratings and configurations: as indicated.
- c. Bodies: white as per [NEMA WD 1](#).
- d. Face and body: thermoplastic supported on a metal mounting strap.
- e. Dimensional requirements: per [NEMA WD 6](#).
- f. Screw-type, side-wired wiring terminals or of the solderless pressure type having suitable conductor-release arrangement.
- g. Grounding pole connected to mounting strap.
- h. The receptacle: containing triple-wipe power contacts and double or triple-wipe ground contacts.

2.10.1 Weatherproof Receptacles

Provide receptacles, UL listed for use in "wet locations" with integral GFCI protection. Include cast metal box with gasketed, hinged, lockable and weatherproof while-in-use, die-cast metal/aluminum cover plate.

2.10.2 Ground-Fault Circuit Interrupter Receptacles

[UL 943](#), duplex type for mounting in standard outlet box. Provide device capable of detecting current leak when the current to ground is 6 milliamperes or higher, and tripping per requirements of [UL 943](#) for Class A ground-fault circuit interrupter devices. Provide screw-type, side-wired wiring terminals or pre-wired (pigtail) leads.

2.10.3 Plugs

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

2.10.4 Dryer Receptacles

NEMA 14-30 configuration, rated 30 amperes, 125/250 volts. Furnish one matching plug with each receptacle.

2.11 PANELBOARDS

Provide panelboards in accordance with the following:

- a. UL 67 and UL 50 having a short-circuit current rating as indicated.
- b. Panelboards for use as service disconnecting means: additionally conform to UL 869A.
- c. Panelboards: circuit breaker-equipped.
- d. Designed such that individual breakers can be removed without disturbing adjacent units or without loosening or removing supplemental insulation supplied as means of obtaining clearances as required by UL.
- e. "Specific breaker placement" is required in panelboards to match the breaker placement indicated in the panelboard schedule on the design drawings. If it is not possible to match "specific breaker placement" during construction, obtain Government approval prior to device installation.
- f. Use of "Subfeed Breakers" is not acceptable.
- g. Main breaker: "separately" mounted "above" branch breakers.
- h. Where "space only" is indicated, make provisions for future installation of breakers.
- i. Directories: indicate load served by each circuit in panelboard.
- j. Directories: indicate source of service to panelboard (e.g., Panel PA served from Panel MDP).
- k. Provide new directories for existing panels modified by this project as indicated.
- l. Type directories and mount in holder behind transparent protective covering.
- m. Panelboards: listed and labeled for their intended use.
- n. Panelboard nameplates: provided as indicated.
 - a. UL 67 and UL 50.
 - b. Panelboards for use as service disconnecting: additionally conform to UL 869A.
 - c. Panelboards: circuit breaker-equipped.
 - d. Designed such that individual breakers can be removed without disturbing adjacent units or without loosening or removing supplemental insulation supplied as means of obtaining clearances as required by UL.

- e. Where "space only" is indicated, make provisions for future installation of breaker sized as indicated.
- f. Directories: indicate load served by each circuit of panelboard.
- g. Directories: indicate source of service (e.g. upstream panel, switchboard, motor control center) to panelboard.
- h. Type directories and mount in holder behind transparent protective covering.

2.11.1 Enclosure

Provide panelboard enclosure in accordance with the following:

- a. [UL 50](#).
- d. Outdoor cabinets: NEMA 4x
- e. Front edges of cabinets: form-flanged or fitted with structural shapes welded or riveted to the sheet steel, for supporting the panelboard front.
- f. All cabinets: fabricated such that no part of any surface on the finished cabinet deviates from a true plane by more than [1/8 inch](#).
- g. Holes: provided in the back of indoor surface-mounted cabinets, with outside spacers and inside stiffeners, for mounting the cabinets with a [1/2 inch](#) clear space between the back of the cabinet and the wall surface.
- h. Flush doors: mounted on hinges that expose only the hinge roll to view when the door is closed.
- i. Each door: fitted with a combined catch and lock latch.
- j. Keys: two provided with each lock, with all locks keyed alike.
- k. Finished-head cap screws: provided for mounting the panelboard fronts on the cabinets.

2.11.2 Panelboard Buses

Support bus bars on bases independent of circuit breakers. Design main buses and back pans so that breakers may be changed without machining, drilling, or tapping. Provide isolated neutral bus in each panel for connection of circuit neutral conductors. Provide separate ground bus identified as equipment grounding bus per [UL 67](#) for connecting grounding conductors; bond to steel cabinet.

2.11.3 [Circuit Breakers](#)

[UL 489](#), thermal magnetic-type having a minimum short-circuit current rating equal to the short-circuit current rating of the panelboard in which the circuit breaker will be mounted. Breaker terminals: UL listed as suitable for type of conductor provided. Series rated circuit breakers and plug-in

circuit breakers are unacceptable.

2.11.3.1 Multipole Breakers

Provide common trip-type with single operating handle. Design breaker such that overload in one pole automatically causes all poles to open. Maintain phase sequence throughout each panel so that any three adjacent breaker poles are connected to Phases A, B, and C, respectively.

2.11.3.2 Circuit Breaker With Ground-Fault Circuit Interrupter

[UL 943](#) and [NFPA 70](#). Provide with auto-monitoring (self-test) and lockout features, "push-to-test" button, visible indication of tripped condition, and ability to detect and trip when current imbalance is 6 milliamperes or higher per requirements of [UL 943](#) for Class A ground-fault circuit interrupter devices.

2.12 LOCKOUT REQUIREMENTS

Provide circuit breakers, disconnecting means, and other devices that are electrical energy-isolating 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](#), [NFPA 70E](#) and [29 CFR 1910.303](#). Comply with requirements of Division 23, "Mechanical" for mechanical isolation of machines and other equipment.

2.13 GROUNDING AND BONDING EQUIPMENT

2.13.1 Ground Rods

[UL 467](#). Ground rods: cone pointed solid copper, with minimum diameter of [3/4 inch](#) and minimum length [10 feet](#). Sectional type rods may be used for rods 20 feet or longer.

2.13.2 Ground Bus

Copper ground bus: provided in the electrical equipment rooms as indicated.

2.13.3 [Secondary Bonding Busbar](#)

Provide corrosion-resistant grounding busbar suitable for indoor installation in accordance with [TIA-607](#). Busbars: plated for reduced contact resistance. If not plated, clean the busbar prior to fastening the conductors to the busbar and apply an anti-oxidant to the contact area to control corrosion and reduce contact resistance. Provide a Primary bonding busbar (PBB) in the telecommunications entrance facility[and a Secondary bonding busbar (SBB) in all other telecommunications rooms and equipment rooms]. The Primary bonding busbar (PBB)[and the Secondary bonding busbar (SBB)]: sized in accordance with the immediate application requirements and with consideration of future growth. Provide Secondary bonding busbars with the following:

- a. Predrilled copper busbar provided with holes for use with standard sized lugs,
- b. Minimum dimensions of [0.25 in](#) thick by [4 in](#) wide for the PBB[and [2 in](#) wide for SBBs] with length as indicated;
- c. Listed by a nationally recognized testing laboratory.

2.14 MANUFACTURER'S NAMEPLATE

Provide on each item of equipment 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.

2.15 FIELD FABRICATED NAMEPLATES

Provide field fabricated nameplates in accordance with the following:

- a. **ASTM D709**.
- b. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified or as indicated on the drawings.
- c. Each nameplate inscription: identify the function and, when applicable, the position.
- d. Nameplates: melamine plastic, **0.125 inch** thick, white with black center core.
- f. Surface: matte finish. Corners: square. Accurately align lettering and engrave into the core.
- g. Minimum size of nameplates: **one by 2.5 inches**.
- h. Lettering size and style: a minimum of **0.25 inch** high normal block style.

2.16 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. Provide marking that is clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

PART 3 EXECUTION

3.1 INSTALLATION

Electrical installations, including weatherproof and hazardous locations and ducts, plenums and other air-handling spaces: conform to requirements of **NFPA 70** and **IEEE C2** and to requirements specified herein.

3.1.1 Underground Service

Underground service conductors and associated conduit: continuous from service entrance equipment to outdoor power system connection.

3.1.2 Overhead Service

Overhead service conductors into buildings: terminate at service entrance

fittings or weatherhead outside building. Overhead service conductors and support bracket for overhead conductors are included in Section 33 71 01 OVERHEAD TRANSMISSION AND DISTRIBUTION.

3.1.3 Hazardous Locations

Perform work in hazardous locations, as defined by NFPA 70, 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. Provide conduit with tapered threads.

3.1.4 Service Entrance Identification

Service entrance disconnect devices, switches, and enclosures: labeled and identified as such.

3.1.4.1 Labels

Wherever work results in service entrance disconnect devices in more than one enclosure, as permitted by NFPA 70, label each enclosure, new and existing, as one of several enclosures containing service entrance disconnect devices. Label, at minimum: indicate number of service disconnect devices housed by enclosure and indicate total number of enclosures that contain service disconnect devices. Provide laminated plastic labels conforming to paragraph FIELD FABRICATED NAMEPLATES. Use lettering of at least 0.25 inch in height, and engrave on black-on-white matte finish. Service entrance disconnect devices in more than one enclosure: provided only as permitted by NFPA 70.

3.1.5 Wiring Methods

Provide insulated conductors installed in rigid steel conduit, IMC, rigid nonmetallic conduit, or EMT, except where specifically indicated or specified otherwise or required by NFPA 70 to be installed otherwise. Grounding conductor: separate from electrical system neutral conductor. Provide insulated green equipment grounding conductor for circuit(s) installed in conduit and raceways. Minimum conduit size: 1/2 inch in diameter for low voltage lighting and power circuits. Vertical distribution in multiple story buildings: made with metal conduit in fire-rated shafts, with metal conduit extending through shafts for minimum distance of 6 inches. Firestop conduit which penetrates fire-rated walls, fire-rated partitions, or fire-rated floors

3.1.5.1 Pull Wire

Install pull wires in empty conduits. Pull wire: plastic having minimum 200-pound force tensile strength. Leave minimum 36 inches of slack at each end of pull wire.

3.1.6 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.

3.1.6.1 Restrictions Applicable to Aluminum Conduit

- a. Do not install underground or encase in concrete or masonry.
- b. Do not use brass or bronze fittings.
- c. Do not use when the enclosed conductors must be shielded from the effects of High-altitude Electromagnetic Pulse (HEMP).

3.1.6.2 Restrictions Applicable to EMT

- a. Do not install underground.
- b. Do not encase in concrete, mortar, grout, or other cementitious materials.
- c. Do not use in areas subject to physical damage including but not limited to equipment rooms where moving or replacing equipment could physically damage the EMT.
- d. Do not use in hazardous areas.
- e. Do not use outdoors.
- f. Do not use in fire pump rooms.
- g. Do not use when the enclosed conductors must be shielded from the effects of High-altitude Electromagnetic Pulse (HEMP).

3.1.6.3 Restrictions Applicable to Nonmetallic Conduit

- a. PVC Schedule 40.
 - (1) Do not use where subject to physical damage, including but not limited to, mechanical equipment rooms, electrical equipment rooms, fire pump rooms, and where restrictions are applying to both PVC Schedule 40 and PVC Schedule 80.
 - (2) Do not use above grade, except where allowed in this section for rising through floor slab or indicated otherwise.
- b. PVC Schedule 40 and Schedule 80.
 - (1) Do not use where subject to physical damage, including but not limited to, hospitals, power plant, missile magazines, and other such areas.
 - (2) Do not use in hazardous (classified) areas.
 - (3) Do not use in penetrating fire-rated walls or partitions, or fire-rated floors.

-

3.1.6.4 Underground Conduit

Plastic-coated rigid steel; plastic-coated steel IMC; PVC, Type EPC-40
Plastic coating: extend minimum 6 inches above floor.

3.1.6.5 Conduit Support

Support conduit by pipe straps, wall brackets, threaded rod conduit hangers, or ceiling trapeze. Plastic cable ties are not acceptable. Fasten by wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; and by machine screws, welded threaded studs, or spring-tension clamps on steel work. Threaded C-clamps may be used on rigid steel conduit only. Do not weld conduits or pipe straps to steel structures. Do not exceed one-fourth proof test load for load applied to fasteners. Provide vibration resistant and shock-resistant fasteners attached to concrete ceiling. Do not cut main reinforcing bars for any holes cut to depth of more than 1 1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete joints. Fill unused holes. In partitions of light steel construction, use sheet metal screws. In suspended-ceiling construction, run conduit above ceiling. Do not support conduit by ceiling support system. Conduit and box systems: supported independently of both (a) tie wires supporting ceiling grid system, and (b) ceiling grid system into which ceiling panels are placed. Do not share supporting means between electrical raceways and mechanical piping or ducts. Coordinate installation with above-ceiling mechanical systems to assure maximum accessibility to all systems. Spring-steel fasteners may be used for lighting branch circuit conduit supports in suspended ceilings in dry locations. [Support exposed risers in wire shafts of multistory buildings by U-clamp hangers at each floor level and at 10 foot maximum intervals.] Where conduit crosses building expansion joints, provide suitable [watertight] expansion fitting that maintains conduit electrical continuity by bonding jumpers or other means. For conduits greater than 2 1/2 inches inside diameter, provide supports to resist forces of 0.5 times the equipment weight in any direction and 1.5 times the equipment weight in the downward direction.

3.1.6.6 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.

3.1.6.7 Locknuts and Bushings

Fasten conduits to sheet metal boxes and cabinets with two locknuts where required by NFPA 70, where insulated bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, use at least minimum single locknut and bushing. Provide locknuts with sharp edges for digging into wall of metal enclosures. Install bushings on ends of conduits, and provide insulating type where required by NFPA 70.

3.1.6.8 Flexible Connections

Provide flexible steel conduit between 3 and 6 feet in length for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for motors. Install flexible conduit to allow 20 percent slack. Minimum flexible steel conduit size: 1/2 inch diameter. Provide liquid tight flexible nonmetallic conduit in wet and damp locations for equipment subject to vibration, noise transmission, movement or motors. Provide separate ground conductor across flexible connections. Plastic cable ties are not acceptable as a support method.

3.1.7 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: cast-metal, hub-type when located in wet locations, when surface mounted on outside of exterior surfaces, when surface mounted on interior walls exposed up to 7 feet above floors and walkways, and when specifically indicated. Boxes in other locations: sheet steel, except that aluminum boxes may be used with aluminum conduit, and nonmetallic boxes may be used with nonmetallic conduit system. Provide each box with volume required by NFPA 70 for number of conductors enclosed in box. Boxes for mounting lighting fixtures: minimum 4 inches square, or octagonal, except that smaller boxes may be installed as required by fixture configurations, as approved. Boxes for use in masonry-block or tile walls: square-cornered, tile-type, or standard boxes having square-cornered, tile-type covers. Provide gaskets for cast-metal boxes installed in wet locations and boxes installed flush with outside of exterior surfaces. Provide separate boxes for flush or recessed fixtures when required by fixture terminal operating temperature; provide readily removable fixtures for access to boxes unless ceiling access panels are provided. Support boxes and pendants for surface-mounted fixtures on suspended ceilings independently of ceiling supports. Fasten boxes and supports with wood screws on wood, with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel. In open overhead spaces, cast boxes threaded to raceways need not be separately supported except where used for fixture support; support sheet metal boxes directly from building structure or by bar hangers. Where bar hangers are used, attach bar to raceways on opposite sides of box, and support raceway with approved-type fastener maximum 24 inches from box. When penetrating reinforced concrete members, avoid cutting reinforcing steel.

3.1.7.1 Boxes

Boxes for use with raceway systems: minimum 1 1/2 inches deep, except where shallower boxes required by structural conditions are approved. Boxes for other than lighting fixture outlets: 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.

3.1.7.2 Pull Boxes

Construct of at least minimum size required by NFPA 70 except where cast-metal boxes are required in locations specified herein. Provide boxes with screw-fastened covers. Where several feeders pass through common pull box, tag feeders to indicate clearly electrical characteristics, circuit number, and panel designation.

3.1.8 Mounting Heights

Mount panelboards, enclosed circuit breakers, motor controller and disconnecting switches so height of center of grip of the operating handle of the switch or circuit breaker at its highest position is maximum 79 inches above floor or working platform or as allowed in Section 404.8 per NFPA 70. Mount lighting switches 48 inches above finished floor. Mount receptacles 18 inches above finished floor, unless otherwise indicated. Mount other devices as indicated. Measure mounting heights of wiring devices and outlets to center of device or outlet.

3.1.9 Nonmetallic Sheathed Cable Installation

Where possible, install cables concealed behind ceiling or wall finish. Thread cables through holes bored on approximate centerline of wood members; notching of end surfaces is not permitted. Provide sleeves through concrete or masonry for threading cables. Install exposed cables parallel to or at right angles to walls or structural members. Protect exposed nonmetallic sheathed cables less than 4 feet above floors from mechanical injury by installation in conduit or tubing. When cable is used in metal stud construction, insert plastic stud grommets in studs at each point through which cable passes, prior to installation of cable.

]3.1.10 Splices

Make splices in accessible locations. Make splices in conductors No. 10 AWG and smaller diameter with insulated, pressure-type connector. Make splices in conductors No. 8 AWG and larger diameter with solderless connector, and cover with insulation material equivalent to conductor insulation.

3.1.10.1 Splices of Aluminum Conductors

Make with solderless circumferential compression-type, aluminum-bodied connectors UL listed for AL/CU. Remove surface oxides from aluminum conductors by wire brushing and immediately apply oxide-inhibiting joint compound and insert in connector. After joint is made, wipe away excess joint compound, and insulate splice.

[3.1.11 Terminating Aluminum Conductors

3.1.11.1 Termination to Copper Bus

Terminate aluminum conductors to copper bus either by: (a) inline splicing a copper pigtail, of ampacity at least that of aluminum conductor, or (b) utilizing circumferential, compression-type, aluminum-bodied terminal lug UL listed for AL/CU, and steel Belleville cadmium-plated hardened steel spring washers, flat washers, bolts, and nuts. Carefully install Belleville spring washers with crown up toward nut or bolt head, with concave side of Belleville bearing on heavy-duty, wide series flat washer of larger diameter than Belleville. Tighten nuts sufficiently to flatten Belleville, and leave in position. Lubricate hardware with joint compound prior to making connection. Wire brush and apply joint compound to conductor prior to inserting in lug.

3.1.11.2 Termination to Aluminum Bus

Terminate aluminum conductors to aluminum bus by using aluminum nuts, bolts, washers, and compression lugs. Wire brush and apply joint compound to conductor prior to inserting in lug. Lubricate hardware with joint compound prior to making connection. When bus contact surface is unplated, scratch-brush and coat with joint compound, without grit.

]3.1.12 Covers and Device Plates

Install with edges in continuous contact with finished wall surfaces without use of mats or similar devices. Plaster fillings are not permitted. Install plates with alignment tolerance of 1/16 inch. Use of sectional-type device plates are not permitted. Provide gasket for plates

installed in wet locations.

3.1.13 Electrical Penetrations

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

3.1.14 Grounding and Bonding

Provide in accordance with **NFPA 70**. Ground exposed, non-current-carrying metallic parts of electrical equipment, access flooring support system, metallic raceway systems, grounding conductor in metallic and nonmetallic raceways, telecommunications system grounds, and neutral conductor of wiring systems. Make ground connection at main service equipment, and extend grounding conductor to point of entrance of metallic water service. Make connection to water pipe by suitable ground clamp or lug connection to plugged tee. If flanged pipes are encountered, make connection with lug bolted to street side of flanged connection. Supplement metallic water service grounding system with additional made electrode in compliance with **NFPA 70**. Make ground connection to driven ground rods on exterior of building. Bond additional driven rods together with a minimum of 4 AWG soft bare copper wire buried to a depth of at least 12 inches. Interconnect all grounding media in or on the structure to provide a common ground potential. This includes lightning protection, electrical service, telecommunications system grounds, as well as underground metallic piping systems. Make interconnection to the gas line on the customer's side of the meter. Use main size lightning conductors for interconnecting these grounding systems to the lightning protection system. In addition to the requirements specified herein, provide telecommunications grounding in accordance with **TIA-607**. Where ground fault protection is employed, ensure that connection of ground and neutral does not interfere with correct operation of fault protection.

3.1.14.1 Ground Rods

Provide ground rods and measure the resistance to ground using the fall-of-potential method described in **IEEE 81**. Do not exceed 25 ohms under normally dry conditions for the maximum resistance of a driven ground. If this resistance cannot be obtained with a single rod, additional rods, spaced on center. Spacing for additional rods must be a minimum of 10 feet 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.

3.1.14.2 Grounding Connections

Make grounding connections which are buried or otherwise normally inaccessible, by exothermic weld or high 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 high compression connections using a hydraulic or electric compression tool to provide the correct circumferential pressure. Provide tools and dies as recommended by the manufacturer. Use an embossing die code or other standard method to provide visible

indication that a connector has been adequately compressed on the ground wire.

3.1.14.3 Ground Bus

Provide a copper ground bus in the electrical equipment rooms as indicated. Noncurrent-carrying metal parts of equipment: effectively grounded by bonding to the ground bus. Bond the ground bus to both the entrance ground, and to a ground rod or rods as specified above having the upper ends terminating approximately 4 inches above the floor. Make connections and splices of the brazed, welded, bolted, or pressure-connector type, except use pressure connectors or bolted connections for connections to removable equipment.

3.1.15 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 and are provided under the section specifying the associated equipment.

3.1.16 Government-Furnished Equipment

Contractor[rough-in for Government-furnished equipment][make connections to Government-furnished equipment] to make equipment operate as intended, including providing miscellaneous items such as plugs, receptacles, wire, cable, conduit, flexible conduit, and outlet boxes or fittings.

3.1.17 Repair of Existing Work

Perform repair of existing work, demolition, and modification of existing electrical distribution systems as follows:

3.1.17.1 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.

3.1.17.2 Existing Concealed Wiring to be Removed

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

3.1.17.3 Removal of Existing Electrical Distribution System

Removal of existing electrical distribution system equipment includes equipment's associated wiring, including conductors, cables, exposed conduit, surface metal raceways, boxes, and fittings, back to equipment's power source as indicated.

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 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[s]. Where applicable, test electrical equipment in accordance with [NETA ATS](#).

3.4.1 Devices Subject to Manual Operation

Operate each device subject to manual operation at least five times, demonstrating satisfactory operation each time.

3.4.2 600-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 1,000 volts DC for 600 volt rated wiring and 500 volts DC for 300 volt rated wiring per [NETA ATS](#) to provide direct reading of resistance. All existing wiring to be reused must also be tested.

3.4.3 Ground-Fault Receptacle Test

Test ground-fault receptacles with a "load" (such as a plug in light) to verify that the "line" and "load" leads are not reversed. Press the TEST button and then the RESET button to verify by LED status that the device is a self-test model as specified in [UL 943](#).

3.4.4 Grounding System Test

Test grounding system to ensure continuity, and that resistance to ground is not excessive. Test each ground rod for resistance to ground before making connections to rod; tie grounding system together and test for resistance to ground. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall. Submit written results of each test to Contracting Officer, and indicate location of rods as well as resistance and soil conditions at time measurements were made.

[] -- End of Section --

SECTION 26 51 00

INTERIOR LIGHTING
05/20, CHG 2: 11/21

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 A580/A580M | (2018) Standard Specification for Stainless Steel Wire |
| ASTM A641/A641M | (2019) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire |
| ASTM A653/A653M | (2022) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process |
| ASTM A1008/A1008M | (2021a) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable |
| ASTM B164 | (2003; R 2014) Standard Specification for Nickel-Copper Alloy Rod, Bar, and Wire |
| ASTM B633 | (2019) Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel |

EUROPEAN UNION (EU)

- | | |
|----------------------|------------------------------------------------------------------------------------------------------|
| Directive 2011/65/EU | (2011) Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment |
|----------------------|------------------------------------------------------------------------------------------------------|

ILLUMINATING ENGINEERING SOCIETY (IES)

- | | |
|----------------|-----------------------------------------------------------------------------------------------------------|
| ANSI/IES LM-79 | (2019) Approved Method: Electrical and Photometric Measurements of Solid State Lighting Products |
| ANSI/IES LM-80 | (2020) Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules |
| ANSI/IES LS-1 | (2020) Lighting Science: Nomenclature and Definitions for Illuminating Engineering |

- ANSI/IES TM-15 (2020) Technical Memorandum: Luminaire Classification System for Outdoor Luminaires
- ANSI/IES TM-21 (2021) Technical Memorandum: Projecting Long-Term Luminous, Photon, and Radiant Flux Maintenance of LED Light Sources
- ANSI/IES TM-30 (2020) Technical Memorandum: IES Method for Evaluating Light Source Color Rendition
- IES Lighting Library IES Lighting Library

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

- IEEE 100 (2000; Archived) The Authoritative Dictionary of IEEE Standards Terms
- IEEE C2 (2023) National Electrical Safety Code

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- ANSI C78.54 (2019) Specification Sheet for Tubular Fluorescent Replacement and Retrofit LED Lamps
- NEMA 250 (2020) Enclosures for Electrical Equipment (1000 Volts Maximum)
- NEMA ANSLG C78.377 (2017) Electric Lamps— Specifications for the Chromaticity of Solid State Lighting Products
- NEMA C82.77-10 (2020) Harmonic Emission Limits - Related Power Quality Requirements
- NEMA SSL 1 (2016) Electronic Drivers for LED Devices, Arrays, or Systems
- NEMA SSL 3 (2011) High-Power White LED Binning for General Illumination

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 70 (2023) National Electrical Code
- NFPA 101 (2021; TIA 21-1) Life Safety Code

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

- 47 CFR 15 Radio Frequency Devices

UNDERWRITERS LABORATORIES (UL)

- UL 1598 (2021; Reprint Jun 2021) Luminaires
- UL 1993 (2017) Self-Ballasted Lamps and Lamp Adapters

UL 8750

(2015; Reprint Sep 2021) UL Standard for
Safety Light Emitting Diode (LED)
Equipment for Use in Lighting Products

1.2 DEFINITIONS

- a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications and on the drawings, must be as defined in IEEE 100 and ANSI/IES LS-1.
- b. For LED luminaire light sources, "Useful Life" is the operating hours before reaching 70 percent of the initial rated lumen output (L70) with no catastrophic failures under normal operating conditions. This is also known as 70 percent "Rated Lumen Maintenance Life" as defined in ANSI/IES LM-80.
- c. For LED luminaires, "Luminaire Efficacy" (LE) is the appropriate measure of energy efficiency, measured in lumens/watt. This is gathered from LM-79 data for the luminaire, in which absolute photometry is used to measure the lumen output of the luminaire as one entity, not the source separately and then the source and housing together.
- d. Total harmonic distortion (THD) is the root mean square (RMS) of all the harmonic components divided by the total fundamental current.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

SD-03 Product Data

Luminaires;

Luminaire Warranty;

Switches;

Occupancy/Vacancy Sensors;

Photosensors;

SD-05 Design Data

SD-06 Test Reports

ANSI/IES LM-79 Test Report;

ANSI/IES LM-80 Test Report;

ANSI/IES TM-21 Test Report;

ANSI/IES TM-30 Test Report;

Occupancy/Vacancy Sensor Verification Test;

Photosensor Verification Test;

SD-07 Certificates

SD-10 Operation and Maintenance Data

Lighting System, Data Package 5;

1.4 QUALITY ASSURANCE

Data, drawings, and reports must employ the terminology, classifications and methods prescribed by the [IES Lighting Library](#) as applicable, for the lighting system specified.

1.4.1 Luminaire Drawings

Include dimensions, accessories installation details, and construction details. Photometric data, including CRI, CCT, LED driver type, zonal lumen data, and candlepower distribution data must accompany shop drawings.

1.4.2 Luminaire Design Data

- a. Provide safety certification and file number for the luminaire family that must be listed, labeled, or identified in accordance with the [NFPA 70](#). Applicable testing bodies are determined by the US Occupational Safety Health Administration (OSHA) as Nationally Recognized Testing Laboratories (NRTL) and include: CSA (Canadian Standards Association), ETL (Edison Testing Laboratory), and UL (Underwriters Laboratories).
- b. Provide long term lumen maintenance projections for each LED luminaire in accordance with [ANSI/IES TM-21](#). Data used for projections must be obtained from testing in accordance with [ANSI/IES LM-80](#).

1.4.3 [ANSI/IES LM-79 Test Report](#)

Submit test report on manufacturer's standard production model of specified luminaire. Testing must be performed at the same operating drive current as specified luminaire. Include all applicable and required data in IES format as outlined under "14.0 Test Report" in [ANSI/IES LM-79](#).

1.4.4 [ANSI/IES LM-80 Test Report](#)

Submit report on manufacturer's standard production LED light source (package, array, or module) of specified luminaire. Testing must be performed at the same operating drive current as specified luminaire. Include all applicable and required data as outlined under "8.0 Test Report" in [ANSI/IES LM-80](#).

1.4.5 [ANSI/IES TM-21 Test Report](#)

Submit test report on manufacturer's standard production LED light source (package, array, or module) of specified luminaire. Testing must be performed at the same operating drive current as specified luminaire. Include all applicable and required data, as well as required interpolation information as outlined under "7.0 Report" in [ANSI/IES TM-21](#).

1.4.6 ANSI/IES TM-30 Test Report

Submit color vector graphic in accordance with ANSI/IES TM-30 on manufacturer's standard production LED light source (package, array, or module) of specified luminaire. Include spectral distribution of test LED light source.

1.4.7 Occupancy/Vacancy Sensor Coverage Layout

Provide floor plans showing coverage layouts of all devices using manufacturer's product information.

1.4.8 Test Laboratories

Test laboratories for the ANSI/IES LM-79 and ANSI/IES LM-80 test reports must be one of the following:

- a. National Voluntary Laboratory Accreditation Program (NVLAP) accredited for solid-state lighting testing as part of the Energy-Efficient Lighting Products laboratory accreditation program for both LM-79 and LM-80 testing.
- b. One of the qualified labs listed on the Department of Energy - LED Lighting Facts Approved Testing Laboratories List for LM-79 testing.
- c. One of the EPA-Recognized Laboratories listed for LM-80 testing.

1.4.9 Regulatory Requirements

Equipment, materials, installation, and workmanship must be in accordance with the mandatory and advisory provisions of NFPA 70, unless more stringent requirements are specified or indicated. Provide luminaires and assembled components that are approved by and bear the label of UL for the applicable location and conditions unless otherwise specified.

1.4.10 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 must have been in satisfactory commercial or industrial use for six months prior to bid opening. The six-month period must include applications of equipment and materials under similar circumstances and of similar size. The product must have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the six-month period. Where two or more items of the same class of equipment are required, these items must 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.

1.4.10.1 Alternative Qualifications

Products having less than a six-month 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.

1.4.10.2 Material and Equipment Manufacturing Date

Do not use products manufactured more than six months prior to date of delivery to site, unless specified otherwise.

1.5 WARRANTY

Support all equipment items 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.

1.5.1 Luminaire Warranty

Provide and transfer to the government the original LED luminaire manufacturers standard commercial warranty for each different luminaire manufacturer used in the project.

- a. Provide a written five year minimum replacement warranty for material, luminaire finish, and workmanship. Provide written warranty document that contains all warranty processing information needed, including customer service point of contact, whether or not a return authorization number is required, return shipping information, and closest return location to the luminaire location.
 - (1) Finish warranty must include failure and substantial deterioration such as blistering, cracking, peeling, chalking, or fading.
 - (2) Material warranty must include:
 - (a) All LED drivers and integral control equipment.
 - (b) Replacement when more than 15 percent of LED sources in any lightbar or subassembly(s) are defective, non-starting, or operating below 70 percent of specified lumen output.
- b. Warranty period must begin in accordance with the manufacturer's standard warranty starting date.
- c. Provide replacements that are promptly shipped, without charge, to the using Government facility point of contact and that are identical to or an improvement upon the original equipment. All replacements must include testing of new components and assembly.

PART 2 PRODUCTS

2.1 PRODUCT COORDINATION

2.2 LUMINAIRES

UL 1598, NEMA C82.77-10. Provide luminaires as indicated in the luminaire schedule and NL plates or details on project plans, complete with light source, wattage, and lumen output indicated. All luminaires of the same type must be provided by the same manufacturer. Luminaires must be specifically designed for use with the driver and light source provided.

2.2.1 Luminaires

UL 8750, ANSI/IES LM-79, ANSI/IES LM-80. For all luminaires, provide:

- a. Complete system with LED drivers and light sources.
- b. Housings constructed of non-corrosive materials. All new aluminum housings must be anodized or powder-coated. All new steel housings must be treated to be corrosion resistant.
- c. ANSI/IES TM-21, ANSI/IES LM-80. Minimum L70 lumen maintenance value of 50,000 hours unless otherwise indicated in the luminaire schedule. Luminaire drive current value must be identical to that provided by test data for luminaire in question.
- d. Minimum efficacy as specified in the luminaire schedule. Theoretical models of initial lamp lumens per watt are not acceptable. If efficacy values are not listed in the luminaire schedule, provide luminaires that meet the following minimum values:

Luminaire Style	Minimum Luminaire Efficacy
Recessed 1 by 4, 2 by 4, and 2 by 2	100 LPW
Recessed Downlight (fixed, adjustable, wallwash)	80 LPW
Linear, Accent (undercabinet, cove)	45 LPW
Linear, Ambient (indirect wall mount, linear pendent)	100 LPW
High Bay, Low Bay, and Industrial Locations	100 LPW
Food Service and Hazardous Locations	60 LPW
Other (track, residential diffusers)	50 LPW
Exterior Wall Sconce	50 LPW
Steplight	30 LPW
Parking Garage Luminaire	100 LPW

- e. UL listed for dry or damp location typical of interior installations. Any luminaire mounted on the exterior of the building must be UL listed for wet location typical of exterior installations.
- f. LED driver and light source package, array, or module are accessible for service or replacement without removal or destruction of luminaire.
- g. Lenses constructed of heat tempered borosilicate glass, UV-resistant acrylic, or silicone. Sandblasting, etching and polishing must be performed as indicated in the luminaire description.
- h. ANSI/IES TM-15. Provide exterior building-mounted luminaires that do not exceed the BUG ratings as listed in the luminaire schedule. If BUG ratings are not listed in the luminaire schedule, provide luminaires that meet the following minimum values for each application and mounting conditions:

Lighting Application	Mounting Conditions	BUG Rating
Exterior Wall Sconce	Above 4 feet AFF	B1-U0-G2
Exterior Wall Sconce	Below or at 4 feet AFF	B4-U0-G4
Steplight	Above 4 feet AFF	B1-U1-G2
Steplight	Below or at 4 feet AFF	B4-U1-G4
Parking Garage Luminaire	Ceiling mounted	B4-U4-G3

- i. For all recessed luminaires that are identified to be in contact with insulation, provide luminaires that are IC-rated.
- j. For all recessed luminaires that are to be installed in air plenums, require housings that are Chicago Plenum rated.

2.3 LIGHT SOURCES

NEMA ANSLG C78.377, NEMA SSL 3. Provide type, delivered lumen output, and wattage as indicated in the luminaire schedule on project plans.

2.3.1 LED Light Sources

Provide LED light sources that meet the following requirements:

- a. **NEMA ANSLG C78.377.** Emit white light and have a nominal CCT of 3500 Kelvin.
- b. Minimum Color Rendering Index (CRI) of 90.
- c. **Directive 2011/65/EU.** Restriction of Hazardous Substances (RoHS) compliant.
- d. Light source color consistency by utilizing a binning tolerance within a 3-step McAdam ellipse.

2.3.1.1 Linear LED Lamps

Provide linear LED Lamps that are compatible with existing instant-start or programmed-start ballasts, and meet the following additional requirements:

- a. **UL 1993** UL Type A linear LED lamp.
- b. Power Factor greater than or equal to 0.90 at full input power and across specified dimming range.
- c. Maximum Total Harmonic Distortion (THD) less than or equal to 20 percent at full input power and across specified dimming range.
- d. Lumen per watt efficacy no less than 120.
- e. Minimum beam angle of 270 degrees.
- f. Lamp datasheet complies with **ANSI C78.54**. Manufacturer must provide list of all ballasts that are compatible for use with lamp.

2.4 LED DRIVERS

NEMA SSL 1, UL 8750. Provide LED drivers that are electronic, UL Class 1 or Class 2, constant-current type and that comply with the following requirements:

- a. The combined driver and LED light source system does not exceed the minimum luminaire efficacy values as listed in the luminaire schedule provided.
- b. Operates at a voltage of 120 volts at 50/60 hertz, with input voltage fluctuations of plus/minus 10 percent.
- c. Power Factor (PF) greater than or equal to 0.90 at full input power and across specified dimming range.
- d. Maximum Total Harmonic Distortion (THD) less than 20 percent at full input power and across specified dimming range.
- e. Operates for at least 50,000 hours at maximum case temperature and 90 percent non-condensing relative humidity.
- f. Withstands Category A surges of 2 kV without impairment of performance. Provide surge protection that is integral to the driver.
- g. Integral thermal protection that reduces the output power to protect the driver and light source from damage if the case temperature approaches or exceeds the driver's maximum operating temperature.
- h. **47 CFR 15.** Complies with the requirements of the Federal Communications Commission (FCC) rules and regulations, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).
- i. Class A sound rating.
- j. **Directive 2011/65/EU.** Restriction of Hazardous Substances (RoHS) compliant.
- k. Provide dimming capability as indicated in the luminaire schedule on project plans.

2.5 LUMINAIRE MOUNTING ACCESSORIES

2.5.1 Recess and Surface Mounted Luminaires

Provide access to light source and LED driver from bottom of luminaire. Provide trim and lenses for the exposed surface of flush-mounted luminaires as indicated on project drawings and specifications. Luminaires recessed in ceilings which have a fire resistive rating of one hour or more must be enclosed in a box which has a fire resistive rating equal to that of the ceiling. For surface mounted luminaires with brackets, provide flanged metal stem attached to outlet box, with threaded end suitable for supporting the luminaire rigidly in design position. Flanged part of luminaire stud must be of broad base type, secured to outlet box at not fewer than three points.

2.5.2 Luminaire Support Hardware

2.5.2.1 Wire

ASTM A641/A641M. Galvanized, soft tempered steel, minimum 0.11 inches in diameter, or galvanized, braided steel, minimum 0.08 inches in diameter.

2.5.2.2 Wire for Humid Spaces

ASTM A580/A580M. Composition 302 or 304, annealed stainless steel, minimum 0.11 inches in diameter.

ASTM B164. UNS NO4400, annealed nickel-copper alloy, minimum 0.11 inches in diameter.

2.5.2.3 Threaded Rods

Threaded steel rods, 3/16 inch diameter, zinc or cadmium coated.

2.5.2.4 Straps

Galvanized steel, one by 3/16 inch, conforming to **ASTM A653/A653M**, with a light commercial zinc coating or **ASTM A1008/A1008M** with an electrodeposited zinc coating conforming to **ASTM B633**, Type RS.

2.5.3 Power Hook Luminaire Hangers

UL 1598. Provide an assembly consisting of through-wired power hook housing, interlocking plug and receptacle, power cord, and luminaire support loop. Power hook housing must be cast aluminum having two 3/4 inch threaded hubs. Support hook must have safety screw. Luminaire support loop must be cast aluminum with provisions for accepting 3/4 inch threaded stems. Power cord must include 16 inches of 3 conductor No. 16 Type SO cord. Assembly must be rated 120 volts or 277 volts, 15 amperes.

2.6 EQUIPMENT IDENTIFICATION

2.6.1 Manufacturer's Nameplate

Each item of equipment must 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.

2.6.2 Labels

UL 1598. All luminaires must be clearly marked for operation of specific light sources and LED drivers. The labels must be easy to read when standing next to the equipment, and durable to match the life of the equipment to which they are attached. Note the following light source characteristics in the format "Use Only _____":

- a. Correlated Color Temperature (CCT) and Color Rendering Index (CRI) for all luminaires.
- b. Driver and dimming protocol.

All markings related to light source type must be clear and located to be readily visible to service personnel, but unseen from normal viewing angles

when light sources are in place. LED drivers must have clear markings indicating dimming type and indicate proper terminals for the various outputs.

2.7 FACTORY APPLIED FINISH

NEMA 250. Provide all luminaires and lighting equipment with factory-applied painting system that as a minimum, meets requirements of corrosion-resistance testing.

PART 3 EXECUTION

3.1 INSTALLATION

IEEE C2, NFPA 70.

3.1.1 Light Sources

When light sources are not provided as an integral part of the luminaire, deliver light sources of the type, wattage, lumen output, color temperature (CCT), color rendering index (CRI), and voltage rating indicated to the project site and install just prior to project completion, if not already installed in the luminaires from the factory.

3.1.2 Luminaires

Set luminaires plumb, square, and level with ceiling and walls, in alignment with adjacent luminaires and secure in accordance with manufacturers' directions and approved drawings. Provide accessories as required for ceiling construction type indicated on Finish Schedule. Luminaire catalog numbers do not necessarily denote specific mounting accessories for type of ceiling in which a luminaire may be installed. Provide wires, straps, or rods for luminaire support in this section. Install luminaires with vent holes free of air blocking obstacles.

3.1.2.1 Suspended Luminaires

Measure mounting heights from the bottom of the luminaire for ceiling-mounted luminaires and to center of luminaire for wall-mounted luminaires. Obtain architect approval of the exact mounting height on the job before commencing installation and, where applicable, after coordinating with the type, style, and pattern of the ceiling being installed. Support suspended luminaires from structural framework of ceiling or from inserts cast into slab.

- a. Provide suspended luminaires with 45 degree swivel hangers so that they hang plumb and level.
- b. Locate so that there are no obstructions within the 45 degree range in all directions.
- c. The stem, canopy and luminaire must be capable of 45 degree swing.
- d. Rigid pendent stem, aircraft cable, rods, or chains **4 feet** or longer excluding luminaire must be braced to prevent swaying using three cables at 120 degree separation.
- e. Suspended luminaires in continuous rows must have internal wireway systems for end to end wiring and must be properly aligned to provide a

straight and continuous row without bends, gaps, light leaks or filler pieces.

- f. Utilize aligning splines on extruded aluminum luminaires to assure minimal hairline joints.
- g. Support steel luminaires to prevent "oil-canning" effects.
- h. Match supporting pendants with supported luminaire. Aircraft cable must be stainless steel.
- i. Match finish of canopies to match the ceiling, and provide low profile canopies unless otherwise shown.
- j. Maximum distance between suspension points must be **10 feet** or as recommended by the manufacturer, whichever is less.

3.1.2.2 Recessed and Semi-Recessed Luminaires

- a. Support recessed and semi-recessed luminaires independently from the building structure by a minimum of two wires, straps or rods per luminaire and located near opposite corners of the luminaire. Secure horizontal movement with clips provided by manufacturer. Ceiling grid clips are not allowed as an alternative to independently supported luminaires.
- b. Support round luminaires or luminaires smaller in size than the ceiling grid independently from the building structure by a minimum of four wires, straps or rods per luminaire, spaced approximately equidistant around.
- c. Do not support luminaires by acoustical tile ceiling panels.
- d. Where luminaires of sizes less than the ceiling grid are indicated to be centered in the acoustical panel, support each independently and provide at least two **3/4 inch** metal channels spanning, and secured to, the ceiling tees for centering and aligning the luminaire.
- f. Adjust aperture rings on all applicable ceiling recessed luminaires to accommodate various ceiling material thickness. Coordinate cut-out size in ceiling to ensure aperture covers cut-out entirely. Install aperture rings such that the bottom of the ring is flush with finished ceiling or not more than **1/16 inch** above. Do not install luminaires such that the aperture ring extends below the finished ceiling surface.

3.1.3 LED Drivers

Provide LED drivers integral to luminaire as constructed by the manufacturer.

3.1.4 Exit Signs

NFPA 101. Wire exit signs and emergency lighting units ahead of the local switch, to the normal lighting circuit located in the same room or area.

3.1.5 Lighting Controls

3.1.5.1 Occupancy/Vacancy Sensors

- a. Provide quantity of sensor units indicated as a minimum. Provide additional units to give full coverage over controlled area. Full coverage must provide hand and arm motion detection for office and administration type areas and walking motion for industrial areas, warehouses, storage rooms and hallways.
- b. Locate ceiling-mounted sensors no closer than 6 feet from the nearest HVAC supply or return diffuser.
- c. Locate the sensor(s) as indicated and in accordance with the manufacturer's recommendations.

3.1.5.2 Photosensors

Locate and aim sensor as indicated and in accordance with the manufacturer's recommendations. Adjust sensor set-point in accordance with the manufacturer's recommendations and for the indicated light level of the area of coverage, measured at the work plane.

3.2 FIELD QUALITY CONTROL

3.2.1 Tests

3.2.1.1 Lighting Control Verification Tests

Verify lighting control system and devices operate according to approved sequence of operations. Verification tests are to be completed after commissioning.

- a. Verify occupancy/vacancy sensors operate as described in sequence of operations. Provide testing of sensor coverage, sensitivity, and time-out settings in all spaces where sensors are placed. This is to be completed only after all furnishings have been installed. Submit [occupancy/vacancy sensor verification test](#).
- b. Verify photosensors operate as described in sequence of operations. Provide testing of sensor coverage, aiming, and calibration in all spaces where sensors are placed. This is to be completed only after all furnishings have been installed. Submit [photosensor verification test](#).
- c. Verify wall box dimmers and scene wallstations operate as described in sequence of operations.

3.2.1.2 Emergency Lighting Test

Interrupt power supply to demonstrate proper operation of emergency lighting. If adjustments are made to the lighting system, re-test system to show compliance with standards.

-- End of Section --

SECTION 33 71 01

OVERHEAD TRANSMISSION AND DISTRIBUTION
05/19, CHG 1: 11/19

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 A123/A123M (2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- ASTM A153/A153M (2016a) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- ASTM A575 (2020) Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades
- ASTM A576 (2017) Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality
- ASTM D709 (2017) Standard Specification for Laminated Thermosetting Materials

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

- IEEE 100 (2000; Archived) The Authoritative Dictionary of IEEE Standards Terms
- IEEE C2 (2023) National Electrical Safety Code
- IEEE C135.1 (1999) Standard for Zinc-Coated Steel Bolts and Nuts for Overhead Line Construction
- IEEE C135.2 (1999) Threaded Zinc-Coated Ferrous Strand-Eye Anchor Rods and Nuts for Overhead Line Construction
- IEEE C135.22 (1988) Standard for Zinc-Coated Ferrous Pole-Top Insulator Pins with Lead Threads for Overhead Line Construction

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- ANSI C29.2 (2020) American National Standard for Insulators - Wet-Process Porcelain and Toughened Glass - Distribution Suspension Type

- ANSI C29.3 (2015; R 2022) American National Standard for Wet Process Porcelain Insulators - Spool Type
- ANSI C29.4 (1989; R 2012) Standard for Wet-Process Porcelain Insulators - Strain Type
- ANSI C29.5 (1984; R 2002) Wet-Process Porcelain Insulators (Low and Medium Voltage Pin Type)
- ANSI/NEMA WC 71/ICEA S-96-659 (2014) Standard for Nonshielded Cables Rated 2001-5000 Volts for use in the Distribution of Electric Energy
- NEMA WC 70 (2021) Power Cable Rated 2000 Volts or Less for the Distribution of Electrical Energy
- NEMA/ANSI C29.7 (1996; 2002) American National Standard for Wet Process Porcelain Insulators - High-Voltage Line Post Type

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 70 (2023) National Electrical Code

1.2 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, must be as defined in IEEE 100.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Conductors;

SD-05 Design Data

SD-06 Test Reports

Field Test Plan;

Field Quality Control;

SD-07 Certificates

SD-09 Manufacturer's Field Reports

SD-10 Operation and Maintenance Data

1.4 QUALITY ASSURANCE

1.4.1 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory except of NFPA 70 when more stringent requirements are specified or indicated, as though the word, "must" 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 and IEEE C2 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 must have been in satisfactory commercial or industrial use for 2-years prior to bid opening. The 2-year period must include applications of equipment and materials under similar circumstances and of similar size. The product must 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 must not be used, unless specified otherwise.

1.4.3 Ground Resistance Test Reports

Submit the measured ground resistance of grounding system. When testing grounding electrodes and grounding systems, identify each grounding electrode and each grounding system for testing. Include the test method and test setup (i.e. pin location) used to determine ground resistance and soil conditions at the time the measurements were made.

1.5 DELIVERY, STORAGE, AND HANDLING

Devices and equipment must be visually inspected by the Contractor when received and prior to acceptance from conveyance. Protect stored items from the environment in accordance with the manufacturer's published instructions. Replace damaged items. Store oil filled transformers and switches in accordance with the manufacturer's requirements.

1.6 WARRANTY

The equipment items must 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 HARDWARE

Hardware must be hot-dip galvanized in accordance with [ASTM A153/A153M](#) and [ASTM A123/A123M](#).

Zinc-coated hardware must comply with [IEEE C135.1](#), [IEEE C135.2](#), [IEEE C135.22](#). Steel hardware must comply with [ASTM A575](#) and [ASTM A576](#). Pole-line hardware must be hot-dip galvanized[steel.][steel, except anchor rods of the copper-molten welded-to-steel type with nonferrous corrosion-resistant fittings must be used.] Intall washers under boltheads and nuts on wood surfaces and elsewhere as required. Washers used on through-bolts and double-arming bolts must be approximately 2-1/4 inches square and 3/16 inch thick. The diameter of holes in washers must be the correct standard size for the bolt on which a washer is used. Washers for use under heads of carriage-bolts must be of the proper size to fit over square shanks of bolts. Use eye bolts, bolt eyes, eyenuts, strain-load plates, lag screws, guy clamps, fasteners, hooks, shims, and clevises wherever required to support and to protect poles, brackets, crossarms, guy wires, and insulators.

2.2 INSULATORS

Provide wet-process porcelain insulators which are radio interference free.

- a. Line post type insulators: [NEMA/ANSI C29.7](#), as indicated.
- b. Suspension insulators: [ANSI C29.2](#), as indicated.
- c. Spool insulators: [ANSI C29.3](#), as indicated.
- d. Guy strain insulators: [ANSI C29.4](#), as indicated.
- e. Pin insulators: [ANSI C29.5](#), as indicated.

2.3 NEUTRAL-SUPPORTED SECONDARY AND SERVICE DROP CABLES

Secondary cables must be, triplex or quadruplex, as required, with cross-linked polyethylene insulation on the phase conductors. Cables shall conform to [NEMA WC 70](#) and [ANSI/NEMA WC 71/ICEA S-96-659](#) for cross-linked polyethylene insulation.

2.4 NAMEPLATES

2.4.1 Manufacturer's Nameplate

Each item of equipment must 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. Equipment containing liquid-dielectrics must have the type of dielectric on the nameplate.

2.4.2 Field Fabricated Nameplates

ASTM D709. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified or as indicated on the drawings. Each nameplate inscription must identify the function and, when applicable, the position. Nameplates must be melamine plastic, **0.125 inch** thick, white with black center core. Surface must be matte finish. Corners must be square. Accurately align lettering and engrave into the core. Minimum size of nameplates must be **one by 2.5 inches**. Lettering must be a minimum of **0.25 inch** high normal block style.

2.5 SOURCE QUALITY CONTROL

PART 3 EXECUTION

3.1 INSTALLATION

Provide overhead pole line installation conforming to requirements of **IEEE C2** and **NFPA 70** for overhead services. Provide material required to make connections into existing system and perform excavating, backfilling, and other incidental labor.

3.1.1 Overhead Service

Terminate overhead service conductors into buildings at service entrance fittings or weatherhead outside building. Installation and connection of service entrance equipment to overhead service conductor is included. Nearby support bracket for overhead wires must be above finished grade at building. Drip loops must be formed on conductors at entrances to buildings, cabinets, or conduits.

3.1.2 Tree Trimming

Where lines pass through trees, trees must be trimmed at least **15 feet** clear on both sides horizontally and below for medium-voltage lines, and **5 feet** clear on both sides horizontally and below for other lines. No branch must overhang horizontal clearances.

3.1.3 Hardware

Provide hardware with washer against wood and with nuts and lock nuts applied wrench tight. Provide locknuts on threaded hardware connections. Locknuts must be M-F style and not palnut style.

3.1.4 Grounding

Unless otherwise indicated, grounding must conform to **IEEE C2** and **NFPA 70**.

3.1.4.1 Grounding Electrode Installation

Install grounding electrodes as follows:

- a. Driven rod electrodes - Unless otherwise indicated, locate ground rods approximately **3 feet** out from base of the pole and drive into the earth until the tops of the rods are approximately **one foot** below finished grade. Evenly spaced multiple rods at least **10 feet** apart and connected together **2 feet** below grade with a minimum No. 6 bare copper conductor.

- b. Plate electrodes - Install plate electrodes in accordance with the manufacturer's instructions and **IEEE C2** and **NFPA 70**.

3.1.4.2 Grounding Electrode Conductors

[On multi-grounded circuits, as defined in **IEEE C2**, provide a single continuous vertical grounding electrode conductor. Bond neutrals, surge arresters, and equipment grounding conductors to this conductor. For single-grounded or ungrounded systems, provide a grounding electrode conductor for the surge arrester and equipment grounding conductors and a separate grounding electrode conductor for the secondary neutrals. Staple grounding electrode conductors to wood poles at intervals not exceeding **2 feet**. On metal poles, a preformed galvanized steel strap, **5/8 inch** wide by **22 gauge** minimum by length, secured by a preformed locking method standard with the manufacturer, must be used to support a grounding electrode conductor installation on the pole and spaced at intervals not exceeding **5 feet** with one band not more than **3 inches** from each end of the vertical grounding electrode conductor.]Size grounding electrode conductors as indicated. Connect secondary system neutral conductors directly to the transformer neutral bushings, then connected with a neutral bonding jumper between the transformer neutral bushing and the vertical grounding electrode conductor as indicated. Bends greater than 45 degrees in grounding electrode conductor are not permitted.

3.1.4.3 Grounding Electrode Connections

Make above grade grounding connections on pole lines by exothermic weld or by using a compression connector. Make below grade grounding connections by exothermic weld. Make exothermic welds strictly in accordance with manufacturer's written recommendations. Welds which have puffed up or which show convex surfaces indicating improper cleaning, are not acceptable. No mechanical connectors are required at exothermic weldments. Compression connectors must be type that uses a hydraulic compression tool to provide correct pressure. Provide tools and dies recommended by compression connector manufacturer. An embossing die code or similar method must provide visible indication that a connector has been fully compressed on ground wire.

3.1.4.4 Grounding and Grounded Connections

- a. Where no primary or common neutral exists, bond surge arresters and frames of equipment operating at over 750 volts together and connected to a dedicated primary grounding electrode.
- b. Where no primary or common neutral exists, bond transformer secondary neutral bushing, secondary neutral conductor, and frames of equipment operating at under 750 volts together and connected to a dedicated secondary grounding electrode.
- c. When a primary or common neutral exists, the neutral must be connected to a grounding electrode. Transformer secondary neutral bushing and frames of equipment operating at under 750 volts must be bonded together and connected to a common neutral and to a common grounding electrode.

3.1.4.5 Protective Molding

Protect grounding conductors which are run on surface of wood poles by PVC

molding extending from ground line throughout communication and transformer spaces.

3.1.5 CONDUCTOR INSTALLATION

3.1.5.1 Line Conductors

Unless otherwise indicated, install conductors in compliance with IEEE C2 Grade B requirements and in accordance with revised manufacturer's approved tables of sags and tensions. Handle conductors with care necessary to prevent nicking, kinking, gouging, abrasions, sharp bends, cuts, flattening, or otherwise deforming or weakening conductor or any damage to insulation or impairing its conductivity. Remove damaged sections of conductor and splice conductor. Conductors must be paid out with the free end of conductors fixed and cable reels portable, except where terrain or obstructions make this method unfeasible. Bend radius for any insulated conductor must not be less than the applicable NEMA specification recommendation. Conductors must not be drawn over rough or rocky ground, nor around sharp bends. When installed by machine power, conductors must be drawn from a mounted reel through stringing sheaves in straight lines clear of obstructions. Initial sag and tension must be checked by the Contractor, in accordance with the manufacturer's approved sag and tension charts, within an elapsed time after installation as recommended by the manufacturer.

3.1.5.2 Connectors and Splices

Conductor splices, as installed, must exceed ultimate rated strength of conductor and must be of type recommended by conductor manufacturer. No splice must be permitted within 10 feet of a support. Connectors and splices must be mechanically and electrically secure under tension and must be of the nonbolted compression type. The tensile strength of any splice must be not less than the rated breaking strength of the conductor. Splice materials, sleeves, fittings, and connectors must be noncorrosive and must not adversely affect conductors. Aluminum-composition conductors must be wire brushed and an oxide inhibitor applied before making a compression connection. Connectors which are factory-filled with an inhibitor are acceptable. Inhibitors and compression tools must be of types recommended by the connector manufacturer. Primary line apparatus taps must be by means of hot line clamps attached to compression type bail clamps (stirrups). Low-voltage connectors for copper conductors must be of the solderless pressure type. Noninsulated connectors must be smoothly taped to provide a waterproof insulation equivalent to the original insulation, when installed on insulated conductors. On overhead connections of aluminum and copper, the aluminum must be installed above the copper.

3.1.5.3 Conductor-To-Insulator Attachments

Conductors must be attached to insulators by means of clamps, shoes or tie wires, in accordance with the type of insulator. For insulators requiring conductor tie-wire attachments, tie-wire sizes must be as specified in TABLE I.

TABLE I - TIE-WIRE REQUIREMENTS	
CONDUCTOR Copper (AWG)	TIE WIRE Soft-Drawn Copper (AWG)

TABLE I - TIE-WIRE REQUIREMENTS	
6	8
4 and 2	6
1 through 3/0	4
4/0 and larger	2
AAC, AAAC, or ACSR (AWG)	AAAC OR AAC (AWG)
Any size	6 or 4

3.1.5.4 Armor Rods

Provide armor rods for AAC, AAAC, and ACSR conductors. Armor rods must be installed at supports, except armor rods will not be required at primary dead-end assemblies if aluminum or aluminum-lined zinc-coated steel clamps are used. Lengths and methods of fastening armor rods must be in accordance with the manufacturer's recommendations. For span lengths of less than 200 feet, flat aluminum armor rods may be used. Flat armor rods, not less than 0.03 by 0.25 inch must be used on No. 1 AWG AAC and AAAC and smaller conductors and on No. 5 AWG ACSR and smaller conductors. On larger sizes, flat armor rods must be not less than 0.05 by 0.30 inches. For span lengths of 200 feet or more, preformed round armor rods must be used.

3.1.5.5 Ties

Provide ties on pin insulators tight against conductor and insulator and ends turned down flat against conductor so that no wire ends project.

3.1.5.6 Low-Voltage Insulated Cables

Support low-voltage cables on clevis fittings using spool insulators. Provide dead-end clevis fittings and suspensions insulators where required for adequate strength. Dead-end construction must provide a strength exceeding the rated breaking strength of the neutral messenger. Provide clevis attachments with not less than 5/8 inch through-bolts. Secondary racks may be used when installed on wood poles and where the span length does not exceed 200 feet. Secondary racks must be two-, three-, or four-wire, complete with spool insulators. Racks must meet strength and deflection requirements for heavy-duty steel racks, and must be rounded and smooth to avoid damage to conductor insulation. Each insulator must be held in place with a 5/8 inch button-head bolt equipped with a nonferrous cotter pin, or equivalent, at the bottom. Attach racks for dead-ending four No. 4/0 AWG or four larger conductors to poles with three 5/8 inch through-bolts. Attach other secondary racks to poles with at least two 5/8 inch through-bolts. Minimum vertical spacing between conductors must not be less than 8 inches.

3.1.5.7 Reinstalling Conductors

Existing conductors to be reinstalled or resagged must be strung to "final" sag table values indicated for the particular conductor type and size involved.

3.1.5.8 New Conductor Installation

String new conductors to "initial" sag table values **or as** recommended by the manufacturer for conductor type and size of conductor and ruling span indicated.

3.1.5.9 Fittings

Dead end fittings must conform to written recommendations of conductor manufacturer and must develop full ultimate strength of conductor.

3.1.5.10 Aluminum Connections

Make aluminum connections to copper or other material using only splices, connectors, lugs, or fittings designed for that specific purpose. Keep a copy of manufacturer's instructions for applying these fittings at job site for use of the inspector.

3.2 FIELD QUALITY CONTROL

3.2.1 General

Perform field testing in the presence of the Contracting Officer. The Contractor must notify the Contracting Officer prior to conducting tests. The Contractor must furnish materials, labor, and equipment necessary to conduct field tests. The Contractor must perform tests and inspections recommended by the manufacturer unless specifically waived by the Contracting Officer. The Contractor must maintain a written record of tests which includes date, test performed, personnel involved, devices tested, serial number and name of test equipment, and test results. Field reports will be signed and dated by the Contractor.

3.2.2 Safety

The Contractor must provide and use safety devices such as rubber gloves, protective barriers, and danger signs to protect and warn personnel in the test vicinity. The Contractor must replace any devices or equipment which are damaged due to improper test procedures or handling.

3.2.3 Low-Voltage Cable Test

For underground secondary or service laterals from overhead lines, the low-voltage cable, complete with splices, must be tested for insulation resistance after the cables are installed, in their final configuration, ready for connection to the equipment, and prior to energization. The test voltage must be 500 volts dc, applied for one minute between each conductor and ground and between all possible combinations of conductors in the same trench, duct, or cable, with other conductors in the same trench, duct, or conduit. The minimum value of insulation must be:

$$R \text{ in megohms} = (\text{rated voltage in kV} + 1) \times 1000 / (\text{length of cable in feet})$$

Repair each cable failing this test or replace. The repaired cable must then be retested until failures have been eliminated.

3.2.4 Follow-Up Verification

Upon completion of acceptance checks and tests, the Contractor must show by

demonstration in service that circuits and devices are in good operating condition and properly performing the intended function.

-- End of Section --



Marine Corps Base (MCB) Camp Lejeune Contractor Environmental Guide

Prepared For:

Marine Corps Installations East-Marine Corps Base Camp Lejeune

Version Number 3



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RECORD OF CHANGES

Date	Description of Changes	Page #	Name/Initials

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CERTIFICATION PAGE

I certify that I have read, understood, and accept this document and all attachments, and that all those within my party working on a job site within Marine Corps Base Camp Lejeune and/or Marine Corps Air Station New River will comply with the environmental policies and regulations herein. I am aware that there are penalties for not complying with this Guide.

Signature

Date

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LIST OF ACRONYMS AND ABBREVIATIONS

ACM	Asbestos-Containing Material
AHERA	Asbestos Hazard and Emergency Response Act
AHPA	Archaeological and Historic Preservation Act
ARPA	Archeological Resource Protection Act
ASHARA	Asbestos School Hazard Abatement Reauthorization Act
ASD	Accumulation Start Date
ASO	Air Station Order
BMP	Best Management Practice
BO	Base Order
C&D	Construction and Demolition
CAA	Clean Air Act
CAMA	Coastal Area Management Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability
CETEP	Comprehensive Environmental Training and Education Program
CFC	Chlorofluorocarbon
CFR	Code of Federal Regulations
CG	Commanding General
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DHHS	Department of Health and Human Services
DLADS	Defense Logistics Agency Disposition Services
DM	Decision Memorandum

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DMM	Discarded Military Munitions
DoD	Department of Defense
DoN	Department of Navy
DOT	Department of Transportation
DRMS	Defense Reutilization and Marketing Service
EA	Environmental Assessment
EAD	Environmental Affairs Department
ECON	Environmental Conservation Branch
EISA	Energy Independence and Security Act
EHS	Extremely Hazardous Substances
ELLAP	Environmental Lead Laboratory Accreditation Program
EMD	Environmental Management Division
EMS	Environmental Management System
EO	Executive Order
EOD	Explosives and Ordnance Disposal
EPA	Environmental Protection Agency
EPR	Extended Producer Responsibility
EPCRA	Emergency Planning and Community Right-to-Know Act
EPEAT	Electronic Product Environmental Assessment Tool
FAR	Federal Acquisition Regulation
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FSC	Facilities Support Contracts
FWS	Fish and Wildlife Service
GIS	Geographic Information System
GP	Green Procurement
HAP	Hazardous Air Pollutants

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HCFC	Hydrochlorofluorocarbon
HCS	Hazard Communication Standard
HHCU	Health Hazards Control Unit (North Carolina)
HM	Hazardous Material
HMTA	Hazardous Materials Transportation Act
HQMC	Headquarters Marine Corps
HQW	High Quality Water
HVAC	Heating, Ventilation, and Air Conditioning
HW	Hazardous Waste
HWMP	Hazardous Waste Management Plan
IGI&S	Installation Geospatial Information & Services
INRMP	Integrated Natural Resources Management Plan
IRP	Installation Restoration Program
LBP	Lead-Based Paint
LDA	Land-Disturbing Activities
LQG	Large Quantity Generator
MAG	Marine Aircraft Group
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MCM	Minimum Control Measure
MCIEAST	Marine Corps Installations East
MCO	Marine Corps Order
MEC	Munitions and Explosives of Concern
MEF	Marine Expeditionary Force
MRF	Materials Recovery Facility
MS4	Municipal Separate Storm Sewer Systems
MSW	Municipal Solid Waste
NAPL	Non-Aqueous Phase Liquid

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NC	North Carolina
NCAC	North Carolina Administrative Code
NCDAQ	North Carolina Department of Air Quality
NCDCM	North Carolina Division of Coastal Management
NCDEQ	North Carolina Department of Environmental Quality
NCDFR	North Carolina Division of Forest Resources
NCDMS	North Carolina Division of Mitigation Services
NCDWR	North Carolina Division of Water Resources
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRC	National Response Center
NRHP	National Register of Historic Places
ODS	Ozone-Depleting Substance
OPA	Oil Pollution Act
ORW	Outstanding Resource Water
OSHA	Occupational Safety and Health Administration
OWS	Oil-Water Separator
P2	Pollution Prevention
PACM	Presumed Asbestos-Containing Material
PCB	Polychlorinated biphenyl
POC	Point of Contact
POL	Petroleum, Oil, and Lubricant
PPA	Pollution Prevention Act
ppm	Parts Per Million

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PPV	Public-Private Venture
PWD	Public Works Division
QRP	Qualified Recycling Program
RACM	Regulated Asbestos-Containing Material
RCRA	Resource Conservation and Recovery Act
RCRS	Resource Conservation and Recovery Section
ROICC	Resident Officer in Charge of Construction
RRP	Renovation, Repair, and Painting
SAA	Satellite Accumulation Area
SARA	Superfund Amendments & Reauthorization Act
SDS	Safety Data Sheet
SHPO	State Historic Preservation Officer
SPCC	Spill Prevention Control and Countermeasures
SSPP	Strategic Sustainability Performance Plan
SWDA	Solid Waste Disposal Act
SWPPP	Stormwater Pollution Prevention Plan (Also referred to as SPPP in NC)
T&P	Treatment and Processing
TCLP	Toxic Characteristic Leaching Procedure
TSD	Treatment, Storage, and Disposal
TSI	Thermal System Insulation
ULCP	Unit Level Contingency Plan
USC	United States Code
USACE	United States Army Corps of Engineers
USMC	United States Marine Corps
UW	Universal Waste

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UXO Unexploded Ordnance

XRF X-Ray Fluorescence

CONTRACTOR'S PHONE DIRECTORY

In the event of an emergency, refer to the emergency numbers below. All non-emergency contractor inquiries regarding the operations at Marine Corps Base (MCB) Camp Lejeune and Marine Corps Air Station New River should be directed to the Resident Officer in Charge of Construction (ROICC) or Contract Representative. The ROICC or Contract Representative will either directly contact or refer contractors to the appropriate Division or Organization.

Emergency and Important Non-Emergency Numbers

Fire and Emergency Services Division.....	911
Ambulance.....	911
Hearing Impaired.....	(910) 451-4444
CHEMTREC (Emergency 24-hour/Outside MCB Camp Lejeune).....	(800) 424-9300
Hazardous Chemical Spill.....	911
Military Police.....	911
National Response Center (Outside MCB Camp Lejeune).....	(202) 372-2428
Toll Free.....	(800) 424-8802
Provost Marshall Office.....	911

Marine Corps Base Camp Lejeune

Operator/ Directory Assistance.....	(910) 451-1113
Confined Space Program Manager.....	(910) 451-5725
Environmental Management Division.....	(910) 451-5003
-Environmental Compliance Branch.....	(910) 451-5837

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Asbestos Management
Resource Conservation and Recovery Section
(910) 451-1482
Hazardous Material Consolidation Site/Free Issue
.....(910) 451-1482
Recycling Center, Building 982.....(910) 451-4214
-Environmental Conservation Branch.....(910) 451-5063
Fish & Wildlife
Forestry Management
NEPA
Conservation Law Enforcement
..... (910) 451-2196/5226
-Environmental Quality Branch.....(910) 451-5068
Air Quality
Underground Storage Tanks
Water Quality
Explosives and Ordnance Disposal.....(910) 451-0558
Public Works Division.....(910) 451-5307
-Construction Project Managers.....(910) 451-2583
-Contracts Branch.....(910) 451-2582
-Officer In Charge of Construction (Main)..(910) 451-2581
-Public Works Base Utility Director.....(910) 451-5024
Water Line Break/Wastewater Line Break.....(910)
451-7190 (x225)
-Public Works Solid Waste Division/Landfill
.....(910) 451-2946
Range Control.....(910) 451-3064
Regional Geospatial Information & Services (Installation
Manager).....(910) 451-8915
Safety Department.....(910) 451-5725

Marine Corps Air Station New River

Confined Space Program.....(910) 449-4964
Consolidated Hazardous Material Reutilization and
Inventory Management Program.....(910) 449-4531/4533
Environmental Affairs Department
(Director).....(910) 449-5441
-Environmental Affairs Department (Environmental
Manager).....(910) 449-5442
-Environmental Affairs Department (GIS
Manager).....(910) 449-6144
-Environmental Affairs Department (Hazardous
Waste).....(910) 449-5997
-Conservation Law Enforcement.....(910) 449-0108
Explosives Safety Officer.....(910) 449-5443
Military Police (Non-Emergency).....(910) 449-4248/4249
Public Works Division.....(910) 449-6506
-Officer In Charge of Construction.....(910) 449-5587
Safety Department.....(910) 449-4527

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1.0 CONTRACTOR ENVIRONMENTAL GUIDE OVERVIEW

Environmental protection is an integral part of the Marine Corps mission in order to protect public health, preserve environmental quality, comply with regulatory requirements, and develop and strengthen relationships between the Marine Corps community and external stakeholders. The purpose of the MCB Camp Lejeune Contractor Environmental Guide is to assist contractors working aboard Marine Corps Installations East's (MCIEAST's) Marine Corps Base (MCB) Camp Lejeune and Marine Corps Air Station (MCAS) New River in maintaining the mission by complying with Federal and State environmental laws and regulations, as well as the United States Marine Corps (USMC) and installation environmental policies. This guide is written in accordance with Marine Corps Order (MCO) P5090.2A and designed to answer many of the environmental questions that arise, as well as to provide pertinent information on environmental topics and training requirements.

This document should be used only as a *guide* to the environmental issues contractors may face while working aboard MCB Camp Lejeune and MCAS New River.

NOTE: This document should be used only as a guide to the environmental issues contractors may face while working

aboard MCB Camp Lejeune and MCAS New River. It is expected that contractors will work closely with the Environmental Management Division (EMD) at MCB Camp Lejeune, the Environmental Affairs Department (EAD) at MCAS New River, and Contract Representatives regarding environmental management issues, concerns, and/or questions. Should the need arise, this guide provides

**Contact the ROICC
or Contract
Representative
with any
questions.**

contractors with EMD, EAD, and emergency response points of contact (POCs). All initial inquiries should be directed to the Resident Officer in Charge of Construction (ROICC) or Contract Representative, who will either direct the contractor

or contact the appropriate environmental office if additional clarification regarding an environmental issue is necessary.

NOTE: It is very important to note that this guide is designed to provide requirements specific to MCB Camp Lejeune-issued contracts. It is the contractor's responsibility to know and comply with all Federal, State, and local regulations. MCB Camp Lejeune environmental personnel will assist contractors with compliance issues; however, the primary burden of regulatory identification, familiarity, and compliance lies with the contractor. This training *does not* replace any required regulatory environmental training or certification as per contract requirements. All required environmental training should be completed *prior* to working at MCIEAST installations.

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

1.1. KEY DEFINITIONS AND CONCEPTS

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

1.1.1. Key Definitions

- **Environment.** Surroundings, to include all surface water, groundwater, drinking water supply, land surface or subsurface area, or ambient air within the United States or under the jurisdiction of the United States, including manmade structures, indoor air environments, natural resources, and archeological and cultural resources.
- **Environmental Management Division.** MCB Camp Lejeune's division responsible for environmental issues and compliance at MCB Camp Lejeune.
- **Environmental Affairs Department.** MCAS New River's department responsible for environmental issues and compliance at MCAS New River.
- **Environmental Management System (EMS).** A systematic approach for integrating environmental

considerations and accountability into day-to-day decisionmaking and long-term planning processes across all missions, practices, and functions. The EMS institutionalizes processes for continual environmental improvement and reducing risks to mission through ongoing planning, review, and preventive or corrective action.

1.1.2. Key Concepts

- **Environmental Requirement.** A defined standard pertaining to environmental compliance, pollution prevention (P2), or natural/cultural resources, subject to uniform application. Environmental requirements may be in the form of a law, regulation, Executive Order (EO), policy, ordinance, permit, Base Order (BO), or other form that prescribes a standard.
- **Executive Order.** Legally binding orders given by the President, as head of the Executive Branch, to direct Federal agencies and officials in their execution of congressionally established laws or policies.
- **MCB Camp Lejeune.** Throughout this document, MCB Camp Lejeune includes all MCB Camp Lejeune real property and contracts for work performed at MCAS New River and all outlying fields associated with MCB Camp Lejeune.
- **Marine Corps Order.** A directive of continuing authority or information, meant to be a permanent reference and requiring continuing action, issued by Headquarters Marine Corps (HQMC). In accordance

with MCO 5215.1K (10 May 2007), all MCOs shall, where applicable: establish, describe, or change existing policy, programs and major activities, and organizations; define missions; assign responsibilities; issue procedural guidance; and be written in standardized format.

- **Resident Officer In Charge of Construction.** The ROICC administers construction contracts and is the contractor's first line of contact with the government.
- **Regulatory Requirements.** Government (including Federal, State, and local) environmental regulations implemented by environmental statutes. Federal regulations often establish minimum standards for State and local governments' implementing programs.
- **Statutory Requirements.** Federal environmental statutes are laws that generally require compliance by U.S. Department of Defense (DoD) installations.

1.2. INSTALLATION BACKGROUND

MCB Camp Lejeune was established in 1941 in Onslow County, along the southern coast of North Carolina (NC). MCB Camp Lejeune is just south of MCAS New River. MCB Camp Lejeune takes advantage of 156,000 acres and 11 miles of beach capable of supporting amphibious operations, 32 gun positions, 48 tactical landing zones, three state-of-the-art training facilities, and 80 live fire ranges for its training mission.

The primary function of MCB Camp Lejeune is national defense, providing a home installation for the II Marine Expeditionary Force (MEF), 2nd Marine Division, 2nd Force Service Support Group, and other combat units and support commands. MCB Camp Lejeune's mission is to maintain combat-ready units for expeditionary deployment. MCB Camp Lejeune maintains and utilizes supply warehouses, maintenance shops, hazardous material storage, nonhazardous and hazardous waste storage, bulk fuel storage and transfer facilities, fleet parking, housing areas, recreational areas, two golf courses, and a marina.

MCAS New River is the principal USMC helicopter operating location on the East Coast and supports aircrew training in the H-53 helicopter. It is also the evaluation and prospective bed-down site for the V-22 Osprey. The mission of MCAS New River is to provide the necessary support for its Marine Aircraft Group (MAG) tenant units, MAG-26 and MAG-29.

1.2.1. Environmental Management Division and Environmental Affairs Department

MCB Camp Lejeune's EMD, within the Installation and Environment Department, is responsible for all natural resource and environmental matters aboard the installation. EMD works closely with MCB Camp Lejeune personnel, educating and training them to comply with environmental laws while accomplishing the military mission.

The EAD at MCAS New River works closely with the EMD on environmental compliance and protection matters. Due to

various joint operations, MCB Camp Lejeune and MCAS New River participate together in one EMS. See Figure 1-1 and Figure 1-2 for organization charts of EMD and EAD.

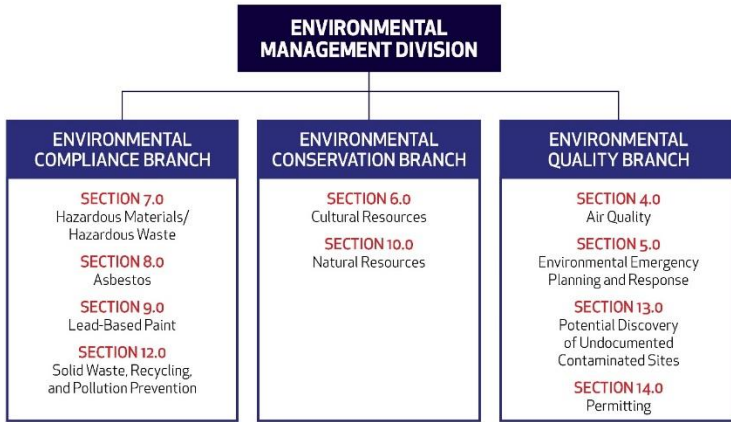


Figure 1-1. Environmental Management Division (MCB Camp Lejeune) Organization Chart



Figure 1-2. Environmental Affairs Department (MCAS New River) Organization Chart

1.2.2. Expectations

Contractors aboard the installation, which are committed to strict compliance with environmental laws and regulations,

assist MCB Camp Lejeune in providing the best possible training facilities for today's Marines and Sailors, while honoring our environmental responsibilities and objectives. Violation of environmental laws may result in severe civil or criminal penalties and fines.

1.3. OVERVIEW OF REQUIREMENTS

Contractors operating aboard MCB Lejeune and MCAS New River must be aware of and adhere to all applicable environmental regulations and requirements, which include but may not be limited to the following:

- **[EO 12088, Federal Compliance with Pollution Control Standards \(October 13, 1978\)](#)**. Requires all facilities owned by or leased to or by the military to be designed, operated, and maintained in compliance with all applicable environmental standards. Military and civilian personnel must cooperate with Federal, State, and local environmental protection agencies and comply with applicable standards and criteria issued by these agencies to the extent permitted by law.
- **[EO 13423, Strengthening Federal Environmental, Energy, and Transportation Management](#)**. Requires Federal agencies to comply with applicable Federal, State, local, and host nation environmental laws and regulations. Additionally, requirements include more widespread use of EMSs as the framework for sustainability management.

- [EO 13514, Federal Leadership in Environmental, Energy, and Economic Performance.](#) Requires Federal agencies to meet various sustainability goals, to include the reduction of greenhouse gas emissions. Applicable provisions for meeting these goals are to be included in acquisition and service contracts.
- [MCO P5090.2A, Environmental Compliance and Protection Manual \(26 August 2013\).](#) USMC policies and responsibilities for compliance with environmental statutes and regulations, as well as the management of USMC environmental programs.

1.3.1. Contractor Environmental Guide

This guide consists of the following information:

- MCB Camp Lejeune Contractor Environmental Guide
 - o EMS overview and requirements
 - o Environmental program-specific requirements
- MCB Camp Lejeune General EMS and Environmental Awareness Training for Contractors and Vendors
- Signature Page

Prior to beginning work onsite, or within 30 days of beginning work onsite, all contractors and their employees performing work aboard MCB Camp Lejeune must review these materials and complete EMS and General Environmental Awareness training.

Prior to beginning work onsite, or within 30 days of beginning work onsite, all contractors and their employees performing work aboard MCB Camp Lejeune must review these materials and complete EMS and General Environmental Awareness training. This guide summarizes the EMS and environmental programs at MCB Camp Lejeune, as well as key requirements associated with the various environmental issues contractors may encounter while performing work aboard the installation. Contractors are expected to work with their ROICC or Contract

Representatives and EMD/EAD when environmental concerns or issues arise.

1.3.2. Environmental and EMS Training

In accordance with Department of Defense (DoD) instructions and MCOs, EMD has implemented a Comprehensive Environmental Training and Education Program (CETEP). The goal of the CETEP is to ensure that appropriate environmental instruction and related information are provided to all levels of the Marine Corps in the most effective and efficient manner to achieve full compliance with all applicable environmental training

requirements. A major component of the CETEP is to provide general environmental awareness training to all individuals associated with the installation, including contractors.

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

All contractors are required to receive both EMS and general environmental awareness training at the level necessary for their job function.

All contractors are required to receive both EMS and general environmental awareness training at the level necessary for their job function. This guide satisfies these training requirements (See the Appendix).

As such, contractors working aboard MCB Camp Lejeune will do the following:

- Conduct job responsibilities in compliance with environmental regulations and in conformance with EMS requirements.
- Complete all applicable environmental training and maintain associated records as per contract requirements.

- Complete EMS and general environmental awareness training, and be aware of and understand the MCB Camp Lejeune Environmental Policy.
- Contact their ROICC or Contract Representative immediately regarding environmental and/or EMS issues.

Prior to beginning work onsite or within 30 days, all contractors must sign and date the signature page and return it to the installation Contract Representative. Anyone who works on a contract at any point during the contract period must receive this information and training.

1.4. POINTS OF CONTACT

EMD Branches and phone numbers are found in the Contractor's Phone Directory on pages xv and xvi of this Guide. All initial inquiries regarding an environmental issue should be directed to the ROICC or Contract Representative, who will either directly contact or refer the contractor to the appropriate environmental office if additional clarification is necessary. In the case of a spill or environmental emergency, immediately dial 911. Additional emergency response procedures are provided in Section 5.0 of this Guide.

Table 1-1. Contacts in Case of a Spill

For spills of:	Call:	Follow-up:
Hazardous waste	911	Spill Report
Unknown materials	911	Spill Report
Material on a permeable surface	911	Spill Report
Greater than 5 gallons of a material	911	Spill Report
Material that reaches stormwater inlets or waterways	911	
Nonhazardous waste	(910) 451-1482	911

1.5. OVERVIEW MAP

Figure 1-3 provides an overview map that displays the locations of installation facilities discussed throughout this Guide.

CAMP LEJEUNE CONTRACTOR ENVIRONMENTAL GUIDE FINAL

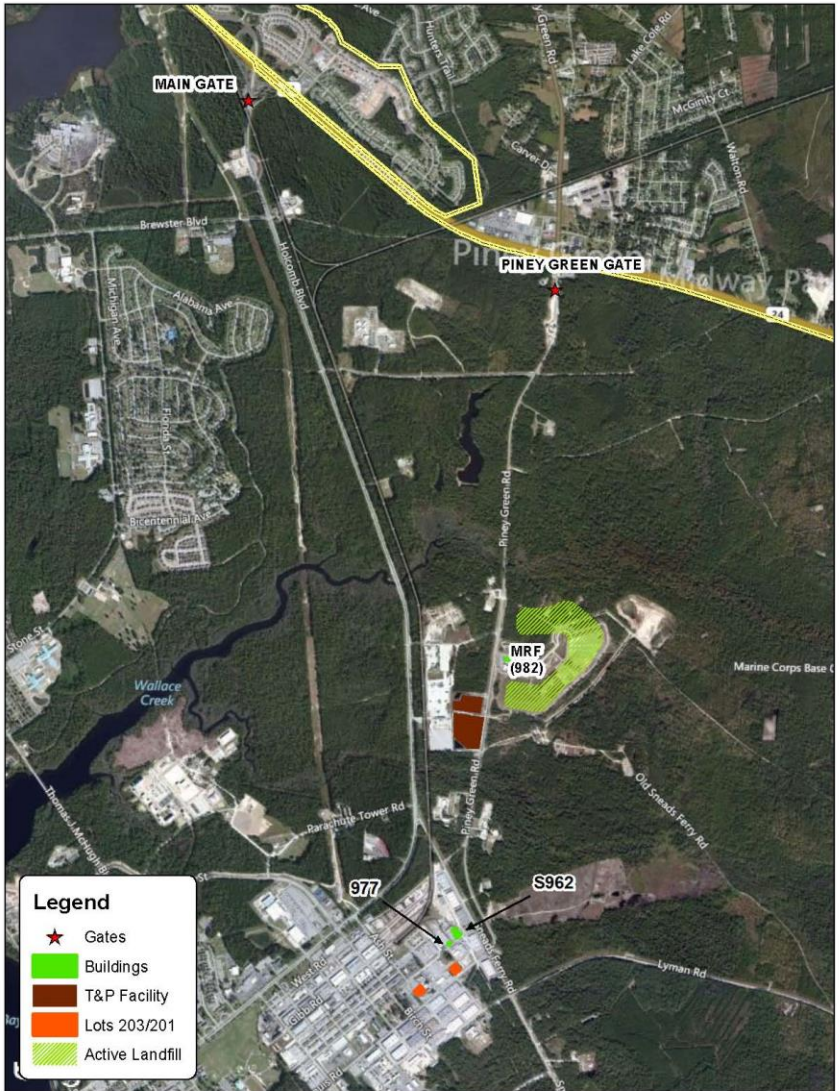


Figure 1-3. Overview Map

2.0 ENVIRONMENTAL MANAGEMENT SYSTEM

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

MCB Camp Lejeune and MCAS New River jointly operate an EMS, which provides a systematic way of continually implementing environmental requirements and evaluating performance. The EMS is founded on the principles of MCB Camp Lejeune's Environmental Policy, which is endorsed by the Commanding General (CG). Three key principles of the Environmental Policy are to:

- Comply with relevant environmental laws and regulations;
- Prevent pollution; and
- Continually improve the EMS.

The EMS promotes sustained mission readiness through actively identifying and implementing opportunities for efficient resource use. The USMC implements EMS at all levels to continually improve environmental compliance programs and meet evolving EOs and DoD requirements for mission sustainability. The EMS highlights the fact that the authority and principal responsibility for controlling environmental impacts belong to those commands, units,

offices, and personnel (including contractors and vendors) whose activities have the potential to impact the environment.

2.1. KEY DEFINITION AND CONCEPTS

The following key definitions and concepts are associated with an EMS. Please consult the ROICC or Contract Representative with any questions about these definitions or concepts.

**Please consult the
ROICC or Contract
Representative
with any
questions.**

2.1.1. Key Definitions

- **Environment.** Surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation.
- **Environmental Aspect.** A characteristic of an organization's activities, products, or services that may cause, in normal operation or upset mode, an impact to an environmental or other resource. Each practice may have several aspects.
- **Environmental Impact.** An effect, beneficial or adverse, of a practice's aspect on an environmental or other resource. Each practice may have several impacts.
- **Environmental Resources.** Sensitive environmental receptors (e.g., air, water, natural

resources) or cultural or historic assets at MCB Camp Lejeune or MCAS New River, in the surrounding community, within the ecosystem, or beyond, that may be impacted by the operation of practices.

- **Practice.** A unit process that supports a military mission and may impact environmental resources. (It is the ability to impact an environmental resource that is key to defining a practice. However, practices may also impact other resources.)
- **Practice Owner.** Person(s) responsible for control of practices. EMS procedures use the term *practice owner* when the assignment of more specific responsibilities is left to the owning organizations.
- **Requirement.** Legislation, regulation, or policy issued by any Executive, Federal, State, local, DoD, Department of Navy (DoN), or USMC authority that addresses environmental considerations and requires action.

2.1.2. Key Concepts

- **Environmental Management System.** A systematic approach for integrating environmental considerations and accountability into day-to-day decisionmaking and long-term planning processes across all missions, activities, and functions. The EMS institutionalizes processes for continual environmental improvement and for reducing risks to mission through ongoing planning, review, and preventive or corrective action.

- **Environmental Policy.** Public commitment by senior leaders to the management of the installation’s environmental affairs, including environmental compliance, pollution prevention, natural/cultural resource management, cleanup, risk to mission, and continual improvement of the EMS.
- **Plan, Do, Check, Act.** Four-step model by which the EMS carries out change – **Plan:** establish objectives and processes; **Do:** implement and execute the plan; **Check:** study and analyze the results; **Act:** take action based on what you learned.

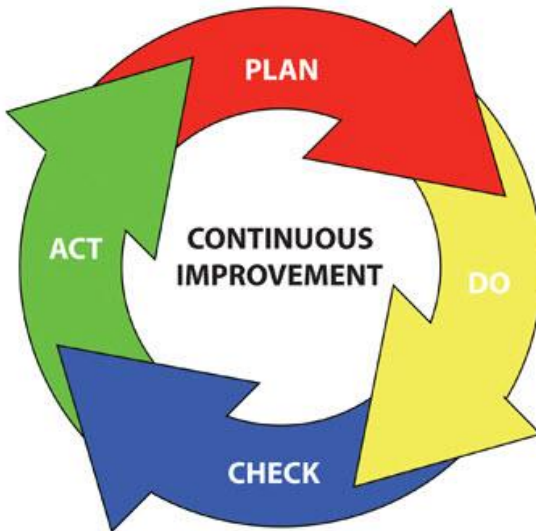


Figure 2-1. Plan, Do, Check, Act Cycle

2.2. OVERVIEW OF REQUIREMENTS

Contractors operating aboard MCB Camp Lejeune and MCAS New River must be aware of and adhere to all applicable regulations and requirements concerning EMS, which include but may not be limited to the following:

- **EO 13148, Greening the Government Through Leadership in Environmental Management.** Mandates that environmental management considerations must be an integral component of Federal Government policies, operations, planning, and management, with the primary goal for each agency to promote the sustainable management of Federal facility lands through the implementation of cost-effective, environmentally sound practices, and programs to reduce adverse impacts to the natural environment.
- **EO 13423, Strengthening Federal Environmental, Energy, and Transportation Management.** Establishes the EMS as the primary management approach for addressing environmental aspects, including energy and transportation aspects, and as the reporting mechanism for communicating progress on meeting performance goals.
- **EO 13514, Leadership in Environmental, Energy, and Economic Performance.** Requires continuing implementation of formal EMSs at all appropriate organizational levels to support the sustainability performance requirements of the Order.

2.3. ENVIRONMENTAL MANAGEMENT SYSTEM

An EMS is a systematic way to identify and eliminate or minimize the installation's environmental risk-to-mission. MCB Camp Lejeune's EMS identifies practices and their aspects as a starting point for prioritizing environmental management initiatives. Each installation practice, such as construction/renovation/demolition, equipment operation/maintenance/disposal, landscaping, or pesticide/herbicide management and application, has one or more environmental aspects. Figure 2-2 illustrates the simplified potential interactions of one practice, construction/renovation/demolition, with the environment.



Figure 2-2. Potential Interactions of Construction and Demolition Activities with the Environment

2.4. EMS RESPONSIBILITIES

Contractors are expected to understand that the practices they support on the installation may interact with and have the potential to impact the environment. Therefore, it is expected that contractors will do the following:

- Review the Contractor Environmental Guide.
- Be aware of the Environmental Policy (Attachment 2-1).
- Conduct practices in a way that avoids and/or minimizes impacts to the environment by complying with all applicable Federal, State, and local environmental regulations and BOs.
- Be familiar with spill response procedures.
- Report all environmental emergencies and spills.
- Report any environmental problems or concerns promptly, and notify the ROICC or Contract Representative.
- Respond to data collection efforts upon request.

Contractors are expected to understand that the activities performed on the installation may interact with the environment and have the potential to impact the environment.

2.5. CONTRACTOR ENVIRONMENTAL GUIDE AND EMS

The sections of this Contractor Environmental Guide are categorized based on the type of environmental requirements routinely encountered by contractors at MCB Camp Lejeune. The following matrix is derived from MCB Camp Lejeune's EMS Working Group sessions and relates the contents of this guide to the practices aboard MCB Camp Lejeune. It is provided to assist contractors in narrowing down specific requirements that may apply to onsite activities.

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Table 2-1. Practices Identified Under MCB Camp Lejeune's EMS

MCB Camp Lejeune 2015 Practices	Env. Emergency Response/ Spill Response, Section 5.0	HM/HW, Section 7.0	Potential Discovery of Undocumented Contaminated Sites, Section 13.0	Asbestos, Section 8.0	Lead-Based Paint, Section 9.0	Stormwater, Section 11.0	Solid Waste, Recycling, and P2, Section 12.0	Training, Section 3.0	Cultural Resources, Section 6.0	Permitting, Section 14.0	Air Quality, Section 4.0	Natural Resources, Section 10.0
	Applicable to All Practices Conducted Aboard MCB Camp Lejeune	Applicable to All Practices Conducted Aboard MCB Camp Lejeune	Applicable to All Practices Conducted Aboard MCB Camp Lejeune	Applicable to All Practices Conducted Aboard MCB Camp Lejeune	Applicable to All Practices Conducted Aboard MCB Camp Lejeune	Applicable to All Practices Conducted Aboard MCB Camp Lejeune	Applicable to All Practices Conducted Aboard MCB Camp Lejeune	Applicable to All Practices Conducted Aboard MCB Camp Lejeune	Applicable to All Practices Conducted Aboard MCB Camp Lejeune	Applicable to All Practices Conducted Aboard MCB Camp Lejeune	Applicable to All Practices Conducted Aboard MCB Camp Lejeune	Applicable to All Practices Conducted Aboard MCB Camp Lejeune
Battery management		●					●					
Boat operation/maintenance		●										
Boat, ramp, dock cleaning						●						
Boiler operation		●										
Building operation/maintenance/repair		●		●			●					
Channel dredging						●						
Chlorination		●										
Composting						●	●					
Construction/demo/renovation				●	●	●	●		●			
Cooling tower operation and maintenance		●										
De-greasing		●									●	
Drinking water management		●										
Engine operation and maintenance		●									●	
Equipment operation/maintenance/disposal		●		●			●					
Erosion/ runoff control						●						●
Fish stocking												

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MCB Camp Lejeune 2015 Practices	Env. Emergency Response/ Spill Response, Section 5.0	HM/HW, Section 7.0	Potential Discovery of Undocumented Contaminated Sites, Section 13.0	Asbestos, Section 8.0	Lead-Based Paint, Section 9.0	Stormwater, Section 11.0	Solid Waste, Recycling, and P2, Section 12.0	Training, Section 3.0	Cultural Resources, Section 6.0	Permitting, Section 14.0	Air Quality, Section 4.0	Natural Resources, Section 10.0
Applicable to All Practices Conducted Aboard MCB Camp Lejeune	●	●										
Fueling and fuel mgt./ storage		●				●						
Grease traps							●					
Habitat management		●										●
HCP operation		●										
HM storage		●				●						
HM transportation		●					●					
HW disposal offsite transport		●					●					
HW satellite accumulation area		●									●	
HW storage (<90 days)		●										
HW transportation		●		●								
Land clearing					●				●			●
Landfill gas energy recovery system						●						
Landscaping		●				●						
Laundry		●										
Live fire range operation		●				●						●
Livestock operation						●	●					
Metal working		●					●				●	
Non-destructive inspection		●										
ODS/ halon management		●									●	
Packaging/unpack-aging							●					
Applicable to All Practices Conducted Aboard MCB Camp Lejeune												

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MCB Camp Lejeune 2015 Practices	Env. Emergency Response/ Spill Response, Section 5.0	HM/HW, Section 7.0	Potential Discovery of Undocumented Contaminated Sites, Section 13.0	Asbestos, Section 8.0	Lead-Based Paint, Section 9.0	Stormwater, Section 11.0	Solid Waste, Recycling, and P2, Section 12.0	Training, Section 3.0	Cultural Resources, Section 6.0	Permitting, Section 14.0	Air Quality, Section 4.0	Natural Resources, Section 10.0
	Applicable to All Practices Conducted Aboard MCB Camp Lejeune	Applicable to All Practices Conducted Aboard MCB Camp Lejeune	Applicable to All Practices Conducted Aboard MCB Camp Lejeune	Applicable to All Practices Conducted Aboard MCB Camp Lejeune	Applicable to All Practices Conducted Aboard MCB Camp Lejeune	Applicable to All Practices Conducted Aboard MCB Camp Lejeune	Applicable to All Practices Conducted Aboard MCB Camp Lejeune	Applicable to All Practices Conducted Aboard MCB Camp Lejeune	Applicable to All Practices Conducted Aboard MCB Camp Lejeune	Applicable to All Practices Conducted Aboard MCB Camp Lejeune	Applicable to All Practices Conducted Aboard MCB Camp Lejeune	Applicable to All Practices Conducted Aboard MCB Camp Lejeune
Paint booth												
Paint gun cleaning		●										
Paint removal		●			●							
Painting		●										
Parts replacement		●		●								
Pesticide/herbicide mgt. and application		●				●						
Polishing		●					●					
Pumping station/ force main		●										
Range residue clearance		●				●	●					
Recreational facilities operation		●										
Road construction and maintenance						●	●		●	●		●
Rock-crushing operations							●				●	
Roofing kettle		●										
Sewers												
Sidewalk and road deicing		●				●						
Soil excavation/grading						●			●			
Solid waste collection/transportatio n							●				●	
Storage tank management	●										●	

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MCB Camp Lejeune 2015 Practices		Env. Emergency Response/ Spill Response, Section 5.0	HM/HW, Section 7.0	Potential Discovery of Undocumented Contaminated Sites, Section 13.0	Asbestos, Section 8.0	Lead-Based Paint, Section 9.0	Stormwater, Section 11.0	Solid Waste, Recycling, and P2, Section 12.0	Training, Section 3.0	Cultural Resources, Section 6.0	Permitting, Section 14.0	Air Quality, Section 4.0	Natural Resources, Section 10.0
Stormwater collection/ conveyance	Applicable to All Practices Conducted Aboard MCB Camp Lejeune						●						
Surface washing													
Swimming pool operation and maintenance		●											
Timber management													
Universal waste storage/ collection		●											
Urban wildlife management								●					
UXO/EOD operations		●											
Vehicle maintenance		●						●					
Vehicle parking							●						
Wash rack						●							
	Applicable to All Practices Conducted Aboard MCB Camp Lejeune												

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Attachment 2-1
**MCB Camp Lejeune's Environmental
Policy Statement**

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COMMANDING GENERAL'S ENVIRONMENTAL POLICY STATEMENT

The protection and enhancement of our natural environment is a valuable tool in sustaining the training and support mission of Marine Corps Installations East-Marine Corps Base Camp Lejeune (MCIEAST-MCB CAMLEJ). As MCIEAST-MCB CAMLEJ prepares for the increasing demands on facilities, training areas, ranges, and quality-of-life services that support the readiness of our forces, we are committed to protecting human health, conserving natural and cultural resources, and complying with regulatory requirements.

The MCIEAST-MCB CAMLEJ Environmental Management System (EMS) promotes sustained mission readiness through actively identifying and implementing solutions and opportunities for efficient resource use. Through the EMS, MCIEAST-MCB CAMLEJ will continually assess daily operations in order to identify and implement improvements to its practices that will ensure compliance with governing regulations and meet the sustainability objectives of Executive Orders 13514 and 13423. In this endeavor, MCIEAST-MCB CAMLEJ will:

- Continue proactive compliance with all environmental laws, regulations, and U. S. Marine Corps policies.
- Integrate natural and cultural resource management with the military mission whenever practical.
- Incorporate sound environmental practices into all of our operations and business decisions.
- Implement pollution prevention initiatives, waste diversion, recycling, and waste minimization programs.
- Assess and remediate contaminated sites aboard the Base that are the result of past disposal practices or spills and leaks of hazardous materials.
- Implement energy efficiency and water conservation management projects.
- Procure sustainable products, including biobased, environmentally preferable, energy efficient, water efficient, and recycled-content products.
- Collaborate with local communities and regulatory agencies to enhance stewardship of the environment, create goodwill and build trust.
- Educate our Marines, Sailors, and Civilian Marines about their responsibility to protect our natural environment, stressing the important role each individual plays in an effective EMS.

Join me in applying these environmental management principles to protect and enhance our natural environment, while strengthening the combat readiness of our forces and the quality-of-life services to our warriors and their families.

A handwritten signature in black ink, appearing to read "R. F. Castellvi".

R. F. CASTELLVI
Brigadier General, U.S. Marine Corps
Commanding General
Marine Corps Installations East-Marine Corps Base Camp Lejeune

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3.0 TRAINING

To minimize the environmental impact of MCB Camp Lejeune operations, all contractors are required to receive both EMS and general environmental awareness training at the level necessary for their job function.

The contractor is responsible for ensuring that every employee completes a program of classroom instruction or on-the-job training that teaches the employee to perform his or her duties in compliance with Federal, State, and local regulatory requirements.

To minimize the environmental impact of MCB Camp Lejeune operations, all civilian and military personnel, including contractors, are required to

receive both EMS and general environmental awareness training at the level necessary for their job function. Use of the Contractor Environmental Guide satisfies these training requirements. A training presentation is provided in the Appendix.

NOTE: The contractor is responsible for knowing and complying with Federal, State, and local regulations. MCB Camp Lejeune environmental personnel will assist contractors with compliance issues; however, the primary burden of regulatory identification, familiarity, and compliance lies with the contractor. This training *does not*

replace any required regulatory training as per contract requirements. Required training should be completed *prior* to working at MCB Camp Lejeune.

3.1. KEY DEFINITIONS AND CONCEPTS

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

Please consult the ROICC or Contract Representative with any questions or concerns about the information in this section.

3.1.1. Key Definitions

- **Explicitly Required Training.** Training expressly required by specific laws, regulations, or policies that apply due to the nature of work assignments, job functions, and/or specific licensing or certification requirements mandated by environmental laws, regulations, or policies.
- **Implicitly Required Training.** Instruction/information that is not expressly required by laws, regulations, or policies, but that may be reasonably inferred as being required to maintain compliance or is determined through EMS to reduce overall environmental risk.

3.1.2. Key Concepts

- **Comprehensive Environmental Training and Education Program (CETEP).** The USMC training program designed to ensure that high-quality, efficient, and effective environmental training, education, and information are provided at all levels of the USMC.
- **Environmental Management System (EMS).** The part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes, and resources for developing, implementing, achieving, reviewing, and maintaining the Environmental Policy.
- **EMS Training.** All contractors are required to receive EMS training at the level necessary for their job function.
- **General Environmental Awareness Training.** Instruction designed to ensure that MCB Camp Lejeune and MCAS New River personnel become familiar with the installation environmental policies and programs for regulatory compliance, natural resource conservation, P2, and environmental protection. General EMS and Environmental Awareness Training for contractors and vendors is required for all MCB Camp Lejeune contractors. The training presentation is included as an Appendix to this document.

3.1.3. Environmental Management System

Training is potentially applicable to all EMS practices conducted aboard MCB Camp Lejeune.

3.2. OVERVIEW OF REQUIREMENTS

Contractors operating aboard MCB Lejeune and MCAS New River must be aware of and adhere to all applicable regulations and requirements concerning training, which include but may not be limited to the following:

- [Executive Order 13423](#). Strengthening Federal Environmental, Energy, and Transportation Management. Requires implementation of an EMS at all appropriate organizational levels.

3.3. TRAINING REQUIREMENTS

3.3.1. General Environmental Awareness

In accordance with DoD instructions and MCO, the EMD at MCB Camp Lejeune has implemented a CETEP. A major component of the CETEP is to provide general environmental awareness training to all individuals associated with the installation, including contractors and vendors. Prior to or within 30 days of beginning work onsite, all contractors and their employees performing work aboard

Prior to or within 30 days of beginning work onsite, all contractors are required to receive both EMS and general environmental awareness training.

MCB Camp Lejeune must receive general environmental awareness training.

3.3.2. Environmental Management System

In addition to CETEP requirements, MCB Camp Lejeune has implemented an installation-wide EMS per EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, and DoD and USMC EMS policy. The EMS highlights the fact that the authority and principal responsibility for controlling environmental impacts belong to those commands, units, offices, and personnel (including contractors and vendors) whose activities have the potential to impact the environment.

Prior to or within 30 days of beginning work onsite, all contractors and their employees performing work aboard MCB Camp Lejeune must receive EMS training.

3.3.3. Recordkeeping

Upon completion of the training materials included in the Appendix of the Contractor Environmental Guide, each employee must sign the Training Roster. The Contracting Representative must maintain these records in the contract file.

All training records, including other applicable environmental training, must be maintained onsite for review.

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4.0 AIR QUALITY

The Air Quality Program is responsible for ensuring that the installation complies with all applicable Federal, State, and local air quality regulations. The ROICC or Contract Representative will provide a copy of BO 5090.6A, Air Quality Management, which has additional information.

4.1. KEY DEFINITIONS AND CONCEPTS

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

Please consult the ROICC or Contract Representative with any questions or concerns about the information in this section.

4.1.1. Key Definitions

- **Criteria Pollutants.** Pollutants that the U.S. Environmental Protection Agency (EPA) Administrator has determined will cause or contribute to air pollution, that may reasonably be anticipated to endanger public health and welfare, and for which air quality criteria have been established (i.e., sulfur dioxide, nitrogen oxides,

ground-level ozone, carbon monoxide, lead, and particulate matter).

- **Dust-Causing Activity.** Any activity that has the potential to generate an excess level of dust, including but not limited to construction and demolition (C&D), blasting and sanding, construction of haul roads, land clearing, or fallow fields.
- **Hazardous Air Pollutants.** Air pollutants, as identified within 42 United States Code (USC) 7412, that cause or may cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental and ecological effects.
- **Ozone-Depleting Substance.** Chemicals, such as certain refrigerants, that cause depletion of the stratospheric ozone layer—primarily chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) and their blends.
- **Particulate Matter.** A criteria air pollutant that includes dust, soot, and other small materials that are released into and transported by air.
- **Title V Operating Permit.** Permit issued under the Clean Air Act (CAA) Amendments of 1990 for all major sources of air pollution. All emission sources at the installation must be listed on the permit.

4.1.2. Key Concepts

- **Emission Sources.** Before beginning any emitting activity, please have the ROICC or Contract

Representative contact EMD to determine whether any permitting, monitoring, reporting, testing, and/or recordkeeping requirements apply.

- **Permitted Sources.** Ensure that construction/authorization permits are in place prior to beginning construction and/or prior to the arrival onsite of new or additional emission sources (emergency generators, paint booths, etc.).

4.1.3. Environmental Management System

Contractor activities associated with air quality include the following:

- Boat operation/maintenance
- Boiler operation
- Chlorination
- Degreasing
- Engine operation and maintenance
- Fueling and fuel management/storage
- Hazardous material (HM) storage/transportation
- Hazardous waste (HW) satellite accumulation area/HW transportation
- Live fire range operations
- Metal working
- Ozone-depleting substance (ODS)/halon management

- Paint booth operations/paint gun cleaning/paint removal
- Polishing
- Road construction and maintenance
- Rock-crushing operations
- Solid waste collection/transportation
- Storage tank management
- Unexploded ordnance (UXO)/explosives and ordnance disposal (EOD) operations
- Vehicle maintenance

The potential impacts of these activities on the environment include degradation of air quality, degradation of quality of life, and depletion of nonrenewable resources.

4.2. OVERVIEW OF REQUIREMENTS

Contractors operating aboard the installation must be aware of and adhere to all applicable regulations and requirements regarding air quality, which include but may not be limited to:

- [Clean Air Act Amendments of 1990.](#) Protect human health and clean air resources by establishing standards and regulations for the control of air pollutants.
- [Title V Operating Permit.](#) Operating permit required for any major stationary source that emits or

has the potential to emit 100 tons per year or more of any criteria air pollutant and outlines the requirements to address and ensure air quality compliance.

- [BO 5090.6A, Air Quality Management.](#) Implements policies and procedures at the installation level that all personnel must follow in order to demonstrate compliance with the Title V permit and USMC requirements.
- [Base Bulletin 5090, Open Burning of Vegetative Debris.](#) Outlines procedures for conducting open burning in accordance with State regulations and installation procedures.
- [North Carolina Department of Air Quality \(NCDAQ\) Rules.](#) Outlines all State-specific air quality rules, control requirements, procedures for permits, and approvals contained in 15A North Carolina Administrative Code (NCAC) 02D, 02H, and 02Q applicable to North Carolina entities.

4.3. PERMIT REQUIREMENTS

The installation has a single permit, the CAA Title V Construction and Operating Permit, which includes all stationary air emission sources at the facility; therefore, all permit application submittals to the NCDAQ must be coordinated through the EMD. The NCDAQ will review and process the application and then issue a permit to construct and operate or to modify the emission source(s). A permit is required prior to the construction of any emission source. Timely submittal of the permit application is required to

obtain the final permit prior to commencing construction. The most common types of emission sources at the installation are as follows:

- Boilers
- Generators
- Engine test stands
- Surface coating/painting operations
- Paint removal (chemical and mechanical), abrasive blasting, or other surface preparation activities
- Fuel storage and fuel dispensing
- Grinding
- Woodworking
- Welding
- ODS/refrigerant recovery and recycling operations (industrial chillers, refrigerators, air conditioning compressors, cleaning agents, etc.)
- Bulk chemical and flammable materials storage

A permit is required for the construction of any emission source. Timely submittal of the permit application is necessary to ensure the permit is available before commencing construction.

4.4. ADDITIONAL ACTIVITIES OF CONCERN

Contact the ROICC or Contract Representative for additional information regarding activities that do not

necessarily require modification to the Title V permit, but that must be coordinated with or tracked by EMD or the NCDAQ. Examples of these activities include, but are not limited to, the following:

- **Use, Maintenance, and Management of Refrigerants and other ODS.** Includes installation, recovery, replacement, conversion, or service of refrigerant-containing equipment (chillers, refrigerators, air conditioning condensers, etc.). All contractors will use Best Management Practices (BMPs) during refrigerant management activities. All Heating, Ventilation, and Air Conditioning (HVAC) technicians will maintain their appropriate State-specific licenses and present them to the ROICC or Contract Representative upon request.
- **Emergency Generators.** Includes the installation and temporary use of emergency generators during electrical failures and construction activities. All contractors will coordinate with the ROICC or Contract Representative to determine if the intended generator may be exempted or must be temporarily permitted for the intended use.
- **Open Burning (e.g., right-of-way clearing, storm debris burning).** Open burning activities aboard MCB Camp Lejeune and MCAS New River must be coordinated through EMD and the Fire Department. Open burning activities are only permissible for land clearing and right-of-way maintenance when the following conditions are met:

- o The wind direction at the time the burning is initiated is away from any public transport roads within 250 feet so they are not affected by smoke, ash, or other air pollutants from the burning.
- o The location of the burning is at least 500 feet from any dwelling, group of dwellings, commercial or institutional establishment, or other occupied structure not located on the property on which the burning is conducted, unless an air curtain burner is used. If an air curtain burner is used, the regional office supervisor may grant exceptions to the setback requirements.
- o Heavy oils, asphaltic materials (e.g., shingles and other roofing materials), items containing natural or synthetic rubber, or any materials other than vegetative plant growth are not burned.
- o Initial burning must begin between 0800 and 1800. After 1800, no material may be added to the fire until 0800 the following day.
- o No fires may be started, and no vegetation may be added to existing fires, when the North Carolina Division of Forest Resources has banned burning for that area.
- o Burners that have the potential to burn more than 8,100 tons per year may be subject to Title V air quality permitting requirements.

Situations that require a regulatory exemption evaluation by the NCDAQ Regional Office

Supervisors are coordinated through EMD's Environmental Quality Branch Air Quality Program Manager. The ROICC or Contract Representative will address any additional questions or provide a copy of Base Bulletin 5090, which contains a summary of the installation's open burning requirements.

The four designated sites at MCB Camp Lejeune that are permitted for storing and/or burning storm debris are in the following areas: Mainside at the borrow pit near the Piney Green landfill, Courthouse Bay, Camp Johnson, and Camp Geiger. Only storm debris may be accumulated at these sites. EMD must notify the NCDAQ if the installation intends to burn the storm debris at one of these sites. Contact the ROICC or Contract Representative for more information.

- **Fire training outside of designated fire training pits.** State approval is required to conduct fire training outside of the designated fire training pits. First, complete the Notification of Open Burning for the Training of Firefighting Personnel form. The form is available at the following site: http://daq.state.nc.us/enf/openburn/ob_firetrain.pdf.

Before the training exercise, an accredited North Carolina Asbestos Inspector must inspect any structure to be burned to ensure that it is free from asbestos. Turn in the completed form to EMD for submittal to NCDAQ and the Division of Public Health, Health Hazards Control Unit. Contact the

ROICC or Contract Representative for additional information.

- **Dust-causing activities (e.g., concrete and rock crushing).** Wet suppression is required during the entire dust-causing operation. Ensure that an adequate water supply is available, and coordinate with the Fire and Emergency Services Division if access to a fire hydrant is necessary. Applicable wet suppression may be required during temporary concrete-crushing operations during C&D activities.
- **Noise Management.** USMC commands engaged in any activity resulting in noise emissions must comply with Federal, State, interstate, and local requirements for the control and management of environmental noise to minimize disruption to the local community. To the maximum extent practicable, personnel should limit the use of power tools, machinery, construction equipment, and other noisy devices to normal working hour

5.0 ENVIRONMENTAL EMERGENCY PLANNING AND RESPONSE

Environmental emergency planning and response can reduce injuries, protect employees, reduce asset losses, minimize downtime, and minimize environmental impacts of uncontrolled releases of pollutants to air, land, and water. The purpose of emergency planning is to prepare for, mitigate, respond to, and recover from environmental emergencies while minimizing any potential impacts to human health and the environment. Contractors operating aboard MCB Camp Lejeune must be aware of and adhere to all environmental emergency response procedures and notification requirements to minimize detrimental effects from inadvertent releases.

Procedures relating to emergencies caused by unforeseen site conditions are addressed in Section 5.0 of this guide. If an environmental emergency is identified, contact 911 immediately. Additional inquiries should be directed to the ROICC or Contract Representative.

5.1. KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with environmental emergency response and spill response requirements. If you have any

Please consult the ROICC or Contract Representative with any questions or concerns about the information in this section.

questions or concerns about the information in this section, please consult the ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

5.1.1. Key Definitions

- **Berm.** A mound used to prevent the spread of a contaminant.
- **Discharge.** Any spilling, leaking, pumping, pouring, emitting, emptying, or dumping not explicitly permitted.
- **Navigable waters.** The waters of the United States and territorial seas, including waters that have been or may be used for commerce, waters subject to tidal flow, interstate waters and wetlands, and all other waters (intrastate lakes, rivers, streams, intermittent streams, flats, wetlands, sloughs, prairies, wet meadows, natural ponds, tributaries, etc.).
- **Petroleum, Oil, and Lubricant (POL).** A broad term that includes all petroleum and associated products or oil of any kind or in any form, including, but not limited to, petroleum, fuel oil, vegetable oil, animal oil, sludge, oil refuse, and oil mixed with wastes.
- **Release.** Pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers, and other closed receptacles) of any hazardous

chemical, hazardous substance, or extremely hazardous substance (EHS). Releases may be aboveground, belowground, or to water.

- **Spill Event.** The reportable discharge of oil into or upon the navigable waters of the United States or adjoining shorelines in harmful quantities, as defined by the Code of Federal Regulations (CFR) in 40 CFR 110.

5.1.2. Key Concepts

- **Environmental Emergency Response Contacts.** The following table identifies the emergency contact information for various spill scenarios. In addition to these emergency response contacts, the ROICC or Contract Representative should be notified immediately after an incident.

Table 5-1. Environmental Emergency Response Contacts

For spills of:	Call:	Follow-up:
Hazardous waste	911	Spill Report
Unknown materials	911	Spill Report
Material on a permeable surface	911	Spill Report

For spills of:	Call:	Follow-up:
Greater than 5 gallons of a material	911	Spill Report
Material that reaches stormwater inlets or waterways	911	
Nonhazardous waste	(910) 451-1482	911

- Contractors have containment and cleanup responsibilities following a spill, and there may be additional follow-up reporting or requirements. Contact the ROICC or Contract Representative for additional guidance.

5.1.3. Environmental Management System

Environmental planning and response are potentially applicable to all EMS practices conducted aboard MCB Camp Lejeune.

5.2. OVERVIEW OF REQUIREMENTS

Contractors operating aboard MCB Lejeune and MCAS New River must be aware of and adhere to all applicable regulations and requirements regarding emergency response

and spill response procedures, which include but may not be limited to the following:

- [Clean Air Act of 1970, Section 112r](#) Mandates the prevention and control of air emissions and specifies emergency planning where the potential exists for accidental release of hazardous air pollutants.
- [Clean Water Act \(CWA\) of 1972](#). Establishes the basic structure for regulating discharges of pollutants into the waters of the United States. The CWA establishes that there should be no discharges of oil or hazardous substances into or upon the navigable waters of the United States or adjoining shorelines, which may affect natural resources under the management of the United States.
- [Comprehensive Environmental Response, Compensation, and Liability \(CERCLA\) Act of 1980](#). Authorizes a Federal response to any release or threatened release of a hazardous substance into the environment. This act defines hazardous substances by reference to substances that are listed or designated under other environmental statutes.
- [Emergency Planning and Community Right-to-Know Act \(EPCRA\) of 1986, Section 304](#). Establishes requirements for reporting a release to ensure a quick response by local emergency responders. Notification requirements apply to two chemical lists: the CERCLA Hazardous Substance list and the EHS list. The “List of Lists” provides a comprehensive identification of hazardous

substances and EHSs. In addition, facilities may be required to submit a list of their hazardous materials inventory maintained onsite or Safety Data Sheets (SDS) to response personnel.

- [**Oil Pollution Act \(OPA\) of 1990.**](#) Addresses oil storage at facilities and emphasizes preparedness and response activities. This act prohibits the harmful discharge of oil and hazardous substances into waters of the United States. The OPA requires contingency planning for “worst case” discharges and demonstrated response capabilities through planning, equipment, training, and exercises.
- [**Resource Conservation and Recovery Act \(RCRA\) of 1976.**](#) Protects human health and the environment from the hazards associated with hazardous waste handling, generation, transportation, treatment, storage, and disposal. Subtitle C of the RCRA requires owners and operators of hazardous waste facilities to develop comprehensive management plans that address spill prevention and cleanup.

5.3. SPILL NOTIFICATION

5.3.1. POL/Hazardous Materials Spill Notification Procedures

In accordance with MCB Camp Lejeune notification requirements, any discharge of oil or hazardous materials must be immediately reported to the MCB Camp Lejeune Fire Department at 911.

MCB Camp Lejeune maintains a Spill Prevention, Control, and Countermeasures (SPCC) Plan that establishes procedures to prevent oil spills and documents existing oil spill prevention structures, procedures, and equipment. The Installation SPCC Plan provides general information for any type of response actions needed for spills aboard MCB Camp Lejeune. Contractors engaged in the handling and transfer of POL or hazardous materials must develop a Unit-Level Contingency Plan (ULCP) that addresses the spill response for their specific sites and potential spill types. This ULCP must be maintained onsite, and all personnel working within that site must be made aware of its location and use.

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

In the event of a spill, contact the ROICC or Contract Representative (after contacting emergency responders) to obtain a spill report form. Return the completed spill report form to EMD (fax to (910) 451-3471) and to the ROICC or Contract Representative. A copy of the spill report form is included as Attachment 5-1. The following information must be provided when reporting a spill:

- Name and phone number
- Location of spill (building. number, street)
- Number and type of injuries, if any
- Type and amount of spilled material

- Source of the spill (container, vehicle, etc.)
- Action being taken, if any, to control the spill
- Estimated time of spill

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

5.3.2. Wastewater Spill and Water Line Break Notification

Contractors operating aboard MCB Camp Lejeune and MCAS New River must be aware of water and wastewater utilities in their specific work/project area.

Wastewater Spills

In the event of a wastewater spill, report the incident to the Public Works Base Utilities at (910) 451-7190 (x225). In addition, report the incident immediately to the ROICC or Contract Representative. The following information must be provided:

- Name and phone number
- Location of spill (building number, street address)
- Type and amount of spilled material
- Source of the spill
- Action being taken, if any, to control the spill
- Estimated time of spill

Water Line Breaks

In the event of a water line break, report the incident to the Public Works Base Utilities at (910) 451-7190 (x225). In addition, report the incident immediately to the ROICC or Contract Representative. The following information must be provided:

- Name and phone number
- Location of spill (building number, street address)
- Reason for the break
- Estimated time of the break

5.4. FOLLOW-UP

If surface run-off is contaminated, the contractor will, under the advisement of the Fire Department or EMD, construct a temporary berm or containment area. Contaminated surface water will be removed in accordance with all safety and environmental requirements for the installation. Notify the Resource Conservation and Recovery Section (RCRS) at (910) 451-1482; the RCRS will provide concurrence for temporary containment areas and removal of contaminated runoff.

If solid or hazardous waste was generated as the result of a spill, refer to Sections 12.0 and 7.0 of this guide for disposal requirements.

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Attachment 5-1

Spill Reporting Form

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**MARINE CORPS INSTALLATIONS EAST
MARINE CORPS BASE CAMP LEJEUNE
UNIT LEVEL SPILL FORM**

Spill Date: Spill Time: **RESPONDERS**Response Initiator: Major Command: Phone Number: Unit Name: Fire Department Response: Responder Name: EMD Respond? Responder Name:

GPS Coordinates:

X: Y: **SPILL IDENTIFICATION**Spilled Substance: State: Source (Vehicle, drum, etc.): Building: Estimated Amount:

Cause of Spill:

Containment/Clean-up Action Taken:

Parties Performing Spill Clean-up/Removal (EMD Turn-in Date):

Additional Assistance Required:

REPORT CERTIFICATIONPrinted Name/Rank: Signature: E-mail: Date:

All releases must be reported to the Base Fire Department by calling 911. The Environmental Management Division can be reached by calling (910) 451-1482. Units are required to maintain a copy of all completed spill forms, preferably in their ESOP Binder.

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6.0 CULTURAL RESOURCES

MCB Camp Lejeune enjoys a rich history, and remnants of our past may be found throughout the real properties that make up the installation. All personnel at MCB Camp Lejeune are responsible for ensuring the cultural resources entrusted to the USMC care remain intact and available for future generations. Contractors are responsible for notifying the ROICC or Contract Representative immediately if they encounter suspected archaeological sites, artifacts, or human remains.

6.1. KEY DEFINITIONS AND CONCEPTS

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

Please consult the ROICC or Contract Representative with any questions or concerns about the information in this section.

6.1.1. Key Definitions

- **Archaeological Resource.** Defined by the [Archaeological Resources Protection Act \(ARPA\)](#) as any material remains of past human life or activities

that are at least 100 years old and are capable of providing scientific or human understanding of past human behavior and cultural adaptation, including the site on which the remains are located. Examples include pottery, basketry, bottles, weapons, weapon projectiles, tools, structures or portions of structures, pit houses, rock paintings, rock carvings, intaglios, graves, human skeletal materials/remains, or any portion or piece of any of the foregoing items or structures. Non-fossilized and fossilized paleontological specimens, or any portion or piece thereof, are not considered archaeological resources unless found in an archaeological context. (According to the National Historic Preservation Act (NHPA) of 1966, some historic properties built within the past 50 years can achieve significance if they are of exceptional importance [National Register Criteria Consideration G].)

- **Cultural Resource.** A generic term for the collective evidence of the past activities and accomplishments of people, including buildings, structures, districts, sites, features, and objects of significance in history, architecture, archaeology, engineering, or culture, per [MCO P5090.2A](#).
- **Effect.** Any condition of a project that may cause a change in the quality of the historic, architectural, archaeological, or cultural character of a property that qualifies it for listing in the National Register of Historic Places (NRHP). A project is considered to have an effect on a historic or cultural property when any aspect of the project changes the integrity of the

location, design, setting, materials, workmanship, feeling, or association of the property that contributes to its significance.

- **Historic Property.** Any prehistoric or historic district, site, building, structure, or object significant in U.S. history, architecture, archaeology, engineering, or culture and included, or eligible for listing in, the NRHP, per the [NHPA](#) and [MCO P5090.2A](#).
- **State Historic Preservation Officer.** The person designated to administer the State Historic Preservation Program, including identifying and nominating eligible properties to the NRHP and administering applications for listing historic properties in the NRHP.

6.1.2. Key Concepts

- **Notification.** Contractors must notify the ROICC or Contract Representative if they encounter any cultural resources.
- **Policy.** DoD policy is to preserve significant historic and archaeological resources.

6.1.3. Environmental Management System

Contractor practices associated with cultural resources include the following:

- Construction/demolition/renovation
- Land clearing

- Road construction and maintenance
- Soil excavation/grading

The potential impacts of these activities on the environment include damage, destruction, alteration, theft, or demolition of historic properties.

6.2. OVERVIEW OF REQUIREMENTS

It is DoD policy to integrate the archeological and historic preservation requirements of applicable laws with the planning and management of activities under DoD control; to minimize expenditures through judicious application of options available in complying with applicable laws; and to encourage practical, economically feasible rehabilitation and adaptive use of significant historical resources.

Contractors operating aboard MCB Lejeune and MCAS New River must be aware of and adhere to all applicable regulations and requirements regarding cultural resources, which include but may not be limited to the following:

- [BO 5090.8A](#). Sets forth regulations and establishes responsibilities associated with management of archaeological and historic resources aboard MCB Camp Lejeune.
- [Archaeological and Historic Preservation Act \(AHPA\) of 1974 \(16 USC 469 et seq.\)](#) Amends the Reservoir Salvage Act to extend its provisions beyond the construction of dams to any terrain alteration resulting from any Federal construction

project or federally licensed project, activity, or program.

- [**Archeological Resources Protection Act of 1979 \(16 USC 470 et seq.\)**](#) Requires Federal land managers to issue permits for the excavation or removal of artifacts from lands under their jurisdiction. The ARPA requires that relevant Native American tribes be notified of permit issuance if significant religious or cultural sites will be affected. It prohibits the excavation, damage, alteration, theft, or defacement of an archaeological site or artifacts unless permitted by the Federal land manager.
- [**DoD Directive 4710.1, Archaeological and Historic Resources Management.**](#) Provides policy for the management of archaeological and historic resources on land and in water under DoD control.
- [**EO 11593, May 13, 1971.**](#) Requires all Federal agencies to administer cultural properties under their control. Agencies are required to direct their policies, plans, and programs so that significant sites and structures are preserved.
- [**Historic Sites, Buildings, and Antiquities Act of 1935 \(Public Law 74-292, 16 USC 461 et seq.\)**](#). States that it is Federal policy to preserve historic and prehistoric properties of national significance.
- [**National Environmental Policy Act \(NEPA\) of 1969 \(42 USC 4321 et seq.\)**](#). States that it is Federal government policy to preserve important historic, cultural, and natural aspects of our national heritage

and requires the consideration of environmental concerns during project planning and execution.

- **National Historic Preservation Act of 1966 (16 USC 470 et seq.)**. Establishes historic preservation as a national policy and requires Federal agencies undertaking actions that may affect NRHP-eligible historic properties to consult State historic preservation offices and the Advisory Council on Historic Preservation. Section 110 of NHPA requires Federal agencies to inventory, evaluate, identify, and protect cultural resources that are determined eligible for listing in the NRHP.
- **Public Buildings Cooperative Use Act of 1976 (Public Law 94-541)**. Encourages adaptive reuse of historic buildings as administrative facilities for Federal agencies.
- **Title 36 CFR Part 65, National Historic Landmarks Program**. Identifies and designates National Historic Landmarks, and encourages the long-range preservation of nationally significant properties that illustrate or commemorate the history and prehistory of the United States.

6.3. PROCEDURES

All contractors are expected to follow these procedures:

- Notify the ROICC or Contract Representative immediately concerning any encounter with suspected archaeological sites, artifacts, human remains, or any other suspected cultural resources during contractor activities.
- Stop work in the immediate area of the discovery until directed by the Contract Representative to resume work.

Notify the ROICC or Contract Representative immediately concerning any encounter with suspected archaeological sites, artifacts, or human remains during contractor activities.

Be particularly aware of surroundings when working in a designated historic area. The Camp Lejeune Installation Geospatial Information & Services Office of the Geospatial Services Division can provide resource mapping of known cultural resource areas for all planners, project managers, contractors, and others, through formal request. The ROICC or Contract Representative will assist with making arrangements to request access for Geographic Information System mapping.

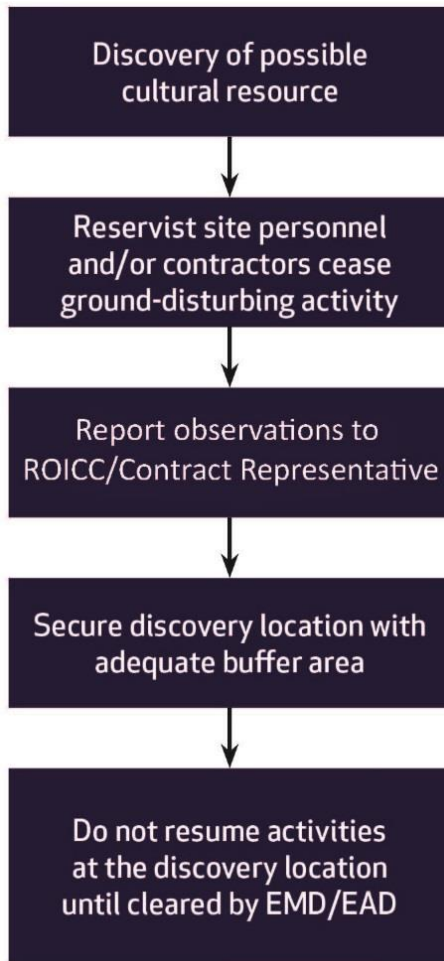


Figure 6-1. Possible Cultural Resource Discovery Flow Chart

7.0 HAZARDOUS MATERIALS/HAZARDOUS WASTE MANAGEMENT

All persons on a USMC installation are subject to compliance with Federal, State, and local regulations and permit conditions addressing the proper management of hazardous materials and waste. Mishandling these wastes and materials may result in violation notices, fines, and/or penalties. The EPA regulates hazardous wastes through the RCRA, which provides specific regulatory definitions for hazardous waste and its management. The RCRA governs all hazardous waste from the point of generation to ultimate disposal, including hazardous waste generated by contractors aboard MCB Camp Lejeune and MCAS New River. Hazardous materials, including those used by contractors aboard the installation, are also regulated by the EPCRA. Additionally, the North Carolina Department of Environmental Quality (NCDEQ) has issued more stringent rules and regulations governing hazardous materials and hazardous waste management that also apply to contractors.

7.1. KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with hazardous materials (HM), hazardous wastes (HW), and their management. If you have any questions or concerns about the information in this section,

**Direct questions
or concerns about
the information in
this section to the
ROICC or Contract
Representative.**

please consult the ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

7.1.1. Key Definitions

- **90-day Accumulation Area.** These areas are used to store HW temporarily until it is either manifested and shipped off site for disposal or transferred to a permitted storage facility. HW may be accumulated for up to 90 days in these areas. MCB Camp Lejeune's 90-day accumulation facility is located on Michael Road.
- **Generator.** Any person whose activity or process produces HW or whose activity or process subjects HW to regulation.
- **Hazardous Material.** A chemical compound, or a combination of compounds, posing or capable of posing a significant risk to public health, safety, or the environment as a result of its quantity, concentration, or physical/chemical/infectious properties.
- **Hazardous Waste.** Any discarded material (including solid, liquid, or gas) or combination of discarded materials which, due to quantity, concentration, or physical, chemical, or infectious characteristics may:
 - o Cause or significantly contribute to an increase in mortality or cause a serious irreversible or incapacitating reversible illness; or

- o Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.
- **Manifest.** A document that allows all parties involved in HW management (e.g., generators, transporters, disposal facilities, EPA, State agencies) to track the movement of HW from the point of generation to the point of ultimate treatment, storage, or disposal. All HW manifests for waste generated aboard MCB Camp Lejeune must be reviewed and released by personnel from the Resource Conservation and Recovery Section, EMD, who can be contacted at (910) 451-1482.
- **Non-RCRA-Regulated Waste.** Waste that is not regulated or is exempt from regulation under RCRA HW requirements but has other regulatory requirements for proper management.
- **Satellite Accumulation Area (SAA).** Designated areas at or near the point of generation, where HW is accumulated. Generators may accumulate up to 55 gallons of HW or one quart of acute HW at a satellite area for an indefinite amount of time. When 55 gallons of HW (or 1 quart of acute HW) are exceeded, the generator must date the container and transfer it to an approved 90-day site or long-term HW storage facility within 72 hours. EMD authorization for an SAA must be obtained and posted at the site. EMD authorization will establish individual limits for each SAA. No SAA

authorizations will exceed 55 gallons of HW or 1 quart of acute HW. In accordance with installation policy, HW in an SAA should not be stored longer than 365 days, even if the container is not full.

- **Safety Data Sheet (SDS).** A document that provides information about (1) chemical properties, environmental hazards, and health hazards; and (2) protective measures, along with safety precautions, for handling, storing, and transporting hazardous chemical products. The Hazard Communication Standard (HCS), 29 CFR 1910.1200(g), was revised in 2012 to mandate the use of a single Globally Harmonized System of Classification and Labelling of Chemicals (GHS) by manufacturers, distributors and importers to communicate information on chemical-related hazards. The information contained in the SDS is standardized in a 16-section format. Employers must ensure that the SDSs for all hazardous chemicals in the workplace are readily accessible to employees.
- **Treatment.** Any method, technique, or process designed to change the physical, chemical, or biological character or composition of any HW to neutralize the waste; or to recover energy or material resources from the waste; or to render such waste nonhazardous or less hazardous, safer to transport, store, or dispose of, or amenable for recovery or storage, or reduction in volume.
- **Treatment, Storage, and Disposal (TSD) Facilities.** TSD facilities conduct HW treatment,

storage, or disposal operations and require an RCRA part B permit for final approval to operate. The part B permit is maintained to accurately identify the most current operations at the TSD facility. MCB Camp Lejeune does not have a TSD facility.

- **Universal Waste (UW).** UW regulations streamline HW management standards for batteries, pesticides, mercury-containing equipment, and fluorescent lamps. The regulations govern the collection and management of these widely generated wastes, thus facilitating environmentally sound collection and proper recycling or treatment. In North Carolina, batteries, thermostats, obsolete agricultural pesticides, and fluorescent lamps may be managed under the UW Rule. UW must be transferred off site within 1 year of the date when the material was first identified as waste.
- **Used Oil.** Any oil that has been refined from crude oil or synthetic oil and, as a result of use, storage, or handling, has become unsuitable for its original purpose due to the presence of impurities or loss of original properties. Used oil may be suitable for further use and is economically recyclable; therefore, it is managed as a separate category of material.

7.1.2 Key Concepts

- **HW Management.** The systematic control of the collection, source separation, storage, transportation, processing, treatment, recovery, and disposal of HW. In addition, HW Management includes processes to

reduce the HW's effect on the environment and to recover resources from it.

- **HW Minimization.** The USMC policy is to reduce the quantity of HW disposed of by source reduction, recycling, treatment, and disposal. The highest priorities are reducing HW generation, and recycling. The goal of the USMC is to achieve continuous reduction of HW generation through P2 initiatives, BMPs, and use of the best available demonstrated technology.
- **National Fire Protection Association.** The U.S. trade association that creates and maintains private, copyrighted standards and codes, including the diamond hazard label in Figure 7-1, which is used by emergency personnel to quickly and easily identify the risks posed by hazardous materials.

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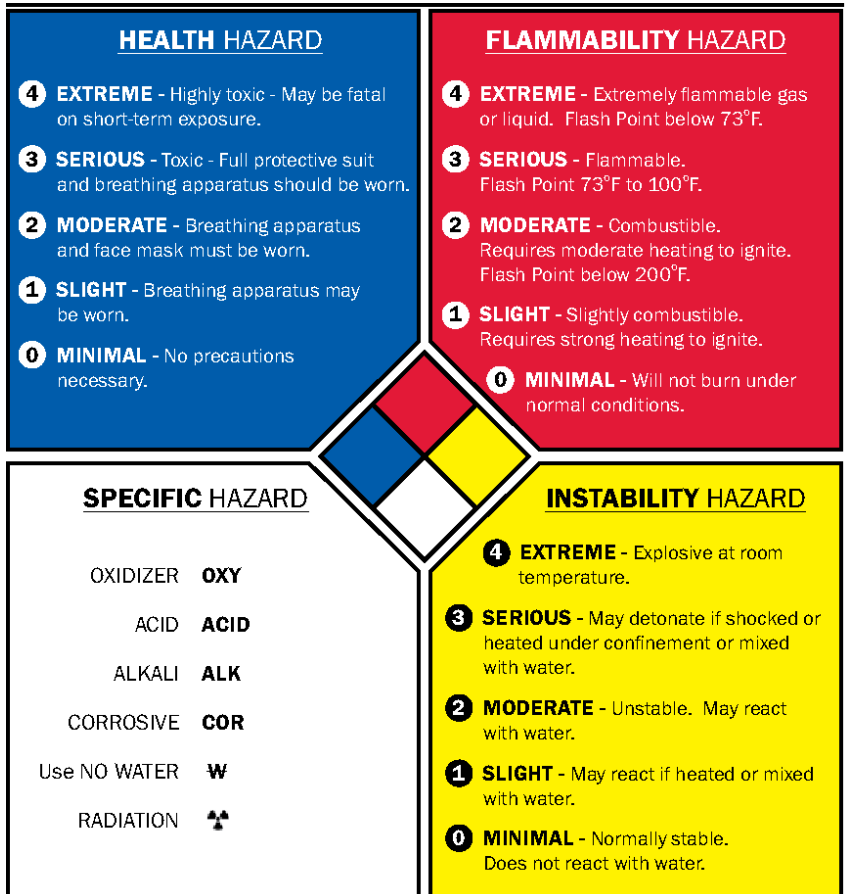


Figure 7-1. Diamond Hazard Label

7.1.3 Environmental Management System

Contractor practices associated with HM and HW management include, but are not limited to, the following:

- Battery management
- Boat operation/ maintenance
- Boiler operation
- Building operation/ maintenance/repair
- Chlorination
- Cooling tower operation and maintenance
- Construction/renovation/ demolition
- Degreasing
- Drinking water management
- Engine operation and maintenance
- Equipment operation/ maintenance/disposal
- Fueling and fuel management/storage
- Habitat management
- HCP operation
- HM storage
- HM transportation
- HW disposal offsite transport
- HW satellite accumulation area

HW storage (<90 days)
HW transportation
Laboratory
Landscaping
Laundry
Live fire range operations
Metal working
Non-destructive inspection
ODS/halon management
Paint gun cleaning
Paint removal
Painting
Parts replacement
Pesticide/herbicide management and application
Polishing
Pumping station/force main
Range residue clearance
Recreational facilities operation
Roofing kettle
Sidewalk and road deicing
Storage tank management
Swimming pool operation and maintenance

Universal waste storage/collection

UXO/EOD operations

Vehicle maintenance

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

7.2. OVERVIEW OF REQUIREMENTS

Contractors operating aboard MCB Lejeune and MCAS New River must be aware of and adhere to all applicable regulations and requirements regarding HM and HW, which include but may not be limited to the following:

- **[BO 5090.9, Hazardous Material/Waste Management/Air Station Order \(ASO\) 5090.2, Environmental Compliance and Protection Program for MCAS New River.](#)** Establishes procedures and general responsibilities for the disposal of HM and HW under environmental permits and authorizations.
- **[Emergency Planning and Community Right-to-Know Act.](#)** Establishes requirements regarding emergency planning and the reporting of hazardous chemical storage and use.
- **[Hazardous Material Transportation Act \(HMTA\) of 1975.](#)** The principal Federal law regulating the transportation of HM. Established to mitigate the risks to health, property, and the environment inherent in the transportation of HM in intrastate, interstate, and foreign commerce. The HMTA is administered by the U.S. Department of Transportation (DOT) and regulates the shipping, marking, labeling, placarding, and recordkeeping requirements for HM, including HW and military munitions.

- **Resource Conservation and Recovery Act of 1976.** Establishes standards for HW generators as necessary to protect human health and the environment by instituting statutory standards for generators and transporters of HW that will ensure the following: proper recordkeeping and reporting; use of a manifest system; use of appropriate labels and containers; containerization and accumulation time; and proper management of TSD facilities. In addition, it gives the EPA and State agencies authority to access facility premises and all records regarding HW management.
- **40 CFR Subchapter I (Parts 260–299), Solid Wastes.** Federal regulations promulgated under the 1976 RCRA that regulate HW management, generators, transporters, and owners or operators of TSD facilities. North Carolina has adopted the Federal HW rules by reference.

Because the installation is designated as a Large Quantity Generator (LQG) of HW, all HW generated aboard MCB Camp Lejeune must meet the regulatory requirements of this generator designation. An LQG may maintain three types of HW accumulation/storage areas: satellite, 90-day, and permitted. Typically, HW is accumulated at an SAA and later transferred to a 90-day or permitted storage area.

Both MCB Camp Lejeune and MCAS New River maintain Hazardous Waste Management Plans (HWMPs) that outline the specific requirements for managing HM and HW. The HWMP identifies and provides guidance to implement all regulatory HW management activities and is available to all

personnel who accumulate, generate, transport (including on-installation transportation), treat, store, or dispose of HW.

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

Contractors are responsible for the management of all HM and the ultimate disposition of any HW generated aboard MCB Camp Lejeune during a contract performance period. The ROICC or Contract Representative will contact Environmental personnel, who will provide additional guidance and oversight to verify compliance with applicable Federal, State,

and local laws governing the generation, handling, and disposal of HM, HW, UW, used oil, petroleum-contaminated materials, RCRA-regulated HW, and non-RCRA-regulated waste.

Depending on the type of project, contractors may be required to submit a site-specific HWMP to the ROICC or the Contract Representative prior to beginning work. Additionally, the Contracting Officer may require a Contractor Hazardous Material Inventory Log and corresponding SDSs for all materials to be used during the execution of the contract. EMD/EAD will use the SDSs to help contractors establish their Hazardous Material Storage and SAAs.

7.3. HAZARDOUS MATERIALS REQUIREMENTS

If a project uses HM:

- Reduce/reuse/recycle when possible; meet contract requirements for recycling.
- Segregate incompatible materials. Consult the SDS or material manufacturers with questions about a material's compatibility. Some examples of incompatible materials likely to be used by contractors are:

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

- o *Corrosives* (e.g., batteries, stripping and cleaning compounds containing acids or bases) *and Flammables* (e.g., fuels, oils, paints, and adhesives)
- o *Corrosives and Oxidizers* (e.g., peroxide, perchlorates, sodium hypochlorite/bleach, or calcium hypochlorite)
- o *Oxidizers and Flammables*
- All compatible materials should be segregated and stored within designated storage lockers or cabinets (i.e., flammable materials should be stored in designated flammable storage lockers or cabinets, and corrosives should be stored in designated corrosives storage lockers or cabinets).

- Do not store large quantities of materials. Keep on hand only what can be used.
- Maintain an inventory of all HM maintained onsite, with adequate controls in place to prevent unauthorized access.
- Do not dump any HM into floor drains, sinks, oil-water separators (OWSs), or storm drains, or onto the ground.

Stop work immediately if a project unearths a hazardous material (such as MEC/DMM/UXO) and report the situation to the ROICC or Contract Representative.

- Store containers that hold 55 gallons or more (including in-use electrical generators and portable equipment) in proper secondary containment. Permanent secondary containment must be inspected weekly, temporary secondary containment must be inspected daily; all inspections and drainage of stormwater from secondary containment must be documented.

- Maintain SDSs and appropriate spill control/cleanup materials onsite at all times.
- Provide HM storage and usage information for regulatory reporting to the appropriate environmental office upon request.
- Stop work immediately if a project unearths any unknown HM (e.g., munitions and explosives of

concern [MEC], discarded military munitions [DMM], or unexploded ordnance [UXO]), and immediately report the situation to the ROICC or Contract Representative.

- Do not leave HM (or HW) onsite once the contract is completed. Remove it from the installation or make arrangements through the ROICC or Contract Representative to contact RCRS or EAD for turn-in procedures upon completion of the contract.

7.4. UNIVERSAL WASTE REQUIREMENTS

The NCDEQ allows thermostats, obsolete agricultural pesticides, lamps, and certain types of batteries to be managed as UW. UW has less stringent requirements for storage, transport, and collection, but it must still comply with full HW requirements for final recycling, treatment, or disposal. Federal UW requirements are outlined in [40 CFR 273](#). Contact the ROICC or Contract Representative regarding any additional direction or questions on the handling of UW.

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

- Words: UNIVERSAL WASTE.
- Content: Noun name found on the specific Hazardous Waste Profile Sheet (DRMS Form 1930), which is available from EMD (e.g., *batteries*,

fluorescent lamps, pesticides, mercury-containing equipment).

- Accumulation Start Date (ASD): The ASD must be marked on the subject container as soon as the UW item is placed in the container. Storage of UW cannot exceed 365 days.
- Number of Containers: The number of containers marked reflects the total number of containers disposed of within the current document (i.e., 1 of 1, etc.).

Contractors who need UW accumulation areas should contact the ROICC or Contract Representative, who will contact RCRS or EAD personnel to help contractors establish an accumulation area for UW. Key points for this process:

- The containers must be under the control of the contractor generating the waste and must be closed at all times except when waste is being added.
- Per installation policy, UW containers/areas must be inspected weekly using the *Weekly Hazardous Waste (HW) Site Inspection Form*, included as Attachment 7-1 and Attachment 7-2. Written records noting discrepancies and corrective actions must be maintained onsite for 3 years. Copies of inspection reports should be provided to the ROICC or Contract Representative.
- When the ASD reaches 1 year, or when the container is full, the waste generator has 72 hours (3 days) to arrange for the transportation of the UW to an RCRA

Part B permitted storage area. Contact the ROICC or Contract Representative to coordinate the removal of the UW when the container is full or the contract is finished.

7.5. HAZARDOUS WASTE REQUIREMENTS

The appropriate environmental office must be notified before any HW is generated on projects managed by the ROICC or the Facilities Support Contracts (FSC). Have the ROICC or Contract Representative contact RCRS or EAD with questions regarding whether or not a waste meets the definition of HW. Installation personnel must approve all regulated waste and HW storage locations.

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

If a project generates HW:

- Minimize generation through waste minimization and P2 techniques.
- Have the ROICC or Contract Representative contact RCRS or EAD with questions regarding how to manage the waste. Do not mix waste types (e.g., used oil rags and solvent rags).
- Have the ROICC or Contract Representative contact RCRS or EAD for turn-in procedures as wastes are

generated, to determine if waste can be disposed of on the installation.

- Do not dump any HW into floor drains, sinks, OWSs, or storm drains, or onto the ground. Do not place HW into general/municipal trash dumpsters.
- Ensure that HW drums are properly labeled and lids are secured (wrench tight).
- Ensure that SAAs are managed properly and storage limits are not exceeded; have the ROICC or Contract Representative consult RCRS or EAD prior to creating a new SAA.

7.5.1. Storage

All HW must be properly containerized, stored, and labeled at the time the waste is first generated. HW must be stored in containers that meet applicable DOT specifications. HW labels, as required by the EPA and the NCDEQ, must contain the following information:

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

Any HW generated by contractors must be stored in an SAA. Contractors who need an SAA should contact the ROICC or Contract Representative, who will contact RCRS or EAD personnel to help the contractor establish each SAA. A summary of procedures follows:

- The HW generator may accumulate as much as 55 gallons of a specific HW stream (or up to one quart of acute HW) in a container at or near the point of generation.
- The containers must be under the control of the contractor generating the waste and must be kept closed (wrench tight) at all times except when waste is being added.
- HW containers must be inspected weekly using the *Weekly Hazardous Waste (HW) Site Inspection Form*, included as Attachment 7-1 and Attachment 7-2. Written records noting discrepancies and corrective actions must be maintained for a period of 3 years. Copies of inspection reports should be provided to the ROICC or Contract Representative.
- The generating contractor must monitor the level of waste in the SAA container and contact the ROICC or Contract Representative to coordinate disposal or determine if the contractor can turn in the HW to RCRS or EAD before the container is full. If the SAA container becomes full, the generating contractor has 72 hours (3 days) to arrange for the transport of the HW to an RCRA Part B permitted

storage area. Storage of HW in an SAA should not exceed 365 days, even if the container is not full.

7.5.2. Manifesting and Disposal

All disposal of HW generated by contractors must be coordinated with the installation. HW and UW generated aboard MCB Camp Lejeune and MCAS New River must be transported off the installation by a permitted HW transporter and must include a *Uniform Hazardous Waste Manifest* form (EPA Form 8700-22) or an equivalent approved manifest. The following procedures must be followed for disposal of HW:

- Use the MCB Camp Lejeune or MCAS New River EPA identification number for disposal of all contractor-generated HW.
- HW may only be transported by authorized personnel or permitted companies. Prior to

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

transportation offsite, the HW generator must ensure that all DOT requirements for labeling, marking, placarding, and containerizing are met. The HW generator must also ensure that the transporter has obtained the installation's EPA identification number for the transportation of HW and that an appropriate waste manifest accompanies each shipment.

- The HW manifest can only be signed by personnel from the installation who have been designated in writing by the CG. The ROICC or Contract Representative should contact RCRS or EAD about manifesting regulated and non-regulated wastes offsite. Under **NO** circumstances can a contractor, ROICC, or Contract Representative sign a HW manifest or use another EPA identification number for wastes generated at the installation.
- All HW must be submitted to a permitted TSD facility. HW generators must certify that the facility receiving the waste employs the most practical and current treatment, storage, or disposal methods for minimizing present and future threats to human health and the environment.

7.6. NON-RCRA-REGULATED WASTE REQUIREMENTS

Non-RCRA-regulated wastes include used oil (when recycled), non-terne (tin and lead alloy) plated oil filters (not mixed with listed waste), CFC refrigerants (from totally enclosed equipment), certain wastes containing Polychlorinated Biphenyl (PCB), asbestos, and batteries not managed as UW.

7.6.1. Used Oil and Oil Filters

Used motor oil itself is *not* regulated as HW in North Carolina if it is recycled or burned for energy recovery. If used oil is not recycled, the generator must determine prior to disposal whether it is HW. Used oil must be collected in

drums or another approved container marked “Used Oil.” If the used oil storage container has a volume of 55 gallons or more, it must be stored in secondary containment.

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

Terne plated oil filters contain an alloy of tin and lead. They are considered a hazardous waste due to their lead content and are typically located on industrial and heavy duty vehicles and equipment. All other used oil filters are not regulated as HW in North Carolina, as long as they are not mixed with listed HW. To qualify for this exclusion, the following conditions must be met:

- Used oil filters must be gravity hot-drained by puncturing the filter anti-drain back valve or filter dome and hot draining into a “Used Oil” storage drum. “Hot-drained” means that the oil filter is drained at a temperature that approximates the temperature at which the engine operates.
- Any incidental spillage that occurs must be cleaned up with a dry sweep, rags, or “absorbent matting.”
- Drained used oil filters must be collected in a container that is in good condition and is labeled with the words “Drained Used Oil Filters.”

- No other waste streams should be deposited in containers collecting used oil filters for disposal.
- Coordinate with the ROICC or Contract Representative to determine if the drained used oil filters can be given to RCRS or EAD.

7.6.2. Used Antifreeze

Antifreeze is composed of regulated chemicals, including ethylene glycol and propylene glycol, and during typical use may become contaminated with traces of fuel or metal particles (i.e., lead, cadmium, or chromium). It may also become HW if it has been mixed with other wastes, such as gasoline or solvents. Additional characterization may be required to determine whether or not used antifreeze is HW. Used antifreeze that is not recycled may be regulated as HW if the results from the Toxic Characteristics Leaching Procedure (TCLP) indicate metal contents that meet or exceed RCRA thresholds.

The State of North Carolina does not regulate used antifreeze as HW, as long as it is recycled by reuse, distillation, filtration, or ion exchange. Used antifreeze must be stored in closed containers on an impermeable concrete surface with adequate spill controls (secondary containment, appropriate stocked spill kits, etc.). Contact the ROICC or Contract Representative to determine if used antifreeze can be given to RCRS or EAD.

7.6.3. Petroleum-Contaminated Wipes and Oily Rags

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

- Store oil-contaminated wipes and oily rags in metal containers because of their flammability/combustibility and to protect them from the weather.
- Do not throw these non-regulated waste items into solid waste dumpsters or garbage cans.
- Contact the ROICC or Contract Representative to determine if petroleum-contaminated wipes and oily rags can be given to RCRS or EAD.

7.6.4. Used Electronic Equipment

Used electronic equipment may contain lead solder or PCB oils (e.g., light ballast). Turn in these items as they are generated. Have the ROICC or Contract Representative contact RCRS or EAD for proper handling and/or turn-in procedures.

7.6.5. New and Used Batteries (Not Regulated as Universal Waste)

- Store compatible batteries together (i.e., lithium batteries should be stored with other lithium batteries).

- Store batteries off the ground to prevent them from coming into contact with water.
- Store lead-acid batteries away from an open flame.
- Place rechargeable batteries in plastic bags before storing them with other rechargeable batteries.
- Do not dispose of batteries unless authorized.
- Have the ROICC or Contract Representative contact RCRS or EAD for proper handling and/or turn-in procedures.

Attachment 7-1
Weekly Hazardous Waste (HW) Site
Inspection Form
MCB Camp Lejeune

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MCB Camp Lejeune Weekly Hazardous Waste (HW) Site
Inspection
Universal Waste (UW)/Satellite Accumulation Area (SAA)

Building Number/location of HW Site: _____

Unit Evaluated: _____

Evaluation Date: ____/____/____

Evaluation By (Site Manager): _____

Evaluation Time: _____

QUESTION	YES	NO	Location of Discrepancy <i>and</i> Proposed Corrective Action
1. Is housekeeping maintained in acceptable manner?			
2. Is any HW present at the site?			
3. Are HW containers properly marked?			
4. Are HW containers in serviceable condition?			
5. Are container bungs, caps, and openings properly secured?			
6. Is a unit spill plan/activation prominently posted?			
7. Is 911 spill response sign posted?			
8. Are " Danger-Unauthorized Personnel Keep Out " signs posted so they may be seen from any approach?			
9. Are " No Smoking " signs posted?			

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QUESTION	YES	NO	Location of Discrepancy <i>and</i> Proposed Corrective Action
10. Does the site have emergency communication system or two-man rule in effect? If the two-man rule is implemented, is a sign posted with the legend " Two-Man Rule in Effect "?			
11. Are properly charged fire extinguishers, as well as eye wash stations, present and inspected at least monthly?			
12. Is the post indicator valve in good operating condition and secured in the closed position, and are there any structural defects such as cracked concrete?			
13. Is the proper spill response equipment readily available?			
14. Is the site designated and recognizable, and is the EMD Authorization posted within the site as to be visible to personnel placing waste into the container? (SAA site only)			
15. Are all HWs properly segregated and stored in the designated site?			
16. Are any hazardous materials being stored in the Satellite Accumulation Area or < 90-day storage site?			

Attachment 7-2
Weekly Hazardous Waste (HW) Site
Inspection Form
MCAS New River

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**Weekly Hazardous Waste Storage
Area Inspection Form**

Squadron: _____ **Inspector:** _____

Date: _____ **Signature:** _____

<u>Question</u>	<u>Yes</u>	<u>No</u>	<u>Corrective Actions or N/A</u>
1. Is the HW container located at or near the point of generation?			
2. Is the HW container DOT approved?			
3. Is the HW container marked correctly with the words "Hazardous Waste," correct noun name of contents, NSN'S and unit designator?			
4. Is the HW container closed and wrench tight when no one is adding to the container?			
5. If a funnel is left in place, does that funnel have a plug or ball valve to be considered closed or secured?			
6. Is the HW container in good condition? (No excessive rust or dents in critical areas, seals are in place, no bulging or collapsing and no signs of spillage or leakage)			
7. Is the Spill Contingency Plan posted and in plain view?			
8. Is the SAA Site approval letter from EAD posted at the SAA site?			
9. Is the SAA Site limited to Authorized Personnel only?			

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<u>Question</u>	<u>Yes</u>	<u>No</u>	<u>Corrective Actions or N/A</u>
10. Is the HW container below the proper ullage for a liquid to expand? (4 inches from the top)			
11. Are SAA HW containers moved to the 90-Day Site within 72 hours when filled to the proper ullage or weight capacity of the container?			
12. (90-Day Site only) Are all palletized waste streams correctly marked with "Hazardous Waste" or "Universal Waste," noun name of the waste, NSN and unit designator on the pallet or wall of the waste structure?			
13. (90-Day Site only) Are all HW containers turned in prior to the 90 th day after the ASD?			
14. Are adequate spill response supplies readily available for use in case of spill or leakage?			
15. Is there a means of emergency communication between storage facilities and working spaces?			
16. Is the SAA site or 90-Day Site in a good state of police?			

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NAVOSHENVTRACEN COMPATIBILITY CHART



HMUG GROUP	HCC see note 2	GROUP NAME	EXAMPLES	INCOMPATIBLE MATERIALS	EXAMPLES	REACTION IF MIXED
1	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31, C32, C33, C34, C35, C36, C37, C38, C39, C40, C41, C42, C43, C44, C45, C46, C47, C48, C49, C50, C51, C52, C53, C54, C55, C56, C57, C58, C59, C60, C61, C62, C63, C64, C65, C66, C67, C68, C69, C70, C71, C72, C73, C74, C75, C76, C77, C78, C79, C80, C81, C82, C83, C84, C85, C86, C87, C88, C89, C90, C91, C92, C93, C94, C95, C96, C97, C98, C99, C100	ACIDS	Battery Acid Pine Removers De-Icel Spray	FLAMMABLES/ COMBUSTIBLES ALKALIBASES/CAUSTICS OXIDIZERS (HMUG Groups 2, 3, 4, 6, 7, 8, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21)	Degreasers, Carbon Removers, Anti-Fogging Compounds	HEAT GAS GENERATION VIOLENT REACTION
2	F1 to F1, F1.1 to F1.14, F1.15, F1.16, F1.17, F1.18, F1.19, F1.20, F1.21, F1.22, F1.23, F1.24, F1.25, F1.26, F1.27, F1.28, F1.29, F1.30, F1.31, F1.32, F1.33, F1.34, F1.35, F1.36, F1.37, F1.38, F1.39, F1.40, F1.41, F1.42, F1.43, F1.44, F1.45, F1.46, F1.47, F1.48, F1.49, F1.50, F1.51, F1.52, F1.53, F1.54, F1.55, F1.56, F1.57, F1.58, F1.59, F1.60, F1.61, F1.62, F1.63, F1.64, F1.65, F1.66, F1.67, F1.68, F1.69, F1.70, F1.71, F1.72, F1.73, F1.74, F1.75, F1.76, F1.77, F1.78, F1.79, F1.80, F1.81, F1.82, F1.83, F1.84, F1.85, F1.86, F1.87, F1.88, F1.89, F1.90, F1.91, F1.92, F1.93, F1.94, F1.95, F1.96, F1.97, F1.98, F1.99, F1.100	ADHESIVES	Epoxy Isocyanate Chloroethylene Epoxy	ACIDS ALKALIBASES/CAUSTICS OXIDIZERS (HMUG Groups 1, 5, 18)		HEAT FIRE HAZARD
3	B1, B2, B3, B4, B5, B6, B7, B8, B9, B10, B11, B12, B13, B14, B15, B16, B17, B18, B19, B20, B21, B22, B23, B24, B25, B26, B27, B28, B29, B30, B31, B32, B33, B34, B35, B36, B37, B38, B39, B40, B41, B42, B43, B44, B45, B46, B47, B48, B49, B50, B51, B52, B53, B54, B55, B56, B57, B58, B59, B60, B61, B62, B63, B64, B65, B66, B67, B68, B69, B70, B71, B72, B73, B74, B75, B76, B77, B78, B79, B80, B81, B82, B83, B84, B85, B86, B87, B88, B89, B90, B91, B92, B93, B94, B95, B96, B97, B98, B99, B100	ALKALIES/BASES/CAUSTICS	Ammonia Sulfuric Hydroxide Cleaners	FLAMMABLES/COMBUSTIBLES OXIDIZERS (HMUG Groups 1, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21)	Battery acid, Paint Removers, Cellulose Sprays, Degreaser, Solvents	HEAT GAS GENERATION VIOLENT REACTION
4	C1 to C1, C1.1 to C1.14, C1.15, C1.16, C1.17, C1.18, C1.19, C1.20, C1.21, C1.22, C1.23, C1.24, C1.25, C1.26, C1.27, C1.28, C1.29, C1.30, C1.31, C1.32, C1.33, C1.34, C1.35, C1.36, C1.37, C1.38, C1.39, C1.40, C1.41, C1.42, C1.43, C1.44, C1.45, C1.46, C1.47, C1.48, C1.49, C1.50, C1.51, C1.52, C1.53, C1.54, C1.55, C1.56, C1.57, C1.58, C1.59, C1.60, C1.61, C1.62, C1.63, C1.64, C1.65, C1.66, C1.67, C1.68, C1.69, C1.70, C1.71, C1.72, C1.73, C1.74, C1.75, C1.76, C1.77, C1.78, C1.79, C1.80, C1.81, C1.82, C1.83, C1.84, C1.85, C1.86, C1.87, C1.88, C1.89, C1.90, C1.91, C1.92, C1.93, C1.94, C1.95, C1.96, C1.97, C1.98, C1.99, C1.100	CLEANING COMPOUNDS	Degreasers Carbon Removers Anti-Fogging Compounds	DETERGENT/SOAPS OXIDIZERS (HMUG Group 1, 7, 18)	Calcium Hypochlorite, Sodium Hypo, Hydrogen Peroxide	HEAT FIRE HAZARD
5	G1 to G1, G1.1 to G1.14, G1.15, G1.16, G1.17, G1.18, G1.19, G1.20, G1.21, G1.22, G1.23, G1.24, G1.25, G1.26, G1.27, G1.28, G1.29, G1.30, G1.31, G1.32, G1.33, G1.34, G1.35, G1.36, G1.37, G1.38, G1.39, G1.40, G1.41, G1.42, G1.43, G1.44, G1.45, G1.46, G1.47, G1.48, G1.49, G1.50, G1.51, G1.52, G1.53, G1.54, G1.55, G1.56, G1.57, G1.58, G1.59, G1.60, G1.61, G1.62, G1.63, G1.64, G1.65, G1.66, G1.67, G1.68, G1.69, G1.70, G1.71, G1.72, G1.73, G1.74, G1.75, G1.76, G1.77, G1.78, G1.79, G1.80, G1.81, G1.82, G1.83, G1.84, G1.85, G1.86, G1.87, G1.88, G1.89, G1.90, G1.91, G1.92, G1.93, G1.94, G1.95, G1.96, G1.97, G1.98, G1.99, G1.100	COMPRESSED GASES	Acetylene, Propane, Nitrogen, Argon, Helium, Oxygen	HEAT SOURCES Consult paragraph C23 for specific handling and storage guidance (HMUG Group 1, 4, 18)		FIRE HAZARD EXPLOSION HAZARD
6	F2 to F2, F2.1 to F2.14, F2.15, F2.16, F2.17, F2.18, F2.19, F2.20, F2.21, F2.22, F2.23, F2.24, F2.25, F2.26, F2.27, F2.28, F2.29, F2.30, F2.31, F2.32, F2.33, F2.34, F2.35, F2.36, F2.37, F2.38, F2.39, F2.40, F2.41, F2.42, F2.43, F2.44, F2.45, F2.46, F2.47, F2.48, F2.49, F2.50, F2.51, F2.52, F2.53, F2.54, F2.55, F2.56, F2.57, F2.58, F2.59, F2.60, F2.61, F2.62, F2.63, F2.64, F2.65, F2.66, F2.67, F2.68, F2.69, F2.70, F2.71, F2.72, F2.73, F2.74, F2.75, F2.76, F2.77, F2.78, F2.79, F2.80, F2.81, F2.82, F2.83, F2.84, F2.85, F2.86, F2.87, F2.88, F2.89, F2.90, F2.91, F2.92, F2.93, F2.94, F2.95, F2.96, F2.97, F2.98, F2.99, F2.100	CORROSION PREVENTIVE COMPOUNDS	Corrosion Inhibitors Chemical Conversion Compounds	ACID/BASES OXIDIZERS IGNITION SOURCES (HMUG Groups 1, 3, 18, 20)		FIRE HAZARD
7	D1 to D1, D1.1 to D1.14, D1.15, D1.16, D1.17, D1.18, D1.19, D1.20, D1.21, D1.22, D1.23, D1.24, D1.25, D1.26, D1.27, D1.28, D1.29, D1.30, D1.31, D1.32, D1.33, D1.34, D1.35, D1.36, D1.37, D1.38, D1.39, D1.40, D1.41, D1.42, D1.43, D1.44, D1.45, D1.46, D1.47, D1.48, D1.49, D1.50, D1.51, D1.52, D1.53, D1.54, D1.55, D1.56, D1.57, D1.58, D1.59, D1.60, D1.61, D1.62, D1.63, D1.64, D1.65, D1.66, D1.67, D1.68, D1.69, D1.70, D1.71, D1.72, D1.73, D1.74, D1.75, D1.76, D1.77, D1.78, D1.79, D1.80, D1.81, D1.82, D1.83, D1.84, D1.85, D1.86, D1.87, D1.88, D1.89, D1.90, D1.91, D1.92, D1.93, D1.94, D1.95, D1.96, D1.97, D1.98, D1.99, D1.100	DETERGENTS/ SOAPS	Tricloron Phosphate Scouring Powders Dishwashing	ACID/CONCENTRATED COMPOUNDS (HMUG Group 1, 4, 18)	Battery Acid, Paint Removers, Cellulose Sprays	VIOLENT REACTION HEAT
8	F3 to F3, F3.1 to F3.14, F3.15, F3.16, F3.17, F3.18, F3.19, F3.20, F3.21, F3.22, F3.23, F3.24, F3.25, F3.26, F3.27, F3.28, F3.29, F3.30, F3.31, F3.32, F3.33, F3.34, F3.35, F3.36, F3.37, F3.38, F3.39, F3.40, F3.41, F3.42, F3.43, F3.44, F3.45, F3.46, F3.47, F3.48, F3.49, F3.50, F3.51, F3.52, F3.53, F3.54, F3.55, F3.56, F3.57, F3.58, F3.59, F3.60, F3.61, F3.62, F3.63, F3.64, F3.65, F3.66, F3.67, F3.68, F3.69, F3.70, F3.71, F3.72, F3.73, F3.74, F3.75, F3.76, F3.77, F3.78, F3.79, F3.80, F3.81, F3.82, F3.83, F3.84, F3.85, F3.86, F3.87, F3.88, F3.89, F3.90, F3.91, F3.92, F3.93, F3.94, F3.95, F3.96, F3.97, F3.98, F3.99, F3.100	GREASES	Lithium Greases Silicone Molybdenum	OXIDIZERS ALKALIBASES/CAUSTICS (HMUG Groups 3, 5, 18)		FIRE HAZARD HEAT
9	T1 to T1, T1.1 to T1.14, T1.15, T1.16, T1.17, T1.18, T1.19, T1.20, T1.21, T1.22, T1.23, T1.24, T1.25, T1.26, T1.27, T1.28, T1.29, T1.30, T1.31, T1.32, T1.33, T1.34, T1.35, T1.36, T1.37, T1.38, T1.39, T1.40, T1.41, T1.42, T1.43, T1.44, T1.45, T1.46, T1.47, T1.48, T1.49, T1.50, T1.51, T1.52, T1.53, T1.54, T1.55, T1.56, T1.57, T1.58, T1.59, T1.60, T1.61, T1.62, T1.63, T1.64, T1.65, T1.66, T1.67, T1.68, T1.69, T1.70, T1.71, T1.72, T1.73, T1.74, T1.75, T1.76, T1.77, T1.78, T1.79, T1.80, T1.81, T1.82, T1.83, T1.84, T1.85, T1.86, T1.87, T1.88, T1.89, T1.90, T1.91, T1.92, T1.93, T1.94, T1.95, T1.96, T1.97, T1.98, T1.99, T1.100	HYDRAULIC FLUIDS	Petroleum-Based Synthetic Fire-Retardant	CORROSION, OXIDIZERS (HMUG Group 1, 3, 5, 18)		VIOLENT REACTION
10	F4 to F4, F4.1 to F4.14, F4.15, F4.16, F4.17, F4.18, F4.19, F4.20, F4.21, F4.22, F4.23, F4.24, F4.25, F4.26, F4.27, F4.28, F4.29, F4.30, F4.31, F4.32, F4.33, F4.34, F4.35, F4.36, F4.37, F4.38, F4.39, F4.40, F4.41, F4.42, F4.43, F4.44, F4.45, F4.46, F4.47, F4.48, F4.49, F4.50, F4.51, F4.52, F4.53, F4.54, F4.55, F4.56, F4.57, F4.58, F4.59, F4.60, F4.61, F4.62, F4.63, F4.64, F4.65, F4.66, F4.67, F4.68, F4.69, F4.70, F4.71, F4.72, F4.73, F4.74, F4.75, F4.76, F4.77, F4.78, F4.79, F4.80, F4.81, F4.82, F4.83, F4.84, F4.85, F4.86, F4.87, F4.88, F4.89, F4.90, F4.91, F4.92, F4.93, F4.94, F4.95, F4.96, F4.97, F4.98, F4.99, F4.100	INSPECTION PENETRANTS	Petroleum-Based Dyes	CORROSION, OXIDIZERS (HMUG Group 1, 3, 5, 18)	Battery Acid Small Cans Chlorine Laundry Bleach Calcium Hypochlorite Hydrogen Peroxide Oxalic Acid Paint Removers	VIOLENT REACTION HEAT
11	A1 to A1, A1.1 to A1.14, A1.15, A1.16, A1.17, A1.18, A1.19, A1.20, A1.21, A1.22, A1.23, A1.24, A1.25, A1.26, A1.27, A1.28, A1.29, A1.30, A1.31, A1.32, A1.33, A1.34, A1.35, A1.36, A1.37, A1.38, A1.39, A1.40, A1.41, A1.42, A1.43, A1.44, A1.45, A1.46, A1.47, A1.48, A1.49, A1.50, A1.51, A1.52, A1.53, A1.54, A1.55, A1.56, A1.57, A1.58, A1.59, A1.60, A1.61, A1.62, A1.63, A1.64, A1.65, A1.66, A1.67, A1.68, A1.69, A1.70, A1.71, A1.72, A1.73, A1.74, A1.75, A1.76, A1.77, A1.78, A1.79, A1.80, A1.81, A1.82, A1.83, A1.84, A1.85, A1.86, A1.87, A1.88, A1.89, A1.90, A1.91, A1.92, A1.93, A1.94, A1.95, A1.96, A1.97, A1.98, A1.99, A1.100	LUBRICANTS/ OILS	General Purpose, Grease, Turbine, Weapons	ACIDS, OXIDIZERS (HMUG Group 1, 5, 18)	Chlorine Laundry Bleach Calcium Hypochlorite Hydrogen Peroxide Oxalic Acid Paint Removers	EXPLOSION HAZARD
12	P1 to P1, P1.1 to P1.14, P1.15, P1.16, P1.17, P1.18, P1.19, P1.20, P1.21, P1.22, P1.23, P1.24, P1.25, P1.26, P1.27, P1.28, P1.29, P1.30, P1.31, P1.32, P1.33, P1.34, P1.35, P1.36, P1.37, P1.38, P1.39, P1.40, P1.41, P1.42, P1.43, P1.44, P1.45, P1.46, P1.47, P1.48, P1.49, P1.50, P1.51, P1.52, P1.53, P1.54, P1.55, P1.56, P1.57, P1.58, P1.59, P1.60, P1.61, P1.62, P1.63, P1.64, P1.65, P1.66, P1.67, P1.68, P1.69, P1.70, P1.71, P1.72, P1.73, P1.74, P1.75, P1.76, P1.77, P1.78, P1.79, P1.80, P1.81, P1.82, P1.83, P1.84, P1.85, P1.86, P1.87, P1.88, P1.89, P1.90, P1.91, P1.92, P1.93, P1.94, P1.95, P1.96, P1.97, P1.98, P1.99, P1.100	PAINT MATERIALS	Primers, Enamels, Linethanes, Lacquers, Varnishes, Non-Solid, Primer	ACIDS, OXIDIZERS (HMUG Group 1, 5, 18)		HEAT FIRE HAZARD
13	C1 to C1, C1.1 to C1.14, C1.15, C1.16, C1.17, C1.18, C1.19, C1.20, C1.21, C1.22, C1.23, C1.24, C1.25, C1.26, C1.27, C1.28, C1.29, C1.30, C1.31, C1.32, C1.33, C1.34, C1.35, C1.36, C1.37, C1.38, C1.39, C1.40, C1.41, C1.42, C1.43, C1.44, C1.45, C1.46, C1.47, C1.48, C1.49, C1.50, C1.51, C1.52, C1.53, C1.54, C1.55, C1.56, C1.57, C1.58, C1.59, C1.60, C1.61, C1.62, C1.63, C1.64, C1.65, C1.66, C1.67, C1.68, C1.69, C1.70, C1.71, C1.72, C1.73, C1.74, C1.75, C1.76, C1.77, C1.78, C1.79, C1.80, C1.81, C1.82, C1.83, C1.84, C1.85, C1.86, C1.87, C1.88, C1.89, C1.90, C1.91, C1.92, C1.93, C1.94, C1.95, C1.96, C1.97, C1.98, C1.99, C1.100	PHOTO CHEMICALS	Developer, Stopbath, Toner, Squeezer, Replenisher	ACIDS HEAVY METALS (HMUG Group 1, 18, 20)		HEAT FIRE HAZARD
14	F4 to F4, F4.1 to F4.14, F4.15, F4.16, F4.17, F4.18, F4.19, F4.20, F4.21, F4.22, F4.23, F4.24, F4.25, F4.26, F4.27, F4.28, F4.29, F4.30, F4.31, F4.32, F4.33, F4.34, F4.35, F4.36, F4.37, F4.38, F4.39, F4.40, F4.41, F4.42, F4.43, F4.44, F4.45, F4.46, F4.47, F4.48, F4.49, F4.50, F4.51, F4.52, F4.53, F4.54, F4.55, F4.56, F4.57, F4.58, F4.59, F4.60, F4.61, F4.62, F4.63, F4.64, F4.65, F4.66, F4.67, F4.68, F4.69, F4.70, F4.71, F4.72, F4.73, F4.74, F4.75, F4.76, F4.77, F4.78, F4.79, F4.80, F4.81, F4.82, F4.83, F4.84, F4.85, F4.86, F4.87, F4.88, F4.89, F4.90, F4.91, F4.92, F4.93, F4.94, F4.95, F4.96, F4.97, F4.98, F4.99, F4.100	POLISH/WAX COMPOUNDS	Buffing Compounds Metal Polishes General Purpose Waxes	CORROSION OXIDIZERS (HMUG Group 1, 3, 18)		HEAT, FIRE HAZARD VIOLENT REACTION
15	F2 to F2, F2.1 to F2.14, F2.15, F2.16, F2.17, F2.18, F2.19, F2.20, F2.21, F2.22, F2.23, F2.24, F2.25, F2.26, F2.27, F2.28, F2.29, F2.30, F2.31, F2.32, F2.33, F2.34, F2.35, F2.36, F2.37, F2.38, F2.39, F2.40, F2.41, F2.42, F2.43, F2.44, F2.45, F2.46, F2.47, F2.48, F2.49, F2.50, F2.51, F2.52, F2.53, F2.54, F2.55, F2.56, F2.57, F2.58, F2.59, F2.60, F2.61, F2.62, F2.63, F2.64, F2.65, F2.66, F2.67, F2.68, F2.69, F2.70, F2.71, F2.72, F2.73, F2.74, F2.75, F2.76, F2.77, F2.78, F2.79, F2.80, F2.81, F2.82, F2.83, F2.84, F2.85, F2.86, F2.87, F2.88, F2.89, F2.90, F2.91, F2.92, F2.93, F2.94, F2.95, F2.96, F2.97, F2.98, F2.99, F2.100	SOLVENTS	Methyl Ethyl Ketone (MEK) Toluene, Xylene Acetone	CORROSION OXIDIZERS BATTERIES (HMUG Groups 1, 5, 18, 20, 21)	Battery Acid Calcium Hypochlorite Sodium Hypo Sodium Hydroxide	HEAT FIRE HAZARD
16	T1 to T1, T1.1 to T1.14, T1.15, T1.16, T1.17, T1.18, T1.19, T1.20, T1.21, T1.22, T1.23, T1.24, T1.25, T1.26, T1.27, T1.28, T1.29, T1.30, T1.31, T1.32, T1.33, T1.34, T1.35, T1.36, T1.37, T1.38, T1.39, T1.40, T1.41, T1.42, T1.43, T1.44, T1.45, T1.46, T1.47, T1.48, T1.49, T1.50, T1.51, T1.52, T1.53, T1.54, T1.55, T1.56, T1.57, T1.58, T1.59, T1.60, T1.61, T1.62, T1.63, T1.64, T1.65, T1.66, T1.67, T1.68, T1.69, T1.70, T1.71, T1.72, T1.73, T1.74, T1.75, T1.76, T1.77, T1.78, T1.79, T1.80, T1.81, T1.82, T1.83, T1.84, T1.85, T1.86, T1.87, T1.88, T1.89, T1.90, T1.91, T1.92, T1.93, T1.94, T1.95, T1.96, T1.97, T1.98, T1.99, T1.100	THERMAL INSULATION	Asbestos Fiberglass Glass Wool	MATERIAL IS NOT REACTIVE KEEP DRY		NO REACTION
17	C1 to C1, C1.1 to C1.14, C1.15, C1.16, C1.17, C1.18, C1.19, C1.20, C1.21, C1.22, C1.23, C1.24, C1.25, C1.26, C1.27, C1.28, C1.29, C1.30, C1.31, C1.32, C1.33, C1.34, C1.35, C1.36, C1.37, C1.38, C1.39, C1.40, C1.41, C1.42, C1.43, C1.44, C1.45, C1.46, C1.47, C1.48, C1.49, C1.50, C1.51, C1.52, C1.53, C1.54, C1.55, C1.56, C1.57, C1.58, C1.59, C1.60, C1.61, C1.62, C1.63, C1.64, C1.65, C1.66, C1.67, C1.68, C1.69, C1.70, C1.71, C1.72, C1.73, C1.74, C1.75, C1.76, C1.77, C1.78, C1.79, C1.80, C1.81, C1.82, C1.83, C1.84, C1.85, C1.86, C1.87, C1.88, C1.89, C1.90, C1.91, C1.92, C1.93, C1.94, C1.95, C1.96, C1.97, C1.98, C1.99, C1.100	WATER TEST/ TREATMENT CHEMICALS	Nitric Acid Muriatic Nitrate Caustic Soda	CORROSION OXIDIZERS HEAVY METALS (HMUG Group 1, 3, 18, 20, 21)		HEAT VIOLENT REACTION
18	D1 to D1, D1.1 to D1.14, D1.15, D1.16, D1.17, D1.18, D1.19, D1.20, D1.21, D1.22, D1.23, D1.24, D1.25, D1.26, D1.27, D1.28, D1.29, D1.30, D1.31, D1.32, D1.33, D1.34, D1.35, D1.36, D1.37, D1.38, D1.39, D1.40, D1.41, D1.42, D1.43, D1.44, D1.45, D1.46, D1.47, D1.48, D1.49, D1.50, D1.51, D1.52, D1.53, D1.54, D1.55, D1.56, D1.57, D1.58, D1.59, D1.60, D1.61, D1.62, D1.63, D1.64, D1.65, D1.66, D1.67, D1.68, D1.69, D1.70, D1.71, D1.72, D1.73, D1.74, D1.75, D1.76, D1.77, D1.78, D1.79, D1.80, D1.81, D1.82, D1.83, D1.84, D1.85, D1.86, D1.87, D1.88, D1.89, D1.90, D1.91, D1.92, D1.93, D1.94, D1.95, D1.96, D1.97, D1.98, D1.99, D1.100	OXIDIZERS	Calcium Hypochlorite Laundry Bleach Oxalic Acid	PETROLEUM BASED MATERIALS FUELS, SOLVENTS, CORROSION, HEAT (HMUG Groups 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22)		FIRE HAZARD VIOLENT REACTION EXPLOSION HAZARD TOXIC GAS GENERATION
19	F1 to F1, F1.1 to F1.14, F1.15, F1.16, F1.17, F1.18, F1.19, F1.20, F1.21, F1.22, F1.23, F1.24, F1.25, F1.26, F1.27, F1.28, F1.29, F1.30, F1.31, F1.32, F1.33, F1.34, F1.35, F1.36, F1.37, F1.38, F1.39, F1.40, F1.41, F1.42, F1.43, F1.44, F1.45, F1.46, F1.47, F1.48, F1.49, F1.50, F1.51, F1.52, F1.53, F1.54, F1.55, F1.56, F1.57, F1.58, F1.59, F1.60, F1.61, F1.62, F1.63, F1.64, F1.65, F1.66, F1.67, F1.68, F1.69, F1.70, F1.71, F1.72, F1.73, F1.74, F1.75, F1.76, F1.77, F1.78, F1.79, F1.80, F1.81, F1.82, F1.8					

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8.0 ASBESTOS

Asbestos was widely used in many products (especially building parts) prior to 1990 for its fire resistance, strength, and affordability. However, exposure to friable asbestos can lead to lung diseases including cancer. Contractors working aboard the installation must follow all Federal, State, and local regulations/specifications for the proper notification, removal, disposal, and management of all asbestos-containing materials (ACM) associated with demolition and renovation projects.

8.1. KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with asbestos and its management. If you have any questions or concerns about the information in this section, please consult the ROICC or

Contract Representative, who will contact the appropriate EMD program if additional clarification is necessary.

Please consult the ROICC or Contract Representative with any questions or concerns about the information in this section.

8.1.1. Key Definitions

- **Abatement.** Work performed to repair, maintain, remove, isolate, or encapsulate ACM.
- **Asbestos.** Asbestos is the generic term for a group of naturally occurring fibrous silicate minerals, including those that typically exhibit high tensile

strength, flexibility, and resistance to thermal, chemical, and electrical conditions. Asbestos was commonly used in installed products such as roofing shingles, floor tiles, cement pipe and sheeting, roofing felts, insulation, ceiling tiles, fire-resistant drywall, and acoustical products.

- **Asbestos-Containing Material.** Any material containing more than 1 percent asbestos, per 29 CFR 1926.1101.
- **Category I Non-friable ACM.** Asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing products containing more than 1 percent asbestos, per 40 CFR 61, Subpart M.
- **Category II Non-friable ACM.** Any material, excluding Category I non-friable ACM, containing more than 1 percent asbestos that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure, per 40 CFR 61, Subpart M.
- **Demolition.** The wrecking or removal of any load-bearing walls or structure with any related handling operations.
- **Friable.** Any ACM that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure (may include damaged ACM that was previously identified as non-friable), per 40 CFR 763.
- **Glove Bag.** A sealed compartment with attached inner gloves that is used for handling ACM. Glove bags provide a small work area enclosure typically used for small-scale asbestos stripping operations.

- **Presumed Asbestos-Containing Material (PACM).** Thermal system insulation (TSI) and surfacing material found in buildings constructed no later than 1980, per 29 CFR 1926.1101.
- **Regulated Asbestos-Containing Material (RACM).** Includes friable ACM, Category I non-friable ACM that has become friable, Category I non-friable ACM that has been sanded, ground, cut, etc., and Category II non-friable ACM that has a high probability of becoming crumbled, pulverized, or reduced to powder during demolition or renovation, per 40 CFR 61, Subpart M.
- **Removal.** Stripping, chipping, sanding, sawing, drilling, scraping, sucking, and other methods of separating material from its installed location in a building.
- **Renovation.** Altering a facility or its components in any way, including stripping or removal of RACM, per 40 CFR 61, Subpart M.

8.1.2. Key Concepts

- **Demolition Notification.** North Carolina law requires notification for all demolition, regardless of whether asbestos is present, 10 working days prior to starting demolition.
- **Disposal.** ACM waste can be accepted at the MCB Camp Lejeune Sanitary Landfill. Work with the ROICC or Contract Representative to coordinate the disposal through the MCB Camp Lejeune Sanitary

Landfill. Asbestos waste is only accepted on Mondays through Thursdays from 0700 to 1000.

- **Removal Requirements.** Permits for asbestos removal or demolition must be obtained when the ACM present exceeds 260 linear feet, 160 square feet, or 35 cubic feet. Additionally, proper work practice procedures must be followed during demolition or renovation operations.
- **Renovation Notification.** If ACM is present within a structure, North Carolina law requires notification of renovation 10 working days prior to starting renovation.

8.1.3. Environmental Management System

Contractor practices associated with asbestos management include the following:

- Building operation/maintenance/repair
- Construction/demolition/renovation
- Equipment operation/maintenance/disposal
- HW transportation
- Parts replacement

The potential impacts of these activities on the environment include soil contamination, degradation of water quality and air quality, and the potential exposure of installation occupants.

8.2. OVERVIEW OF REQUIREMENTS

Contractors operating aboard the installation must be aware of and adhere to all applicable regulations and requirements regarding ACM, which include but may not be limited to the following:

- [Asbestos General Standard, 29 CFR 1910.1001 – Asbestos.](#) Applies to all occupational exposures to asbestos in all industries covered by the Occupational Safety and Health Administration (OSHA).
- [Asbestos Hazard and Emergency Response Act \(AHERA\), 1986.](#) AHERA was written primarily to provide officials in schools, grades K-12, with rules and guidance for the management of ACM.
- [Asbestos School Hazard Abatement Reauthorization Act, 1992.](#) This act extended AHERA regulations to cover public and commercial buildings.
- [National Emission Standards for Hazardous Air Pollutants \(NESHAP\), Subpart A, General Provisions, and 40 CFR 61 – Subpart M – National Emission Standard for Asbestos.](#) Includes standards for asbestos demolition, renovation, and disposal, and administrative requirements.
- [Naval Facilities Engineering Service Center, Facilities Management Guide for Asbestos and Lead.](#) Summarizes asbestos and lead requirements

that routinely affect facilities operations, to protect workers, building occupants, and the environment.

- [Naval Facilities Guide Specifications and Engineering Control of Asbestos Materials.](#) Covers the requirements for safety procedures and requirements for the demolition, removal, encapsulation, enclosure, repair, and disposal of ACM.
- [North Carolina Asbestos Hazard Management Program, NC General Statutes, Chapter 130A, Article 19; 10A NCAC 41C.0601-.0608 and .0611.](#) Incorporates 40 CFR 763 and 29 CFR 1926.1101 by reference and outlines criteria for asbestos exposures in public areas, accreditation of persons conducting asbestos management activities, and asbestos permitting and fee requirements.
- [Safety and Health Regulations for Construction, Asbestos, 29 CFR 1926.1101.](#) Regulates asbestos in the construction, demolition, alteration, repair, maintenance, or renovation of structures that contain asbestos.

8.3. RESPONSIBILITIES BEFORE A DEMOLITION OR RENOVATION PROJECT

Prior to starting a demolition or renovation project, contractors must:

- Determine whether ACM, PACM, and/or RACM are present in the buildings involved in the project.
- Complete the necessary notifications to the State of North Carolina and obtain any necessary permits for the removal of ACM, PACM, and/or RACM.
- Understand what actions to take if ACM, PACM, and/or RACM are unexpectedly encountered during project execution.
- Remove all non-friable and friable ACM in accordance with all Federal, State, and local regulations, prior to demolition activities.
- Know how to properly dispose of ACM, and provide any waste disposal manifests generated for disposal.

The ROICC or Contract Representative is required to notify Camp Lejeune's Asbestos Program Manager of all work involving asbestos removals, including glove bag projects.

8.3.1. Identification of ACM and PACM

Form DHHS 3768 *must* be posted onsite during all permitted projects.

Contract documents will identify the presence of known ACM, PACM, and RACM. Contact the ROICC or Contract Representative with questions regarding the presence of these materials as identified in the contract documents. An inspection conducted by a Health Hazards

Control Unit (HHCU)-licensed asbestos inspector may be necessary to confirm the location and quantities of any ACM, PACM, and/or RACM and determine if any previously unidentified materials are present.

8.3.2. Notification

To maintain accurate files and records, the ROICC or Contract Representative is required to notify the Asbestos Program Manager, who is part of the Installations and Environment Department, of all work involving asbestos removals, including glove bag projects.

The North Carolina Department of Health and Human Services (DHHS) Form 3768, *Asbestos Permit Application and Notification for*

Demolition and Renovation, must be submitted to the North Carolina HHCU 10 working days in advance of demolition activities, regardless of whether asbestos is present. This form must be posted onsite during the entire duration of the project. Have the ROICC or Contract Representative contact the Asbestos Program Manager with questions or concerns about requirements for notification of demolition or renovation.

A demolition/renovation notification form, DHHS 3768, must be submitted to the NC HHCU 10 working days before demolition activities, regardless of whether asbestos is present.

8.3.3. Removal

Any ACM, PACM, and/or RACM present must be removed before the area is disturbed during renovation or demolition

activities (except in certain rare instances). Certification and handling requirements for asbestos removal are provided in 10A NCAC 41C and the Asbestos NESHAP. Refer to these regulations for detailed requirements.

8.3.4. Training

North Carolina regulations require that all persons who perform asbestos management activities in the State of North Carolina must be accredited by the North Carolina HHCU under the appropriate accreditation category (i.e., Building Inspector, Project Supervisor, and/or Abatement Worker). Training documentation should be available upon request.

8.4. RESPONSIBILITIES DURING A DEMOLITION OR RENOVATION PROJECT

North Carolina regulations require that DHHS Form 3768, *Asbestos Permit Application and Notification for Demolition and Renovation*, be acquired by the contractor and posted onsite during all permitted projects. Contractors must post this form when the project will remove the following: at least 260 linear feet, 160 square feet, or 35 cubic feet of RACM or asbestos that might become regulated as a result of handling. The form must also be posted for nonscheduled asbestos removal that will exceed these numbers in a calendar year.

During a renovation or demolition project, if the contractor suspects the presence of additional ACM (other than the materials identified in contract documents), the contractor

must immediately report the suspected area to the ROICC or Contract Representative. Before proceeding, the facility must be inspected by an asbestos inspector licensed by the North Carolina HHCUC. The individual performing the asbestos survey will coordinate with the ROICC or Contract

During a renovation or demolition project, a contractor who suspects additional ACM is present must immediately report the suspected area to the ROICC or Contract Representative.

Representative throughout the process. A legible copy of the building inspection report must be provided to the North Carolina HHCUC prior to each demolition and upon request for renovations; a building inspection report will be acceptable only if the inspection was performed during the 3 years prior to the demolition. A copy of the report should also be forwarded to the Asbestos Program Manager.

For specific work procedures and requirements for glove bag projects, refer to 29 CFR 1926.1101.

8.5. DISPOSAL OF ACM WASTE

Contractors can dispose of ACM waste at the MCB Camp Lejeune Sanitary Landfill after first coordinating with the MCB Camp Lejeune Landfill office through the ROICC or Contract Representative. The contractor must provide the MCB Camp Lejeune Landfill with Form DHHS 3787, *North Carolina Health Hazards Control Unit's Asbestos*

Waste Shipment Record. The contractor must submit this form to the North Carolina HHCU for all permitted asbestos removal projects.

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9.0 LEAD-BASED PAINT

Lead was used in paint for its color and water-resistant properties until it was banned in 1978 for its highly toxic properties that may cause a range of health problems, especially in young children. Improper removal of lead-based paint (LBP) may result in paint chips and dust, which may contaminate a structure inside and out. The North Carolina DHHS regulations require any person who performs an inspection, risk assessment, or abatement to be certified. North Carolina DHHS also requires a person to obtain a permit for conducting an abatement of a child-occupied facility or target housing.

9.1. KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with LBP activities. If you have any questions or concerns about the information in this section, please consult the ROICC or Contract Representative, who will contact the appropriate Environmental Department or Safety Representative if additional clarification is necessary.

9.1.1. Key Definitions

- **Abatement.** The permanent removal or elimination of all LBP hazards.
- **Demolition.** The removal of any load-bearing walls or structure.

- **Inspection.** A surface-by-surface investigation to determine the presence of LBP, and a report explaining the results of the investigation.
- **Lead-Based Paint.** Surface coatings that contain lead in amounts equal to or in excess of 1.0 milligram per square centimeter, as measured by X-ray fluorescence (XRF) or laboratory analysis, or more than 0.5 percent by weight, per 40 CFR 745.
- **Lead-Containing Paint.** Surface coatings that contain lead in any amount greater than the laboratory reporting limit but less than 1.0 milligram per square centimeter, or less than 0.5 percent by weight, per 29 CFR 1926.62 and 29 CFR 1910.1025 (also contained in 40 CFR 745 Subpart L, and adopted by the State of North Carolina under North Carolina General Statute Chapter 130A, Article 19A).
- **Renovation.** Alteration of a facility or its components in any way.
- **Target Housing.** Any housing constructed before 1978, with the exception of housing for the elderly and persons with disabilities (unless a child under the age of 6 lives there) and residential dwellings where the living areas are not separated from the sleeping areas (efficiencies, studio apartments, dormitories, etc.).

9.1.2. Key Concepts

- **Disposal.** Analysis is required to determine proper disposal of waste (non-hazardous or hazardous). A Toxic Characteristic Leaching Procedure (TCLP) analysis must be conducted to determine whether lead levels have exceeded 5 parts per million (ppm), which is the RCRA threshold for HW determination.
- **LBP Survey.** A LBP survey is required prior to disturbing painted surfaces, to determine whether the paint meets the criteria of lead containing over 1.0 milligram per square centimeter or over 0.5 percent by weight.
- **Training.** LBP training requirements set forth by the OSHA must be followed by all personnel involved in all LBP removal activities. MCB Camp Lejeune Base Safety tracks this training for contract staff, as the Safety Office houses the Lead Program Manager.

9.1.3. Environmental Management System

Contractor practices associated with LBP include the following:

- Construction/demolition/renovation
- HW transportation
- Paint removal

The potential impacts of these activities on the environment include the potential degradation of soil, water, and air

environments, and the potential exposure of installation occupants.

9.2. OVERVIEW OF REQUIREMENTS

Contractors operating aboard the installation must be aware of and adhere to all applicable Federal, State, and local regulations and requirements regarding LBP activities, which include but may not be limited to the following:

- [Naval Facilities Engineering Service Center, Facilities Management Guide for Asbestos and Lead.](#) Summarizes asbestos and lead requirements that routinely impact facilities operations, in order to protect workers, building occupants, and the environment.
- [Lead-Based Paint Hazard Management Program, NC General Statutes, Chapter 130A, Article 19A, Section 130A-453.01 through 453.11.](#) Requires a person who performs an inspection, risk assessment, abatement, or abatement design work in a child-occupied facility (daycare center, pre-school, etc.) or housing built before 1978 to be certified and establishes the requirements for certification, including the oversight of required training. It also requires a person who conducts an abatement of a child-occupied facility or target housing to obtain a permit for the abatement; establishes work practice standards for LBP abatement activities; and has adopted requirements included in 40 CFR Part 745, Subpart L and 40 CFR Part 745, Subpart D.

- **[Lead-Based Paint Hazard Management Program for Renovation, Repair, and Painting \(RRP\), 10A NCAC 41C.0900.](#)** Common renovation activities may create hazardous lead dust and chips by disturbing LBP, which may be harmful to adults and children. This article requires that dust sampling technicians, firms, and individuals performing renovation, repair, and painting projects for compensation that disturb LBP in housing and child-occupied facilities built before 1978 be certified and follow specific work practices to prevent lead contamination. Child-occupied facilities include, but are not limited to, child care facilities and schools (with children under the age of 6) that were built before 1978.
- **[10A NCAC 41C.0800, Lead-Based Paint Hazard Management Program.](#)** Requires (1) all individuals and firms involved in LBP activities to be certified and (2) all LBP activities to be carried out in accordance with 40 CFR 745.
- **[29 CFR 1926, Safety and Health Regulations for Construction.](#)** Contains the OSHA requirements for construction activities where workers may come into contact with lead.
- **[40 CFR Part 745, Lead-Based Paint Poisoning Prevention in Certain Residential Structures.](#)** Ensures that (1) LBP abatement professionals, including workers, supervisors, inspectors, risk assessors, and project designers, are well trained in conducting LBP activities; and (2) inspections for the

identification of LBP, risk assessments for the evaluation of LBP hazards, and abatements for the permanent elimination of LBP hazards are conducted safely, effectively, and reliably by requiring certification of professionals.

9.3. RESPONSIBILITIES BEFORE RENOVATION OR DEMOLITION

**Buildings
constructed prior
to 1978 are
assumed to
contain LBP.**

Ordinary renovation and maintenance activities may create dust that contains lead, but following lead-safe work practices may help mitigate or prevent lead hazards. The North Carolina RRP Program (10A

NCAC 41C.0900) mandates that contractors, property managers, and others working for compensation in homes and child-occupied facilities built before 1978 be trained in and use lead-safe work practices. In addition, it mandates that contractors provide the owner and occupants with *The Lead-Safe Certified Guide to Renovate Right* information pamphlet, which is found at the following website: <http://epi.publichealth.nc.gov/lead/pdf/RenovateRight.pdf>

Individuals must be certified by the State of North Carolina to perform RRP activities for compensation in housing and child-occupied facilities built before 1978. A firm engaged in regulated renovation activities (such as RRP that disturbs more than 6 square feet of interior painted surfaces or 20 square feet of exterior painted surfaces, or dust sampling after renovation) must be a certified renovation firm.

To address the hazards associated with the improper abatement or removal of LBP, any person who performs an inspection, risk assessment, abatement, or abatement design work in a child-occupied facility (child development centers, preschools, etc.) or housing built before 1978 must be certified by the State of North Carolina. Any person who conducts an abatement of a child-occupied facility or target housing must also obtain a permit for the abatement. Individuals conducting LBP abatement activities in North Carolina, such as inspections, risk assessments, LBP hazards abatement, clearance testing, or abatement project design in housing and child-occupied facilities built before 1978, must be certified by the State of North Carolina. A firm engaged in abatement activities must be a certified lead abatement firm.

Prior to any renovation or demolition aboard the installation that involves the disturbance of painted surfaces, a LBP survey must be completed by an inspector certified in North Carolina, retained through the ROICC or Public Works Division (PWD). Certain projects will use PWD staff to conduct the sampling, and other projects will use contracted personnel. Buildings constructed prior to 1978 are assumed to contain LBP; therefore, no LBP survey is necessary. The LBP survey (through sampling and analysis) will determine whether painted surfaces meet the criteria of LBP (lead content equal to or greater than 1.0 milligram per square centimeter as measured by XRF or lab analysis, or 0.5 percent by weight). Naval Facilities Guide Specifications and contract documents must be implemented for contracts where LBP is to be abated/removed prior to demolition or renovation.

If the area is to be reoccupied, final clearance must be conducted, including a visual inspection and sample collection, prior to reoccupation. Clearance on all projects involving abatement must be provided by a certified risk assessor or a certified LBP inspector. Clearance for RRP projects may be conducted by a certified risk assessor, certified LBP inspector, or certified dust sampling technician.

9.4. PERMITS

Contractors must obtain a North Carolina LBP Abatement Permit from North Carolina DHHS when lead paint is removed from targeted structures (child-occupied facilities or housing built prior to 1978).

9.5. DISPOSAL

If the LBP survey determines that LBP will be abated as part of a renovation or demolition project, the contractor must take analytical samples to determine whether the waste material is hazardous. Usually, a TCLP sample is collected from a “representative” sample of the material removed. The

If the LBP survey determines that LBP will be abated as part of a renovation or demolition project, analytical samples must be taken to determine whether the material is hazardous.

The laboratory conducting the sample analysis must be accredited by the Environmental Lead Laboratory Accreditation Program. A list of these accredited labs is available by contacting (703) 849-8888 or visiting

http://apps.aiha.org/qms_aiha/public/pages/reports/publicScopeView.aspx?ProgramCode=37&Version=2.

If the LBP is removed from the underlying building material, then the paint is the waste stream. If the LBP is removed with the building material, then both materials are considered the waste stream.

If the lead content is below HW regulatory disposal levels, consult the ROICC or Contract Representative to determine whether if the contract allows for the disposal of the material in the MCB Camp Lejeune Sanitary Landfill. Lead waste is only accepted on Mondays through Thursdays from 0700 to 1000.

If the abated LBP is above HW regulatory levels, refer to Section 7.0 of this guide for information on HW management and disposal requirements.

9.6. TRAINING

Before the project begins, workers who are subject to lead exposure during abatement or removal activities must be trained according to the OSHA regulations in 29 CFR 1926.62 concerning lead exposure in construction, and they must receive all training and certification specified by 10A NCAC 41C.0800 and 10A NCAC 41C.0900. The contractor is responsible for providing this training before initiating any work aboard MCB Camp Lejeune.

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10.0 NATURAL RESOURCES

The installation has stewardship and recovery responsibilities over the natural resources on the installation. These responsibilities are regulated under numerous laws described in this section. The installation ensures compliance with these laws through an interdisciplinary process of review and coordination of all activities occurring on the installation.

Contractors working on the installation are responsible for complying with conditions and measures imposed on their work as a result of this process; these responsibilities include preserving the natural resources within the project boundaries and outside the limits of permanent work, restoring work sites to an equivalent or improved condition after the work is complete, and confining construction activities to the limits of the work indicated or specified. The contractor is advised that the installation is subject to strict compliance with Federal, State, and local wildlife laws and regulations. The contractor must not disturb wildlife (birds, nesting birds, mammals, reptiles, amphibians, and fish) or the native habitat adjacent to the project area except when indicated or specified.

10.1. KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with natural resources management. If you have any questions or concerns

**Please consult the
ROICC or Contract
Representative
with any
questions or
concerns about
the information in
this section.**

about the information in this section or require assistance regarding any wildlife matters (snakes, nesting birds, nuisance wildlife, etc.) on the site or within the project area, please consult the ROICC or Contract Representative, who will contact the Environmental Conservation Branch.

10.1.1. Key Definitions

- **Conservation.** The planned management, use, and protection of natural resources to provide their sustained use and continued benefit to present and future generations.
- **Ecosystem.** A dynamic, natural complex of living organisms interacting with each other and with their associated nonliving environment.
- **Habitat.** An area where a plant or animal species lives, grows, and reproduces, and the environment that satisfies its life requirements.
- **Natural Resource.** Soil, water, air, plants, and animals, according to the Natural Resources Conservation Service.
- **Endangered or Threatened Species.** Federally listed taxon that is “in danger of extinction throughout all or a significant portion of its range” or “likely to become endangered within the foreseeable future throughout all or a significant portion of its range.”
- **Riparian Buffer.** Vegetated area bordering a body of water, such as a stream, lake, or pond.

- **Wetland.** Areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas, per the EPA.

10.1.2. Key Concepts

- **Coastal Zone Management Act (CZMA) of 1972.** Requires each installation to ensure that its operations, activities, projects, and programs affecting the coastal zone in or on coastal lands or waters are consistent with the federally approved Coastal Zone Management Plan of the State.
- **Ecosystem Management.** A goal-driven approach to managing natural and cultural resources that supports present and future mission requirements; preserves ecosystem integrity; is at a scale compatible with natural processes; is cognizant of natural processes' time scales; recognizes social and economic viability within functioning ecosystems; is adaptable to complex, changing requirements; and is realized through effective partnerships among private, local, State, tribal, and Federal interests. Ecosystem management is a process that considers the environment as a complex system functioning as a whole, not as a collection of parts, and recognizes that people and their social and economic needs are a part of the whole.

- **Integrated Natural Resources Management Plan (INRMP).** A planning document using ecosystem management principles to direct the management and conservation of installation natural resources, which includes all elements of natural resources management applicable to the installation.
- **National Environmental Policy Act.** Requires Federal agencies, including the USMC, to consider the environmental impacts of projects prior to implementation. All projects that support military training, minor and major military construction, maintenance, and natural resources management actions are reviewed for potential environmental impacts. Contractors must obtain and review any NEPA documentation associated with their projects. All NEPA documentation can be obtained from the ROICC or Contract Representative.
- **Threatened and Endangered Species.** Specific requirements regarding protected areas on the installation apply to contractor activities. Eight federally threatened and endangered species are currently managed at MCB Camp Lejeune – red-cockaded woodpecker, green sea turtle, loggerhead sea turtle, rough-leaved loosestrife, seabeach amaranth, piping plover, red knot, and American alligator. In addition, as of March 25, 2015, the U.S. Fish and Wildlife Service lists six species as threatened and nine as endangered for Onslow County, NC. Consult the ROICC or Contract Representative to determine if there are any project

requirements regarding threatened or endangered species.

- **Timber.** Contractors must ensure that the ROICC or Contract Representative notify the EMD's Forest Management Program prior to conducting site work. Timber will not be released to contractors without the approval of the Forest Management Program.
- **Waters of the United States.** All waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce; interstate waters; the territorial seas; impoundments; tributaries; adjacent waters including wetlands, ponds, lakes, oxbows, and impoundments; waters determined to have a significant nexus; Carolina bays; Pocosins; and waters within the 100-year floodplain or within 4,000 feet of the high tide line or ordinary high water mark; per 33 U.S.C. 1251 *et seq.* Section 328.3.
- **Wetlands.** Any work in installation waters or wetlands requires a permit prior to the start of an activity.

10.1.3. Environmental Management System

Contractor practices associated with natural resources include the following:

- Erosion/runoff control
- Fish stocking
- Habitat management

- Land clearing
- Live fire range operations
- Road construction and maintenance
- Soil excavation/grading
- Timber management
- Urban wildlife management

The potential impacts of these activities on the environment include air emissions, sedimentation, eutrophication of surface waters (addition of nutrients that stimulate aquatic plant growth and depletes oxygen), degradation of habitat, impacts to marine mammals, damage to commercial and noncommercial timber, impacts to endangered species and natural resources, and degradation of soil quality.

10.2. OVERVIEW OF REQUIREMENTS

Contractors operating aboard the installation must be aware of and adhere to all applicable regulations and requirements regarding natural resources, which include but may not be limited to the following:

- [Bald and Golden Eagle Protection Act of 1940, as Amended \(16 USC 688 et seq.\)](#). Prohibits taking, possessing, and transporting bald eagles and golden eagles and importing and exporting their parts, nests, or eggs. The definition of “take” includes pursue, shoot, shoot at, poison, wound, capture, trap, collect, molest, or disturb.

- **BO 5090.11A, Protected Species Program.** Sets forth regulations and establishes responsibilities to ensure the conservation of threatened and endangered species and species at risk aboard MCB Camp Lejeune.
- **BO 5090.12, Environmental Impact Review Procedures.** Implements NEPA 1969 and NEPA policy and guidance in Chapter 12 of MCO P5090.2A.
- **Clean Water Act of 1972.** Establishes the basic structure for regulating wastewater discharges and placing fill materials into the waters of the United States.
- **CZMA of 1972 (16 USC 1451 *et seq.*).** Requires that Federal actions affecting any land/water use or coastal zone natural resource be implemented consistent with the enforceable policies of an approved State coastal management program. Requires concurrence from the State before taking an action affecting the use of land, water, or natural resources of the coastal zone.
- **Endangered Species Act of 1973 (16 USC 1531 *et seq.*).** Requires all Federal agencies to carry out programs to conserve federally listed endangered and threatened species of plants and wildlife.
- **EO 11990, Protection of Wetlands, 24 May 1977.** Addresses Federal agency actions required to identify and protect wetlands, minimize the risk of wetlands destruction or modification, and preserve

and enhance the natural and beneficial values of wetlands.

- **[EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, 10 January 2001.](#)** Requires each Federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement a plan to promote the conservation of migratory bird populations.
- **[Marine Mammal Protection Act of 1972 \(MMPA\), as Amended \(16 USC 1361 *et seq.*\)](#)**. Mandates a moratorium on the killing, capturing, harming, and importing of marine mammals and marine mammal products. The MMPA also prohibits the taking of any marine mammal, including to harass, hunt, capture, collect, or kill any marine mammal, including any of the following: collection of dead animals or their parts, restraint or detention of a marine mammal, tagging a marine mammal, the negligent or intentional operation of an aircraft or vessel, or any other negligent or intentional act that results in disturbing or molesting a marine mammal.
- **[Migratory Bird Treaty Act of 1918, as Amended \(16 USC 703 *et seq.*\)](#)**. Protects migratory birds (listed in 50 CFR 10.13) and their nests and eggs and establishes a permitting process for the taking of migratory birds by establishing a Federal prohibition to “pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause

to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird or any part, nest, or egg of any such bird.”

- **MCO P5090.2A, Environmental Compliance and Protection Manual.** Provides guidance and instruction to installations to ensure the protection, conservation, and management of watersheds, wetlands, natural landscapes, soils, forests, fish and wildlife, and other natural resources as vital USMC assets.
- **NEPA 1969 (42 U.S.C. 4321 et seq.).** Requires Federal agencies, including the USMC, to consider the environmental impacts of projects before the decisionmaker proceeds with the implementation. All projects that support military training, major and minor military construction, maintenance, and natural resources management actions are reviewed for potential environmental impacts.
- **Rivers and Harbors Act of 1899.** Prohibits the excavation, filling, or alteration of the course, condition, or capacity of any port, harbor, or channel without prior approval from the Chief of Engineers.
- **Sikes Act of 1960, as Amended (16 USC 670 et seq.).** Requires military installations to manage natural resources for multipurpose uses and public access appropriate for those uses, as well as ensuring no net loss to training, testing or other defined

missions of the installation through the development and implementation of an INRMP.

- [Neuse River Basin Riparian Buffer Rules \(15A NCAC 02B.0233\)](#). Require a 50-foot riparian buffer that is divided into two zones. The 30 feet closest to the water (Zone 1) must remain undisturbed. The outer 20 feet (Zone 2) may include managed vegetation, such as lawns or shrubbery. The riparian buffer rules also require diffuse flow of stormwater runoff. The buffers apply to intermittent streams, perennial streams, lakes, ponds, estuaries, and modified natural streams that are depicted on the most recent printed version of the soil survey map prepared by the Natural Resources Conservation Service or the 1:24,000 scale quadrangle topographic map prepared by the U.S. Geologic Survey.

10.3. NATIONAL ENVIRONMENTAL POLICY ACT

Staff specialists from various installation departments participate in the NEPA process, which coordinates the review of projects and documents environmental impacts (or lack thereof) for projects before implementation.

The documentation of this review process occasionally includes mandatory conditions affecting the design and construction/ implementation of the project. The documentation, when completed, is provided to the action proponent, who is expected to provide it to the ROICC or Contract Representative.

Consult the ROICC or Contract Representative to obtain or review any NEPA documentation associated with the project. The documentation marks the end of the NEPA review process; it does not constitute approval for the proponent of the action to implement the action. Some contracts may include stipulations from the NEPA document that must be implemented prior to the onset of work to

Consult the ROICC or Contract Representative to obtain or review any NEPA documentation associated with the project.

prevent environmental impacts and violations of Federal or State rules and regulations. Stipulations could include replacing monitoring wells if damages occur from contractor operations, stopping work if contamination is encountered, notification that a wetlands permit is required, seasonal restrictions, etc.

10.4. TIMBER

Potential timber resources are identified during the NEPA process. The contractor is responsible for advising the ROICC or Contract Representative to notify EMD's Forest Management Program prior to beginning site work. Additionally, the ROICC or Contract Representative and/or contractor is required to notify the Forest Management Program if the contract has been amended with modifications to the site location.

MCB Camp Lejeune manages its forest in accordance with the installation INRMP. The Forest Management Program

maintains first right of refusal for all timber products on construction projects and will determine whether the Government will harvest the timber or release it to the contractor. The Government retains exclusive rights to all forest products on construction projects. If the Government elects to harvest the timber, only merchantable timber will be removed.

Contractors must adhere to the following requirements when performing site work that may impact timber resources:

- Do not remove, cut, deface, injure, or destroy trees or shrubs without authorization from the ROICC or Contract Representative.
- Do not fasten or attach ropes, cables, or guy wires to nearby trees for anchorages without authorization from the ROICC or Contract Representative. (If these actions are authorized, the contractor is responsible for any resultant damage.)
- Protect trees that are to remain in place and that may be injured, bruised, defaced, or otherwise damaged by construction operations.
- With the ROICC or Contract Representative's approval, use approved methods of excavation to

Protect existing trees that are to remain in place and that may be injured, bruised, defaced, or otherwise damaged by construction operations.

remove trees with 30 percent or more of their root systems destroyed.

- With the ROICC or Contract Representative's approval, remove trees and other landscape features scarred or damaged by equipment operations, and replace with equivalent, undamaged trees and landscape features.

Please refer to Section 12.0 for disposal information for land-clearing debris.

10.5. THREATENED AND ENDANGERED SPECIES

Entry into a threatened or endangered species site or shorebird nesting area marked with signs and/or white paint is prohibited without written permission from installation personnel.

With the exception of improved roadways, entry into a threatened or endangered species site or shorebird nesting area marked with signs and/or white paint is prohibited without written permission from installation personnel. BO 5090.11A lists threatened and endangered species that may be encountered at the installation. The following restrictions apply on the installation unless written permission is explicitly provided:

- Work on Onslow Beach or Brown's Island is not permitted between April 1 and October 31. Traffic

on the beaches should be limited to below the high tide line.

- Vehicles and lighting are prohibited on the beaches overnight between May 1 and October 31.
- Construction activities are prohibited within 1,500 feet of a bald eagle's nest (JD, MC, and IF Training area).
- Cutting or damaging pine trees is not permitted.
- Altering hydrology through excavation, ditching, etc., is prohibited.
- Fish and wildlife must not be disturbed.
- Water flows may not be altered; the native habitat adjacent to the project and critical to the survival of fish and wildlife may not be significantly disturbed, except as indicated or specified.

10.6. WETLANDS

10.6.1. Avoidance

In accordance with MCO P5090.2A, all facilities and operational actions must avoid, to the maximum degree feasible, wetlands destruction or degradation, regardless of the wetlands size or legal necessity for a permit. Prior to the onset of

Contractors must incorporate avoidance and minimization measures to comply with the national policy to permit no overall net loss of wetlands.

construction, coordination with the Environmental Conservation Branch of EMD should have taken place during project design to ensure CWA permitting issues are addressed by the contractor at the earliest opportunity. Contractors must incorporate avoidance and minimization measures to comply with the national policy to permit no overall net loss of wetlands, as well as meeting concept design criteria while incorporating avoidance and minimization measures to protect wetlands, streams, and waters of the United States. Any proposed action that would significantly affect wetlands must be coordinated with the CG of MCB Camp Lejeune.

The contractor must ensure that construction of all buildings, facilities, and related amenities, including earthwork, grading, landscaping, drainage, stormwater management, parking lot and paved roadway, sidewalks, site excavation, sanitary sewer system extensions, and domestic water extensions, avoids, to the maximum degree feasible, wetlands destruction or degradation.

Identified and mapped boundaries of the legally defined wetlands on all USMC lands within the project area will be distributed to the ROICC or Contract Representative for use (if available) and included in all design products, including drawings, plans, and figures.

10.6.2. Permits

All unavoidable potential impacts to wetlands or waters of the United States require prior coordination as described in this section. Failure to acquire written authorization for

If work in wetlands is required, know who is responsible for obtaining permits, and what the terms and conditions of the permits require.

impacts to wetlands and/or waters of the United States may result in significant project delays or design modifications.

No discharge of fill material, mechanized land clearing, or any other activity is allowed in jurisdictional wetlands or waters of the United States without the proper approvals. The contractor

may be responsible for obtaining the following permits (including pre-permit coordination, preparation, and submission of all permit applications after review and concurrence by the installation) and complying with all regulations and requirements stipulated by the State of North Carolina as conditions upon issuance of the permits:

- U. S. Army Corps of Engineers (USACE), Section 404 Permit (individual or applicable nationwide permit); CWA of 1977, as Amended (Public Law 95-217, 33 U. S. C. 1251 et seq.)
- North Carolina Division of Water Resources (NCDWR), Section 401 Water Quality Certification – (15A NCAC 02H) NCDEQ; CWA of 1977, as Amended (Public Law 95-217, 33 U. S. C. 1251 et seq.)
- North Carolina Division of Coastal Management (NCDQM), Federal Consistency Determination (15A NCAC 07) NCDEQ; CZMA of 1972 (16 USC 1451 et seq.)

Two types of activities generally require a permit from the USACE:

- **Activities within navigable waters.** Activities such as dredging, constructing docks and bulkheads, and placing navigation aids require review under Section 10 of the Rivers and Harbors Act of 1899 to ensure that they will not cause an obstruction to navigation.
- **Activities in wetlands and waters of the United States (regulated by Section 404 of the CWA of 1972).** A major aspect of the regulatory program under Section 404 of the CWA is determining which areas qualify for protection as wetlands. Contractors should contact the USACE, the NCDWR, or the NCDCM if there is any question about whether activities could impact wetlands, streams, or protected buffers.

Contractors working on the installation will not perform any work in waters of the United States or wetlands without an approved permit (even if the work is temporary).

Contractors working on the installation will not perform any work in waters of the United States or wetlands without an approved permit (even if the work is temporary). Examples of temporary discharges include dewatering of dredged material prior to final disposal and temporary fills for access roadways, cofferdams, storage, and work areas.

10.6.3. Impacts

Any disturbance to the soil or substrate (bottom material) of a wetland or water body, including a stream bed or protected buffer, is an impact and may adversely affect the hydrology of an area. Discharges of fill material generally include the following, without limitation:

- Placement of fill material that is necessary for the construction of any structure or impoundment requiring rock, sand, dirt, or other material for its construction; site-development fills for recreational, industrial, commercial, residential, and other uses; and causeways or road fills
- Dams and dikes
- Artificial islands
- Property protection or reclamation devices such as riprap, groins, seawalls, breakwaters, revetments, and beach nourishment
- Levees
- Fill for intake and outfall pipes and subaqueous utility lines
- Fill associated with the creation of ponds
- Any other work involving the discharge of fill or dredged material

10.6.4. Mitigation

Any facility requirement that cannot be sited to avoid wetlands must be designed to minimize wetlands degradation and must include compensatory mitigation as required by wetland regulatory agencies (USACE and NCDWR) in all phases of project planning, programming, and budgeting.

The contractor may be required to develop onsite mitigation, consisting of wetland/stream restoration or creation, for all unavoidable wetland and stream impacts, whenever possible and feasible.

The contractor may be required to develop onsite mitigation, if appropriate, consisting of wetland/stream/buffer restoration or creation, for all unavoidable wetland, stream, and buffer impacts, whenever possible and feasible. Use of USMC lands and lands of other entities may be permissible for mitigation purposes for USMC projects when consistent with EPA and USACE guidelines or permit provisions. Land within the project area suitable for

establishment of mitigation may be evaluated by the contractor and used for mitigation where compatible with mission requirements and approved by the CG. Proposals for permanent resource areas must be approved by the Assistant Secretary of the Navy (Installations and Environment) or his/her designee.

Offsite mitigation is preferred and should be coordinated through the North Carolina Division of Mitigation Services or an approved private mitigation bank.

10.7. TEMPORARY CONSTRUCTION

Traces of temporary construction facilities, such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other signs of construction, should be removed upon completion of a contract or project. Temporary roads, parking areas, and similar temporarily used areas should be graded to conform to surrounding contours and the area restored, to the degree practical, to its state prior to any disturbing activities.

11.0 STORMWATER

MCB Camp Lejeune is responsible for stormwater permits associated with construction, industrial, or municipal activities that discharge to outfalls leading to receiving waters. The most applicable permit for contractors is the construction permit, since the majority of the contractor activities are affiliated with construction/renovation.

However, the contractor is also responsible for adhering to the requirements of the industrial and municipal permits held by MCB Camp Lejeune for all of the contractor activities on the installation. In essence, all contractors for the installation need to know and implement the

necessary measures to prevent stormwater runoff and pollution runoff from land-disturbing activities (LDAs) and associated construction permit requirements, as well as industrial and municipal activities. The general requirements for each area, as they apply to contractors, are discussed in the following subsections.

Please consult the ROICC or Contract Representative with any questions or concerns about the information in this section.

11.1. KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with stormwater. If you have any questions or concerns about the information in this section, please consult the ROICC or Contract Representative, who will contact the

appropriate environmental office if additional clarification is necessary.

11.1.1. Key Definitions

- **Best Management Practices.** Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs include structural and nonstructural stormwater controls, operation and maintenance procedures, treatment requirements, and practices to control site runoff (e.g., sediment, spillage or leaks, sludge or waste disposal, or drainage from material storage). See the following website for more information: <http://deq.nc.gov/about/divisions/energy-mineral-land-resources/stormwater>
- **Certificate of Stormwater Compliance.** A document providing approval for development activities that meet the requirements for coverage under a stormwater general permit.
- **Discharge (Pollutant).** The addition of any pollutant or combination of pollutants to waters of the United States from any point source, including, but not limited to, any spilling, leaking, pumping, pouring, emitting, emptying, or dumping of any pollutant; this excludes discharges in compliance with a National Pollution Discharge Elimination System (NPDES) permit.

- **Erosion and Sedimentation Control Plan.** Any plan, amended plan, or revision to an approved plan submitted to the North Carolina Division of Land Resources or its delegated authority in accordance with North Carolina General Statute 113A-57. Erosion and Sedimentation Control Plans show the devices and practices that are required to retain sediment generated by the land-disturbing activity within the boundaries of the tract during construction and upon development of the tract. *Note that in North Carolina, the Erosion and Sedimentation Control Plan and the NCG010000 Construction General Permit are considered the Stormwater Pollution Prevention Plan (SWPPP, or SPPP) for a construction site.* See the following website for more information:

<http://deq.nc.gov/about/divisions/energy-mineral-land-resources/stormwater>

- **Land Disturbance.** Areas that are subject to clearing, excavating, grading, stockpiling, and placement/removal of earth material.
- **Nonpoint Source Discharge.** All discharges from stormwater runoff that cannot be attributed to a discernible, confined, and discrete conveyance. (*See also point source discharge, below.*)
- **Point Source Discharge.** Any discernible, confined, and discrete conveyance, including but specifically not limited to, any pipe, ditch, channel, tunnel conduit, well, discrete fissure, container, rolling stock, or concentrated animal feeding operation from

which pollutants are or may be discharged to waters of the State. (*See also nonpoint source discharge, above.*)

- **Stormwater (Runoff).** The portion of precipitation (rain and/or snowmelt) that does not naturally infiltrate into the ground or evaporate but flows via overland flows, channels, or pipes into a defined surface-water channel or stormwater system during and immediately following a storm event. As the runoff flows over the land or impervious surfaces (such as streets, parking lots, and building rooftops), it accumulates sediment and/or other pollutants that could pollute receiving streams.
- **Stormwater Associated with Construction Activities.** The discharge of stormwater from construction activities, including clearing, grading, and excavating, that result in a land disturbance of equal to or greater than 1 acre, per 40 CFR 122.
- **Stormwater Associated with Industrial Activities.** The discharge from any conveyance that is used for collecting and conveying stormwater and which is directly related to manufacturing, processing, or raw materials storage areas from an applicable industrial plant or activity, per 40 CFR 122.
- **Stormwater Associated with Municipal Activities.** The discharge of stormwater from municipal activities, including public works shops, vehicle maintenance shops, and other municipal activities, with the potential to cause stormwater pollution.

11.1.2. Key Concepts

- **Energy Independence and Security Act (EISA).** In December 2007, Section 438 of EISA was issued. This section requires that Federal facility projects over 5,000 square feet must “maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to temperature, rate, volume, and duration of flow.” In January 2010, the DoD Policy of Implementing Section 438 of the EISA was issued; this document includes a flowchart with implementation steps.
- **Good Housekeeping.** Good housekeeping practices refer to the maintenance of a clean and orderly facility to prevent potential pollution sources from coming into contact with stormwater. The practices include procedures to reduce the possibility of mishandling materials or equipment. Good housekeeping practices benefit stormwater quality and also provide for a clean, safe place for employees and clients. *Note that good housekeeping is one of the six minimum control measures (MCMs) of the MS4 permit requirements.*
- **Low Impact Development (LID).** LID is a holistic approach that incorporates site-specific ecosystem and watershed-based considerations for planning and design. The goal of LID is to mimic a site’s predevelopment hydrology by using design techniques that infiltrate, filter, store, evaporate, and detain runoff close to the source. LID seeks to control

non-point source pollutants “nature’s way,” through the application of plant-soil-water mechanisms that maintain and protect the ecological and biological integrity of receiving waters and wetlands.

- **National Pollution Discharge Elimination System.** The national program for issuing, modifying, revoking, reissuing, terminating, monitoring, and enforcing permits. The NPDES stormwater program regulates stormwater discharges from three potential stormwater sources, as follows:
 - **Construction Activities.** LDAs that disturb 1 or more acres need an NPDES permit. At a minimum, these permits require the development of a site-specific Erosion and Sedimentation Control Plan to address sediment controls during construction and upon development of the tract. As previously noted, the Erosion and Sedimentation Control Plan and the NCG010000 Construction General Permit are considered the SWPPP for a construction site in North Carolina. In the applicable areas of the installation, a State Stormwater Management Permit and coverage under the Construction General Permit may be required. *Note that construction site runoff control is also one of the six MCMs of the Municipal Separate Storm Sewer Systems (MS4) permit requirements.*
 - **Industrial Activities.** Owners and operators of industrial facilities that fall into any of the 30 industrial sectors identified by EPA stormwater

regulations need an NPDES Phase I permit if stormwater is discharged directly into surface water (or MS4). The permit regulations specify steps that facility operators must take prior to becoming eligible for permit coverage and actions that must be taken to continue coverage under an existing permit. These steps and actions include, but are not limited to, effluent limits, monitoring, inspection, sampling, reporting, and corrective action requirements.

- o **Municipal Separate Storm Sewer Systems.** Owners and operators of MS4s need an NPDES Phase II permit. An MS4 is a system of pipes and drainage ditches within an urbanized area used to collect storm runoff and convey it to receiving waters. Polluted runoff is commonly transported through MS4s, from which it is often discharged untreated into local waterbodies.
- **Operational Requirements.** Equipment, discharge, and material use requirements that apply to all construction and industrial activities.
- **Post-Construction Requirements.** The management of stormwater generated on a stable, established site after the construction process is complete. The State Stormwater Management Program sets forth requirements for post-construction stormwater runoff control. *Note that post construction is one of the six MCMs of the MS4 permit requirements.*

- **Stormwater Pollution Prevention Plan.** A plan required by permits provided under NPDES that provides guidance to prevent stormwater pollution from construction, industrial, or municipal activities. *Note that the terminology for this plan (and associated acronym) varies somewhat from State to State.*

11.1.3. Environmental Management System

Contractor practices associated with stormwater include the following:

- Boat, ramp, dock cleaning
- Channel dredging
- Composting
- Construction/demolition/renovation
- Erosion/runoff control
- Fueling and fuel management/storage
- HM storage
- Land clearing
- Laundry
- Landscaping
- Livestock operations
- Pesticide/herbicide management and application
- Range residue clearance

- Road construction and maintenance
- Sewers
- Sidewalk and road deicing
- Soil excavation/grading
- Stormwater collection/conveyance
- Surface washing
- Vehicle parking
- Wash rack

Other activities that contractors could be involved in that may cause stormwater pollution include:

- Grounds maintenance (herbicide, pesticides, fertilizer, etc.)
- Outdoor material storage
- Building/roof repairs
- Industrial activities

The potential impacts of these activities on the environment include degradation of water quality and damage to public and private property due to flooding.

11.2. OVERVIEW OF REQUIREMENTS

Contractors operating aboard the installation must be aware of and adhere to all applicable regulations and requirements regarding potential stormwater contamination, which include but may not be limited to:

- **Clean Water Act of 1972.** Establishes the basic structure for regulating discharges of pollutants into the waters of the United States. The CWA establishes that no oil or hazardous substances should be discharged into or upon the navigable waters of the United States or adjoining shorelines, which may affect natural resources under the management of the United States through the following goals: (1) eliminate the introduction of pollutants into waters of the United States, and (2) develop water quality, which protects and propagates fish, shellfish, and wildlife and provides for recreation in and on the water.
- **40 CFR 122, National Pollutant Discharge Elimination System.** Requires industrial, construction, and municipal stormwater permits for the discharge of pollutants from any point source into waters of the United States.
- **15A NCAC Chapter 4.** Requires all persons conducting a land-disturbing activity to take all reasonable measures to protect all public and private property from damage caused by the release of sediments from the activity. The primary tool used to accomplish the objective is the development of an Erosion and Sedimentation Control Plan.
 - o Identify critical areas
 - o Limit exposure areas
 - o Limit time of exposure
 - o Control surface water

- o Control sedimentation
- o Manage stormwater runoff

More information can be found at:

<http://reports.oah.state.nc.us/ncac.asp?folderName=\Title%2015A%20-%20Environmental%20Quality\Chapter%2004%20-%20Sedimentation%20Control>

- **15A NCAC 02H.1000 Stormwater Management.**
The State Stormwater Management Program requires all persons conducting LDAs that (1) require a Coastal Area Management Act (CAMA) Major Development Permit or an Erosion and Sedimentation Control Plan, and (2) are located within coastal counties or drain to specific classifications of water bodies, to protect surface waters and highly productive aquatic resources from the adverse impacts of uncontrolled high-density development or the potential failure of stormwater control measures. To receive permit approval, projects must limit the density of development, reduce the use of conventional collection systems in favor of vegetative systems, and incorporate post-construction, structural BMPs.

11.3. PRIOR TO SITE WORK

Contractors are required to address the following in the below section prior to beginning site work.

11.3.1. Construction Notifications

Any project involving LDAs aboard the installation must be reviewed by the installation's NEPA Review Board prior to the onset of work so that potential impacts of the project and associated mitigation measures (if necessary) can be determined. Documentation of this review should have been provided to the ROICC or Contract Representative and may include mandatory conditions affecting the construction/implementation of the project. Consult the ROICC or Contract Representative to obtain or review any NEPA documentation associated with the project in the contract.

Any project involving LDAs aboard the installation must be reviewed by the installation's NEPA Review Board prior to the onset of work.

11.3.2. Familiarity with the Stormwater Phase I Industrial Permit

Discharges of industrial stormwater have the potential to contain contaminants from industrial activity. Because of this, MCB Camp Lejeune holds a Stormwater Phase I industrial permit. This type of discharge is defined and regulated in 40 CFR 122, the EPA final rule regarding NPDES stormwater permitting.

Contractors are responsible for preparing project-specific permit applications and related plans and for coordinating the permit review schedule with the ROICC or Contract Representative.

Daily industrial operations discharging stormwater aboard MCB Camp Lejeune and MCAS New River are covered under an individual NPDES permit. In accordance with the permit, the installation maintains an industrial SWPPP that identifies potential sources of pollution that may affect the water quality of stormwater discharges associated with an industrial activity. Refer to Section 11.4 for more information on contractor responsibilities associated with this permit.

11.3.3. Familiarity with the Stormwater Phase II Municipal Permit

Discharges of municipal stormwater have the potential to contain contaminants from municipal activity. Because of this, MCB Camp Lejeune holds a Stormwater Phase II municipal permit. This type of discharge is defined and regulated in 40 CFR 122, the EPA final rule regarding NPDES stormwater permitting.

Daily municipal operations discharging stormwater aboard MCB Camp Lejeune and MCAS New River are covered under an NPDES permit. In accordance with the permit, the installation maintains a municipal Stormwater Plan to address the six MCMs of the permit, as well as other requirements. Refer to Section 11.4 for more information on contractor responsibilities associated with this permit.

11.3.4. Project-Specific Construction Permits

Contractors are responsible for preparing all project-specific stormwater permit applications and related plans and for coordinating the permit review schedule with the ROICC or

Contract Representative. MCB Camp Lejeune is the responsible party for all project-specific stormwater permits located outside of Public-Private Venture (PPV) housing. All permit-required plans and applications must be submitted to the appropriate MCB Camp Lejeune organization to go through internal approval prior to submission to the appropriate State agency. The permit review schedule should allow adequate time for internal review prior to State submission deadlines.

All permit-required plans and applications must go through internal approval before being submitted to the appropriate State agency.

Adequate review time fluctuates and is based on the type of permit application. Stormwater compliance should be coordinated with the appropriate PPV partner for housing-related projects outside the jurisdiction of MCB Camp Lejeune.

Permit coverage is required under the North Carolina General Permit No. NCG010000 (General Permit) for construction activities that disturb 1 acre or more of land. Three copies of a proposed Erosion and Sedimentation Control Plan must be prepared and submitted to the NCDEQ Sedimentation Control Commission (or to an approved local program) at least 30 days prior to beginning construction activity to obtain coverage under the General Permit. A copy of the plan will be kept on file at the job site at all times while the site is active. **Coverage under the permit becomes effective when a plan approval is issued. No LDAs may take place prior to receiving the plan approval.** The

approved plan is considered a requirement or condition of the General Permit; deviation from the approved plan will constitute a violation of the terms and conditions of the permit unless prior approval for the deviations has been obtained.

A State Stormwater Management Permit, issued in accordance with 15A NCAC 02H.1000, is required for all development activities that require a CAMA Major Development Permit or an Erosion and Sedimentation Control Plan and that meet any of the following criteria:

- Development within the 20 coastal counties
- Development within 1 mile of and draining to any waters classified as High Quality Water (HQW) and rated “excellent” based on biological and physical/chemical characteristics through the NCDWR monitoring or special studies, primary nursery areas designated by the Marine Fisheries Commission, and other functional nursery areas designated by the Marine Fisheries Commission
- Development that drains to an Outstanding Resource Water, which is a subset of HQW that is intended to protect unique and special waters having excellent water quality and being of exceptional ecological or recreational significance to the State or Nation

A State Stormwater Management Permit is required for all activities that will disturb 1 acre or more of land.

Because the installation is in a coastal county, any project that disturbs greater than 1 acre of land (requiring coverage under the General Permit for construction activity) will also require a State Stormwater Management Permit. A State Stormwater Management Permit application must be submitted and filed with the NCDEQ, Division of Water Quality, after the construction plans and specifications are complete and before construction activities begin. Additional information is available on the NCDEQ website:

<http://deq.nc.gov/about/divisions/energy-mineral-land-resources/stormwater>

State Stormwater Management Permits typically specify design standards for conveyance systems and structural BMPs, a schedule of compliance, and general conditions to which the permittee must adhere.

11.4. RESPONSIBILITIES DURING SITE WORK

The contractor is responsible for maintaining the quality of the stormwater runoff and preventing pollution of stormwater at the construction/job site. The job site may be inspected by installation environmental personnel to ensure compliance with the contractor's construction and/or the installation's industrial SWPPP, municipal stormwater plan, and applicable permits. The following requirements apply to all projects at the installation that have the potential to impact water quality:

- Any changes to the project area that do not comply with the approved Erosion and Sedimentation Control Plan, alter the approved post-construction stormwater conveyance system, or could otherwise significantly change the nature or increase the quantity of pollutants discharged should be immediately communicated to the ROICC or Contract Representative.
- All permitted erosion and sedimentation control projects will be inspected by the contractor at least once every 7 calendar days (unless discharges to a 303(d)-listed water body are occurring) and within 24 hours after any storm event greater than 0.5 inch of rain per 24-hour period, as required by the North Carolina General Permit No. NCG010000. Inspection results shall be maintained by the designated contractor throughout the duration of an active construction project.
- Equipment used during the project activities must be operated and maintained in such a manner as to prevent the potential or actual pollution of the surface or ground waters of the State.
- No POL products (e.g. fuels, lubricants, hydraulic fluids), coolants (e.g., antifreeze), or any other substance shall be discharged onto the ground, into surface waters, or down storm drains (to include leaking vehicles, heavy equipment, pumps, and/or structurally deficient containers of hazardous materials).

- Spent fluids shall be disposed of in a manner so as not to enter surface or ground waters of the State, or storm drains. Disposal of spent fluids is outlined in Section 7.0.
- Implement spill prevention measures, clean up all spills immediately, and follow the spill reporting requirements presented in Section 5.0. Any spilled fluids shall be cleaned up to the extent practicable and disposed of in a manner so as not to allow their entry into the water (surface or ground) of the State. Refer to Section 5.0 for emergency and spill response procedures.
- Herbicide, pesticide, and fertilizer use shall be consistent with the Federal Insecticide, Fungicide, and Rodenticide Act and shall be used in accordance with label restrictions. Refer to Section 7.0 for additional information on Hazardous Material/Hazardous Waste Management.
- Particular care must be used when storing materials outside. Materials and equipment stored outside that could potentially affect the quality of stormwater runoff include, but are not limited to, garbage dumpsters, vehicles, miscellaneous metals, chemical storage, fuels storage, wood products, and empty storage drums. These materials should be stored under cover whenever practicable. Contact the ROICC or Contract Representative with any questions about whether an outdoor storage practice is acceptable.

- Use good housekeeping practices to maintain clean and orderly work areas, paying particular attention to those areas that may contribute pollutants to stormwater. For industrial activities, refer to the link below for more information on best management practices to prevent stormwater pollution. EPA Industrial Fact Sheet Series for Activities Covered by EPA's multi-sector general stormwater permit: <http://www.epa.gov/npdes>

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12.0 SOLID WASTE, RECYCLING, AND POLLUTION PREVENTION (P2)

Contractors should minimize the amount of solid waste requiring disposal in a landfill.

The installation has a proactive P2 and recycling program, and contractors should minimize the amount of solid waste requiring disposal in a landfill. This section addresses solid waste, including both municipal solid waste (MSW) and construction and demolition (C&D) waste. HM and HW are discussed in Section 7.0 of this guide. Contractors are required to comply with all Federal, State, and local laws and regulations for proper disposal and recycling of all solid wastes.

12.1. KEY DEFINITIONS AND CONCEPTS

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

Please consult the ROICC or Contract Representative with any questions or concerns about the information in this section.

12.1.1. Key Definitions

- **Construction and Demolition Debris.** Inert materials generated during the construction, renovation, and demolition of buildings, roads, and bridges. C&D waste often contains bulky, heavy materials such as concrete, lumber (from buildings), asphalt (from roads and roofing shingles), gypsum (the main component of drywall), and glass (from windows).
- **Green Procurement (GP).** The purchase of products and services that are environmentally preferable, when compared with competing products that serve the same purpose, in accordance with federally mandated “green” procurement preference programs. GP is intended to have a lesser or reduced negative effect on human health and the environment, and to permit fulfilling the social, economic, and other requirements of present and future generations.
- **Pollution Prevention.** Reducing the amount of pollution entering waste streams or otherwise released to the environment through source reduction and process efficiencies.
- **Recycling.** Activities that may include collection, separation, and processing, by which products or other materials are recovered from the solid waste stream for use as raw materials in the manufacturing of new products. Recycling also includes using, reusing, or reclaiming materials, as well as processes

that regenerate a material or recover a usable product from it.

- **Municipal Solid Waste.** Any solid materials discarded, including garbage, construction debris, commercial refuse, non-hazardous materials, non-recyclable wood, or other non-recyclable material per BO 11350.1, Refuse Disposal Procedures.

12.1.2. Key Concepts

- **Pollution Prevention/Green Procurement.** Installation contractors are strongly encouraged to use P2 and GP practices.
- **Qualified Recycling Program (QRP).** An organized operation that diverts or recovers scrap or waste streams and that identifies, segregates, and maintains the integrity of the recyclable materials in order to maintain or enhance the marketability of the materials.
- **Recycling.** Recycling is required on the installation. The MCB Camp Lejeune Landfill (Base Landfill) Recycling Center accepts specified recyclables according to the schedule in Table 12-1. Call (910) 451-4214 prior to a bulk turn-in.
- **Solid Waste.** Solid waste is disposed of in accordance with contract specifications (off the installation or at the Base Landfill). Data related to disposal off the installation (to include C&D waste) must be provided to the ROICC or Contract Representative on a monthly basis.

- **Source Reduction.** Any practice that reduces the amount of any HM, pollutant, or contaminant entering any waste stream or released into the environment prior to recycling, treatment, and disposal that could reduce the hazard to public health and the environment. Source reduction may include equipment or technology modification; process or procedure modification; reformulation or redesign of products; substitution of raw materials; and improvements in housekeeping, maintenance, training, or inventory control.

12.1.3. Environmental Management System

Contractor practices associated with solid waste, recycling, and P2 include the following:

- Battery management
- Building operation/maintenance/repair
- Composting
- Construction/demolition/renovation
- Equipment operation/maintenance/disposal
- Grease traps
- HW disposal offsite transport
- Land clearing
- Livestock operations
- Metal working
- Packaging/unpackaging

- Paint removal
- Painting
- Parts replacement
- Polishing
- Range residue clearance
- Recreational facilities operation
- Road construction maintenance
- Rock crushing operations
- Solid waste collection/transportation
- Storage tank management
- Urban wildlife management
- Vehicle maintenance

The potential impacts of these activities on the environment include soil degradation, surface water quality degradation, depletion of landfill space, and depletion of nonrenewable resources.

12.2. OVERVIEW OF REQUIREMENTS

Contractors operating aboard the installation must be aware of and adhere to all applicable regulations and requirements regarding solid waste disposal, recycling, and P2, which include but may not be limited to the following:

- [**BO 5090.17, Solid Waste Reduction – Qualified Recycling Program.**](#) Provides guidance for solid

waste reduction, P2, and management of recyclable materials.

- **[BO 11350.2D, Refuse Disposal Procedures.](#)** Establishes procedures for the separation, collection, and disposal of refuse and the disposal of waste wood products.
- **[DoD Instruction 4715.4, Pollution Prevention.](#)** Establishes the DoD requirement for installation QRPs and calls for GP.
- **[EO 13423, Strengthening Federal Environmental, Energy and Transportation Management.](#)** Integrates prior practices, strategies, and requirements to further enhance the environmental and energy performance and compliance requirements. The EO sets goals in several environmental areas, including recycling.
- **[EO 13514, Federal Leadership in Environmental, Energy, and Economic Performance.](#)** Expands on the environmental performance requirements for Federal agencies, to include setting goals for solid waste diversion.
- **[Pollution Prevention Act of 1990 \(42 USC 13101 et seq.\).](#)** Establishes the national policy that “pollution should be prevented or reduced at the source whenever feasible,” and establishes the following hierarchy: source reduction, recycling, treatment, and disposal.
- **[Resource Conservation and Recovery Act of 1976.](#)** Governs the disposal of solid waste and establishes

Federal waste disposal standards and requirements for State and regional authorities. The objectives of Subtitle D are to assist in developing and encouraging methods for the disposal of solid waste that are environmentally sound and that maximize the utilization of valuable resources recoverable from solid waste.

- **Solid Waste Disposal Act (SWDA) of 1965.** Requires Federal facilities to comply with all Federal, State, interstate, and local requirements concerning the disposal and management of solid wastes, including permitting, licensing, and reporting requirements. The SWDA encourages the reuse of waste through recycling and requires the procurement of products that contain recycled materials.

12.3. SOLID WASTE REQUIREMENTS

Contractors must follow all Federal, State, and local requirements regarding the collection, storage, and disposal of solid waste. Contact the ROICC or Contract Representative for additional information regarding solid waste requirements.

At a minimum, the following actions are required for all contractors:

1. Prior to performing work that will or may generate solid waste at the installation, all contractors must provide their ROICC or Contract Representative with a copy of their Solid Waste Disposal Permit

unless the use of the Base Landfill is authorized for disposal. If the Base Landfill is authorized, the contractor must contact the Base Landfill Operations Clerk to ensure the contract is registered in the Landfill Tracking System. Recycling should be coordinated with the ROICC or Contract Representative and the Landfill Manager.

2. Provide the weight of ALL waste, both MSW and C&D, that is either disposed of or recycled, to the ROICC or Contract Representative, with a copy to the Landfill Manager. This requirement does not apply if the landfill/recycling facility picks up or accepts materials directly from the contractor. If contractors transport waste offsite for disposal, it is mandatory that they track the material weight and provide that information to their ROICC or Contract Representative for input into the annual Pollution Prevention Annual Data Summary.

In addition, contractors producing solid waste on the installation are required to take these steps:

- Pick up solid waste, separate it according to material type, and place it in covered containers of the correct type that are regularly emptied for recycling or landfilling.
- Verify that the solid waste contains no HM or HW.
- Prevent contamination of the site and the surrounding areas when handling and disposing of waste.

- Leave the project site clean upon completion of a project.

12.3.1. MCB Camp Lejeune Landfill Acceptable Waste Streams

To dispose of waste at the Base Landfill, contractors must be authorized with a valid construction pass and placard representing the related contract. Contractors must also contact the Landfill Operator prior to unloading refuse. Contact the ROICC or Contract Representative with any questions regarding use of the landfill or to coordinate disposal.

The Base Landfill accepts certain types of solid waste under the conditions specified in Table 12-1. Base Landfill hours of operation are 0730 to 1530, Monday through Friday, but ACM waste must be delivered between 0700 and 1000, Monday through Thursday. Each material must be separated into different loads.

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Table 12-1. Base Landfill Requirements

No Personal Property/ Off-Base Trash Accepted
Landfill Operating Hours
0700-1500 Monday – Thursday 0700-1400 Friday
Wood Products
The following products may be mixed together and delivered to the landfill: <ul style="list-style-type: none"> • Scrap lumber (unpainted) • Embark boxes (broken down) • Pallets (broken/untreated) <p>The following products must be separated and delivered to the landfill:</p> <ul style="list-style-type: none"> • Trees (cut to 10 feet or less and free of soil) • Leaves and scrubs • Serviceable pallets
Lead Based Painted Wood Products
<ul style="list-style-type: none"> • Delivered before 1400 Monday – Thursday • Not accepted on Friday • Cut in less than 8-foot lengths • Wrapped in 6-millimeter plastic bags/sealed
Asbestos (all types)
<ul style="list-style-type: none"> • Appointment needed (910-451-5011 / 2946) • Delivered by 1000 (Mon – Thurs.) • Not accepted on Friday • Double wrapped in 6-millimeter plastic bags

<ul style="list-style-type: none">• Sealed with duct tape• Labeled and manifested prior to delivery
Organic Products
<ul style="list-style-type: none">• Leaves, pine straw, grass, and shrub clippings• No bags or containers allowed• No twigs or limbs over 2 inches in diameter• Less than 6-foot lengths
Concrete
<ul style="list-style-type: none">• Delivered separately from other items• Wire and rebar must be cut off flush with exposed surfaces• Concrete and culverts• Bricks and blocks• Mortar products
Soil
Non-contaminated soil accepted
Recyclable Products (Must be separated and dropped off at a designated recycling drop-off point or at a Recycling Center)
<ul style="list-style-type: none">• Wood pallets (delivered separately)• White paper (mixed flat or shredded)• Newspaper• Magazines• Military publications (binders removed)• Phone books• Plastic and glass (containers or bottles)• Toner cartridges• Cardboard (delivered separately if in bulk)

- Vinyl siding (delivered separately, in less than 6-foot lengths)
- Asphalt shingles (delivered separately)

Scrap metals

Other Related Information

Asphalt may be accepted in small quantities, as needed, at the discretion of the Landfill Manager (large quantities of asphalt must be taken off the installation).

All furniture must be accompanied by a DD Form 1348, with a classification of rejected by the Base Property Office **AND** downgraded to scrap by Defense Logistics Agency Disposition Services (DLADS).

All other Base or USMC property must be accompanied by a DD Form 1348 and downgraded to scrap by DLADS.

Scrap materials related to **ordinance, ammunition or dangerous items**, including containers, tubes, and packing, must also be accompanied by Ammunition, Explosives, and Other Dangerous Articles (AEDA) certifications and copies of the certifier and verifier's appointment letters.

Phone Numbers: (area code 910)

- Landfill Manager 451-4998
- Recycling Manager 451-4214
- Landfill Fax 451-9935

- Landfill Clerk 451-2946
- EMD 451-5837
- EOD 451-0558

Unacceptable Items

- Hazardous Waste
- Liquid Waste
- Useable Appliances
- Paint and Paint Cans
- Appliances
- Electronics
- Computer Equipment
- Batteries
- Wire (Communication/Barbed/ Concertina)
- Oyster Shells
- Contaminated Soil
- Tires
- 55-Gallon Drums
- Oil Filters
- Petroleum Containers
- Regulated Medical Waste
- PCBs or PCB containers
- Demilitarized Waste
- Construction and Demolition Debris (unless specified in the contract)

12.4. RECYCLING REQUIREMENTS

The installation's QRP is managed by the EMD in collaboration with the Public Works Division. Reducing solid waste saves money and helps protect the environment by conserving natural resources. Additionally, USMC facilities are mandated to recycle, and the installation must meet solid waste diversion goals specified in EO 13514, the

DoD Strategic Sustainability Performance Plan, and the EMS.

12.4.1. Recycling Center

The MCB Camp Lejeune Recycling Center, Building 982, is co-located with the Base Landfill on Piney Green Road. Normal working hours are Monday through Thursday, 0700–1500, and Friday, 0700–1400. All materials should be brought to the Recycling Center. Have the ROICC or Contract Representative contact the Recycling Center at (910) 451-4214 for additional details. Call Recycling Coordinator at (910) 451-4214 for specific types and categories of materials accepted.

The following types and categories of materials are accepted for recycling but must be delivered to the Recycling Center on Piney Green Road:

- Scrap metal
- Steel (high temperature, corrosion resistant)
- Brass (includes spent/fired munitions, but excludes brass casings above .50 caliber; please call the Recycling Coordinator at (901) 451-4214 for details and documentation requirements)
- Copper and copper wire
- Aluminum (plate, sheet, scrap) and aluminum cans
- Paper (white, news, magazine)
- Cardboard

- Glass bottles (no window, windshields, or drinking glass)
- Plastic bottles
- Toner cartridges

Special arrangements may be made for other materials (C&D waste) or larger volumes of commonly recycled materials from events such as C&D. Regulations set forth in BO 11350.1 must be followed.

12.4.2. Other Recyclables

- **Asphalt Pavement.** Asphalt must be removed and delivered to an asphalt recycling facility. Contractors must provide a record of the total tons of asphalt recycled and the corporate name and location of the recycling facility to their ROICC or Contract Representative, with a copy to the Landfill Manager.
- **Empty Metal Paint Cans.** Take empty metal paint cans to Building S-962 for recycling. Turn in all HM cans or HM containers that are generated from MCB Camp Lejeune or MEF contracts to Building S-962 on Michael Road on the scheduled contractor turn-in day. Have the ROICC or Contract Representative contact EMD for more information. Any waste generated from this process must be managed appropriately.
- **Other Metals.** Take other metals to the DLADS disposal area in Lot 201, following the guidelines of BO 5090.17.

- **Red Rag Recycling.** Contractors should seek a red rag program to supply and launder shop rags. This service supplies clean rags and picks them up after use. The rags are laundered offsite and returned.
- **Universal Waste.** See Section 7.0 of this guide for management procedures.
- **Unused Hazardous Materials.** Turn in these materials to the HM Free Issue Point, Building 977 on Michael Road. Have the ROICC or Contract Representative contact the Free Issue Point at (910) 451-1482.
- **White Rag Recycling.** White rags are used in painting (these have no dye and thus do not interfere with these types of operations) and may be laundered offsite in a program analogous to the red rag recycling service.

12.5. POLLUTION PREVENTION AND GREEN PROCUREMENT

MCB Camp Lejeune is subject to GP requirements. GP implements environmentally protective principles in the procurement arena and includes preferential use of the following:

- Products made from recovered materials
- Biobased products
- Water- and energy-efficient products
- Alternatives to ozone-depleting substances

- Non-toxic and less-toxic products
- Electronics that meet Electronic Product Environmental Assessment Tool standards
- Products that do not contain toxic chemicals, hazardous substances, or other pollutants targeted for reduction and elimination by the DoD
- Products with alternative fuel use/increased fuel efficiency
- Environmentally preferable purchasing practices

Contractors are encouraged to employ GP practices whenever feasible.

13.0 POTENTIAL DISCOVERY OF UNDOCUMENTED CONTAMINATED SITES

MCB Camp Lejeune was placed on the EPA National Priorities List, effective November 4, 1989. To ensure the protection of human health and the environment, a proactive Installation Restoration Program has been established to assess and remediate various sites on the installation. Numerous investigations have been performed to ensure that all of the installation's contaminated sites have been found, but additional contaminated areas may still exist. It is the contractor's responsibility to notify the ROICC or Contract Representative of any unforeseen site conditions while on the installation. It is recommended that any contractors performing intrusive activities on the installation be properly trained in accordance with the OSHA standards in 29 CFR 1910.120(e). If intrusive activities are planned for known contaminated areas, all required environmental training should be completed *prior* to working at MCB Camp Lejeune. Copies of training records should be available upon request by Federal or State regulators.

**Contact the ROICC
or Contract
Representative
with questions or
concerns about
the information in
this section.**

13.1. KEY DEFINITIONS AND CONCEPTS

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

13.1.1. Key Definitions

- **Free Product.** A discharged HM/HW, POL, or environmental pollutant that is present in the environment as a floating or sinking non-aqueous phase liquid that exists in its free state (i.e., exceeds the solubility limit of liquids or saturation limit of soil/solids).
- **National Priorities List.** List of sites of national priority among the known releases or threatened releases of hazardous substances, pollutants, or contaminants.
- **Petroleum, Oil, and Lubricants.** A broad term that includes all petroleum and associated products or oil of any kind or in any form, including, but not limited to, petroleum, fuel oil, vegetable oil, animal oil, sludge, oil refuse, and oil mixed with wastes.
- **Unforeseen Site Condition.** A potentially hazardous or unanticipated site condition encountered on a job site.

- **Munitions and Explosives of Concern.** Military munitions that may pose explosives safety risks, including MEC, UXO, DMM, and munitions constituents present in a high enough concentration to present an explosives hazard.

13.1.2. Key Concepts

- **Notification.** Contractors must notify the ROICC or Contract Representative, in writing, of any unforeseen site conditions prior to disturbing them.
- **Response.** Contractors must stop working and evacuate work areas if unforeseen site contaminants, HM, or MEC/DMM/UXO are suspected to be present.

13.1.3. Environmental Management System

Unforeseen site conditions are potentially applicable to all EMS practices conducted aboard MCB Camp Lejeune.

13.2. OVERVIEW OF REQUIREMENTS

Contractors operating aboard the installation must be aware of and adhere to all applicable regulations and requirements regarding unforeseen site conditions, which include but may not be limited to the following:

- **[CERCLA of 1980 and Superfund Amendments & Reauthorization Act \(SARA\) of 1986.](#)** Establishes the Nation's HW site cleanup program.

- [Occupational Safety and Health Standards, 29 CFR 1910.](#) Federal standards that govern occupational health and safety to ensure the protection of employees from recognized hazards, such as exposure to toxic chemicals, excessive noise levels, mechanical dangers, heat or cold stress, or unsanitary conditions. The standards include provisions for many facets of employee safety and health, including, but not limited to, employee training, personal protective equipment, HM communication, medical surveillance, and emergency planning.

13.3. UNFORESEEN SITE CONDITION PROCEDURES

Contractors must promptly, before the conditions are disturbed, give a written notice to the ROICC or Contract Representative of (1) any subsurface or latent physical conditions at the site that differ materially from those indicated in the contract, or (2) any unknown physical conditions at the site, of an unusual nature, that differ materially from those ordinarily encountered.

The ROICC or Contract Representative will investigate the site conditions promptly after receiving the notice.

The most common unforeseen conditions at MCB Camp Lejeune typically relate to POL contamination and MEC/DMM/UXO. Procedures for these scenarios are provided in the following sections.

13.3.1. Petroleum, Oil, and Lubricants

The most frequently encountered condition that requires EMD assistance is the presence of a POL odor while excavating. If an odor or any free product is encountered during construction or excavation activities, take the following actions:

- Stop work.
- Immediately clear the area of all personnel to a safe distance upwind of the suspected area.
- Call the Fire and Emergency Services Division (911) immediately if personnel are affected or injured by the suspected contaminant.
- Call the Fire and Emergency Services Division to properly secure the area.
- Notify the ROICC or Contract Representative so that the EMD Spill Response Team will be contacted to determine the appropriate course of action.

If there is an odor, stop work and immediately clear the area of all personnel to a safe distance upwind of the suspected area.

Please note that if contaminated soil is removed during excavation activities, the soil will have to be characterized prior to disposition. While it is staged and awaiting characterization sampling results, contaminated soil is to be placed within a bermed area on an impervious surface or barrier and securely covered with plastic or appropriate

material. Sample results and characterization will determine the ultimate disposition of the soil. In accordance with installation policy, contaminated soil is not permitted to be reintroduced into excavations.

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Recognize

13.3.2. Munitions and Ordnance

Retreat

Report

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MCB Camp Lejeune has been in operation as a military training installation since the early 1940s. As such, munitions or an ordnance item may be encountered during site excavation or construction activities. MEC, DMM, or UXO at MCB Camp Lejeune and its outlying areas typically include flares, mines, grenades, rockets, artillery projectiles, bulk explosives, fuses, or blasting caps. These items may vary in condition from very good/easily recognizable to unrecognizable, fragmented, or corroded scrap metal. MEC, DMM, or UXO may be encountered on the ground surface, partially buried, or completely buried.

Contractors operating aboard the installation should follow the “3R” concept if a possible munitions or ordnance item is discovered: **“Recognize, Retreat, and Report.”**

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Recognize

Retreat

Report

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- **Recognize.** Contractors with the potential to encounter any possible MEC, DMM, or UXO should have a basic knowledge of these items. The item does not have to

be specifically recognized or identified, but it is important for personnel to recognize the potential hazard.

- **Retreat.** If a suspected MEC, DMM, or UXO item is encountered, leave the immediate area and DO NOT DISTURB the item. If possible, note the general size and shape of the item, any markings, and the location.
- **Report.** Report all occurrences to the appropriate authority, including any observations (e.g., size, shape, markings, and location).

Stop work immediately if a project unearths a hazardous material, such as MEC/DMM/UXO, and report the situation to the ROICC or Contract Representative.

If a project unearths any potential MEC/DMM/UXO, recognize the potential hazard. Stop work immediately, and have all personnel clear the immediate area. Report the situation and any observations to the ROICC or Contract Representative, who will then report the item to Range Control and Explosive Ordnance Disposal (EOD). The following

link is to a 6-minute “UXO Safety” awareness training video that provides additional guidance.

<http://www.lejeune.marines.mil/OfficesStaff/ExplosivesSafety/%20trainingandguides.aspx>

For other emergency response procedures, please refer to Section 5.0 of this guide.

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14.0 PERMITTING

Contractors operating aboard the installation must ensure that all relevant environmental permits are obtained before work commences onsite. Contractors must work with their ROICC or Contract Representative to determine permitting responsibilities prior to beginning work. Contractors must adhere to all permit conditions. Examples of permits related to the environment are provided in Section 14.3.

14.1. KEY DEFINITIONS AND CONCEPTS

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

Please consult the ROICC or Contract Representative with any questions or concerns about the information in this section.

14.1.1. Key Definitions

- **Major Source.** Any source that emits or has the potential to emit 100 tons per year or more of any criteria air pollutant in accordance with Title V of the CAA.

- **Permit.** A legally enforceable document required by statutory regulation for potential sources of pollution that is required for operations that may have an environmental impact. Permits may be administered at the Federal, State, or local level.
- **Target Housing.** Any housing constructed before 1978, with the exception of housing for the elderly and persons with disabilities (unless a child under the age of 6 lives or is expected to live there) and residential dwellings where the living areas are not separated from the sleeping areas (efficiencies, studio apartments, dormitories, etc.).

14.1.2. Key Concepts

- **Permits.** Prior to beginning work aboard the installation, consult applicable permit requirements and ensure that they are met before work begins. Copies of all applicable permits/authorizations should be retained onsite for the life of the project. Additional information on North Carolina permits is found on the following webpage: <http://deq.nc.gov/about/divisions/environmental-assistance-customer-service/deacs-permit-guidance/environmental-permit-assistance>

Consult the ROICC or Contract Representative for additional information concerning the contract's permit requirements. The contractor is responsible for ensuring that all required permits are acquired prior to any work aboard MCB Camp Lejeune.

14.1.3. Environmental Management System

Currently, no practices are associated with permitting under the EMS.

14.2. OVERVIEW OF REQUIREMENTS

Please refer to the individual sections of this Guide for applicable permitting regulations and requirements for each environmental media. Many permits have specific timetables for submittal prior to project initiation. Contractors must consult the permit requirements and ensure that all pertaining permits are obtained in the required timeframe.

14.3. PROJECT PERMITS AND APPROVALS

The NCDEQ website (<http://deq.nc.gov/>) is a useful reference for determining required permits and obtaining necessary forms.

Prior to work being awarded, EMD's NEPA Section should have performed an environmental review of the installation-associated action proponent to comply with NEPA 1969. The outcome of this review would be either a Decision Memorandum or an Environmental Assessment. Contractors must refer to their contract and the requirements

outlined in the NEPA documentation for specific permitting requirements. EMD Program Managers are available for

guidance; however, if the contractor is tasked with preparing permit applications, the contractor is expected to have the capability and expertise required to complete the submittals in accordance with the guidance provided by the regulatory agency that issues the permit. In addition, EMD must be provided with copies of all permits submitted to the NCDEQ. In some cases, EMD must submit the permit application. Please direct questions to the ROICC or Contract Representative.

Some permits that may be required are discussed in applicable sections of this Guide. The following list of permits is not meant to be all-inclusive; please be aware that other permits may also be required. The NCDEQ website (<http://deq.nc.gov/>) is a useful reference for determining required permits and obtaining necessary forms. In addition, any inspection and/or data collection required by the permits must be retained onsite for review upon request.

14.3.1. Stormwater (Section 11.0)

- **[NPDES Stormwater Discharge Permit for Construction Activities \(also referred to as General Permit No. NCG010000\)](#)**. Required for all LDAs that exceed 1 acre; also requires an accompanying Erosion and Sedimentation Control Plan.
- **[General Permit SWG050000](#)**. Required for residential development activities within the 20 coastal counties (including Onslow County) located within 1/2 mile and draining to class SA waters (waters classified as SA are tidal salt waters that are

used for commercial shellfishing or marketing purposes) that disturb less than 1 acre if adding more than 10,000 square feet of built-upon area that will result in a built-upon area greater than 12 percent of the total project area.

- **High-Density Stormwater Permit.** Required when (1) the LDA exceeds 1 acre and impervious surfaces are greater than or equal to 25 percent of the total project area adjacent to non-SA waters or greater than or equal to 12 percent of the total project area adjacent to SA water; or (2) total development exceeds 10,000 square feet of impervious surface.
- **Low-Density Stormwater Permit.** Required when the LDA exceeds 1 acre and impervious surfaces are less than 25 percent of the total project area when adjacent to non-SA waters or less than 12 percent of the total project area when adjacent to SA waters.

14.3.2. Asbestos (Section 8.0)

- **Asbestos Permit Application and Notification for Demolition/Renovation.** DHHS Form 3768, available at the following website (under *Forms & Applications*):

<http://epi.publichealth.nc.gov/asbestos/ahmp.html>

14.3.3. Lead-Based Paint (Section 9.0)

- **North Carolina Lead-Based Paint Abatement Permit Application.** Any person or firm conducting an abatement of a child-occupied facility or target

housing is required to obtain a Lead Hazard Management Plan Permit. The application is available at the following website: <http://epi.publichealth.nc.gov/lead/pdf/LeadAbatePermit08-07.pdf>

14.3.4. Air Quality (Section 4.0)

- **Construction Permits.** Construction permits are required for all new stationary sources and all existing stationary sources that are added to or are modified with new equipment that may emit air pollutants. Permits may be required for the construction or modification of the following types of emission sources:
 - o Boilers
 - o Generators
 - o Engine test stands
 - o Surface coating/painting operations
 - o Refrigerant recovery and recycling operations for other ozone-depleting substances, such as industrial chillers, refrigerators, air conditioning compressors, or cleaning agents.
 - o Chemical or mechanical paint removal, abrasive blasting, grinding, or other surface preparation activities
 - o Fuel storage and fuel dispensing
 - o Woodworking shops

- o Welding shops
- o Bulk chemical or flammables storage
- o Open burning
- o Fire training
- o Rock crushing or other dust-causing activities
- **New Source Review Permit.** A New Source Review permit is a pre-construction permit that authorizes the construction of new major sources of air pollution or major modifications of existing sources.

14.3.5. Wetlands (Section 10.6)

- **Section 404 Clean Water Act Permit.** Contractors working aboard the installation will not perform any work in waters of the United States or wetlands (see definition below) without an approved permit (even if the work is temporary). Unavoidable impacts to wetlands or waters of the United States will require coordination and written approval from the USACE for a Section 404 CWA permit (individual or applicable nationwide permit), the NCDWR for a Section 401c Water Quality certification, and the NCDCM for a Federal Consistency Determination. Failure to acquire written authorization for making impacts to wetlands and/or waters of the United States may result in significant project delays or design modifications. See the following website for more information:

<http://www.epa.gov/laws-regulations>

14.3.6. Drinking Water/Wastewater

- **Approval of Engineering Plans and Specifications for Water Supply Systems.** Applicants must submit engineering plans and specifications at least 30 days prior to the date upon which the Authorization to Construct is desired. Authorization to Construct must be obtained prior to onset of work.
- **Wastewater Extension Permit.** NCDEQ Form FTA 02/03 – Rev. 3 04/05. Applicants submitting Form FTA 02/03 should plan to allow the State approximately 90 days to issue the permit. The Wastewater Extension Permit must be obtained prior to onset of work.

Appendix

General EMS & Environmental Awareness Training for Contractors & Vendors

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**MCB Camp Lejeune, NC/
MCAS New River**



**General EMS and
Environmental Awareness
Training
for
Contractors and Vendors**

Revised: April 2008





Disclaimer

- This training does not replace any required regulatory environmental training as per your contract
 - Required environmental training should be completed *prior* to working aboard the Installation
 - Training records should be available for review upon request





Training Overview

- EMS and the Environmental Policy
- Environmental Management Division
- General Environmental Awareness
- Spill Response Basics
- Summary





EMS and the Environmental Policy





What is an EMS?

- MCB Camp Lejeune and MCAS New River have implemented an Environmental Management System (EMS) that is founded on the principles of our respective **Environmental Policy**.
- The purpose of the EMS is to sustain and enhance mission readiness and access to training areas through effective and efficient environmental management.
- The EMS emphasizes that the authority and principal responsibility for controlling environmental impacts belong to those commands, units, offices, and personnel, *including contractors and vendors*, whose activities have the potential to impact the environment.





Why have an EMS?

“To sustain our operations and training capabilities, and to safeguard land-use availability, will comply with environmental laws and conserve the natural and cultural resources with which it has been entrusted.”

Excerpt from the Commanding Officer's Environmental Policy Statement





What YOU Need to Know

- The Installation has an EMS

- These three goals are the foundation of our **Environmental Policy**:
 1. **Comply** with regulatory requirements

 2. **Protect** human health

 3. **Conserve** natural and cultural resources





YOUR EMS Responsibilities

- Be aware of the Environmental Policy
- Be familiar with spill procedures
- Keep your eyes open for potential problems
- Report any environmental problems or concerns promptly and notify your ROICC or Contract Representative





Environmental Management Division (EMD), MCBCL

Environmental Affairs Department (EAD), MCASNR





EMD/EAD can help!

- The appropriate environmental office works with your ROICC or Contract Representative to ensure:
 - Proper management of waste
 - Compliance with regulations
 - Required environmental plans are developed and followed, if applicable
 - Required environmental training material is provided for contractor use





What Does EMD/EAD Do for You?



- If you have EMS or environmentally related questions, contact your ROICC or Contract Representative who will then work with EMD & EAD to determine how to proceed





Remember...

ALL environmental program requirements are applicable to **ALL** contractors and vendors working aboard the Installation!





General Environmental Awareness





Water Quality

■ Construction/demolition and other projects can result in:

- Stormwater pollution
- Erosion and sedimentation



■ If a project could impact water quality:

- Don't dispose of oil, chemicals, or any other material/debris down storm drains
- Keep sediment, leaves, and construction debris away from storm drains (use barriers)
- Sediment Erosion Control Plans are required for sites when more than 1 acre will be disturbed





Used Oil

■ Oil handling/changing operations can result in:

- Spills
- Waste
- Groundwater, stormwater, or soil contamination



■ If a project involves the use of oil:

- Perform maintenance in paved, designated areas
- Recycle used oil, oil filters, and other fluids...don't dump down storm drain or dispose of in the trash
- Clean up spills immediately and properly!





Air Quality

If a project could impact air quality:

- Prior to beginning operations, have your ROICC or Contract Representative contact the Installation Air Quality Program representative for applicable Federal and state permitting requirements
- Follow all permit requirements, including material usage recordkeeping for Title V permit sources
- Notify your ROICC or Contract Representative before bringing new equipment on site
- Notify your ROICC or Contract Representative before modifying an existing permitted source (including physical changes and material changes). Examples of permitted sources include boilers, generators, fuel tanks, and welding/soldering operations





Hazardous Waste Management

■ Hazardous waste generation can result in:

- Consumption of natural resources
- Increased Regulatory Burden

■ If a project generates hazardous waste:

- Reduce/Minimize the generation of hazardous waste
- Contact your ROICC or Contract Representative if unsure how to manage a waste
- Don't put hazardous wastes into general trash dumpsters
- Ensure satellite accumulation areas (SAA) are managed properly
 - Notify your ROICC or Contract Representative prior to creating a new SAA!
- Ensure hazardous waste drums are labeled and lids are secured





Hazardous Materials

- **If a project requires the use hazardous material (HAZMAT):**
 - Keep flammable materials in HAZMAT lockers
 - Don't store large quantities – keep on hand only what you will use
 - Maintain MSDSs for each material on-site
 - Place materials stored outside in secondary containment to prevent spill/reduce releases
 - Stop work if you unearth a hazardous material (i.e., ordnance) and report to your ROICC or Contract Representative





PCB and Asbestos

■ If a project generates or involves the removal of PCB or asbestos:

- Manage and handle PCB and asbestos only if you are properly trained
- Manage PCB and asbestos in proper containers with appropriate labeling





Solid Waste Management

- **Solid waste generation can result in:**
 - Consumption of natural resources
 - Decreased landfill space
- **If a project generates regulated or solid waste:**
 - Reduce/Reuse/Recycle when possible; meet contract requirements for recycling
 - Contact your ROICC or Contract Representative if unsure how to manage a waste
 - Don't put unauthorized wastes into general trash dumpsters – Recyclable products should be placed in appropriate containers & not co-mingled with solid waste
 - Don't use government-owned dumpsters for your contractor waste and debris





Good Housekeeping

■ Poor housekeeping can result in:

- Fines, termination of contract
- Environmental contamination, spills
- Injuries



■ Maintain good housekeeping:

- **DO** store flammable materials in HAZMAT lockers
- **DO** ensure containers are labeled and lids are secured
- **DO** keep stormwater drains clear of debris
- **DO** clean up work sites at the end of *each* day
- **DO** clean up spills immediately and properly
- **DO** clean up work area after job completion
- **DON'T** pour material down storm or floor drains
- **DON'T** stockpile waste – put it where it belongs!





Spill Response Basics





If You Have or See a Spill...

Call 911





Natural Resources – Threatened & Endangered Species

- The Installation is currently home to nine federally listed endangered species: red-cockaded woodpecker (RCW), green sea turtle, loggerhead sea turtle), rough-leaved loosestrife, seabeach amaranth, piping plover, American alligator, and American bald eagle and Hirst's panic grass.



- The following restrictions apply:
 - Construction activities are restricted within 1500 ft of a bald eagle's nest
 - Vehicles & lighting are prohibited on the beaches overnight = 1 May -31 Oct
 - Cutting or damaging pine trees in not permitted
 - Fish & wildlife must not be disturbed





Natural Resources – Wetlands

- The US Army Corps of Engineers defines a wetland as " areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."
- No discharge of fill material, mechanized land clearing, or any other activity is allowed in jurisdictional wetlands or Waters of the United States without the proper approvals.
- Permits will be required





Natural Resources – Timber

There are over 127,000 acres of forested land aboard the Installation

- The MCBCL Forest Management Program has 1st right of refusal for all timber products on construction projects
 - The following restrictions apply:



- Do not cut or deface trees w/o authorization
- Protect existing trees that are to remain in place
- Do not fasten or attach ropes or cables to existing nearby trees for anchorages w/o authorization





Cultural Resources

The Installation manages a variety of historic and prehistoric archaeological sites, as well as historic structures.

- **IF YOU FIND A BONE, BOTTLE OR PIECE OF POTTERY THAT YOU THINK MIGHT HAVE ARCHAEOLOGICAL OR HISTORIC INTEREST, DON'T PICK IT UP. IF YOU FIND ANY OF THESE THINGS, MARK THE AREA & NOTIFY THE BASE ARCHAEOLOGIST, EMD AT 451-5063.**





Summary





Summary

- MCB Camp Lejeune and MCAS New River protect, preserve, and enhance their natural resources through their EMS and Environmental Policies
 - **We comply** with relevant environmental laws and regulations
 - **We prevent pollution**
 - **We continually improve** the EMS
- **YOU** are responsible for complying with applicable environmental requirements too
- If you aren't sure what to do...**ASK!**
 - Your ROICC or Contract Representative and EMD/EAD are here to help





Remember...

Consult the *Contractor Environmental Guide* for more detailed information pertaining to environmental requirements applicable to the work you do.

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



