



PROJECT SPECIFICATIONS

SXHT 12-1042, Repair Building 402, 45 SW-JA
Relocation

Patrick Air Force Base

11/21/2019

100% Design Submittal

Contract Number FA2521-18-D-0002

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SECTION 01 11 00.00 30

SUMMARY OF WORK

10/14

PART 1 GENERAL

1.1 SUMMARY

The work to be performed under this project is located at Patrick Air Force Base. Patrick Air Force Base is located approximately three miles south of Cocoa Beach on State Road 1A.

The work to be performed under this project consists of providing the labor, equipment and materials to, providing the labor, equipment and materials necessary for structural, architectural, interiors, mechanical, plumbing, fire protection, and electrical work, complete in accordance with the drawings and specifications.

1.2 PROJECT DESCRIPTION

1.2.1 Civil/Site

Demolish and remove asphalt concrete pavement, various concrete curbs and two (2) concrete curb islands beneath the existing drive thru canopy. Grade, topsoil, and sod all disturbed areas where existing pavement has been demolished. No new pavement will be installed.

Install approximately 206 LF of five (5) foot wide concrete sidewalk and six (6) LF of eight (8) foot wide concrete sidewalk to provide access to the main lobby, two (2) exterior egress doors and to connect existing sidewalk paths. Grade all newly installed concrete sidewalks in accordance ADA Standards for Accessible Design.

1.2.2 Structural

The structure of existing building 402 is comprised of concrete beams and columns supported by concrete spread footings. The roof structure is comprised of metal deck with light weight concrete supported by the steel joists spanning between concrete beams.

The canopy located on the west of the building was previously used as drive-in bank teller stations. The existing concrete curbs and slab will be demolished and removed. The canopy will be enclosed on the three open sides using 8 inches CMU supported by a continuous concrete wall footing and braced at the top to the existing concrete beams. A brick veneer will be applied to the exterior of the CMU wall to match existing finishes. A new concrete slab on grade will be constructed for the new floor.

1.2.3 Architectural

Architect-Engineer (A&E) services are required to prepare contract documents including drawings, specifications, design analysis and a cost estimate to repair and upgrade Building 402 (former credit union) to support 45 SW/JA (legal) mission. The drive thru will be enclosed to serve as the lobby. The west of the building will be re-purposed as a courtroom facility. The east side of the building will be reconfigured to meet

administrative requirements for 45 SW/JA. Work includes the relocation of interior walls, where needed to facilitate office and courtroom arrangement, per 45 SW/JA and AF requirements. All new finishes will be in compliance with PAFB base standards and will additionally follow AF design guidance for courtroom and legal facilities.

1.2.4 Mechanical

1.2.4.1 HVAC

The original assumption was that the existing air handlers can support the building load. However current calcs indicate that an additional unit may be required to support the load. Currently that unit, if required, is envisioned as a mini split type with a location to be determined and indicated in subsequent submissions.

The HVAC systems added or modified under this scope of work and showing on these drawings consist of changes to the ductwork and balance of air flows into the existing area of work. This system, which utilizes the existing units, will continue to supply capacity to condition the loads in the space.

1.2.4.2 Plumbing

Demolish all existing plumbing fixtures and abandon hot water piping. All existing restroom plumbing fixtures will be replaced in same place as existing. Reuse existing sewage, vent, and water piping to the greatest extent possible. All existing floor drains to remain.

Demolish all plumbing fixtures in the south breakroom. Cut and cap the existing sewage, vent and water piping in the south breakroom 133.

The new guest bathroom will include new fixtures consistent to the provided drawings. The slab will be cut and trenching done within the bathroom and along the adjacent hallway to install a floor drain centered at TOF lowest elevation and sanitary sewer line to tie into the building main. New potable water piping will be tied into existing, routed through hallways for accessibility using the shortest run possible. New vent to roof with necessary penetration.

The new break area sink will tie into nearest existing potable water, sewage, and vent piping provided existing drain piping can support additional fixture per FBC Plumbing guidelines. The new hi/lo water fountain fixtures will tie into existing potable water, sewage, and vent piping remaining from previous breakroom sink.

The new janitor's closet will be cut and trenched to the extent of the nearest existing sewage line in the adjacent bathroom. The new floor mounted service sink will be tied into existing water, sewage, and vent piping using the shortest route possible. The new electric water heater will be installed in the north corner of this room and new hot water piping will be routed to facility lavatories and sinks.

1.2.5 Electrical

Provide new wire, conduit, lights, and devices as required to support the building renovations. The existing panelboards, lightning protection system, and grounding systems were surveyed and determined to be in good working condition. Demolish all existing receptacles and light fixtures back to existing panelboards and replace with new branch circuits to

support the reconfigured spaces. Existing conduits will be reused to the greatest extent possible. Replace the main circuit breaker on existing main switchboard with a new 3-pole 600A circuit breaker.

New light fixtures will be dimmable 2 x 2-foot LED troffers throughout the facility and a combination of LED troffers and recessed can lights in the courtroom. The illuminance levels in the facility are based on Illuminating Engineering Society of North America (IESNA) guidelines and will be minimum average 40 foot-candles for all areas of the courtroom interior and an average of 30 foot-candles for all other areas of the facility calculated at 3 feet above finished floor. The existing lighting fixtures in the electrical room will remain. Egress emergency lighting will be provided by emergency battery packs in select LED troffers to achieve a minimum of 1 foot-candle at finished floor.

1.2.6 Fire Alarm

Demolish obsolete existing fire alarm system and replaced with a new addressable system. New Fire Alarm Control Panel will be located in Electrical Room 103 and a new Fire Alarm Annunciator will be installed in the main lobby Room 100. The new system includes a new fire alarm control panel, batteries, terminal cabinet, heat detectors, a smoke detector, manual pull stations, visual notification devices and audible/visual notification devices Manual pull stations will single action without glass rods.

1.2.7 Telecommunications

Demolish all existing data and telephone outlets, cabling and conduits and provide new RJ-45 data/VoIP telephone outlets, CAT6 cabling and conduit to support the building renovations. The existing communications rack located in the existing conference room will be relocated by others prior to construction.

1.2.8 Special Construction

Prior to any building and/or equipment demolition, provide abatement of hazardous materials in areas deemed to contain asbestos, heavy metals or both. Please refer Asbestos and existing lead-based paint survey and recommendations.

1.3 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.

45TH SPACE WING (SWI)

45 SWI 31-1

Integrated Defense Plan

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101

(2018; TIA 18-1; TIA 18-2; TIA 18-3) Life Safety Code

U.S. AIR FORCE (USAF)

AFI 33-580

(2013) Spectrum Management

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1

(2014) Safety and Health Requirements
Manual

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

29 CFR 1910

Occupational Safety and Health Standards

29 CFR 1926

Safety and Health Regulations for
Construction

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control information only. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES in sufficient detail to show full compliance with the specification:

SD-01 Preconstruction Submittals

Submit the following items to the Contracting Officer:

Lifting Operation Plan;G

Utility Outage Requests;G

Connection Requests;G

Air Force Form 3952 (AF 3952), Chemical/Hazardous Material Request
Authorization;G (including all paint)

Solid Waste Disposal Diversion Tracking;G

Premises/Access Plan

Storage Area Request;G

Contractor Survey Record Drawings;G

Superintendent Contact and Qualifications;G

1.5 CONTRACT DRAWINGS

See Drawing Index for list of project drawings.

Contract drawings, maps, and specifications will be furnished to the Contractor either hard copy or electronic at the Government's discretion. Reference publications will not be furnished.

Contractor shall immediately check furnished drawings and notify the Contracting Officer of any discrepancies.

The drawings indicate the general location and arrangement of existing conditions. Field measurements may be necessary to determine the size and quantity of materials. Conditions which are obvious/visible or which should be reasonably anticipated by the Contractor on inspection will not

be considered under the Differing Site Conditions clause of this contract.

1.5.1 Layout of Work and Elevations

Dimensions and elevations indicated in the layout of work shall be verified by the Contractor. Discrepancies between the drawings, specifications and/or existing conditions shall be referred to the Contracting Officer in writing, for review, before the affected work is performed. Failure to make notification shall place the responsibility upon the Contractor to carry out the work in a satisfactory and workmanlike manner.

1.6 WORK SCHEDULING

Work Schedules for all on-site activities must be reviewed and approved by the Contracting Officer prior to start of the project; and all activities coordinated with the Contracting Officer once work has begun. Due to the critical nature of the work location, all work pertaining to this contract shall be completed without disrupting the operation of Building 402.

Contractor shall allow for non-access days where construction activity is prohibited due to hazardous operations or launch activity. When possible, the Government will provide 24 hour notification each time the restrictions are invoked.

1.6.1 Requirements

Working hours will normally range between the hours of 7:30 AM and 4:00 PM (0730-1600) excluding Saturdays, Sundays and Federal Holidays. If work must be done during periods other than above, additional Government inspection and Range Support personnel may be required. Notification must be given to the Contracting Officer five working days in advance of intention to work during other periods to allow assignment of additional inspection forces when the Contracting Officer determines that they are reasonably available. If such support is reasonably available, the Contracting Officer may authorize work to be performed during periods other than normal duty hours/days. Work beyond normal hours/days may be required for major utility outages. It is to the government's discretion to request copies of contractor inspection records for periods worked on holidays and weekends (FAR 52.246-12 Inspection of Construction).

If night work is required from 1 May to 31 October between 2100 to 0600 hours, a light management plan must be reviewed and approved through the Contracting Officer and 45 CES Environmental (45 CES/CEIE) at least 45 days prior to night work commencement.

No construction work shall take place over the Christmas/New Year holiday period. This period will start one full work day before the Federal Christmas holiday and end the first work day after the Federal New Year Holiday. The Contractor may request to work during this time at the discretion of the Contracting Officer, however no base support will be available.

1.7 OCCUPANCY OF PREMISES/ACCESS REQUIREMENTS

Building(s) will not be occupied during performance of work under this Contract. Occupancy notifications will be posted in a prominent location in the work area. Contractor shall post warning signs in accordance with OSHA requirements.

Before work is started, the Contractor shall submit a [Premises/Access Plan](#) to the Contracting Officer or Representative for approval. The plan shall include a sequence of procedures, means of access, space plan for storage of materials and equipment, and use of approaches, corridors, and stairways.

This plan must comply with [NFPA 101](#) requirements that all exits and exit access must be maintained at all times. Base Fire Department is required to approve any deviations which affect the exiting or exit access from the building.

1.7.1 Facility Contents

1.7.1.1 Responsibilities

The schedule of work shall be closely coordinated with the Contracting Officer. Unless otherwise stated, remove all furniture, equipment, curtains, drapes, pictures, blackboards, etc., as required to perform the work. Any movable or fixed furniture, equipment, carpet, etc., remaining in the work area shall be covered and protected from damage. All relocated items shall also be protected from damage throughout the construction period. After completion of work and prior to final acceptance, replace removed items in their original location.

Demolition of critical facility systems mechanical, electrical, etc. shall not be started until replacement equipment is on site.

1.7.1.2 Maintain Clean Work Areas

All work areas shall be kept clean at all times. Contractor shall prevent introduction of dirt or dust into areas adjacent to the work areas. All materials, tools and equipment shall be thoroughly cleaned prior to being brought into the work areas or adjacent areas.

1.7.1.3 Damage To Existing Equipment

Any damage must be reported to the Contracting Officer immediately. Damage to existing materials, equipments, systems, or properties occurring from Contractor activities or neglect, shall, at the sole discretion of the Contracting Officer, be repaired or replaced by the Contractor at no cost to the Federal Government.

1.7.1.4 New Material and Construction Equipment

Only material and construction equipment designated for performance of contract work may be stored at the construction site or located in Government-controlled warehouses or shop facilities.

1.7.2 Construction Area Access And Control

1.7.2.1 Access and Control Requirements

Exclusive use or control of any area will not be allowed as the Government must have access to all areas at all times. All work must be scheduled around operational constraints.

1.7.3 Vehicle Parking

1.7.3.1 Requirements

Job and support vehicles for workers will be parked in designated parking areas within reasonable access to the worksite. All vehicle operators must comply with all traffic laws including mandatory seat belt usage, speed limits and hauling restrictions. Contractor shall be responsible for repairing or replacing any facility/grounds damaged areas.

1.8 STORAGE, TRANSPORTATION AND PROTECTION

1.8.1 Storage

At Government discretion, Contractor may be assigned a storage area upon submitting written [Storage Area Request](#) to the Contracting Officer. Contractor's Storage Area Request shall indicate dimensions of trailer, size of storage area, and utilities required. All trailers shall be in good and safe condition. Storage space is normally co-located with construction site, at the Contracting Officer's discretion. Storage areas may require fence and screening as required by Government. Contractor shall secure storage areas during inclement weather situation.

Contractor is to submit a Work Order Management System (WOMS) through CE to request a telephone number and line for their office trailer. Commercial Internet service is available through local Internet service provider at contractor cost.

Office trailers and long term (longer than one year) storage trailers shall be painted to match the base approved color", as noted in the base Facilities Sustainment guide. Trailers located on site for short term storage, less than one year, will not need to meet this requirement. In addition, all office trailers and long term storage trailers shall be skirted along the entire perimeter with a wood lattice material. This skirting shall be painted to match the same trailer color as described above. Contractor shall be responsible for the storage and protection of all of their materials and equipment, whether incorporated into the job or not.

1.8.2 Protection

Store and protect products in accordance with manufacturer's instructions. Store products with seals, labels intact and legible. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to the product. Products acceptable for exterior storage shall be on sloped supports above ground. Contractor shall not use swales, drainage ditches, or any other storm water permitted area to store materials or equipment. If swales, drainage ditches or any other storm water permitted areas must be used for storage, Contractor must get special permission from Contracting Officer.

1.8.3 Transportation

Transport and handle products in accordance with manufacturer's instructions. Promptly inspect shipments to ensure the products comply with requirements, quantities are correct, and products are undamaged. Protect products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products. Store loose granular materials on solid flat surfaces in a well drained

area. Prevent mixing with foreign materials.

1.8.4 Hazardous Materials

The Contractor and all subcontractors shall comply with, but not limited to: AFI 32-7086, Hazardous Materials Management, February 2015 and the 45th SW HAZMAT Tracking Procedures for Construction and Service Contractors. No hazardous materials such as paint, oil, grease, adhesive, sealant, etc. are allowed to be brought onto any 45 SW Installation without prior approval. The Contractor shall contact the 45 CES/CEIE Hazardous Materials Program Manager to review hazardous materials authorization procedures prior to hazardous materials being brought onto 45 SW facilities. Submit an Air Force Form 3952 (AF 3952), Chemical/Hazardous Material Request Authorization if hazardous materials & petroleum product will be used on site. Hazardous Materials & petroleum product containers shall be stored on an impervious surface with containment. Incompatible materials shall be segregated and have separate containment systems. Additional HAZMAT requirements are provided in Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS.

1.8.5 Site Protection Plan

Structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations shall be protected against damage. Contractor shall comply with "FAR 52.236-9, Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements" and is required to protect areas adjacent to the construction site.

1.9 GOVERNMENT-FURNISHED EQUIPMENT - None

1.10 ON-SITE PERMITS

1.10.1 Utility Outage Requests And Connection Requests

Work shall be scheduled to hold outages to a minimum.

Utility outages and Connection Requests required during the execution of work that affect existing systems shall be arranged at the convenience of the Government, which may require scheduling outside of the regular working hours or on weekends, at no additional cost to the Government.

Each Utility Outage and Connection Requests shall state the system involved, area involved, approximate duration of outage, and the nature of work involved.

1.10.1.1 Requirements

A written request for a utilities outage (electricity, communication, water, compressed air, gas, steam, air conditioning, fire detection and suppression systems, etc.) must be submitted to the Contracting Officer at least 14 calendar days in advance of the desired outage. Approval is required prior to scheduling any outage. All limitations noted on the approved outage authorization shall be carefully observed. A utilities outage without prior approval and coordination is prohibited.

Utility outages affecting fire alarm, fire detection, fire suppression, fire pumps and water supplies to fire protection systems greater than 4 hours will require a fire watch.

Since many systems are critical to facility operations, the number and duration of utility outages shall be kept to an absolute minimum. All work effort shall be coordinated and sufficient manpower, materials, and equipment shall be provided to complete the work within the authorized outage window.

Existing utility services may be interrupted only when approved by the Contracting Officer. The interruption shall be scheduled at a time of minimum demand on the utility, convenient to the Government. Outages on weekends, holidays, or evenings shall be performed at no additional cost to the Government.

Contractor shall make all necessary arrangements to schedule and provide connections to existing utilities and to cause minimum interruption to system operation. All temporary utility hook-ups and disconnects shall be made by the Contractor.

If the Contractor fails to comply with a scheduled outage, the cost to reschedule the outage will be deducted from the final contract payment.

1.10.2 Protection of Work

All construction work requires a Work Clearance Request, AF Form 103. This permit is processed by the Government and provided to the Contractor. It is required prior to the start of any construction at the project site and must be posted in a conspicuous location on site during all construction activities.

Contractor shall obtain (from technical representative), prepare, and properly complete "Base Civil Engineering Work Clearance Request" AF Form 103. Prior to submitting 103 for review and approval, contractor shall mark in white paint all locations requiring utility locates and a commercial utility locate ticket number must be obtained by calling SUNSHINE at 1-800-432-4770. Contractor shall provide coordination for location of buried structures and utility lines before beginning any work involving digging/excavation. Contact the Government Technical Representative to schedule locates prior to any excavation. The Technical representative shall be the first and the last to coordinate on the AF Form 103.

Contractor shall temporarily halt any machine excavation work or other surface penetration when approaching within 5 feet of the existing utility line until the Contractor has exposed the utility line by hand excavation to fix its location.

1.10.3 Burn Permits

Burn permits are required for any spark, flame, or welding activity. Burn Permits shall be obtained thru [PAFB Fire Department \(494-7642\)](#).

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

Burning of trash or rubbish is not permitted on any USAF facility.

1.11 SALVAGE AND DISPOSAL OF MATERIAL AND EQUIPMENT

1.11.1 Removal

Remove and/or relocate only those materials or items of equipment

specifically indicated in the drawings and specifications. Removal operations shall be performed in such a manner that adjacent areas, installed equipment, or existing utilities are not damaged. Repair all openings that occur due to removal or demolition operations to match adjacent, existing surfaces. Any damage incurred during removal operations shall be repaired at no additional cost to the Government.

1.11.2 Housekeeping

Sufficient personnel and equipment shall be provided to ensure compliance with all housekeeping requirements. Work will not be allowed in those areas that do not comply with the requirements of Section 14.C of EM 385-1-1. Job sites are to be kept clean on an ongoing, daily basis. All areas are to be thoroughly cleaned prior to leaving the jobsite at completion of project work.

1.11.3 Salvage of Material And Equipment

All salvageable materials or items to be removed shall remain the property of the Federal Government. Salvageable items are listed below in the paragraph entitled, "Salvage Items". Salvageable items shall be transported to and deposited at the Defense Logistics Agency Office - Disposition Services (DLA) at Jacksonville, Florida at the Contractor's expense.

Salvageable material must be segregated and separated into categories before transport. Material shall be palletized or moveable by forklift (maximum 10,000 lbs). For material that is not palletized, it will be the responsibility of the Contractor to provide labor support for material removal.

Deliveries to DLA shall be scheduled through the Contracting Officer a minimum of 72 hours in advance. All salvageable items delivered to DLA shall be accompanied by a properly prepared DD Form 1348. This form will be furnished by the Contracting Officer. A signed copy by DLA reflecting the turn in materials shall be furnished to the Contracting Officer.

Contractor shall maintain property control records for material or equipment designated as salvage. Contractor's system of property control may be used if approved by the Contracting Officer. Contractor shall be responsible for storage and protection of salvaged materials and equipment until disposition by the Contracting Officer.

Material to be salvaged and reinstalled by the Contractor shall be protected during removal and stored to prevent damage.

For reference purposes salvageable is defined as: items, material, equipment which can be refitted, reworked, and restored and put to use or sold. The Contracting Officer shall have sole discretion as to determining whether any particular item is salvageable.

1.11.3.1 Salvage Items - None

1.11.4 Waste Disposal

Non-salvageable material and debris shall be removed from work areas and disposed of daily. Contractor shall dispose of C&D at a State approved disposal site.

Refer to Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS for further waste disposal and record keeping requirements.

1.11.5 Cleanup

All waste materials, except indicated salvaged items, generated by the construction shall be hauled off U.S. Government property at the end of each work day and deposited at a disposal site selected by the Contractor. Disposal shall be in accordance with federal, state, county and city ordinances and at the expense of the Contractor.

Upon completion of the construction each day, the Contractor shall leave the work premises in a clean, neat and workmanlike condition, satisfactory to the Contracting Officer.

1.11.6 Salvage And Disposal Record Keeping

Contractor shall maintain and submit quarterly and at the completion of the project the SOLID WASTE DISPOSAL DIVERSION TRACKING form to the Contracting Officer of all materials removed from the job site. This inventory shall include waste materials disposed in landfills and materials reused on the job, sold for salvage and recycled.

1.12 RADIO FREQUENCY MANAGEMENT PROCEDURES

The following procedures shall be followed in obtaining radio frequency authorization:

The policy and procedures contained in AFI 33-580 shall be followed to obtain frequency allocation approval of electronic devices and USAF Radio Frequency Assignment.

1.13 COMMUNICATION SECURITY

Government telecommunications networks are continually subject to interception by hostile/unfriendly intelligent organizations. Therefore, the DOD has authorized the military departments to conduct COMSEC monitoring and recording of telephone calls from, or terminating at, DOD organizations. Contractor shall assume the responsibility for ensuring frequent dissemination of this information to all employees dealing with official DOD information.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 ACCESS REQUIREMENTS

3.1.1 Construction Site Requirement

All on-site project work is confined to non-restricted areas. That is, no restricted area badge shall be necessary to accomplish the on-site work. However, normal access requirements into PAFB must still be accomplished.

3.1.2 Air Force Restricted Area Requirements (Black & Blue Restricted Unescorted Badge)

Access to construction sites located in restricted areas requires a Black & Blue Restricted Area Unescorted Badge. Contractor is responsible for satisfying the prerequisites for unescorted entry and/or providing escorted entry to a restricted area for all their personnel and subcontractor personnel. Escort services will not be provided by the Government. It is the Contractor's responsibility to determine the minimum number of personnel needed and obtain the required badges with escort authority in order to meet the contract requirements. Failure to do so could result in denied access to the construction site, interruption of performance and negatively impact timely contract completion.

Individuals meeting the 45 SWI 31-1 security requirements will be allowed to acquire restricted area badges. If the Contractor has proper clearance in JPAS, the Contractor may complete an AF Form 2586 "Unescorted Entry Authorization Certificate" (signed by the CE Security Manager in signature block #2) and transmit it to the Facility Manager of the restricted area for signature. After obtaining signatures, the individual must make an appointment with Visitor Control Center to obtain a Restricted Area Badge.

In order for Contractor personnel to enter restricted areas, a Restricted Area Badge for the area is required. Those individuals not in possession of a Restricted Area Badge (RAB) must remain under the surveillance of the escorts at all times while working in the restricted area. Escorts are subject to having their base access privileges revoked if it is found that they are not in visual contact with the employees they are escorting. The required responsibilities and duties of an escort shall be adhered to by all Contractor and subcontractor personnel. 45 SWI 31-1 and Restricted Area Badge Processing Guide outline the requirements and procedures in obtaining a restricted area badge.

Contingent upon the location and nature of the work, a construction site "Free Zone" may be established by the Commander of the restricted area site. If the area is designated as a construction site "Free Zone", only normal access requirements will apply.

3.2 PAFB VEHICLE INSPECTION

The Oversized Vehicle Search Area is located on State Road A1A approximately 1 mile north of Pineda Causeway. Manned Operating hours are scheduled from 0600-1700. For after hours access, call PAFB Security Forces at (321) 494-2000 to co-ordinate entry. Mandatory inspection is required for all: Commercial Vehicles, Tractor Trailers, Trailers, RVs and Boats. All other passenger vehicles will be turned away from this gate and are required to enter at either the Main Gate or South Gate. Allow ample time for inspections, especially for the critical delivery period of mixed concrete. The government will not be responsible for rejected batches, caused by Contractor delays. Advance coordination is highly recommended.

3.3 PAFB DELIVERIES

3.3.1 Non-Hazardous Deliveries

All deliveries of construction material and equipment to job sites (including cement trucks) shall use the PAFB East Commercial Gate (located on State Road A1A approximately 1 mile north of Pineda Causeway) for access. The operating hours for the Oversized Vehicle Search Area are

0600-1700. After hours access shall be through the South Gate. The driver of each delivery vehicle and their passengers must have the following:

- a. A valid photo ID; and
- b. A valid bill of lading; and
- c. A known delivery point on PAFB; and
- d. An on-base or local phone number and POC to vouch for delivery

Only deliveries that can be verified will be allowed to proceed. Special deliveries, deliveries after normal business hours, or deliveries that cannot negotiate through the barricades must be coordinated in advance.

All delivery vehicles shall be inspected by Security Forces personnel prior to being allowed to proceed onto the installation.

3.3.2 Hazardous Deliveries

Deliveries of fuel, large volume of chemicals, or other hazardous materials shall comply with this section. All hazardous deliveries shall enter through the same gates as non-hazardous deliveries and have the information required for non-hazardous deliveries (see subpart entitled "Non-Hazardous Deliveries" of this section). Only deliveries that can be verified will be allowed to proceed. In addition, hazardous deliveries must be scheduled a minimum of 48 hours in advance for escort by Security Forces to and from job site. Contractors shall contact the PAFB Security Forces at 321-494-2000 to arrange for hazardous delivery escorts. Deliveries that have not arranged in advance for Security Forces escorts will be turned away and must be re-scheduled.

3.4 RESPONSIBILITIES

The Government reserves the right to revoke badging authority, escort authority and/or base access privileges for any person, at any time and for any reason. Contractor understands that the Government has made every attempt to identify potential delays associated with background checks and badging requirements and those delays have been considered in the construction schedule. Delays resulting from the Contractor's failure to follow the badging guidelines above shall not be considered grounds for contract extension or compensation.

3.5 EXCAVATION

3.5.1 Dig/Utility Locate Permit Requirements

3.5.1.1 Location of Buried Structures and Utility Lines

Accurately locate and paint structures and utility lines indicated by the Government provided Utility Locators on PAFB. If unidentified underground utilities are encountered during excavation, notify the Contracting Officer and cease operations until they are properly identified.

3.5.1.2 Excavation, Trenching, and Backfilling

Open only those trenches for which material is ready to be placed. As soon as approved by the Technical Representative, trenches shall be backfilled and tamped as required by the drawings and specifications. As a minimum,

the topsoil shall be replaced and the disturbed area shall be grassed by seeding, watered and maintained for a minimum of 60 calendar days. All excavation shall be in compliance with OSHA regulations. Mark or barricade construction work which may present a hazard.

3.5.1.3 Cutting of Roads, Streets, Driveways, and Paved Areas

Repair roads, streets, and paved parking areas which require surface cutting under this project within 10 calendar days after initial cutting. The topping shall be a minimum of 2 inches of asphalt and match existing (concrete topping on asphalt areas is not allowed). Mark, barricade, and illuminate construction work on or near roads or streets which may present a traffic hazard per OSHA 29 CFR 1910. Contractor shall provide signaling, lighting, and barricades in the construction area conforming to the Manual on Uniform Traffic Control Devices, OSHA 29 CFR 1926.201 and 1926.202. Closures of Streets, parking lots, and other traffic areas will not be permitted unless approved by the Contracting Officer after written request 14 calendar days before the scheduled closure.

3.5.2 Restrictions

Excavation at the work site may be accomplished with machinery only after underground utilities have been identified and with approval by Contracting Officer.

Hand digging is required within five feet of located underground utilities.

3.5.3 Temporary Shoring, Bracing And Supports

11 new excavation and trenching work shall be securely and safely supported during installation with temporary, but substantial, shoring, bracing, hangers and other supports as required by OSHA regulations. After new work is completed and completely cured (if required) and all permanent fasteners, anchors and supports are properly installed, the temporary supports shall be removed.

3.5.4 Barricades

Guardrails, fences or other suitable barricades and warning lights shall be placed at all open excavations/trenches which are adjacent to paths, walkways, sidewalks, vehicle parking areas, and other pedestrian or vehicle thoroughfares. Coordinate with 45 CE Environmental prior to placing warning lights.

3.6 LAND SURVEYING REQUIREMENTS

Land surveying, to include all projections and datum points, shall be required for all modifications affecting civil site plans (e.g., utilities, additions, new construction or storm water modifications). The survey shall be performed by a State of Florida Professional Licensed Surveyor (PLS) and shall be submitted by the Contractor in digital and hard copy format.

3.6.1 Contractor Provided Survey Support

Record drawings shall reflect all civil site developments such as new facility and/or land modifications, external structural changes to aboveground structures, and changes to underground structures and utilities external to facilities located on lands owned by or held in leasehold

interest of the federal government.

Information in record drawings shall include, but not be limited to:

Location of all new lines, conduits, valves, fittings, fire hydrants, meters, terminal points using at least two ties to permanent points (manholes, power poles, curbs, or storm water inlets), or GPS coordinates with accuracy to 1 foot or better unless more stringent accuracy requirements are specified in other sections of this contract. Locate manhole, catch basin, and storm water control structures noting top of rim, inverts, weirs, dimensions and conduit sizes and material entering the structure. An acceptable station and offset system may be used for service lines and fittings only.

Location of new lines from property easement lines or edges of pavement at intervals of 300 feet.

All utility routing and interface changes shall be reflected on the drawings to scale and defined with sufficient dimensions.

Locate with elevation all improvements constructed or modified including but not limited to pavement, striping, curbs, sidewalks, signs, gutters, walls, fences, buildings, pads, open stormwater conveyance systems, stormwater retention/detention ponds, etc. Elevation information should be adequate to illustrate flow patterns, retention capacity and overflow levels. Ground contours at intervals of 1 foot in elevation shall be shown on unpaved areas of the site on the sketch of survey

Contractor shall facilitate the receipt of surveyed coordinates for facility footprint corners coordinates and underground structures and utilities external to facilities by submitting digital data using the spatial reference identified below to 45 CES through the Contracting Officer within five (5) working days of foundation construction, or open excavation.

Record drawing prints will be drawn at a minimum scale of 1 inch = 100 feet. Areas requiring additional detail shall be enlarged as necessary.

Record drawings shall be provided in digital format. Geospatially referenced files shall be in ESRI GIS Geodatabase, ESRI GIS Shapefile, or AutoCAD DWG format. Information should be provided in separate layers/levels as specified by GIS and in at least the same degree of separation as the design drawings that were provided. Designation for naming of layers/levels shall adhere to current DOD, A/E/C CAD Standards with strict adherence to layer format. <https://cadbim.usace.army.mil/>. New like items shall be contained in the same levels to permit easy conversion to GIS layers.

All lines, letters, and details shall be sharp, clean, and fully legible.

5 (Five) reproducible print and one digital copy in an electronic storage media of the Contractor Survey Record Drawings are required for submittal.

3.6.1.1 Horizontal Reference Datum

All surveys shall be referenced to WGS1984 17 North UTM (G1674)-2012

aligned to with ITRF08 (epoch date 2005.0), unless specified otherwise by the Contracting Officer.

3.6.1.2 Vertical Reference Datum

All surveys shall be referenced to EGM96, unless specified otherwise by the Contracting Officer. The survey shall include a description of the reference benchmarks from which the EGM96 has been determined.

3.7 HOISTING AND LIFTING

3.7.1 [Lifting Operation Plan](#)

Contractor shall have a Lifting Operation Plan and procedure that is fully in accordance with the requirements of OSHA regulations, and shall include drawings/sketches of lifting slings, lifting equipment, and tag lines. The plan shall show weights, center of gravity, and clearances of load over entire lift. Plans shall have details showing any structural mounting of hoisting equipment on sheaves or structural steel, and shall show loading calculations on any such structural mounting showing forces, weights, turning moments, etc. A procedure shall accompany the drawings describing all lifting operations. Use spreader bars wherever necessary to prevent hoisting cables from contacting equipment/material.

3.8 QUALITY CONTROL

It is the Contractor's responsibility to provide, inspect and document the level of quality that has been established by all applicable standards, codes and guidelines. The Contractor shall use skilled workers, an adequate number of which are thoroughly trained and have a minimum of 3 years experience in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for the proper performance of the work in each section of these specifications. Contractor shall submit [Superintendent Contact and Qualifications](#) to the Contracting Officer.

3.8.1 Licenses

Contractor or their subcontractors shall be licensed by the State of Florida or have an equivalent out-of-state license in all areas applicable to this contract or as otherwise stated elsewhere in this contract. Copies of licenses and certificates shall be provided to the Contracting Officer. Asbestos Abatement Contractor shall be licensed by the State of Florida.

3.8.2 Quality Control Manager

The Quality Control Manager shall direct the execution of the Contractor's approved Quality Control Plan with exclusive responsibility for administration of the plan and inspections of work. The Quality Control Manager shall be available during normal duty within thirty (30) minutes after notification to meet with the Contracting Officer, or designated representative. The Quality Control Manager shall be a different individual than the project superintendent.

3.8.3 Government Inspection/Approval

When the Contractor considers that the work is acceptable to the Government and is complete, he/she shall inform the Contracting Officer, or designated representative, and the Government Project Manager that the work is complete and ready for inspections. In the event that the work is not

acceptable, the Contractor shall record a list of items noted by the Government Project Manager. A subsequent inspection may take place in order to review the corrected items. The Government is not required to inspect all work.

3.8.4 Inspection Files

The Contractor shall be responsible for keeping inspection files for all projects. Files shall include on site records of all inspections conducted by the Contractor and the necessary corrective actions taken. Daily Reports shall be kept and made available to the Government throughout the contract performance period and for the period after completion until final settlement of any claims made under this contract.

3.9 SUPERINTENDENT

Provide name and qualifications and past experience for review. Designate a competent superintendent who shall have full authority to act for the Contractor and who shall be the primary contact with the Government until acceptance. Contractor's superintendent shall be at the job site at all times when work is taking place and shall have full authority to act for the Contractor.

Refer to Section 01 45 00.00 10 QUALITY CONTROL for additional requirements.

3.10 CONSTRUCTION SCHEDULING REQUIREMENTS

3.10.1 Contractor Coordination Meetings

Contractor or their representative shall attend weekly project meetings, not to exceed 3 hours, scheduled by the Government. Subcontractor representatives shall attend as required.

Discussion shall address the progress schedule, potential factors of delay, deficiencies, material delivery schedules, submittals, and safety issues.

3.10.2 On-Site Construction Sequence

The required work shall be performed in a sequence to minimize the time when potable water, air conditioning, panelboards, transformers, power supply, etc. are inoperative or out-of-service. Remove a single item of equipment, install the new replacement item, tie in required utilities, test, and restore the new item of equipment to fully operational status before removing subsequent equipment.

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SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

08/15

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

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-04 Samples

Color Boards; G

1.3 COLOR BOARDS FOR AIR FORCE PROJECTS

Submit five sets of color boards within 90 calendar days after Contract Award. Each set of boards must include samples of colors and finishes of interior surfaces, such as walls, floors, and ceilings. Present the samples on 8 by 10-1/2 inches boards (modules) with a maximum spread of 24 by 31-1/2 inches for foldouts. Design modules to fit in a standard loose-leaf, three-ring binder. Where special finishes such as architectural concrete, carpet, or prefinished textured metal panels are required, submit samples not less than 12 inches square with the board. If more space is needed, more than one board per set may be submitted. Certify that the color samples have been reviewed in detail, and that the color samples are in strict accordance with contract drawings and specifications, except as may be otherwise explicitly stated. Submittal of color samples does not relieve the Contractor of the responsibility to submit samples required elsewhere herein.

1.4 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.

1.5 SUPERVISION

1.5.1 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.

1.5.2 Superintendent Qualifications

The project superintendent must have 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.

1.5.3 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 insure 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.

1.6 PRECONSTRUCTION CONFERENCE

After award of the contract but prior to commencement of any work at the site, meet with the Contracting Officer to discuss and develop a mutual understanding relative to the administration of the value engineering and safety program, preparation of the schedule of prices or earned value report, shop drawings, and other submittals, scheduling programming, prosecution of the work, and clear expectations of the "Interim DD Form 1354" Submittal. Major subcontractors who will engage in the work must also attend.

1.7 ELECTRONIC MAIL (E-MAIL) ADDRESS

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

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

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

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SECTION 01 33 00

SUBMITTAL PROCEDURES

08/18

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Submittal Descriptions (SD)

Submittal requirements are specified in the technical sections. Examples and descriptions of submittals identified by the Submittal Description (SD) numbers and titles follow:

SD-01 Preconstruction Submittals

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

Work Plan

Quality Control (QC) plan

Environmental Protection Plan

SD-02 Shop Drawings

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

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

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

SD-03 Product Data

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

portion of the work.

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

SD-04 Samples

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

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

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

SD-05 Design Data

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

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

Document required of Contractor, or of a manufacturer, supplier, installer or Subcontractor through Contractor. The document purpose is to further promote the 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-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 and as-built drawings. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract.

1.1.2 Approving Authority

Office or designated person authorized to approve the submittal.

1.1.3 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.

1.2 SUBMITTALS

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

SD-01 Preconstruction Submittals

Submittal Register; G

1.3 SUBMITTAL CLASSIFICATION

1.3.1 Government Approved (G)

Government approval is required for extensions of design, critical materials, variations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Government.

Within the terms of the Contract Clause SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION, submittals are considered to be "shop drawings."

1.3.2 For Information Only

Submittals not requiring Government approval will be for information only. Within the terms of the Contract Clause SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION, they are not considered to be "shop drawings."

1.3.3 Sustainability Reporting Submittals (S)

Submittals for Guiding Principle Validation (GPV) or Third Party Certification (TPC) are indicated with an "S" designation. These submittals are for information only.

Schedule submittals for these items throughout the course of construction as provided; do not wait until closeout.

1.4 PREPARATION

1.4.1 Transmittal Form

1.4.2 Submittal Format

1.4.2.1 Format of SD-01 Preconstruction Submittals

When the submittal includes a document that is to be used in the project, or is to become part of the project record, other than as a submittal, do not apply the Contractor's approval stamp to the document itself, but to a separate sheet accompanying the document.

Provide data in the unit of measure used in the contract documents.

1.4.2.2 Format for SD-02 Shop Drawings

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

- a. Include the nameplate data, size, and capacity on drawings. Also include applicable federal, military, industry, and technical society publication references.
- b. Dimension drawings, except diagrams and schematic drawings. Prepare drawings demonstrating interface with other trades to scale. Use the same unit of measure for shop drawings as indicated on the contract drawings. Identify materials and products for work shown.

Submit an electronic copy of drawings in PDF format.

1.4.2.2.1 Drawing Identification

Include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to information required in paragraph IDENTIFYING SUBMITTALS.

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

Reserve a blank space, no smaller than 3 inches on the right-hand side of each sheet for the Government disposition stamp.

1.4.2.3 Format of SD-03 Product Data

Present product data submittals for each section. Include a table of contents, listing the page and catalog item numbers for product data.

Indicate, by prominent notation, each product that is being submitted; indicate the specification section number and paragraph number to which it pertains.

1.4.2.3.1 Product Information

Supplement product data with material prepared for the project to satisfy the submittal requirements where product data does not exist. Identify this material as developed specifically for the project, with information and format as required for submission of SD-07 Certificates.

Provide product data in units used in the Contract documents. Where product data are included in preprinted catalogs with another unit, submit the dimensions in contract document units, on a separate sheet.

1.4.2.3.2 Standards

Where equipment or materials are specified to conform to industry or technical-society reference standards of such organizations as the American National Standards Institute (ANSI), ASTM International (ASTM), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratories (UL), or Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. State on the certificate that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

1.4.2.3.3 Data Submission

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

Submit the manufacturer's instructions before installation.

1.4.2.4 Format of SD-04 Samples

1.4.2.4.1 Sample Characteristics

Furnish samples in the following sizes, unless otherwise specified or unless the manufacturer has prepackaged samples of approximately the same size as specified:

- a. Sample of Equipment or Device: Full size.
- b. Sample of Materials Less Than 2 by 3 inches: Built up to 8 1/2 by 11 inches.
- c. 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.
- d. 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.
- e. Sample Volume of Nonsolid Materials: Pint. Examples of nonsolid materials are sand and paint.
- f. Color Selection Samples: 2 by 4 inches. Where samples are specified for selection of color, finish, pattern, or texture, submit the full set of available choices for the material or product specified. Sizes and quantities of samples are to represent their respective standard unit.
- g. Sample Panel: 4 by 4 feet.
- h. Sample Installation: 100 square feet.

1.4.2.4.2 Sample Incorporation

Reusable Samples: Incorporate returned samples into work only if so specified or indicated. Incorporated samples are to be in undamaged condition at the time of use.

Recording of Sample Installation: Note and preserve the notation of any area constituting a sample installation, but remove the notation at the final clean-up of the project.

1.4.2.4.3 Comparison Sample

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

When color, texture, or pattern is specified by naming a particular manufacturer and style, include one sample of that manufacturer and style, for comparison.

1.4.2.5 Format of SD-05 Design Data

Provide design data and certificates on 8 1/2 by 11 inch paper.

1.4.2.6 Format of SD-06 Test Reports

By prominent notation, indicate each report in the submittal. Indicate the specification number and paragraph number to which each report pertains.

1.4.2.7 Format of SD-07 Certificates

Provide design data and certificates on 8 1/2 by 11 inch paper.

1.4.2.8 Format of SD-08 Manufacturer's Instructions

Present manufacturer's instructions submittals for each section. Include the manufacturer's name, trade name, place of manufacture, and catalog model or number on product data. Also include applicable federal, military, industry, and technical-society publication references. If supplemental information is needed to clarify the manufacturer's data, submit it as specified for SD-07 Certificates.

Submit the manufacturer's instructions before installation.

1.4.2.8.1 Standards

Where equipment or materials are specified to conform to industry or technical-society reference standards of such organizations as the American National Standards Institute (ANSI), ASTM International (ASTM), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratories (UL), or Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. State on the certificate that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

1.4.2.9 Format of SD-09 Manufacturer's Field Reports

By prominent notation, indicate each report in the submittal. Indicate the specification number and paragraph number to which each report pertains.

1.4.2.10 Format of SD-10 Operation and Maintenance Data (O&M)

Comply with the requirements specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA for O&M Data format.

1.4.2.11 Format of SD-11 Closeout Submittals

When the submittal includes a document that is to be used in the project or is to become part of the project record, other than as a submittal, do not apply the Contractor's approval stamp to the document itself, but to a separate sheet accompanying the document.

Provide data in the unit of measure used in the contract documents.

1.4.3 Source Drawings for Shop Drawings

1.4.3.1 Source Drawings

The entire set of source drawing files (DWG) will not be provided to the Contractor. Request the specific Drawing Number for the preparation of shop drawings. Only those drawings requested to prepare shop drawings will be provided. These drawings are provided only after award.

1.4.3.2 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 is 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 its subconsultants 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 source drawing files are not construction documents. Differences may exist between the source drawing files and the corresponding construction documents. The Government makes no representation regarding the accuracy or completeness of the electronic source drawing files, nor does it make representation to the compatibility of these files with the Contractor hardware or software. The Contractor is responsible for determining if any conflict exists. 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. Use of these source drawing files does not relieve the Contractor of the 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 indication of ownership (seals, logos, signatures, initials and dates).

1.4.4 Electronic File Format

Provide submittals in electronic format, with the exception of material samples required for SD-04 Samples items. Compile the submittal file as a single, complete document, to include the Transmittal Form described within. Name the electronic submittal file specifically according to its contents, and coordinate the file naming convention with the Contracting Officer. Electronic files must be of sufficient quality that all information is legible. Use PDF as the electronic format, unless otherwise specified or directed by the Contracting Officer. Generate PDF files from original documents with bookmarks so that the text included in the PDF file is searchable and can be copied. If documents are scanned, optical character resolution (OCR) routines are required. Index and bookmark files exceeding 30 pages to allow efficient navigation of the file. When required, the electronic file must include a valid electronic signature or a scan of a signature.

1.5 QUANTITY OF SUBMITTALS

1.5.1 Number of SD-01 Preconstruction Submittal Copies

Unless otherwise specified, submit two sets of administrative submittals.

1.5.2 Number of SD-04 Samples

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

1.6 INFORMATION ONLY SUBMITTALS

Submittals without a "G" designation must be certified by the QC manager and submitted to the Contracting Officer for information-only. Approval of the Contracting Officer is not required on information only submittals. The Contracting Officer will mark "receipt acknowledged" on submittals for information and will return only the transmittal cover sheet to the Contractor. Normally, submittals for information only will not be returned. However, the Government reserves the right to return unsatisfactory submittals and require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

1.7 PROJECT SUBMITTAL REGISTER

A sample Project Submittal Register showing items of equipment and materials for when submittals are required by the specifications is provided as "Appendix A - Submittal Register."

1.7.1 Submittal Management

Prepare and maintain a submittal register, as the work progresses. Do not change data that is output in columns (c), (d), (e), and (f) as delivered by Government; retain data that is output in columns (a), (g), (h), and (i) as approved. As an attachment, provide a submittal register showing items of equipment and materials for which submittals are required by the specifications. This list may not be all-inclusive and additional submittals may be required.

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

Column (d): Lists each submittal description (SD Number. and type, e.g., SD-02 Shop Drawings) required in each specification section.

Column (e): Lists one principal paragraph in each 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 the project requirements.

Thereafter, the Contractor is to track all submittals by maintaining a complete list, including completion of all data columns and all dates on which submittals are received by and returned by the Government.

1.7.2 Preconstruction Use of Submittal Register

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

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

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

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

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

1.7.3 Contractor Use of Submittal Register

Update the following fields with each submittal throughout the contract.

Column (b) Transmittal Number: List of consecutive, Contractor-assigned numbers.

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

Column (l) Date submittal transmitted.

Column (q) Date approval was received.

1.7.4 Approving Authority Use of Submittal Register

Update the following fields:

Column (b) Transmittal Number: List of consecutive, Contractor-assigned numbers.

Column (l) Date submittal was received.

Column (m) through (p) Dates of review actions.

Column (q) Date of return to Contractor.

1.7.5 Action Codes

1.7.6 Delivery of Copies

Submit an **updated** electronic copy of the submittal register to the Contracting Officer with each invoice request. Provide an updated Submittal Register monthly regardless of whether an invoice is submitted.

1.8 VARIATIONS

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

1.8.1 Considering Variations

Discussion of variations with the Contracting Officer before submission will help ensure that functional and quality requirements are met and minimize rejections and resubmittals. When contemplating a variation that results in lower cost, consider submission of the variation as a Value Engineering Change Proposal (VECP).

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

1.8.2 Proposing Variations

When proposing variation, deliver a 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. Include the DOR's written analysis and approval. If lower cost is a benefit, also include an estimate of the cost savings. In addition to documentation required for variation, include the submittals required for the item. Clearly mark the proposed variation in all documentation.

1.8.3 Warranting that Variations are Compatible

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

1.8.4 Review Schedule Extension

In addition to the normal submittal review period, a period of 14 days will be allowed for the Government to consider submittals with variations.

1.9 SCHEDULING

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

- a. Coordinate scheduling, sequencing, preparing, and processing of submittals with performance of work so that work will not be delayed by submittal processing. The Contractor is responsible for additional

time required for Government reviews resulting from required resubmittals. The review period for each resubmittal is the same as for the initial submittal.

- b. Submittals required by the contract documents are listed on the submittal register. If a submittal is listed in the submittal register but does not pertain to the contract work, the Contractor is to include the submittal in the register and annotate it "N/A" with a brief explanation. Approval by the Contracting Officer does not relieve the Contractor of supplying submittals required by the contract documents but that have been omitted from the register or marked "N/A."
- c. Resubmit the submittal register and annotate it monthly with actual submission and approval dates. When all items on the register have been fully approved, no further resubmittal is required.

Contracting Officer review will be completed within 7 days after the date of submission.

1.10 GOVERNMENT APPROVING AUTHORITY

When the approving authority is the Contracting Officer, the Government will:

- a. Note the date on which the submittal was received.
- b. Review submittals for approval within the 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 REVIEW NOTATIONS and with comments and markings appropriate for the action indicated.

Upon completion of review of submittals requiring Government approval, stamp and date submittals. one copy of the submittal will be retained by the Contracting Officer and balance of copies of the submittal will be returned to the Contractor.

1.10.1 Review Notations

Submittals will be returned to the Contractor with the following notations:

- a. Submittals marked "approved" or "accepted" authorize proceeding with the work covered.
- b. Submittals marked "approved as noted" or "approved, except as noted, resubmittal not required," authorize proceeding with the work covered provided that the Contractor takes no exception to the corrections.
- c. Submittals marked "not approved," "disapproved," or "revise and resubmit" indicate incomplete submittal or noncompliance with the contract requirements or design concept. Resubmit with appropriate changes. Do not proceed with work for this item until the resubmittal is approved.
- d. Submittals marked "not reviewed" indicate that the 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.

- e. Submittals marked "receipt acknowledged" indicate that submittals have been received by the Government. This applies only to "information-only submittals" as previously defined.

1.11 DISAPPROVED SUBMITTALS

Make corrections required by the Contracting Officer. If the Contractor considers any correction or notation on the returned submittals to constitute a change to the contract drawings or specifications, give notice to the Contracting Officer as required under the FAR clause titled CHANGES. The Contractor is responsible for the dimensions and design of connection details and the construction of work. Failure to point out variations may cause the Government to require rejection and removal of such work at the Contractor's expense.

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

1.12 APPROVED SUBMITTALS

The Contracting Officer's approval of submittals is not to be construed as a complete check, and indicates only that the general method of construction, materials, detailing, and other information are satisfactory.

Approval or acceptance by the Government for a submittal does not relieve the Contractor of the responsibility for meeting the contract requirements or for any error that may exist, because under the Quality Control (QC) requirements of this contract, the Contractor is responsible for ensuring information contained within each submittal accurately conforms with the requirements of the contract documents.

After submittals have been approved or accepted by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.13 APPROVED SAMPLES

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

Match the approved samples for materials and equipment incorporated in the work. If requested, approved samples, including those that may be damaged in testing, will be returned to the Contractor, at its expense, upon completion of the contract. Unapproved samples will also be returned to the Contractor at its expense, if so requested.

Failure of any materials to pass the specified tests will be sufficient

cause for refusal to consider, under this contract, any further samples of the same brand or make as that material. The Government reserves the right to disapprove any material or equipment that has previously proved unsatisfactory in service.

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

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

TITLE: Repair Building 402, 45 SW-JA Relocation										SUBMITTAL REGISTER										
JOB NAME: SXHT 12-1042																				
LOCATION:																				
CONTRACT NO:																				
CONTRACTOR:																				
										CONTRACTOR SCHEDULE DATES		CONTRACTOR ACTION				APPROVING AUTHORITY				
(a) (b) (c) (d) (e) (f) (g) (h) (i) (j) (k) (l) (m) (n) (o) (p) (q) (r)																				
Line	Activity #	Transmittal #	Specification Section	SD #	Submittal Description	Item Submitted	Paragraph #	Classification: GOVT or A/E Reviewer	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 Revwr	Date RCD From Other Reviewer	Action Code	Date Of Action	Date RCD From CONTR	Remarks
1			01 11 00.00 30	1	Preconstruction Submittals	Lifting Operation Plan	3.7.1	G												
2			01 11 00.00 30	1	Preconstruction Submittals	Utility Outage Requests	1.10.1	G												
3			01 11 00.00 30	1	Preconstruction Submittals	Connection Requests	1.10.1	G												
4			01 11 00.00 30	1	Preconstruction Submittals	AF 3952	1.8.4	G												
5			01 11 00.00 30	1	Preconstruction Submittals	Solid Waste Disposal Diversion Tracking	1.11.6	G												
6			01 11 00.00 30	1	Preconstruction Submittals	Premises/Access Plan	1.7													
7			01 11 00.00 30	1	Preconstruction Submittals	Storage Area Request	1.8.1	G												
8			01 11 00.00 30	1	Preconstruction Submittals	Contractor Survey Record Drawings	3.6.1	G												
9			01 11 00.00 30	1	Preconstruction Submittals	Superintendent Contact and Qualifications	3.8	G												
10			01 30 00	4	Samples	Color Boards	1.3	G												
11			01 33 00	1	Preconstruction Submittals	Submittal Register	1.7	G												
12			01 35 26	1	Preconstruction Submittals	Accident Prevention Plan (APP)	1.7	G												
13			01 35 26	6	Test Reports	Monthly Exposure Reports	1.4													
14			01 35 26	6	Test Reports	Notifications and Reports	1.12													
15			01 35 26	6	Test Reports	Accident Reports	1.12.2	G												
16			01 35 26	6	Test Reports	LHE Inspection Reports	1.12.3													
17			01 35 26	7	Certificates	Crane Operators/Riggers	1.6.1.4													
18			01 35 26	7	Certificates	Standard Lift Plan	1.7.2.1	G												
19			01 35 26	7	Certificates	Critical Lift Plan	1.7.2.2	G												
20			01 35 26	7	Certificates	Activity Hazard Analysis (AHA)	1.8													
21			01 35 26	7	Certificates	Hot Work Permit	1.9.1													
22			01 35 26	7	Certificates	Certificate of Compliance	1.12.4													
23			01 45 00.00 10	1	Preconstruction Submittals	Contractor Quality Control (CQC) Plan	3.2	G												
24			01 45 00.00 10	6	Test Reports	Verification Statement	3.9.2													
25			01 50 00	1	Preconstruction Submittals	Construction Site Plan	1.3	G												
26			01 50 00	1	Preconstruction Submittals	Traffic Control Plan	3.4.1	G												
27			01 50 00	3	Product Data	Backflow Preventers	1.4	G												
28			01 50 00	6	Test Reports	Backflow Preventer Tests	2.5													
29			01 50 00	7	Certificates	Backflow Tester	1.4.1													
30			01 50 00	7	Certificates	Backflow Preventers	1.4													
31			01 57 19	1	Preconstruction Submittals	Preconstruction Survey	1.5.1													
32			01 57 19	1	Preconstruction Submittals	Regulatory Notifications	1.5.2													
33			01 57 19	1	Preconstruction Submittals	Environmental Protection Plan	1.6													
34			01 57 19	11	Closeout Submittals	Waste Determination Documentation	3.6.1	G												
35			01 57 19	11	Closeout Submittals	Disposal Documentation for Hazardous and Regulated Waste	3.6.3.6	G												
36			01 57 19	11	Closeout Submittals	Solid Waste Management Report	3.6.2.1	G												
37			01 57 19	11	Closeout Submittals	Hazardous Waste/Debris Management	3.6.3.1	G												
38			01 57 19	11	Closeout Submittals	Regulatory Notifications	1.5.2	G												
39			01 57 19	11	Closeout Submittals	Contractor Certification	3.6.2.1	G												
40			01 74 19	1	Preconstruction Submittals	Waste Management Plan	1.6	G												
41			01 74 19	11	Closeout Submittals	Records	1.7													
42			01 78 00	3	Product Data	Warranty Management Plan	1.6.1													
43			01 78 00	3	Product Data	Warranty Tags	1.6.4													
44			01 78 00	3	Product Data	Spare Parts Data	1.5													
45			01 78 00	8	Manufacturer's Instructions	Instructions	1.6.1													
46			01 78 00	10	Operation and Maintenance Data	Operation and Maintenance Manuals	3.4	G												
47			01 78 00	11	Closeout Submittals	As-Built Drawings	3.1	G												
48			01 78 00	11	Closeout Submittals	Record Drawings	3.2	G												
49			01 78 00	11	Closeout Submittals	Interim DD Form 1354	3.3	G												
50			01 78 00	11	Closeout Submittals	Checklist for DD Form 1354	3.3	G												
51			01 78 00	11	Closeout Submittals	High Performance and Sustainable Building (HPSB) Checklist	3.3	G												

52			01 78 23	10	Operation and Maintenance Data	O&M Database	1.4	G											
53			01 78 23	10	Operation and Maintenance Data	Training Plan	3.1.1	G											
54			01 78 23	10	Operation and Maintenance Data	Training Outline	3.1.3	G											
55			01 78 23	10	Operation and Maintenance Data	Training Content	3.1.2	G											
56			01 78 23	11	Closeout Submittals	Training Video Recording	3.1.4	G											
57			01 78 23	11	Closeout Submittals	Validation of Training Completion	3.1.6	G											
58			02 82 00	3	Product Data	Amended Water	1.2.2	G											
59			02 82 00	3	Product Data	Safety Data Sheets (SDS) for All Materials	1.3.9	G											
60			02 82 00	3	Product Data	Encapsulants	2.1	G											
61			02 82 00	3	Product Data	Respirators	3.1.2.1	G											
62			02 82 00	3	Product Data	Local Exhaust Equipment	3.1.7	G											
63			02 82 00	3	Product Data	Pressure Differential Automatic Recording Instrument	3.1.7	G											
64			02 82 00	3	Product Data	Vacuums	3.1.8	G											
65			02 82 00	3	Product Data	Glovebags	3.1.10	G											
66			02 82 00	6	Test Reports	Air Sampling Results	1.5.5	G											
67			02 82 00	6	Test Reports	Pressure Differential Recordings for Local Exhaust System	1.5.6	G											
68			02 82 00	6	Test Reports	Encapsulation Test Patches	3.2.12.2	G											
69			02 82 00	6	Test Reports	Clearance Sampling	3.2.13.5	G											
70			02 82 00	6	Test Reports	Asbestos Disposal Quantity Report	3.3.3.2	G											
71			02 82 00	7	Certificates	Employee Training	1.3.4	G											
72			02 82 00	7	Certificates	Notifications	1.3.5	G											
73			02 82 00	7	Certificates	Respiratory Protection Program	1.3.7	G											
74			02 82 00	7	Certificates	Asbestos Hazard Abatement Plan	1.3.10	G											
75			02 82 00	7	Certificates	Testing Laboratory	1.3.11	G											
76			02 82 00	7	Certificates	Landfill Approval	1.3.12	G											
77			02 82 00	7	Certificates	Delivery Tickets	1.3.12	G											
78			02 82 00	7	Certificates	Waste Shipment Records	1.3.12	G											
79			02 82 00	7	Certificates	Transporter Certification	1.3.13	G											
80			02 82 00	7	Certificates	Medical Certification	1.3.14	G											
81			02 82 00	7	Certificates	Private Qualified Person Documentation	1.5.1	G											
82			02 82 00	7	Certificates	Competent Person	1.5.2	G											
83			02 82 00	7	Certificates	Worker's License	1.5.3	G											
84			02 82 00	7	Certificates	Contractor's License	1.5.4	G											
85			02 82 00	7	Certificates	Federal, State or Local Citations on Previous Projects	1.5.9	G											
86			02 82 00	7	Certificates	Encapsulants	2.1	G											
87			02 82 00	7	Certificates	Equipment Used to Contain Airborne Asbestos Fibers	3.1	G											
88			02 82 00	7	Certificates	Water Filtration Equipment	3.1.3.3	G											
89			02 82 00	7	Certificates	Vacuums	3.1.8	G											
90			02 82 00	7	Certificates	Ventilation Systems	3.1.8	G											
91			02 82 00	11	Closeout Submittals	Permits and Licenses	1.3.5	G											
92			02 82 00	11	Closeout Submittals	Notifications	1.3.5	G											
93			02 82 00	11	Closeout Submittals	Respirator Program Records	1.3.7.1	G											
94			02 82 00	11	Closeout Submittals	Protective Clothing Decontamination Quality Control Records	1.5.7	G											
95			02 82 00	11	Closeout Submittals	Protective Clothing Decontamination Facility Notification	1.5.8	G											
96			02 82 00	11	Closeout Submittals	Rental Equipment	1.7.1	G											
97			03 30 53	2	Shop Drawings	Installation Drawings	1.4	G											
98			03 30 53	3	Product Data	Water-Reducing or Retarding Admixture	2.2.3.1												
99			03 30 53	3	Product Data	Curing Materials	2.2.11												
100			03 30 53	3	Product Data	Expansion Joint Filler Strips, Premolded	2.2.6												
101			03 30 53	3	Product Data	Joint Sealants - Field Molded Sealants	2.2.7												
102			03 30 53	3	Product Data	Mix Design Data	2.3	G											
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PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.22	(2007; R 2017) Safety Requirements for Rope-Guided and Non-Guided Workers' Hoists
ASSE/SAFE A10.34	(2001; R 2012) Protection of the Public on or Adjacent to Construction Sites
ASSE/SAFE Z359.0	(2012) Definitions and Nomenclature Used for Fall Protection and Fall Arrest
ASSE/SAFE Z359.1	(2016) The Fall Protection Code
ASSE/SAFE Z359.11	(2014) Safety Requirements for Full Body Harnesses
ASSE/SAFE Z359.12	(2009) Connecting Components for Personal Fall Arrest Systems
ASSE/SAFE Z359.13	(2013) Personal Energy Absorbers and Energy Absorbing Lanyards
ASSE/SAFE Z359.14	(2014) Safety Requirements for Self-Retracting Devices for Personal Fall Arrest and Rescue Systems
ASSE/SAFE Z359.15	(2014) Safety Requirements for Single Anchor Lifelines and Fall Arresters for Personal Fall Arrest Systems
ASSE/SAFE Z359.2	(2017) Minimum Requirements for a Comprehensive Managed Fall Protection Program
ASSE/SAFE Z359.3	(2017) Safety Requirements for Lanyards and Positioning Lanyards
ASSE/SAFE Z359.4	(2013) Safety Requirements for Assisted-Rescue and Self-Rescue Systems, Subsystems and Components
ASSE/SAFE Z359.6	(2016) Specifications and Design Requirements for Active Fall Protection Systems

ASSE/SAFE Z359.7 (2011) Qualification and Verification
Testing of Fall Protection Products

ASME INTERNATIONAL (ASME)

ASME B30.20 (2013; INT Oct 2010 - May 2012)
Below-the-Hook Lifting Devices

ASME B30.22 (2016) Articulating Boom Cranes

ASME B30.23 (2011) Personnel Lifting Systems Safety
Standard for Cableways, Cranes, Derricks,
Hoists, Hooks, Jacks, and Slings

ASME B30.26 (2015; INT Jun 2010 - Jun 2014) Rigging
Hardware

ASME B30.3 (2016) Tower Cranes

ASME B30.5 (2014) Mobile and Locomotive Cranes

ASME B30.7 (2011) Winches

ASME B30.8 (2015) Floating Cranes and Floating
Derricks

ASME B30.9 (2014; INT Feb 2011 - Nov 2013) Slings

ASTM INTERNATIONAL (ASTM)

ASTM F855 (2015) 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 (2003) Guide for Protective Grounding of
Power Lines

IEEE C2 (2017; Errata 1-2 2017; INT 1 2017)
National Electrical Safety Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10 (2018; TIA 18-1) Standard for Portable
Fire Extinguishers

NFPA 241 (2013; Errata 2015) Standard for
Safeguarding Construction, Alteration, and
Demolition Operations

NFPA 51B (2014) Standard for Fire Prevention During
Welding, Cutting, and Other Hot Work

NFPA 70 (2017; ERTA 1-2 2017; TIA 17-1; TIA 17-2;
TIA 17-3; TIA 17-4; TIA 17-5; TIA 17-6;
TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10;

TIA 17-11; TIA 17-12; TIA 17-13; TIA
17-14; TIA 17-15; TIA 17-16; TIA 17-17)
National Electrical Code

NFPA 70E (2018; TIA 18-1; TIA 81-2) Standard for
Electrical Safety in the Workplace

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-1019 (2012; R 2016) Standard for Installation,
Alteration and Maintenance of Antenna
Supporting Structures and Antennas

TIA-222 (2005G; Add 1 2007; Add 2 2009; Add 3
2014; Add 4 2014; R 2014; R 2016)
Structural Standards for Steel Antenna
Towers and Antenna Supporting Structures

U.S. ARMY CORPS OF ENGINEERS (USACE)

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

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

29 CFR 1910 Occupational Safety and Health Standards

29 CFR 1910.147 The Control of Hazardous Energy (Lock
Out/Tag Out)

29 CFR 1926 Safety and Health Regulations for
Construction

29 CFR 1926.1400 Cranes and Derricks in 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

CPL 02-01-056 (2014) Inspection Procedures for Accessing
Communication Towers by Hoist

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 in 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, 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 ASSE/SAFE 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 and include 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 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 though 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 requirements of EM 385-1-1 Appendix Q, and ASSE/SAFE Z359.0, with 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 USACE Property and Equipment

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

1.2.17 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).

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-01 Preconstruction Submittals

Accident Prevention Plan (APP); G

SD-06 Test Reports

Monthly Exposure Reports

Notifications and Reports

Accident Reports; G

LHE Inspection Reports

SD-07 Certificates

Crane Operators/Riggers

Standard Lift Plan; G

Critical Lift Plan ; G

Activity Hazard Analysis (AHA)

Hot Work Permit

Certificate of Compliance

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 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 SITE QUALIFICATIONS, DUTIES, AND MEETINGS

1.6.1 Personnel Qualifications

1.6.1.1 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 (1) 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.

1.6.1.1.1 Additional Site Safety and Health Officer (SSHO) Requirements and Duties

The SSHO may not serve as the Quality Control Manager. The SSHO also may not serve as the Superintendent.

1.6.1.2 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 the Contracting Officer for information in consultation with the Safety Office.

1.6.1.2.1 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.

1.6.1.2.2 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.

1.6.1.3 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 (5) 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.

1.6.1.4 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. Provide proof of current qualification.

1.6.2 Personnel Duties

1.6.2.1 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 conference, 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 duties are not being effectively carried out. If 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.

1.6.3 Meetings

1.6.3.1 Preconstruction Conference

- a. Contractor representatives who have a responsibility or significant role in accident prevention on the project must attend the preconstruction conference. 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 at the conference 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.

1.6.3.2 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 on 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.

1.7 ACCIDENT PREVENTION PLAN (APP)

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 conference 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 ASSE/SAFE A10.34), and the environment.

1.7.1 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.

1.7.2 Plans

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

1.7.2.1 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 3 months.

1.7.2.2 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.

1.7.2.2.1 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.

1.7.2.2.2 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.

1.7.2.3 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.

1.7.2.4 Fall Protection and Prevention (FP&P) Plan

The plan must comply with the requirements of EM 385-1-1, Section 21.D and ASSE/SAFE 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).

1.7.2.5 Rescue and Evacuation Plan

Provide a Rescue and Evacuation Plan in accordance with EM 385-1-1 Section 21.N and ASSE/SAFE 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.

1.7.2.6 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 and Section 31 00 00 EARTHWORK.

1.8 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.

1.8.1 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.

1.8.2 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.

1.9 DISPLAY OF SAFETY INFORMATION

1.9.1 Safety Bulletin Board

Within one calendar day(s) after commencement of work, erect a safety bulletin board at the job site. Where size, duration, or logistics of project do not facilitate a bulletin board, an alternative method, acceptable to the Contracting Officer, that is accessible and includes all mandatory information for employee and visitor review, 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. Hot work permit.

1.9.2 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.

1.10 SITE SAFETY REFERENCE MATERIALS

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

1.11 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.

1.12 NOTIFICATIONS and REPORTS

1.12.1 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 4 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.

1.12.2 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. The Contracting Officer will provide copies of any required or special forms.
- b. Near Misses: 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.

1.12.3 LHE Inspection Reports

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

1.12.4 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 HOT WORK

1.13.1 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.

1.13.2 Work Around Flammable Materials

Obtain permit approval from a NFPA Certified Marine Chemist 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

1.14 SEVERE STORM PLAN

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

- a. Secure outside equipment and materials and place materials that could be damaged in protected areas.
- b. Check surrounding area, including roof, for loose material, equipment, debris, and other objects that could be blown away or against existing facilities.
- c. Ensure that temporary erosion controls are adequate.

PART 2 PRODUCTS (Not Used)

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. An employee check-in/check-out communication procedure must be developed to ensure employee safety.

3.1.2 Hazardous Material Exclusions

Notwithstanding any other hazardous material used in this contract, radioactive materials or instruments capable of producing ionizing/non-ionizing radiation (with the exception of radioactive material and devices used in accordance with 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.

3.1.3 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 14 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.

Refer to Section 01 11 00.00 30 SUMMARY OF WORK for additional requirements.

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 Installation representative 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 HECF training in accordance with EM 385-1-1, Section 12.C. Clarify when personal protective equipment is required during switching operations, inspection, and verification.

Refer to Section 01 11 00.00 30 SUMMARY OF WORK for additional requirements.

3.4 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 ASSE/SAFE Z359.2 and EM 385-1-1, Sections 21.A and 21.D.

3.4.1 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. 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 ASSE/SAFE Z359.2 in the AHA.

3.4.2 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, ASSE/SAFE Z359.0, ASSE/SAFE Z359.1, ASSE/SAFE Z359.2, ASSE/SAFE Z359.3, ASSE/SAFE Z359.4, ASSE/SAFE Z359.6, ASSE/SAFE Z359.7, ASSE/SAFE Z359.11, ASSE/SAFE Z359.12, ASSE/SAFE Z359.13, ASSE/SAFE Z359.14, and ASSE/SAFE Z359.15.

3.4.2.1 Additional Personal Fall Protection

In addition to the required fall protection systems, other protection 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.

3.4.2.2 Personal Fall Protection Harnesses

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 carabiners 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. All full body harnesses must be equipped 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.

3.4.3 Fall Protection for Roofing Work

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

a. Low Sloped Roofs:

- (1) For work within 6 feet of an edge, on a roof having a slope less

than or equal to 4:12 (vertical to horizontal), protect personnel from falling by use of personal fall arrest/restraint systems, guardrails, or safety nets. A safety monitoring system is not adequate fall protection and is not authorized. Provide in accordance with 29 CFR 1926.500.

- (2) For work greater than 6 feet from an edge, erect and install warning lines in accordance with 29 CFR 1926.500 and EM 385-1-1, Section 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.

3.4.4 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.

3.4.5 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.

3.4.6 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 comply with the requirements of EM 385-1-1, ASSE/SAFE Z359.2, and ASSE/SAFE Z359.4.

3.5 WORK PLATFORMS

3.5.1 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.

3.5.2 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.

3.6 EQUIPMENT

3.6.1 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.

3.6.2 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. Contractor's operator must remain with the crane during the spot check. Rigging gear must comply with OSHA, ASME B30.9 Standards and host country 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.

3.6.3 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.

3.6.4 Base Mounted Drum Hoists

- a. Operation of base mounted drum hoists must comply with EM 385-1-1 and ASSE/SAFE A10.22.
- b. Rigging gear must comply with applicable ASME/OSHA standards
- c. When used on telecommunication towers, base mounted drum hoists must comply 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.

3.6.5 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.

3.7 EXCAVATIONS

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

3.7.1 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.

3.7.2 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 5 feet of the underground system.

3.7.3 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.

3.8 ELECTRICAL

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

3.8.1 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.

3.8.2 Qualifications

Electrical work must be performed by QP personnel 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 and Host Nation requirements applicable to where work is being performed.

3.8.3 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.

3.8.4 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.

3.8.5 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 --

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SOURCES FOR REFERENCE PUBLICATIONS

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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.

45TH SPACE WING (SWI) 45 CES/CE,1224 JUPITER STREET PATRICK AIR
FORCE BASE, FLORIDA 32925

ACOUSTICAL SOCIETY OF AMERICA (ASA)
1305 Walt Whitman Road, Suite 300
Melville, NY 11747-4300
Ph: 516-576-2360
Fax: 631-923-2875
E-mail: asa@aip.org
Internet: <http://asa.aip.org>

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: amca@amca.org
Internet: <http://www.amca.org>

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)
2111 Wilson Blvd, Suite 500
Arlington, VA 22201
Ph: 703-524-8800
Fax: 703-562-1942

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

ALUMINUM ASSOCIATION (AA)
National Headquarters
1525 Wilson Boulevard, Suite 600
Arlington, VA 22209
Ph: 703-358-2960
E-Mail: info@aluminum.org
Internet: <http://www.aluminum.org>

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)
1827 Walden Office Square, Suite 550
Schaumburg, IL 60173-4268
Ph: 847-303-5664
Fax: 847-303-5774
E-mail: customerservice@aamanet.org
Internet: <http://www.aamanet.org>

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)
444 North Capital Street, NW, Suite 249
Washington, DC 20001
Ph: 202-624-5800
Fax: 202-624-5806
E-Mail: info@ashto.org
Internet: <http://www.aashto.org>

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)
1 Davis Drive
P.O. Box 12215
Research Triangle Park, NC 27709-2215
Ph: 919-549-8141
Fax: 919-549-8933
Internet: <http://www.aatcc.org>

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABMA)
2025 M Street, NW, Suite 800
Washington, DC 20036
Ph: 202-367-1155
E-mail: info@americanbearings.org
Internet: <http://www.americanbearings.org>

AMERICAN CONCRETE INSTITUTE (ACI)
38800 Country Club Drive
Farmington Hills, MI 48331-3439
Ph: 248-848-3700
Fax: 248-848-3701
E-mail: bkstore@concrete.org
Internet: <http://www.concrete.org>

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

AMERICAN HARDBOARD ASSOCIATION (AHA)
1210 West Northwest Highway
Palatine, IL 60067
Ph: 847-934-8800
Fax: 847-934-8803
E-mail: aha@hardboard.org
Internet: <http://domensino.com/AHA/>

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

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

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)
P.O. Box 210
Germantown, MD 20875-0210
Ph: 301-972-1700
Fax: 301-540-8004
E-mail: alsc@alsc.org
Internet: <http://www.alsc.org>

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

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

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

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)
1800 East Oakton Street
Des Plaines, IL 60018
Ph: 847-699-2929

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

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448
Ph: 708-995-3019
Fax: 708-479-6139
E-mail: staffengineer@asse-plumbing.org
Internet: <http://www.asse-plumbing.org>

AMERICAN WATER WORKS ASSOCIATION (AWWA)
6666 West Quincy Avenue
Denver, CO 80235-3098
Ph: 303-794-7711
E-mail: distribution@awwa.org
Internet: <http://www.awwa.org>

AMERICAN WELDING SOCIETY (AWS)
13301 NW 47 Ave
Miami, FL 33054

Ph: 888-WELDING, 305-824-1177, 305-826-6192
Fax: 305-826-6195
E-mail: customer.service@awspubs.com
Internet: <http://www.aws.org>

AMERICAN WOOD COUNCIL (AWC)
222 Catoctin Circle SE, Suite 201
Leesburg, VA 20175
Ph: 800-890-7732
Fax: 412-741-0609
E-mail: publications@awc.org
Internet: <http://www.awc.org>

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

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

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

ASME INTERNATIONAL (ASME)
Two Park Avenue, M/S 10E
New York, NY 10016-5990

Ph: 800-843-2763
Fax: 973-882-1717
E-mail: customercare@asme.org
Internet: <http://www.asme.org>

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

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)
520 N. Northwest Highway
Park Ridge, IL 60068
Ph: +1 847-699-2929
E-mail: customerservice@assp.org

ASTM INTERNATIONAL (ASTM)
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959
Ph: 877-909-2786
Internet: <http://www.astm.org>

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

CALIFORNIA AIR RESOURCES BOARD (CARB)
1001 I Street
Sacramento, CA 95814
Ph: 800-242-445-
Internet: <http://www.arb.ca.gov>

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

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

CAST IRON SOIL PIPE INSTITUTE (CISPI)
3008 Preston Station Drive
Hixson, TN 37343
Ph: 423-842-2122
Internet: <http://www.cispi.org>

COMPOSITE PANEL ASSOCIATION (CPA)
19465 Deerfield Avenue, Suite 306
Leesburg, VA 20176
Ph: 703-724-1128
Fax: 703-724-1588
Internet: <http://www.compositepanel.org/>

COMPRESSED GAS ASSOCIATION (CGA)
14501 George Carter Way, Suite 103
Chantilly, VA 20151-1788
Ph: 703-788-2700
Fax: 703-961-1831
E-mail: cga@cganet.com
Internet: <http://www.cganet.com>

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

ELECTRONIC INDUSTRIES ALLIANCE (EIA)
EIA has become part of the ELECTRONIC COMPONENTS INDUSTRY
ASSOCIATION (ECIA)

FM GLOBAL (FM)
270 Central Avenue
P.O. Box 7500
Johnston, RI 02919-4923
Ph: 877-364-6726
Fax: 401-275-3029
E-mail: servicedesk.myrisk@fmglobal.com
Internet: <http://www.fmglobal.com>

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH
(FCCCHR)
University of South California
Research Annex 219
3716 South Hope Street
Los Angeles, CA 90089-7700
Ph: 213-740-2032 or 866-545-6340
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PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

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QUALITY CONTROL
11/16

PART 1 GENERAL

1.1 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program. Include all associated costs in the applicable Bid Schedule item.

1.2 SUBMITTALS

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

SD-01 Preconstruction Submittals

Contractor Quality Control (CQC) Plan; G

SD-06 Test Reports

Verification Statement

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

Establish and maintain an effective quality control (QC) system that complies with FAR 52.246-12 Inspection of Construction. QC consist of plans, procedures, and organization necessary to produce an end product which complies with the Contract requirements. The QC system covers all construction operations, both onsite and offsite, and be keyed to the proposed construction sequence. The project superintendent will be held responsible for the quality of work and is subject to removal by the Contracting Officer for non-compliance with the quality requirements specified in the Contract. In this context the highest level manager responsible for the overall construction activities at the site, including quality and production is the project superintendent. The project superintendent maintains a physical presence at the site at all times and is responsible for all construction and related activities at the site, except as otherwise acceptable to the Contracting Officer.

3.2 CONTRACTOR QUALITY CONTROL (CQC) PLAN

Submit no later than 15 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements FAR 52.246-12 Inspection of Construction. The Government will

consider an interim plan for the first 30 days of operation. **Construction Design and construction** will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional work.

3.2.1 Content of the CQC Plan

Include, as a minimum, the following to cover all construction-operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers and purchasing agents:

- a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff will implement the three phase control system for all aspects of the work specified. Include a CQC System Manager that reports to the project superintendent.
- b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.
- c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the Contract. Letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities will be issued by the CQC System Manager. Furnish copies of these letters to the Contracting Officer.
- d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. These procedures must be in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.
- e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities approved by the Contracting Officer are required to be used.)
- f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.
- g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. Establish verification procedures that identified deficiencies have been corrected.
- h. Reporting procedures, including proposed reporting formats.
- i. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks, has separate control requirements, and is identified by different trades or disciplines, or it is work by the same trade in a different environment. Although each section of the specifications can generally be considered as a definable feature of work, there are frequently more than one definable features under a particular section. This list will

be agreed upon during the coordination meeting.

- j. Where the applicable Code issue by the International Code Council (ICC) calls for inspections by the Building Official, the Contractor must include the inspections in the Quality Control Plan and must perform the inspections required by the applicable ICC. The Contractor must perform these inspections using independent qualified inspectors. Include the Special Inspection Plan requirements in the QC Plan.

3.2.2 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in the Contractor Quality Control (CQC) Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.3 Notification of Changes

After acceptance of the CQC Plan, notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.3 COORDINATION MEETING

After the [Preconstruction Conference](#), before start of construction, and prior to acceptance by the Government of the CQC Plan, meet with the Contracting Officer and discuss the Contractor's quality control system. Submit the CQC Plan a minimum of 7 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details must be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting will be prepared by the Government, signed by both the Contractor and the Contracting Officer and will become a part of the contract file. There can be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings or address deficiencies in the CQC system or procedures which can require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION

3.4.1 Personnel Requirements

The requirements for the CQC organization are a Safety and Health Manager, CQC System Manager, and sufficient number of additional qualified personnel to ensure safety and Contract compliance. The Safety and Health Manager reports directly to a senior project (or corporate) official independent from the CQC System Manager. The Safety and Health Manager will also serve as a member of the CQC Staff. Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as part of the CQC organization. The Contractor's CQC staff maintains a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure Contract compliance. The CQC staff will be subject to acceptance by the Contracting Officer. Provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization.

Promptly complete and furnish all letters, material submittals, shop drawing submittals, schedules and all other project documentation to the CQC organization. The CQC organization is responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

3.4.2 CQC System Manager

Identify as CQC System Manager an individual within the onsite work organization that is responsible for overall management of CQC and has the authority to act in all CQC matters for the Contractor. The CQC System Manager is required to be a graduate engineer, graduate architect, or a graduate of construction management, with a minimum of 10 years construction experience on construction similar to this Contract. This CQC System Manager is on the site at all times during construction and is employed by the prime Contractor. The CQC System Manager is assigned as CQC System Manager but has duties as project superintendent in addition to quality control. Identify in the plan an alternate to serve in the event of the CQC System Manager's absence. The requirements for the alternate are the same as the CQC System Manager.

3.4.3 CQC Personnel

In addition to CQC personnel specified elsewhere in the contract, provide as part of the CQC organization specialized personnel to assist the CQC System Manager for the following areas: electrical, mechanical, civil, structural, environmental, and architectural. These individuals or specialized technical companies are directly employed by the prime Contractor and can not be employed by a supplier or subcontractor on this project; be physically present at the construction site during work on the specialized **personnel's** areas of responsibility; have the necessary education or experience in accordance with the experience matrix listed herein. These individuals can perform other duties but need to be allowed sufficient time to perform the specialized personnel's assigned quality control duties as described in the Quality Control Plan. A single person can cover more than one area provided that the single person is qualified to perform quality control activities in each designated and that workload allows.

Experience Matrix	
Area	Qualifications
Civil	Graduate Civil Engineer or Construction Manager with 2 years experience in the type of work being performed on this project or technician with 5 yrs related experience
Mechanical	Graduate Mechanical Engineer with 2 yrs experience or person with 5 years of experience supervising mechanical features of work in the field with a construction company

Experience Matrix	
Area	Qualifications
Electrical	Graduate Electrical Engineer with 2 years related experience or person 5 years of experience supervising electrical features of work in the field with a construction company
Structural	Graduate Civil Engineer (with Structural Track or Focus) or Construction Manager with 2 years experience or person 5 years of experience supervising structural features of work in the field with a construction company
Architectural	Graduate Architect with 2 years experience or person with 5 years related experience
Environmental	Graduate Environmental Engineer with 3 years experience
Testing, Adjusting and Balancing (TAB) Personnel	Specialist must be a member of AABC or an experienced technician of the firm certified by the NEBB

3.4.4 Additional Requirement

In addition to the above experience and education requirements, the Contractor Quality Control (CQC) System Manager and Alternate CQC System Manager are required to have completed the Construction Quality Management (CQM) for Contractors course. If the CQC System Manager does not have a current certification, obtain the CQM for Contractors course certification within 90 days of award. This course is periodically offered by the Naval Facilities Engineering Command and the Army Corps of Engineers. Contact the Contracting Officer for information on the next scheduled class.

The Construction Quality Management Training certificate expires after 5 years. If the CQC System Manager's certificate has expired, retake the course to remain current.

3.4.5 Organizational Changes

Maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.5 SUBMITTALS AND DELIVERABLES

Submittals, if needed, have to comply with the requirements in Section 01 33 00 SUBMITTAL PROCEDURES. The CQC organization is responsible for certifying that all submittals and deliverables are in compliance with the contract requirements. When Section 01 91 00.15 TOTAL BUILDING COMMISSIONING are included in the contract, the submittals required by

those sections have to be coordinated with Section 01 33 00 SUBMITTAL PROCEDURES to ensure adequate time is allowed for each type of submittal required.

3.6 CONTROL

CQC is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control are required to be conducted by the CQC System Manager for each definable feature of the construction work as follows:

3.6.1 Preparatory Phase

This phase is performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase includes:

- a. A review of each paragraph of applicable specifications, reference codes, and standards. Make available during the preparatory inspection a copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field. Maintain and make available in the field for use by Government personnel until final acceptance of the work.
- b. Review of the Contract drawings.
- c. Check to assure that all materials and equipment have been tested, submitted, and approved.
- d. Review of provisions that have been made to provide required control inspection and testing.
- e. Review Special Inspections, the Statement of Special Inspections and the Schedule of Special Inspections.
- f. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the Contract.
- g. Examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
- h. Review of the appropriate activity hazard analysis to assure safety requirements are met.
- i. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.
- j. Check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
- k. Discussion of the initial control phase.
- l. The Government needs to be notified at least 48 hours in advance of beginning the preparatory control phase. Include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the

definable feature. Document the results of the preparatory phase actions by separate minutes prepared by the CQC System Manager and attach to the daily CQC report. Instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2 Initial Phase

This phase is accomplished at the beginning of a definable feature of work. Accomplish the following:

- a. Check work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.
- b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing are in compliance with the contract.
- c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
- d. Resolve all differences.
- e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
- f. The Government needs to be notified at least 48 hours in advance of beginning the initial phase for definable feature of work. Prepare separate minutes of this phase by the CQC System Manager and attach to the daily CQC report. Indicate the exact location of initial phase for definable feature of work for future reference and comparison with follow-up phases.
- g. The initial phase for each definable feature of work is repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.
- h. Coordinate scheduled work with Special Inspections, the Statement of Special Inspections and the Schedule of Special Inspections.

3.6.3 Follow-up Phase

Perform daily checks to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. Record the checks in the CQC documentation. Conduct final follow-up checks and correct all deficiencies prior to the start of additional features of work which may be affected by the deficient work. Do not build upon nor conceal non-conforming work. Coordinate scheduled work with Special Inspections, the Statement of Special Inspections and the Schedule of Special Inspections.

3.6.4 Additional Preparatory and Initial Phases

Conduct additional preparatory and initial phases on the same definable features of work if: the quality of on-going work is unacceptable; if there are changes in the applicable CQC staff, onsite production

supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity; or if other problems develop.

3.7 TESTS

3.7.1 Testing Procedure

Perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and acceptance tests when specified. Procure the services of an approved testing laboratory at the project site. Perform the following activities and record and provide the following data:

- a. Verify that testing procedures comply with contract requirements.
- b. Verify that facilities and testing equipment are available and comply with testing standards.
- c. Check test instrument calibration data against certified standards.
- d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
- e. Record results of all tests taken, both passing and failing on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test. If approved by the Contracting Officer, actual test reports are submitted later with a reference to the test number and date taken. Provide an information copy of tests performed by an offsite or commercial test facility directly to the Contracting Officer. Failure to submit timely test reports as stated results in nonpayment for related work performed and disapproval of the test facility for this Contract.

3.7.2 Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.8 COMPLETION INSPECTION

3.8.1 Punch-Out Inspection

Conduct an inspection of the work by the CQC System Manager near the end of the work, or any increment of the work established by a time stated in FAR 52.211-10 Commencement, Prosecution, and Completion of Work, or by the specifications. Prepare and include in the CQC documentation a punch list of items which do not conform to the approved drawings and specifications, as required by paragraph DOCUMENTATION. Include within the list of deficiencies the estimated date by which the deficiencies will be corrected. Make a second inspection the CQC System Manager or staff to ascertain that all deficiencies have been corrected. Once this is accomplished, notify the Government that the facility is ready for the Government Pre-Final inspection.

3.8.2 Pre-Final Inspection

The Government will perform the pre-final inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. Ensure that all items on this list have been corrected before notifying the Government, so that a Final inspection with the customer can be scheduled. Correct any items noted on the Pre-Final inspection in a timely manner. These inspections and any deficiency corrections required by this paragraph need to be accomplished within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate completion dates.

3.8.3 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative is required to be in attendance at the final acceptance inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands can also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Notify the Contracting Officer at least 14 days prior to the final acceptance inspection and include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the Contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance FAR 52.246-12 Inspection of Construction.

3.9 DOCUMENTATION

3.9.1 Quality Control Activities

Maintain current records providing factual evidence that required quality control activities and tests have been performed. Include in these records the work of subcontractors and suppliers on an acceptable form that includes, as a minimum, the following information:

- a. The name and area of responsibility of the Contractor/Subcontractor.
- b. Operating plant/equipment with hours worked, idle, or down for repair.
- c. Work performed each day, giving location, description, and by whom.
- d. Test and control activities performed with results and references to specifications/drawings requirements. Identify the control phase (Preparatory, Initial, Follow-up). List of deficiencies noted, along with corrective action.
- e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.
- f. Submittals and deliverables reviewed, with Contract reference, by whom, and action taken.

- g. Offsite surveillance activities, including actions taken.
- h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
- i. Instructions given/received and conflicts in plans and specifications.

3.9.2 Verification Statement

Indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. Cover both conforming and deficient features and include a statement that equipment and materials incorporated in the work and workmanship comply with the Contract. Furnish the original and one copy of these records in report form to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, prepare and submit one report for every 7 days of no work and on the last day of a no work period. All calendar days need to be accounted for throughout the life of the contract. The first report following a day of no work will be for that day only. Reports need to be signed and dated by the Contractor Quality Control (CQC) System Manager. Include copies of test reports and copies of reports prepared by all subordinate quality control personnel within the CQC System Manager Report.

3.10 NOTIFICATION OF NONCOMPLIANCE

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

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SECTION 01 50 00

TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS

05/18

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.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

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

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

FCCCHR List (continuously updated) List of Approved Backflow Prevention Assemblies

FCCCHR Manual (10th Edition) Manual of Cross-Connection Control

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 241 (2013; Errata 2015) Standard for Safeguarding Construction, Alteration, and Demolition Operations

NFPA 70 (2017; ERTA 1-2 2017; TIA 17-1; TIA 17-2; TIA 17-3; TIA 17-4; TIA 17-5; TIA 17-6; TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10; TIA 17-11; TIA 17-12; TIA 17-13; TIA 17-14; TIA 17-15; TIA 17-16; TIA 17-17) National Electrical Code

U.S. ARMY CORPS OF ENGINEERS (USACE)

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

U.S. FEDERAL AVIATION ADMINISTRATION (FAA)

FAA AC 70/7460-1 (2015; Rev L) Obstruction Marking and Lighting

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

MUTCD (2015) Manual on Uniform Traffic Control Devices

1.2 SUBMITTALS

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

SD-01 Preconstruction Submittals

Construction Site Plan; G

Traffic Control Plan; G

SD-03 Product Data

Backflow Preventers; G

SD-06 Test Reports

Backflow Preventer Tests

SD-07 Certificates

Backflow Tester Certification

Backflow Preventers Certificate of Full Approval

1.3 CONSTRUCTION SITE PLAN

Prior to the start of work, submit a site plan showing the locations and dimensions of temporary facilities (including layouts and details, equipment and material storage area (onsite and offsite), and access and haul routes, avenues of ingress/egress to the fenced area and details of the fence installation. Identify any areas which may have to be graveled to prevent the tracking of mud. Indicate if the use of a supplemental or other staging area is desired. Show locations of safety and construction fences, site trailers, construction entrances, trash dumpsters, temporary sanitary facilities, and worker parking areas.

1.4 BACKFLOW PREVENTERS CERTIFICATE

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

1.4.1 Backflow Tester Certificate

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

1.4.2 Backflow Prevention Training Certificate

Submit a certificate recognized by the State or local authority that states the Contractor has completed at least 10 hours of training in backflow

preventer installations. The certificate must be current.

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 (60mph or 95 km/hr) 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 **50 knots** or greater expected within 72 hours): Normal daily jobsite cleanup and good housekeeping practices. Collect and store in piles or containers scrap lumber, waste material, and rubbish for removal and disposal at the close of each work day. Maintain the construction site including storage areas, free of accumulation of debris. Stack form lumber in neat piles less than **4 feet** high. Remove all debris, trash, or objects that could become missile hazards.
- b. Condition THREE (Sustained winds of **50 knots** or greater expected within 48 hours): Maintain "Condition FOUR" requirements and commence securing operations necessary for "Condition ONE" which cannot be completed within 18 hours. Cease all routine activities which might interfere with securing operations. Commence securing and stow all gear and portable equipment. Make preparations for securing buildings. Review requirements pertaining to "Condition TWO" and continue action as necessary to attain "Condition THREE" readiness.
- c. Condition TWO (Sustained winds of **50 knots** or greater expected within 24 hours): Curtail or cease routine activities until securing operation is complete. Reinforce or remove form work and scaffolding. Secure machinery, tools, equipment, materials, or remove from the jobsite. Expend every effort to clear all missile hazards and loose equipment from general base areas.
- d. Condition ONE. (Sustained winds of **50 knots** or greater expected within 12 hours): Secure the jobsite, and leave Government premises.

PART 2 PRODUCTS

2.1 TEMPORARY SIGNAGE

2.1.1 Bulletin Board

Within one calendar day of mobilization on site and prior to the commencement of work activities, provide a clear weatherproof covered bulletin board not less than **36 by 48 inches** in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, Safety and Health Information as required by **EM 385-1-1** Section 01 and other information approved by the Contracting Officer. Coordinate requirements herein with **01 35 26** GOVERNMENTAL SAFETY REQUIREMENTS.

2.1.2 Project Identification Signs

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

2.1.3 Warning Signs

Post temporary signs, tags, and labels to give workers and the public adequate warning and caution of construction hazards according to the EM 385-1-1 Section 04. Attach signs to the perimeter fencing every 150 feet warning the public of the presence of construction hazards. Signs must require unauthorized persons to keep out of the construction site. Correct the data required by safety signs daily.

2.2 TEMPORARY TRAFFIC CONTROL

2.2.1 Barricades

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

2.3 FENCING

Provide fencing along the construction site and at all open excavations and tunnels to control access by unauthorized personnel. Safety fencing must be highly visible to be seen by pedestrians and vehicular traffic. Specific fencing requirements are as described herein. All fencing will meet the requirements of EM 385-1-1.

2.3.1 Polyethylene Mesh Safety Fencing

Temporary safety fencing must be a high visibility orange colored, high density polyethylene grid, a minimum of 48 inches high and maximum mesh size of 2 inches. Fencing must extend from the grade to a minimum of 48 inches above the grade and be tightly secured to T-posts spaced as necessary to maintain a rigid and taut fence. Fencing must remain rigid and taut with a minimum of 200 pounds of force exerted on it from any direction with less than 4 inches of deflection.

2.3.2 Chain Link Panel Fencing

Temporary panel fencing must be galvanized steel chain link panels 6 feet high. Multiple fencing panels may be linked together at the bases to form long spans as needed. Each panel base must be weighted down using sand bags or other suitable materials in order for the fencing to withstand anticipated winds while remaining upright. Fencing must remain rigid and taut with a minimum of 200 pounds of force exerted on it from any direction with less than 4 inches of deflection.

2.3.3 Post-Driven Chain Link Fencing

Temporary post-driven fencing must be galvanized chain link fencing 6 feet

high supported by an tightly secured to galvanized steel posts driven below grade. Fence posts must be located on minimum 10 foot centers. Posts may be set in various [surfaces](#) such as sand, soil, [asphalt](#) or concrete as necessary. Chain link fencing must remain rigid and taut with a minimum of 200 pounds of force exerted on it from any direction with less than 4 inches of deflection. Fencing and posts must be completely removed at the completion of construction and any surfaces disturbed or damaged must be restored to its original condition. Underground utilities must be located and identified prior to setting fence posts. Fence must be equipped with a lockable gate. Gate must remain locked when construction personnel are not present.

2.4 TEMPORARY WIRING

Provide temporary wiring in accordance with [EM 385-1-1](#) Section 11, [NFPA 241](#) and [NFPA 70](#). Include monthly inspection and testing of all equipment and apparatus.

2.5 BACKFLOW PREVENTERS

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

PART 3 EXECUTION

3.1 EMPLOYEE PARKING

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

3.2 TEMPORARY BULLETIN BOARD

Locate the bulletin board at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer.

3.3 AVAILABILITY AND USE OF UTILITY SERVICES

3.3.1 Temporary Utilities

Provide temporary utilities required for construction. Materials may be new or used, must be adequate for the required usage, not create unsafe conditions, and not violate applicable codes and standards.

3.3.2 Payment for Utility Services

- a. The Government will make all reasonably required utilities available from existing outlets and supplies, as specified in the contract. Unless otherwise provided in the contract, the amount of each utility service consumed will be charged to or paid at prevailing rates charged

to the Government or, where the utility is produced by the Government, at reasonable rates determined by the Contracting Officer. Carefully conserve any utilities furnished without charge.

- b. The point at which the Government will deliver such utilities or services and the quantity available is as indicated. Pay all costs incurred in connecting, converting, and transferring the utilities to the work.

3.3.3 Meters and Temporary Connections

Provide and maintain necessary temporary connections, distribution lines, and meter bases (Government will provide meters) required to measure the amount of each utility used for the purpose of determining charges. Notify the Contracting Officer, in writing, 5 working days before final electrical connection is desired so that a utilities contract can be established. The Government will provide a meter and make the final hot connection after inspection and approval of the Contractor's temporary wiring installation. Do not make the final electrical connection.

3.3.4 Final Meter Reading

Before completion of the work and final acceptance of the work by the Government, notify the Contracting Officer, in writing, 5 working days before termination is desired. The Government will take a final meter reading, disconnect service, and remove the meters. Then remove all the temporary distribution lines, meter bases, and associated paraphernalia. Pay all outstanding utility bills before final acceptance of the work by the Government.

3.3.5 Sanitation

Provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer and periodically empty wastes into a municipal, district, or station sanitary sewage system, or remove waste to a commercial facility. Obtain approval from the system owner prior to discharge into any municipal, district, or commercial sanitary sewer system. Any penalties or fines associated with improper discharge will be the responsibility of the Contractor. Coordinate with the Contracting Officer and follow station regulations and procedures when discharging into the station sanitary sewer system. Maintain these conveniences at all times. Include provisions for pest control and elimination of odors. Government toilet facilities will not be available to Contractor's personnel.

3.3.6 Telephone

Make arrangements and pay all costs for telephone facilities desired.

3.3.7 Obstruction Lighting of Cranes

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

3.3.8 Fire Protection

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

3.4 TRAFFIC PROVISIONS

3.4.1 Maintenance of Traffic

- a. Conduct operations in a manner that will not close any thoroughfare or interfere in any way with traffic on railways or highways except with written permission of the Contracting Officer at least 15 calendar days prior to the proposed modification date, and provide a [Traffic Control Plan](#) detailing the proposed controls to traffic movement for approval. The plan must be in accordance with State and local regulations and the [MUTCD](#), Part VI. Contractor may move oversized and slow-moving vehicles to the worksite provided requirements of the highway authority have been met.
- b. Conduct work so as to minimize obstruction of traffic, and maintain traffic on at least half of the roadway width at all times. Obtain approval from the Contracting Officer prior to starting any activity that will obstruct traffic.
- c. Provide, erect, and maintain, at contractors expense, lights, barriers, signals, passageways, detours, and other items, that may be required by the Life Safety Signage, overhead protection authority having jurisdiction.

3.4.2 Protection of Traffic

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

3.4.3 Rush Hour Restrictions

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

3.4.4 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 CONTRACTOR'S TEMPORARY FACILITIES

Contractor-owned or -leased trailers must be identified by Government

assigned numbers. Size and location of the number provided by Contracting Officer. Apply the number to the trailer within 14 calendar days of notification, or sooner, if directed by the Government. Temporary facilities will meet requirements as identified in EM 385-1-1 Section 04.

3.5.1 Safety Systems

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

3.5.2 Administrative Field Offices

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

3.5.3 Storage Area

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

3.5.4 Supplemental Storage Area

Upon request, and pending availability, the Contracting Officer will designate another or supplemental area for the use and storage of trailers, equipment, and materials. This area may not be in close proximity of the construction site but will be within the installation boundaries. The area will be maintained in a clean and orderly fashion and secured if needed to protect supplies and equipment. Utilities will not be provided to this area by the Government.

3.5.5 Appearance of Trailers

- a. Trailers which are rusted, have peeling paint or are otherwise in need of repair will not be allowed on Installation property. Trailers must present a clean and neat exterior appearance and be in a state of good repair.

3.5.6 Maintenance of Storage Area

- a. Keep fencing in a state of good repair and proper alignment. Grassed

or unpaved areas, which are not established roadways, and will be traversed with construction equipment or other vehicles, will be covered with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways, should the Contractor elect to traverse them with construction equipment or other vehicles. Mow and maintain grass located within the boundaries of the construction site for the duration of the project. Grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers will be edged or trimmed neatly.

3.5.7 Security Provisions

Provide adequate outside security lighting at the temporary facilities. The Contractor will be responsible for the security of its own equipment.

3.5.8 Weather Protection of Temporary Facilities and Stored Materials

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

3.5.8.1 Building and Site Storm Protection

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

3.6 GOVERNMENT FIELD OFFICE

3.6.1 Resident Engineer's Office

Provide the Government Resident Engineer with an office, approximately 200 square feet in floor area, located where directed and providing space heat, air conditioning unit, electric light and power, and toilet facilities consisting of one lavatory and one water closet complete with connections to water and sewer mains. Provide a mail slot in the door or a lockable mail box mounted on the surface of the door. Include a 4 by 8 foot plan table, computer work space a standard size office desk and chair, and telephone. At completion of the project, the office will remain the property of the Contractor and be removed from the site. Utilities will be connected and disconnected in accordance with local codes and to the satisfaction of the Contracting Officer. Compliance with safety and appearance requirements for temporary facilities stated in previous paragraphs is required.

3.6.2 Trailer-Type Mobile Office

The option is available to furnish and maintain a trailer-type mobile office acceptable to the Contracting Officer to meet the requirements of the minimum facilities specified above. Securely anchor the trailer to the ground at all four corners to guard against movement during high winds.

Coordinate requirements for proper anchoring with EM 383-1-1 Section 04.

3.7 PLANT COMMUNICATIONS

Whenever the individual elements of the plant are located so that operation by normal voice between these elements is not satisfactory, install a satisfactory means of communication, such as telephone or other suitable devices and make available for use by Government personnel.

3.8 TEMPORARY PROJECT SAFETY FENCING

As soon as practicable, but not later than 15 days after the date established for commencement of work, furnish and erect temporary project safety fencing at the work site. Maintain the safety fencing during the life of the contract and, upon completion and acceptance of the work, ~~remove from~~ the work site.

3.9 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 any 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.

3.10 RESTORATION OF STORAGE AREA

Upon completion of the project remove the bulletin board, signs, barricades, haul roads, and any 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.

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TEMPORARY ENVIRONMENTAL CONTROLS

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PART 1 GENERAL

1.1 REFERENCES

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

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

29 CFR 1910.120	Hazardous Waste Operations and Emergency Response
40 CFR 112	Oil Pollution Prevention
40 CFR 241	Guidelines for Disposal of Solid Waste
40 CFR 243	Guidelines for the Storage and Collection of Residential, Commercial, and Institutional Solid Waste
40 CFR 258	Subtitle D Landfill Requirements
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 261.7	Residues of Hazardous Waste in Empty Containers
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 262.31	Standards Applicable to Generators of Hazardous Waste-Labeling
40 CFR 262.34	Standards Applicable to Generators of Hazardous Waste-Accumulation Time
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 266	Standards for the Management of Specific

	Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
40 CFR 268	Land Disposal Restrictions
40 CFR 273	Standards For Universal Waste Management
40 CFR 273.2	Standards for Universal Waste Management - Batteries
40 CFR 273.4	Standards for Universal Waste Management - Mercury Containing Equipment
40 CFR 273.5	Standards for Universal Waste Management - Lamps
40 CFR 279	Standards for the Management of Used Oil
40 CFR 300	National Oil and Hazardous Substances Pollution Contingency Plan
40 CFR 300.125	National Oil and Hazardous Substances Pollution Contingency Plan - Notification and Communications
40 CFR 355	Emergency Planning and Notification
40 CFR 50	National Primary and Secondary Ambient Air Quality Standards
40 CFR 60	Standards of Performance for New Stationary Sources
40 CFR 63	National Emission Standards for Hazardous Air Pollutants for Source Categories
40 CFR 64	Compliance Assurance Monitoring
49 CFR 171	General Information, Regulations, and Definitions
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR 172.101	Hazardous Material Regulation-Purpose and Use of Hazardous Material Table
49 CFR 173	Shippers - General Requirements for Shipments and Packagings
49 CFR 178	Specifications for Packagings

1.2 DEFINITIONS

1.2.1 Contractor Generated Hazardous Waste

Contractor generated hazardous waste is materials that, if abandoned or

disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the Contractor to execute work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e. methyl ethyl ketone, toluene), waste thinners, excess paints, excess solvents, waste solvents, excess pesticides, and contaminated pesticide equipment rinse water.

1.2.2 Electronics Waste

Electronics waste is discarded electronic devices intended for salvage, recycling, or disposal.

1.2.3 Environmental Pollution and Damage

Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally or historically.

1.2.4 Environmental Protection

Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.2.5 Hazardous Debris

As defined in paragraph SOLID WASTE, debris that contains listed hazardous waste (either on the debris surface, or in its interstices, such as pore structure) in accordance with 40 CFR 261. Hazardous debris also includes debris that exhibits a characteristic of hazardous waste in accordance with 40 CFR 261.

1.2.6 Hazardous Materials

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

Hazardous material is any material that: Is regulated as a hazardous material in accordance with 49 CFR 173; or requires a Safety Data Sheet (SDS) in accordance with 29 CFR 1910.120; or during end use, treatment, handling, packaging, storage, transportation, or disposal meets or has components that meet or have potential to meet the definition of a hazardous waste as defined by 40 CFR 261 Subparts A, B, C, or D. Designation of a material by this definition, when separately regulated or controlled by other sections or directives, does not eliminate the need for adherence to that hazard-specific guidance which takes precedence over this section for "control" purposes. Such material includes ammunition, weapons, explosive actuated devices, propellants, pyrotechnics, chemical and biological warfare materials, medical and pharmaceutical supplies, medical waste and infectious materials, bulk fuels, radioactive materials, and other materials such as asbestos, mercury, and polychlorinated biphenyls (PCBs).

1.2.7 Hazardous Waste

Hazardous Waste is any material that meets the definition of a solid waste and exhibit a hazardous characteristic (ignitability, corrosivity, reactivity, or toxicity) as specified in 40 CFR 261, Subpart C, or contains a listed hazardous waste as identified in 40 CFR 261, Subpart D.

1.2.8 Oily Waste

Oily waste are those materials that are, or were, mixed with Petroleum, Oils, and Lubricants (POLs) and have become separated from that POLs. Oily wastes also means materials, including wastewaters, centrifuge solids, filter residues or sludges, bottom sediments, tank bottoms, and sorbents which have come into contact with and have been contaminated by, POLs and may be appropriately tested and discarded in a manner which is in compliance with other state and local requirements.

This definition includes materials such as oily rags, "kitty litter" sorbent clay and organic sorbent material. These materials may be land filled provided that: It is not prohibited in other state regulations or local ordinances; the amount generated is "de minimus" (a small amount); it is the result of minor leaks or spills resulting from normal process operations; and free-flowing oil has been removed to the practicable extent possible. Large quantities of this material, generated as a result of a major spill or in lieu of proper maintenance of the processing equipment, are a solid waste. As a solid waste, perform a hazardous waste determination prior to disposal. As this can be an expensive process, it is recommended that this type of waste be minimized through good housekeeping practices and employee education.

1.2.9 Regulated Waste

Regulated waste are solid wastes that have specific additional federal, state, or local controls for handling, storage, or disposal.

1.2.10 Sediment

Sediment is soil and other debris that have eroded and have been transported by runoff water or wind.

1.2.11 Solid Waste

Solid waste is a solid, liquid, semi-solid or contained gaseous waste. A solid waste can be a hazardous waste, non-hazardous waste, or non-Resource Conservation and Recovery Act (RCRA) regulated waste. Types of solid waste typically generated at construction sites may include:

1.2.11.1 Debris

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

1.2.11.2 Green Waste

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

1.2.11.3 Material not regulated as solid waste

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

1.2.11.4 Non-Hazardous Waste

Non-hazardous waste is waste that is excluded from, or does not meet, hazardous waste criteria in accordance with 40 CFR 263.

1.2.11.5 Recyclables

Recyclables are materials, equipment and assemblies such as doors, windows, door and window frames, plumbing fixtures, glazing and mirrors that are recovered and sold as recyclable, wiring, insulated/non-insulated copper wire cable, wire rope, and structural components. It also includes commercial-grade refrigeration equipment with Freon removed, household appliances where the basic material content is metal, clean polyethylene terephthalate bottles, cooking oil, used fuel oil, textiles, high-grade paper products and corrugated cardboard, stackable pallets in good condition, clean crating material, and clean rubber/vehicle tires. Metal meeting the definition of lead contaminated or lead based paint contaminated may not be included as recyclable if sold to a scrap metal company. Paint cans that meet the definition of empty containers in accordance with 40 CFR 261.7 may be included as recyclable if sold to a scrap metal company.

1.2.11.6 Surplus Soil

Surplus soil is existing soil that is in excess of what is required for this work, including aggregates intended, but not used, for on-site mixing of concrete, mortars, and paving. Contaminated soil meeting the definition of hazardous material or hazardous waste is not included and must be managed in accordance with paragraph HAZARDOUS MATERIAL MANAGEMENT.

1.2.11.7 Scrap Metal

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

1.2.11.8 Wood

Wood is dimension and non-dimension lumber, plywood, chipboard, hardboard. Treated or painted wood that meets the definition of lead contaminated or

lead based contaminated paint is not included. Treated wood includes, but is not limited to, lumber, utility poles, crossties, and other wood products with chemical treatment.

1.2.12 Wastewater

Wastewater is the used water and solids from a community that flow to a treatment plant.

1.2.12.1 Stormwater

Stormwater is any precipitation in an urban or suburban area that does not evaporate or soak into the ground, but instead collects and flows into storm drains, rivers, and streams.

1.2.13 Universal Waste

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

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation. Submit the following in accordance with Section [01 33 00 SUBMITTAL PROCEDURES](#):

[SD-01 Preconstruction Submittals](#)

[Preconstruction Survey](#)

[Regulatory Notifications](#)

[Environmental Protection Plan](#)

[SD-11 Closeout Submittals](#)

[Waste Determination Documentation; G](#)

[Disposal Documentation for Hazardous and Regulated Waste; G](#)

[Solid Waste Management Report; G](#)

[Hazardous Waste/Debris Management; G](#)

[Regulatory Notifications; G](#)

[Contractor Certification; G](#)

1.4 ENVIRONMENTAL PROTECTION REQUIREMENTS

Provide and maintain, during the life of the contract, environmental protection as defined [herein](#). Plan for and provide environmental protective measures to control pollution that develops during 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. Protect the environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire duration of this Contract. Comply with federal, state, and local regulations pertaining to the environment, including water, air, solid waste, hazardous waste and substances, oily substances, and noise pollution.

Tests and procedures assessing whether construction operations comply with Applicable Environmental Laws may be required. Analytical work must be performed by qualified laboratories; and where required by law, the laboratories must be certified.

1.4.1 Conformance with the Environmental Management System

Perform work under this contract consistent with the policy and objectives identified in the installation's Environmental Management System (EMS). Perform work in a manner that conforms to objectives and targets of the environmental programs and operational controls identified by the EMS. Support Government personnel when environmental compliance and EMS audits are conducted by escorting auditors at the Project site, answering questions, and providing proof of records being maintained. Provide monitoring and measurement information as necessary to address environmental performance relative to environmental, energy, and transportation management goals. In the event an EMS nonconformance or environmental noncompliance associated with the contracted services, tasks, or actions occurs, take corrective and preventative actions. In addition, employees must be aware of their roles and responsibilities under the installation EMS and of how these EMS roles and responsibilities affect work performed under the contract.

Coordinate with the installation's EMS coordinator to identify training needs associated with environmental aspects and the EMS, and arrange training or take other action to meet these needs. Provide training documentation to the Contracting Officer. The Installation Environmental Office will retain associated environmental compliance records. Make EMS Awareness training completion certificates available to Government auditors during EMS audits and include the certificates in the Employee Training Records. See paragraph EMPLOYEE TRAINING RECORDS.

1.5 QUALITY ASSURANCE

1.5.1 Preconstruction Survey and Protection of Features

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS. Prior to start of any onsite construction activities, perform a [Preconstruction Survey](#) of the project site with the Contracting Officer, and take photographs showing existing environmental conditions in and adjacent to the site. Submit a report for the record. Include in the report a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of

trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. The Contractor and the Contracting Officer will sign this survey report upon mutual agreement regarding its accuracy and completeness. Protect those environmental features included in the survey report and any indicated on the drawings, regardless of interference that their preservation may cause to the work under the Contract.

1.5.2 Regulatory Notifications

Provide regulatory notification requirements in accordance with federal, state and local regulations. In cases where the Government will also provide public notification (such as stormwater permitting), coordinate with the Contracting Officer. Submit copies of regulatory notifications to the Contracting Officer at least 30 days prior to commencement of work activities. Typically, regulatory notifications must be provided for the following (this listing is not all-inclusive): demolition, renovation, NPDES defined site work, construction, removal or use of a permitted air emissions source, and remediation of controlled substances (asbestos, hazardous waste, lead paint).

1.5.3 Environmental Brief

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

Prior to initiating any work on site, meet with the Contracting Officer and installation Environmental Office to develop a mutual understanding relative to the details of environmental protection, including measures for protecting natural and cultural resources, required reports, required permits, permit requirements (such as mitigation measures), and other measures to be taken.

1.5.4 Non-Compliance Notifications

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with federal, state or local environmental laws or regulations, permits, and other elements of the Contractor's EPP. After receipt of such notice, inform the Contracting Officer of the proposed corrective action and take such action when approved by the Contracting Officer. The Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions will be granted or equitable adjustments allowed for any such suspensions. This is in addition to any other actions the Contracting Officer may take under the contract, or in accordance with the Federal Acquisition Regulation or Federal Law.

1.6 ENVIRONMENTAL PROTECTION PLAN

The purpose of the EPP is to present an overview of known or potential environmental issues that must be considered and addressed during construction. Incorporate construction related objectives and targets from the installation's EMS into the EPP. Include in the EPP measures for protecting natural and cultural resources, required reports, and other measures to be taken. Meet with the Contracting Officer or Contracting Officer Representative to discuss the EPP and develop a mutual

understanding relative to the details for environmental protection including measures for protecting natural resources, required reports, and other measures to be taken. Submit the EPP within 30 days after Contract award. Revise the EPP throughout the project to include any reporting requirements, changes in site conditions, or contract modifications that change the project scope of work in a way that could have an environmental impact. No requirement in this section will relieve the Contractor of any applicable federal, state, and local environmental protection laws and regulations. During Construction, identify, implement, and submit for approval any additional requirements to be included in the EPP. Maintain the current version onsite.

The EPP includes, but is not limited to, the following elements:

1.6.1 General Overview and Purpose

1.6.1.1 Descriptions

A brief description of each specific plan required by environmental permit or elsewhere in this Contract such as stormwater pollution prevention plan, spill control plan, air pollution control plan, contaminant prevention plan, biological resources plan, traffic control plan, Hazardous, Toxic and Radioactive Waste (HTRW) Plan, and Non-Hazardous Solid Waste Disposal Plan.

1.6.1.2 Duties

The duties and level of authority assigned to the person(s) on the job site who oversee environmental compliance, such as who is responsible for adherence to the EPP, who is responsible for spill cleanup and training personnel on spill response procedures, who is responsible for manifesting hazardous waste to be removed from the site (if applicable), and who is responsible for training the Contractor's environmental protection personnel.

1.6.1.3 Procedures

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

1.6.1.4 Communications

Communication and training procedures that will be used to convey environmental management requirements to Contractor employees and subcontractors.

1.6.1.5 Contact Information

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

1.6.2 General Site Information

1.6.2.1 Drawings

Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, jurisdictional wetlands, material storage areas, structures, sanitary facilities, storm drains and conveyances, and stockpiles of excess soil.

1.6.2.2 Work Area

Work area plan showing the proposed activity in each portion of the area and identify the areas of limited use or nonuse. Include measures for marking the limits of use areas, including methods for protection of features to be preserved within authorized work areas and methods to control runoff and to contain materials on site, and a traffic control plan.

1.6.2.3 Documentation

A letter signed by an officer of the firm appointing the Environmental Manager and stating that person is responsible for managing and implementing the Environmental Program as described in this contract. Include in this letter the Environmental Manager's authority to direct the removal and replacement of non-conforming work.

1.6.3 Stormwater Management and Control

- a. Ground cover
- b. Erodible soils
- c. Temporary measures
 - (1) Structural Practices
 - (2) Temporary and permanent stabilization
- d. Effective selection, implementation and maintenance of Best Management Practices (BMPs).

1.6.4 Protection of the Environment from Waste Derived from Contractor Operations

Control and disposal of solid and sanitary waste. Control and disposal of hazardous waste.

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

- a. List of the types of hazardous wastes expected to be generated
- b. Procedures to ensure a written waste determination is made for appropriate wastes that are to be generated
- c. Sampling/analysis plan, including laboratory method(s) that will be used for waste determinations and copies of relevant laboratory certifications
- d. Methods and proposed locations for hazardous waste accumulation/storage (that is, in tanks or containers)
- e. Management procedures for storage, labeling, transportation, and disposal of waste (treatment of waste is not allowed unless specifically noted)

- f. Management procedures and regulatory documentation ensuring disposal of hazardous waste complies with Land Disposal Restrictions (40 CFR 268)
- g. Management procedures for recyclable hazardous materials such as lead-acid batteries, used oil, and similar
- h. Used oil management procedures in accordance with 40 CFR 279; Hazardous waste minimization procedures
- i. Plans for the disposal of hazardous waste by permitted facilities; and Procedures to be employed to ensure required employee training records are maintained.

1.6.5 Prevention of Releases to the Environment

Procedures to prevent releases to the environment

Notifications in the event of a release to the environment

1.6.6 Regulatory Notification and Permits

List what notifications and permit applications must be made. Some permits require up to 180 days to obtain. Demonstrate that those permits have been obtained or applied for by including copies of applicable environmental permits. The EPP will not be approved until the permits have been obtained.

1.6.7 Clean Air Act Compliance

1.6.7.1 Haul Route

Identify truck and material haul routes along with a Dirt and Dust Control Plan for controlling dirt, debris, and dust on Installation roadways. As a minimum, identify in the plan the subcontractor and equipment for cleaning along the haul route and measures to reduce dirt, dust, and debris from roadways.

1.6.7.2 Pollution Generating Equipment

Identify air pollution generating equipment or processes that may require federal, state, or local permits under the Clean Air Act. Determine requirements based on any current installation permits and the impacts of the project. Provide a list of all fixed or mobile equipment, machinery or operations that could generate air emissions during the project to the Installation Environmental Office (Air Program Manager).

1.6.7.3 Stationary Internal Combustion Engines

Identify portable and stationary internal combustion engines that will be supplied, used or serviced. Comply with 40 CFR 60 Subpart IIII, 40 CFR 60 Subpart JJJJ, 40 CFR 63 Subpart ZZZZ, and local regulations as applicable. At minimum, include the make, model, serial number, manufacture date, size (engine brake horsepower), and EPA emission certification status of each engine. Maintain applicable records and log hours of operation and fuel use. Logs must include reasons for operation and delineate between emergency and non-emergency operation.

1.6.7.4 Refrigerants

Identify management practices to ensure that heating, ventilation, and air conditioning (HVAC) work involving refrigerants complies with 40 CFR 82 requirements. Technicians must be certified, maintain copies of certification on site, use certified equipment and log work that requires the addition or removal of refrigerant. Any refrigerant reclaimed is the property of the Government, coordinate with the Installation Environmental Office to determine the appropriate turn in location.

1.6.7.5 Air Pollution-engineering Processes

Identify planned air pollution-generating processes and management control measures (including, but not limited to, spray painting, abrasive blasting, demolition, material handling, fugitive dust, and fugitive emissions). Log hours of operations and track quantities of materials used.

1.6.7.6 Compliant Materials

Provide the Government a list of and SDSs for all hazardous materials proposed for use on site. Materials must be compliant with all Clean Air Act regulations for emissions including solvent and volatile organic compound contents, and applicable National Emission Standards for Hazardous Air Pollutants requirements. The Government may alter or limit use of specific materials as needed to meet installation permit requirements for emissions.

1.7 ENVIRONMENTAL RECORDS BINDER

Maintain on-site a separate three-ring Environmental Records Binder and submit at the completion of the project. Make separate parts within the binder that correspond to each submittal listed under paragraph CLOSEOUT SUBMITTALS in this section.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 PROTECTION OF NATURAL RESOURCES

Minimize interference with, disturbance to, and damage to fish, wildlife, and plants, including their habitats. Prior to the commencement of activities, consult with the Installation Environmental Office, regarding rare species or sensitive habitats that need to be protected. The protection of rare, threatened, and endangered animal and plant species identified, including their habitats, is the Contractor's responsibility.

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 that is consistent with the requirements of the Installation Environmental Office or as otherwise specified. Confine construction activities to within the limits of the work indicated or specified.

3.1.1 Flow Ways

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 specified and permitted.

3.1.2 Vegetation

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

Protect existing trees that are to remain to ensure they are not injured, bruised, defaced, or otherwise damaged by construction operations. Remove displaced rocks from uncleared areas. Coordinate with the Contracting Officer and Installation Environmental Office to determine appropriate action for trees and other landscape features scarred or damaged by equipment operations.

3.2 STORMWATER

Do not discharge stormwater from construction sites to the sanitary sewer. If the water is noted or suspected of being contaminated, it may only be released to the storm drain system if the discharge is specifically permitted. Obtain authorization in advance from the Installation Environmental Office for any release of contaminated water.

3.2.1 Construction

3.2.2 Erosion and Sediment Control Measures

Provide erosion and sediment control measures in accordance with state and local laws and regulations. Preserve vegetation to the maximum extent practicable.

3.2.2.1 Erosion Control

Prevent erosion by implementing silt fencing, mulching, Compost Blankets, or Geotextiles. Stabilize slopes by sodding, seeding or such combination of these methods necessary for effective erosion control. Use of hay bales is prohibited.

3.2.2.2 Sediment Control Practices

Implement sediment control practices to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Implement sediment control practices prior to soil disturbance and prior to creating areas with concentrated flow, during the construction process to minimize erosion and sediment laden runoff. Include the following devices: silt fence, temporary construction exit and storm drain inlet protection. Location and details of installation and construction are indicated on the drawings.

3.2.3 Work Area Limits

Mark the areas that need not be disturbed under this Contract prior to commencing construction activities. Mark or fence isolated areas within the general work area that are not to be disturbed. Protect monuments and

markers before construction operations commence. Where construction operations are to be conducted during darkness, any markers must be visible in the dark. Personnel must be knowledgeable of the purpose for marking and protecting particular objects.

3.2.4 Work Areas

Place staging areas and stockpile storage in areas designated as directed by the Contracting Officer. Provide erosion and sediment controls for onsite borrow and spoil areas to prevent sediment from entering nearby waters. Control temporary excavation and embankments for plant or work areas to protect adjacent areas.

3.3 PROTECTION OF CULTURAL RESOURCES

3.3.1 Archaeological Resources

If, during excavation or other construction activities, any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found, activities that may damage or alter such resources will be suspended. Resources covered by this paragraph include, but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, immediately notify the Contracting Officer so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. Cease all activities that may result in impact to or the destruction of these resources. Secure the area and prevent employees or other persons from trespassing on, removing, or otherwise disturbing such resources. The Government retains ownership and control over archaeological resources.

3.4 AIR RESOURCES

Equipment operation, activities, or processes will be in accordance with 40 CFR 64 and state air emission and performance laws and standards.

3.4.1 Burning

Burning is prohibited on the Government premises.

3.4.2 Dust Control

Keep dust down at all times, including during nonworking periods. Dry power brooming will not be permitted. Instead, use vacuuming, wet mopping, wet sweeping, or wet power brooming. Air blowing will be permitted only for cleaning nonparticulate debris such as steel reinforcing bars. Only wet cutting will be permitted for cutting concrete blocks, concrete, and bituminous concrete. Do not unnecessarily shake bags of cement, concrete mortar, or plaster.

3.4.2.1 Particulates

Dust particles, aerosols and gaseous by-products from construction activities, and processing and preparation of materials (such as from asphaltic batch plants) must be controlled at all times, including weekends, holidays, and hours when work is not in progress. Maintain excavations, stockpiles, haul roads, permanent and temporary access roads,

plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates that would exceed 40 CFR 50, state, and local air pollution standards or that would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, baghouse, scrubbers, electrostatic precipitators, or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp. Provide sufficient, competent equipment available to accomplish these tasks. Perform particulate control as the work proceeds and whenever a particulate nuisance or hazard occurs. Comply with state and local visibility regulations.

3.4.3 Odors

Control odors from construction activities. The odors must be in compliance with state regulations and local ordinances and may not constitute a health hazard.

3.5 WASTE MINIMIZATION

Minimize the use of hazardous materials and the generation of waste. Include procedures for pollution prevention/ hazardous waste minimization in the Hazardous Waste Management Section of the EPP. Obtain a copy of the installation's Pollution Prevention/Hazardous Waste Minimization Plan for reference material when preparing this part of the EPP. If no written plan exists, obtain information by contacting the Contracting Officer. Describe the anticipated types of the hazardous materials to be used in the construction when requesting information.

3.6 WASTE MANAGEMENT AND DISPOSAL

3.6.1 Waste Determination Documentation

Complete a Waste Determination form (provided at the pre-construction conference) for Contractor-derived wastes to be generated. F2F Contractor will determine DOT Labeling requirements, provide required labels and provide guidelines for waste turn in's to F2F contractor. All potentially hazardous solid waste streams that are not subject to a specific exclusion or exemption from the hazardous waste regulations (e.g. scrap metal, domestic sewage) or subject to special rules, (lead-acid batteries and precious metals) must be characterized in accordance with the requirements of 40 CFR 261 or corresponding applicable state or local regulations. Base waste determination on user knowledge of the processes and materials used, and analytical data when necessary. Consult with the Installation environmental staff for guidance on specific requirements. Attach support documentation to the Waste Determination form. As a minimum, provide a Waste Determination form for the following waste (this listing is not inclusive): oil- and latex -based painting and caulking products, solvents, adhesives, aerosols, petroleum products, and containers of the original materials.

3.6.2 Solid Waste Management

3.6.2.1 Solid Waste Management Report

Provide copies of the waste handling facilities' weight tickets, receipts, and bills of sale. In lieu of sales documentation, a statement indicating the disposal location for the solid waste that is signed by an employee authorized to legally obligate or bind the firm may be submitted. The

sales documentation [Contractor certification](#) must include the receiver's tax identification number and business, EPA or state registration number, along with the receiver's delivery and business addresses and telephone numbers. For each solid waste retained for the Contractor's own use, submit the information previously described in this paragraph on the solid waste disposal report. Prices paid or received do not have to be reported to the Contracting Officer unless required by other provisions or specifications of this Contract or public law.

3.6.2.2 Control and Management of Solid Wastes

Pick up solid wastes, and place in covered containers that 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. Employ segregation measures so that no hazardous or toxic waste will become co-mingled with non-hazardous solid waste. Transport solid waste off Government property and dispose of it in compliance with [40 CFR 260](#), state, and local requirements for solid waste disposal. A Subtitle D RCRA permitted landfill is the minimum acceptable offsite solid waste disposal option. Verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate. Solid waste disposal offsite must comply with most stringent local, state, and federal requirements, including [40 CFR 241](#), [40 CFR 243](#), and [40 CFR 258](#).

Manage hazardous material used in construction, including but not limited to, aerosol cans, waste paint, cleaning solvents, contaminated brushes, and used rags, in accordance with [49 CFR 173](#).

3.6.3 Control and Management of Hazardous Waste

Do not dispose of hazardous waste on Government property. Do not discharge any waste to a sanitary sewer, storm drain, or to surface waters or conduct waste treatment or disposal on Government property without written approval of the Contracting Officer.

3.6.3.1 [Hazardous Waste/Debris Management](#)

Identify construction activities that will generate hazardous waste or debris. Provide a documented waste determination for resultant waste streams. Identify, label, handle, store, and dispose of hazardous waste or debris in accordance with federal, state, and local regulations, including [40 CFR 261](#), [40 CFR 262](#), [40 CFR 263](#), [40 CFR 264](#), [40 CFR 265](#), [40 CFR 266](#), and [40 CFR 268](#).

Manage hazardous waste in accordance with the approved Hazardous Waste Management Section of the EPP. Store hazardous wastes in approved containers in accordance with [49 CFR 173](#) and [49 CFR 178](#). Hazardous waste generated within the confines of Government facilities is identified as being generated by the Government. Prior to removal of any hazardous waste from Government property, hazardous waste manifests must be signed by personnel from the Installation Environmental Office. Do not bring hazardous waste onto Government property. Provide the Contracting Officer with a copy of waste determination documentation for any solid waste streams that have any potential to be hazardous waste or contain any chemical constituents listed in 40 CFR 372-SUBPART D.

3.6.3.2 Waste Storage/Satellite Accumulation/90 Day Storage Areas

Accumulate hazardous waste at satellite accumulation points and in compliance with 40 CFR 262.34 and applicable state or local regulations. Individual waste streams will be limited to 55 gallons of accumulation (or 1 quart for acutely hazardous wastes). If the Contractor expects to generate hazardous waste at a rate and quantity that makes satellite accumulation impractical, the Contractor may request a temporary 90 day accumulation point be established. Submit a request in writing to the Contracting Officer and provide the following information (Attach Site Plan to the Request):

Contract Number	
Contractor	
Haz/Waste or Regulated Waste POC	
Phone Number	
Type of Waste	
Source of Waste	
Emergency POC	
Phone Number	
Location of the Site	

Attach a Waste Determination form for the expected waste streams. Allow 10 working days for processing this request. Additional compliance requirements (e.g. training and contingency planning) that may be required are the responsibility of the Contractor. Barricade the designated area where waste is being stored and post a sign identifying as follows:

"DANGER - UNAUTHORIZED PERSONNEL KEEP OUT"

3.6.3.3 Hazardous Waste Disposal

3.6.3.3.1 Responsibilities for Contractor's Disposal

Provide hazardous waste manifest to the Installations Environmental Office for review, approval, and signature prior to shipping waste off Government property.

3.6.3.3.1.1 Services

Provide service necessary for the final treatment or disposal of the hazardous material or waste in accordance with 40 CFR 260, local, and state, laws and regulations, and the terms and conditions of the Contract within 60 days after the materials have been generated. These services include necessary personnel, labor, transportation, packaging, detailed analysis (if required for disposal or transportation, include manifesting or complete waste profile sheets, equipment, and compile documentation).

3.6.3.3.1.2 Samples

Obtain a representative sample of the material generated for each job done to provide waste stream determination.

3.6.3.3.1.3 Analysis

Analyze each sample taken and provide analytical results to the Contracting Officer. See paragraph WASTE DETERMINATION DOCUMENTATION.

3.6.3.3.1.4 Labeling

Determine the Department of Transportation's (DOT's) proper shipping names for waste (each container requiring disposal) and demonstrate to the Contracting Officer how this determination is developed and supported by the sampling and analysis requirements contained herein. Label all containers of hazardous waste with the words "Hazardous Waste" or other words to describe the contents of the container in accordance with 40 CFR 262.31 and applicable state or local regulations.

3.6.3.3.2 Contractor Disposal Turn-In Requirements

Hazardous waste generated must be disposed of in accordance with the following conditions to meet installation requirements:

- a. Drums must be compatible with waste contents and drums must meet DOT requirements for 49 CFR 173 for transportation of materials.
- b. Band drums to wooden pallets.
- c. No more than three 55 gallon drums or two 85 gallon over packs are to be banded to a pallet.
- d. Band using 1-1/4 inch minimum band on upper third of drum.
- e. Provide label in accordance with 49 CFR 172.101.
- f. Leave 3 to 5 inches of empty space above volume of material.

3.6.3.4 Universal Waste Management

Manage the following categories of universal waste in accordance with federal, state, and local requirements and installation instructions:

- a. Batteries as described in 40 CFR 273.2
- b. Lamps as described in 40 CFR 273.5
- c. Mercury-containing equipment as described in 40 CFR 273.4

Mercury is prohibited in the construction of this facility, unless specified otherwise, and with the exception of mercury vapor lamps and fluorescent lamps. Dumping of mercury-containing materials and devices such as mercury vapor lamps, fluorescent lamps, and mercury switches, in rubbish containers is prohibited. Remove without breaking, pack to prevent breakage, and transport out of the activity in an unbroken condition for disposal as directed.

3.6.3.5 Electronics End-of-Life Management

Recycle or dispose of electronics waste, including, but not limited to, used electronic devices such computers, monitors, hard-copy devices, televisions, mobile devices, in accordance with 40 CFR 260-262, state, and local requirements, and installation instructions.

3.6.3.6 Disposal Documentation for Hazardous and Regulated Waste

Contact the Contracting Officer for the facility RCRA identification number that is to be used on each manifest.

Submit a copy of the applicable EPA and or state permit(s), manifest(s), or license(s) for transportation, treatment, storage, and disposal of hazardous and regulated waste by permitted facilities. Hazardous or toxic waste manifests must be reviewed, signed, and approved by the Contracting Officer before the Contractor may ship waste. To obtain specific disposal instructions, coordinate with the Installation Environmental Office.

3.6.4 Releases/Spills of Oil and Hazardous Substances

3.6.4.1 Response and Notifications

Exercise due diligence to prevent, contain, and respond to spills of hazardous material, hazardous substances, hazardous waste, sewage, regulated gas, petroleum, lubrication oil, and other substances regulated in accordance with 40 CFR 300. Maintain spill cleanup equipment and materials at the work site. In the event of a spill, take prompt, effective action to stop, contain, curtail, or otherwise limit the amount, duration, and severity of the spill/release. In the event of any releases of oil and hazardous substances, chemicals, or gases; immediately (within 15 minutes) notify the Installation Fire Department, the Installation Command Duty Officer, the Installation Environmental Office, the Contracting Officer.

Submit verbal and written notifications as required by the federal (40 CFR 300.125 and 40 CFR 355), state, local regulations and instructions. Provide copies of the written notification and documentation that a verbal notification was made within 20 days. Spill response must be in accordance with 40 CFR 300 and applicable state and local regulations. Contain and clean up these spills without cost to the Government.

3.6.4.2 Clean Up

Clean up hazardous and non-hazardous waste spills. Reimburse the Government for costs incurred including sample analysis materials, clothing, equipment, and labor if the Government will initiate its own spill cleanup procedures, for Contractor- responsible spills, when: Spill cleanup procedures have not begun within one hour of spill discovery/occurrence; or, in the Government's judgment, spill cleanup is inadequate and the spill remains a threat to human health or the environment.

3.6.5 Mercury Materials

Immediately report to the Environmental Office and the Contracting Officer instances of breakage or mercury spillage. Clean mercury spill area to the satisfaction of the Contracting Officer.

Do not recycle a mercury spill cleanup; manage it as a hazardous waste for disposal.

3.6.6 Wastewater

3.6.6.1 Disposal of wastewater must be as specified below.

3.6.6.1.1 Treatment

Do not allow wastewater from construction activities, such as onsite material processing, concrete curing, foundation and concrete clean-up, water used in concrete trucks, and forms to enter water ways or to be discharged prior to being treated to remove pollutants. Dispose of the construction- related waste water by collecting and placing it in a retention pond where suspended material can be settled out or the water can evaporate to separate pollutants from the water. The site for the retention pond must be coordinated and approved with the Contracting Officer. The residue left in the pond prior to completion of the project must be removed, tested, and disposed of off- Government property in accordance with federal, state, and local laws and regulations. Backfill the area to the original grade, top-soiled, and seeded or sodded.

3.6.6.1.2 Surface Discharge

For discharge of ground water, obtain a state or federal permit specific for pumping and discharging ground water prior to surface discharging. Surface discharge in accordance with federal, state, and local laws and regulations.

3.7 HAZARDOUS MATERIAL MANAGEMENT

Include hazardous material control procedures in the Safety Plan. Address procedures and proper handling of hazardous materials, including the appropriate transportation requirements. Do not bring hazardous material onto Government property that does not directly relate to requirements for the performance of this contract. Submit an SDS and estimated quantities to be used for each hazardous material to the Contracting Officer prior to bringing the material on the installation. Typical materials requiring SDS and quantity reporting include, but are not limited to, oil and latex based painting and caulking products, solvents, adhesives, aerosol, and petroleum products. Use hazardous materials in a manner that minimizes the amount of hazardous waste generated. Containers of hazardous materials must have National Fire Protection Association labels or their equivalent. Certify that hazardous materials removed from the site are hazardous materials and do not meet the definition of hazardous waste, in accordance with 40 CFR 261.

3.8 PREVIOUSLY USED EQUIPMENT

Clean previously used construction equipment prior to bringing it onto the project site. Equipment must be free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. Consult with the U.S. Department of Agriculture jurisdictional office for additional cleaning requirements.

3.9 MILITARY MUNITIONS

In the event military munitions, as defined in 40 CFR 260, are discovered or uncovered, immediately stop work in that area and immediately inform the Contracting Officer.

3.10 PETROLEUM, OIL, LUBRICANT (POL) STORAGE AND FUELING

POL products include flammable or combustible liquids, such as gasoline, diesel, lubricating oil, used engine oil, hydraulic oil, mineral oil, and cooking oil. Store POL products and fuel equipment and motor vehicles in a manner that affords the maximum protection against spills into the environment. Manage and store POL products in accordance with EPA 40 CFR 112, and other federal, state, regional, and local laws and regulations. Use secondary containments, dikes, curbs, and other barriers, to prevent POL products from spilling and entering the ground, storm or sewer drains, stormwater ditches or canals, or navigable waters of the United States. Describe in the EPP (see paragraph ENVIRONMENTAL PROTECTION PLAN) how POL tanks and containers must be stored, managed, and inspected and what protections must be provided.

3.10.1 Used Oil Management

Manage used oil generated on site in accordance with 40 CFR 279. Determine if any used oil generated while onsite exhibits a characteristic of hazardous waste. Used oil containing 1,000 parts per million of solvents is considered a hazardous waste and disposed of at the Contractor's expense. Used oil mixed with a hazardous waste is also considered a hazardous waste. Dispose in accordance with paragraph HAZARDOUS WASTE DISPOSAL.

3.10.2 Oil Storage Including Fuel Tanks

Provide secondary containment and overfill protection for oil storage tanks. A berm used to provide secondary containment must be of sufficient size and strength to contain the contents of the tanks plus 5 inches freeboard for precipitation. Construct the berm to be impervious to oil for 72 hours that no discharge will permeate, drain, infiltrate, or otherwise escape before cleanup occurs. Use drip pans during oil transfer operations; adequate absorbent material must be onsite to clean up any spills and prevent releases to the environment. Cover tanks and drip pans during inclement weather. Provide procedures and equipment to prevent overfilling of tanks. If tanks and containers with an aggregate aboveground capacity greater than 1320 gallons will be used onsite (only containers with a capacity of 55 gallons or greater are counted), provide and implement a SPCC plan meeting the requirements of 40 CFR 112. Do not bring underground storage tanks to the installation for Contractor use during a project. Submit the SPCC plan to the Contracting Officer for approval.

Monitor and remove any rainwater that accumulates in open containment dikes or berms. Inspect the accumulated rainwater prior to draining from a containment dike to the environment, to determine there is no oil sheen present.

3.11 INADVERTENT DISCOVERY OF PETROLEUM-CONTAMINATED SOIL OR HAZARDOUS WASTES

If petroleum-contaminated soil, or suspected hazardous waste is found during construction that was not identified in the Contract documents, immediately notify the Contracting Officer. Do not disturb this material until authorized by the Contracting Officer.

3.12 POST CONSTRUCTION CLEANUP

Clean up areas used for construction in accordance with Contract Clause: "Cleaning Up". Unless otherwise instructed in writing by the Contracting Officer, 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 vestiges of construction prior to final acceptance of the work. Grade parking area and similar temporarily used areas to conform with surrounding contours.

-- End of Section --

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SECTION 01 58 00

PROJECT IDENTIFICATION

08/09

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1.1.1 Project Signboard (Air Force)

PART 2 PRODUCTS

PART 3 EXECUTION

ATTACHMENTS:

project sign detail

-- End of Section Table of Contents --

SECTION 01 58 00

PROJECT IDENTIFICATION
08/09

PART 1 GENERAL

1.1 PROJECT SIGN

Prior to initiating any work on site, provide one project identification sign at the location designated by the Contracting Officer. Construct the sign in accordance with project sign detail, which can be downloaded at: <https://www.wbdg.org/FFC/NAVGRAPH/graphdoc.pdf>. Maintain sign throughout the life of the project. Upon completion of the project, remove the sign from the site.

1.1.1 Project Signboard (Air Force)

Furnish the sign, maintain the sign during construction, and remove the sign from the job site upon completion of the project. Details of sign graphics and construction are indicated in Plates 6 and 7 of sketches attached to this section.

The 18 inch maximum width and height for Air Force and rectangular height for NAVFAC applied stickers shall be created in the design indicated, and printed on a 2 mil transparent film. The weather resistant, self adhering film shall be rated for a minimum of 2 year exterior vertical exposure and be mounted to sign with pressure sensitive, permanent acrylic adhesive. Shop cut sticker to square shape and provide pull-off backing sheet on adhesive side of sticker for shipping.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

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DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 74 19

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

01/07

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-- End of Section Table of Contents --

SECTION 01 74 19

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT
01/07

PART 1 GENERAL

1.1 REFERENCES

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

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

40 CFR 246.200

High-grade Paper Recovery

1.2 GOVERNMENT POLICY

Government policy is to apply sound environmental principles in the design, construction and use of facilities. As part of the implementation of that policy: (1) practice efficient waste management when sizing, cutting, and installing products and materials and (2) use all reasonable means to divert construction and demolition waste from landfills and incinerators and to facilitate their recycling or reuse. Divert a minimum of 60 percent by weight of total project solid waste from the landfill.

1.3 MANAGEMENT

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

1.4 SUBMITTALS

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

SD-01 Preconstruction Submittals

Waste Management Plan; G

SD-11 Closeout Submittals

Records

1.5 MEETINGS

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

- a. Preconstruction meeting.
- b. Regular QC meetings.
- c. Work safety meetings.

1.6 WASTE MANAGEMENT PLAN

Submit a waste management plan within 15 days after contract award and not less than 10 days before the preconstruction meeting. The plan demonstrates how to meet the the project waste diversion goal. Also, include the following in the plan:

- a. Name of individuals on the Contractor's staff responsible for waste prevention and management.
- b. Actions that will be taken to reduce solid waste generation, including coordination with subcontractors to ensure awareness and participation.
- c. Description of the regular meetings to be held to address waste management.
- d. Description of the specific approaches to be used in recycling/reuse of the various materials generated, including the areas on site and equipment to be used for processing, sorting, and temporary storage of wastes.
- e. Characterization, including estimated types and quantities, of the waste to be generated.
- f. Name of landfill and/or incinerator to be used and the estimated costs for use, assuming that there would be no salvage or recycling on the project.
- g. Identification of local and regional reuse programs, including non-profit organizations such as schools, local housing agencies, and organizations that accept used materials such as materials exchange networks and Habitat for Humanity. Include the name, location, and phone number for each reuse facility to be used, and provide a copy of the permit or license for each facility.

- h. List of specific waste materials that will be salvaged for resale, salvaged and reused on the current project, salvaged and stored for reuse on a future project, or recycled. Identify the recycling facilities by name, location, and phone number, including a copy of the permit or license for each facility.
- i. Identification of materials that cannot be recycled/reused with an explanation or justification, to be approved by the Contracting Officer.
- j. Description of the means by which any waste materials identified in item (h) above will be protected from contamination.
- k. Description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site).
- l. Anticipated net cost savings determined by subtracting Contractor program management costs and the cost of disposal from the revenue generated by sale of the materials and the incineration and/or landfill cost avoidance.

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

1.7 RECORDS

Maintain records to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration. Make the records available to the Contracting Officer during construction, and deliver to the Contracting Officer upon completion of the construction a copy of the records.

1.8 COLLECTION

Separate, store, protect, and handle at the site identified recyclable and salvageable waste products in a manner that maximizes recyclability and salvagability of identified materials. Provide the necessary containers, bins and storage areas to facilitate effective waste management and clearly and appropriately identify them. Provide materials for barriers and enclosures around recyclable material storage areas which are nonhazardous and recyclable or reusable. Locate out of the way of construction traffic. Provide adequate space for pick-up and delivery and convenience to subcontractors. Recycling and waste bin areas are to be kept neat and clean, and handle recyclable materials to prevent contamination of materials from incompatible products and materials. Clean contaminated materials prior to placing in collection containers. Use cleaning materials that are nonhazardous and biodegradable. Handle hazardous waste and hazardous materials in accordance with applicable regulations and coordinate with Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS. Separate materials by one of the following methods:

1.8.1 Source Separated Method.

Separate waste products and materials that are recyclable from trash and

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

- a. Land clearing debris.
- b. Asphalt.
- c. Concrete and masonry.
- d. Metal (e.g. banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized, stainless steel, aluminum, copper, zinc, lead brass, bronze).
 - (1) Ferrous.
 - (2) Non-ferrous.
- e. Wood (nails and staples allowed).
- f. Debris.
- g. Glass (colored glass allowed).
- h. Paper.
 - (1) Bond.
 - (2) Newsprint.
 - (3) Cardboard and paper packaging materials.
- i. Plastic.

Type	
1	Polyethylene Terephthalate (PET, PETE)
2	High Density Polyethylene (HDPE)
3	Vinyl (Polyvinyl Chloride or PVC)
4	Low Density Polyethylene (LDPE)
5	Polypropylene (PP)
6	Polystyrene (PS)

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

- j. Gypsum.
- k. Non-hazardous paint and paint cans.
- l. Carpet.
- m. Ceiling tiles.
- n. Insulation.
- o. Beverage containers.

1.8.2 Co-Mingled Method.

Place waste products and recyclable materials into a single container and then transport to a recycling facility where the recyclable materials are sorted and processed.

1.8.3 Other Methods.

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

1.9 DISPOSAL

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

1.9.1 Reuse.

Give first consideration to salvage for reuse since little or no re-processing is necessary for this method, and less pollution is created when items are reused in their original form. Coordinate reuse with the Contracting Officer. Consider sale or donation of waste suitable for reuse.

1.9.2 Recycle.

Recycle waste materials not suitable for reuse, but having value as being recyclable. Recycle all fluorescent lamps, HID lamps, and mercury-containing thermostats removed from the site. In addition, the 45 Space Wing (45 SW) recycles high-grade office paper and corrugated containers (cardboard) as required in IAW 40 CFR 246.200, 201 and 202; these items must be recycled and not placed in trash containers. Large pieces of cardboard must be broken down and placed in a cardboard recycle

bin or placed next to mixed paper or secure bins (Styrofoam used in shipping packages is not recyclable). Arrange for timely pickups from the site or deliveries to recycling facilities in order to prevent contamination of recyclable materials.

1.9.3 Waste

Dispose of materials with no practical use or economic benefit to waste-to-energy plants where available. As the last choice, dispose of materials at a landfill or incinerator.

1.9.4 Return

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

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used. -- End of Section --

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SECTION 01 78 00

CLOSEOUT SUBMITTALS

08/11

PART 1 GENERAL

1.1 REFERENCES

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

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 1-300-08

(2009, with Change 2, 2011) 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.

1.3 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

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

SD-03 Product Data

Warranty Management Plan

Warranty Tags

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

Interim DD Form 1354; G

Checklist for DD Form 1354; G

High Performance and Sustainable Building (HPSB) Checklist; 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 four sets 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 to the Government upon acceptance of the work. 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. A 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. 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)."

Record each product used in the project that has a requirement or option of containing recycled content, noting total price, total value of post-industrial recycled content, total value of post-consumer recycled content, exemptions (1, 2, 3, or 4, as indicated), and comments. Recycled content values may be determined by weight or volume percent, but must be consistent throughout.

PART 3 EXECUTION

3.1 AS-BUILT DRAWINGS

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 and/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 foundations, etc.
- 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.
- l. Modifications (include within change order price the cost to change working as-built markup drawings to reflect modifications).
- m. Actual location of anchors, construction and control joints, etc., in concrete.
- n. Unusual or uncharted obstructions that are encountered in the contract work area during construction.
- o. Location, extent, thickness, and size of stone protection particularly where it will be normally submerged by water.

3.2 RECORD DRAWING FILES

Prepare record drawings using the specified electronic file format applying the same graphic standards specified for original drawings. The title block and drawing border to be used for any new final record drawings must be identical to that used on the contract drawings. Accomplish additions and corrections to the contract drawings using CAD files. Provide all program files and hardware necessary to prepare final PDF record drawings. The Contracting Officer will review final PDF record drawings for accuracy and return them to the Contractor for required corrections, changes, additions, and deletions.

3.2.1 Rename the CAD Drawing files

Rename the CAD Drawing files using the contract number as the Project Code field, (e.g., W91238-15-C-10A-102.DWG as instructed in the Pre-Construction conference. Use only those renamed files for the Marked-up changes. Make all changes on the layer/level as the original item.

- a. For AutoCAD files (DWG), enter all as-built delta changes and notations on the AS-BUILT layer.
- b. When final revisions have been completed, show the wording "RECORD DRAWING AS-BUILTS" followed by the name of the Contractor in letters at least 3/16 inch high on the cover sheet drawing. Date RECORD DRAWING AS-BUILTS" drawing revisions in the revision block.

3.2.2 Record Drawings

Submit the final record PDF and CAD drawings package for the entire project within 20 days of substantial completion of all phases of work. Submit one set of ANSI D size PDF and CAD files on optical disc, read-only memory (ROM), two sets of ANSI D size prints and one set of the approved working record drawings. The package must be complete in all details and identical in form and function to the contract drawing files supplied by the Government.

3.3 REAL PROPERTY RECORD

Near the completion of Project, but a minimum of 60 days prior to final acceptance of the work, complete 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. Attach the Real Property receiving Component's completed High Performance and Sustainable Building (HPSB) Checklist for each applicable building to the completed DD 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.

3.4 OPERATION AND MAINTENANCE MANUALS

Provide project operation and maintenance manuals as specified in Section 01 78 23 OPERATION AND MAINTENANCE MANUALS DATA.

3.5 CLEANUP

Leave premises "broom clean." Clean interior and exterior glass surfaces exposed to view; remove temporary labels, stains and foreign substances; polish transparent and glossy surfaces; vacuum carpeted and soft surfaces. Clean equipment and fixtures to a sanitary condition. Clean Replace filters of operating equipment. Clean debris from roofs, gutters, downspouts and drainage systems. Sweep paved areas and rake clean landscaped areas. Remove waste and surplus materials, rubbish and construction facilities from the site.

-- End of Section --

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SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

08/15

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. 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

1.2 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.

1.2.1 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.

1.2.2 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 5 for commissioned items without a specified data package requirement in the individual technical sections. Provide a Data Package 5

instead of Data Package 1 or 2, as specified in the individual technical section, for items that are commissioned.

1.2.3 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.

1.2.4 Commissioning Authority Review and Approval

Submit the commissioned systems and equipment submittals to the Commissioning Authority (CxA) to review for completeness and applicability. Obtain validation from the CxA that the systems and equipment provided meet the requirements of the Contract documents and design intent, particularly as they relate to functionality, energy performance, water performance, maintainability, sustainability, system cost, indoor environmental quality, and local environmental impacts. The CxA communicates deficiencies to the Contracting Officer. Submit the O&M manuals to the Contracting Officer upon a successful review of the corrections, and with the CxA recommendation for approval and acceptance of these O&M manuals. This work is in addition to the normal review procedures for O&M data.

1.3 O&M DATABASE

Develop an editable, electronic spreadsheet based on the equipment in the Operation and Maintenance Manuals that contains the information required to start a preventive maintenance program. As a minimum, provide list of system equipment, location installed, warranty expiration date, manufacturer, model, and serial number.

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.

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.

1.5.3 Repair

Provide manufacturer's recommended procedures and instructions for correcting problems and making repairs.

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 Manufacturer's Instructions

Provide a copy of SD-08 Manufacturer's Instructions submittals documented with the required approval.

1.5.4.3 O&M Submittal Data

Provide a copy of SD-10 Operation and Maintenance Data submittals documented with the required approval.

1.5.4.4 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.

1.5.4.5 Warranty Information

List and explain the various warranties and clearly identify the servicing and technical precautions prescribed by the manufacturers or contract documents in order to keep warranties in force. Include warranty information for primary components of the system. Provide copies of warranties required by Section 01 78 00 CLOSEOUT SUBMITTALS.

1.5.4.6 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.

1.5.4.7 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.

1.5.4.8 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.

1.5.4.9 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.

1.5.4.10 Field Test Reports

Provide a copy of Field Test Reports (SD-06) submittals documented with the required approval.

1.5.4.11 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
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 - 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

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 building maintenance personnel, and applicable building occupants. Instructors must be well-versed in the particular systems that they are presenting. Address aspects of the Operation and Maintenance Manual submitted in accordance with Section 01 78 00 CLOSEOUT SUBMITTALS.. 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. Training plan must be approved by the Quality Control Manager (QC), [Commissioning Authority \(CxA\)](#) prior to forwarding to the Contracting Officer. Also, coordinate the training schedule with the Contracting Officer and QC and CxA. 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 QC and [CxA](#) is responsible for overseeing and approving the content and adequacy of the training. 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.

3.1.1.3 Training Outline

Provide the Operation and Maintenance Manual Files (Bookmarked PDF) 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.

3.1.1.4 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.

3.1.1.5 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.

3.1.1.6 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.

3.1.1.7 Quality Control Coordination

Coordinate this training with the QC and CxA.

-- End of Section --

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ASBESTOS REMEDIATION

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PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP Z9.2 (2018) Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems

ASTM INTERNATIONAL (ASTM)

ASTM C732 (2006; R 2012) Aging Effects of Artificial Weathering on Latex Sealants

ASTM D2794 (1993; R 2010) Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)

ASTM D4397 (2016) Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications

ASTM D522/D522M (2014) Mandrel Bend Test of Attached Organic Coatings

ASTM E119 (2018c; E 2018) Standard Test Methods for Fire Tests of Building Construction and Materials

ASTM E1368 (2014) Visual Inspection of Asbestos Abatement Projects

ASTM E1494 (2012) Encapsulants for Spray- or Trowel-Applied Friable Asbestos-Containing Building Materials

ASTM E736/E736M (2017) Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members

ASTM E84 (2019b) Standard Test Method for Surface Burning Characteristics of Building Materials

ASTM E96/E96M (2016) Standard Test Methods for Water Vapor Transmission of Materials

COMPRESSED GAS ASSOCIATION (CGA)

CGA G-7 (2014) Compressed Air for Human
Respiration; 6th Edition

INTERNATIONAL SAFETY EQUIPMENT ASSOCIATION (ISEA)

ANSI/ISEA Z87.1 (2015) Occupational and Educational
Personal Eye and Face Protection Devices

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 701 (2019) Standard Methods of Fire Tests for
Flame Propagation of Textiles and Films

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH NMAM (2016; 5th Ed) NIOSH Manual of Analytical
Methods

U.S. ARMY CORPS OF ENGINEERS (USACE)

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

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 340/1-90/018 (1990) Asbestos/NESHAP Regulated Asbestos
Containing Materials Guidance

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

29 CFR 1910.147 The Control of Hazardous Energy (Lock
Out/Tag Out)

29 CFR 1926.103 Respiratory Protection

29 CFR 1926.1101 Asbestos

29 CFR 1926.200 Accident Prevention Signs and Tags

29 CFR 1926.51 Sanitation

29 CFR 1926.59 Hazard Communication

40 CFR 61-SUBPART A General Provisions

40 CFR 61-SUBPART M National Emission Standard for Asbestos

40 CFR 763 Asbestos

42 CFR 84 Approval of Respiratory Protective Devices

49 CFR 107 Hazardous Materials Program Procedures

49 CFR 171 General Information, Regulations, and
Definitions

49 CFR 172 Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements

49 CFR 173 Shippers - General Requirements for Shipments and Packagings

U.S. NAVAL FACILITIES ENGINEERING COMMAND (NAVFAC)

ND OPNAVINST 5100.23 (2005; Rev G) Navy Occupational Safety and Health (NAVOSH) Program Manual

UNDERWRITERS LABORATORIES (UL)

UL 586 (2009; Reprint Dec 2017) UL Standard for Safety High-Efficiency Particulate, Air Filter Units

1.2 DEFINITIONS

1.2.1 ACM

Asbestos Containing Materials.

1.2.2 Amended Water

Water containing a wetting agent or surfactant with a maximum surface tension of 0.00042 psi.

1.2.3 Area Sampling

Sampling of asbestos fiber concentrations which approximates the concentrations of asbestos in the theoretical breathing zone but is not actually collected in the breathing zone of an employee.

1.2.4 Asbestos

The term asbestos includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, and actinolite asbestos and any of these minerals that has been chemically treated or altered. Materials are considered to contain asbestos if the asbestos content of the material is determined to be at least one percent.

1.2.5 Asbestos Control Area

That area where asbestos removal operations are performed which is isolated by physical boundaries which assist in the prevention of the uncontrolled release of asbestos dust, fibers, or debris.

1.2.6 Asbestos Fibers

Those fibers having an aspect ratio of at least 3:1 and longer than 5 micrometers as determined by National Institute for Occupational Safety and Health (NIOSH) Method 7400.

1.2.7 Asbestos Permissible Exposure Limit

0.1 fibers per cubic centimeter of air as an 8-hour time weighted average

measured in the breathing zone as defined by 29 CFR 1926.1101 or other Federal legislation having legal jurisdiction for the protection of workers health.

1.2.8 Authorized Person

Any person authorized by the Contractor and required by work duties to be present in the regulated areas.

1.2.9 Background

The ambient airborne asbestos concentration in an uncontaminated area as measured prior to any asbestos hazard abatement efforts. Background concentrations for other (contaminated) areas are measured in similar but asbestos free locations.

1.2.10 Competent Person (CP)

A person meeting the requirements for competent person as specified in 29 CFR 1926.1101 including a person capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, and is specifically trained in a training course which meet the criteria of EPA's Model Accreditation Plan (40 CFR 763) for project designer or supervisor, or its equivalent. The competent person must have a current State of Florida asbestos contractors or supervisors license.

1.2.11 Contractor

The Contractor is that individual, or entity under contract to perform the herein listed work.

1.2.12 Disposal Bag

A 6 mil thick, leak-tight plastic bag, pre-labeled in accordance with 29 CFR 1926.1101, used for transporting asbestos waste from containment to disposal site.

1.2.13 Disturbance

Activities that disrupt the matrix of ACM, crumble or pulverize ACM, or generate visible debris from ACM. Disturbance includes cutting away small amounts of ACM, no greater than the amount which can be contained in one standard sized glovebag or waste bag, not larger than 60 inches in length and width in order to access a building component.

1.2.14 Encapsulation

The abatement of an asbestos hazard through the appropriate use of chemical encapsulants.

1.2.15 Encapsulants

Specific materials in various forms used to chemically or physically entrap asbestos fibers in various configurations to prevent these fibers from becoming airborne. There are four types of encapsulants as follows which must comply with performance requirements as specified herein.

- a. Removal Encapsulant (can be used as a wetting agent)
- b. Bridging Encapsulant (used to provide a tough, durable surface coating to asbestos containing material)
- c. Penetrating Encapsulant (used to penetrate the asbestos containing material encapsulating all asbestos fibers and preventing fiber release due to routine mechanical damage)
- d. Lock-Down Encapsulant (used to seal off or "lock-down" minute asbestos fibers left on surfaces from which asbestos containing material has been removed).

1.2.16 Friable Asbestos Material

A term defined in 40 CFR 61-SUBPART M and EPA 340/1-90/018 meaning any material which contains more than 1 percent asbestos, as determined using the method specified in 40 CFR 763, Polarized Light Microscopy (PLM), that when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

1.2.17 Glovebag Technique

Those asbestos removal and control techniques put forth in 29 CFR 1926.1101.

1.2.18 Government Consultant (GC)

That qualified person employed directly by the Government to monitor, sample, inspect the work or in some other way advise the Contracting Officer. The GC is normally a private consultant, but can be an employee of the Government.

1.2.19 HEPA Filter Equipment

High efficiency particulate air (HEPA) filtered vacuum and exhaust ventilation equipment with a filter system capable of collecting and retaining asbestos fibers. Filters must retain 99.97 percent of particles 0.3 microns or larger as indicated in UL 586.

1.2.20 Model Accreditation Plan (MAP)

USEPA training accreditation requirements for persons who work with asbestos as specified in 40 CFR 763.

1.2.21 Negative Pressure Enclosure (NPE)

That engineering control technique described as a negative pressure enclosure in 29 CFR 1926.1101.

1.2.22 NESHAP

National Emission Standards for Hazardous Air Pollutants. The USEPA NESHAP regulation for asbestos is at 40 CFR 61-SUBPART M.

1.2.23 Nonfriable Asbestos Material

Material that contains asbestos in which the fibers have been immobilized by a bonding agent, coating, binder, or other material so that the asbestos is well bound and will not normally release asbestos fibers during any

appropriate use, handling, storage or transportation. It is understood that asbestos fibers may be released under other conditions such as demolition, removal, or mishap.

1.2.24 Permissible Exposure Limits (PELs)

1.2.24.1 PEL-Time Weighted Average (TWA)

Concentration of asbestos not in excess of 0.1 fibers per cubic centimeter of air (f/cc) as an 8-hour time weighted average (TWA).

1.2.24.2 PEL-Excursion Limit

An airborne concentration of asbestos not in excess of 1.0 f/cc of air as averaged over a sampling period of 30 minutes.

1.2.25 Personal Sampling

Air sampling which is performed to determine asbestos fiber concentrations within the breathing zone of a specific employee, as performed in accordance with 29 CFR 1926.1101.

1.2.26 Private Qualified Person (PQP)

That qualified person hired by the Contractor to perform the herein listed tasks.

1.2.27 Qualified Person (QP)

A Registered Architect, Professional Engineer, Certified Industrial Hygienist, consultant or other qualified person who has successfully completed training and is therefore accredited under a legitimate State Model Accreditation Plan as described in 40 CFR 763 as a Building Inspector, Contractor/Supervisor Abatement Worker, and Asbestos Project Designer; and has successfully completed the National Institute of Occupational Safety and Health (NIOSH) 582 course "Sampling and Evaluating Airborne Asbestos Dust" or equivalent. The QP must be qualified to perform visual inspections as indicated in ASTM E1368. The QP must be appropriately licensed in the State of Florida.

1.2.28 TEM

Refers to Transmission Electron Microscopy.

1.2.29 Time Weighted Average (TWA)

The TWA is an 8-hour time weighted average airborne concentration of asbestos fibers.

1.2.30 Transite

A generic name for asbestos cement wallboard and pipe.

1.2.31 Wetting Agent

A chemical added to water to reduce the water's surface tension thereby increasing the water's ability to soak into the material to which it is applied. An equivalent wetting agent must have a surface tension of at most 0.00042 psi.

1.2.32 Worker

Individual (not designated as the Competent Person or a supervisor) who performs asbestos work and has completed asbestos worker training required by 29 CFR 1926.1101, to include EPA Model Accreditation Plan (MAP) "Worker" training; accreditation, if required by the OSHA Class of work to be performed or by the state where the work is to be performed. The worker must be appropriately licensed in the State of Florida.

1.3 REQUIREMENTS

1.3.1 Description of Work

The work covered by this section includes the handling and control of asbestos containing materials and describes some of the resultant procedures and equipment required to protect workers, the environment and occupants of the building or area, or both, from contact with airborne asbestos fibers. The work also includes the disposal of any asbestos containing materials generated by the work. More specific operational procedures must be outlined in the Asbestos Hazard Abatement Plan called for elsewhere in this specification. The asbestos work includes the demolition, removal and encapsulation, which is governed by 40 CFR 763. Under normal conditions non-friable or chemically bound materials containing asbestos would not be considered hazardous; however, this material may release airborne asbestos fibers during demolition and removal and therefore must be handled in accordance with the removal and disposal procedures as specified herein. Provide negative pressure enclosure techniques as outlined in this specification. The work area will be evacuated during the asbestos abatement work. A competent person must supervise asbestos removal work as specified herein.

1.3.1.1 Wallboard/Joint Compound

Both composite samples of the wallboard and discrete samples of the components (wallboard and joint compound) have been tested and results are attached.

Discrete samples of the wallboard were tested for the underside of all of the exterior awnings and found to contain greater than one percent asbestos at the exterior awing. Discrete samples of the joint compound at the bank side break room were tested and found to contain greater than one percent asbestos thru-out bank side. Refer to the Pb03 Environmental Monitoring Report No. ACM-152-03-21-19-01 dated March 21, 2019.

1.3.2 Unexpected Discovery of Asbestos

Notify the Contracting Officer if any previously untested building components suspected to contain asbestos are impacted by the work.

1.3.3 Medical Requirements

Provide medical requirements including but not limited to medical surveillance and medical record keeping as listed in 29 CFR 1926.1101.

1.3.3.1 Medical Examinations

Before exposure to airborne asbestos fibers, provide workers with a comprehensive medical examination as required by 29 CFR 1926.1101 or other

pertinent State or local directives. This requirement must have been satisfied within the 12 months prior to the start of work on this contract. The same medical examination must be given on an annual basis to employees engaged in an occupation involving asbestos and within 30 calendar days before or after the termination of employment in such occupation. Specifically identify x-ray films of asbestos workers to the consulting radiologist and mark medical record jackets with the word "ASBESTOS."

1.3.3.2 Medical Records

Maintain complete and accurate records of employees' medical examinations, medical records, and exposure data for a period of 50 years after termination of employment and make records of the required medical examinations and exposure data available for inspection and copying to: The Assistant Secretary of Labor for Occupational Safety and Health (OSHA), or authorized representatives of them, and an employee's physician upon the request of the employee or former employee.

1.3.4 Employee Training

Submit certificates, prior to the start of work but after the main abatement submittal, signed by each employee indicating that the employee has received training in the proper handling of materials and wastes that contain asbestos in accordance with 40 CFR 763; understands the health implications and risks involved, including the illnesses possible from exposure to airborne asbestos fibers; understands the use and limits of the respiratory equipment to be used; and understands the results of monitoring of airborne quantities of asbestos as related to health and respiratory equipment as indicated in 29 CFR 1926.1101 on an initial and annual basis. Organize certificates by individual worker, not grouped by type of certification. Post appropriate evidence of compliance with the training requirements of 40 CFR 763. Train personnel involved in the asbestos control work in accordance with United States Environmental Protection Agency (USEPA) Asbestos Hazard Emergency Response Act (AHERA) training criteria or State training criteria whichever is more stringent. Document the training by providing: dates of training, training entity, course outline, names of instructors, and qualifications of instructors upon request by the Contracting Officer. Furnish each employee with respirator training and fit testing administered by the PQP as required by 29 CFR 1926.1101 and 29 CFR 1926.103. Fully cover engineering and other hazard control techniques and procedures. Asbestos workers must have a current State of Florida asbestos worker's license.

1.3.5 Permits, Licenses, and Notifications

Prior to the start of work, obtain necessary permits and licenses in conjunction with asbestos removal, encapsulation, hauling, and disposition, and furnish notification of such actions required by Federal, State, regional, and local authorities. Notify the local air pollution control district/agency and the Contracting Officer in writing 20 working days prior to commencement of work in accordance with 40 CFR 61-SUBPART M. Notify the Contracting Officer and other appropriate Government agencies in writing 20 working days prior to the start of asbestos work as indicated in applicable laws, ordinances, criteria, rules, and regulations. Submit copies of all Notifications to the Contracting Officer.

1.3.6 Environment, Safety and Health Compliance

In addition to detailed requirements of this specification, comply with those applicable laws, ordinances, criteria, rules, and regulations of Federal, State, regional, and local authorities regarding handling, storing, transporting, and disposing of asbestos waste materials. Comply with the applicable requirements of the current issue of EM 385-1-1, 29 CFR 1926.1101, 40 CFR 61-SUBPART A, 40 CFR 61-SUBPART M, 40 CFR 763 and ND OPNAVINST 5100.23. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting the work. Where the requirements of this specification, applicable laws, rules, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirement as defined by the Government apply.

1.3.7 Respiratory Protection Program

Establish and implement a respirator program as required by 29 CFR 1926.1101, and 29 CFR 1926.103. Submit a written description of the program to the Contracting Officer. Submit a written program manual or operating procedure including methods of compliance with regulatory statutes.

1.3.7.1 Respirator Program Records

Submit records of the respirator program as required by 29 CFR 1926.103, and 29 CFR 1926.1101.

1.3.7.2 Respirator Fit Testing

The Contractor's PQP must conduct a qualitative or quantitative fit test conforming to 29 CFR 1926.103 for each worker required to wear a respirator, and any authorized visitors who enter a regulated area where respirators are required to be worn. A respirator fit test must be performed prior to initially wearing a respirator and every 12 months thereafter. If physical changes develop that will affect the fit, a new fit test must be performed. Functional fit checks must be performed each time a respirator is put on and in accordance with the manufacturer's recommendation.

1.3.7.3 Respirator Selection and Use Requirements

Provide respirators, and ensure that they are used as required by 29 CFR 1926.1101 and in accordance with CGA G-7 and the manufacturer's recommendations. Respirators must be approved by the National Institute for Occupational Safety and Health NIOSH, under the provisions of 42 CFR 84, for use in environments containing airborne asbestos fibers. For air-purifying respirators, the particulate filter must be high-efficiency particulate air (HEPA)/(N-,R-,P-100). The initial respirator selection and the decisions regarding the upgrading or downgrading of respirator type must be made by the Contractor's Designated IH based on the measured or anticipated airborne asbestos fiber concentrations to be encountered.

1.3.8 Asbestos Hazard Control Supervisor

The Contractor must be represented on site by a supervisor, trained using the model Contractor accreditation plan as indicated in the Federal statutes for all portions of the herein listed work.

1.3.9 Hazard Communication

Adhere to all parts of 29 CFR 1926.59 and provide the Contracting Officer with a copy of the Safety Data Sheets (SDS) for all materials brought to the site.

1.3.10 Asbestos Hazard Abatement Plan

Submit a detailed plan of the safety precautions such as lockout, tagout, tryout, fall protection, and confined space entry procedures and equipment and work procedures to be used in the encapsulation, removal and demolition of materials containing asbestos. The plan, not to be combined with other hazard abatement plans, must be prepared, signed, and sealed by the PQP. Provide a Table of Contents for each abatement submittal, which follows the sequence of requirements in the contract. The plan must include but not be limited to the precise personal protective equipment to be used including, but not limited to, respiratory protection, type of whole-body protection and if reusable coveralls are to be employed decontamination methods (operations and quality control plan), the location of asbestos control areas including clean and dirty areas, buffer zones, showers, storage areas, change rooms, removal encapsulation method, interface of trades involved in the construction, sequencing of asbestos related work, disposal plan, type of wetting agent and asbestos sealer to be used, locations of local exhaust equipment, planned air monitoring strategies, and a detailed description of the method to be employed in order to control environmental pollution. The plan must also include (both fire and medical emergency) response plans and an Activity Hazard Analyses (AHAs) in accordance with EM 385-1-1. The Asbestos Hazard Abatement Plan must be approved in writing prior to starting any asbestos work. The Contractor, Asbestos Hazard Control Supervisor,, CP and PQP must meet with the Contracting Officer prior to beginning work, to discuss in detail the Asbestos Hazard Abatement Plan, including work procedures and safety precautions. Once approved by the Contracting Officer, the plan will be enforced as if an addition to the specification. Any changes required in the specification as a result of the plan must be identified specifically in the plan to allow for free discussion and approval by the Contracting Officer prior to starting work.

1.3.11 Testing Laboratory

Submit the name, address, and telephone number of each testing laboratory selected for the sampling, analysis, and reporting of airborne concentrations of asbestos fibers along with evidence that each laboratory selected holds the appropriate State license and permits and certification that each laboratory is American Industrial Hygiene Association (AIHA) accredited and that persons counting the samples have been judged proficient by current inclusion on the AIHA Asbestos Analysis Registry (AAR) and successful participation of the laboratory in the Proficiency Analytical Testing (PAT) Program. Where analysis to determine asbestos content in bulk materials or transmission electron microscopy is required, submit evidence that the laboratory is accredited by the National Institute of Science and Technology (NIST) under National Voluntary Laboratory Accreditation Program (NVLAP) for asbestos analysis. The testing laboratory firm must be independent of the asbestos contractor and must have no employee or employer relationship which could constitute a conflict of interest.

1.3.12 Landfill Approval

Submit written evidence that the landfill is approved for asbestos disposal

by the U.S. Environmental Protection Agency and local regulatory agencies. Within three working days after delivery, submit detailed [delivery tickets](#), prepared, signed, and dated by an agent of the landfill, certifying the amount of asbestos materials delivered to the landfill. Submit a copy of the [waste shipment records](#) within one day of the shipment leaving the project site.

1.3.13 [Transporter Certification](#)

Submit written evidence that the transporter is approved to transport asbestos waste in accordance with the DOT requirements of [49 CFR 171](#), [49 CFR 172](#) and [49 CFR 173](#) as well as registration requirements of [49 CFR 107](#) and all other State and local regulatory agency requirements.

1.3.14 [Medical Certification](#)

Provide a written certification for each worker and supervisor, signed by a licensed physician indicating that the worker and supervisor has met or exceeded all of the medical prerequisites listed herein and in [29 CFR 1926.1101](#) and [29 CFR 1926.103](#) as prescribed by law. Submit certificates prior to the start of work but after the main abatement submittal.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation. Submit the following in accordance with Section [01 33 00 SUBMITTAL PROCEDURES](#):

[SD-03 Product Data](#)

[Amended Water; G](#)

[Safety Data Sheets \(SDS\) for All Materials; G](#)

[Encapsulants; G](#)

[Respirators; G](#)

[Local Exhaust Equipment; G](#)

[Pressure Differential Automatic Recording Instrument; G](#)

[Vacuums; G](#)

[Glovebags; G](#)

[SD-06 Test Reports](#)

[Air Sampling Results; G](#)

[Pressure Differential Recordings for Local Exhaust System; G](#)

[Encapsulation Test Patches; G](#)

[Clearance Sampling; G](#)

[Asbestos Disposal Quantity Report; G](#)

SD-07 Certificates

Employee Training; G

Notifications; G

Respiratory Protection Program; G

Asbestos Hazard Abatement Plan; G

Testing Laboratory; G

Landfill Approval; G

Delivery Tickets; G

Waste Shipment Records; G

Transporter Certification; G

Medical Certification; G

Private Qualified Person Documentation; G

Competent Person; G

Worker's License; G

Contractor's License; G

Federal, State or Local Citations on Previous Projects; G

Encapsulants; G

Equipment Used to Contain Airborne Asbestos Fibers; G

Water Filtration Equipment; G

Vacuums; G

Ventilation Systems; G

SD-11 Closeout Submittals

Permits and Licenses; G

Notifications; G

Respirator Program Records; G

Protective Clothing Decontamination Quality Control Records; G

Protective Clothing Decontamination Facility Notification; G

Rental Equipment; G

1.5 QUALITY ASSURANCE

1.5.1 Private Qualified Person Documentation

Submit the name, address, and telephone number of the Private Qualified Person (PQP) selected to prepare the Asbestos Hazard Abatement Plan, direct monitoring and training, and documented evidence that the PQP has successfully completed training in and is accredited and where required is certified as, a Building Inspector, Contractor/Supervisor Abatement Worker, and Asbestos Project Designer as described by 40 CFR 763 and has successfully completed the National Institute of Occupational Safety and Health (NIOSH) 582 course "Sampling and Evaluating Airborne Asbestos Dust" or equivalent. The PQP must be appropriately licensed in the State of Florida. The PQP and the asbestos contractor must not have an employee/employer relationship or financial relationship which could constitute a conflict of interest. The PQP must be a first tier subcontractor.

1.5.2 Competent Person Documentation

The Competent Person must be experienced in the administration and supervision of asbestos abatement projects including exposure assessment and monitoring, work practices, abatement methods, protective measures for personnel, setting up and inspecting asbestos abatement work areas, evaluating the integrity of containment barriers, placement and operation of local exhaust systems, ACM generated waste containment and disposal procedures, decontamination units installation and maintenance requirements, site safety and health requirements, and notification of other employees onsite. The Competent Person must be on-site at all times when asbestos abatement activities are underway. Submit training certification and a current State of Florida Asbestos Contractor's and Supervisor's License. Submit evidence that the Competent Person has a minimum of 3 years of on-the-job asbestos abatement experience relevant to OSHA competent person requirements.

1.5.3 Worker's License

Submit documentation that workers meet the requirements of 29 CFR 1926.1101, 40 CFR 61-SUBPART M and have a current State of Florida Asbestos Workers License.

1.5.4 Contractor's License

Submit a copy of the asbestos contractor's license issued by the State of Florida. Submit the following certification along with the license: "I certify that the personnel I am responsible for during the course of this project fully understand the contents of 29 CFR 1926.1101, 40 CFR 61-SUBPART MEM 385-1-1, and the Federal, State and local requirements for those asbestos abatement activities that they will be involved in." This certification statement must be signed by the Company's President or Chief Executive.

1.5.5 Air Sampling Results

Complete fiber counting and provide results to the PQP for review within 16 hours of the "time off" of the sample pump. Notify the Contracting Officer immediately of any airborne levels of asbestos fibers in excess of the acceptable limits. Submit sampling results to the Contracting Officer and the affected Contractor employees where required by law within three working days, signed by the testing laboratory employee performing air

sampling, the employee that analyzed the sample, and the PQP. 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 must levels exceed 0.1 fibers per cubic centimeter.

1.5.6 Pressure Differential Recordings for Local Exhaust System

Provide a local exhaust system that creates a negative pressure of at least 0.02 inches of water relative to the pressure external to the enclosure and operate it continuously, 24-hours a day, until the temporary enclosure of the asbestos control area is removed. Submit pressure differential recordings for each work day to the PQP for review and to the Contracting Officer within 24-hours from the end of each work day.

1.5.7 Protective Clothing Decontamination Quality Control Records

Provide all records that document quality control for the decontamination of reusable outer protective clothing.

1.5.8 Protective Clothing Decontamination Facility Notification

Submit written evidence that persons who decontaminate, store, or transport asbestos contaminated clothing used in the performance of this contract were duly notified in accordance with 29 CFR 1926.1101.

1.5.9 Federal, State or Local Citations on Previous Projects

Submit a statement, signed by an officer of the company, containing a record of any citations issued by Federal, State or local regulatory agencies relating to asbestos activities within the last 5 years (including projects, dates, and resolutions); a list of penalties incurred through non-compliance with asbestos project specifications, including liquidated damages, overruns in scheduled time limitations and resolutions; and situations in which an asbestos-related contract has been terminated (including projects, dates, and reasons for terminations). If there are none, a negative declaration signed by an officer of the company must be provided.

1.6 SECURITY

Entry into regulated areas must only be by personnel authorized by the Contractor and the Contracting Officer. Personnel authorized to enter regulated areas must be trained and wear the required personal protective equipment.

1.7 EQUIPMENT

1.7.1 Rental Equipment

Provide a copy of the written notification to the rental company concerning the intended use of the equipment and the possibility of asbestos contamination of the equipment.

PART 2 PRODUCTS

2.1 ENCAPSULANTS

Encapsulants must conform to current USEPA requirements, contain no toxic or hazardous substances as defined in 29 CFR 1926.59, and conform to the following performance requirements.

2.1.1 Removal Encapsulants

<u>Requirement</u>	<u>Test Standard</u>
Flame Spread - 25, Smoke Emission - 50	ASTM E84
Life Expectancy - 20 years	ASTM C732 Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E96/E96M
Fire Resistance - Negligible affect on fire resistance rating over 3 hour test (Classified by UL for use over fibrous and cementitious sprayed fireproofing)	ASTM E119
Impact Resistance - Minimum 43 in/lb	ASTM D2794 Gardner Impact Test
Flexibility - no rupture or cracking	ASTM D522/D522M Mandrel Bend Test

2.1.2 Bridging Encapsulant

<u>Requirement</u>	<u>Test Standard</u>
Flame Spread - 25, Smoke Emission - 50	ASTM E84
Life Expectancy - 20 years	ASTM C732 Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E96/E96M
Fire Resistance - Negligible affect on fire resistance rating over 3-hour test (Classified by UL for use over fibrous and cementitious sprayed fireproofing)	ASTM E119
Impact Resistance - Minimum 43 in/lb	ASTM D2794 Gardner Impact Test
Flexibility - no rupture or cracking	ASTM D522/D522M Mandrel Bend Test

2.1.3 Penetrating Encapsulant

<u>Requirement</u>	<u>Test Standard</u>
Flame Spread - 25, Smoke Emission - 50	ASTM E84
Life Expectancy - 20 years	ASTM C732 Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E96/E96M
Cohesion/Adhesion Test - 50 pounds of force/foot	ASTM E119
Fire Resistance - Negligible affect on fire resistance rating over 3-hour test (Classified by UL for use over fibrous and cementitious sprayed fireproofing)	ASTM E119
Impact Resistance - Minimum 43 in/lb	ASTM D2794 Gardner Impact Test
Flexibility - no rupture or cracking	ASTM D522/D522M Mandrel Bend Test

2.1.4 Lock-down Encapsulant

<u>Requirement</u>	<u>Test Standard</u>
Flame Spread - 25, Smoke Emission - 50	ASTM E84
Life Expectancy - 20 years	ASTM C732 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 E119
Bond Strength: 100 pounds of force/foot	ASTM E736/E736M
(Tests compatibility with cementitious and fibrous fireproofing)	

2.2 ENCASEMENT PRODUCTS

Encasement must consist of primary cellular polymer coat, polymer finish coat, and any other finish coat as approved by the Contracting Officer.

2.3 DUCT TAPE

Industrial grade duct tape of appropriate widths suitable for bonding sheet plastic and disposal container.

2.4 DISPOSAL CONTAINERS

Leak-tight (defined as solids, liquids, or dust that cannot escape or spill out) disposal containers must be provided for ACM wastes as required by [29 CFR 1926.1101](#). Disposal containers can be in the form of:

- a. Disposal Bags
- b. Fiberboard Drums
- c. Cardboard Boxes

2.5 SHEET PLASTIC

Sheet plastic must be polyethylene of [6 mil](#) minimum thickness and must be provided in the largest sheet size necessary to minimize seams. Film must be clear, frosted or black and conform to [ASTM D4397](#), except as specified below

2.5.1 Flame Resistant

Where a potential for fire exists, flame-resistant sheets must be provided. Film must be frosted or black and must conform to the requirements of [NFPA 701](#).

2.5.2 Reinforced

Reinforced sheets must be provided where high skin strength is required, such as where it constitutes the only barrier between the regulated area and the outdoor environment. The sheet stock must consist of translucent, nylon-reinforced or woven-polyethylene thread laminated between 2 layers of polyethylene film. Film must meet flame resistant standards of [NFPA 701](#).

2.6 MASTIC REMOVING SOLVENT

Mastic removing solvent must be nonflammable and must not contain methylene chloride, glycol ether, or halogenated hydrocarbons. Solvents used onsite must have a flash point greater than [140 degrees F](#).

2.7 LEAK-TIGHT WRAPPING

Two layers of [6 mil](#) minimum thick polyethylene sheet stock must be used for the containment of removed asbestos-containing components or materials such as large tanks, boilers, insulated pipe segments and other materials. Upon placement of the ACM component or material, each layer must be individually leak-tight sealed with duct tape.

2.8 VIEWING INSPECTION WINDOW

Where feasible, a minimum of one clear, 1/8 inch thick, acrylic sheet, 18 by 24 inches, must be installed as a viewing inspection window at eye level on a wall in each containment enclosure. The windows must be sealed leak-tight with industrial grade duct tape.

2.9 WETTING AGENTS

Removal encapsulant (a penetrating encapsulant) must be provided when conducting removal abatement activities that require a longer removal time or are subject to rapid evaporation of amended water. The removal encapsulant must be capable of wetting the ACM and retarding fiber release during disturbance of the ACM greater than or equal to that provided by amended water. Performance requirements for penetrating encapsulants are specified in paragraph ENCAPSULANTS above.

PART 3 EXECUTION

3.1 EQUIPMENT

Provide the Contracting Officer or the Contracting Officer's Representative, with at least two complete sets of personal protective equipment including decontaminating reusable coveralls as required for entry to and inspection of the asbestos control area. Provide equivalent training to the Contracting Officer or a designated representative as provided to Contractor employees in the use of the required personal protective equipment. Provide manufacturer's certificate of compliance for all equipment used to contain airborne asbestos fibers.

3.1.1 Air Monitoring Equipment

The Contractor's PQP must approve air monitoring equipment. The equipment must include, but must not be limited to:

- a. High-volume sampling pumps that can be calibrated and operated at a constant airflow up to 16 liters per minute.
- b. Low-volume, battery powered, body-attachable, portable personal pumps that can be calibrated to a constant airflow up to approximately 3.5 liters per minute, and a self-contained rechargeable power pack capable of sustaining the calibrated flow rate for a minimum of 10 hours. The pumps must also be equipped with an automatic flow control unit which must maintain a constant flow, even as filter resistance increases due to accumulation of fiber and debris on the filter surface.
- c. Single use standard 25 mm diameter cassette, open face, 0.8 micron pore size, mixed cellulose ester membrane filters and cassettes with 50 mm electrically conductive extension cowl, and shrink bands for personal air sampling.
- d. A flow calibrator capable of calibration to within plus or minus 2 percent of reading over a temperature range of minus 4 to plus 140 degrees F and traceable to a NIST primary standard.

3.1.2 Respirators

Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human

Services.

3.1.2.1 Respirators for Handling Asbestos

Provide personnel engaged in pre-cleaning, cleanup, handling, encapsulation, removal and/or demolition of asbestos materials with respiratory protection as indicated in 29 CFR 1926.1101 and 29 CFR 1926.103. Breathing air must comply with CGA G-7.

3.1.3 Exterior Whole Body Protection

3.1.3.1 Outer Protective Clothing

Provide personnel exposed to asbestos with disposable "non-breathable," or reusable "non-breathable" whole body outer protective clothing, head coverings, gloves, and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber gloves for comfort, but must not be used alone. Make sleeves secure at the wrists, make foot coverings secure at the ankles, and make clothing secure at the neck by the use of tape. Reusable whole body outer protective clothing must be either disposed of as asbestos contaminated waste upon exiting from the asbestos regulated work area or be properly decontaminated.

3.1.3.2 Work Clothing

Provide cloth work clothes for wear under the outer protective clothing and foot coverings and either dispose of or properly decontaminate them as recommended by the PQP after each use.

3.1.3.3 Personal Decontamination Unit

Provide a temporary, negative pressure unit with a separate decontamination locker room and clean locker room with a shower that complies with 29 CFR 1926.51(f)(4)(ii) through (V) in between for personnel required to wear whole body protective clothing. Provide two separate lockers for each asbestos worker, one in each locker room. Keep street clothing and street shoes in the clean locker. HEPA vacuum and remove asbestos contaminated disposable protective clothing while still wearing respirators at the boundary of the asbestos work area and seal in impermeable bags or containers for disposal. HEPA vacuum and remove asbestos contaminated reusable protective clothing while still wearing respirators at the boundary of the asbestos work area, seal in two impermeable bags, label outer bag as asbestos contaminated waste, and transport for decontamination.

Do not wear work clothing between home and work. Locate showers between the decontamination locker room and the clean locker room and require that all employees shower before changing into street clothes. Collect used shower water and filter with approved water filtration equipment to remove asbestos contamination. Wastewater filters must be installed in series with the first stage pore size 20 microns and the second stage pore size of 5 microns. Dispose of filters and residue as asbestos waste. Discharge clean water to the sanitary system. Dispose of asbestos contaminated work clothing as asbestos contaminated waste or properly decontaminate as specified in the Contractor's Asbestos Hazard Abatement Plan. Keep the floor of the decontamination unit's clean room dry and clean at all times. Proper housekeeping and hygiene requirements must be maintained. Provide soap and towels for showering, washing and drying. Cloth towels provided must be disposed of as ACM waste or must be laundered in accordance with 29 CFR 1926.1101. Physically attach the decontamination units to the

asbestos control area. Construct both a personnel decontamination unit and an equipment decontamination unit onto and integral with each asbestos control area.

3.1.3.4 Decontamination of Reusable Outer Protective Clothing

When reusable outer protective clothing is used, transport the double bagged clothing to a previously notified commercial/industrial decontamination facility for decontamination. Perform non-destructive testing to determine the effectiveness of asbestos decontamination. If representative sampling is used, ensure the statistical validity of the sampling results. If representative sampling is used, reject any entire batch in which any of the pieces exceed 40 fibers per square millimeter. Inspect reusable protective clothing prior to use to ensure that it will provide adequate protection and is not or is not about to become ripped, torn, deteriorated, or damaged, and that it is not visibly contaminated. Notify, in writing, all personnel involved in the decontamination of reusable outer protective clothing as indicated in 29 CFR 1926.1101.

3.1.3.5 Eye Protection

Provide eye protection that complies with ANSI/ISEA Z87.1 when operations present a potential eye injury hazard. Provide goggles to personnel engaged in asbestos abatement operations when the use of a full face respirator is not required.

3.1.4 Regulated Areas

All Class I, II, and III asbestos work must be conducted within regulated areas. The regulated area must be demarcated to minimize the number of persons within the area and to protect persons outside the area from exposure to airborne asbestos. Control access to regulated areas, ensure that only authorized personnel enter, and verify that Contractor required medical surveillance, training and respiratory protection program requirements are met prior to allowing entrance.

3.1.5 Load-out Unit

Provide a temporary load-out unit that is adjacent and connected to the regulated area. Attach the load-out unit in a leak-tight manner to each regulated area.

3.1.6 Warning Signs and Labels

Provide bilingual warning signs printed in English and Spanish at all approaches to asbestos control areas. Locate signs at such a distance that personnel may read the sign and take the necessary protective steps required before entering the area. Provide labels and affix to all asbestos materials, scrap, waste, debris, and other products contaminated with asbestos. Containers with preprinted warning labels conforming to the requirements are acceptable

3.1.6.1 Warning Sign

Provide vertical format conforming to 29 CFR 1926.200, and 29 CFR 1926.1101 minimum 20 by 14 inches displaying the following legend in the lower panel:

<u>Legend</u>	<u>Notation</u>
DANGER	one inch Sans Serif Gothic or Block
ASBESTOS	one inch Sans Serif Gothic or Block
MAY CAUSE CANCER	one inch Sans Serif Gothic or Block
CAUSES DAMAGE TO LUNGS	1/4 inch Sans Serif Gothic or Block
AUTHORIZED PERSONNEL ONLY	1/4 inch Sans Serif Gothic or Block
WEAR RESPIRATORY PROTECTION AND PROTECTIVE CLOTHING IN THIS AREA	1/4 inch Sans Serif Gothic or Block

Spacing between lines must be at least equal to the height of the upper of any two lines.

3.1.6.2 Warning Labels

Provide labels conforming to 29 CFR 1926.1101 of sufficient size to be clearly legible, displaying the following legend:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST AVOID CREATING DUST

3.1.7 Local Exhaust System

Provide a local exhaust system in the asbestos control area in accordance with ASSP Z9.2 and 29 CFR 1926.1101 that will provide at least four air changes per hour inside of the negative pressure enclosure. Local exhaust equipment must be operated 24-hours per day, until the asbestos control area is removed and must be leak proof to the filter and equipped with HEPA filters. Maintain a minimum pressure differential in the control area of minus 0.02 inch of water column relative to adjacent, unsealed areas. Provide continuous 24-hour per day monitoring of the pressure differential with a pressure differential automatic recording instrument. The building ventilation system must not be used as the local exhaust system for the asbestos control area. Filters on exhaust equipment must conform to ASSP Z9.2 and UL 586. Terminate the local exhaust system out of doors and remote from any public access or ventilation system intakes.

3.1.1.8 Tools

Vacuums must be leak proof to the filter and equipped with HEPA filters. Filters on vacuums must conform to **ASSP Z9.2** and **UL 586**. Do not use power tools to remove asbestos containing materials unless the tool is equipped with effective, integral HEPA filtered exhaust **ventilation systems**. Remove all residual asbestos from reusable tools prior to storage or reuse. Reusable tools must be thoroughly decontaminated prior to being removed from the regulated areas.

3.1.1.9 Rental Equipment

If rental equipment is to be used, furnish written notification to the rental agency concerning the intended use of the equipment and the possibility of asbestos contamination of the equipment.

3.1.1.10 Glovebags

Submit written manufacturers proof that glovebags will not break down under expected temperatures and conditions.

3.1.1.11 Single Stage Decontamination Area

A decontamination area (equipment room/area) must be provided for Class I work involving less than **25 feet** or **10 square feet** of TSI or surfacing ACM, and for Class II and Class III asbestos work operations where exposures exceed the PELs or where there is no negative exposure assessment. The equipment room or area must be adjacent to the regulated area for the decontamination of employees, material, and their equipment which could be contaminated with asbestos. The area must be covered by an impermeable drop cloth on the floor or horizontal working surface. The area must be of sufficient size to accommodate cleaning of equipment and removing personal protective equipment without spreading contamination beyond the area.

3.1.1.12 Decontamination Area Exit Procedures

Ensure that the following procedures are followed:

- a. Before leaving the regulated area, remove all gross contamination and debris from work clothing using a HEPA vacuum.
- b. Employees must remove their protective clothing in the equipment room and deposit the clothing in labeled impermeable bags or containers for disposal or laundering.
- c. Employees must not remove their respirators until showering.
- d. Employees must shower prior to entering the clean room. If a shower has not been located between the equipment room and the clean room or the work is performed outdoors, ensure that employees engaged in Class I asbestos jobs:
 - a) Remove asbestos contamination from their work suits in the equipment room or decontamination area using a HEPA vacuum before proceeding to a shower that is not adjacent to the work area; or
 - b) Remove their contaminated work suits in the equipment room, without cleaning worksuits, and proceed to a shower that is not adjacent to the work area.

3.2 WORK PROCEDURE

Perform asbestos related work in accordance with 29 CFR 1926.1101, 40 CFR 61-SUBPART M, and as specified herein. Use wet removal procedures, appropriate encapsulation procedures as listed in the asbestos hazard abatement plan and negative pressure enclosure techniques. Wear and utilize protective clothing and equipment as specified herein. No eating, smoking, drinking, chewing gum, tobacco, or applying cosmetics is permitted in the asbestos work or control areas. Personnel of other trades not engaged in the encapsulation, removal and demolition of asbestos containing material must not be exposed at any time to airborne concentrations of asbestos unless all the personnel protection and training provisions of this specification are complied with by the trade personnel. Seal all roof top penetrations, except plumbing vents, prior to asbestos roofing work. Shut down the building heating, ventilating, and air conditioning system, cap the openings to the system, and provide temporary heating, and ventilation, and air conditioning prior to the commencement of asbestos work. Power to the regulated area must be locked-out and tagged in accordance with 29 CFR 1910.147. All electrical work must be performed by a licensed electrician. Stop abatement work in the regulated area immediately when the airborne total fiber concentration: (1) equals or exceeds 0.01 f/cc, or the pre-abatement concentration, whichever is greater, outside the regulated area; or (2) equals or exceeds 1.0 f/cc inside the regulated area. Correct the condition to the satisfaction of the Contracting Officer, including visual inspection and air sampling. Work must resume only upon notification by the Contracting Officer. Corrective actions must be documented. If an asbestos fiber release or spill occurs, stop work immediately, correct the condition to the satisfaction of the Contracting Officer including clearance sampling, prior to resumption of work.

3.2.1 Building Ventilation System and Critical Barriers

Building ventilation system supply and return air ducts in a regulated area must be shut down and isolated by lockable switch or other positive means in accordance with 29 CFR 1910.147 and isolated by airtight seals to prevent the spread of contamination throughout the system. The airtight seals must consist of air-tight rigid covers for building ventilation supply and exhaust grills where the ventilation system is required to remain in service during abatement or 2 layers of polyethylene. Edges to wall, ceiling and floor surfaces must be sealed with industrial grade duct tape.

- a. A Competent Person must supervise the work.
- b. For indoor work, critical barriers must be placed over all openings to the regulated area.
- c. Impermeable dropcloths must be placed on surfaces beneath all removal activity.

3.2.2 Protection of Existing Work to Remain

Perform work without damage or contamination of adjacent work. Where such work is damaged or contaminated as verified by the Contracting Officer using visual inspection or sample analysis, it must be restored to its original condition or decontaminated by the Contractor at no expense to the Government as deemed appropriate by the Contracting Officer. This includes inadvertent spill of dirt, dust, or debris in which it is reasonable to

conclude that asbestos may exist. When these spills occur, stop work immediately. Then clean up the spill. When satisfactory visual inspection and air sampling results are obtained from the PQP work may proceed at the discretion of the Contracting Officer.

3.2.3 Furnishings

Furniture and equipment will remain in the building. Cover and seal furnishings with 6-mil plastic sheet or remove from the work area and store in a location on site approved by the Contracting Officer.

3.2.4 Precleaning

Wet wipe and HEPA vacuum all surfaces potentially contaminated with asbestos prior to establishment of an enclosure.

3.2.5 Asbestos Control Area Requirements

3.2.5.1 Negative Pressure Enclosure

Block and seal openings in areas where the release of airborne asbestos fibers can be expected. Establish an asbestos negative pressure enclosure with the use of curtains, portable partitions, or other enclosures in order to prevent the escape of asbestos fibers from the contaminated asbestos work area. Negative pressure enclosure development must include protective covering of uncontaminated walls, and ceilings with a continuous membrane of two layers of minimum 6-mil plastic sheet sealed with tape to prevent water or other damage. Provide two layers of 6-mil plastic sheet over floors and extend a minimum of 12 inches up walls. Seal all joints with tape. Provide local exhaust system in the asbestos control area. Openings will be allowed in enclosures of asbestos control areas for personnel and equipment entry and exit, the supply and exhaust of air for the local exhaust system and the removal of properly containerized asbestos containing materials. Replace local exhaust system filters as required to maintain the efficiency of the system.

3.2.5.2 Glovebag

If the construction of a negative pressure enclosure is infeasible, use alternate techniques as indicated in 29 CFR 1926.1101. Establish designated limits for the asbestos regulated area with the use of rope or other continuous barriers, and maintain all other requirements for asbestos control areas. The PQP must conduct personal samples of each worker engaged in asbestos handling (removal, disposal, transport and other associated work) throughout the duration of the project. If the quantity of airborne asbestos fibers monitored at the breathing zone of the workers at any time exceeds background or 0.01 fibers per cubic centimeter whichever is greater, stop work, evacuate personnel in adjacent areas or provide personnel with approved protective equipment at the discretion of the Contracting Officer. This sampling may be duplicated by the Government at the discretion of the Contracting Officer. If the air sampling results obtained by the Government differ from those obtained by the Contractor, the Government will determine which results predominate. If adjacent areas are contaminated as determined by the Contracting Officer, clean the contaminated areas, monitor, and visually inspect the area as specified herein.

3.2.5.3 Regulated Area for Class II Removal

Establish designated limits for the asbestos regulated work area with the use of red barrier tape; install critical barriers, splash guards and signs, and maintain all other requirements for asbestos control area except local exhaust. Place impermeable dropcloths on surfaces beneath removal activity extending out 3 feet in all directions. A detached decontamination system may be used. Conduct area monitoring of airborne fibers during the work shift at the designated limits of the asbestos work area and conduct personal samples of each worker engaged in the work. If workers the airborne fiber concentration of the workers or designated limits at any time exceeds background or 0.01 fibers per cubic centimeter, whichever is greater, stop work immediately and correct the situation.

3.2.6 Removal Procedures

Wet asbestos material with a fine spray of amended water during removal, cutting, or other handling so as to reduce the emission of airborne fibers. Remove material and immediately place in 6 mil plastic disposal bags. Remove asbestos containing material in a gradual manner, with continuous application of the amended water or wetting agent in such a manner that no asbestos material is disturbed prior to being adequately wetted. Where unusual circumstances prohibit the use of 6 mil plastic bags, submit an alternate proposal for containment of asbestos fibers to the Contracting Officer for approval. For example, in the case where both piping and insulation are to be removed, the Contractor may elect to wet the insulation, wrap the pipes and insulation in plastic and remove the pipe by sections. Containerize asbestos containing material while wet. Do not allow asbestos material to accumulate or become dry. Lower and otherwise handle asbestos containing material as indicated in 40 CFR 61-SUBPART M.

3.2.6.1 Sealing Contaminated Items Designated for Disposal

Remove contaminated architectural, mechanical, and electrical appurtenances such as venetian blinds, full-height partitions, carpeting, duct work, pipes and fittings, radiators, light fixtures, conduit, panels, and other contaminated items designated for removal by completely coating the items with an asbestos lock-down encapsulant at the demolition site before removing the items from the asbestos control area. These items need not be vacuumed. The asbestos lock-down encapsulant must be tinted a contrasting color and spray-applied by airless method. Thoroughness of sealing operation must be visually gauged by the extent of colored coating on exposed surfaces. Lock-down encapsulants must comply with the performance requirements specified herein.

3.2.6.2 Exposed Pipe Insulation Edges

Contain edges of asbestos insulation to remain that are exposed by a removal operation. Wet and cut the rough ends true and square with sharp tools and then encapsulate the edges with a 1/4 inch thick layer of non-asbestos containing insulating cement troweled to a smooth hard finish. When cement is dry, lag the end with a layer of non-asbestos lagging cloth, overlapping the existing ends by at least 4 inches. When insulating cement and cloth is an impractical method of sealing a raw edge of asbestos, take appropriate steps to seal the raw edges as approved by the Contracting Officer.

3.2.7 Methods of Compliance

3.2.7.1 Mandated Practices

The specific abatement techniques and items identified must be detailed in the Contractor's AHAP. Use the following engineering controls and work practices in all operations, regardless of the levels of exposure:

- a. Vacuum cleaners equipped with HEPA filters.
- b. Wet methods or wetting agents except where it can be demonstrated that the use of wet methods is unfeasible due to the creation of electrical hazards, equipment malfunction, and in roofing.
- c. Prompt clean-up and disposal.
- d. Inspection and repair of polyethylene.
- e. Cleaning of equipment and surfaces of containers prior to removing them from the equipment room or area.

3.2.7.2 Control Methods

Use the following control methods:

- a. Local exhaust ventilation equipped with HEPA filter;
- b. Enclosure or isolation of processes producing asbestos dust;
- c. Where the feasible engineering and work practice controls are not sufficient to reduce employee exposure to or below the PELs, use them to reduce employee exposure to the lowest levels attainable and must supplement them by the use of respiratory protection.

3.2.7.3 Unacceptable Practices

The following work practices must not be used:

- a. High-speed abrasive disc saws that are not equipped with point of cut ventilator or enclosures with HEPA filtered exhaust air.
- b. Compressed air used to remove asbestos containing materials, unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud created by the compressed air.
- c. Dry sweeping, shoveling, or other dry clean up.
- d. Employee rotation as a means of reducing employee exposure to asbestos.

3.2.8 Class I Work Procedures

In addition to requirements of paragraphs MANDATED PRACTICES and CONTROL METHODS, the following engineering controls and work practices must be used:

- a. A Competent Person must supervise the installation and operation of the control methods.
- b. For jobs involving the removal of more than 25 feet or 10 square feet of TSI or surfacing material, place critical barriers over all openings

to the regulated area.

- c. HVAC systems must be isolated in the regulated area by sealing with a double layer of plastic or air-tight rigid covers.
- d. Impermeable dropcloths (6 mil or greater thickness) must be placed on surfaces beneath all removal activity.
- e. Where a negative exposure assessment has not been provided or where exposure monitoring shows the PEL was exceeded, the regulated area must be ventilated with a HEPA unit and employees must use PPE.

3.2.9 Specific Control Methods for Class I Work

Use Class I work procedures, control methods and removal methods for the following ACM:

- a. Spray Applied Fireproofing
- b. Gypsum Wallboard and Joint Compound
- c. Thermal System Insulation and Mudded Pipe Fittings
- d. Plaster and Textured Ceilings and Walls
- e. Vermiculite

3.2.9.1 Negative Pressure Enclosure (NPE) System

The system must provide at least four air changes per hour inside the containment. The local exhaust unit equipment must be operated 24-hours per day until the containment is removed. The NPE must be smoke tested for leaks at the beginning of each shift and be sufficient to maintain a minimum pressure differential of minus 0.02 inch of water column relative to adjacent, unsealed areas. Pressure differential must be monitored continuously, 24-hours per day, with an automatic manometric recording instrument and Records must be provided daily on the same day collected to the Contracting Officer. The Contracting Officer must be notified immediately if the pressure differential falls below the prescribed minimum. The building ventilation system must not be used as the local exhaust system for the regulated area. The NPE must terminate outdoors unless an alternate arrangement is allowed by the Contracting Officer. All filters used must be new at the beginning of the project and must be periodically changed as necessary and disposed of as ACM waste.

3.2.9.2 Glovebag Systems

Glovebags must be used without modification, smoke-tested for leaks, and completely cover the circumference of pipe or other structures where the work is to be done. Glovebags must be used only once and must not be moved. Glovebags must not be used on surfaces that have temperatures exceeding 150 degrees F. Prior to disposal, glovebags must be collapsed using a HEPA vacuum. Before beginning the operation, loose and friable material adjacent to the glovebag operation must be wrapped and sealed in 2 layers of plastic or otherwise rendered intact. At least two persons must perform glovebag removal. Asbestos regulated work areas must be established for glovebag abatement. Designated boundary limits for the asbestos work must be established with rope or other continuous barriers and all other requirements for asbestos control areas must be maintained,

including area signage and boundary warning tape.

- a. Attach HEPA vacuum systems to the bag to prevent collapse during removal of ACM.
- b. The negative pressure glove boxes must be fitted with gloved apertures and a bagging outlet and constructed with rigid sides from metal or other material which can withstand the weight of the ACM and water used during removal. A negative pressure must be created in the system using a HEPA filtration system. The box must be smoke tested for leaks prior to each use.

3.2.9.3 Mini-Enclosure

Double bulkhead containment or Mini-containment (small walk-in enclosure) to accommodate no more than two persons, may be used if the disturbance or removal can be completely contained by the enclosure. The mini-enclosure must be inspected for leaks and smoke tested before each use. Air movement must be directed away from the employee's breathing zone within the mini-enclosure.

3.2.9.4 Wrap and Cut Operation

Prior to cutting pipe, the asbestos-containing insulation must be wrapped with polyethylene and securely sealed with duct tape to prevent asbestos becoming airborne as a result of the cutting process. The following steps must be taken: install glovebag, strip back sections to be cut **6 inches** from point of cut, and cut pipe into manageable sections.

3.2.9.5 Class I Removal Method

Class I ACM must be removed using a control method described above. Prepare work area as previously specified. Establish designated limits for the asbestos regulated work area with the use of red barrier tape, critical barriers, signs, and maintain all other requirements for asbestos control area. Spread one layer of **6-mil** seamless plastic sheeting on the floor below the work area. Cut manageable sections of gypsum wallboard and joint compound and immediately place into a **6-mil** minimum thickness disposal bag or other approved container. Make every effort to keep the material from falling to the floor of the work area. Use a wire brush and wet clean to remove residual material from studs. Continue wet cleaning until the surface is clean of visible material and encapsulate stud walls. Remove ACM thermal system insulation and mudded pipe fittings using mechanical means and wet methods and immediately place into **6-mil** thickness disposal bag. Continue wet cleaning until surfaces are free of visible debris. Remove ACM plaster ceilings or walls using mechanical means and adequately wet methods and immediately place into **6-mil** thickness disposal bag. Make every effort to keep the material from falling to the floor of the work area. Continue wet cleaning until surfaces are free of visible debris. Remove ACM textured ceiling finish using a scraper and wet methods and immediately place into **6-mil** thickness disposal bag. Floors are considered contaminated from fallen textured ceiling finish. Clean up debris on floor and dispose of carpet as asbestos contaminated material. After removal of the material use a wire brush to clean the exposed concrete ceiling to remove residual material. Continue wet cleaning until surfaces are free of visible debris. Bag all asbestos debris which has fallen to the floor as asbestos-containing debris. Place all debris in plastic disposal bags of **6-mil** minimum thickness. Once the material is in the disposal bag, apply additional water as needed to achieve "adequately wet" conditions for

NESHAP compliance. Place bagged asbestos waste under negative pressure with the use of a HEPA vacuum, goose neck and duck tape to seal the bag, wash to remove any visible contamination and place into a second 6-mil minimum thickness disposal bag. Containerize asbestos containing waste while wet. Lower and otherwise handle asbestos containing materials as indicated in 40 CFR 61-SUBPART M. Conduct area monitoring of airborne fibers during the work shift at the designated limits of the asbestos work area and conduct personal samples of each worker engaged in the work. If the quantity of airborne asbestos fibers monitored at the breathing zone of the workers or the designated limits at any time exceeds background or 0.01 fibers per cubic centimeter, whichever is greater, stop work, and immediately correct the situation.

3.2.10 Class II Work Procedures

In addition to the requirements of paragraphs MANDATED PRACTICES and CONTROL METHODS, the following engineering controls and work practices must be used:

- a. A Competent Person must supervise the work.
- b. For indoor work, critical barriers must be placed over all openings to the regulated area.
- c. Impermeable dropcloths must be placed on surfaces beneath all removal activity.

3.2.11 Specific Control Methods for Class II Work

3.2.11.1 Vinyl and Asphaltic Flooring Materials Carpet and Mastic

Establish designated limits for the asbestos regulated work area with the use of red barrier tape, critical barriers, signs, and maintain all other requirements for asbestos control area except local exhaust. A detached decontamination system may be used. When removing vinyl floor tile and mastic or carpet and mastic which contains ACM, use the following practices. Remove floor tile and mastic or carpet and mastic using adequately wet methods. Remove floor tiles or carpet and mastic intact (if possible). Wetting is not required when floor tiles are heated and removed intact. Do not sand flooring or its backing. Scrape residual adhesive and backing using wet methods. Mechanical chipping is prohibited unless performed in a negative pressure enclosure. Dry sweeping is prohibited. Use vacuums equipped with HEPA filter, disposable dust bag, and metal floor tool (no brush) to clean floors. Place debris into a 6-mil minimum thickness disposal bag or other approved container. Once the material is in the disposal bag, apply additional water as needed to achieve "adequately wet" conditions for NESHAP compliance. Place bagged asbestos waste under negative pressure with the use of a HEPA vacuum, goose neck and duck tape to seal the bag, wash to remove any visible contamination and place into a second 6-mil minimum thickness disposal bag. Containerize asbestos containing waste while wet. Lower and otherwise handle asbestos containing materials as indicated in 40 CFR 61-SUBPART M. Conduct area monitoring of airborne fibers during the work shift at the designated limits of the asbestos work area and conduct personal samples of each worker engaged in the work. If workers the airborne fiber concentration of the workers or designated limits at any time exceeds background or 0.01 fibers per cubic centimeter, whichever is greater, stop work immediately and correct the situation.

3.2.11.2 Sealants and Mastic

Establish designated limits for the asbestos regulated work area with the use of red barrier tape, critical barriers and signs, and maintain all other requirements for asbestos control area except local exhaust. Spread 6-mil plastic sheeting on the ground around the perimeter of the work area extending out in all directions. Using adequately wet methods, carefully remove the ACM sealants and mastics using a scraper or knife blade. As it is removed place the material into a disposal bag. Make every effort to keep the asbestos material from falling to the ground or work area floor below. Dry sweeping is prohibited. Use vacuums equipped with HEPA filter and disposable dust bag. Place debris into a 6-mil minimum thickness disposal bag or other approved container. Once the material is in the disposal bag, apply additional water as needed to achieve "adequately wet" conditions for NESHAP compliance. Place bagged asbestos waste under negative pressure with the use of a HEPA vacuum, goose neck and duck tape to seal the bag, wash to remove any visible contamination and place into a second 6-mil minimum thickness disposal bag. Containerize asbestos containing waste while wet. Lower and otherwise handle asbestos containing materials as indicated in 40 CFR 61-SUBPART M. Conduct area monitoring of airborne fibers during the work shift at the designated limits of the asbestos work area and conduct personal samples of each worker engaged in the work. If the airborne fiber concentration of the workers or at designated limits at any time exceeds background or 0.01 fibers per cubic centimeter, whichever is greater, stop work immediately and correct the situation.

3.2.11.3 Suspect Fire Doors

Establish designated limits for the asbestos regulated work area with the use of red barrier tape, critical barriers, signs, and maintain all other requirements for asbestos control area except local exhaust. A detached decontamination system may be used. Spread 6-mil plastic sheeting on the ground beneath the work area and around the perimeter of the work area extending out in all directions. Remove door intact from hinges and wrap with 6-mil plastic sheeting. Inspect the interior areas of the door to determine if ACM is present. If ACM is not present the door may be disposed of as general construction debris. If ACM is present place whole door in enclosed container for disposal. Conduct area monitoring of airborne fibers during the work shift at the designated limits of the asbestos work area and conduct personal samples of each worker engaged in the work. If the airborne fiber concentration of the workers or designated limits at any time exceeds background or 0.01 fibers per cubic centimeter, whichever is greater, stop work immediately and correct the situation.

3.2.11.4 Gaskets

Establish designated limits for the asbestos regulated work area with the use of red barrier tape, critical barriers, signs, and maintain all other requirements for asbestos control area except local exhaust. Gaskets must be thoroughly wetted with amended water prior to removal and immediately placed in a disposal container. If a gasket is visibly deteriorated and unlikely to be removed intact, removal must be undertaken within a glovebag. Any scraping to remove residue must be performed wet. Place debris into a 6-mil minimum thickness disposal bag or other approved container. Once the material is in the disposal bag, apply additional water as needed to achieve "adequately wet" conditions for NESHAP compliance. Place bagged asbestos waste under negative pressure with the use of a HEPA vacuum, goose neck and duck tape to seal the bag, wash to

remove any visible contamination and place into a second 6-mil minimum thickness disposal bag. Containerize asbestos containing waste while wet. Conduct area monitoring of airborne fibers during the work shift at the designated limits of the asbestos work area and conduct personal samples of each worker engaged in the work. If the airborne fiber concentration of the workers or designated limits at any time exceeds background or 0.01 fibers per cubic centimeter, whichever is greater, stop work immediately and correct the situation.

3.2.12 Encapsulation Procedures

3.2.12.1 Preparation of Test Patches

Install three test patches of encapsulant as indicated. Use airless spray at the lowest pressure and as recommended by the encapsulant manufacturer. Follow exactly the manufacturer's instructions for thinning recommendations, application procedures and rates. Curing time must be not less than five days or that recommended by the manufacturer, whichever is more. A test patch must be 9 square feet in size.

3.2.12.2 Field Testing

Field test the encapsulation test patches in accordance with ASTM E1494, paragraph "Required Field Test," in the presence of the Contracting Officer.

Keep a written record of the testing procedures and test results. Upon successful testing of the encapsulant, submit a signed statement to the Contracting Officer certifying that the encapsulant is suitable for installation on the particular asbestos containing material.

3.2.12.3 Large-Scale Application

Apply encapsulant using the same equipment and procedures as employed for the test patches. Keep the encapsulant material stirred to prevent settling. Keep a clean work area. Change pre-filters in the ventilation equipment as soon as they appear clogged by encapsulant aerosol or pressure differential drops below 0.02 Hg.

3.2.13 Air Sampling

Perform sampling of airborne concentrations of asbestos fibers in accordance with 29 CFR 1926.1101, the Contractor's air monitoring plan and as specified herein. Sampling performed in accordance with 29 CFR 1926.1101 must be performed by the PQP. Sampling performed for environmental and quality control reasons must be performed by the PQP. Unless otherwise specified, use NIOSH Method 7400 for sampling and analysis. Monitoring may be duplicated by the Government at the discretion of the Contracting Officer. If the air sampling results obtained by the Government differ from those results obtained by the Contractor, the Government will determine which results predominate. Results of breathing zone samples must be posted at the job site and made available to the Contracting Officer. Submit all documentation regarding initial exposure assessments, negative exposure assessments, and air-monitoring results.

3.2.13.1 Sampling Prior to Asbestos Work

Provide area air sampling and establish the baseline one day prior to the masking and sealing operations for each demolition, removal and encapsulation site. Establish the background by performing area sampling in similar but uncontaminated sites in the building.

3.2.13.2 Sampling During Asbestos Work

The PQP must provide personal and area sampling as indicated in [29 CFR 1926.1101](#) and governing environmental regulations. In addition, provided the same type of work is being performed, provide area sampling at least once every work shift close to the work inside the enclosure, outside the clean room entrance to the enclosure, and at the exhaust opening of the local exhaust system. If sampling outside the enclosure shows airborne levels have exceeded background or 0.01 fibers per cubic centimeter, whichever is greater, stop all work, correct the condition(s) causing the increase, and notify the Contracting Officer immediately. Where alternate methods are used, perform personal and area air sampling at locations and frequencies that will accurately characterize the evolving airborne asbestos levels.

3.2.13.3 Final Clearance Requirements, NIOSH PCM Method

For PCM sampling and analysis using [NIOSH NMAM](#) Method 7400, the fiber concentration inside the abated regulated area, for each airborne sample, must be less than 0.01 f/cc. The abatement inside the regulated area is considered complete when every PCM final clearance sample is below the clearance limit. If any sample result is greater than 0.01 total f/cc, the asbestos fiber concentration (asbestos f/cc) must be confirmed from that same filter using [NIOSH NMAM](#) Method 7402 (TEM) at Contractor's expense. If any confirmation sample result is greater than 0.01 asbestos f/cc, abatement is incomplete and cleaning must be repeated at the Contractor's expense. Upon completion of any required recleaning, resampling with results to meet the above clearance criteria must be done at the Contractor's expense.

3.2.13.4 Final Clearance Requirements, EPA TEM Method

For EPA TEM sampling and analysis, using the EPA Method specified in [40 CFR 763](#), abatement inside the regulated area is considered complete when the arithmetic mean asbestos concentration of the five inside samples is less than or equal to 70 structures per square millimeter (70 S/mm). When the arithmetic mean is greater than 70 S/mm, the three blank samples must be analyzed. If the three blank samples are greater than 70 S/mm, resampling must be done. If less than 70 S/mm, the five outside samples must be analyzed and a Z-test analysis performed. When the Z-test results are less than 1.65, the decontamination must be considered complete. If the Z-test results are more than 1.65, the abatement is incomplete and cleaning must be repeated. Upon completion of any required recleaning, resampling with results to meet the above clearance criteria must be done at the Contractor's expense.

3.2.13.5 Sampling After Final Clean-Up ([Clearance Sampling](#))

Provide area sampling of asbestos fibers and establish an airborne asbestos concentration of less than 0.01 fibers per cubic centimeter after final clean-up but before removal of the enclosure or the asbestos work control area. After final cleanup and the asbestos control area is dry but prior to clearance sampling, the PQP must perform a visual inspection in accordance with [ASTM E1368](#) to ensure that the asbestos control and work area is free of any accumulations of dirt, dust, or debris. Perform at least [three](#) samples. 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 must be less than 0.01 fibers per cubic centimeter or be not greater than the background, whichever is greater. Should any of the final samples indicate a higher value take appropriate actions to re-clean the area and repeat the sampling and TEM analysis at the Contractor's expense.

3.2.13.6 Air Clearance Failure

If clearance sampling results fail to meet the final clearance requirements, pay all costs associated with the required recleaning, resampling, and analysis, until final clearance requirements are met.

3.2.14 Lock-Down

Prior to removal of plastic barriers and after pre-clearance clean up of gross contamination, the PQP must conduct a visual inspection of all areas affected by the removal or encapsulation in accordance with ASTM E1368. Inspect for any visible fibers, and to ensure that encapsulants were applied evenly and appropriately. Spray apply a post removal (lock-down) encapsulant to ceiling, walls, floors and other areas exposed in the removal area. The exposed area includes but is not limited to plastic barriers, furnishings and articles to be discarded as well as dirty change room, air locks for bag removal and decontamination chambers.

3.2.15 Site Inspection

While performing asbestos engineering control work, the Contractor must be subject to on-site inspection by the Contracting Officer who may be assisted by or represented by safety or industrial hygiene personnel. If the work is found to be in violation of this specification, the Contracting Officer or his representative will issue a stop work order to be in effect immediately and until the violation is resolved. All related costs including standby time required to resolve the violation must be at the Contractor's expense.

3.3 CLEAN-UP AND DISPOSAL

3.3.1 Housekeeping

Essential parts of asbestos dust control are housekeeping and clean-up procedures. Maintain surfaces of the asbestos control area free of accumulations of asbestos fibers. Give meticulous attention to restricting the spread of dust and debris; keep waste from being distributed over the general area. Use HEPA filtered vacuum cleaners. DO NOT BLOW DOWN THE SPACE WITH COMPRESSED AIR. When asbestos removal is complete, all asbestos waste is removed from the work-site, and final clean-up is completed, the Contracting Officer will attest that the area is safe before the signs can be removed. After final clean-up and acceptable airborne concentrations are attained but before the HEPA unit is turned off and the enclosure removed, remove all pre-filters on the building HVAC system and provide new pre-filters. Dispose of filters as asbestos contaminated materials. Reestablish HVAC mechanical, and electrical systems in proper working order. The Contracting Officer will visually inspect all surfaces within the enclosure for residual material or accumulated dust or debris. The Contractor must re-clean all areas showing dust or residual materials. If re-cleaning is required, air sample and establish an acceptable asbestos airborne concentration after re-cleaning. The Contracting Officer must agree that the area is safe in writing before unrestricted entry will be

permitted. The Government must have the option to perform monitoring to determine if the areas are safe before entry is permitted.

3.3.2 Title to Materials

All waste materials, except as specified otherwise, become the property of the Contractor and must be disposed of as specified in applicable local, State, and Federal regulations and herein.

3.3.3 Disposal of Asbestos

3.3.3.1 Procedure for Disposal

Coordinate all waste disposal manifests with the Contracting Officer and NAVFAC EV. Collect asbestos waste, contaminated waste water filters, asbestos contaminated water, scrap, debris, bags, containers, equipment, and asbestos contaminated clothing which may produce airborne concentrations of asbestos fibers and place in sealed fiber-proof, waterproof, non-returnable containers (e.g. double plastic bags 6 mils thick, cartons, drums or cans). Wastes within the containers must be adequately wet in accordance with 40 CFR 61-SUBPART M. Affix a warning and Department of Transportation (DOT) label to each container including the bags or use at least 6 mils thick bags with the approved warnings and DOT labeling preprinted on the bag. Clearly indicate on the outside of each container the name of the waste generator and the location at which the waste was generated. Prevent contamination of the transport vehicle (especially if the transport vehicle is a rented truck likely to be used in the future for non-asbestos purposes). These precautions include lining the vehicle cargo area with plastic sheeting (similar to work area enclosure) and thorough cleaning of the cargo area after transport and unloading of asbestos debris is complete. Dispose of waste asbestos material at an Environmental Protection Agency (EPA) or State-approved asbestos landfill off Government property. For temporary storage, store sealed impermeable bags in asbestos waste drums or skids. An area for interim storage of asbestos waste-containing drums or skids will be assigned by the Contracting Officer or his authorized representative. Comply with 40 CFR 61-SUBPART M, State, regional, and local standards for hauling and disposal. Sealed plastic bags may be dumped from drums into the burial site unless the bags have been broken or damaged. Damaged bags must remain in the drum and the entire contaminated drum must be buried. Uncontaminated drums may be recycled. Workers unloading the sealed drums must wear appropriate respirators and personal protective equipment when handling asbestos materials at the disposal site.

3.3.3.2 Asbestos Disposal Quantity Report

Direct the PQP to record and report, to the Contracting Officer, the amount of asbestos containing material removed 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.

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SECTION 03 30 53

MISCELLANEOUS CAST-IN-PLACE CONCRETE
05/14

PART 1 GENERAL

1.1 SUMMARY

Perform all work in accordance with ACI 318.

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 CONCRETE INSTITUTE (ACI)

ACI 117	(2010; Errata 2011) Specifications for Tolerances for Concrete Construction and Materials and Commentary
ACI 301	(2016) Specifications for Structural Concrete
ACI 302.1R	(2015) Guide for Concrete Floor and Slab Construction
ACI 304R	(2000; R 2009) Guide for Measuring, Mixing, Transporting, and Placing Concrete
ACI 305R	(2010) Guide to Hot Weather Concreting
ACI 318	(2014; Errata 1-2 2014; Errata 3-5 2015; Errata 6 2016; Errata 7-9 2017) Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary (ACI 318R-14)
ACI 347R	(2014; Errata 1 2017) Guide to Formwork for Concrete
ACI SP-66	(2004) ACI Detailing Manual

ASTM INTERNATIONAL (ASTM)

ASTM A1064/A1064M	(2017) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A615/A615M	(2016) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM C1064/C1064M	(2017) Standard Test Method for

	Temperature of Freshly Mixed Hydraulic-Cement Concrete
ASTM C1260	(2014) Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C143/C143M	(2015) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150/C150M	(2018) Standard Specification for Portland Cement
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 C172/C172M	(2017) Standard Practice for Sampling Freshly Mixed Concrete
ASTM C309	(2011) Standard Specification for Liquid Membrane-Forming Compounds for Curing 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 C39/C39M	(2018) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C494/C494M	(2017) Standard Specification for Chemical Admixtures for Concrete
ASTM C685/C685M	(2017) Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM C94/C94M	(2018) Standard Specification for Ready-Mixed Concrete
ASTM D1752	(2018) Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D75/D75M	(2014) Standard Practice for Sampling Aggregates

ASTM E1155	(2014) Standard Test Method for Determining Floor Flatness and Floor Levelness Numbers
ASTM E1155M	(2014) Standard Test Method for Determining Floor Flatness and Floor Levelness Numbers (Metric)
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
ASTM E96/E96M	(2016) Standard Test Methods for Water Vapor Transmission of Materials

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

40 CFR 247	Comprehensive Procurement Guideline for Products Containing Recovered Materials

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

Installation Drawings; G

SD-03 Product Data

Water-Reducing or Retarding Admixture
Curing Materials
Expansion Joint Filler Strips, Premolded
Joint Sealants - Field Molded Sealants
Mix Design Data; G
Curing Compound

SD-06 Test Reports

Compressive Strength Testing; G
Slump; G

SD-07 Certificates

Cementitious Materials
Aggregates
Delivery Tickets

1.4 QUALITY ASSURANCE

Indicate specific locations of Concrete Placement, Steel Reinforcement, Control Joints on [installation drawings](#) and include, but not be limited to, square [feet](#) of concrete placements, thicknesses and widths, plan dimensions, and arrangement of cast-in-place concrete section.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

The Government retains the option to sample and test joint sealer, joint filler material, aggregates and concrete to determine compliance with the specifications. Provide facilities and labor as may be necessary to assist the Government in procurement of representative test samples. Obtain samples of aggregates at the point of batching in accordance with [ASTM D75/D75M](#). Sample concrete in accordance with [ASTM C172/C172M](#). Determine slump in accordance with [ASTM C143/C143M](#) respectively, when cylinders are molded. Prepare, cure, and transport compression test specimens in accordance with [ASTM C31/C31M](#). Test compression test specimens in accordance with [ASTM C39/C39M](#). Take samples for strength tests not less than once each shift in which concrete is produced. Provide a minimum of five specimens from each sample; two to be tested at 28 days for acceptance, two will be tested at 7 days for information and one held in reserve.

2.1.1 Strength

Acceptance test results are the average strengths of two specimens tested at 28 days. The strength of the concrete is considered satisfactory so long as the average of three consecutive acceptance test results equal or exceed the specified compressive strength, f'c, but not more than 20 percent, and no individual acceptance test result falls below f'c by more than [500 psi](#).

2.1.2 Construction Tolerances

Apply a Class "C" finish to all surfaces except those specified to receive a Class "D" finish. Apply a Class "D" finish to all post-construction surfaces which will be permanently concealed. Surface requirements for the classes of finish required are as specified in [ACI 117](#).

2.1.3 Concrete Mixture Proportions

Concrete mixture proportions are the responsibility of the Contractor. Mixture proportions must include the dry weights of cementitious material(s); the nominal maximum size of the coarse aggregate; the specific gravities, absorptions, and saturated surface-dry weights of fine and coarse aggregates; the quantities, types, and names of admixtures; and quantity of water per [yard](#) of concrete. Provide materials included in the mixture proportions of the same type and from the same source as will be used on the project. The specified compressive strength f'c is [4,000 psi](#) at 28 days. The maximum nominal size coarse aggregate is [1 inch](#), in accordance with [ACI 304R](#). The slump shall be between [2 and 5 inches](#). The maximum water-cementitious material ratio is 0.50. Submit the applicable test reports and mixture proportions that will produce concrete of the quality required, ten days prior to placement of concrete.

2.2 MATERIALS

Submit manufacturer's literature from suppliers which demonstrates compliance with applicable specifications for the specified materials.

2.2.1 Cementitious Materials

Submit Manufacturer's certificates of compliance, accompanied by mill test reports, attesting that the concrete materials meet the requirements of the specifications in accordance with the Special Clause "CERTIFICATES OF COMPLIANCE". Also, certificates for all material conforming to EPA's Comprehensive Procurement Guidelines (CPG), in accordance with 40 CFR 247. Provide cementitious materials that conform to the appropriate specifications listed:

2.2.1.1 Portland Cement

ASTM C150/C150M, Type I with tri-calcium aluminates (C3A) content less than 10 percent and a maximum cement-alkali content of 0.80 percent Na₂Oe (sodium oxide) equivalent.

2.2.2 Aggregates

For fine and coarse aggregates meet the quality and grading requirements of ASTM C33/C33M. Perform evaluation of fine and coarse aggregates separately and in combination, matching the proposed mix design proportioning. All results of the separate and combination testing must have a measured expansion less than 0.08 percent at 28 days after casting. If the test data indicates an expansion of 0.08 percent or greater, reject the aggregate(s) or perform additional testing using ASTM C1260 and ASTM C1567. Submit certificates of compliance and test reports for aggregates showing the material(s) meets the quality and grading requirements of the specifications under which it is furnished.

2.2.3 Admixtures

Provide admixtures, when required or approved, in compliance with the appropriate specification listed. Retest chemical admixtures that have been in storage at the project site, for longer than 6 months or that have been subjected to freezing, at the expense of the Contractor at the request of the Contracting Officer and will be rejected if test results are not satisfactory.

2.2.3.1 Water-Reducing or Retarding Admixture

Provide water-reducing or retarding admixture meeting the requirements of ASTM C494/C494M, Type A, B, or D.

2.2.4 Water

Mixing and curing water in compliance with the requirements of ASTM C1602/C1602M; potable, and free of injurious amounts of oil, acid, salt, or alkali.

2.2.5 Reinforcing Steel

Provide reinforcing bars conforming to the requirements of ASTM A615/A615M, Grade 60, deformed. Provide welded steel wire reinforcement conforming to the requirements of ASTM A1064/A1064M. Detail reinforcement not indicated

in accordance with ACI 301 and ACI SP-66.

2.2.6 Expansion Joint Filler Strips, Premolded

Expansion joint filler strips, premolded of sponge rubber conforming to ASTM D1752, Type I.

2.2.7 Joint Sealants - Field Molded Sealants

Conform to ASTM C920, Type M, Grade NS, Class 25, use NT for vertical joints and Type M, Grade P, Class 25, use T for horizontal joints. Provide polyethylene tape, coated paper, metal foil, or similar type bond breaker materials. The backup material needs to be compressible, nonshrink, nonreactive with the sealant, and a nonabsorptive material such as extruded butyl or polychloroprene foam rubber. Immediately prior to installation of field-molded sealants, clean the joint of all debris and further cleaned using water, chemical solvents, or other means as recommended by the sealant manufacturer or directed.

2.2.8 Formwork

Design and engineer the formwork as well as its construction in accordance with ACI 301 Section 2 and 5 and ACI 347R. Fabricate of wood, steel, or other approved material.

2.2.9 Form Coatings

Provide form coating in accordance with ACI 301.

2.2.10 Vapor Retarder

ASTM E1745 Class C polyethylene sheeting, minimum 15 mil thickness or other equivalent material with a maximum permeance rating of 0.04 perms per ASTM E96/E96M.

Consider plastic vapor retarders and adhesives with a high recycled content, low toxicity low VOC (Volatile Organic Compounds) levels.

2.2.11 Curing Materials

Provide curing materials in accordance with ACI 301, Section 5.

2.3 READY-MIX CONCRETE

Provide ready-mix concrete with mix design data conforming to ACI 301 Part 2. Submit delivery tickets in accordance with ASTM C94/C94M for each ready-mix concrete delivery, include the following additional information: .

- a. Type and brand cement
- b. Cement content in 94-pound bags per cubic yard of concrete
- c. Maximum size of aggregate
- d. Amount and brand name of admixture
- e. Total water content expressed by water cementitious material ratio

2.4 ACCESSORIES

2.4.1 Curing Compound

Provide curing compound conforming to [ASTM C309](#). Submit manufactures instructions for placing curing compound.

PART 3 EXECUTION

3.1 PREPARATION

Prepare construction joints to expose coarse aggregate. The surface must be clean, damp, and free of laitance. Construct ramps and walkways, as necessary, to allow safe and expeditious access for concrete and workmen. Remove snow, ice, standing or flowing water, loose particles, debris, and foreign matter. Satisfactorily compact earth foundations. Make spare vibrators available. Placement cannot begin until the entire preparation has been accepted by the Government.

3.1.1 Embedded Items

Secure reinforcement in place after joints, anchors, and other embedded items have been positioned. Arrange internal ties so that when the forms are removed the metal part of the tie is not less than [2 inches](#) from concrete surfaces permanently exposed to view or exposed to water on the finished structures. Prepare embedded items so they are be free of oil and other foreign matters such as loose coatings or rust, paint, and scale. The embedding of wood in concrete is permitted only when specifically authorized or directed. Provide all equipment needed to place, consolidate, protect, and cure the concrete at the placement site and in good operating condition.

3.1.2 Formwork Installation

Forms must be properly aligned, adequately supported, and mortar-tight. Provide smooth form surfaces, free from irregularities, dents, sags, or holes when used for permanently exposed faces. Chamfer all exposed joints and edges , unless otherwise indicated.

3.1.3 Vapor Retarder

Install in accordance with [ASTM E1643](#). Apply vapor retarder over compacted fill. Lap edges not less than [12 inches](#). Seal all joints with pressure-sensitive adhesive not less than [2 inches](#) wide. Protect the vapor barrier at all times to prevent injury or displacement prior to and during concrete placement.

3.1.4 Production of Concrete

3.1.4.1 Ready-Mixed Concrete

Provide ready-mixed concrete conforming to [ASTM C94/C94M](#) except as otherwise specified.

3.1.4.2 Concrete Made by Volumetric Batching and Continuous Mixing

Conform to [ASTM C685/C685M](#).

3.2 CONVEYING AND PLACING CONCRETE

Convey and place concrete in accordance with [ACI 301](#), Section 5.

3.2.1 Hot-Weather Requirements

Place concrete in hot weather in accordance with [ACI 305R](#)

3.3 FINISHING

3.3.1 Temperature Requirement

Do not finish or repair concrete when either the concrete or the ambient temperature is below [50 degrees F](#).

3.3.2 Finishing Formed Surfaces

Remove all fins and loose materials , and surface defects including filling of tie holes. Repair all honeycomb areas and other defects. Remove all unsound concrete from areas to be repaired. Ream or chip surface defects greater than [1/2 inch](#) in diameter and holes left by removal of tie rods in all surfaces not to receive additional concrete and fill with dry-pack mortar. Brush-coat the prepared area with an approved epoxy resin or latex bonding compound or with a neat cement grout after dampening and filling with mortar or concrete. Use a blend of portland cement and white cement in mortar or concrete for repairs to all surfaces permanently exposed to view shall be so that the final color when cured is the same as adjacent concrete.

3.3.3 Finishing Unformed Surfaces

Finish unformed surfaces in accordance with [ACI 301](#), Section 5.

FINISH	LOCATION
Float	
Trowel	
Broom or Belt	

3.3.3.1 Flat Floor Finishes

In accordance with [ACI 302.1R](#), construct in accordance with one of the methods recommended in Table 7.15.3, "Typical Composite FF/FL Values for Various Construction Methods." [ACI 117](#) for tolerances tested by [ASTM E1155M](#) or [ASTM E1155](#). These requirements are based upon the latest FF/FL method.

3.3.3.1.1 Floor Slabs

Conform floor slabs on grade to the following ACI F-number requirements unless noted otherwise:

Specified Overall Values	FF30/FL23 minimum
Minimum Local Values	FF17/FL15 minimum

3.3.3.2 Measurement of Floor Tolerances

Test floor slabs within 24 hours of the final troweling. Submit test results to Contracting Officer within 12 hours after collecting data. Floor flatness inspector must provide a tolerance report which includes:

- a. Name of Project
- b. Name of Contractor
- c. Date of Data Collection
- d. Date of Tolerance Report
- e. A Key Plan Showing Location of Data Collected
- f. Results Required by ASTM E1155M ASTM E1155

3.3.3.3 Expansion and Contraction Joints

Make expansion and contraction joints in accordance with the details shown or as otherwise specified. Provide 1/2 inch thick transverse expansion joints where new work abuts an existing concrete. Provide expansion joints at a maximum spacing of 30 feet on center in sidewalks, unless otherwise indicated. Provide contraction joints at a maximum spacing of 6 linear feet in sidewalks and at a maximum spacing of 15 feet in slabs, unless otherwise indicated. Cut contraction joints at a minimum of 1 inch deep with a jointing tool after the surface has been finished.

3.4 CURING AND PROTECTION

Cure and protect in accordance with ACI 301, Section 5.

3.5 FORM WORK

Provide form work in accordance with ACI 301, Section 2 and Section 5.

3.5.1 Removal of Forms

Remove forms in accordance with ACI 301, Section 2.

3.6 STEEL REINFORCING

Reinforcement must be free from loose, flaky rust and scale, and free from oil, grease, or other coating which might destroy or reduce the reinforcement's bond with the concrete.

3.6.1 Fabrication

Shop fabricate steel reinforcement in accordance with ACI 318 and ACI SP-66. Provide shop details and bending in accordance with ACI 318 and ACI SP-66.

3.6.2 Splicing

Perform splices in accordance with ACI 318 and ACI SP-66.

3.6.3 Supports

Secure reinforcement in place by the use of metal or concrete supports,

spacers, or ties.

3.7 EMBEDDED ITEMS

Before placing concrete, take care to determine that all embedded items are firmly and securely fastened in place. Provide embedded items free of oil and other foreign matter, such as loose coatings of rust, paint and scale. Embedding of wood in concrete is permitted only when specifically authorized or directed.

3.8 TESTING AND INSPECTING

Report the results of all tests and inspections conducted at the project site informally at the end of each shift. Submit written reports weekly. Deliver within three days after the end of each weekly reporting period. See Section 01 45 00.00 10 QUALITY CONTROL.

3.8.1 Field Testing Technicians

The individuals who sample and test concrete must have demonstrated a knowledge and ability to perform the necessary test procedures equivalent to the ACI minimum guidelines for certification of Concrete Field Testing Technicians, Grade I.

3.8.2 Preparations for Placing

Inspect foundation or construction joints, forms, and embedded items in sufficient time prior to each concrete placement to certify that it is ready to receive concrete.

3.8.3 Sampling and Testing

- a. Obtain samples and test concrete for quality control during placement. Sample fresh concrete for testing in accordance with ASTM C172/C172M. Make six test cylinders.
- b. Test concrete for compressive strength at 7 and 28 days for each design mix and for every 100 cubic yards of concrete. Test two cylinders at 7 days; two cylinders at 28 days; and hold two cylinders in reserve. Conform test specimens to ASTM C31/C31M. Perform compressive strength testing conforming to ASTM C39/C39M.
- c. Test slump at the site of discharge for each design mix in accordance with ASTM C143/C143M. Check slump once during each shift that concrete is produced.
- d. Determine temperature of concrete at time of placement in accordance with ASTM C1064/C1064M. Check concrete temperature at least once during each shift that concrete is placed.

3.8.4 Action Required

3.8.4.1 Placing

Do not begin placement until the availability of an adequate number of acceptable vibrators, which are in working order and have competent operators, has been verified. Discontinue placing if any lift is

inadequately consolidated.

3.8.4.2 Slump

Whenever a slump test result is outside the specification limits, adjust the batch weights of water and fine aggregate prior to delivery of concrete to the forms. Make the adjustments so that the water-cementitious material ratio does not exceed that specified in the submitted concrete mixture proportion and the required concrete strength is still met.

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SECTION 04 20 00

UNIT MASONRY

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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 216.1 (2014) Code Requirements for Determining Fire Resistance of Concrete and Masonry Construction Assemblies
- ACI 318 (2014; Errata 1-2 2014; Errata 3-5 2015; Errata 6 2016; Errata 7-9 2017) Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary (ACI 318R-14)
- ACI SP-66 (2004) ACI Detailing Manual

ASTM INTERNATIONAL (ASTM)

- ASTM A1008/A1008M (2016) 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 A153 (2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- ASTM A1064/A1064M (2017) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
- ASTM A153/A153M (2016) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- ASTM A36/A36M (2014) Standard Specification for Carbon Structural Steel
- ASTM A615/A615M (2016) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- ASTM A641/A641M (2009a; R 2014) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire

ASTM A653/A653M	(2018) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A951/A951M	(2011) Standard Specification for Steel Wire for Masonry Joint Reinforcement
ASTM A996/A996M	(2016) Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
ASTM C1019	(2018) Standard Test Method for Sampling and Testing Grout
ASTM C1314	(2014) Standard Test Method for Compressive Strength of Masonry Prisms
ASTM C1611/C1611M	(2014) Standard Test Method for Slump Flow of Self-Consolidating Concrete
ASTM C216	(2017) Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale)
ASTM C270	(2014a) Standard Specification for Mortar for Unit Masonry
ASTM C476	(2018) Standard Specification for Grout for Masonry
ASTM C494/C494M	(2017) Standard Specification for Chemical Admixtures for Concrete
ASTM C67/C67M	(2018) Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile
ASTM C780	(2017) Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
ASTM C90	(2016) Standard Specification for Loadbearing Concrete Masonry Units
ASTM D2000	(2012; R 2017) Standard Classification System for Rubber Products in Automotive Applications
ASTM D2287	(2012) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds

THE MASONRY SOCIETY (TMS)

TMS MSJC	(2016) Masonry Standard Joint Committee's (MSJC) Book - Building Code Requirements and Specification for Masonry Structures, Containing TMS 402/ACI 530/ASCE 5, TMS

602/ACI 530.1/ASCE 6, and Companion
Commentaries

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Reinforcement Detail Drawings; G

SD-03 Product Data

Hot Weather Procedures; G

Clay Brick; G

Cellular Plastic Weep Vent; G

Cavity Drainage Materials; G

Cement; G

Cementitious Materials; G

SD-05 Design Data

Masonry Compressive Strength; G

Bracing Calculations; G

SD-06 Test Reports

Field Testing of Mortar

Field Testing of Grout

Prism Tests

SD-07 Certificates

Clay Brick

Concrete Masonry Units (CMU)

Precast Concrete Units

Cementitious Materials

Anchors, Ties, and Bar Positioners

Joint Reinforcement

Clay Masonry Expansion-Joint Materials

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver, store, handle, and protect material to avoid chipping, breakage, and contact with soil or contaminating material. Store and prepare materials in already disturbed areas to minimize project site disturbance and size of project site.

1.3.1 Masonry Units

Cover and protect masonry units from precipitation. Conform to handling and storage requirements of **TMS MSJC**.

- a. Mark prefabricated lintels on top sides to show either the lintel schedule number or the number and size of top and bottom bars.

1.3.2 Reinforcement, Anchors, and Ties

Store steel reinforcing bars, coated anchors, ties, and joint reinforcement above the ground. Maintain steel reinforcing bars and uncoated ties free of loose mill scale and loose rust.

1.3.3 Cementitious Materials, Sand and Aggregates

Deliver cementitious and other packaged materials in unopened containers, plainly marked and labeled with manufacturers' names and brands. Store cementitious material in dry, weathertight enclosures or completely cover. Handle cementitious materials in a manner that will prevent the inclusion of foreign materials and damage by water or dampness. Store sand and aggregates in a manner to prevent contamination and segregation.

1.4 PROJECT/SITE CONDITIONS

Conform to **TMS MSJC** for hot and cold weather masonry erection.

1.4.1 Hot Weather Procedures

When ambient air temperature exceeds 100 degrees F, or exceeds 90 degrees F and the wind velocity is greater than 8 mph, comply with **TMS MSJC** Article 1.8 D for: preparation prior to conducting masonry work; construction while masonry work is in progress; and protection for newly completed masonry.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

2.1.1 Design - Specified Compressive Strength of Masonry

The specified compressive strength of masonry, f'_m , is as indicated for each type of masonry.

2.1.2 Performance - Verify Masonry Compressive Strength

Verify specified compressive strength of masonry using the "Unit Strength Method" of **TMS MSJC**. Submit calculations and certifications of unit and mortar strength.

Verify specified compressive strength of masonry using the "Prism Test Method" of **TMS MSJC** when the "Unit Strength Method" cannot be used. Submit

test results.

2.2 MANUFACTURED UNITS

2.2.1 General Requirements

Do not change the source of materials, which will affect the appearance of the finished work, after the work has started except with Contracting Officer's approval. Submit test reports from an approved independent laboratory. Certify test reports on a previously tested material as the same materials as that proposed for use in this project. Submit certificates of compliance stating that the materials meet the specified requirements.

2.2.2 Clay Brick

2.2.2.1 General

2.2.2.1.1 Sample Submittal

Submit brick samples as specified, showing the color range and texture of clay brick. Limit units used on the project to those that conform to the approved sample. Submit sample of colored mortar with applicable masonry unit and color samples of three stretcher units and one unit for each type of special shape.

2.2.2.1.2 Uniformity

Deliver clay brick units factory-blended to provide a uniform appearance and color range in the completed wall.

2.2.2.2 Solid Clay Brick

Provide solid clay brick that conforms to ASTM C216, Type FBS, Grade SW. Where brick cores, recesses, or deformation would be exposed to view, provide 100 percent solid units. Provide brick with texture and color range to match the brick at the existing facility.

Provide brick with specified sizes.

- a. Modular size, 3-5/8 inches thick, 2-1/4 inches high, and 7-5/8 inches long, unless otherwise indicated or required to match existing.

2.2.3 Concrete Units

2.2.3.1 Concrete Masonry Units (CMU)

2.2.3.1.1 Cement

Use only cement that has a low alkali content and is of one brand.

2.2.3.1.2 Size

Provide units with specified dimension of 8 inches wide, 8 inches high, and 16 inches long.

2.2.3.1.3 Surfaces

Provide units with exposed surfaces that are smooth and of uniform texture.

2.2.3.1.4 Unit Types

- a. Hollow Load-Bearing Units: **ASTM C90**, normal weight. Provide load-bearing units for exterior walls, foundation walls, load-bearing walls, and shear walls.

2.2.3.1.5 Jamb Units

Provide jamb units of the shapes and sizes to conform with wall units. Solid units may be incorporated in the masonry work where necessary to fill out at corners, gable slopes, and elsewhere as approved.

Provide sash jamb units with a 3/4 by 3/4 inch groove near the center at end of each unit.

2.2.3.2 Fire-Rated Concrete Masonry Units

For indicated fire-rated construction, provide concrete masonry units of minimum equivalent thickness for the fire rating indicated and the corresponding type of aggregates indicated in TABLE I. Units containing more than one of the aggregates listed in TABLE I will be rated by linear interpolation based on the percent by dry-rodded volume of each aggregate used in manufacturing the units.

TABLE I FIRE-RATED CONCRETE MASONRY UNITS							
Aggregate Type	Minimum Equivalent Thickness for Fire-Resistance Rating, inch						
	1/2 hour	3/4 hour	1 hour	1-1/2 hour	2 hours	3 hours	4 hours
Calcareous or siliceous gravel (other than limestone)	2.0	2.4	2.8	3.6	4.2	5.3	6.2
Limestone, cinders, or air-cooled slag	1.9	2.3	2.7	3.4	4.0	5.0	5.9
Expanded clay, expanded shale, or expanded slate	1.8	2.2	2.6	3.3	3.6	4.4	5.1
Expanded slag or pumice	1.5	1.9	2.1	2.7	3.2	4.0	4.7

Determine equivalent thickness in accordance with **ACI 216.1**. Where walls are to receive plaster or be faced with brick, or otherwise form an assembly; include the thickness of plaster or brick or other material in the assembly in determining the equivalent thickness. Submit calculation results.

2.2.4 Precast Concrete Units

2.2.4.1 General

- a. Provide precast concrete trim, lintels, copings, splashblocks and sills that are factory-made units in a plant regularly engaged in producing precast concrete units. Unless otherwise indicated, provide precast concrete with minimum 4,000 psi compressive strength, conforming to Section 03 30 53 MISCELLANEOUS CAST-IN-PLACE CONCRETE using 1/2 inch to No. 4 nominal-size coarse aggregate, and with reinforcement required for handling of the units. Maintain minimum clearance of 3/4 inch between reinforcement and faces of units.
- b. Unless precast-concrete items have been subjected during manufacture to saturated-steam pressure of at least 120 psi for at least 5 hours, either damp-cure for 24 hours or steam-cure and then age under cover for 28 days or longer. In precast concrete members weighing over 80 pounds provide built-in loops of galvanized wire or other approved provisions for lifting and anchoring.
- c. Fabricate units with beds and joints at right angles to the face, with sharp true arises and with drip grooves on the underside where units overhang walls. Form exposed-to-view surfaces free of surface voids, spalls, cracks, and chipped or broken edges and with uniform appearance and color. Unless otherwise specified, provide units with a smooth dense finish.
- d. Prior to installation, wet and inspect each unit for crazing. Items showing evidence of dusting, spalling, crazing, or having surfaces treated with a protective coating will be rejected.
- e. Submit specified factory certificates.

2.2.4.2 Precast Concrete Lintels

Provide precast concrete lintels, unless otherwise shown, of a thickness equal to the wall and reinforced with minimum two No. 4 bars for the full length. Provide top and bottom bars for lintels over 36 inches in length. Provide at least 8 inches bearing at each end. Label the top of lintels and clearly mark each lintel to show location in the structure. Design reinforced lintels in conformance with ACI 318 for flexural and shear strength, using concrete with a minimum 28 day compressive strength of 4,000 psi. Limit lintel deflection due to dead plus live load to L/600 or 0.3 inches.

2.2.4.3 Precast Concrete Sills and Copings

Cast sills and copings washes. For windows having mullions, cast sills in sections with head joints at mullions and a 1/4 inch allowance for mortar joints. Roughen the ends of sills, except a 3/4 inch wide margin at exposed surfaces, for bond. Provide rounded nosings on treads of door sills. Reinforce sills with not less than two No. 4 bars.

2.3 EQUIPMENT

2.3.1 Vibrators

Maintain at least one spare vibrator on site at all times.

2.3.2 Grout Pumps

Pumping through aluminum tubes is not permitted.

2.4 MATERIALS

2.4.1 Mortar Materials

2.4.1.1 Cementitious Materials

Provide cementitious materials that conform to those permitted by [ASTM C270](#).

2.4.1.2 Aggregate and Water

Provide aggregate (sand) and water that conform to materials permitted by [ASTM C270](#).

2.4.2 Grout and Ready-Mix Grout Materials

2.4.2.1 Cementitious Materials for Grout

Provide cementitious materials that conform to those permitted by [ASTM C476](#).

2.4.2.2 Admixtures for Grout

Water-reducing admixtures that conform to [ASTM C494/C494M](#) Type F or G and viscosity-modifying admixtures that conform to [ASTM C494/C494M](#) Type S are permitted for use in grout. Other admixtures require approval by the Contracting Officer.

2.4.2.3 Aggregate and Water

Provide fine and coarse aggregates and water that conform to materials permitted by [ASTM C476](#).

2.5 MORTAR AND GROUT MIXES

2.5.1 Mortar Mix

- a. Provide mortar Type S, M unless specified otherwise herein.
- b. Provide mortar that conforms to [ASTM C270](#). Use Type M,S mortar for foundation walls.
- c. Provide Type S mortar for non-load-bearing, non-shear-wall interior masonry.
- d. Provide approved commercial fire clay mortar or refractory cement (calcium-aluminate) mortar for fire brick and flue liners.
- e. For field-batched mortar, measure component materials by volume. Use measuring boxes for materials that do not come in packages, such as sand, for consistent batching. Mix cementitious materials and aggregates between 3 and 5 minutes in a mechanical batch mixer with a sufficient amount of water to produce a workable consistency. Do not hand mix mortar unless approved by the Contracting Officer. Maintain workability of mortar by remixing or retempering. Discard mortar that has begun to stiffen or is not used within 2-1/2 hours after initial mixing.

- f. For preblended mortar, follow manufacturer's mixing instructions.

2.5.2 Grout and Ready Mix Grout Mix

Use grout that conforms to [ASTM C476](#), fine. Use conventional grout with a slump between [8 and 11 inches](#). Use self-consolidating grout with slump flow of [24 to 30 inches](#) and a visual stability index (VSI) not greater than 1. Provide minimum grout strength of [2000 psi](#) in 28 days, as tested in accordance with [ASTM C1019](#). Do not change proportions and do not use materials with different physical or chemical characteristics in grout for the work unless additional evidence is furnished that grout meets the specified requirements. Use ready-mixed grout that conforms to [ASTM C476](#).

2.6 ACCESSORIES

2.6.1 Anchors, Ties, and Bar Positioners

2.6.1.1 General

- a. Fabricate anchors and ties without drips or crimps. Size anchors and ties to provide a minimum of [5/8 inch](#) mortar cover from each face of masonry.
- b. Fabricate steel wire anchors and ties shall from wire conforming to [ASTM A1064/A1064M](#) and hot-dip galvanize in accordance with [ASTM A153/A153M](#).
- c. Fabricate joint reinforcement in conformance with [ASTM A951/A951M](#). Hot dip galvanize joint reinforcement in exterior walls and in interior walls exposed to moist environment in conformance with [ASTM A153/A153M](#). Galvanize joint reinforcement in other interior walls in conformance with [ASTM A641/A641M](#); coordinate with paragraph JOINT REINFORCEMENT below.
- d. Fabricate sheet metal anchors and ties in conformance with [ASTM A1008/A1008M](#). Hot dip galvanize sheet metal anchors and ties in exterior walls and in interior walls exposed to moist environment in compliance with [ASTM A153/A153M](#) Class B. Galvanize sheet metal anchors and ties in other interior walls in compliance with [ASTM A653/A653M](#), Coating Designation G60.

2.6.1.2 Wall Ties for Multi-Wythe Masonry Construction

Provide rectangular-shaped wall ties, fabricated of hot-dipped galvanized [W2.8](#) diameter steel wire. Provide rectangular wall ties no less than [4 inches](#) wide.

Provide adjustable type wall ties, if approved for use, that consist of two essentially U-shaped elements fabricated of minimum [W2.8](#) diameter steel wire or pintle type ties that are inserted to eyes of horizontal joint reinforcement, hot-dip galvanized. Provide adjustable ties with double pintle legs and allows a maximum offset of [1-1/4 inch](#) between each element of the tie and maximum distance between connecting parts no more than [1/16 inch](#). Form the pintle and eye elements shall be formed so that both can be in the same plane. Wall ties may also be of a continuous type conforming to paragraph JOINT REINFORCEMENT.

2.6.1.3 Dovetail Anchors

Provide dovetail anchors of 3/16 inch diameter steel wire, triangular shaped, and attached to a 12 gauge or heavier steel dovetail section. Use these anchors to connect the exterior masonry wythe as it passes over the face of concrete columns, beams, or walls. Fill cells immediately above and below these anchors unless solid units are used.

2.6.1.4 Adjustable Anchors

2.6.1.5 Bar Positioners

Factory-fabricate bar positioners, used to prevent displacement of reinforcing bars during the course of construction, from 9 gauge steel wire or equivalent, and hot-dip galvanized. Bar positioners must be suitable for intended use and be corrosion resistant steel. Bar positioners not fully contained within the wythe must be hot-dip galvanized.

2.6.2 Joint Reinforcement

Factory fabricate joint reinforcement in conformance with ASTM A951/A951M, welded construction. Provide ladder type joint reinforcement, having one longitudinal wire in the mortar bed of each face shell for hollow units and one wire for solid units and with all wires a minimum of 9 gauge. Size joint reinforcement to provide a minimum of 5/8 inch cover from each face. Space crosswires not more than 16 inches. Provide joint reinforcement for straight runs in flat sections not less than 10 feet long. Provide joint reinforcement with factory formed corners and intersections. If approved for use, joint reinforcement may be furnished with adjustable wall tie features. Submit one piece of each type used, including corner and wall intersection pieces, showing at least two cross wires.

2.6.3 Reinforcing Steel Bars

Reinforcing steel bars and rods shall conform to ASTM A615/A615M or ASTM A996/A996M, Grade 60.

2.6.4 Concrete Masonry Control Joint Keys

Provide control joint keys of a factory fabricated solid section of natural or synthetic rubber (or combination thereof) conforming to ASTM D2000 M2AA-805 with a minimum durometer hardness of 80 or polyvinyl chloride conforming to ASTM D2287 Type PVC 654-4 with a minimum durometer hardness of 85. Form the control joint key with a solid shear section not less than 5/8 inch thick and 3/8 inch thick flanges, with a tolerance of plus or minus 1/16 inch, to fit neatly, but without forcing, in masonry unit jamb sash grooves.

2.6.5 Clay Masonry Expansion-Joint Materials

Provide backer rod and sealant as specified in Section 07 92 00 JOINT SEALANTS.

2.6.6 Through Wall Flashing, Weeps, and Cavity Drainage Material

2.6.6.1 Through-Wall Membrane Flashing

Provide rubberized-asphalt through-wall flashing; composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound,

bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch.

- a. Accessories: Provide preformed corners, end dams, other special shapes, and seaming and termination materials produced by the flashing manufacturer.

2.6.6.2 Cellular Plastic Weep Vent

One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color to match brick color, unless otherwise selected by Contracting Officer from manufacturer's standard colors.

2.6.6.3 Cavity Drainage Materials

Free draining mesh of polymer strands that will not degrade within the cavity. Provide in strips, full-depth of cavity and 10 inches high, unless otherwise indicated, with dovetail shaped notches or dimpled surfaces designed to prevent clogging with mortar droppings.

2.6.7 Shelf Angles

Fabricate shelf angles from steel angles of sizes indicated and for attachment to masonry and concrete; ASTM A36/A36M. Provide horizontally slotted holes to receive 3/4 inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

- a. Provide mitered and welded units at corners.
- b. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.

For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

Hot-dip galvanize shelf angles located in exterior walls; ASTM A153. Field paint exposed portions of shelf angles with high-performance coating system specified in Section 09 90 00 PAINTS AND COATINGS.

PART 3 EXECUTION

3.1 EXAMINATION

Prior to start of work, verify the applicable conditions as set forth in TMS MSJC, inspection.

3.2 PREPARATION

3.2.1 Stains

Protect exposed surfaces from mortar and other stains. When mortar joints are tooled, remove mortar from exposed surfaces with fiber brushes and wooden paddles. Protect base of walls from splash stains by covering adjacent ground with sand, sawdust, or polyethylene.

3.2.2 Loads

Do not apply uniform loads for at least 12 hours or concentrated loads for

at least 72 hours after masonry is constructed. Provide temporary bracing as required.

3.2.3 Concrete Surfaces

Where masonry is to be placed, clean concrete of laitance, dust, dirt, oil, organic matter, or other foreign materials and slightly roughen to provide a surface texture with a depth of at least $\frac{1}{8}$ inch. Sandblast, if necessary, to remove laitance from pores and to expose the aggregate.

3.2.4 Shelf Angles

Adjust shelf angles as required to keep the masonry level and at the proper elevation.

3.2.5 Bracing

Provide bracing and scaffolding necessary for masonry work. Design bracing to resist wind pressure as required by OSHA and local codes and submit [bracing calculations](#), sealed by a registered professional engineer. Do not remove bracing in less than 10 days.

3.3 ERECTION

3.3.1 General

- a. Coordinate masonry work with the work of other trades to accommodate built-in items and to avoid cutting and patching. Lay masonry units in running bond pattern. Lay facing courses level with back-up courses, unless the use of adjustable ties has been approved in which case the tolerances is plus or minus $\frac{1}{2}$ inch. Adjust each unit to its final position while mortar is still soft and has plastic consistency.
- b. Remove and clean units that have been disturbed after the mortar has stiffened, and relay with fresh mortar. Keep air spaces, cavities, chases, expansion joints, and spaces to be grouted free from mortar and other debris. Select units to be used in exposed masonry surfaces from those having the least amount of chipped edges or other imperfections detracting from the appearance of the finished work.
- c. When necessary to temporarily discontinue the work, step (rack) back the masonry for joining when work resumes. Toothing may be used only when specifically approved by the Contracting Officer. Before resuming work, remove loose mortar and thoroughly clean the exposed joint. Cover the top of walls subjected to rain or snow with nonstaining waterproof covering or membrane when work is not in process. Extend the covering a minimum of 610 mm 2 feet down on each side of the wall and hold securely in place.
- d. Ensure that units being laid and surfaces to receive units are free of water film and frost. Lay solid units in a nonfurrowed full bed of mortar. Bevel mortar for veneer wythes and slope down toward the cavity side. Shove units into place so that the vertical joints are tight. Completely fill vertical joints between solid units with mortar, except where indicated at control, expansion, and isolation joints. Place hollow units so that mortar extends to the depth of the face shell at heads and beds, unless otherwise indicated. Mortar will be permitted to protrude up to $\frac{1}{2}$ inch into the space or cells to be grouted. Provide means to prevent mortar from dropping into the space

below or clean grout spaces prior to grouting.

- e. In multi-wythe construction with collar joints no more than $\frac{3}{4}$ inch wide, bring up the inner wythe not more than 16 inches ahead of the outer wythe. Fill collar joints with mortar during the laying of the facing wythe, and filling shall not lag the laying of the facing wythe by back-buttering each unit as it is laid.

3.3.1.1 Jointing

Tool mortar joints when the mortar is thumbprint hard. Tool horizontal joints after tooling vertical joints. Brush mortar joints to remove loose and excess mortar.

3.3.1.1.1 Tooled Joints

Tool mortar joints in exposed exterior and interior masonry surfaces concave, using a jointer that is slightly larger than the joint width so that complete contact is made along the edges of the unit. Perform tooling so that the mortar is compressed and the joint surface is sealed. Use a jointer of sufficient length to obtain a straight and true mortar joint. No exterior joints are to be left un-tooled.

3.3.1.1.2 Flush Joints

Flush cut mortar joints in concealed masonry surfaces and joints at electrical outlet boxes in wet areas. Finish flush cut joints by cutting off the mortar flush with the face of the wall. Point joints in unparged masonry walls below grade tight. For architectural units, such as fluted units, completely fill both the head and bed joints and flush cut.

3.3.1.1.3 Door and Window Frame Joints

On the exposed interior side of exterior frames, joints between frames and abutting masonry walls shall be raked to a depth of $\frac{3}{8}$ inch. On the exterior side of exterior frames, joints between frames and abutting masonry walls shall be raked to a depth of $\frac{3}{8}$ inch.

3.3.1.1.4 Joint Widths

- a. Construct brick masonry with mortar joint widths equal to the difference between the specified and nominal dimensions of the unit, within tolerances permitted by TMS MSJC.
- b. Provide $\frac{3}{8}$ inch wide mortar joints in concrete masonry, except for prefaced concrete masonry units.
- c. Provide $\frac{3}{8}$ inch wide mortar joints on unfaced side of prefaced concrete masonry units and not less than $\frac{3}{16}$ inch nor more than $\frac{1}{4}$ inch wide on prefaced side.
- d. Maintain mortar joint widths within tolerances permitted by TMS MSJC

3.3.1.2 Cutting and Fitting

Use full units of the proper size wherever possible, in lieu of cut units. Locate cut units where they would have the least impact on the architectural aesthetic goals of the facility. Perform cutting and fitting, including that required to accommodate the work of others, by

masonry mechanics using power masonry saws. Concrete masonry units may be wet or dry cut. Before being placed in the work, dry wet-cut units to the same surface-dry appearance as uncut units being laid in the wall. Provide cut edges that are clean, true and sharp.

- a. Carefully make openings in the masonry so that wall plates, cover plates or escutcheons required by the installation will completely conceal the openings and will have bottoms parallel with the masonry bed joints. Provide reinforced masonry lintels above openings over 12 inches wide for pipes, ducts, cable trays, and other wall penetrations, unless steel sleeves are used.
- b. Do not reduce masonry units in size by more than one-third in height and one-half in length. Do not locate cut products at ends of walls, corners, and other openings.

3.3.1.3 Unfinished Work

Rack back unfinished work for joining with new work. Tooothing may be resorted to only when specifically approved by the Contracting Officer. Remove loose mortar and thoroughly clean the exposed joints before laying new work.

3.3.1.4 Clay Masonry Expansion Joints

Provide clay masonry expansion joints as indicated. Construct by filling with a compressible foam pad. Ensure that no mortar or other noncompressible materials are within the joint. Install backer rod and sealant in accordance with Section 07 92 00 JOINT SEALANTS.

3.3.1.5 Control Joints

Provide control joints in concrete masonry as indicated. Construct by using special control-joint units in accordance with the details shown on the Drawings. Form a continuous vertical joint at control joint locations, including through bond beams, by utilizing half blocks in alternating courses on each side of the joint. Interrupt the control joint key in courses containing continuous bond beam reinforcement. Interrupt the horizontal reinforcement and grout in bond beams at the control joint except in bond beams at the floor and roof diaphragms.

Where mortar was placed in the joint, rake both faces of the control joints to a depth of 3/4 inch. Install backer rod and sealant on both faces in accordance with Section 07 92 00 JOINT SEALANTS.

3.3.2 Clay Brick Masonry

3.3.2.1 Brick Placement

Lay brick facing with the better face exposed. Lay brick in running bond with each course bonded at corners, unless otherwise indicated. Lay molded brick with the frog side down. Do not lay brick that is cored, recessed, or has other deformations in a manner that allows those deformations to be exposed to view; lay 100 percent solid units in these areas. Completely fill head and bed joints of solid units with mortar. Lay hollow units with mortar joints as specified for concrete masonry units.

3.3.2.2 Wetting of Units

Wetting of clay, brick units having an initial rate of absorption of more than 1 gram per minute per square inch of bed surface shall be in conformance with ASTM C67/C67M. Ensure that each unit is nearly saturated when wetted but surface dry when laid.

3.3.2.3 Brick Sills

Lay brick on edge, slope not less than 3/4 inch downward to the outside, and project not less than 1/2 inch beyond the face of the wall to form a wash and drip. Fill all joints solidly with mortar and tool.

3.3.3 Anchored Veneer Construction

- a. Construct exterior masonry wythes to the thickness indicated on the drawings. Provide air space as indicated behind the masonry veneer. Provide means to ensure that the cavity space and flashings are kept clean of mortar droppings and other loose debris. Maintain chases and raked-out joints free from mortar and debris.
- b. Place masonry in running bond pattern.
- c. For veneer with a masonry backup wythe, lay up both the inner and the outer wythes together except when adjustable joint reinforcement assemblies are approved for use. When both wythes are not brought up together, install through-wall flashings with the exterior wythe, securing the top edge of the flashing with a termination bar and sealant, or protect flashings that are installed with the interior wythe from damage until they are fully enclosed in the wall.
- d. Provide anchors (ties) to connect the veneer to substrate as indicated, but not more than 16 inches o.c. vertically and 32 inches o.c. horizontally with not less than 1 anchor for each 3.5 sq. ft. of wall area. Provide additional anchors around openings larger than 16 inches in either direction. Space anchors around perimeter of opening at a maximum of 24 inches on center. Place anchors within 12 inches of openings.
- e. With solid units, embed anchors in mortar joint and extend into the veneer a minimum of 1-1/2 inch, with at least 5/8 inch mortar cover to the outside face.

3.3.4 Composite Walls

Tie masonry wythes together with joint reinforcement or with unit wall ties. Embed wall ties at least 1-1/2 inch into mortar of solid units and at least 1/2 inch into the mortar of the outer face shell of hollow units. Provide at least one tie every 2.67 square feet for wire size W1.7 and at least one tie every 4.50 square feet for wire size W2.8. Space ties at a maximum of 36 inches horizontally and 24 inches vertically. Do not cross expansion joints or control joints with ties. Fill collar joints between masonry facing and masonry backup solidly with grout.

3.3.5 Reinforced, Single Wythe Concrete Masonry Units Walls

3.3.5.1 Concrete Masonry Unit Placement

- a. Fully bed units used to form piers, pilasters, columns, starting courses on footings, solid foundation walls, lintels, and beams, and where cells are to be filled with grout in mortar under both face shells and webs. Provide mortar beds under both face shells for other units. Mortar head joints for a distance in from the face of the unit not less than the thickness of the face shell.
- b. Solidly grout foundation walls below grade.
- c. Stiffen double walls at wall-mounted plumbing fixtures by use of strap anchors, two above each fixture and two below each fixture, located to avoid pipe runs, and extending from center to center of each wall within the double wall. Adequately reinforce walls and partitions for support of wall-hung plumbing fixtures when chair carriers are not specified.

3.3.5.2 Preparation for Reinforcement

Lay units in such a manner as to preserve the unobstructed vertical continuity of cores to be grouted. Remove mortar protrusions extending $1/2$ inch or more into cells before placing grout. Position reinforcing bars accurately as indicated before placing grout. Where vertical reinforcement occurs, fill cores solid with grout in accordance with paragraph PLACING GROUT in this Section.

3.3.6 Cavity Walls (Multi-Wythe Noncomposite Walls)

Provide a continuous cavity as indicated. Bevel mortar beds away from cavity to prevent projection into cavity when bricks are shoved in place. Keep cavities clear and clean of mortar droppings.

Securely tie the two wythes together with horizontal joint reinforcement, or provide ties to connect the masonry wythes as specified hereinbefore. Ties with drips are not permitted.

3.3.7 ANCHORAGE

3.3.7.1 Anchorage to Concrete

Anchorage of masonry to the face of concrete columns, beams, or walls shall be with dovetail anchors spaced not over 16 inches on centers vertically and 24 inches on center horizontally.

3.3.7.2 Anchorage at Intersecting Walls

Provide wire mesh anchors at maximum 16 inches spacing at intersections of interior non-bearing masonry walls.

Anchor structural masonry walls with horizontal joint reinforcement spaced no more than 16 feet on center, unless the drawings indicate a movement joint at the intersection.

3.3.8 Lintels

3.3.8.1 Precast Concrete Lintels

Provide precast concrete and steel lintels as shown on the Drawings. Set lintels in a full bed of mortar with faces plumb and true. Provide steel and precast lintels with a minimum bearing length of 8 inches unless otherwise indicated. In partially grouted masonry, provide fully grouted units under the full lintel bearing length, unless otherwise indicated.

3.3.9 Sills and Copings

Set sills and copings in a full bed of mortar with faces plumb and true. Slope sills and copings to drain water.

3.4 INSTALLATION

3.4.1 Bar Reinforcement Installation

3.4.1.1 Preparation

Submit detail drawings showing bar splice locations. Identify bent bars on a bending diagram and reference and locate such bars on the drawings. Show wall dimensions, bar clearances, and wall openings. Utilize bending details that conform to the requirements of ACI SP-66. No approval will be given to the shop drawings until the Contractor certifies that all openings, including those for mechanical and electrical service, are shown. If, during construction, additional masonry openings are required, resubmit the approved shop drawings with the additional openings shown along with the proposed changes. Clearly highlight location of these additional openings. Provide wall elevation drawings with minimum scale of 1/4 inch per foot. Submit drawings including plans, elevations, and details of wall reinforcement; details of reinforcing bars at corners and wall intersections; offsets; tops, bottoms, and ends of walls; control and expansion joints; lintels; and wall openings.

Clean reinforcement of loose, flaky rust, scale, grease, mortar, grout, and other coatings that might destroy or reduce its bond prior to placing grout. Do not use bars with kinks or bends not shown on the approved shop drawings. Place reinforcement prior to grouting. Unless otherwise indicated, extend vertical wall reinforcement to within 2 inches of tops of walls.

3.4.1.2 Positioning Bars

- a. Accurately place vertical bars within the cells at the positions indicated on the drawings. A minimum clearance of 1/2 inch shall be maintained between the bars and masonry units. Provide minimum clearance between parallel bars of 1/2 inch between the bars and masonry units for coarse grout and a minimum clearance of 1/4 inch between the bars and masonry units for fine grout. Provide minimum clearance between parallel bars of 1 inch or one diameter of the reinforcement, whichever is greater. Vertical reinforcement may be held in place using bar positioners located near the ends of each bar and at intermediate intervals of not more than 192 diameters of the reinforcement or by other means to prevent displacement beyond permitted tolerances. As masonry work progresses, secure vertical reinforcement to prevent displacement beyond allowable tolerances.

- b. Position horizontal reinforcing bars as indicated. Stagger splices in adjacent horizontal bars, unless otherwise indicated.
- c. Form splices by lapping bars as indicated. Do not cut, bend or eliminate reinforcing bars. Foundation dowel bars may be field-bent when permitted by TMS MSJC.

3.4.1.3 Splices of Bar Reinforcement

Lap splice reinforcing bars as indicated.

3.4.2 Placing Grout

3.4.2.1 General

Fill cells containing reinforcing bars with grout. Solidly grout hollow masonry units in walls or partitions supporting plumbing, heating, or other mechanical fixtures, voids at door and window jambs, and other indicated spaces. Solidly grout cells under lintel bearings on each side of openings for full height of openings. Solidly grout walls below grade, lintels, and bond beams. Units other than open end units may require grouting each course to preclude voids in the units.

Discard site-mixed grout that is not placed within 1-1/2 hours after water is first added to the batch or when the specified slump is not met without adding water after initial mixing. Discard ready-mixed grout that does not meet the specified slump without adding water other than water that was added at the time of initial discharge. Allow sufficient time between grout lifts to preclude displacement or cracking of face shells of masonry units. Provide a grout shear key between lifts when grouting is delayed and the lower lift loses plasticity. If blowouts, flowouts, misalignment, or cracking of face shells should occur during construction, tear down the wall and rebuild.

3.4.2.2 Vertical Grout Barriers for Multi-Wythe Composite Walls

In multi-wythe composite walls, provide grout barriers in the collar joint not more than 30 feet apart, or as required, to limit the horizontal flow of grout for each pour.

3.4.2.3 Horizontal Grout Barriers

Embed horizontal grout barriers in mortar below cells of hollow units receiving grout.

3.4.2.4 Grout Holes and Cleanouts

3.4.2.4.1 Grout Holes

Provide grouting holes in slabs, spandrel beams, and other in-place overhead construction. Locate holes over vertical reinforcing bars or as required to facilitate grout fill in bond beams. Provide additional openings spaced not more than 16 inches on centers where grouting of hollow unit masonry is indicated. Form such openings not less than 4 inches in diameter or 3 by 4 inches in horizontal dimensions. Upon completion of grouting operations, plug and finish grouting holes to match surrounding surfaces.

3.4.2.4.2 Cleanouts for Hollow Unit Masonry Construction

For hollow masonry units, provide cleanout holes at the bottom of every grout pour in cores containing vertical reinforcement when the height of the grout pour exceeds 5 feet 4 inches. Where all cells are to be grouted, construct cleanout courses using bond beam units in an inverted position to permit cleaning of all cells. Provide cleanout holes at a maximum spacing of 32 inches where all cells are to be filled with grout.

Establish a new series of cleanouts if grouting operations are stopped for more than 4 hours. Provide cleanouts not less than 3 by 3 inch by cutting openings in one face shell. Manufacturer's standard cutout units may be used at the Contractor's option. Do not cleanout holes until masonry work, reinforcement, and final cleaning of the grout spaces have been completed and inspected. For walls which will be exposed to view, close cleanout holes in an approved manner to match surrounding masonry.

3.4.2.4.3 Cleanouts for Multi-Wythe Composite Masonry Construction

Provide cleanouts for construction of walls that incorporate a grout filled cavity between solid masonry wythes, provide cleanouts at the bottom of every pour by omitting every other masonry unit from one wythe. Establish a new series of cleanouts if grouting operations are stopped for more than 4 hours. Do not plug cleanout holes until masonry work, reinforcement, and final cleaning of the grout spaces have been completed and inspected. For walls which will be exposed to view, close cleanout holes in an approved manner to match surrounding masonry.

3.4.2.5 Grout Placement

A grout pour is the total height of masonry to be grouted prior to erection of additional masonry. A grout lift is an increment of grout placement within a grout pour. A grout pour is filled by one or more lifts of grout.

- a. Lay masonry to the top of a pour permitted by TMS MSJC Table 7, based on the size of the grout space and the type of grout. Prior to grouting, remove masonry protrusions that extend 1/2 inch or more into cells or spaces to be grouted. Provide grout holes and cleanouts in accordance with paragraph GROUT HOLES AND CLEANOUTS above when the grout pour height exceeds 5 feet 4 inches. Hold reinforcement, bolts, and embedded connections rigidly in position before grouting is started. Do not prewet concrete masonry units.
- b. Place grout using a hand bucket, concrete hopper, or grout pump to fill the grout space without segregation of aggregate. Operate grout pumps to produce a continuous stream of grout without air pockets, segregation, or contamination.
- c. If the masonry has cured at least 4 hours, grout slump is maintained between 10 to 11 inches, and no intermediate reinforced bond beams are placed between the top and bottom of the pour height, place conventional grout in lifts not exceeding 12 feet 8 inches. For the same curing and slump conditions but with intermediate bond beams, limit conventional grout lift to the bottom of the lowest bond beam that is more than 5 feet 4 inches above the bottom of the lift, but do not exceed 12 feet 8 inches. If masonry has not cured at least 4 hours or grout slump is not maintained between 10 to 11 inches, place conventional grout in lifts not exceeding 5 feet 4 inches.

- d. Consolidate conventional grout lift and reconsolidate after initial settlement before placing next lift. For grout pours that are 12 inches or less in height, consolidate and reconsolidate grout by mechanical vibration or puddling. For grout pours that are greater than 12 inches in height, consolidate and reconsolidate grout by mechanical vibration. Apply vibrators at uniformly spaced points not further apart than the visible effectiveness of the machine. Limit duration of vibration to time necessary to produce satisfactory consolidation without causing segregation. If previous lift is not permitted to set, dip vibrator into previous lift. Do not insert vibrators into lower lifts that are in a semi-solidified state. If lower lift sets prior to placement of subsequent lift, form a grout key by terminating grout a minimum of 1-1/2 inch below a mortar joint. Vibrate each vertical cell containing reinforcement in partially grouted masonry. Do not form grout keys within beams.
- e. If the masonry has cured 4 hours, place self-consolidating grout (SCG) in lifts not exceeding the pour height. If masonry has not cured for at least 4 hours, place SCG in lifts not exceeding 5 feet 4 inches. Do not mechanically consolidate self-consolidating grout. Place self-consolidating grout in accordance with manufacturer's recommendations.
- f. Upon completion of each day's grouting, remove waste materials and debris from the equipment, and dispose of outside the masonry.

3.4.3 Joint Reinforcement Installation

Install joint reinforcement at 16 inches on center unless otherwise indicated. Lap joint reinforcement not less than 6 inches. Install prefabricated sections at corners and wall intersections. Place the longitudinal wires of joint reinforcement in mortar beds to provide not less than 5/8 inch cover to either face of the unit.

3.4.4 Bond Beams

Reinforce and grout bond beams as indicated and as described in paragraphs above. Install grout barriers under bond beam units to retain the grout as required, unless wall is fully grouted or solid bottom units are used. For high lift grouting in partially grouted masonry, provide grout retaining material on the top of bond beams to prevent upward flow of grout. Ensure that reinforcement is continuous, including around corners, except through control joints or expansion joints, unless otherwise indicated.

3.4.5 Flashing and Weeps

Install through-wall flashing at obstructions in the cavity wall and where indicated. Ensure continuity of the flashing at laps and inside and outside corners by splicing. Ensure that the top edge of the flashing is sealed as indicated.

Wherever through-wall flashing occurs, provide weep holes to drain flashing to exterior at locations indicated. Locate weeps not more than 24 inches on centers in mortar joints of the exterior wythe directly on the horizontal leg of through-wall flashing over foundations, bond beams, and any other horizontal interruptions of the cavity. Maintain weeps free of mortar and other obstructions.

3.5 APPLICATION

3.5.1 Interface with Other Products

3.5.1.1 Built-In Items

Fill spaces around built-in items with mortar. Point openings around flush-mount electrical outlet boxes in wet locations with mortar. Embed anchors, ties, wall plugs, accessories, flashing, pipe sleeves and other items required to be built-in as the masonry work progresses. Fully embed anchors, ties and joint reinforcement in the mortar. Fill cells receiving anchor bolts and cells of the first course below bearing plates with grout, unless otherwise indicated.

3.5.1.2 Door and Window Frame Joints

On the exposed interior and exterior sides of exterior frames, rake joints between frames and abutting masonry walls to a depth of $\frac{3}{8}$ inch.

3.5.1.3 Bearing Plates

Set bearing plates for beams, joists, joist girders and similar structural members to the proper line and elevation with damp-pack bedding mortar, except where non-shrink grout is indicated. Provide bedding mortar and non-shrink grout as specified in Section 03 30 53 MISCELLANEOUS CAST-IN-PLACE CONCRETE.

3.5.2 Tolerances

Lay masonry plumb, true to line, with courses level within the tolerances of TMS MSJC, Article 3.3 F.

3.6 FIELD QUALITY CONTROL

3.6.1 Tests

3.6.1.1 Field Testing of Mortar

Perform mortar testing at the following frequency: 1 times per day. For each required mortar test, provide a minimum of three mortar samples. Perform initial mortar testing prior to construction for comparison purposes during construction.

Prepare and test mortar samples for mortar aggregate ratio in accordance with ASTM C780 Appendix A4.

3.6.1.2 Field Testing of Grout

- a. Perform grout testing at the following frequency: 1 times per day. For each required grout property to be evaluated, provide a minimum of three specimens.
- b. Sample and test conventional and self-consolidating grout for compressive strength and temperature in accordance with ASTM C1019.
- c. Evaluate slump in conventional grout in accordance with ASTM C1019.
- d. Evaluate slump flow and visual stability index of self-consolidating grout in accordance with ASTM C1611/C1611M.

3.6.1.3 Prism Tests

Perform at least one prism test sample for each 5,000 square feet of wall but not less than three such tests for any building. Evaluate three prisms in each test. Fabricate, store, handle, and test prisms in accordance with ASTM C1314.

Seven-day tests may be used provided the relationship between the 7- and 28-day strengths of the masonry is established by the tests of the materials used. If the compressive strength of any prism falls below the specified value by more than 500 psi, take steps to assure that the load-carrying capacity of the structure is not jeopardized. If the likelihood of low-strength masonry is confirmed and computations indicate that the load-carrying capacity may have been significantly reduced, tests of cores drilled, or prisms sawed, from the area in question may be required. In such case, take three specimens for each prism test more than 500 psi below the specified value. Masonry in the area in question will be considered structurally adequate if the average compressive strength of three specimens is equal to or exceeds the specified value. Additional testing of specimens extracted from locations represented by erratic core or prism strength test results will be permitted.

3.7 POINTING AND CLEANING

After mortar joints have attained their initial set, but prior to hardening, completely remove mortar and grout daubs and splashings from masonry-unit surfaces that will be exposed or painted. Before completion of the work, rake out defects in joints of masonry to be exposed or painted, fill with mortar, and tool to match existing joints. Immediately after grout work is completed, remove scum and stains that have percolated through the masonry work using a low pressure stream of water and a stiff bristled brush. Do not clean masonry surfaces, other than removing excess surface mortar, until mortar in joints has hardened. Leave masonry surfaces clean, free of mortar daubs, dirt, stain, and discoloration, including scum from cleaning operations, and with tight mortar joints throughout. Do not use metal tools and metal brushes for cleaning.

3.7.1 Dry-Brushing Concrete Masonry

Dry brush exposed concrete masonry surfaces at the end of each day's work and after any required pointing, using stiff-fiber bristled brushes.

3.7.2 Clay Brick Surfaces

Clean exposed clay brick masonry surfaces to obtain surfaces free of stain, dirt, mortar and grout daubs, efflorescence, and discoloration or scum from cleaning operations. Perform cleaning in accordance with the approved cleaning procedure demonstrated on the mockup.

After cleaning, examine the sample panel of similar material for discoloration or stain as a result of cleaning. If the sample panel is discolored or stained, change the method of cleaning to ensure that the masonry surfaces in the structure will not be adversely affected. Water-soak exposed masonry surfaces and then clean with a proprietary masonry cleaning agent specifically recommended for the color and texture by the clay brick manufacturer and manufacturer of the cleaning product. Apply the solution with stiff fiber brushes, followed immediately by thorough rinsing with clean water. Use proprietary cleaning agents in

conformance with the cleaning product manufacturer's printed recommendations. Remove efflorescence in conformance with the brick manufacturer's recommendations.

3.8 PROTECTION

Protect facing materials against staining. Cover top of walls with nonstaining waterproof covering or membrane to protect from moisture intrusion when work is not in progress. Continue covering the top of the unfinished walls until the wall is waterproofed with a complete roof or parapet system. Extend covering a minimum of 2 feet down on each side of the wall and hold securely in place. Before starting or resuming work, clean top surface of masonry in place of loose mortar and foreign material.

-- End of Section --

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DIVISION 05 - METALS

SECTION 05 40 00

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05/15

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SECTION 05 40 00

COLD-FORMED METAL FRAMING
05/15

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 318 (2014; Errata 1-2 2014; Errata 3-5 2015; Errata 6 2016; Errata 7-9 2017) Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary (ACI 318R-14)

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI S100 (2012) North American Specification for the Design of Cold-Formed Steel Structural Members

AISI S200 (2007) North American Standard for Cold-Formed Steel Framing - General Provision

AISI S201 (2007) North American Standard for Cold-Formed Steel Framing - Product Data

AISI S202 (2011) Code of Standard Practice for Cold-formed Steel Structural Framing

AISI S211 (2007) North American Standard for Cold-Formed Steel Framing - Wall Stud Design

AISI S212 (2007) North American Standard for Cold-Formed Steel Framing - Header Design

AISI S213 (2007; Suppl 1 2009) North American Standard for Cold-Formed Steel Framing - Lateral Design

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M (2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A153/A153M (2016) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A307	(2014; E 2017) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A370	(2018) Standard Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM A653/A653M	(2018) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A1003/A1003M	(2015) Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members
ASTM C955	(2017) Standard Specification for Cold-Formed Steel Structural Framing Members
ASTM C1007	(2011a) Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories
ASTM C1513	(2018) Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections
ASTM E119	(2018c; E 2018) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E329	(2018) Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
ASTM E488/E488M	(2015) Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
ASTM F1554	(2018) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
ASTM F1941	(2010) Standard Specification for Electrodeposited Coatings on Threaded Fasteners (Unified Inch Screw Threads (UN/UNR))
ASTM F2329/F2329M	(2015) Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC

(2018) International Building Code

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-301-01

(2013; with Change 4, 2018) Structural
Engineering

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Framing Components; G

SD-03 Product Data

Steel Studs, Tracks, Bracing, Bridging and Accessories

Recycled Content of Steel Products; S

SD-05 Design Data

Metal Framing Calculations; G

SD-07 Certificates

Load-Bearing Cold-Formed Metal Framing

1.3 DELIVERY, STORAGE, AND HANDLING

Steel framing and related accessories shall be stored and handled in accordance with the AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing".

1.4 LOAD-BEARING COLD-FORMED METAL FRAMING

Include top and bottom tracks, bracing, fastenings, and other accessories necessary for complete installation. Framing members shall have the structural properties indicated. Where physical structural properties are not indicated, they shall be as necessary to withstand all imposed loads. Design framing in accordance with AISI S100. Non-load-bearing metal framing, furring, and ceiling suspension systems are specified in Section 09 22 00 SUPPORTS FOR PLASTER AND GYPSUM BOARD. Metal suspension systems for acoustical ceilings are specified in Section 09 51 00 ACOUSTICAL CEILINGS.

Submit mill certificates or test reports from independent testing agency, qualified in accordance with ASTM E329, showing that the steel sheet used in the manufacture of each cold-formed component complies with the minimum yield strengths and uncoated steel thickness specified. Test reports shall be based on the results of three coupon tests in accordance with ASTM A370.

1.5 MAXIMUM DEFLECTION

Deflections of structural members shall not exceed the more restrictive of the limitations of [ICC IBC](#) and [UFC 3-301-01](#).

1.6 QUALITY ASSURANCE

- a. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a registered professional engineer.
- b. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to [ASTM E329](#) for testing indicated.
- c. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- d. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per [ASTM E119](#) by, and displaying a classification label from, a testing and inspecting agency acceptable to authorities having jurisdiction.
- e. AISI Specifications and Standards: Comply with:
 - (1) [AISI S100](#), "North American Specification for the Design of Cold-Formed Steel Structural Members".
 - (2) [AISI S200](#), "North American Standard for Cold-Formed Steel Framing - General Provision".
 - (3) [AISI S201](#), "North American Standard for Cold-Formed Steel Framing - Product Data".
 - (4) [AISI S202](#), "Code of Standard Practice for Cold-Formed Steel Structural Framing".
 - (5) [AISI S211](#), "North American Standard for Cold-Formed Steel Framing - Wall Stud Design".
 - (6) [AISI S212](#), "North American Standard for Cold-Formed Steel Framing - Header Design".
 - (7) [AISI S213](#), "North American Standard for Cold-Formed Steel Framing - Lateral Design".

1.6.1 Drawing Requirements

Submit [framing components](#) to show sizes, thicknesses, layout, material designations, methods of installation, and accessories including the following:

- a. Cross sections, plans, and/or elevations showing component types and locations for each framing application; including shop coatings and material thicknesses for each framing component.

- b. Connection details showing fastener type, quantity, location, and other information to assure proper installation.
- c. Drawings depicting panel configuration, dimensions, components, locations, and construction sequence if the Contractor elects to install prefabricated/prefinished frames.

Sign and seal fabrication drawings by a registered professional engineer.

1.6.2 Design Data Required

Submit [metal framing calculations](#) with design criteria and structural loading to verify sizes, thickness, and spacing of members and connections signed and sealed by a registered professional engineer. Show methods and practices used in installation.

PART 2 PRODUCTS

2.1 STEEL [STUDS](#), TRACKS, BRACING, BRIDGING AND ACCESSORIES

Framing components shall comply with [ASTM C955](#) and the following.

- a. Provide products with an average [recycled content of steel products](#) so postconsumer recycled content plus one half of preconsumer recycled content not less than 25 percent.
- b. Steel Sheet: [ASTM A1003/A1003M](#), Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - (1) Grade: As required by structural performance.
 - (2) Coating: G90 (Z275).
- c. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - (1) Minimum Base-Metal Thickness: [0.0428 inch](#).
 - (2) Flange Width: [2 inches](#).
- d. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
 - (1) Minimum Base-Metal Thickness: Matching steel studs.
 - (2) Flange Width: [1-1/4 inches](#).

2.1.1 Studs and Joists of [54 mils \(0.054 Inch\)](#) and Heavier

Galvanized steel, [ASTM A653/A653M](#) and [ASTM A1003/A1003M](#), SS Grade 50, G90.

2.1.2 Studs and Joists of [43 mils \(0.043 Inch\)](#) and Lighter

Studs and Joists of [43 mils \(0.043 Inch\)](#) and Lighter, Track, and Accessories (All thicknesses): Galvanized steel, [ASTM A653/A653M](#) and [ASTM A1003/A1003M](#), SS, Grade 33 33,000 psi G60.

2.1.3 Sizes, Thickness, Section Modulus, and Other Structural Properties

Size and thickness as required.

2.2 MARKINGS

Studs and track shall have product markings stamped on the web of the section. The markings shall be repeated throughout the length of the member at a maximum spacing of 4 feet on center and shall be legible and easily read. The product marking shall include the following:

- a. An ICC number.
- b. Manufacturer's identification.
- c. Minimum delivered uncoated steel thickness.
- d. Protective coating designator.
- e. Minimum yield strength.

2.3 CONNECTIONS

2.3.1 Steel-To-Concrete Connections

- a. Anchor Rods: ASTM F1554, Grade 36; galvanized per ASTM A153/A153M.
- b. Post-Installed Concrete Anchors: Adhesive or expansion anchors fabricated from corrosion-resistant materials with allowable load capacities in accordance with ICC-ES AC193 and ACI 318 greater than or equal to the design load as determined by testing per ASTM E488/E488M conducted by a qualified testing agency.
- c. Power-Actuated Fasteners: Fabricated from corrosion-resistant materials with allowable load capacities in accordance with ICC-ES AC 70 greater than or equal to the design load as determined by testing per ASTM E1190 conducted by a qualified testing agency.

2.3.2 Steel-To-Steel Connections

- a. Screws: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping steel screws of the type and size indicated. Provide low-profile head beneath sheathing and manufacturer's standard elsewhere. Electroplated to a minimum of 5 micron zinc coating per ASTM F1941 or hot-dipped galvanized per ASTM A123/A123M or ASTM A153/A153M.
- b. Bolts: ASTM A307 coated by hot-dip process per ASTM F2329/F2329M or zinc-coated by mechanical-deposition process per ASTM B695, Class 55.
- c. Welding Electrodes: Comply with AWS standards.

2.4 PLASTIC GROMMETS

Supply plastic grommets for stud webs as recommended by stud manufacturer, to protect electrical wires and plumbing piping. Prevent metal-to-metal contact between wiring/piping and studs.

2.5 SEALER GASKET

Closed-cell neoprene foam, 1/4-inch thick, selected from manufacturer's standard widths to match width of bottom track on concrete slab or foundation.

PART 3 EXECUTION

3.1 FASTENING

Fasten framing members together by using self-drilling, self-tapping screws. Electrodes and screw connections shall be as required and indicated in the design calculations.

3.1.1 Screws

Screws shall be of the self-drilling self-tapping type, size, and location as required. Screw penetration through joined materials shall not be less than three exposed threads. Minimum spacings and edge distances for screws shall be as specified in AISI S100. Screws covered by sheathing materials shall have low profile heads.

3.1.2 Anchors

Anchors shall be of the type, size, and location as required.

3.1.3 Powder-Actuated Fasteners

Powder-actuated fasteners shall be of the type, size, and location as required.

3.2 INSTALLATION

Install cold-formed framing in accordance with ASTM C1007 and AISI S200.

Install cold-formed steel framing according to AISI S202 and to manufacturer's written instructions unless more stringent requirements are indicated.

3.2.1 Tracks

Provide accurately aligned runners at top and bottom of studs. Install sealer gasket under bottom of track on concrete slab or foundation. Anchor tracks as indicated in design calculations. Butt weld joints in tracks or splice with stud inserts. Fasteners shall be at least 3 inches from the edge of concrete slabs.

3.2.2 Studs

Cut studs square and set with firm bearing against webs of top and bottom tracks. Position studs vertically in tracks and space as indicated in design. Do not splice studs. Provide at least two studs at jambs of doors and other openings 2 feet wide or larger. Provide jack studs over openings, as necessary, to maintain indicated stud spacing. Provide tripled studs at corners, positioned to receive interior and exterior finishes. Fasten studs to top and bottom tracks by welding or screwing both flanges to the tracks. Framed wall openings shall include headers and supporting components as shown on the drawings. Headers shall be installed in all openings that are larger than the stud spacing in a wall. In

curtain wall construction, provide for vertical movement where studs connect to the structural frame. Provide horizontal bracing in accordance with the design calculations and **AISI S100**. Bracing shall be not less than the following:

<u>LOAD</u>	<u>HEIGHT</u>	<u>BRACING</u>
Wind load only	Up to 10 feet	One row at mid-height
	Over 10 feet	Rows 5'-0" o.c. maximum
Axial load	Up to 10 feet	Two rows at 1/3 points
	Over 10 feet	Rows 3'-4" o.c. maximum

3.2.3 Erection Tolerances

- a. Framing members which will be covered by finishes such as wallboard, plaster, or ceramic tile set in a mortar setting bed, shall be within the following limits:
 - (1) Layout of walls and partitions: 1/4 inch from intended position;
 - (2) Plates and runners: 1/4 inch in 8 feet from a straight line;
 - (3) Studs: 1/4 inch in 8 feet out of plumb, not cumulative; and
 - (4) Face of framing members: 1/4 inch in 8 feet from a true plane.
- b. Framing members which will be covered by ceramic tile set in dry-set mortar, latex-portland cement mortar, or organic adhesive shall be within the following limits:
 - (1) Layout of walls and partitions: 1/4 inch from intended position;
 - (2) Plates and runners: 1/8 inch in 8 feet from a straight line;
 - (3) Studs: 1/8 inch in 8 feet out of plumb, not cumulative; and
 - (4) Face of framing members: 1/8 inch in 8 feet from a true plane.

-- End of Section --

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DIVISION 05 - METALS

SECTION 05 50 13

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05/17

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SECTION 05 50 13

MISCELLANEOUS METAL FABRICATIONS
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 INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 303 (2016) Code of Standard Practice for Steel Buildings and Bridges

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP A10.3 (2013) Safety Requirements for Powder-Actuated Fastening Systems American National Standard for Construction and Demolition Operations

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2015; Errata 1 2015; Errata 2 2016) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME B18.2.1 (2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series)

ASME B18.2.2 (2015) Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)

ASME B18.6.2 (1998; R 2010) Slotted Head Cap Screws, Square Head Set Screws, and Slotted Headless Set Screws: Inch Series

ASME B18.6.3 (2013; R 2017) Machine Screws, Tapping Screws, and Machine Drive Screws (Inch Series)

ASME B18.21.1 (2009; R 2016) Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series)

ASME B18.21.2M (1999; R 2014) Lock Washers (Metric Series)

ASME B18.22M (1981; R 2017) Metric Plain Washers

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM A47/A47M	(1999; R 2018; E 2018) Standard Specification for Ferritic Malleable Iron Castings
ASTM A53/A53M	(2018) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2016) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A307	(2014; E 2017) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A500/A500M	(2018) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A653/A653M	(2018) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A780/A780M	(2009; R 2015) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A924/A924M	(2018) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM C1513	(2018) Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections
ASTM D1187/D1187M	(1997; E 2011; R 2011) Asphalt-Base Emulsions for Use as Protective Coatings for Metal
ASTM E488/E488M	(2015) Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
ASTM F1554	(2018) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

MASTER PAINTERS INSTITUTE (MPI)

MPI 79 (2012) Primer, Alkyd, Anti-Corrosive for Metal

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 3 (1982; E 2004) Power Tool Cleaning

SSPC SP 6/NACE No.3 (2007) Commercial Blast Cleaning

U.S. ARMY CORPS OF ENGINEERS (USACE)

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

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Miscellaneous Angles and Plates, Installation Drawings; G

1.3 QUALIFICATION OF WELDERS

Qualify welders in accordance with AWS D1.1/D1.1M. Use procedures, materials, and equipment of the type required for the work.

1.4 DELIVERY, STORAGE, AND PROTECTION

Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove and replace damaged items with new items.

1.5 MISCELLANEOUS REQUIREMENTS

1.5.1 Fabrication Drawings

Submit fabrication drawings showing layout(s), connections to structural system, and anchoring details as specified in AISC 303.

1.5.2 Installation Drawings

Submit templates, erection, and installation drawings indicating thickness, type, grade, class of metal, and dimensions. Show construction details, reinforcement, anchorage, and installation in relation to the building construction.

PART 2 PRODUCTS

2.1 MATERIALS

Provide exposed fastenings of compatible materials (avoid contact of dissimilar metals). Coordinate color and finish with the material to which fastenings are applied.

2.1.1 Structural Carbon Steel

Provide in accordance with ASTM A36/A36M.

2.1.2 Structural Tubing

Provide in accordance with ASTM A500/A500M.

2.1.3 Steel Pipe

Provide in accordance with ASTM A53/A53M, Type E or S, Grade B.

2.1.4 Fittings for Steel Pipe

Provide standard malleable iron fittings in accordance with ASTM A47/A47M.

2.1.5 Anchor Bolts

Provide in accordance with ASTM F1554. Where exposed, provide anchor bolts of the same material, color, and finish as the metal to which they are applied.

2.1.5.1 Expansion Anchors and Adhesive Anchors

Provide expansion anchors and adhesive anchors as indicated. Minimum embedment as indicated. Design values listed are as tested in accordance with ASTM E488/E488M.

2.1.5.2 Lag Screws and Bolts

Provide in accordance with ASME B18.2.1, type and grade best suited for the purpose.

2.1.5.3 Bolts, Nuts, Studs and Rivets

Provide in accordance with ASME B18.2.2 or ASTM A307.

2.1.5.4 Powder Actuated Fasteners

Follow safety provisions in accordance with ASSP A10.3.

2.1.5.5 Screws

Provide in accordance with ASME B18.2.1, ASME B18.6.2, ASME B18.6.3 and ASTM C1513.

2.1.5.6 Washers

Provide plain washers in accordance with ASME B18.22M, ASME B18.21.1. Provide beveled washers for American Standard beams and channels, square or rectangular, tapered in thickness, and smooth. Provide lock washers in accordance with ASME B18.21.2M, ASME B18.21.1.

2.2 FABRICATION FINISHES

2.2.1 Galvanizing

Hot-dip galvanize items specified to be zinc-coated, after fabrication

where practicable. Provide galvanizing in accordance with ASTM A123/A123M, ASTM A153/A153M, ASTM A653/A653M or ASTM A924/A924M, Z275 G90.

2.2.2 Galvanize

Anchor bolts, grating fasteners, washers, and parts or devices necessary for proper installation, unless indicated otherwise.

2.2.3 Repair of Zinc-Coated Surfaces

Repair damaged surfaces with galvanizing repair method and paint in accordance with ASTM A780/A780M or by application of stick or thick paste material specifically designed for repair of galvanizing, as approved by Contracting Officer. Clean areas to be repaired and remove slag from welds. Heat, with a torch, surfaces to which stick or paste material will be applied. Heat to a temperature sufficient to melt the metals in the stick or paste. Spread molten material uniformly over surfaces to be coated and wipe off excess material.

2.2.4 Shop Cleaning and Painting

2.2.4.1 Surface Preparation

Blast clean surfaces in accordance with SSPC SP 6/NACE No.3. Surfaces that will be exposed in spaces above ceiling or in attic spaces, crawl spaces, furred spaces, and chases may be cleaned in accordance with SSPC SP 3 in lieu of being blast cleaned. Wash cleaned surfaces which become contaminated with rust, dirt, oil, grease, or other contaminants with solvents until thoroughly clean. Steel to be embedded in concrete must be free of dirt and grease prior to embed. Do not paint or galvanize bearing surfaces, including contact surfaces within slip critical joints. Shop coat these surfaces with rust prevention.

2.2.4.2 Pretreatment, Priming and Painting

Apply pre-treatment, primer, and paint in accordance with manufacturer's printed instructions. On surfaces concealed in the finished construction or not accessible for finish painting, apply an additional prime coat to a minimum dry film thickness of 1.0 mil. Tint additional prime coat with a small amount of tinting pigment.

2.2.5 Nonferrous Metal Surfaces

Protect by plating, anodic, or organic coatings.

2.3 MISCELLANEOUS PLATES AND SHAPES

Provide items that do not form a part of the structural steel framework, such as lintels, sill angles, miscellaneous mountings and frames. Provide lintels fabricated from structural steel shapes over openings in masonry walls and partitions as indicated and as required to support wall loads over openings. Provide with connections and fasteners. Construct to have at least 8 in bearing on masonry at each end.

Provide angles and plates in accordance with ASTM A36/A36M, for embedment as indicated. Galvanize embedded items exposed to the elements in accordance with ASTM A123/A123M.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Install items at locations indicated in accordance with manufacturer's instructions. Verify all field dimensions prior to fabrication. Include materials and parts necessary to complete each assembly, whether indicated or not. Miss-alignment and miss-sizing of holes for fasteners is cause for rejection. Conceal fastenings where practicable. Joints exposed to weather must be watertight.

3.2 WORKMANSHIP

Provide miscellaneous metalwork that is true and accurate in shape, size, and profile. Make angles and lines continuous and straight. Make curves consistent, smooth and unfaceted. Provide continuous welding along the entire area of contact except where tack welding is permitted. Do not tack weld exposed connections. Unless otherwise indicated and approved, provide a smooth finish on exposed surfaces. Provide countersunk rivets where exposed. Provide coped and mitered corner joints aligned flush and without gaps.

3.3 ANCHORAGE, FASTENINGS, AND CONNECTIONS

Provide anchorage as necessary, whether indicated or not, for fastening miscellaneous metal items securely in place. Include slotted inserts, expansion shields, powder-driven fasteners, toggle bolts (when approved for concrete), through bolts for masonry, headed shear studs, machine and carriage bolts for steel, through bolts, lag bolts, and screws for wood. Do not use wood plugs. Provide non-ferrous attachments for non-ferrous metal. Provide exposed fastenings of compatible materials (avoid contact of dissimilar metals), that generally match in color and finish the surfaces to which they are applied. Conceal fastenings where practicable. Provide all fasteners flush with the surfaces they fasten, unless indicated otherwise.

3.4 BUILT-IN WORK

Where necessary and not otherwise indicated, form built-in metal work for anchorage with concrete or masonry. Provide built-in metal work in ample time for securing in place as the work progresses.

3.5 WELDING

Perform welding, welding inspection, and corrective welding in accordance with AWS D1.1/D1.1M. Use continuous welds on all exposed connections. Grind visible welds smooth in the finished installation. Provide welded headed shear studs in accordance with AWS D1.1/D1.1M, Clause 7, except as otherwise specified. Provide in accordance with the safety requirements of EM 385-1-1.

3.6 DISSIMILAR METALS

Where dissimilar metals are in contact, protect surfaces with a coating in accordance with MPI 79 to prevent galvanic or corrosive action. Where aluminum is in contact with concrete, plaster, mortar, masonry, wood, or absorptive materials subject to wetting, protect in accordance with ASTM D1187/D1187M, asphalt-base emulsion. Clean surfaces with metal shavings from installation at the end of each work day.

3.7 PREPARATION

3.7.1 Material Coatings and Surfaces

Remove rust preventive coating just prior to field erection, using a remover approved by the metal manufacturer. Surfaces, when assembled, must be free of rust, grease, dirt and other foreign matter.

3.7.2 Environmental Conditions

Do not clean or paint surfaces when damp or exposed to foggy or rainy weather, when metallic surface temperature is less than minus 5 degrees F above the dew point of the surrounding air, or when surface temperature is below 45 degrees F or over 95 degrees F, unless approved by the Contracting Officer. Metal surfaces to be painted must be dry for a minimum of 48 hours prior to the application of primer or paint.

3.8 INSTALLATION MISCELLANEOUS PLATES AND SHAPES

Provide lintels fabricated from structural steel shapes over openings in masonry walls and partitions as required to support wall loads over openings. Provide with connections and fasteners. Construct to have at least 8 inches bearing on masonry at each end.

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ROUGH CARPENTRY

08/16

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SECTION 06 10 00

ROUGH CARPENTRY
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.

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)

ALSC PS 20 (2015) American Softwood Lumber Standard

AMERICAN WOOD COUNCIL (AWC)

AWC NDS (2015) National Design Specification (NDS)
for Wood Construction

AWC WFCM (2012) Wood Frame Construction Manual for
One- and Two-Family Dwellings

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA BOOK (2015) AWPA Book of Standards

AWPA M2 (2016) Standard for the Inspection of
Preservative Treated Wood Products for
Industrial Use

AWPA M6 (2013) Brands Used on Preservative Treated
Materials

AWPA P49 (2015) Standard for Fire Retardant FR-1

AWPA P5 (2015) Standard for Waterborne
Preservatives

AWPA T1 (2017) Use Category System: Processing and
Treatment Standard

AWPA U1 (2017) Use Category System: User
Specification for Treated Wood

APA - THE ENGINEERED WOOD ASSOCIATION (APA)

APA L870 (2010) Voluntary Product Standard, PS
1-09, Structural Plywood

ASME INTERNATIONAL (ASME)

ASME B18.2.1 (2012; Errata 2013) Square and Hex Bolts
and Screws (Inch Series)

ASME B18.2.2 (2015) Nuts for General Applications:
Machine Screw Nuts, Hex, Square, Hex
Flange, and Coupling Nuts (Inch Series)

ASME B18.5.2.1M (2006; R 2011) Metric Round Head Short
Square Neck Bolts

ASME B18.5.2.2M (1982; R 2010) Metric Round Head Square
Neck Bolts

ASME B18.6.1 (2016) Wood Screws (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM A153/A153M (2016) Standard Specification for Zinc
Coating (Hot-Dip) on Iron and Steel
Hardware

ASTM A307 (2014; E 2017) Standard Specification for
Carbon Steel Bolts, Studs, and Threaded
Rod 60 000 PSI Tensile Strength

ASTM D2898 (2010; R 2017) Standard Practice for
Accelerated Weathering of
Fire-Retardant-Treated Wood for Fire
Testing

ASTM F1667 (2018a) Standard Specification for Driven
Fasteners: Nails, Spikes, and Staples

ASTM F547 (2017) Standard Terminology of Nails for
Use with Wood and Wood-Base Materials

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

FM GLOBAL (FM)

FM 4435 (2013) Roof Perimeter Flashing

GREEN SEAL (GS)

GS-36 (2013) Adhesives for Commercial Use

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168 (2017) Adhesive and Sealant Applications

SOUTHERN PINE INSPECTION BUREAU (SPIB)

SPIB 1003 (2014) Standard Grading Rules for Southern
Pine Lumber

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-1923	(Rev A; Notice 3) Shield, Expansion (Lag, Machine and Externally Threaded Wedge Bolt Anchors)
CID A-A-1924	(Rev A; Notice 3) Shield, Expansion (Self Drilling Tubular Expansion Shell Bolt Anchors)
CID A-A-1925	(Rev A; Notice 3) Shield Expansion (Nail Anchors)

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Nailers and Nailing Strips; G

SD-03 Product Data

Fire-retardant Treatment

Adhesives

SD-06 Test Reports

Preservative-treated Lumber and Plywood

SD-07 Certificates

Certificates of Grade

Indoor Air Quality for Non-aerosol Adhesives

1.3 DELIVERY AND STORAGE

Deliver materials to the site in an undamaged condition. Store, protect, handle, and install prefabricated structural elements in accordance with manufacturer's instructions and as specified. Store materials off the ground to provide proper ventilation, with drainage to avoid standing water, and protection against ground moisture and dampness. Store materials with a moisture barrier at both the ground level and as a cover forming a well ventilated enclosure. Do not use materials that have visible moisture or biological growth. Remove defective and damaged materials and provide new materials.

1.4 GRADING AND MARKING

1.4.1 Lumber

Mark each piece of framing and board lumber or each bundle of small pieces of lumber with the grade mark of a recognized association or independent inspection agency. Such association or agency must be certified by the

Board of Review, American Lumber Standards Committee, to grade the species used. Surfaces that are to be exposed to view must not bear grademarks, stamps, or any type of identifying mark.

1.4.2 Plywood

Mark each sheet with the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of the plywood. The mark must identify the plywood by species group or span rating, exposure durability classification, grade, and compliance with [APA L870](#). Surfaces that are to be exposed to view must not bear grademarks or other types of identifying marks.

1.4.3 [Preservative-Treated](#) Lumber and Plywood

The Contractor is responsible for the quality of treated wood products. Each treated piece must be inspected in accordance with [AWPA M2](#) and permanently marked or branded, by the producer, in accordance with [AWPA M6](#). The Contractor must provide Contracting Officer's Representative (COR) with the inspection report of an approved independent inspection agency that offered products comply with applicable AWPA Standards. The appropriate Quality Mark on each piece will be accepted, in lieu of inspection reports, as evidence of compliance with applicable AWPA treatment standards.

1.4.4 Fire-Retardant Treated Lumber

Mark each piece in accordance with [AWPA M6](#), except pieces that are to be natural or transparent finished. In addition, exterior fire-retardant lumber must be distinguished by a permanent penetrating blue stain. Labels of a nationally recognized independent testing agency will be accepted as evidence of conformance to the fire-retardant requirements of [AWPA M6](#).

1.5 SIZES AND SURFACING

[ALSC PS 20](#) for dressed sizes of yard and structural lumber. Lumber must be surfaced four sides. Size references, unless otherwise specified, are nominal sizes, and actual sizes must be within manufacturing tolerances allowed by the standard under which the product is produced. Other measurements are IP or SI standard.

1.6 MOISTURE CONTENT

Air-dry or kiln-dry lumber. Kiln-dry treated lumber after treatment. Maximum moisture content of wood products must be as follows at the time of delivery to the job site:

- a. Framing lumber and board, 19 percent maximum

1.7 PRESERVATIVE TREATMENT

Treat wood products with waterborne wood preservatives conforming to [AWPA P5](#). Pressure treatment of wood products must conform to the requirements of [AWPA BOOK](#) Use Category System Standards U1 and T1. Pressure-treated wood products must not contain arsenic, chromium, or other agents classified as carcinogenic, probably carcinogenic, or possibly carcinogenic to humans (compounds in Groups 1, 2A, or 2B) by the International Agency for Research on Cancer (IARC), Lyon, France. Pressure-treated wood products must not

exceed the limits of the U.S. EPA's Toxic Characteristic Leaching Procedure (TCLP), and must not be classified as hazardous waste. Submit certification from treating plant stating chemicals and process used and net amount of preservatives retained are in conformance with specified standards. In accordance with AWWPA U1 provide non-copper preservative treatment such as EL2, PTI or SBX, DOT for products in direct contact with sheet metal.

- a. 0.25 pcf intended for above ground use.
- b. 0.40 pcf intended for ground contact and fresh water use. 0.60 pcf intended for Ammoniacal Copper Quaternary Compound (ACQ)-treated foundations. 0.80 to 1.00 pcf intended for ACQ-treated pilings. All wood must be air or kiln dried after treatment. Specific treatments must be verified by the report of an approved independent inspection agency, or the AWWPA Quality Mark on each piece. Minimize cutting and avoid breathing sawdust. Brush coat areas that are cut or drilled after treatment with either the same preservative used in the treatment or with a 2 percent copper naphthenate solution.
 - (1) Wood furring and nailers that are set into or in contact with concrete or masonry.
 - (2) Nailers, edge strips, crickets, curbs, and cants for roof decks.

1.8 FIRE-RETARDANT TREATMENT

Fire-retardant treated wood must be pressure treated with fire retardants conforming to AWWPA P49. Fire retardant treatment of wood products must conform to the requirements of AWWPA U1, Commodity Specification H and AWWPA T1, Section H. Treatment and performance inspection must be by an independent and qualified testing agency that establishes performance ratings. Each piece or bundle of treated material must bear identification of the testing agency to indicate performance in accordance with such rating. Treated materials to be exposed to rain wetting must be subjected to an accelerated weathering technique in accordance with ASTM D2898 prior to being tested. Such items which will not be inside a building, and such items which will be exposed to heat or high humidity, must receive exterior fire-retardant treatment. Fire-retardant-treated wood products must be free of halogens, sulfates, ammonium phosphate, and formaldehyde.

1.9 CERTIFICATIONS

1.9.1 Certified Wood Grades

Provide certificates of grade from the grading agency on graded but unmarked lumber or plywood attesting that materials meet the grade requirements specified herein.

PART 2 PRODUCTS

2.1 LUMBER

2.1.1 Framing Lumber

Framing lumber such as nailing strips, blocking, rough bucks and nailers shall be one of the species listed in the table below. Minimum grade of species shall be as listed.

<u>Table of Grades for Framing and Board Lumber</u>			
<u>Grading Rules</u>	<u>Species</u>	<u>Framing</u>	<u>Board Lumber</u>
SPIB 1003 standard grading rules	Southern Pine	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	No. 2 Boards

2.2 PLYWOOD PANELS

2.2.1 Sheathing and Other Uses

2.2.1.1 Plywood

Plywood for mounting of electrical panels, sizes as indicated; A-C Grade, fire-retardant treated; 3/4 inch thick, unless otherwise indicated.

Plywood for sheathing shall be Structural I, sizes as indicated; span rating not less than 24/0; nominal thickness 3/4 inch, unless otherwise indicated.

2.3 OTHER MATERIALS

2.3.1 Miscellaneous Wood Members

2.3.1.1 Blocking

Blocking must be standard or number 2 grade.

2.3.1.2 Rough Bucks

Rough bucks must be straight standard or number 2 grade.

2.3.2 Adhesives

Comply with applicable regulations regarding toxic and hazardous materials and as specified. 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. Provide certification or validation of indoor air quality for non-aerosol adhesives applied on the interior of the building (inside of the weatherproofing system). Provide certification or validation of indoor air quality for aerosol adhesives used on the interior of the building (inside of the weatherproofing system).

2.4 FASTENERS

Unless otherwise indicated or specified, **fasteners** must be of the type and size necessary for the project requirements. Sizes, types, and spacing of fastenings of manufactured building materials must be as recommended by the product manufacturer unless otherwise indicated or specified. **Fasteners** exposed to the weather or embedded in or in contact with preservative treated wood, exterior masonry, or concrete walls or slabs **shall** be **Type 304 stainless steel**. Nails and fastenings for fire-retardant treated lumber and woodwork exposed to the weather **shall** be copper alloy or hot-dipped galvanized fasteners as recommended by the treated wood manufacturer.

2.4.1 Bolts, Nuts, Studs, and Rivets

ASME B18.2.1, ASME B18.5.2.1M, ASME B18.5.2.2M and ASME B18.2.2.

2.4.2 Anchor Bolts

ASTM A307, size as indicated, complete with nuts and washers.

2.4.3 Expansion Shields

CID A-A-1923, CID A-A-1924, and CID A-A-1925. Except as shown otherwise, maximum size of devices must be **3/8 inch**.

2.4.4 Lag Screws and Lag Bolts

ASME B18.2.1.

2.4.5 Wood Screws

ASME B18.6.1.

2.4.6 Nails

ASTM F547, size and type best suited for purpose; staples must be as recommended by the manufacturer of the materials to be joined. For sheathing and subflooring, length of nails must be sufficient to extend **1 inch** into supports. In general, 8-penny or larger nails must be used for nailing through **1 inch** thick lumber and for toe nailing **2 inch** thick lumber; 16-penny or larger nails must be used for nailing through **2 inch** thick lumber. Nails used with treated lumber and sheathing must be hot-dipped galvanized in accordance with **ASTM A153/A153M**. Nailing must be in accordance with the recommended nailing schedule contained in **AWC WFCM**. Where detailed nailing requirements are not specified, nail size and spacing must be sufficient to develop an adequate strength for the connection. The connection's strength must be verified against the nail capacity tables in **AWC NDS**. Reasonable judgment backed by experience must ensure that the designed connection will not cause the wood to split. If a load situation exceeds a reasonable limit for nails, a specialized connector must be used.

2.4.7 Wire Nails

ASTM F1667.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

3.1.1 Anchors

3.1.1.1 Anchors in Masonry

Except where indicated otherwise, embed anchor bolts not less than 15 inches in masonry unit walls and provide each with a nut and a 2 inch diameter washer at bottom end. Fully grout bolts with mortar.

3.1.1.2 Anchors in Concrete

Except where indicated otherwise, embed anchor bolts not less than 8 inches in poured concrete walls and provide each with a nut and a 2 inch diameter washer at bottom end. A bent end may be substituted for the nut and washer; bend must be not less than 90 degrees. Powder-actuated fasteners spaced 3 feet o.c. may be provided in lieu of bolts for single thickness plates on concrete.

3.1.2 Plywood

Install with the grain of the outer plies or long dimension at right angles to supports. Fasten to supports as indicated or as required to suit conditions.

3.2 MISCELLANEOUS

3.2.1 Wood Roof Nailers

Provide sizes and configurations indicated and anchored securely to continuous construction.

3.2.1.1 Roof Edge Strips and Nailers

Provide at perimeter of roof, around openings through roof, and where roofs abut walls, curbs, and other vertical surfaces. Except where indicated otherwise, nailers must be 6 inches wide and the same thickness as the insulation. Anchor nailers securely to underlying construction. Anchor perimeter nailers in accordance with FM 4435.

3.2.2 Rough Wood Bucks

Size as indicated. Set wood bucks true and plumb. Anchor bucks to concrete or masonry with steel straps extending into the wall 8 inches minimum. Place anchors near the top and bottom of the buck and space uniformly at 2 foot maximum intervals.

3.2.3 Wood Blocking

Provide proper sizes and shapes at proper locations for the installation and attachment of wood and other finish materials, fixtures, equipment, and items indicated or specified. Unless otherwise indicated, provide minimum 2 x 4 wood blocking between metal studs for support and anchorage of wall bumpers scheduled in Hardware Sets specified in Section 08 71 00 DOOR

HARDWARE

3.2.4 Temporary Closures

Provide with hinged doors and padlocks and install during construction at exterior doorways and other ground level openings that are not otherwise closed. Cover windows and other unprotected openings with polyethylene or other approved material, stretched on wood frames. Provide dustproof barrier partitions to isolate areas as directed.

3.3 ERECTION TOLERANCES

a. Framing members shall be within the following limits:

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

3.4 WASTE MANAGEMENT OF WOOD PRODUCTS

In accordance with the Waste Management Plan. Refer to Section 01 74 19 CONSTRUCTION WASTE AND DEMOLITION WASTE MANAGEMENT.

-- End of Section --

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SECTION 06 20 00

FINISH CARPENTRY
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.

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4 (1995; R 2004) Basic Hardboard

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)

ALSC PS 20 (2015) American Softwood Lumber Standard

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA U1 (2017) Use Category System: User
Specification for Treated Wood

APA - THE ENGINEERED WOOD ASSOCIATION (APA)

APA L870 (2010) Voluntary Product Standard, PS
1-09, Structural Plywood

ASME INTERNATIONAL (ASME)

ASME B18.2.1 (2012; Errata 2013) Square and Hex Bolts
and Screws (Inch Series)

ASME B18.2.2 (2015) Nuts for General Applications:
Machine Screw Nuts, Hex, Square, Hex
Flange, and Coupling Nuts (Inch Series)

ASME B18.6.1 (2016) Wood Screws (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM A240/A240M (2015b) Standard Specification for
Chromium and Chromium-Nickel Stainless
Steel Plate, Sheet, and Strip for Pressure
Vessels and for General Applications

ASTM A276 (2013a) Standard Specification for
Stainless Steel Bars and Shapes

ASTM A489 (2018; E 2018) Standard Specification for
Carbon Steel Eyebolts

ASTM A554	(2016) Standard Specification for Welded Stainless Steel Mechanical Tubing
ASTM A666	(2015) Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar
ASTM F547	(2017) Standard Terminology of Nails for Use with Wood and Wood-Base Materials
ARCHITECTURAL WOODWORK INSTITUTE (AWI)	
AWI AWS	(2014) Architectural Woodwork Standards
BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)	
ANSI/BHMA A156.9	(2015) Cabinet Hardware
CALIFORNIA AIR RESOURCES BOARD (CARB)	
CARB 93120	(2007) Airborne Toxic Control Measure (ATCM) to Reduce Formaldehyde Emissions from Composite Wood Products
COMPOSITE PANEL ASSOCIATION (CPA)	
CPA A208.1	(2016) Particleboard
HARDWOOD PLYWOOD AND VENEER ASSOCIATION (HPVA)	
HPVA HP-1	(2016) American National Standard for Hardwood and Decorative Plywood
U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)	
40 CFR 770	Formaldehyde Standards for Composite Wood Products
UNDERWRITERS LABORATORIES (UL)	
UL 2818	(2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings
WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)	
WDMA I.S.4	(2015A) Preservative Treatment for Millwork

1.2 SUMMARY

This Section includes the following:

- a. Finish wood moulding and interior trim.
- b. Cabinets.
- c. Wood paneling products.
- d. Decorative metal products.

Related work:

- a. Acoustical Wall Panels: Refer to Section 09 84 20 ACOUSTICAL WALL PANELS.

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

Detail Drawings Indicating All Wood Assemblies; G

SD-03 Product Data

Wood Products; G

Wood Panel Products; G

Treated Wood Products; G

Hardware and Accessories

Cabinets; G

Cabinet Hardware; G

Decorative Metal Products; G

SD-04 Samples

Samples; G

SD-07 Certificates

Indoor Air Quality Certifications

Certificates of Grade; G

1.4 DETAIL DRAWINGS

Submit detail drawings indicating all wood assemblies proposed for use in the project. Indicate materials, species, grade, density, grain, finish details of construction, location of use in the project, finishes, types, method and arrangement of fasteners, and installation details. This includes all fabricated assemblies.

1.5 PRODUCT DATA

Submit Manufacturers printed data including proposed species, grade, density grain, and finish as applicable; sufficient to demonstrate compliance with this specification for each type of wood product specified. For treated wood products also provide documentation of environmentally safe preservatives for each type of wood product specified.

Provide Manufacturers printed data for hardware and all wood accessories including but not limited to edge banding, adhesives, and sealers.

1.6 SAMPLES

Samples indicating proposed species, grade, density grain, and finish for each type of wood product specified. Provide samples of sufficient size to show pattern and color ranges of proposed products.

1.7 DELIVERY, STORAGE, AND HANDLING

Deliver wood products to the jobsite in an undamaged condition. Stack materials to ensure ventilation and drainage. Protect against dampness before and after delivery. Store materials under cover in a well ventilated enclosure and protect against extreme changes in temperature and humidity. 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. Do not store products in building until wet trade materials are dry and humidity of the space is within wood manufacturer's tolerance limits for storage.

1.8 QUALITY ASSURANCE

1.8.1 Certifications

1.8.1.1 Certified Wood Grades

Provide [certificates of grade](#) from the grading agency on graded but unmarked lumber or plywood attesting that materials meet the grade requirements specified herein.

1.8.1.2 Indoor Air Quality Certifications

1.8.1.2.1 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 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 herein.

1.8.1.2.2 Composite Wood Products

For purposes of this specification, composite wood products include hardwood plywood, particleboard, medium density fiberboard (MDF), panel substrates, and door cores. Provide products certified to meet requirements of both [40 CFR 770](#) and [CARB 93120](#). Provide current product certification documentation from certification body.

1.8.2 Lumber

Identify each piece or each bundle of lumber, millwork, and trim by the grade mark of a recognized association or independent inspection agency certified by the Board of Review of the ALSC to grade the species.

1.8.3 Plywood

Provide each sheet of plywood with the mark of a recognized association or independent inspection agency that maintains continuing control over the

quality of the plywood. Marks must identify plywood by species group or span rating, exposure durability classification, grade, and compliance with APA L870.

1.8.4 Hardboard and Particleboard

Provide materials marks or written documentation identifying the producer and the applicable standard.

1.8.5 Pressure Treated Lumber and Plywood

Inspect each treated piece in accordance with AWPB U1.

1.8.6 Non-Pressure Treated Woodwork and Millwork

Mark, stamp, or label to indicate compliance with WDMA I.S.4.

1.8.7 Fire-Retardant Treated Lumber

Each piece must bear an Underwriters Laboratories fire resistance label or comparable label of another nationally recognized independent fire retardant materials testing laboratory.

PART 2 PRODUCTS

2.1 WOOD PRODUCTS

2.1.1 Sizes and Patterns of Wood Products

Provide yard and board lumber sizes in accordance with ALSC PS 20. Provide shaped lumber and millwork in the patterns indicated and in standard patterns of the association covering the species. Size references, unless otherwise specified, are nominal sizes. Provide actual sizes within manufacturing tolerances allowed by the applicable standard.

2.1.2 Moulding and Interior Trim

Provide stair tread with nosing, wall base, rail cap, chair rails, and other standing and running trim indicated, in profiles and dimensions indicated.

Provide species and grades listed in the tables below for transparent and opaque finishes.

2.1.2.1 Hardwood Lumber Trim for Transparent Finish

- a. Species and Grade: Mahogany and maple as indicated; A Finish, plain sliced, book-matched; NHLA.
- b. Maximum Moisture Content: 13 percent.
- c. Finger Jointing: Not allowed.
- d. Face Material: Surfaced (smooth).
- e. Matching: Selected for compatible grain and color.

2.1.2.2 Lumber Trim for Opaque Finish

- a. Species and Grade: Douglas fir-larch or Douglas fir south, Superior or C and Better; NLGA or WWPB.
- b. Maximum Moisture Content: 15 percent.
- c. Finger Jointing: Not allowed.

- d. Face Material: Surfaced (smooth).

2.1.3 Softwood Plywood

Provide in accordance with [APA L870](#). When located on the interior of buildings, provide products with no added urea-formaldehyde resins.

- a. Interior type, A-B Grade, any species group.

2.1.4 Hardwood Plywood

[HPVA HP-1](#), Type II (Interior) [Premium](#) lumber core construction, face veneers of thickness indicated. When located on the interior of buildings, provide products with no added urea-formaldehyde resins.

- a. Species and Grade for Transparent Finish: Mahogany and maple as indicated; A Finish, plain sliced, book-matched; NHLA.
- b. Flat Grain Bamboo Plywood for Transparent Finish: As indicated

Basis-of-Design shall be products manufactured by Smith & Fong, "Plyboo", or comparable products by another manufacturer may be submitted to the Contracting Officer for approval. Manufacturer's products specified are not intended to limit selection of equal products from other manufacturers.

2.1.5 Hardboard

[AHA A135.4](#), standard type, 1/4 inch thick, unless otherwise indicated.

2.1.6 Medium Density Fiberboard (MDF) and Particleboard

[CPA A208.1](#), Grade 1-M-2 or 2-M-2 or better. For products located on the interior of the building (inside of the weatherproofing system).

2.2 WOOD PANEL PRODUCTS

2.2.1 Hardwood Veneer Wall Panels

Provide hardwood veneer wall panels as indicated on drawings using "hardwood plywood" and "moulding and interior trim" as specified in this Section. Provide concealed anchor clips, concealed fasteners, mouldings, trim pieces and ancillary items as indicated and as required for complete wall panel units.

2.2.2 Plywood Veneer Door/Gate

Provide plywood veneer door/gate as indicated on drawings using "hardwood plywood" and "moulding and interior trim" as specified in this Section. Provide single- and double-acting spring hinges as indicated on drawings and mouldings, trim pieces and ancillary items as indicated and as required for complete door/gate units.

2.3 PRESERVATIVE TREATMENT OF WOOD PRODUCTS

2.3.1 Non-Pressure Treatment

Treat woodwork and millwork, such as exterior trim, door trim, and window trim, in accordance with [WDMA I.S.4](#), with either 2 percent copper

napthenate, 3 percent zinc napthenate, or 1.8 percent copper-8-quinolinolate. Provide a liberal brush coat of preservative treatment to field cuts and holes.

2.3.2 Pressure Treatment

Treat lumber and plywood used on the exterior of buildings or in contact with masonry or concrete with a waterborne preservative listed in [AWPA U1](#) (P series is included therein by reference) as applicable, and inspected in accordance with [AWPA U1](#). Identify treatment on each piece of material by the quality mark of an agency accredited by the Board of Review of the American Lumber Standards Committee.

2.4 [HARDWARE AND ACCESSORIES](#)

Provide sizes, types, and spacings of hardware and accessories as recommended in writing by the wood product manufacturer, except as otherwise specified.

2.4.1 Wood Screws

[ASME B18.6.1](#).

2.4.2 Bolts, Nuts, Lag Screws, and Studs

[ASME B18.2.1](#) and [ASME B18.2.2](#).

2.4.3 Nails

Use nails of a size and type best suited for each application and in accordance with [ASTM F547](#). Use hot-dipped galvanized or aluminum nails for exterior applications. For siding, provide nails of sufficient length to extend [1-1/2 inches](#) into supports, including wood sheathing over framing. Where nailing is impractical, provide screws of a size and type best suited for each application.

2.5 FABRICATION

2.5.1 Quality Standards (QS)

2.5.1.1 Grades

The terms "Premium," "Custom," and "Economy" refer to the quality grades defined in [AWI AWS](#). Provide items not otherwise specified in a specific grade as "Custom" grade.

2.5.1.2 Adhesives

Select adhesives for durability and permanent bonding. Address factors such as materials that must be bonded, expansion and contraction, bond strength, fire rating, moisture resistance, and manufacturer's recommendations.

2.5.2 [Cabinets](#)

2.5.2.1 [Cabinet Hardware](#)

[ANSI/BHMA A156.9](#). Provide cabinet hardware including two self, closing hinges for each door, two side mounted metal drawer slides for each drawer;

pulls for all doors and drawers. Comply with the following requirements for all cabinet hardware:

- a. Provide frameless concealed European style, back mounted hinges with 165 degree opening and a self closing feature when at less than 90 degrees open.
- b. Provide drawer slides having a static rating capacity of 100 lbs. Slides to have a self closing/stay closed action, zinc or epoxy coated steel finish, ball bearing rollers, and positive stop with lift out design.
- c. Provide back mounted drawer pulls per BHMA A156.9, B02011, unless otherwise indicated.
- d. Finish for Exposed Hardware: Satin stainless steel, BHMA 630, unless otherwise indicated.
 - e. Provide adjustable shelf standards and supports, BHMA A156.9, B04071 with shelf rests, B04081.

2.5.2.2 Cabinets with Transparent Finish

2.5.2.2.1 AWI AWS Grade

Premium grade.

2.5.2.2.2 Construction

Provide reveal overlay design details, unless otherwise indicated.

2.5.2.2.3 Exposed Surfaces

Mahogany and maple, A Finish, plain sliced, bookmatched; and flat grain bamboo plywood, as indicated.

2.5.2.2.4 Semi-Exposed Surfaces

As specified in the AWI AWS for the grade selected, except where modified per details on drawings.

2.5.2.2.5 Finish

Provide a clear factory finish on wood surfaces after fabrication. Provide fabricator's standard natural finish equivalent to one coat of sealer, one coat of varnish on all surfaces and a second coat of varnish on surfaces exposed to view. Provide spar varnish in exterior or wet area applications. Sand lightly and wipe clean between coats.

2.5.2.3 Cabinets with Plastic Laminate Finish

2.5.2.3.1 AWI AWS Grade

Custom grade

2.5.2.3.2 Construction

Provide reveal overlay design details, unless otherwise indicated.

2.5.2.3.3 Exposed Surfaces

High-pressure decorative laminate, NEMA LD-3, in the following grades:

- a. Horizontal and Countertop Surfaces: Grade HGS.
- b. Vertical Surfaces: Grade VGS.
- c. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.
- d. Colors, Patterns and Finishes: As indicated.

2.5.2.3.4 Semi-exposed Surfaces

As specified in the AWI AWS for the grade selected, except where modified per details on drawings.

2.5.2.3.5 Edge Banding

Provide edge banding for casework doors and drawer fronts in PVC vinyl 0.020 inch thick. Provide width 15/16 inches. Match color and pattern to exposed door and drawer front laminate pattern and color, unless otherwise indicated.

2.5.2.4 Countertops

Refer to Section 12 36 00 COUNTERTOPS for solid surfacing countertops.

2.6 DECORATIVE METAL PRODUCTS

2.6.1 Metal Handrails

2.6.1.1 Structural Performance

Handrails attached to building construction shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

- a. Uniform load of 50 lbf applied in any direction.
- b. Concentrated load of 200 lbf applied in any direction.
- c. Uniform and concentrated loads need not be assumed to act concurrently.

2.6.1.2 Stainless Steel Materials

- a. Tubing: ASTM A554, Grade MT 304.
- b. Pipe: ASTM A312, Grade TP 304.
- c. Bars and Shapes: ASTM A276, Type 304.
- d. Finish: Directional satin finish, ASTM A489, No. 4; unless otherwise indicated.

2.6.1.3 Fabrication

Provide stainless handrails to comply with requirements indicated for design, dimensions, member sizes and spacing, details and anchorage, but not less than that required to support specified structural loads. Provide handrail brackets to match material and finish of handrails, stainless

steel fasteners, and ancillary items as required for a complete handrail system.

2.6.2 Metal Reveal Trim

2.6.2.1 Materials

Stainless steel in profiles and dimensions indicated.

- a. Basis-of-Design: Provide products manufactured by Monarch Metal Fabrications, or comparable products by another manufacturer may be submitted to the Contracting Officer for approval. Manufacturer's products specified are not intended to limit selection of equal products from other manufacturers.
- b. Stainless Steel Sheet, Strip and Plate: ASTM A240/A240M or ASTM A666 Type 304. Thickness as required to suit conditions. Sizes and configurations as indicated. Directional satin finish, No. 4.

2.7 ACCESSORIES

2.7.1 Grommets

Grommets shall be metal material for cutouts with a diameter of 2 inches; color, black. Locations as indicated.

2.7.2 Support Brackets

Recessed and surface mounted aluminum "L" brackets with factory finish powder coat finish in color to match adjacent surfaces, unless otherwise indicated. Bracket size and spacing as indicated and per manufacturer's recommendations to achieve 450 lbs. weight capacity based on evenly distributed static loads.

PART 3 EXECUTION

Do not install building construction materials that show visual evidence of biological growth.

3.1 FINISH WORK

Apply primer to finish work before installing. Where practicable, shop assemble and finish millwork items. Construct joints tight and in a manner to conceal shrinkage but to avoid cupping, twisting and warping after installation. Miter trim and mouldings at exterior angles; cope at interior angles and at returns. Provide millwork and trim in maximum practical lengths. Fasten finish work with finish nails. Provide blind nailing where practicable. Set face nails for putty stopping.

3.1.1 Interior Finish Work

After installation, sand exposed surfaces smooth. Provide window and door trim in single lengths.

3.1.2 Window Stools and Aprons

Provide stools with rabbets over window sills. Provide aprons with returns cut accurately to profile of member.

3.1.3 Bases

Provide flat member with a moulded top. Fasten base to framing or to grounds. Nail shoe mould to base. Set one-piece wood base after finish flooring is in place.

3.2 MISCELLANEOUS

3.2.1 Countertops

Refer to Section 12 36 00 COUNTERTOPS for solid surface countertops installation requirements.

3.2.2 Cabinets

Provide cabinets level, plumb, true, and tight to adjacent walls. Secure cabinets to walls with concealed toggle bolts. Secure top to cabinet with concealed screws. Make cutouts for fixtures from templates supplied by fixture manufacturer. Locate cutouts for pipes so that edges of holes are covered by escutcheons after installation.

3.3 MOULDING AND INTERIOR TRIM

Install mouldings and interior trim straight, plumb, level and with closely fitted joints. Provide exposed surfaces machine sanded at the shop. Cope returns and interior angles at moulded items and miter external corners. Shoulder intersections of flatwork to ease any inherent changes in plane. Provide window and door trim in single lengths. Blind nail to the extent practicable. Set and stop face nailing with a nonstaining putty to match the applied finish. Use screws for attachment to metal; set and stop screws in accordance with the same quality requirements for nails.

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THERMAL INSULATION

11/11

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM C665 (2017) Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing

ASTM C930 (2018) Standard Classification of Potential Health and Safety Concerns Associated with Thermal Insulation Materials and Accessories

ASTM E84 (2019b) Standard Test Method for Surface Burning Characteristics of Building Materials

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

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

29 CFR 1910.134 Respiratory Protection

UNDERWRITERS LABORATORIES (UL)

UL 2818 (2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUMMARY

This Section includes the following thermal insulation products:

- a. Blanket insulation.
- b. Foamed-in-place insulation.

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-03 Product Data

Blanket Insulation; G

Foamed-in-place Insulation; G

Accessories

SD-07 Certificates

Indoor Air Quality for Insulation Materials

Indoor Air Quality for Adhesives

Qualification data for Applicator

SD-08 Manufacturer's Instructions

Insulation

1.4 CERTIFICATIONS

Submit required indoor air quality certifications and validations in one submittal package.

1.4.1 Insulation Products

Provide blanket insulation 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 from certification body.

1.4.2 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 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 herein.

1.4.3 Applicator Qualifications

For foamed-in-place insulation, applicator shall be a firm experienced in applying foamed-in-place insulation similar in material, design and extent to that specified, and shall be trained, or otherwise approved, by the manufacturer.

1.5 QUALITY ASSURANCE

1.5.1 Preinstallation Conference

For foamed-in-place insulation, conduct preinstallation conference at the Project site. Include installers of other construction connecting to the foamed-in-place insulation. Review foamed-in-place insulation system requirements, including surface preparation, substrate conditions and pretreatment, minimum substrate curing period, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

1.5.2 Surface-Burning Characteristics

Provide insulation materials complying with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

- a. Flame-Spread Index: 25 or less.
- b. Smoke-Developed Index: 450 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

1.6.1 Delivery

Deliver materials to site in original sealed wrapping bearing manufacturer's name and brand designation, specification number, type, grade, R-value, and class. Store and handle to protect from damage. Do not allow insulation materials to become wet, soiled, crushed, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storing, and protecting of materials before and during installation.

1.6.2 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.

1.7 SAFETY PRECAUTIONS

1.7.1 Respirators

Provide installers with dust/mist respirators, training in their use, and protective clothing, all approved by National Institute for Occupational Safety and Health (NIOSH)/Mine Safety and Health Administration (MSHA) in accordance with 29 CFR 1910.134.

1.7.2 Other Safety Concerns

Consider other safety concerns and measures as outlined in ASTM C930.

PART 2 PRODUCTS

2.1 BLANKET INSULATION

ASTM C665, Type II, blankets with non-reflecting coverings; Class A, membrane-faced surface with a flame spread of 25 or less, and a smoke developed rating of 150 or less when tested in accordance with ASTM E84.

2.1.1 Thermal Resistance Value (R-VALUE)

The R-Value as indicated on drawings.

2.1.2 Prohibited Materials

Do not provide asbestos-containing materials.

2.1.3 Reduced Volatile Organic Compounds (VOC) for Insulation Materials

Provide certification of indoor air quality for insulation materials.

2.1.4 Sound Attenuation Blankets

Refer to Section 09 29 00 GYPSUM BOARD.

2.2 FOAMED-IN-PLACE INSULATION

2.2.1 Open-Cell Polyurethane Foam Insulation

Spray-applied polyurethane foam using water as a blowing agent; minimum density of 0.4 lb/cu. ft.; and thermal resistance value (R-value) at 1-inch thickness of 3.4 deg F x h x sq. ft./Btu at 75 deg F.

2.2.2 Ignition Barrier

Barrier shall have ICC-ES documentation for use as an ignition barrier on foamed-in-place insulation that will be exposed. Barrier shall provide protection as required by the ICC IBC.

2.3 ACCESSORIES

2.3.1 Adhesive

As recommended by the insulation manufacturer. Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) that meet 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 that meet either emissions requirements of CDPH SECTION 01350 (use the office or classroom requirements, regardless of space type) or VOC content requirements of GS-36. Provide certification or validation of indoor air quality for adhesives.

2.3.2 Mechanical Fasteners

Corrosion resistant fasteners as recommended by the insulation manufacturer.

2.3.3 Wire Mesh

Corrosion resistant and as recommended by the insulation manufacturer.

2.3.4 Ancillary Components

Provide ancillary components and accessories as required for complete insulation system for each type of insulation specified.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Blanket Insulation

Install and handle insulation in accordance with manufacturer's instructions. Keep material dry and free of extraneous materials. Any materials that show visual evidence of biological growth due to presence of moisture must not be installed on the building project. Ensure personal protective clothing and respiratory equipment is used as required. Observe safe work practices.

3.1.1.1 Electrical wiring

Do not install insulation in a manner that would sandwich electrical wiring between two layers of insulation.

3.1.1.2 Continuity of Insulation

Install blanket insulation to butt tightly against adjoining blankets and to studs, headers and any obstructions. Provide continuity and integrity of insulation.

3.1.1.3 Sizing of Blankets

Provide only full width blankets when insulating between studs. Size width of blankets for a snug fit where trusses, joists or studs are irregularly spaced.

3.1.2 Foamed-In-Place Insulation

Apply foamed-in-place insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed, and windows, electrical boxes, and other items not indicated to receive insulation are masked. Install at locations indicated.

3.1.2.1 Miscellaneous Voids

Apply foamed-in-place insulation in miscellaneous voids and cavity spaces as indicated and where required to prevent gaps in insulation

3.1.2.2 Ignition Barrier

Apply ignition barrier to foamed-in-place insulation that will be exposed as defined by the ICC IBC in accordance with manufacturer's written instructions.

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FLUID-APPLIED MEMBRANE 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 C836/C836M

(2015) High Solids Content, Cold
Liquid-Applied Elastomeric Waterproofing
Membrane for Use With Separate Wearing
Course

ASTM D412

(2016) Standard Test Methods for
Vulcanized Rubber and Thermoplastic
Elastomers - Tension

ASTM D4263

(1983; R 2012) 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 D5590

(2000; R 2010; E 2012) Standard Test
Method for Determining the Resistance of
Paint Films and Related Coatings to Fungal
Defacement by Accelerated Four-Week Agar
Plate Assay

ASTM E2178

(2013) Standard Test Method for Air
Permeance of Building Materials

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 E84

(2019b) Standard Test Method for Surface
Burning Characteristics of Building
Materials

ASTM E96/E96M

(2016) Standard Test Methods for Water
Vapor Transmission of Materials

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 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

Fluid-Applied Membrane Air Barrier; G

SD-03 Product Data

Fluid-Applied Membrane Air Barrier; G

Primers, Adhesives, and Mastics; G

Reinforcement; G

Safety Data Sheets; G

SD-04 Samples

Fluid-Applied Membrane Air Barrier Mockup; G

SD-06 Test Reports

Capillary Moisture Test; G

Field Peel Adhesion Test; G

Flame Propagation of Wall Assemblies; G

Flame Spread and Smoke Developed Index Ratings; G

Site Inspections Reports; G

SD-07 Certificates

Fluid-Applied Membrane Air Barrier; G

Qualifications of Manufacturer; G

Qualifications of Installer; G

SD-08 Manufacturer's Instructions

Fluid-Applied Membrane Air Barrier; G

Primers, Adhesives, and Mastics; G

1.3 MISCELLANEOUS REQUIREMENTS

For fluid-applied membrane air barriers provide the following:

1.3.1 Shop Drawings

Submit fluid-applied membrane air barrier shop drawings showing locations and extent of barrier assemblies, transition membranes, details of all typical conditions, intersections with other envelope 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.

1.3.2 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.

1.3.3 Mockup

Provide a mockup of the fluid-applied membrane air barrier. 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.

1.3.4 Test Reports

Submit test reports indicating that capillary moisture tests and field peel adhesion tests on all substrate 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 materials tested in accordance with ASTM E84.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 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.

1.4.2 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.

1.5 CAPILLARY MOISTURE TEST

Perform a [capillary moisture test](#) by plastic sheet method in accordance with [ASTM D4263](#) on the construction mockup and substrate materials. Perform test after curing period as recommended by the air barrier manufacturer. Record mode of failure and area which failed in accordance with [ASTM D4263](#). Once the air barrier material manufacturer has established a minimum adhesion or moisture level for the product on the particular substrate, indicate on the inspection report whether this requirement has been met. Where the manufacturer has not declared a minimum adhesion or moisture value for their product and substrate combination, the inspector must record actual values.

1.6 FIELD PEEL ADHESION TEST

Perform a field peel adhesion test on a construction mockup. Test the applied product for adhesion in accordance with manufacturer's recommendations. Perform test after curing period recommended by the manufacturer. Record mode of failure and area which failed in accordance with [ASTM D4541](#). When the manufacturer has established a minimum adhesion level for the product on the particular substrate, the inspection report must indicate whether this requirement has been met. Where the manufacturer has not declared a minimum adhesion value for their product/substrate combination, the inspector must record actual values.

1.7 QUALITY ASSURANCE

1.7.1 [Qualifications of Manufacturer](#)

Submit documentation verifying that manufacturer of fluid-applied membrane air barrier is currently accredited by the Air Barrier Association of America ([ABAA Accreditation <https://www.airbarrier.org/>](#)).

1.7.2 [Qualifications of Installer](#)

Submit documentation verifying that installers of the fluid-applied membrane 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 construction mock up, 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 fluid-applied membrane air barrier.

1.9 ENVIRONMENTAL CONDITIONS

1.9.1 Temperature

Install fluid-applied membrane air barrier within the range of ambient and substrate temperatures as recommended in writing by the fluid-applied membrane air barrier manufacturer. Do not apply fluid-applied membrane air barrier to a damp or wet substrate. 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

Protect fluid-applied membrane 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 FLUID-APPLIED MEMBRANE AIR BARRIER

Provide a fluid-applied, vapor retarding, air barrier. This barrier must exhibit no visible water leakage when tested in accordance with [ASTM E331](#) and must perform as a liquid water drainage plane with thru-wall flashing to discharge incidental condensation and water penetration to the exterior of the building enclosure. Provide products suitable for use within temperature ranges specified by manufacturer for the location of the project.

2.1.1 Physical Properties

- a. Air Permeance ([ASTM E2178](#)): less than 0.004 CFM per sf at 1.57 psf.
- b. Water Vapor Permeance (Vapor Impermeable Membrane) ([ASTM E96/E96M](#), desiccant method A): 0.1 perms or less.
- c. Tensile Strength ([ASTM D412](#)): Not less than 138 psi.
- d. Elongation ([ASTM D412](#)): Not less than 300 percent.
- e. Low temperature Flexibility and Crack Bridging ([ASTM C836/C836M](#)): Pass at minus 15 degrees F.
- f. Solids by Volume: minimum 50 percent.
- g. Flame propagation of wall assemblies ([NFPA 285](#)): Pass
- h. Surface Burning Characteristics ([ASTM E84](#)):
 - (1) Flame Spread Index Rating not higher than 75.
 - (2) Smoke Developed Index Rating not higher than 150.
- i. Resistance to Mold, Mildew and Fungal Growth ([ASTM D5590](#)): 0, No growth.

2.2 PRIMERS, ADHESIVES, AND MASTICS, AND TRANSITION MEMBRANE

Provide primers, adhesives, mastics, sealants, transition membrane and other accessories as recommended by manufacturer of fluid-applied membrane air barrier for a complete installation.

2.3 SHEET METAL FLASHING

Provide through-wall flashing as specified in Section 04 20 00 UNIT MASONRY.

2.4 JOINT SEALANTS

Provide as specified in Section 07 92 00 JOINT SEALANTS.

2.5 REINFORCEMENT

Provide fiberglass mesh tape, or fluid-applied air barrier manufacturer's approved comparable equal product, reinforcement at seams, edges, projections and penetrations. Reinforce all joints exceeding 1/4 inch with fiberglass mesh.

PART 3 EXECUTION

3.1 EXAMINATION

Before installing fluid-applied membrane air barrier, examine substrates, areas, and conditions under which fluid-applied membrane 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 detrimental to the adhesion of the membranes.
- b. Concrete and masonry surfaces are cured and dry, smooth without large voids, spalled areas or sharp protrusions. Do not proceed with installation until after minimum concrete curing period recommended by fluid-applied membrane air barrier manufacturer.
- c. Fill voids, gaps and spalled areas in substrate to provide an even plane. Strike masonry joints full flush.
- d. 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.
- e. Verify sealants used in substrates, and in joints between substrates, are compatible with fluid-applied membrane air barrier.

3.2 PREPARATION

Clean, prepare, and treat substrate in accordance with manufacturer's written instructions. Ensure clean, dust-free, and dry substrate for fluid-applied membrane air barrier application.

- a. Remove dust, dirt and other contaminants from joints and cracks before coating surfaces.
- b. Prepare, treat, and seal vertical and horizontal surfaces at

terminations and penetrations through fluid-applied membrane air barrier.

- c. At changes in substrate plane, provide transition material (bead of sealant, mastic, extruded silicone sealant, membrane counterflashing or other material recommended by manufacturer) under transition membrane to eliminate all sharp 90 degree inside corners and to make a smooth transition from one plane to another.
- d. 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.
- e. For exterior sheathing substrates, ensure that exterior sheathing is stabilized, with corners and edges fastened with appropriate screws. Treat all joints in accordance with the air barrier manufacturer's instructions prior to application of air barrier material. Allow sufficient time for joint treatments to fully cure before application of transition membranes and fluid-applied membrane air barrier.
- f. For concrete and masonry substrates, fill all voids and holes, particularly in mortar joints, with non-shrinking grout.
- g. Mask off and cover adjacent surfaces to protect from spillage and overspray.

3.3 INSTALLATION

3.3.1 Installation of Transition Membrane

Install **transition** membrane materials in accordance with the details on the drawings, and the following:

- a. Install transition membrane at all required locations prior to installation of the fluid-applied membrane air barrier.
- 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 barrier.
- c. Verify transition membrane completely covers all transition areas and will provide continuity of the finished fluid-applied membrane air barrier without gaps or cracks.

3.3.2 Installation of Flashing

Install through-wall flashing as indicated on drawings.

3.3.3 Installation of Fluid-Applied Membrane Air Barrier

Install materials in accordance with manufacturer's recommendations and the following:

- a. Apply fluid-applied membrane air barrier in single or dual coat application by spray or roller. Apply fluid-applied membrane air barrier within manufacturer's recommended temperature range for application.
- b. Apply fluid-applied membrane air barrier at rate recommended by

manufacturer to yield a wet film thickness of 90 mils.

- c. Apply fluid-applied membrane air barrier around all penetrations ensuring a complete and continuous air barrier. Lap fluid-applied membrane air barrier a minimum of 3 inch over transition membrane to seal leading edge.
- d. Seal membrane terminations, heads of mechanical fasteners, masonry tie fasteners, around penetrations, HVAC assemblies, plumbing and electrical assemblies, doors, windows, louvers, and other assemblies penetrating the fluid-applied membrane air barrier with a termination sealant recommended by the fluid-applied membrane air barrier manufacturer.
- e. Notify the Contracting Officer and Testing Agency upon completion of fluid-applied membrane air barrier installation. Air barrier materials and assemblies must remain exposed until tested and inspected by the ABAA.
- f. Do not allow materials to come in contact with chemically incompatible materials.

3.3.4 Installation of Reinforcement

Install reinforcement at projections, corners, joints, and penetrations where applicable.

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/>), and this Section.

- a. Conduct inspections and testing at 5, 50, and 95 percent completion of this scope of work. Forward written inspection reports to the Contracting Officer within five working days of the inspection and test being performed.
- b. If the inspections reveal any defects, promptly remove and replace defective work at no additional expense to the Government.

3.5 PROTECTION AND CLEANING

3.5.1 Protection

Protect fluid-applied membrane air barrier assemblies from damage during application and remainder of construction in accordance with manufacturer's written instructions.

Coordinate installation, testing, and inspection procedures to ensure exposure period does not exceed that recommended by the product manufacturer. Remove and replace, at no additional cost to the government, membrane products that exceed manufacturer's allowed exposure limits.

3.5.2 Cleaning of Adjacent Surfaces

Clean excess product 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.

3.6 CLEANUP OF SPILLS

Conduct cleanup of uncured product spillage in accordance with manufacturer's written safe handling instructions.

-- End of Section --

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SECTION 07 92 00

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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 C734	(2015) Low-Temperature Flexibility of Latex Sealants After Artificial Weathering
ASTM C834	(2017) Standard Specification for Latex Sealants
ASTM C919	(2012; R 2017) Standard Practice for Use of Sealants in Acoustical Applications
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM D217	(2017) Standard Test Methods for Cone Penetration of Lubricating Grease
ASTM E84	(2019b) Standard Test Method for Surface Burning Characteristics of Building Materials

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

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

UNDERWRITERS LABORATORIES (UL)

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

SD-03 Product Data

Sealants; G

Primers; G

Bond Breakers; G

Backstops; G

SD-07 Certificates

Indoor Air Quality For Interior Sealants

Indoor Air Quality For Interior Floor Joint Sealants

Indoor Air Quality For Interior Acoustical Sealants

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.

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.

2.1.1 Interior Sealants

Provide acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF, except at wet areas. Provide mildew-resistant silicone ASTM C920, Type S, Grade NS, Class 25 in wet areas. 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. Small voids between walls or partitions and adjacent lockers, casework, shelving, door frames, built-in or surface mounted equipment and fixtures, and similar items.	As selected
b. Perimeter of frames at doors, windows, and access panels which adjoin exposed interior concrete and masonry surfaces.	As selected
c. Joints of interior masonry walls and partitions which adjoin columns, pilasters, concrete walls, and exterior walls unless otherwise detailed.	As selected
d. Joints between edge members for acoustical tile and adjoining vertical surfaces.	As selected

LOCATION	COLOR
e. Interior locations, not otherwise indicated or specified, where small voids exist between materials specified to be painted.	As selected
f. Joints between bathtubs and ceramic tile; joints between shower receptors and ceramic tile; joints formed where non-planar tile surfaces meet.	As selected
g. Joints formed between tile floors and tile base cove; joints between tile and dissimilar materials; joints occurring where substrates change.	As selected
h. Behind escutcheon plates at valve pipe penetrations and showerheads in showers.	As selected

2.1.2 Exterior Sealants

For joints in horizontal and vertical surfaces, except floor joints, provide silicone ASTM C920, Type S, Grade NS, Class 100/50, Use NT. Provide location(s) and color(s) of sealant for the following:

LOCATION	COLOR
a. Joints and recesses formed where frames and subsills of windows, doors, louvers, and vents adjoin masonry, concrete, or metal frames. Use sealant at both exterior and interior surfaces of exterior wall penetrations.	Match adjacent surface color.
b. Joints between new and existing exterior masonry walls.	Match adjacent surface color.
c. Masonry joints where shelf angles occur.	Match adjacent surface color.
d. Joints in wash surfaces of stonework.	Match adjacent surface color.
e. Expansion and control joints.	Match adjacent surface color.
f. Interior face of expansion joints in exterior concrete or masonry walls where metal expansion joint covers are not required.	Match adjacent surface color.
g. Voids where items pass through exterior walls.	Match adjacent surface color.

LOCATION	COLOR
h. Metal reglets, where flashing is inserted into masonry joints, and where flashing is penetrated by coping dowels.	Match adjacent surface color.
i. Metal-to-metal joints where sealant is indicated or specified.	Match adjacent surface color.
j. Joints between ends of gravel stops, fasciae, copings, and adjacent walls.	Match adjacent surface color.

2.1.3 Floor Joint Sealants

ASTM C920, Type S or M, Grade P, Class 25, Use T. 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 floor joint sealants. Provide location(s) and color(s) of sealant for the following:

LOCATION	COLOR
a. Seats of metal thresholds for exterior doors.	Match adjacent surface color.
b. Control and expansion joints in floors, slabs, ceramic tile, and walkways.	Match adjacent surface color.

2.1.4 Acoustical Sealants

Rubber or polymer based acoustical sealant in accordance with ASTM C919 to have a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84. Provide non-staining acoustical sealant with a consistency of 250 to 310 when tested in accordance with ASTM D217. Acoustical sealant must remain flexible and adhesive after 500 hours of accelerated weathering as specified in ASTM C734. 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 acoustical sealants.

2.1.5 Preformed Sealants

Provide preformed sealant capable of sealing out moisture, air and dust when installed as recommended by manufacturer. At temperatures from minus 30 to plus 160 degrees F, the sealant must be non-bleeding with no loss of adhesion.

2.1.5.1 Preformed Foam Joint Sealant

Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 10 lb/cu. ft. and impregnated with nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.

2.1.5.2 Weather-Faced Preformed Foam Joint Sealant

Preformed, precompressed, open-cell polyurethane foam sealant having water-repellent properties and manufactured with a weather-resistant covering that is factory-applied and cured. Foam shall not be impregnated with wax or asphalt compounds. Fabricate in roll or stick form to fit joint widths indicated.

- a. Exposed Face Color: Match adjacent substrates, unless otherwise indicated.

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.

2.5 CLEANING SOLVENTS

Provide type(s) recommended by the sealant manufacturer and in accordance with environmental requirements herein. Protect adjacent aluminum 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 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.

3.1.1 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.

3.1.2 Aluminum 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.

3.1.3 Concrete and Masonry Surfaces

Where surfaces have been treated with curing compounds, oil, or other such materials, remove materials by sandblasting or wire brushing. Remove laitance, efflorescence and loose mortar from the joint cavity. Remove resulting debris prior to sealant installation.

3.1.4 Wood Surfaces

Ensure wood surfaces that will be in contact with sealants are free of splinters, sawdust and other loose particles.

3.2 SEALANT PREPARATION

Do not add liquids, solvents, or powders to sealants. Mix multicomponent elastomeric sealants in accordance with manufacturer's printed instructions.

3.3 APPLICATION

3.3.1 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:		
1/4 inch (minimum)	1/4 inch	1/4 inch

<u>JOINT WIDTH</u>	<u>JOINT DEPTH</u>	
	Minimum	Maximum
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.

3.3.2 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.

3.3.3 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.

3.3.4 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.

3.3.5 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.

3.3.6 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.

3.3.7 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.

3.3.8 Installation of Preformed Sealants

Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. Install in compliance with sealant manufacturer's written instructions.

3.4 PROTECTION AND CLEANING

3.4.1 Protection

Protect areas adjacent to joints from sealant smears. Masking tape may be used for this purpose if removed 5 to 10 minutes after the joint is filled and no residual tape marks remain.

3.4.2 Final Cleaning

Upon completion of sealant application, remove remaining smears and stains and leave the work in a clean and neat condition.

- a. Masonry and Other Porous Surfaces: Immediately 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 --

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SECTION 08 11 13

STEEL DOORS AND FRAMES

02/10

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7 (2017) Minimum Design Loads for Buildings and Other Structures

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2015; Errata 1 2015; Errata 2 2016) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A653 (2017) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A924 (2018) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

ASTM C591 (2017) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation

ASTM D2863 (2017a) Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)

ASTM E1886 (2013a) 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

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.115 (2016) Hardware Preparation in Steel Doors and Steel Frames

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC (2018) International Building Code

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR 111 (2009) Recommended Selection and Usage Guide for Standard Steel Doors, Frames and Accessories

SDI/DOOR 113 (2001; R2006) Standard Practice for Determining the Steady State Thermal Transmittance of Steel Door and Frame Assemblies

SDI/DOOR A250.11 (2001) Recommended Erection Instructions for Steel Frames

SDI/DOOR A250.6 (2003; R2009) Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames

SDI/DOOR A250.8 (2003; R2008) Recommended Specifications for Standard Steel Doors and Frames

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Doors; G

Frames; G

Accessories

Show elevations, construction details, metal gages, hardware provisions, method of glazing, and installation details.

Schedule of Frames; G

Schedule of Doors; G

Submit door and frame locations.

SD-03 Product Data

Doors; G

Frames; G

Accessories

Submit manufacturer's descriptive literature for doors, frames, and accessories. Include data and details on door construction, panel (internal) reinforcement, insulation, and door edge construction. When "custom hollow metal doors" are provided in lieu of "standard steel doors," provide additional details and data sufficient for comparison to **SDI/DOOR A250.8** requirements.

SD-05 Design Data

Performance Requirements Validation; G

For products and systems indicated to validate compliance with specified structural performance requirements, provide calculations and design criteria, including engineering analysis data, signed and sealed by the qualified registered Professional Engineer responsible for their preparation.

Miami Dade Acceptance or Florida Product Approval; G

Submit documentation for Notice of Acceptance (NOA) from the Miami Dade County Building Code Compliance Office (BCCO), or Florida Product Approval. Each NOA or Florida Product Approval letter shall show the product name, product description and valid NOA or Florida Product Approval number with expiration date.

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors, frames, and **accessories** undamaged and with protective wrappings or packaging. 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 PERFORMANCE REQUIREMENTS

2.1.1 Structural

Exterior steel door and frame assemblies shall be designed as a system with minimum properties to resist minimum load requirements as specified below.

2.1.1.1 Wind Load Requirements

Design and fabricate exterior steel door and frame assemblies provided to resist wind load criteria indicated on Structural drawings in accordance with ICC IBC and ASCE 7 requirements for Components and Cladding.

2.1.1.2 Miami Dade Acceptance or Florida Product Approval

Provide steel door and frame assemblies for the building exterior having a Notice of Acceptance (NOA) letter from the Miami Dade County Building Code Compliance Office (BCCO) or Florida Product Approval letter.

2.1.1.3 Windborne-Debris-Impact-Resistance Performance

Provide steel door and frame assemblies that pass missile-impact and cyclic-pressure tests when tested according to ASTM E1886 and testing information in ASTM E1996.

- a. Large-Missile Impact: For steel door and frame assemblies located within 30 feet of grade.

2.2 STANDARD STEEL DOORS

SDI/DOOR A250.8, except as specified otherwise. Prepare doors to receive door hardware as specified in Section 08 71 00. 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.

2.2.1 Classification - Level, Performance, Model

2.2.1.1 Maximum Duty Doors

SDI/DOOR A250.8, Level 4, physical performance Level A, Model 1 with core construction as required by the manufacturer for exterior doors, of size(s) and design(s) indicated. Where vertical stiffener cores are required, the space between the stiffeners must be filled with specified insulation. Fabricate from metallic-coated steel sheet.

2.3 INSULATION CORES

Provide insulating cores of the type specified, and provide an apparent U-factor of 0.48 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.

2.4 STANDARD STEEL FRAMES

SDI/DOOR A250.8, Level 4, except as otherwise specified. Form frames to sizes and shapes indicated, with welded corners. Provide steel frames for doors, used openings, unless otherwise indicated.

2.4.1 Welded Frames

Continuously weld frame faces at corner joints. Mechanically interlock or continuously weld stops and rabbets. Grind welds smooth.

Weld frames in accordance with the recommended practice of the Structural Welding Code Sections 1 through 6, AWS D1.1/D1.1M and in accordance with the practice specified by the producer of the metal being welded.

2.4.2 Stops and Beads

Form stops and beads from 20 gage steel. Provide for glazed and other openings in standard steel frames. Secure beads to frames with oval-head, countersunk Phillips self-tapping sheet metal screws or concealed clips and fasteners. Space fasteners approximately 12 to 16 inch on center. Miter molded shapes at corners. Butt or miter square or rectangular beads at corners.

2.4.3 Cased Openings

Fabricate frames for cased openings of same material, gage, and assembly as specified for metal door frames, except omit door stops and preparation for hardware.

2.4.4 Anchors

Provide anchors to secure the frame to adjoining construction. Provide steel anchors, zinc-coated or painted with rust-inhibitive paint, not lighter than 18 gage.

2.4.4.1 Wall Anchors

Provide at least three anchors for each jamb. For frames which are more than 7.5 feet in height, provide one additional anchor for each jamb for each additional 2.5 feet or fraction thereof.

- a. Masonry: Provide anchors of corrugated or perforated steel straps or 3/16 inch diameter steel wire, adjustable or T-shaped;
- b. Stud partitions: Weld or otherwise securely fasten anchors to backs of frames. Design anchors to be fastened to wood studs with nails, to closed steel studs with sheet metal screws, and to open steel studs by wiring or welding;
- c. Completed openings: Secure frames to previously placed concrete or masonry with expansion bolts in accordance with SDI/DOOR 111; and
- d. Solid plaster partitions: Secure anchors solidly to back of frames and tie into the lath. Provide adjustable top strut anchors on each side of frame for fastening to structural members or ceiling construction above. Provide size and type of strut anchors as recommended by the frame manufacturer.

2.4.4.2 Floor Anchors

Provide floor anchors drilled for 3/8 inch anchor bolts at bottom of each jamb member. Where floor fill occurs, terminate bottom of frames at the indicated finished floor levels and support by adjustable extension clips resting on and anchored to the structural slabs.

2.5 HARDWARE PREPARATION

Provide minimum hardware reinforcing gages as specified in SDI/DOOR A250.6. Drill and tap doors and frames to receive finish hardware. Prepare doors and frames for hardware in accordance with the applicable requirements of SDI/DOOR A250.8 and SDI/DOOR A250.6. For additional requirements refer to ANSI/BHMA A156.115. Drill and tap for surface-applied hardware at the project site. Build additional reinforcing for surface-applied hardware into the door at the factory. Locate hardware in accordance with the requirements of SDI/DOOR A250.8, as applicable. Punch door frames, with the exception of frames that will have weatherstripping or soundproof gasketing, 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.

2.6 FINISHES

2.6.1 Factory-Primed Finish

Thoroughly clean all surfaces of interior doors and frames then chemically treat and factory prime with a rust inhibiting coating as specified in SDI/DOOR A250.8.

2.6.2 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 and ASTM A653. 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.

2.6.3 Electrolytic Zinc-Coated Anchors and Accessories

For exterior doors and frames, provide electrolytically deposited zinc-coated steel in accordance with ASTM A879, Commercial Quality, Coating Class A. Phosphate treat and factory prime zinc-coated surfaces as specified in SDI/DOOR A250.8.

2.7 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.

2.7.1 Grouted Frames

For frames to be installed in exterior walls and to be filled with mortar or grout, fill the stops with strips of rigid insulation to keep the grout out of the stops and to facilitate installation of stop-applied head and jamb seals.

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.

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SECTION 08 14 00

WOOD DOORS

08/16

PART 1 GENERAL

1.1 SUBMITTALS

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

SD-02 Shop Drawings

Doors; G

Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

- a. Indicate dimensions and locations of mortises and holes for hardware.
- b. Indicate dimensions and locations of cutouts.
- c. Indicate fire-protection ratings for fire-rated doors.

SD-03 Product Data

Doors; G

For each type of door indicated. Include details of core and edge construction and trim for openings.

SD-04 Samples

Doors

Prior to the delivery of wood doors, submit a sample section of each type of door which shows the stile, rail, veneer, finish, and core construction.

SD-07 Certificates

Indoor Air Quality for Particleboard and Agrifiber Door Cores

AWI Quality Certification Program certificates.

SD-10 Operation and Maintenance Data

Doors, Data Package 1; G

1.2 DELIVERY, STORAGE, AND HANDLING

Deliver doors to the site in an undamaged condition and protect against damage and dampness. Stack doors flat under cover. Support on blocking, a minimum of 4 inch thick, located at each end and at the midpoint of the door. Store doors in a well-ventilated building so that they will not be exposed to excessive moisture, heat, dryness, direct sunlight, or extreme changes of temperature and humidity.

1.3 QUALITY ASSURANCE

1.3.1 Quality Standard

In addition to requirements specified, comply with AWI's "Architectural Woodwork Standards" (AWI AWS).

1.3.2 Preinstallation Conference

Conduct conference at Project site.

1.4 WARRANTY

1.4.1 Manufacturer's Warranty

Manufacturer agrees to repair or replace solid-core doors that fail in materials or workmanship within warranty period of life of installation from date of final acceptance of the work.

Failures include, but are not limited to, warping (bow, cup or twist) more than 1/4 inch in a 42-by-84-inch section and, telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 PRODUCTS

2.1 DOORS

Provide doors of the types, sizes, and designs specified free of urea-formaldehyde resins. Provide certifications of indoor air quality for particleboard and agrifiber door cores.

2.1.1 Flush Wood Doors

2.1.1.1 Particleboard Core Doors

- a. Particleboard: ANSI A208.1, Grade LD-1 or Grade LD-2.
- b. Blocking: Provide wood blocking in particleboard core doors as follows: 5 inch top-rail blocking in doors indicated to have door closers; 5-inch midrail blocking in doors indicated to have exit devices.

2.1.1.2 Interior Solid Core Doors For Transparent Finish

- a. Grade: Premium with Grade AA faces.
- b. Species: Mahogany.

- c. Cut: Match existing.
- d. Match Between Veneer Leaves: Pleasing match.
- e. Assembly of Veneer Leaves on Door Faces: Balance match.
- f. Pair and Set Match: Provide for doors hung in the same opening.
- g. Exposed Vertical and Top Edges: Same species as faces.
- h. Core: Particleboard.
- i. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.

2.1.1.3 Wood Beads for Light Openings in Wood Doors

- a. Wood Species: Same species as door faces.
- b. Profile: Manufacturer's standard shape

2.1.2 Stile and Rail Wood Doors

2.1.2.1 Panel Designs

As indicated on drawings.

2.1.2.2 AWI AWS Grade and Finish

Premium grade; transparent finish.

2.1.2.3 Wood Species and Cut

Mahogany; cut to match or complement of flush wood doors.

2.1.2.4 Door Construction

Clear lumber; may be edge glued for width. Select lumber for similarity of grain and color, and arrange optimum match between adjacent pieces.

2.1.2.5 Stile and Rail Widths

As indicated on drawings.

2.2 FABRICATION

Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting, unless otherwise indicated.

Factory machine doors for hardware that is not surface applied. Comply with final hardware schedules, door frame Shop Drawings, BHMA 156.115-W, and hardware templates.

Cut and trim openings through doors in factory. For light openings, trim openings with moldings of specified material and profile, unless otherwise indicated. Factory install glazing in doors specified to be factory finished; comply with applicable requirements specified in Section 08 81 00

GLAZING

2.3 FACTORY FINISHING

Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied before finishing.

Finish doors at factory that are specified to receive transparent finish as follows:

- a. Grade: Premium.
- b. Finish: System 5, varnish, conversion.
- c. Wash Coat for Close-Grain Woods: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
- d. Staining: As selected by Contracting Officer, unless otherwise specified or indicated.
- e. Sheen: Satin, 31-45.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth. Install doors and frame assemblies in accordance with manufacturer's written installation instructions.

3.1.1 Factory-Finished Doors

Restore finish before installation if fitting or machining is required at Project site.

3.2 ADJUSTING

3.2.1 Operation

Rehang or replace doors that do not swing or operate freely.

3.2.2 Finished Doors

Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished, subject to the discretion of the Contracting Officer, if the work complies with requirements and shows no evidence of repair or refinishing.

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FIBERGLASS DOORS
01/19

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 SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7 (2017) Minimum Design Loads for Buildings and Other Structures

ASTM INTERNATIONAL (ASTM)

ASTM E1886 (2013a) 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 E84 (2019b) Standard Test Method for Surface Burning Characteristics of Building Materials

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC (2018) International Building Code

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Shop Drawings; G

SD-03 Product Data

Product Data; G

Warranties; G

SD-05 Design Data

Performance Requirements Validation; G

For products and systems indicated to validate compliance with specified structural performance requirements, provide calculations and design criteria, including engineering analysis data, signed and sealed by the qualified registered Professional Engineer responsible for their preparation.

Miami Dade Acceptance or Florida Product Approval; G

Submit documentation for Notice of Acceptance (NOA) from the Miami Dade County Building Code Compliance Office (BCCO), or Florida Product Approval. Each NOA or Florida Product Approval letter shall show the product name, product description and valid NOA or Florida Product Approval number with expiration date.

SD-06 Test Reports

Test Reports; G

SD-10 Operation and Maintenance Data

Maintenance Manuals; G

1.3 QUALITY ASSURANCE

1.3.1 Manufacturers

Firms regularly engaged in manufacture of fiberglass doors of the types and sizes required, whose products have been in satisfactory use in similar service for not less than 10 years. Provide fiberglass doors produced by a manufacturer listed in this section.

1.3.2 Source Limitations

Obtain each type of fiberglass door through one (1) source from a single manufacturer.

1.3.3 Surface-Burning Characteristics

Provide insulation materials complying with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.

b. Smoke-Developed Index: 450 or less

1.3.4 Shop Drawings

Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in [product data](#); and other pertinent data.

1.3.5 Test Reports

Submit for doors, indicating compliance with referenced standards.

1.3.6 Operation and Maintenance Data

For air doors to include in maintenance manuals.

1.3.7 Warranties

Sample of warranties.

1.4 DELIVERY, STORAGE, AND HANDLING

Comply with requirements of manufacturer's written instructions.

Package doors on pallets and protect with cardboard top and bottom, corner protectors, banding, and shrink wrap.

Store and handle in strict compliance with manufacturer's written instructions and recommendations.

Protect from damage due to weather, excessive temperature, and construction operations.

1.5 WARRANTY

Manufacturer's standard form, in which manufacturer warrants doors to be free of manufacturing defects in materials or workmanship.

1. Warranty shall be in effect 10 years from date of final acceptance of work.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.1.1 Structural

Exterior FRP door and frame assemblies shall be designed as a system with minimum properties to resist minimum load requirements as specified below.

2.1.1.1 Wind Load Requirements

Design and fabricate exterior FRP door and frame assemblies provided to resist wind load criteria indicated on Structural drawings in accordance with ICC IBC and ASCE 7 requirements for Components and Cladding.

2.1.1.2 Miami Dade Acceptance Or Florida Product Approval

Provide FRP door and frame assemblies for the building exterior having a Notice of Acceptance (NOA) letter from the Miami Dade County Building Code Compliance Office (BCCO) or Florida Product Approval letter.

2.1.1.3 Windborne-Debris-Impact-Resistance Performance

Provide FRP door and frame assemblies that pass missile-impact and cyclic-pressure tests when tested according to ASTM E1886 and testing information in ASTM E1996.

2.1.1.3.1 Large-Missile Impact

For FRP door and frame assemblies located within 30 feet of grade.

2.2 MANUFACTURERS

2.2.1 Basis of Design

Provide products manufactured by Special-Lite, Inc., Model "AF-100 Pultruded Fiberglass Door" and "AF-250 Pultruded Fiberglass Frame", or comparable products by another manufacturer may be submitted to the Contracting Officer for approval. Manufacturer's products specified are not intended to limit selection of equal products from other manufacturers.

2.3 FIBERGLASS (FRP) DOORS AND FRAMES

2.3.1 Door Construction

- a. Materials: Pultruded fiberglass as one monolithic panel with integral stiles.
- b. Door Thickness: 1-3/4 inches.
- c. Stiles: Seamless 9/16 inch thick solid FRP.
- d. Top and Bottom Rails: Manufacturer's standard.
- e. Core: Manufacturer's standard.
- f. Face Sheet: Smooth, pultruded FRP integral to construction of door.
- g. Cutouts: By manufacturer for vision lites, louvers, etc. as indicated.
- h. Hardware: Pre-machined doors according to templates from specified door hardware.
- i. Reinforcements: Manufacturer's standard, except metallic reinforcements not allowed.
- j. Finish: Factory-applied two-part aliphatic polyurethane coating; colors as indicated.

2.3.2 Frame Construction

- a. Materials: Pultruded fiberglass as one monolithic panel with integral stiles.
- b. Door Thickness: 1-3/4 inches.
- c. Stiles: Seamless 9/16 inch thick solid FRP.
- d. Top and Bottom Rails: Manufacturer's standard.
- e. Core: Manufacturer's standard.
- f. Face Sheet: Smooth, pultruded FRP integral to construction of door.
- g. Cutouts: By manufacturer for vision lites, louvers, etc. as indicated.

- h. Hardware: Pre-machined doors according to templates from specified door hardware.
- i. Reinforcements: Manufacturer's standard, except metallic reinforcements not allowed.
- j. Finish: Factory-applied two-part aliphatic polyurethane coating; colors as indicated.

PART 3 EXECUTION

3.1 EXAMINATION

Examine frames and substrates, for suitable conditions where fiberglass doors and composite frames will be installed.

Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.

Reject doors and composite frames with defects.

Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

Install composite door frames level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.

Hardware: Refer to Section 08 71 00 DOOR HARDWARE, for installation.

Install fiberglass doors in compliance with manufacturer's written instructions.

3.3 ADJUSTING

3.3.1 Operation

Rehang or replace doors that do not swing or operate freely.

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SECTION 08 31 00

ACCESS DOORS AND PANELS

05/17

PART 1 GENERAL

1.1 SUBMITTALS

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

SD-02 Shop Drawings

Access Doors; G

SD-03 Product Data

Access Doors; G

Hardware; G

Accessories; G

SD-04 Samples

Finishes; G

1.2 GENERAL REQUIREMENTS

For access doors provide the following:

1.2.1 Shop Drawings

For field assembled access doors and panels, provide plans, elevations, sections, and details for each type of access door and panel assembly. Indicate frame, surface and edge construction, materials, and accessories. Indicate types of finished surfaces and details for panel edge conditions. Provide a door schedule with a unique number for each access door and panel, specific location in the project, location of hinges and hardware for each door.

1.2.2 Product Data

For shop assembled access doors and panels, provide literature indicating sizes, types, frame and edge construction, finishes, hardware, accessories such as gaskets, seals and weatherstripping, and location of each door and panel in the project. Provide details of adjoining work for each condition indicated.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Hinges

Provide concealed spring hinges, 175 degrees of opening, with removable hinge pins to allow removal of door panel from frame. Provide hinges of same steel as door and frame or in accordance with manufacturer's written recommendations. If providing non-continuous hinges, provide in numbers required to maintain alignment of door panel with frame.

2.1.2 Accessories

Provide anchors in size, number and location on four sides to secure access door to substrate. Provide anchors in types as recommended by manufacturer's written installation instructions for each substrate indicated. Provide shims, bushings, clips, gaskets, and other devices as necessary for a complete installation.

2.2 FINISHES

Field paint frames and panels to match wall and ceiling surfaces in which they occur.

PART 3 EXECUTION

3.1 PREPARATION

Field verify all measurements prior to fabrication. Verify access door locations and sizes provide required maintenance access to installed building services components. Protect existing construction and completed work from damage during installation.

3.2 GENERAL INSTALLATION REQUIREMENTS

Install items at locations indicated, in accordance with manufacturer's written instructions. Include materials and parts as necessary for a complete installation of each item. Conceal fastenings where practicable. Poor matching of holes to fasteners is cause for rejection of the work.

3.3 FIELD PAINTING

Field painting primed access doors in accordance with the requirements of Section 09 90 00 PAINTS AND COATINGS.

3.4 ADJUSTMENT

Adjust hardware so that door panel opens freely. Adjust door when closed center door panel in frame.

3.5 ENVIRONMENTAL CONDITIONS

Do not paint surfaces when damp or exposed to weather, when surface temperature is below 45 degrees F or over 95 degrees F, unless approved by the Contracting Officer.

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ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
08/18

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.

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

- AAMA 2605 (2017a) Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels
- AAMA 501.2 (2015) Methods of Test for Exterior Walls
- AAMA 800 (2016) Voluntary Specifications and Test Methods for Sealants

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

- ASCE 7 (2017) Minimum Design Loads for Buildings and Other Structures

ASTM INTERNATIONAL (ASTM)

- ASTM B221 (2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
- ASTM E1105 (2015) Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference
- ASTM E1886 (2013a) 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 E283 (2004; R 2012) 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 E783	(2002; R 2010) Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
ASTM F2248	(2012) Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2018) International Building Code

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 4-010-01	(2018) DoD Minimum Antiterrorism Standards for Buildings

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS TT-P-645	(Rev C) Primer, Paint, Zinc-Molybdate, Alkyd Type

1.2 ADMINISTRATIVE REQUIREMENTS

1.2.1 Pre-Installation Meetings

Conduct a meeting before installation begins to verify the project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.3 PERFORMANCE REQUIREMENTS

1.3.1 Structural

Exterior aluminum-framed glazed door and window assemblies shall be designed as a system with minimum properties to resist minimum load requirements as specified below, and meeting UFC 4-010-01, minimum antiterrorism/force protection criteria, Article 3-11, Standard 10, "Glazing", for exterior windows, skylights, glazed sidelights, and storefront assemblies, and Article 3-13, Standard 12, "Exterior Doors", for exterior glazed and non-glazed doors. Design of the glazed assembly shall include associated hardware, connections of the hardware, anchorage components and supporting structural connections.

1.3.1.1 Frames

Use ASTM F2248 for glazing bite requirements for structurally or non-structurally glazed exterior door and window assemblies.

1.3.1.2 Connections

The design of connections of exterior glazed door and window assemblies to surrounding walls, of hardware and associated connections, of glazing stop connections, and of other elements in shear will be based on allowable stress levels. The allowable fastener loads will be as recommended by the fastener manufacturer for the materials to which the door systems are being connected.

Connections must be capable of preventing the frame from being dislodged from the supporting structural element.

1.3.1.3 Wind Load Requirements

Design and fabricate exterior glazed door and frame assemblies provided to resist wind load criteria indicated on Structural drawings in accordance with ICC IBC and ASCE 7 requirements for Components and Cladding.

1.3.1.4 Miami Dade Acceptance or Florida Product Approval

Provide aluminum-framed entrance and storefront assemblies for the building exterior having a Notice of Acceptance (NOA) letter from the Miami Dade County Building Code Compliance Office (BCCO) or Florida Product Approval letter.

1.3.1.5 Windborne-Debris-Impact-Resistance Performance

Provide aluminum-framed entrance and storefront assemblies that pass missile-impact and cyclic-pressure tests when tested according to ASTM E1886 and testing information in ASTM E1996.

- a. Large-Missile Impact: For aluminum-framed entrance and storefront assemblies located within 30 feet of grade.

1.3.2 Air Infiltration

When tested in accordance with ASTM E283, air infiltration shall not exceed 0.06 cubic feet per minute per square foot of fixed area at a minimum static-air pressure difference of 1.57 pounds per square foot.

1.3.3 Water Penetration under Static Pressure

When tested in accordance with ASTM E331, there shall be no water penetration at a minimum static-air-pressure difference of 15 percent of highest positive wind-load design pressure, but not less than 15 pounds per square foot.

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

SD-02 Shop Drawings

Installation Drawings; G

Fabrication Drawings; G

SD-03 Product Data

Aluminum-framed entrances and storefronts; G

Finish; G

SD-04 Samples

Finish; G

SD-05 Design Data

Performance Requirements Validation; G

For products and systems indicated to validate compliance with specified structural performance requirements, provide calculations and design criteria, including engineering analysis data, signed and sealed by the qualified registered Professional Engineer responsible for their preparation.

Miami Dade Acceptance or Florida Product Approval; G

Submit documentation for Notice of Acceptance (NOA) from the Miami Dade County Building Code Compliance Office (BCCO), or Florida Product Approval. Each NOA or Florida Product Approval letter shall show the product name, product description and valid NOA or Florida Product Approval number with expiration date.

SD-06 Test Reports

Test and inspection reports; G

SD-08 Manufacturer's Instructions

Manufacturer's Instructions

SD-11 Closeout Submittals

Warranty

1.5 QUALITY CONTROL

1.5.1 Qualifications

1.5.1.1 Installer Qualifications

Provide documentation of the installer's experience as determined by the Contractor in performing the work specified in this section.

Ensure that the installers are specialized in work similar to that required for this project, and that they are acceptable to product manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

1.6.1 Packing, Shipping, Handling and Unloading

Deliver materials in the manufacturer's original, unopened, undamaged

containers with identification labels intact.

1.6.2 Storage and Protection

Store materials in a way that protects them from exposure to harmful weather conditions. Avoid damaging the storefront material and components during handling. Protect storefront material against damage from elements, construction activities, and other hazards before, during, and after storefront installation.

Do not use adhesive papers or sprayed coatings that become firmly bonded when exposed to sunlight. Do not leave coating residue on surfaces.

1.7 PROJECT / SITE CONDITIONS

1.7.1 Field Measurements

Verify actual measurements or openings by taking field measurements before fabrication; record these measurements on shop drawings. To avoid construction delays, coordinate field measurements, and fabrication schedule with construction progress.

1.8 WARRANTY

1.8.1 Assembly Warranty

Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1.8.1.1 Failures include, but are not limited to, the following:

- a. Structural failures, including excessive deflection.
- b. Noise or vibration created by wind and thermal and structural movements.
- c. Detoriation of metals and other materials beyond normal weathering.
- d. Water penetration through fixed glazing and framing areas.
- e. Failure of operating components.

1.8.1.2 Warranty Period

Five years from date of final acceptance of the work.

1.8.2 Finish Warranty

Manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1.8.2.1 Warranty Period

10 years from date of final acceptance of the work.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide aluminum-framed entrance and storefront system, of sizes and configurations indicated, complete with glazing and ancillary components as required for a complete system.

2.1.1 Material Standard

ASTM B221; 6063-T5 alloy and tempered.

Provide major portions of the door members at 0.125 inches nominal in thickness and glazing molding at 0.050 inches thick. Unless otherwise indicated, provide door stile and rail face dimensions of the entrance doors as follows:

2.1.1.1 Vertical Stile

3-1/2 inches.

2.1.1.2 Top Rail

3-1/2 inches.

2.1.1.3 Bottom Rail

6-1/2 inches.

2.2 FABRICATION

Provide the following information when submitting fabrication drawings for custom fabrications:

- a. Indicate elevations, detailed design, dimensions, member profiles, joint locations, arrangement of units, and member connections.
- b. Show the following items:
 - (1) Details of special shapes.
 - (2) Reinforcing.
 - (3) Anchorage system.
 - (4) Interfacing with building construction.
 - (5) Provisions for expansion and contraction.
 - (6) Thermal breaks.
- c. Indicate typical glazing details, locations of various types and thickness of glass and internal sealant requirements as recommended by the sealant manufacturer.
- d. Clearly indicate locations of exposed fasteners and joints.
- e. Clearly show where and how the manufacturer's system deviates from Contract drawings and these specifications.

2.2.1 Entrance System Fabrication

Provide door corner construction consisting of mechanical clip fastening, SIGMA deep penetration plug welds and 1 1/8 inch long fillet welds inside and outside all four corners. Provide a hook-in type exterior glazing stop with EPDM glazing gaskets reinforced with non-stretchable cord. Provide an interior glazing stop that is mechanically fastened to the door member and that incorporates a silicone-compatible spacer used with silicone sealant.

Accurately fit and secure joints and corners. Make joints hairline in appearance. Remove burrs and smooth edges. Prepare components with internal reinforcement for door hardware. Arrange fasteners and attachments so that they are concealed from view.

Separate dissimilar metals with protective coating or pre-formed separators to prevent contact and corrosion.

2.2.2 Shop Assembly

Fabricate and assemble units with joints only at the intersection of aluminum members with hairline joints; rigidly secure these units, and seal them in accordance with the manufacturer's recommendations.

2.2.2.1 Welding

Conceal welds on aluminum members in accordance with AWS recommendations or methods recommended by the manufacturer. Members showing welding bloom or discoloration on finish or material distortion will be rejected by the Contracting Officer.

2.2.3 Finish

Organic Coating (high-performance exterior coating):

- a. Comply with requirements of AAMA 2605.
- b. Clean surfaces and pretreat them with a conversion coating before applying 0.3 mil dry-film thickness of epoxy or acrylic primer according to the recommendations of the finish coat manufacturer.
- c. Apply a 2-coat finish system of 70 percent minimum fluoropolymer resin fused to primed surfaces at the temperature recommended by the manufacturer and at a minimum dry film thickness of 1.0 mil.

2.2.4 Fabrication Tolerance

Fabricate and assemble units with joints only at intersection of aluminum members with hairline joints; rigidly secure these units, and seal them in accordance with the manufacturer's recommendations.

Fabricate aluminum entrances in accordance with the entrance manufacturer's prescribed tolerances.

2.2.4.1 Material Cuts

Square to 1/32 inch off square, over largest dimension; proportionate amount of 1/32 inch on the two dimensions.

2.2.4.2 Maximum Offset at Consecutive Members

1/64 inch in alignment between two consecutive members in line, end to end.

2.2.4.3 Maximum Offset at Glazing Pocket Corners

1/64 inch between framing members at glazing pocket corners.

2.2.4.4 Joints

Between adjacent members in same assembly: Joints are hairline and square to the adjacent member.

2.2.4.5 Variation

In squaring diagonals for doors and fabricated assemblies: 1/16 inch.

2.2.4.6 Flatness

For doors and fabricated assemblies: plus/minus 1/16 inch of neutral plane.

2.3 MATERIALS

2.3.1 Sealants

Refer to Section 07 92 00 JOINT SEALANTS. Ensure that all sealants conform to AAMA 800.

2.3.2 Glass

Refer to Section 08 81 00 GLAZING.

2.4 ACCESSORIES

2.4.1 Fasteners

Provide stainless steel fasteners in areas where the fasteners are exposed.

Use non-corrosive and compatible fasteners with components being fastened. Do not use exposed fasteners, except where unavoidable for application of hardware.

In areas where fasteners are not exposed, use aluminum, non-magnetic stainless steel, or other materials warranted by the manufacturer.

For exposed locations, provide countersunk Phillips head screws when items with a matching finish are fastened. For concealed locations, provide the manufacturer's standard fasteners.

Provide nuts or washers that have been designed with a means to prevent disengagement; do not deform fastener threads.

2.4.2 Perimeter Anchors

When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

2.4.2.1 Inserts and Anchorage Devices

Provide manufacturer's standard formed or fabricated assemblies, steel or aluminum, of shapes, plates, bars, or tubes. Shop-coat steel assemblies after fabrication with an alkyd zinc chromate primer complying with FS TT-P-645.

2.4.3 Standard Entrance Hardware

Refer to Section 08 71 00 HARDWARE.

2.4.4 Exposed Flashings, Trim and Closure Panels

Form expensed flashings, sill flashings, trim and closure panels from extruded aluminum finished to match framing of sufficient thickness to suit Project conditions and to maintain a flat appearance.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Site Verification of Conditions

Verify that the condition of substrate previously installed under other sections is acceptable for product installation in accordance with the manufacturer's instructions.

Verify that openings are sized to receive the storefront system and that the sill plate is level in accordance with the manufacturer's acceptable tolerances.

3.2 PREPARATION

Field-verify dimensions before fabricating components for the door portal assembly.

Coordinate requirements for locations of blockouts for anchorage of door portal columns and other embedded components with Section 03 30 53 MISCELLANEOUS CAST-IN-PLACE CONCRETE.

Coordinate the erection of door portal with installation of surrounding glass wall and door assemblies. Ensure that the door portals can provide support and anchorage for assembly components.

3.2.1 Adjacent Surfaces Protection

Protect adjacent work areas and finish surfaces from damage during product installation.

3.2.2 Aluminum Surface Protection

Protect aluminum surfaces from contact with lime, mortar, cement, acids, and other harmful contaminants.

3.3 INSTALLATION

Submit installation drawings for review and approval.

Install the entrance system in accordance with the [manufacturer's instructions](#) and the AAMA storefront and entrance guide specifications manual. Attach the entrance system to the structure, allowing it to be adjusted to accommodate construction tolerances and other irregularities. Provide alignment attachments and shims to permanently fasten the system to the building structure. Align the assembly so that it is plumb and level, and free of warp and twist. Maintain assembly dimensional tolerances aligning with adjacent work.

Set thresholds in a bed of mastic and secure the thresholds. Protect aluminum members in contact with masonry, steel, concrete, or dissimilar materials using nylon pads or a bituminous coating. Shim and brace the aluminum system before anchoring the system to the structure. Verify that weep holes are open, and the metal joints are sealed in accordance with the manufacturer's installation instructions. Seal metal-to-metal joints using a sealant recommended by the system manufacturer.

3.3.1 Tolerances

Ensure that tolerances for wall thickness and other cross-sectional dimensions of entrance members are nominal and in compliance with Aluminum Standards and Data, published by the Aluminum Association.

3.3.2 Adjusting

Adjust operating hardware for smooth operation, and as recommended by the manufacturer.

3.3.3 Related Products Installation Requirements

3.3.3.1 Sealants (Perimeter)

Refer to Section [07 92 00](#) JOINT SEALANTS.

3.3.3.2 Glass

Refer to Section [08 81 00](#) GLAZING.

3.4 FIELD QUALITY CONTROL

3.4.1 Field Quality-Control Testing

Perform the following tests on representative areas of aluminum-framed entrances and storefront.

- a. **Water-Spray Test:** Before installation of interior finishes has begun, areas designated by the Contracting Officer shall be tested according to AAMA 501.2 and shall not evidence water penetration. Perform minimum of two tests in areas as directed by the Contracting Officer.
- b. **Air Infiltration:** ASTM E783 at 1.5 times the rate specified in "Performance Requirements" for laboratory testing, but no more than 0.09 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft. Perform a minimum of two tests in areas as directed by the Contracting Officer.
- c. **Water Penetration:** ASTM E1105 at a minimum uniform static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements", but not

less than 15 lbf/sq. ft., and shall not evidence water penetration.

3.4.2 Requirements

Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.

Additional testing and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.

Prepare and submit test and inspection reports.

3.5 ADJUSTING AND CLEANING

3.5.1 Protection

Protect the installed product's finish surfaces from damage during construction. Protect the aluminum storefront system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.

3.5.2 Cleaning

Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions before acceptance remove excess mastic, mastic smears, and other foreign materials. Remove construction debris from the project site and legally dispose of this debris.

-- End of Section --

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SECTION 08 71 00

DOOR HARDWARE

02/16

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-- End of Section Table of Contents --

SECTION 08 71 00

DOOR HARDWARE
02/16

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 in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E283 (2004; R 2012) 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 A156.13 (2017) Mortise Locks & Latches Series 1000
ANSI/BHMA A156.14 (2013) Sliding and Folding Door Hardware
ANSI/BHMA A156.16 (2018) Auxiliary Hardware
ANSI/BHMA A156.18 (2016) Materials and Finishes
ANSI/BHMA A156.2 (2017) Bored and Preamsembled Locks and Latches
ANSI/BHMA A156.21 (2014) Thresholds
ANSI/BHMA A156.22 (2017) Door Gasketing and Edge Seal Systems
ANSI/BHMA A156.3 (2014) Exit Devices
ANSI/BHMA A156.7 (2016) Template Hinge Dimensions

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

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in

accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Manufacturer's Detail Drawings; G

Verification of Existing Conditions; G

SD-03 Product Data

Product Data; G

SD-08 Manufacturer's Instructions

Installation

SD-10 Operation and Maintenance Data

Hardware Schedule ; 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. Indicate power components and wiring coordination for electrified hardware. 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	Qty	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, pivots, and closers of one lock, hinge, pivot, 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 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 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 ITEMS

Clearly and permanently mark with the manufacturer's name or trademark, hinges, pivots, locks, latches, exit devices, bolts and closers where the identifying mark is visible after the item is installed. For closers with covers, the name or trademark may be beneath the cover. Coordinate electrified door hardware components with corresponding components specified in Division 28 ELECTRONIC SECURITY SYSTEMS (ESS).

2.2.1 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.

Hinge Sizes Chart		
Thickness of Doors in inches	Width of Doors in inches	Height of Hinges (Length of Joint) in inches
7/8 to 1-1/8 screen	To 36	3
1-3/8	To 32	3-1/2
1-3/8	Over 32 to 37	4
1-3/4	To 36	4-1/2
1-3/4	Over 36 to 48	5 Heavy Weight
1-3/4	Over 48	6 Heavy Weight
2, 2-1/4 and 2-1/2	To 42	5 Heavy Weight
2, 2-1/4 and 2-1/2	Over 42	6 Heavy Weight

2.2.2 Locks and Latches

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.

2.2.2.1 Residential Bored Locks and Latches

Provide in accordance with ANSI/BHMA A156.2, Series 4000, Grade 2. Install locks for exterior doors with threaded roses or concealed machine screws.

2.2.3 Cylinders and Cores

Provide cylinders and cores for new locks, including locks provided under other sections of this specification. Provide cylinders and cores with six pin tumblers. Provide cylinders from the products of one manufacturer, and provide cores from the products of one manufacturer.

Provide cylinders for new locks, including locks provided under other sections of this specification. Provide fully compatible cylinders of Grade 1 products from products of one manufacturer with interchangeable cores that are removable by a special control key. Factory set the cores with six pin tumblers using the A4 system and F keyway. Submit a core code sheet with the cores. Provide master keyed cores in one system for this project. Provide construction interchangeable cores.

2.2.4 Keying System

Provide an extension of the existing keying system. Existing locks were manufactured by BEST and have interchangeable cores.

Notify the Contracting Officer 90 days prior to the required delivery of the cylinders. Provide temporary cores and keys for the Contractor's use during construction, and for testing of locksets.

2.2.5 Lock Trim

Provide cast, forged, or heavy wrought construction and commercial plain design for lock trim.

2.2.5.1 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.

2.2.5.2 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.

2.2.5.3 Texture

Provide knurled or abrasive coated knobs or lever handles for doors which are accessible to blind persons and which lead to dangerous areas.

2.2.6 Keys

Provide seven change keys for each interchangeable core, provide two control keys, six masters keys, and six construction master keys. Provide a quantity of key blanks equal to 20 percent of the total number of change keys. Stamp each key with appropriate key control symbol and "U.S. property - do not duplicate." Do not place room numbers on keys.

2.2.7 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.

2.2.8 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.

2.2.9 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, and sweep strips. Air leakage of weatherstripped doors not to exceed 2.19 by 10⁻⁵ (0.5 cubic feet) per minute of air per square meter (foot) of door area when tested in accordance with ASTM E283. Provide weatherstripping with one of the following:

2.2.10 Soundproofing Gasketing

Provide in accordance with ANSI/BHMA A156.22. Provide adjustable doorstops at heads, jams and automatic door bottoms in accordance with the hardware set, of extruded aluminum, anodized, surface applied, with vinyl fin seals between plunger and housing. Provide doorstops with solid neoprene tube, silicone rubber, or closed cell sponge gasket. Provide door bottoms with adjustable operating rod and silicone rubber or closed cell sponge neoprene gasket. Provide doorstops that are mitered at corners. Provide type and function designation where specified in paragraph HARDWARE SETS.

2.2.11 Auxiliary Hardware (Other than locks)

Provide in accordance with ANSI/BHMA A156.16, Grade 1.

2.2.12 Sliding and Folding Door Hardware

Provide in accordance with ANSI/BHMA A156.14, Grade 1. Finishes to match other hardware specified herein.

2.2.13 Special Tools

Provide special tools, such as spanner and socket wrenches and dogging keys, as required to service and adjust hardware items.

2.3 FASTENERS

Provide fasteners of type, quality, size, and quantity appropriate to the specific application. Fasteners 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.

2.4 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. 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.

3.1.2 Soundproofing Installation

Provide as specified for stop applied weatherstripping.

3.1.3 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.

3.2 KEY CABINET AND CONTROL SYSTEM

Locate where directed. Tag one set of file keys and one set of duplicate keys. Place other keys in appropriately marked envelopes, or tag each key. Provide complete instructions for setup and use of key control system. On tags and envelopes, indicate door and room numbers or master or grand master key.

3.3 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.

3.4 HARDWARE SETS

HARDWARE GROUP NO. 1 For use on Door #(s): 103 Provide each PR door(s) with the following:			
Quantity	Description	Catalog Number	Finish
2	Cont. Hinge	224HD	628
1	Panic Hardware	CD-9947-EO	626
1	Panic Hardware	CD-9947-NL-OP-110MD	626
2	SFIC Mortise Cyl.	80-102 X K510-730 XQ11-948 36-083 36-082-025	626
1	SFIC RIM Housing	80-129	626
2	90 DEG Offset Pull	8190EZHD 10" O	630-316
2	Surface Closer	4040XP CUSH	689
2	PA Mountaing Plate	4040XP-18PA	689
2	Meeting Stile	328AA-S	AA
1	Gasketing	8144SBK PSA	BK
2	Door Sweep	39A	A
HARDWARE GROUP NO. 3 For use on Door #(s): 102 Provide each SGL door(s) with the following:			
Quantity (each)	Description	Catalog Number	Finish
3	Hinge	5BB1 4.5 X 4.5	652
1	Entry/Office	T511BB7 DAN	626
1	Kick Plate	8400 10" X 2" LDW B-CS	630
1	Wall Stop	WS406/407CCV	630
1	Gasketing	488FSBK PSA	BK
HARDWARE GROUP NO. 4 For use on Door #(s): 112, 121, 125, 126, 127, 128, 129A, 129B, 130, 131, 132, 133, 134, 135, 136 Provide each SGL door(s) with the following:			
Quantity (each)	Description	Catalog Number	Finish
3	Hinge	5BB1 4.5 X 4.5	652

1	Entry/Office	T511BB7 DAN	626
1	Wall Stop	WS406/407CCV	630
1	Gasketing	8144SBK PSA	BK
HARDWARE GROUP NO. 5 For use on Door #(s): 111 Provide each SGL door(s) with the following:			
Quantity (each)	Description	Catalog Number	Finish
3	Hinge	5BB1 4.5 X 4.5	652
1	Entry/Office	T511BB7 DAN	626
1	Wall Stop	WS406/407CCV	630
1	Gasketing	488FSBK PSA	BK
HARDWARE GROUP NO. 6 For use on Door #(s): 114A Provide each SGL door(s) with the following:			
Quantity (each)	Description	Catalog Number	Finish
3	Hinge	5BB1 4.5 X 4.5	652
1	Privacy Lock	T301S DANE	626
1	Surface Closer	4040XP REG OR PA AS REQ	689
1	Kick Plate	8400 10" X 2" LDW B-CS	630
1	Wall Stop	WS406/407CCV	630
1	Gasketing	488FSBK PSA	BK
HARDWARE GROUP NO. 7 For use on Door #(s): 108 and 115 Provide each SGL door(s) with the following:			
Quantity (each)	Description	Catalog Number	Finish
3	Hinge	5BB1 4.5 X 4.5	652
1	Privacy Lock Lock	T301S DANE	626
1	Surface Closer	4040XP REG OR PA AS REQ	689
1	Kick Plate	8400 10" X 2" LDW B-CS	630

1	Wall Stop	WS406/407CCV	630
1	Gasketing	8144SBK PSA	BK
HARDWARE GROUP NO. 8 For use on Door #(s): 118 and 119 Provide each SGL door(s) with the following:			
Quantity (each)	Description	Catalog Number	Finish
3	Hinge	5BB1 4.5 X 4.5	652
1	Push Plate	8200 4" X 16"	630
1	Pull Plate	8303 10" 4" X 16"	630
1	Surface Closer	4040XP REG OR PA AS REQ	689
1	Kick Plate	8400 10" X 2" LDW B-CS	630
1	Wall Stop	WS406/407CCV	630
3	Gasketing	8144SBK PSA	BK
HARDWARE GROUP NO. 9 For use on Door #(s): 114B Provide each BF door(s) with the following:			
Quantity (each)	Description	Catalog Number	Finish
All hardware by door manufacturer.			
HARDWARE GROUP NO. 10 For use on Door #(s): 101C Provide each PR door(s) with the following:			
Quantity (each)	Description	Catalog Number	Finish
2	Cont. Hinge	224HD EPT	628
2	Power Transfer	EPT10 CON	689
1	Elec Panic Hardware	QEL-9947-EO-CON 24 VDC	626
1	Elec Panic Hardware	QEL-9947-NL-OP-110MD 24 VDC	626

1	SFIC Core	80-033	626
1	SFIC Mortise Cyl.	80-102 X K510-730 XQ11-948 36-083 36-082-025	626
1	SFIC Rim Housing	80-129	626
2	90 Deg Offset Pull	8190EZHD 10" O	630-316
1	Surf. Auto Operator	9553 REG2 MS	ANCLR
2	Actuator, Wall Mount	8310-853T	630
1	Rain Drip	142AA	AA
2	Door Sweep	39A	A
1	Threshold	65A-223-72" (1829MM)	A
2	Wire Harness	CON-192P	
2	Wire Harness	CON-26	
2	Wire Harness	CON-6W	
1	Key Switch	653-05 L2 12/24 VDC	630
1	Power Supply	PS902 900-KL 900-2RS 120/240 VAC	
Note: Wiring Diagram by hardware supplier Functional Description: Depressing actuator inside or outside will open pair of doors automatically unless operator is shut-off by keyswitch inside building. Red/Green lights indicates status of operator. Egress is always allowed via exit devices. Manual ingress by key is available.			
HARDWARE GROUP NO. 11 For use on Door #(s): 124E Provide each SGL door(s) with the following			
Quantity (each)	Description	Catalog Number	Finish
3	Hinge	5BB1 4.5 X 4.5 NRP	630
1	Panic Hardware	80-033	626
1	SFIC COre	4040XP REG OR PA AS REQ	689

1	SFIC Mortise Cyl.	80-102 X K510-730 XQ11-948 36-083 36-082-025	626
1	SFIC Rim Housing	80-129	626
1	Surface Closer	4040XP CUSH	689
1	Optional PA Shoe	4040XP-62A	689
1	Rain Drip	142AA	AA
1	Gasketing	31AA-S	AA
1	Door Sweep	39A	A
1	Threshold	65A-223-72" (1829MM)	A
HARDWARE GROUP NO. 12 For use on Door #(s): 124A and 124C Provide each SGL door(s) with the following:			
Quantity (each)	Description	Catalog Number	Finish
3	Hinge	5BB1 4.5 X 4.5 NRP	630
1	Panic Hardware	CD-99-L-NL-06	626
2	SFIC Core	80-033	626
1	SFIC Mortise Cyl.	80-102 X K510-730 XQ11-948 36-083 36-082-025	626
1	SFIC Rim Housing	80-129	626
1	Surface Closer	4040XP CUSH	689
1	Optional PA Shoe	4040XP-62A	689
1	Gasketing	31AA-S	AA
1	Door Sweep	39A	A
1	Threshold	65A-223-72" (1829MM)	A
HARDWARE GROUP NO. 13 For use on Door #(s): 101A and 104B Provide each SGL door(s) with the following:			
Quantity (each)	Description	Catalog Number	Finish

3	Hinge	5BB1 4.5 X 4.5 NRP	630
1	Panic Hardware	LD-99-EO	626
1	Surface Closer	4040XP CUSH	689
1	Optional PA Shoe	4040XP-62A	689
1	Kick Plate	8400 10" X 2" LDW B-CS	630
1	Rain Drip	142AA	AA
1	Gasketing	31AA-S	AA
1	Door Sweep	39A	A
1	Threshold	65A-223-72" (1829MM)	A
HARDWARE GROUP NO. 14 For use on Door #(s): 110 Provide each SGL door(s) with the following:			
Quantity (each)	Description	Catalog Number	Finish
Existing vault description			
HARDWARE GROUP NO. 15 For use on Door #(s): 105A, 106B, 107A, 109B, and 123 Provide each SGL door(s) with the following:			
Quantity (each)	Description	Catalog Number	Finish
3	Hinge	5BB1 4.5 X 4.5	652
1	Classroom Lock	T561BB7 DAN	626
1	SFIC Core	80-033	626
1	Surface Closer	4040XP REG OR PA AS REQ	689
1	Wall Stop	WS406/407CCV	630
1	Gasketing	8144SBK PSA	BK
HARDWARE GROUP No.16 For use on Door(s): 101B Provide each SGL door(s) with the following:			

Quantity (each)	Description	Catalog Number	Finish
3	Hinge	5BB1 4.5 X 4.5	652
1	Classroom Lock	T561BB7 DAN	626
1	SFIC Core	80-033	626
1	Surface Closer	4040XP REG OR PA AS REQ	689
1	Kick Plate	8400 10" X 2" LDW B-CS	630
1	Wall Stop	WS406/407CCV	630
1	Gasketing	8144SBK PSA	BK
HARDWARE GROUP No.17 For use on Door(s): 100B Provide each SGL door(s) with the following:			
Quantity (each)	Description	Catalog Number	Finish
3	Hinge	5BB1 4.5 X 4.5	652
3	Classroom Lock	T561BB7 DAN	626
3	SFIC Core	80-033	626
3	Surface Closer	4040XP CUSH	689
3	Kick Plate	8400 10" X 2" LDW B-CS	630
3	Gasketing	488FSBK PSA	BK
HARDWARE GROUP No.18 For use on Door(s): 113 and 122 Provide each SGL door(s) with the following:			
Quantity (each)	Description	Catalog Number	Finish
3	Hinge	5BB1 4.5 X 4.5	652
1	Storeroom Lock	T581BB7 DAN	626
1	SFIC Core	80-033	626
1	Surface Closer	4040XP REG OR PA AS REQ	689

1	Kick Plate	8400 10" X 2" LDW B-CS	630
1	Wall Stop	WS406/407CCV	630
1	Gasketing	488FSBK PSA	BK
HARDWARE GROUP No.19 For use on Door(s): 104A Provide each SGL door(s) with the following:			
Quantity (each)	Description	Catalog Number	Finish
3	Hinge	5BB1 4.5 X 4.5	652
1	Classroom Lock	T561BB7 DAN	626
1	SFIC Core	80-033	626
1	Surface Closer	4040XP REG OR PA AS REQ	689
1	Kick Plate	8400 10" X 2" LDW B-CS	630
1	Wall Stop	WS406/407CCV	630
1	Gasketing	8144SBK PSA	BK
HARDWARE GROUP No.20 For use on Door(s): 124D Provide each SGL door(s) with the following:			
Quantity (each)	Description	Catalog Number	Finish
3	Hinge	5BB1 4.5 X 4.5	652
1	Passage Set	T101 DANE	626
1	Surface Closer	4040XP CUSH	689
1	Kick Plate	8400 10" X 2" LDW B-CS	630
1	Gasketing	488FSBK PSA	BK
HARDWARE GROUP No.21 For use on Door(s): 105B, 106A, 107B, and 109A Provide each SGL door(s) with the following:			

Quantity (each)	Description	Catalog Number	Finish
3	Hinge	5BB1 4.5 X 4.5	652
1	Passage Set	T101 DANE	626
1	Surface Closer	4040XP REG OR PA AS REQ	689
1	Wall Stop	WS406/407CCV	630
1	Gasketing	8144SBK PSA	BK

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SECTION 08 81 00

GLAZING

08/11

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GLAZING
08/11

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7 (2017) Minimum Design Loads for Buildings and Other Structures

ASTM INTERNATIONAL (ASTM)

ASTM C1036 (2016) Standard Specification for Flat Glass

ASTM C1048 (2018) Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass

ASTM C1172 (2014) Standard Specification for Laminated Architectural Flat Glass

ASTM E1886 (2013a) 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 E2190 (2010) Standard Specification for Insulating Glass Unit Performance and Evaluation

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC (2018) International Building Code

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

NFRC 100 (2014) Procedure for Determining Fenestration Product U-Factors

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

16 CFR 1201

Safety Standard for Architectural Glazing
Materials

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Installation

Drawings showing complete details of the proposed setting methods, mullion details, edge blocking, size of openings, frame details, materials, and types and thickness of glass.

SD-03 Product Data

Insulating Glass; G

Laminated Glass; G

Low Emissivity Insulating Glass; G

Tempered Glass; G

Heat-Strengthened Float Glass; G

Manufacturer's descriptive product data, handling and storage recommendations, installation instructions, and cleaning instructions.

SD-04 Samples

Insulating Glass

Two 8 by 10 inch samples of glass indicated.

SD-05 Design Data

Performance Requirements Validation; G

For products and systems indicated to validate compliance with specified wind load performance requirements, provide calculations and design criteria, including engineering analysis data, signed and sealed by the qualified registered Professional Engineer responsible for their preparation.

Miami Dade Acceptance or Florida Product Approval; G

Submit documentation for Notice of Acceptance (NOA) from the Miami Dade County Building Code Compliance Office (BCCO), or Florida Product Approval. Each NOA or Florida Product Approval letter shall show the product name, product description and valid NOA or Florida Product Approval number with expiration date

SD-07 Certificates

Insulating Glass

Certificates stating that the glass meets the specified requirements. Labels or manufacturers marking affixed to the glass will be accepted in lieu of certificates.

1.3 SYSTEM DESCRIPTION

1.3.1 Performance Requirements

1.3.1.1 Wind Load Requirements

Design and fabricate exterior glazing provided to resist wind load criteria indicated on Structural drawings in accordance with ICC IBC and ASCE 7 requirements for Components and Cladding.

1.3.1.2 Miami Dade Acceptance or Florida Product Approval

Provide glazing for the building exterior having a Notice of Acceptance (NOA) letter from the Miami Dade County Building Code Compliance Office (BCCO) or Florida Product Approval letter.

1.3.1.3 Windborne-Debris-Impact Resistance

Exterior glazing shall comply with protection testing requirements in ASTM E1996 for wind load criteria indicated on Structural Drawings when tested according to ASTM E1886. Test specimens shall be no smaller in width and length than glazing indicated for use on Project and shall be installed in same manner as glazing indicated for use on Project.

- a. Large-Missile Test: For glazing located within 30 feet of grade.

1.3.1.4 Minimum Antiterrorism/Force Protection Criteria

Design and fabricate exterior glazing Type G1 to resist minimum load requirements as specified in Section 08 41 13 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS, meeting UFC 4-010-01, Standard 10 and Standard 12 requirements.

1.3.2 Safety Glazing

Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

1.3.3 Thermal and Optical Performance Properties

Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures specified below.

- a. For monolithic-glass lites, properties are based on units with lites of thickness indicated.
- b. For laminated-glass lites, properties are based on products of construction indicated.
- c. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
- d. U-Factors: Center-of-glazing values, according to NFRC 100 and

based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg. F.

- e. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
- f. Visible Reflectance: Center-of-glazing values, according to NFRC 300

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver products to the site in unopened containers, labeled plainly with manufacturers' names and brands. Store glass and setting materials in safe, enclosed dry locations and do not unpack until needed for installation. Handle and install materials in a manner that will protect them from damage.

1.5 ENVIRONMENTAL REQUIREMENTS

Do not start glazing work until the outdoor temperature is above 40 degrees F and rising, unless procedures recommended by the glass manufacturer and approved by the Contracting Officer are made to warm the glass and rabbet surfaces. Provide ventilation to prevent condensation of moisture on glazing work during installation. Do not perform glazing work during damp or rainy weather.

1.6 WARRANTY

1.6.1 Warranty for Insulating Glass Units

Warranty insulating glass units against development of material obstruction to vision (such as dust, fogging, or film formation on the inner glass surfaces) caused by failure of the hermetic seal, other than through glass breakage, for a 10-year period from date of final 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 GENERAL

2.1.1 Glazing Publications

Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

2.1.1.1 GANA Publications

GANA "Laminated Glazing Reference Manual" and GANA Glazing Manual.

2.1.1.2 IGMA Publication for Insulating Glass

SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use".

2.1.2 Safety Glazing Labeling

Where safety glazing is indicated, permanently mark glazing with

certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

2.1.3 Insulating-Glass Certification Program

Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

2.2 GLASS

ASTM C1036, unless specified otherwise. In doors and sidelights, provide safety glazing material conforming to 16 CFR 1201.

Refer to Insulating-Laminated Glass Schedule and Monolithic Glass Schedule at the end of this Section.

2.2.1 Laminated Glass

ASTM C1172, fabricated from two sheets of specified heat-strengthened float glass in thicknesses scheduled herein. Glass shall be laminated together with a minimum 0.060 inch thick, clear polyvinyl butyral interlayer. Glass color shall be as scheduled herein. Safety glazing required.

2.2.2 Tempered Glass

ASTM C1048, Kind FT, Condition A (uncoated), Type I, Class 1 (clear), Quality Q3, minimum 6 mm thick, or thicker as required to suit conditions. Safety glazing required.

2.2.3 Heat-Strengthened Glass

ASTM C1048, Kind HS, Condition A (uncoated), Type I, Quality Q3, Class 1 (clear), or Class 2 (tinted). Glass color and thickness shall be as scheduled herein. Safety glazing required.

2.2.4 Low Emissivity Insulating Glass (Low-E)

ASTM C1036 Type I, Quality Q3, float glass, Class 2 (tinted), with anti-reflective low-emissivity coating on No. 2 surface. Minimum thickness and color as schedule herein.

2.2.5 Insulating-Glass Units

Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E2190. Dual seal with manufacturer's standard primary and secondary sealants. Manufacturer's standard spacer material and construction. Desiccant shall be manufacturer's standard.

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 EXAMINATION

Examine framing, glazing channels, and stops, with Installer present, for

compliance with the following:

- a. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
- b. Presence and functioning of weep systems.
- c. Minimum required face and edge clearances.
- d. Effective sealing between joints of glass-framing members.

Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

Provide spacers for glass lites where length plus width is larger than 50 inches.

- a. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
- b. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

Provide edge blocking where indicated or needed to prevent glass lites from

moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.4 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.

3.5 PROTECTION

Protect glass work immediately after installation.

3.6 INSULATING-LAMINATED GLASS SCHEDULE

3.6.1 Glass Types G1 and G2: Low-E Coated, Tinted, Insulating-Laminated Glass Unit

- a. Overall Unit Thickness: Nominal 1-5/16 inches, or as required to meet specified performance requirements.
- b. Indoor Lite: Laminated glass with two plies of specified heat-strengthened clear float glass. Minimum thickness of outer glass ply, 6 mm. Minimum thickness of inner glass ply, 6 mm.
- c. Interlayer: Minimum thickness, 0.090 inch.
- d. Outdoor Lite: Specified heat-strengthened float glass with low-E coating on No. 2 surface; tint as indicated. Minimum thickness, 6 mm.
- e. U-Factor: 0.40 maximum.
- f. Visible Light Transmittance: 45 percent maximum.
- g. Solar Heat Gain Coefficient: 0.25 maximum.
- h. Safety glazing required.

3.7 MONOLITHIC GLASS SCHEDULE

3.7.1 Glass Type: Clear, Fully Tempered Float Glass

- a. Minimum Thickness: 6 mm, unless otherwise indicated.
- b. Safety glazing required.

-- End of Section --

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SECTION 09 22 00

SUPPORTS FOR PLASTER AND GYPSUM BOARD

02/10

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SECTION 09 22 00

SUPPORTS FOR PLASTER AND GYPSUM BOARD
02/10

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 341 (2016) Seismic Provisions for Structural Steel Buildings

ASTM INTERNATIONAL (ASTM)

ASTM A463/A463M (2010; R 2015) Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process

ASTM A653/A653M (2018) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM C645 (2014; E 2015) Nonstructural Steel Framing Members

ASTM C754 (2018) Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

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

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Metal Support Systems; G

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

SD-03 Product Data

Metal Support Systems; G

Sound Isolation Clips; G

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the job site and store in ventilated dry locations permitting easy access for inspection and handling. If materials are stored outdoors, stack materials off the ground, supported on a level platform, and fully protected from the weather. Handle materials carefully to prevent damage. Remove damaged items and provide new items.

PART 2 PRODUCTS

2.1 MATERIALS

Provide steel materials for metal support systems with galvanized coating ASTM A653/A653M, G-60; aluminum coating ASTM A463/A463M, T1-25; or a 55-percent aluminum-zinc coating. Provide support systems and attachments per AISC 341.

2.1.1 Nonload-Bearing Wall Framing and Furring

ASTM C645, but not thinner than 0.0329 inch thickness regardless of the ASTM certified third party testing statement for equivalent thicknesses.

2.1.1.1 Steel Framing For Shaft Wall Assemblies

Provide size and configurations as indicated on drawings.

2.1.2 Sound Isolation Clips

2.1.2.1 Components

- a. Rubber Isolator: Manufacturer's standard natural organic rubber compound blended with fire-inhibiting compounds; molded to isolate ferrule from clip.
- b. Clip: Manufacturer's standard galvanized steel, 16 gauge; designed to fit over 7/8-inch hat-shaped rigid furring channels.
- c. Ferrule: Zinc-electroplated steel.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Non-loadbearing Wall Framing

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

3.1.1.1 Installation of Framing for Shaft Wall Assemblies

Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated on the drawings, manufacturer's written instructions, and ASTM C754 other than stud-spacing requirements.

3.1.2 Systems for Attachment of Gypsum Wallboard

3.1.2.1 Non-loadbearing Wall Framing and Furring

ASTM C754, except as indicated otherwise.

3.1.2.2 Sound-Rated Partitions

Install framing to comply with sound-rated assembly indicated. Install sound isolation clips where indicated in accordance with manufacturer's written instructions.

3.2 ERECTION TOLERANCES

Framing members shall be within the following limits:

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

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CEMENT STUCCO

08/17

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.

ASTM INTERNATIONAL (ASTM)

ASTM A1008/A1008M	(2016) 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 A1064/A1064M	(2017) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A641/A641M	(2009a; R 2014) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM A653/A653M	(2018) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B633	(2019) Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
ASTM C1063	(2018b) Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster
ASTM C150/C150M	(2018) Standard Specification for Portland Cement
ASTM C206	(2014) Standard Specification for Finishing Hydrated Lime
ASTM C847	(2014a) Standard Specification for Metal Lath
ASTM C897	(2015) Aggregate for Job-Mixed Portland

Cement-Based Plasters

ASTM C91/C91M	(2012) Standard Specification for Masonry Cement
ASTM C926	(2018b) Standard Specification for Application of Portland Cement-Based Plaster
ASTM D1784	(2011) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Lath; G

SD-03 Product Data

Plaster Mixes; G

SD-04 Samples

Sample Panel; G

1.3 QUALITY ASSURANCE

Submit a **SAMPLE PANEL** as follows: One 12 inch square stucco panel showing finish texture and color and exposed reinforcement at the edges, one 12 inch square of reinforcement, and a 12 inch length of each accessory proposed, prior to proceeding with stucco work.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver packaged materials to the site in the original packages and containers with labels intact and seals unbroken. Keep cementitious materials dry and stored off the ground, under cover and away from damp surfaces until ready to be used. Aggregate must be covered to prevent the absorption or loss of moisture.

1.5 ENVIRONMENTAL REQUIREMENTS

Do not apply stucco when the ambient temperature is 40 degrees F or lower, or when a drop in temperature below 40 degrees F is expected within 48 hours after application.

PART 2 PRODUCTS

2.1 PLASTER MATERIALS

2.1.1 Portland Cement

Portland cement must conform to ASTM C150/C150M, gray Portland cement Type I.

2.1.2 Lime

Lime must conform to ASTM C206, Type S.

2.1.3 Sand

Sand aggregate for job-mixed base coat and job-mixed finish coat stucco must conform to ASTM C897

2.1.4 Masonry Cement

ASTM C91/C91M, Type N; gray.

2.1.5 Factory-Mixed Acrylic-Based Finish Coating

Factory-mixed acrylic-emulsion coating system, formulated with integral colorfast mineral pigments and fine aggregates; for use over Portland cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic-based finishes.

2.2 ACCESSORIES

Accessories must be roll formed galvanized steel, except that cornerite and striplath must be formed from steel sheets with manufacturer's standard galvanized coating. Vinyl members must be in accordance with ASTM D1784. Welded wire corner reinforcements must be zinc coated, galvanized 17 gauge steel wire conforming to ASTM A1064/A1064M. Furring must include hangers, bolts, inserts, clips, fastenings, and attachments of number, size, and design to develop the full strength of the members.

2.2.1 Aluminum Continuous Soffit Vent

Basis of design shall be products manufactured by XtremeVent, Model No. "CUV8A50W", or comparable products by another manufacturer may be submitted to the Contracting Officer for approval. Manufacturer's products specified are not intended to limit selection of equal products from other manufacturers.

ASTM B209 aluminum sheet continuous louvered soffit vent; alloy as standard with manufacturer for finish required; manufacturer's standard thickness; nominal 2 inches wide exposed face; depth as required for flush application to soffit. Manufacturer's standard factory-applied baked enamel coating in white color, unless otherwise indicated.

2.3 METAL LATH

Expanded-metal lath shall conform to ASTM C847, with ASTM A653, G60 hot-dip galvanized zinc coating; diamond-mesh, self-furring, 3-4 lb/sq. yd.

2.4 WATER

Provide clean, fresh, potable water, free from amounts of oils, acids, alkalis and organic matter that would be injurious to the stucco.

2.5 HANGERS

Provide hangers and attachment capable of supporting a minimum 300 pound ultimate vertical load without failure of supporting material or attachment.

2.5.1 Wires

Conform wires to ASTM A641/A641M, Class 1, 0.08 inch (12 gauge).

2.5.2 Straps

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

2.5.3 Rods

Provide 3/16 inch diameter threaded steel rods, zinc or cadmium coated.

2.6 PLASTER MIXES

2.6.1 General

Comply with ASTM C926 for applications indicated.

2.6.2 Base-Coat Mixes for Use over Metal Lath

Scratch and brown coats for three-coat plaster work as follows:

2.6.2.1 Portland Cement Mixes

- a. Scratch Coat: For cementitious material, mix 1 part Portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
- b. Brown Coat: For cementitious material, mix 1 part Portland cement and 3/4 to 1-1/2 parts lime. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.

2.6.2.2 Masonry Cement Mixes

- a. Scratch Coat: 1 part masonry cement and 2-1/2 to 4 parts aggregate.
- b. Brown Coat: 1 part masonry cement and 3 to 5 parts aggregate, but not less than volume of aggregate used in scratch coat.

2.6.2.3 Portland and Masonry Cement Mixes

- a. Scratch Coat: For cementitious material, mix 1 part Portland cement and 1 part masonry cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
- b. Brown Coat: For cementitious material, mix 1 part Portland cement and 1

part masonry cement. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate use in scratch coat.

2.6.3 Factory-Prepared Finish-Coat Mixes

For acrylic-based finish coating, comply with manufacturer's written instructions.

2.6.3.1 Color and Texture

As indicated on the drawings.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 LATH

Install expanded-metal lath in accordance with ASTM C1063.

3.3 INSTALLING ACCESSORIES

3.3.1 General

Install according to ASTM C1063 and at locations indicated on drawings.

3.3.2 Control Joints

Install control joints at locations indicated on drawings.

3.4 PLASTER APPLICATION

Comply with ASTM C926.

- a. Do not deviate more than plus or minus 1/4 inch in 10 feet from a true plane in finished plaster surfaces, as measured by a 10-foot straightedge placed on surface.
- b. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground, unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
- c. Provide plaster surfaces that are ready to receive field-applied finishes indicated.

3.4.1 Base-Coat Mixes for Use over Metal Lath

Scratch and brown coats for three-coat plasterwork; 3/4 inch thickness.

3.4.2 Acrylic-Based Finish Coatings

Apply coating system, including primers, finish coats, and sealing

topcoats, according to manufacturer's written instructions.

3.5 CURING AND PROTECTION

Perform fog curing by applying a fine mist of water to the stucco. Exercise care during fog curing to avoid erosion damage of the stucco surfaces. Do not use a solid stream of water. Fog not less than three times daily. Protect the stucco from the direct rays of the sun during severe drying conditions using canvas, cloth or other approved sheet material.

3.6 PATCHING AND POINTING

Replace or patch loose, cracked, damaged or defective work as directed. Patching must match existing work in texture and color and must be finished flush.

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GYPSUM BOARD
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.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A118.9 (1990) Test Methods and Specifications for
Cementitious Backer Units

ASTM INTERNATIONAL (ASTM)

ASTM B221 (2014) Standard Specification for Aluminum
and Aluminum-Alloy Extruded Bars, Rods,
Wire, Profiles, and Tubes

ASTM C1002 (2018) Standard Specification for Steel
Self-Piercing Tapping Screws for the
Application of Gypsum Panel Products or
Metal Plaster Bases to Wood Studs or Steel
Studs

ASTM C1047 (2014a) Standard Specification for
Accessories for Gypsum Wallboard and
Gypsum Veneer Base

ASTM C1178 (2018) Standard Specification for Coated
Glass Mat Water-Resistant Gypsum Backing
Panel

ASTM C1288 (2017) Standard Specification for
Fiber-Cement Interior Substrate Sheets

ASTM C1177/C1177M (2013) Standard Specification for Glass
Mat Gypsum Substrate for Use as Sheathing

ASTM C1325 (2017a) Standard Specification for
Non-Asbestos Fiber-Mat Reinforced
Cementitious Backer Units

ASTM C1396/C1396M (2017) Standard Specification for Gypsum
Board

ASTM C475/C475M (2017) Standard Specification for Joint
Compound and Joint Tape for Finishing
Gypsum Board

ASTM C665 (2017) Standard Specification for
Mineral-Fiber Blanket Thermal Insulation

for Light Frame Construction and
Manufactured Housing

- ASTM C834** (2017) Standard Specification for Latex Sealants
- ASTM C840** (2017) Standard Specification for Application and Finishing of Gypsum Board
- ASTM C954** (2018) Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
- ASTM D3273** (2016) Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
- ASTM D3274** (2009; R 2017) Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Fungal or Algal Growth, or Soil and Dirt Accumulation

FM GLOBAL (FM)

- FM APP GUIDE** (updated on-line) Approval Guide
<http://www.approvalguide.com/>

GYPSUM ASSOCIATION (GA)

- GA 214** (2010) Recommended Levels of Gypsum Board Finish
- GA 216** (2010) Application and Finishing of Gypsum Panel Products
- GA 600** (2009) Fire Resistance Design Manual

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

- SCS** SCS Global Services (SCS) Indoor Advantage

UNDERWRITERS LABORATORIES (UL)

- UL 2818** (2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings
- UL Fire Resistance** (2014) Fire Resistance Directory

1.2 SUBMITTALS

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

SD-03 Product Data

Accessories; G

Gypsum Board Products; G

Tile Backing Panels; G

Joint Treatment Materials; G

Interior Trim; G

Sound Attenuation Blankets; G

SD-07 Certificates

Asbestos Free Materials; G

Certify that gypsum board types, gypsum backing board types, cementitious backer units, and joint treating materials do not contain asbestos.

Indoor Air Quality for Gypsum Board

Indoor Air Quality for Non-aerosol Adhesives

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality Certifications

Submit required indoor air quality certifications in one submittal package.

1.3.1.1 Ceiling and Wall Systems

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.

1.3.1.2 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.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

Deliver materials in the original packages, containers, or bundles with each bearing the brand name, applicable standard designation, and name of manufacturer, or supplier.

1.4.2 Storage

Keep materials dry by storing inside a sheltered building. Where necessary to store gypsum board and cementitious backer units outside, store off the ground, properly supported on a level platform, and protected from direct exposure to rain, snow, sunlight, and other extreme weather conditions. Provide adequate ventilation to prevent condensation. Store per manufacturer's recommendations for allowable temperature and humidity range. Do not store panels near materials that may offgas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives. Do not use materials that have visible moisture or biological growth.

1.4.3 Handling

Neatly stack gypsum board and cementitious backer units flat to prevent sagging or damage to the edges, ends, and surfaces.

1.5 ENVIRONMENTAL REQUIREMENTS

Do not expose the gypsum board to excessive sunlight prior to gypsum board application. Maintain a continuous uniform temperature of not less than 50 degrees F and not more than 80 degrees F for at least one week prior to the application of gypsum board work, while the gypsum board application is being done, and for at least one week after the gypsum board is set. Shield air supply and distribution devices to prevent any uneven flow of air across the plastered surfaces. Provide ventilation to exhaust moist air to the outside during gypsum board application, set, and until gypsum board jointing is dry. In glazed areas, keep windows open top and bottom or side to side 3 to 4 inches. Reduce openings in cold weather to prevent freezing of joint compound when applied. For enclosed areas lacking natural ventilation, provide temporary mechanical means for ventilation. In unglazed areas subjected to hot, dry winds or temperature differentials from day to night of 20 degrees F or more, screen openings with cheesecloth or similar materials. Avoid rapid drying. During periods of low indoor humidity, provide minimum air circulation following gypsum boarding and until gypsum board jointing complete and is dry.

1.6 FIRE RESISTIVE CONSTRUCTION

Comply with specified fire-rated assemblies for design numbers indicated per UL Fire Resistance or FM APP GUIDE.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to specifications, standards and requirements specified. Provide gypsum board types, gypsum backing board types, cementitious backing units, and joint treating materials manufactured from asbestos free materials only.

2.1.1 Gypsum Board Products

ASTM C1396/C1396M. Provide certification or validation of indoor air quality for gypsum board.

2.1.1.1 Regular

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

2.1.1.2 Type X

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

2.1.1.3 Type C

Manufactured to have increased fire-resistive capacity. Thickness as required by fire-resistance-rated assembly indicated on drawings; tapered edges.

2.1.1.4 Shaftwall Liner Panel

ASTM C1396/C1396M. Conform to the UL Fire Resistance for the Design Numbers(s) indicated for shaftwall liner panels. Manufacture liner panel for cavity shaftwall system, with water-resistant paper faces, bevel edges, single lengths to fit required conditions, 1 inch thick, by 24inch wide.

2.1.1.5 Mold Resistant / Anti-Microbial Gypsum

ASTM D3273. 48 inch wide, 5/8 inch thick, tapered edges.

2.1.1.6 Acoustically Enhanced Gypsum Board

ASTM C1396/C1396M; multilayer product constructed of two layers of gypsum boards sandwiching a viscoelastic sound-absorbing polymer core; 48 inch wide, 5/8 inch thick, tapered edges.

- a. Basis-of-Design: Provide product manufactured by National Gypsum, Model "Gold Bond SoundBreak XP", or comparable products by another manufacturer may be submitted to the Contracting Officer for approval. Manufacturer's products specified are not intended to limit selection of equal products from other manufacturers.

2.1.2 Tile Backing Panels

2.1.2.1 Glass-Mat, Water-Resistant Backing Board

ASTM C1178 with manufacturer's standard edges. 5/8 inch thick core, Type X, unless otherwise indicated on drawings. Mold resistance tested according to ASTM D3273, score of 10 as rated according to ASTM D3274.

2.1.2.2 Cementitious Tile Backer Units

ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges; 5/8 inch thick, unless otherwise indicated on drawings. Mold resistance tested according to ASTM D3273, score of 10 as rated according to ASTM D3274.

2.1.3 Glass-Mat Interior Gypsum Board

ASTM C1658. Fiberglass mat laminated to both sides; specifically designed for interior use; paintable. Core shall be 5/8 inch thick, Type X, unless otherwise indicated; tapered long edges. Mold resistance tested according to ASTM D3273, score of 10 as rated according to ASTM D3274.

2.1.4 Glass-Mat Exterior Gypsum Sheathing Board

ASTM C1177/C1177M with fiberglass mat laminated to both sides and with

manufacturer's standard edges. Core shall be 5/8 inch thick, Type X, unless otherwise indicated.

2.1.4.1 Sealant for Glass-Mat Exterior Gypsum Sheathing Board

Silicone emulsion sealant complying with ASTM C834, compatible with sheathing tape and sheathing as recommended by sheathing board manufacturer.

2.1.5 Joint Treatment Materials

ASTM C475/C475M. Product must be low emitting VOC types with VOC limits not exceeding 50 g/L. Use all purpose joint and texturing compound containing inert fillers and natural binders, including lime compound. Pre-mixed compounds must be free of antifreeze, vinyl adhesives, preservatives, biocides and other slow releasing compounds.

2.1.5.1 Embedding Compound

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

2.1.5.2 Finishing or Topping Compound

Specifically formulated and manufactured for use as a finishing compound.

2.1.5.3 All-Purpose Compound

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

2.1.5.4 Setting or Hardening Type Compound

Specifically formulated and manufactured for use with fiber glass mesh tape.

2.1.5.5 Joint Tape

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

2.1.6 Fasteners

2.1.6.1 Screws

ASTM C1002, Type "G", Type "S" or Type "W" steel drill screws for fastening gypsum board to gypsum board, wood framing members and steel framing members less than 0.033 inch thick. **ASTM C954** steel drill screws for fastening gypsum board to steel framing members 0.033 to 0.112 inch thick. Provide cementitious backer unit screws with a polymer coating.

2.1.6.2 Staples

No. 16 USS gage flattened galvanized wire staples with 7/16 inch wide crown outside measurement and divergent point for base ply of two-ply gypsum board application. Use as follows:

<u>Length of Legs</u>	<u>Thickness of Gypsum Board</u>
1-1/8 inches	1/2 inch
1-1/4 inches	5/8 inch

2.1.1.7 Adhesives

Provide certification or validation of indoor air quality for non-aerosol adhesives used on the interior of the building (inside of the weatherproofing system).

2.1.1.8 Accessories

ASTM C1047. Fabricate from corrosion protected steel or plastic designed for intended use. Accessories manufactured with paper flanges are not acceptable. Flanges must be free of dirt, grease, and other materials that may adversely affect bond of joint treatment. Provide prefinished or job decorated materials. For predecorated gypsum board provide prefinished metal or plastic trim to match predecorated gypsum board.

2.1.1.9 Water

Provide clean, fresh, and potable water.

2.1.1.10 Interior Trim

2.1.10.1 Material and Shapes

ASTM C1047; galvanized or aluminum-coated steel sheet or rolled zinc.

- a. Cornerbead.
- b. Bullnose bead.
- c. LC-Bead: J-shaped; exposed long flange received joint compound.
- d. L-Bead: L-shaped; exposed long flange receives joint compound.
- e. U-Bead: J-shaped; exposed short flange does not receive joint compound.

2.1.10.2 Aluminum Reveal Trims

Extruded accessories of profiles and dimensions indicated.

- a. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B221, Alloy 6063-T5.
- b. Finish: Factory-applied powder coat in colors to match adjacent walls, unless otherwise indicated.

2.1.1.11 Sound Attenuation Blankets

ASTM C665, Type 1 (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool or rock wool.

2.1.1.12 Acoustical Joint Sealant

Refer to Section 07 92 00 JOINT SEALANTS.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Framing and Furring

Verify that framing and furring are securely attached and of sizes and spacing to provide a suitable substrate to receive gypsum board and cementitious backer units. Verify that all blocking, headers and supports are in place to support plumbing fixtures and to receive soap dishes, grab bars, towel racks, and similar items. Do not proceed with work until framing and furring are acceptable for application of gypsum board and cementitious backer units.

3.1.2 Building Construction Materials

Do not install building construction materials that show visual evidence of biological growth.

3.2 APPLICATION OF GYPSUM BOARD

Apply gypsum board to framing and furring members in accordance with [ASTM C840](#) or [GA 216](#) and the requirements specified. Apply gypsum board with separate panels in moderate contact; do not force in place. Stagger end joints of adjoining panels. Neatly fit abutting end and edge joints. Use gypsum board of maximum practical length; select panel sizes to minimize waste. Cut out gypsum board to make neat, close, and tight joints around openings. In vertical application of gypsum board, provide panels in lengths required to reach full height of vertical surfaces in one continuous piece. Lay out panels to minimize waste; reuse cutoffs whenever feasible. Surfaces of gypsum board and substrate members may be bonded together with an adhesive, except where prohibited by fire rating(s). Treat edges of cutouts for plumbing pipes, screwheads, and joints with water-resistant compound as recommended by the gypsum board manufacturer. Provide type of gypsum board for use in each system specified herein as indicated.

3.2.1 Application of Single-Ply Gypsum Board

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

3.2.2 Gypsum Board for Wall Tile or Tile Base Applied with Adhesive

In dry areas (areas other than tubs, shower enclosures, saunas, steam rooms, gang shower rooms), apply glass mat water-resistant gypsum tile backing board in accordance with [ASTM C840](#), System X or [GA 216](#).

3.2.3 Floating Interior Angles

Minimize framing by floating corners with single studs and drywall clips. Locate the attachment fasteners adjacent to ceiling and wall intersections in accordance with [ASTM C840](#), System XII or [GA 216](#), for single-ply and two-ply applications of gypsum board to wood framing.

3.2.4 Control Joints

Install expansion and contraction joints in ceilings and walls in accordance with [ASTM C840](#), System XIII or [GA 216](#). Fill control joints between studs in fire-rated construction with firesafing insulation to

match the fire-rating of construction.

3.3 APPLYING TILE BACKING PANELS

3.3.1 Glass-Mat, Water-Resistant Backing Board and Cementitious Tile Backer Units

Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4 inch gap where panels abut other construction or penetrations.

3.3.2 Alignment

Where tile backing panels abut other types of panels in the same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.4 INSTALLING TRIM ACCESSORIES

3.4.1 General

For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instruction.

3.4.2 Interior Trim

Install in the following locations and as indicated:

- a. Cornerbead: Use at outside corners.
- b. LC-Bead: Use at exposed panel edges.
- c. L-Bead: Use where indicated.
- d. U-Bead: Use at exposed panel edges.

3.4.3 Aluminum Reveal Trim

Install at locations indicated according to manufacturer's written instructions.

3.5 FINISHING OF GYPSUM BOARD

Tape and finish gypsum board in accordance with [ASTM C840](#), [GA 214](#) and [GA 216](#). Finish plenum areas above ceilings to Level 1 in accordance with [GA 214](#). Finish water resistant gypsum backing board, [ASTM C1396/C1396M](#), to receive ceramic tile to Level 2 in accordance with [GA 214](#). Finish walls and ceilings to receive a heavy-grade wall covering or heavy textured finish before painting to Level 3 in accordance with [GA 214](#). Finish walls and ceilings without critical lighting to receive flat paints, light textures, or wall coverings to Level 4 in accordance with [GA 214](#). Unless otherwise specified, finish all gypsum board walls, partitions and ceilings to Level 5 in accordance with [GA 214](#). Provide joint, fastener depression, and corner treatment. Tool joints as smoothly as possible to minimize sanding and dust. Do not use self-adhering fiber glass mesh tape with conventional drying type joint compounds; use setting or hardening type compounds only. Provide treatment for water-resistant gypsum board as recommended by the gypsum board manufacturer. Protect workers, building occupants, and HVAC systems from gypsum dust.

3.5.1 Uniform Surface

Wherever gypsum board is to receive eggshell, semigloss or gloss paint finish, or where severe, up or down lighting conditions occur, finish gypsum wall surface in accordance to GA 214 Level 5. In accordance with GA 214 Level 5, apply a thin skim coat of joint compound to the entire gypsum board surface, after the two-coat joint and fastener treatment is complete and dry.

3.5.2 Glass-Mat Interior Gypsum Board

Finish according to manufacturer's written instructions.

3.5.3 Glass-Mat, Water-Resistant Backing Board and Cementitious Tile Backer Units

Finish according to manufacturer's written instructions.

3.5.4 Glass-Mat Exterior Gypsum Sheathing Board

Finish and seal according to Gypsum Association Publication GA 253 and manufacturer's written instructions.

3.6 SEALING

Seal openings around pipes, fixtures, and other items projecting through gypsum board and cementitious backer units as specified in Section 07 92 00 JOINT SEALANTS. Apply material with exposed surface flush with gypsum board or cementitious backer units.

3.7 FIRE-RESISTANT ASSEMBLIES

Wherever fire-rated construction is indicated, provide materials and application methods, including types and spacing of fasteners, wall and ceiling framing in accordance with the specifications contained in UL Fire Resistance for the Design Number(s) indicated, or GA 600 for the File Number(s) indicated. Joints of fire-rated gypsum board enclosures must be closed and sealed in accordance with UL test requirements or GA requirements. Seal penetrations through rated partitions and ceilings tight in accordance with tested systems.

3.8 PATCHING

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

3.9 SHAFTWALL SYSTEM

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

-- End of Section --

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CERAMIC, PORCELAIN, AND GLASS TILING

08/17

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 NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A137.1 (2012) American National Standards
Specifications for Ceramic Tile

ANSI A137.2 (2012) American National Standards
Specifications for Glass Tile

ASTM INTERNATIONAL (ASTM)

ASTM C1026 (2013; R 2018) Standard Test Method for
Measuring the Resistance of Ceramic Tile
to Freeze-Thaw Cycling

ASTM C144 (2017) Standard Specification for
Aggregate for Masonry Mortar

ASTM C150/C150M (2018) Standard Specification for Portland
Cement

ASTM C206 (2014) Standard Specification for
Finishing Hydrated Lime

ASTM C207 (2006; R 2011) Standard Specification for
Hydrated Lime for Masonry Purposes

ASTM C33/C33M (2018) Standard Specification for Concrete
Aggregates

ASTM C648 (2004; R 2009) Breaking Strength of
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

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor's Quality Control approval. 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

Setting-Bed; G

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SD-04 Samples

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SD-07 Certificates

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Maintenance Instructions

SD-10 Operation and Maintenance Data

Installation; G

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality Certifications

1.3.1.1 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 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.

1.4 QUALITY ASSURANCE

Provide installers having a minimum of two years 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.

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 standard performance guarantees or warranties that extend beyond a 1-year period [from date of final acceptance of the work](#).

1.8 EXTRA MATERIALS

Supply an extra 2 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, the exception is glass tile. Furnish glass tiles that comply with [ANSI A137.2](#). 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 wet dynamic coefficient of friction (DCOF) value of 0.42 or greater when tested in accordance with ANSI A137.1 requirements. For materials like tile, accessories, and transition strips submit samples of sufficient size to show color range, pattern, type and joints. Submit manufacturer's catalog data.

2.1.1 Porcelain Tile

Provide unglazed, rectified porcelain tile, with color extending uniformly through the body of the tile. Provide tile with a V4 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) as indicated on the drawings.

2.1.2 Accessories

Provide built-in type accessories of the same materials and finish as the wall 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.

2.3 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. Provide certification or validation of indoor air quality for adhesives.

2.4.1 Dry-Set Portland Cement Mortar

TCNA Hdbk.

2.4.2 Latex-Portland Cement Mortar

TCNA Hdbk.

2.4.3 Ceramic Tile Grout

TCNA Hdbk; petroleum-free and plastic-free latex-portland cement grout, except as otherwise indicated.

2.4.4 Epoxy Resin Grout

TCNA Hdbk, ANSI A118.3.

2.4.5 Sealants

Comply with applicable regulations regarding toxic and hazardous materials and as specified. Grout sealant must not change the color or alter the appearance of the grout. Refer to Section 07 92 00 JOINT SEALANTS.

2.5 TRANSITION STRIPS

Provide transition strips as indicated on drawings.

2.6 COLOR, TEXTURE, AND PATTERN

Provide color, pattern and texture as indicated. Color listed is not intended to limit the selection of equal colors from other manufacturers.

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.

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 WALL TILE

Install wall tile in accordance with the TCNA Hdbk, and as indicated.

3.3.1 Workable or Cured Mortar Bed

Install tile over workable mortar bed or a cured mortar bed at the option of the Contractor. Install a 4 mil polyethylene membrane, metal lath, and scratch coat. Conform to TCNA Hdbk for workable mortar bed, materials, and installation of tile. Conform to TCNA Hdbk for cured mortar bed and materials.

3.3.2 Latex-Portland Cement Mortar

Use Latex-Portland Cement to install tile in accordance with TCNA Hdbk. Use Latex Portland Cement when installing porcelain ceramic tile.

3.4 INSTALLATION OF FLOOR TILE

Install floor tile in accordance with TCNA Hdbk and as indicated. Install shower receptors in accordance with TCNA Hdbk method B414 or B415, and as indicated.

3.4.1 Latex-Portland Cement

Use Latex-Portland cement mortar to install tile directly over properly cured, plane, clean concrete slabs in accordance with TCNA Hdbk.

3.4.2 Resinous Grout

Install epoxy resin grout in conformance with TCNA Hdbk and in accordance with manufacturer's written installation instructions.

3.5 INSTALLATION OF TRANSITION STRIPS

Install transition strips in accordance with manufacturer's written instructions.

3.6 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. Submit copy of manufacturer's printed
maintenance instructions.

-- End of Section --

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SECTION 09 51 00

ACOUSTICAL CEILINGS

08/17

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.

ASTM INTERNATIONAL (ASTM)

ASTM A1008/A1008M	(2016) 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 A489	(2018; E 2018) Standard Specification for Carbon Steel Eyebolts
ASTM A641/A641M	(2009a; R 2014) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM A653/A653M	(2018) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B633	(2019) Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
ASTM C635/C635M	(2017) Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings
ASTM C636/C636M	(2013) Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
ASTM E1264	(2014) Acoustical Ceiling Products
ASTM E1477	(1998a; R 2017; E 2018) Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers
ASTM E580/E580M	(2017) Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS

SCS Global Services (SCS) Indoor Advantage

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-310-04

(2013; with Change 1) Seismic Design of Buildings

UNDERWRITERS LABORATORIES (UL)

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" 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

Approved Detail Drawings; G

SD-03 Product Data

Acoustical Ceiling Units; G

SD-04 Samples

Acoustical Ceiling Units; G

SD-07 Certificates

Indoor Air Quality for Type III Ceiling Tiles

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality Certifications

1.3.1.1 Ceiling Tiles

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.

1.3.1.2 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 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.

1.4 DELIVERY, STORAGE. AND HANDLING

Deliver materials to the site in the manufacturer's original unopened containers with brand name and type clearly marked. Carefully handle and store materials in dry, watertight enclosures. Immediately before installation, store acoustical units for not less than 24 hours at the same temperature and relative humidity as the space where they will be installed in order to assure proper temperature and moisture acclimation.

1.5 ENVIRONMENTAL REQUIREMENTS

Maintain a uniform temperature of not less than 60 degrees F nor more than 85 degrees F and a relative humidity of not more than 70 percent for 24 hours before, during, and 24 hours after installation of acoustical units.

1.6 SCHEDULING

Complete and dry interior finish work such as plastering, concrete and terrazzo work before ceiling installation. Complete mechanical, electrical, and other work above the ceiling line; install and start operating heating, ventilating, and air conditioning systems in order to maintain temperature and humidity requirements.

1.7 WARRANTY

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

1.8 EXTRA MATERIALS

Furnish extra materials from the same product run that match products installed and that are packaged with protective covering for storage; identify protective covering with labels describing contents.

1.8.1 Acoustical Ceiling Units

Full-size panels equal to 2 percent of quantity installed.

1.8.2 Suspension System Components

Quantity of each exposed component equal to 2 percent of quantity installed.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide sound controlling units mechanically mounted on a ceiling suspension system for acoustical treatment. The unit size, texture, finish, and color must be as specified. The Contractor has the option to substitute inch-pound (I-P) Recessed Light Fixtures (RLF) for metric RLF. If the Contractor opts to furnish I-P RLF, other ceiling elements like acoustical ceiling tiles, air diffusers, air registers and grills, must also be I-P products. Coordinate the whole ceiling system with other details, like the location of access panels and ceiling penetrations, etc.,

shown on the drawings. The Contractor is responsible for all associated labor and materials and for the final assembly and performance of the specified work and products if I-P products are used. The location and extent of acoustical treatment must be as shown on the [approved detail drawings](#). Submit drawings showing suspension system, method of anchoring and fastening, details, and reflected ceiling plan. Coordinate with paragraph RECLAMATION PROCEDURES for reclamation of mineral fiber acoustical ceiling panels to be removed from the job site.

2.1.1 Ceiling Sound Absorption

Determine the Noise Reduction Coefficient (NRC) in accordance with ASTM C423 Test Method.

2.1.2 Light Reflectance

Determine light reflectance factor in accordance with [ASTM E1477](#) Test Method.

2.2 ACOUSTICAL [CEILING UNITS](#) (Types A1, A2, and C)

Submit two samples of each type of acoustical unit and each type of suspension grid tee section showing texture, finish, and color. Conform acoustical units to [ASTM E1264](#), Class A, and the following requirements:

- a. [Basis-of-Design](#): Provide products manufactured by Armstrong Ceiling Solutions, "Lyra High CAC", "Calla Smooth Texture" and "Woodworks Channeled Plank", or comparable products by another manufacturer may be submitted to the Contracting Officer for approval. Manufacturer's products specified are not intended to limit selection of equal products from other manufacturers.

2.2.1 Units for Exposed-Grid System

2.2.1.1 Type

[III](#) (non-asbestos mineral fiber with painted finish). Provide certification of [indoor air quality](#) for Type [III Ceiling Tiles](#); white color and smooth texture for Types A1 and A2. Type C to match clear stained maple veneer.

2.2.1.2 Flame Spread

Class A, 25 or less

2.2.1.3 Minimum NRC and CAC

As indicated on drawings.

2.2.1.4 Minimum Light Reflectance Coefficient

LR-1, 0.86 or greater for Types A1 and A2.

2.2.1.5 Nominal Size

[24 by 24 by minimum 7/8 inch](#) for Types A1 and A2; [5.553 by 96 by 3/4 inch](#) for Type C

2.2.1.6 Edge Detail

Tegular for Types A1 and A2; square tongue and groove for Type C.

2.2.1.7 Finish

Factory-applied standard finish.

2.3 SUSPENSION SYSTEM

Provide exposed-grid suspension system conforming to ASTM C635/C635M for heavy-duty systems. Provide surfaces exposed to view of aluminum or galvanized steel with a factory-applied baked-enamel finish. Provide wall molding having a flange of 15/16 inch as indicated for Types A1, A2 and C, and 9/16 inch with "Prelude XL" and "Silhouette XL 1/8-inch Reveal" edge details as indicated for Type A1. Provide inside and outside corner caps standard corners. Suspended ceiling framing system must have the capability to support the finished ceiling, light fixtures, air diffusers, and accessories, as shown. Provide a suspension system with a maximum deflection of 1/360 of the span length. Conform seismic details to the guidance in UFC 3-310-04 and ASTM E580/E580M.

2.4 HANGERS

Provide hangers and attachment capable of supporting a minimum 300 pound ultimate vertical load without failure of supporting material or attachment.

2.4.1 Wires

Conform wires to ASTM A641/A641M, Class 1, 0.08 inch (12 gauge) in diameter.

2.4.2 Straps

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

2.4.3 Rods

Provide 3/16 inch diameter threaded steel rods, zinc or cadmium coated.

2.4.4 Eyebolts

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

2.4.5 Anchorage Devices

Comply with ASTM C636/C636M for anchorage devices.

2.5 FINISHES

Use manufacturer's standard textures, patterns and finishes as specified for acoustical units and suspension system members. Treat ceiling suspension system components to inhibit corrosion.

2.6 ACOUSTICAL SEALANT

Refer to Section 07 92 00 JOINT SEALANTS

PART 3 EXECUTION

3.1 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

Examine surfaces to receive directly attached acoustical units for unevenness, irregularities, and dampness that would affect quality and execution of the work. Rid areas, where acoustical units will be cemented, of oils, form residue, or other materials that reduce bonding capabilities of the adhesive. Complete and dry interior finish work such as plastering, concrete, and terrazzo work before installation. Complete and approve mechanical, electrical, and other work above the ceiling line prior to the start of acoustical ceiling installation. Provide acoustical work complete with necessary fastenings, clips, and other accessories required for a complete installation. Do not expose mechanical fastenings in the finished work. Lay out hangers for each individual room or space. Provide hangers to support framing around beams, ducts, columns, grilles, and other penetrations through ceilings. Keep main runners and carrying channels clear of abutting walls and partitions. Provide at least two main runners for each ceiling span. Wherever required to bypass an object with the hanger wires, install a subsuspension system so that all hanger wires will be plumb.

3.1.1 Suspension System

Install suspension system in accordance with ASTM C636/C636M and as specified herein. Do not suspend hanger wires or other loads from underside of steel decking.

3.1.1.1 Plumb Hangers

Install hangers plumb and not pressing against insulation covering ducts and pipes. Where lighting fixtures are supported from the suspended ceiling system, provide hangers at a minimum of four hangers per fixture and located not more than 6 inch from each corner of each fixture.

3.1.1.2 Splayed Hangers

Where hangers must be splayed (sloped or slanted) around obstructions, offset the resulting horizontal force by bracing, countersplaying, or other acceptable means.

3.1.2 Wall Molding

Provide wall molding where ceilings abut vertical surfaces. Miter corners where wall moldings intersect or install corner caps. Secure wall molding not more than 3 inch from ends of each length and not more than 16 inch on centers between end fastenings. Provide wall molding springs at each acoustical unit in semi-exposed or concealed systems.

3.1.3 Acoustical Units

Install acoustical units in accordance with the approved installation

instructions of the manufacturer. Ensure that edges of acoustical units are in close contact with metal supports, with each other, and in true alignment. Arrange acoustical units so that units less than one-half width are minimized. Hold units in exposed-grid system in place with manufacturer's standard hold-down clips, if units weigh less than 1 psf or if required for fire resistance rating.

3.1.4 Sealant

Seal all joints around pipes, ducts or electrical outlets penetrating the ceiling. Apply a continuous ribbon of acoustical sealant on vertical web of wall or edge moldings.

3.2 CLEANING

Following installation, clean dirty or discolored surfaces of acoustical units and leave them free from defects. Remove units that are damaged or improperly installed and provide new units as directed.

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SECTION 09 65 00

RESILIENT FLOORING

08/10

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM F1482	(2015) Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring
ASTM F1861	(2016) Standard Specification for Resilient Wall Base
ASTM F1869	(2016) Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
ASTM F2170	(2018) Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
ASTM F710	(2017) Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

UNDERWRITERS LABORATORIES (UL)

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" 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

Resilient Flooring and Accessories; G

SD-03 Product Data

Resilient Flooring and Accessories; G

Adhesives

SD-04 Samples

Resilient Flooring and Accessories; G

SD-06 Test Reports

Moisture, Alkalinity and Bond Tests; G

SD-07 Certificates

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SD-08 Manufacturer's Instructions

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Installation; G

SD-10 Operation and Maintenance Data

Resilient Flooring and Accessories Data Package 1; G

1.3 CERTIFICATES

1.3.1 Indoor Air Quality

Submit required indoor air quality certifications and validations in one submittal package.

1.3.1.1 Floor Covering Materials

Provide wall base products certified to meet indoor air quality requirements by FloorScore, [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.

1.3.1.2 Adhesives, Caulking 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 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 herein.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the building site in original unopened containers bearing the manufacturer's name, style name, pattern color name and number, production run, project identification, and handling instructions. Store materials in a clean, dry, secure, and well-ventilated area [free from strong contaminant sources and residues](#) with ambient air temperature

maintained above 68 degrees F and below 85 degrees F, stacked according to manufacturer's recommendations. Remove resilient flooring products from packaging to allow ventilation prior to installation. Protect materials from the direct flow of heat from hot-air registers, radiators and other heating fixtures and appliances. Observe ventilation and safety procedures specified in the MSDS. Do not store near materials that may offgas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives.

1.5 ENVIRONMENTAL REQUIREMENTS

Maintain areas to receive resilient flooring at a temperature above 68 degrees F and below 85 degrees F for 3 days before application, during application and 2 days after application, unless otherwise directed by the flooring manufacturer for the flooring being installed. Maintain a minimum temperature of 55 degrees F thereafter. Provide adequate ventilation to remove moisture from area and to comply with regulations limiting concentrations of hazardous vapors.

1.6 SCHEDULING

Schedule resilient flooring application after the completion of other work which would damage the finished surface of the flooring.

1.7 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a one year period.

1.8 EXTRA MATERIALS

Furnish extra materials from the same product run that match products installed and that are packaged with protective covering for storage; identify protective covering with labels describing contents.

1.8.1 Floor Tile and Wall Base

Quantity of each type, color and pattern of wall base equal to 2 percent of quantity installed.

PART 2 PRODUCTS

2.1 WALL BASE

Conform to ASTM F1861, Type TP (thermoplastic rubber) Style B (coved - installed with resilient flooring). Provide 4 inch high and a minimum 1/8 inch thick wall base. Provide job formed outside corners in matching height, shape, and color.

2.2 MOULDING

Provide tapered mouldings of rubber and types as recommended by flooring manufacturer for both edges and transitions of flooring materials specified. Provide vertical lip on moulding of maximum 1/4 inch. Provide bevel change in level between 1/4 and 1/2 inch with a slope no greater than 1:2.

2.3 ADHESIVES

Provide adhesives for flooring, base and accessories as recommended by the

manufacturer and comply with local indoor air quality standards. Submit manufacturer's descriptive data, documentation stating physical characteristics, and mildew and germicidal characteristics.

2.4 SURFACE PREPARATION MATERIALS

Provide surface preparation materials, such as panel type underlayment, lining felt, and floor crack fillers as recommended by the flooring manufacturer for the subfloor conditions. Comply with [ASTM F1482](#) for panel type underlayment products.

2.5 SEALANTS

Provide sealants in accordance with Section [07 92 00](#) JOINT SEALANTS.

2.6 MANUFACTURER'S COLOR, PATTERN AND TEXTURE

Provide color, pattern and texture for [resilient flooring and accessories](#) as indicated on the drawings. Color listed is not intended to limit the selection of equal colors from other manufacturers. Provide [wall base](#) area in continuous area from same production run with same [color](#) and pattern. Submit scaled drawings indicating location of patterns, colors and dimensions. Submit manufacturer's descriptive data and three samples of each indicated color and type of [wall base](#) and accessories sized a minimum [2-1/2 by 4 inch](#). Submit Data Package 1 in accordance with Section [01 78 23](#) OPERATION AND MAINTENANCE DATA.

PART 3 EXECUTION

3.1 EXAMINATION

Examine and verify that site conditions are in agreement with the design package. Report all conditions that will prevent a proper [installation](#). Do not take any corrective action without written permission from the Government. Work will proceed only when conditions have been corrected and accepted by the installer. Submit manufacturer's printed installation instructions for all flooring materials and accessories, including preparation of substrate, seaming techniques, and recommended adhesives.

3.2 SURFACE PREPARATION

Provide a smooth, true, level plane for surface preparation of the flooring, except where indicated as sloped. Floor to be flat to within [3/16 inch in 10 feet](#). Prepare subfloor in accordance with flooring manufacturer's recommended instructions. Prepare the surfaces of lightweight concrete slabs (as defined by the flooring manufacturer) as recommended by the flooring manufacturer. Comply with [ASTM F710](#) for concrete subfloor preparation. Floor fills or toppings may be required as recommended by the flooring manufacturer. Install underlayments, when required by the flooring manufacturer, in accordance with manufacturer's recommended printed installation instructions. Comply with [ASTM F1482](#) for panel type underlayments. Before any work under this section is begun, correct all defects such as rough or scaling concrete, chalk and dust, cracks, low spots, high spots, and uneven surfaces. Repair all damaged portions of concrete slabs as recommended by the flooring manufacturer. Remove concrete curing and sealer compounds from the slabs, other than the type that does not adversely affect adhesion. Remove paint, varnish, oils, release agents, sealers, waxes, and adhesives, as required by the flooring product in accordance with manufacturer's printed installation instructions.

3.3 MOISTURE, ALKALINITY AND BOND TESTS

Determine the suitability of the concrete subfloor for receiving the resilient flooring with regard to moisture content and pH level by moisture and alkalinity tests. Conduct moisture testing in accordance with ASTM F1869 or ASTM F2170, unless otherwise recommended by the flooring manufacturer. Conduct alkalinity testing as recommended by the flooring manufacturer. Determine the compatibility of the resilient flooring adhesives to the concrete floors by a bond test in accordance with the flooring manufacturer's recommendations. Submit copy of test reports for moisture and alkalinity content of concrete slab, and bond test stating date of test, person conducting the test, and the area tested.

3.4 GENERAL INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

3.5 PLACING SOLID VINYL TILES

Install tile flooring and accessories in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's directions. Keep tile lines and joints square, symmetrical, tight, and even. Keep each floor in true, level plane, except where slope is indicated. Vary edge width as necessary to maintain full-size tiles in the field, no edge tile to be less than one-half the field tile size, except where irregular shaped rooms make it impossible. Cut flooring to fit around all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Cut, fit, and scribe edge tile to walls and partitions after field flooring has been applied.

3.6 PLACING MOULDING

Provide moulding where flooring termination is higher than the adjacent finished flooring and at transitions between different flooring materials. When required, locate moulding under door centerline. Moulding is not required at doorways where thresholds are provided. Secure moulding with adhesive as recommended by the manufacturer. Prepare and apply adhesives in accordance with manufacturer's printed directions. Anchor aluminum moulding to floor surfaces as recommended by the manufacturer.

3.7 PLACING WALL BASE

Install wall base in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's printed directions. Tighten base joints and make even with adjacent resilient flooring. Fill voids along the top edge of base at masonry walls with caulk. Roll entire vertical surface of base with hand roller, and press toe of base with a straight piece of wood to ensure proper alignment. Avoid excess adhesive in corners.

3.8 CLEANING

Immediately upon completion of installation of flooring in a room or an area, dry and clean the flooring and adjacent surfaces to remove all surplus adhesive. Clean flooring as recommended in accordance with manufacturer's printed maintenance instructions and within the recommended time frame. As required by the manufacturer, apply the recommended number

of coats and type of polish and finish in accordance with manufacturer's written instructions.

3.9 PROTECTION

From the time of installation until acceptance, protect flooring from damage as recommended by the flooring manufacturer. Remove and replace flooring which becomes damaged, loose, broken, or curled and wall base which is not tight to wall or securely adhered.

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CARPETING

11/17

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 ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC 134 (2016) Electrostatic Propensity of Carpets

AATCC 174 (2016) Antimicrobial Activity Assessment of New Carpets

ASTM INTERNATIONAL (ASTM)

ASTM D2859 (2016) Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials

ASTM D3278 (1996; R 2011) Flash Point of Liquids by Small Scale Closed-Cup Apparatus

ASTM D5793 (2018) Standard Test Method for Binding Sites Per Unit Length or Width of Pile Yarn Floor Coverings

ASTM D5848 (2010; E 2010) Mass Per Unit Area of Pile Yarn Floor Coverings

ASTM D6859 (2011) Standard Test Method for Pile Thickness of Finished Level Pile Yarn Floor Coverings

ASTM D7330 (2015) Standard Test Method for Assessment of Surface Appearance Change in Pile Floor Coverings Using Standard Reference Scales

ASTM E648 (2017a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source

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

CARPET AND RUG INSTITUTE (CRI)

CRI 104	(2015) Carpet Installation Standard for Commercial Carpet
CRI 105	(2015) Carpet Installation Standard for Residential Carpet
CRI GLP QM	(2017) Green Label Plus Quality Manual
CRI Test Method 103	(2015) Standard Test Method for the Evaluation of Texture Appearance Retention of Carpet Standards Program

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 2551	(1981) Machine-made Textile Floor Coverings - Determination of Dimensional Changes Due to the Effects of Varied Water and Heat Conditions

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1113	(2016) Architectural Coatings
SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

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

16 CFR 1630	Standard for the Surface Flammability of Carpets and Rugs (FF 1-70)

UNDERWRITERS LABORATORIES (UL)

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" 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

Installation Drawings; G

SD-03 Product Data

Carpet; G

SD-04 Samples

Carpet; G

SD-06 Test Reports

Moisture and Alkalinity Tests; G

SD-07 Certificates

Indoor Air Quality for Carpet

Indoor Air Quality for non-aerosol adhesives

Indoor Air Quality for concrete primer

SD-08 Manufacturer's Instructions

Surface Preparation

SD-10 Operation and Maintenance Data

Carpet Data Package 1; G

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality for Carpet

1.3.1.1 Floor Covering Materials

Provide carpet and cushion products certified to meet indoor air quality requirements by [UL 2818](#) (GREENGUARD) Gold, [SCS](#) Global Services Indoor Advantage Gold, [CRI GLP QM](#) 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.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the site in the manufacturer's original wrappings and packages clearly labeled with the manufacturer's name, brand name, size, dye lot number, and related information. Remove materials from packaging and store them in a clean, dry, well ventilated area ([100 percent outside air supply, minimum of 1.5 air changes per hour, and no recirculation](#)), protected from damage, soiling, and moisture, and [strong contaminant sources and residues](#), and maintain at a temperature above [60 degrees F](#) for 2 days prior to installation. [Do not store carpet or carpet tiles with materials which have high emissions of volatile organic compounds \(VOCs\) or other contaminants, including paints and adhesives.](#) Do not store carpet near materials that may off gas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives.

1.5 AMBIENT CONDITIONS

Maintain areas in which carpeting is to be installed at a temperature above [60 degrees F](#) and below [90 degrees F](#) for 2 days before installation, during installation, and for 2 days after installation. Provide temporary ventilation during work of this section. Maintain a minimum temperature of [55 degrees F](#) thereafter for the duration of the contract.

1.6 WARRANTY

Provide manufacturer's standard performance guarantees or warranties including minimum ten year wear warranty, two year material and workmanship and ten year tuft bind and delamination.

1.7 EXTRA MATERIALS

Furnish extra materials from the same product run that match products installed and that are packaged with protective covering for storage; identify protective covering with labels describing contents.

1.7.1 Carpet Tile

Quantity of each type, color and pattern of carpet tile equal to 5 percent of quantity installed.

PART 2 PRODUCTS

2.1 CARPET

Furnish first quality carpet that is free of visual blemishes, streaks, poorly dyed areas, fuzzing of pile yarn, spots or stains, and other physical and manufacturing defects. Provide carpet materials and treatments as reasonably nonallergenic and free of other recognized health hazards. Provide a static control construction on all grade carpets which gives adequate durability and performance. Submit manufacturer's catalog data and printed documentation stating physical characteristics, durability, resistance to fading, and flame resistance characteristics for each type of carpet material and installation accessory. Submit manufacturer's Product Data for Carpet. Also, submit Samples of the following:

- a. Carpet: Two "Production Quality" samples 18 by 18 inches of each carpet proposed for use, showing quality, pattern, and color specified

2.1.1 Basis of Design (CPT-4)

Provide products manufactured by StaticSmart Flooring by Julie Industries, or comparable products by another manufacturer may be submitted to the Contracting Officer for approval. Manufacturer's products specified are not intended to limit selection of equal products from other manufacturers.

2.1.2 Physical Characteristics for Modular Tile Carpet

2.1.2.1 Carpet Construction

Tufted

2.1.2.2 Type

Modular tile 24 by 24 inch square with 0.15 percent growth/shrink rate in accordance with ISO 2551.

2.1.2.3 Pile Type

Multilevel patterned loop

2.1.2.4 Pile Fiber

Commercial 100 percent branded (federally registered trademark) nylon continuous filament with manufacturer's standard conductive fiber technology.

2.1.2.5 Gauge or Pitch

Minimum 1/12 inch in accordance with ASTM D5793

2.1.2.6 Stitches or Rows/Wires

Minimum 11 per square inch

2.1.2.7 Surface Pile Weight

Minimum 22 ounces per square yard. This does not include weight of backings. Determine weight in accordance with ASTM D5848.

2.1.2.8 Pile Thickness

Minimum 0.113 inch in accordance with ASTM D6859

2.1.2.9 Dye Method

Solution dyed

2.1.2.10 Backing Materials

Provide primary backing materials like those customarily used and accepted by the trade for each type of carpet. Provide secondary backing to suit project requirements of those customarily used and accepted by the trade for each type of carpet.

2.2 PERFORMANCE REQUIREMENTS

2.2.1 Texture Appearance Retention Rating (TARR)

Provide carpet with a greater than or equal to 3.0 (Heavy) TARR traffic level classification in accordance with ASTM D7330 or CRI Test Method 103.

2.2.2 Static Control

Provide static control to permanently regulate static buildup to less than 0.4 kV when tested at 20 percent relative humidity and 70 degrees F in accordance with AATCC 134.

2.2.3 Flammability and Critical Radiant Flux Requirements

Comply with 16 CFR 1630 or ASTM D2859. Provide carpet in corridors and exits with a minimum average critical radiant flux of 0.45 watts per square centimeter when tested in accordance with ASTM E648.

2.2.4 Antimicrobial

Nontoxic antimicrobial treatment in accordance with AATCC 174 Part I (qualitative), guaranteed by the carpet manufacturer to last the life of the carpet.

2.3 ADHESIVES AND CONCRETE PRIMER

Comply with applicable regulations regarding toxic and hazardous materials. Provide water resistant, mildew resistant, nonflammable, and nonstaining adhesives and concrete primers for carpet installation as required by the carpet manufacturer. Provide release adhesive for modular tile carpet as recommended by the carpet manufacturer. Provide adhesives flashpoint of minimum 140 degrees F in accordance with ASTM D3278. Non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) must meet 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 validation of indoor air quality for non-aerosol adhesives. Concrete primer products used on the interior of the building (defined as inside of the weatherproofing system) must meet 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 1113. Provide validation of indoor air quality for concrete primer.

2.4 MOLDINGS

Refer to Section 09 65 00 RESILIENT FLOORING for tapered moldings.

2.5 COLOR, TEXTURE, AND PATTERN

Provide color, texture, and pattern as indicated.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Do not install carpet on surfaces that are unsuitable and will prevent a proper installation. Prepare subfloor in accordance with flooring manufacturer's recommended instructions. Repair holes, cracks, depressions, or rough areas using material recommended by the carpet or adhesive manufacturer. Free floor of any foreign materials and sweep clean. Before beginning work, test subfloor with glue and carpet to determine "open time" and bond. Submit three copies of the manufacturer's printed Installation instructions for the carpet, including Surface Preparation, seaming techniques, and recommended adhesives and tapes.

3.2 MOISTURE AND ALKALINITY TESTS

Test concrete slab for moisture content and excessive alkalinity in accordance with CRI 104/CRI 105. Submit three copies of reports of Moisture and Alkalinity Tests including content of concrete slab stating date of test, person conducting the test, and the area tested.

3.3 PREPARATION OF CONCRETE SUBFLOOR

Do not commence installation of the carpeting until concrete substrate is at least 90 days old. Prepare the concrete surfaces in accordance with the carpet manufacturer's instructions. Match carpet, when required, and adhesives to prevent off-gassing to a type of curing compounds, leveling agents, and concrete sealer.

3.4 INSTALLATION

Isolate area of installation from rest of building. Perform all work by manufacturer's approved installers. Conduct installation in accordance with the manufacturer's written instructions, approved installation drawings and CRI 104/CRI 105. Protect edges of carpet meeting hard surface flooring with molding and install in accordance with the molding manufacturer's written instructions. Follow ventilation, personal protection, and other safety precautions recommended by the adhesive manufacturer. Continue ventilation during installation and for at least 72 hours following installation. Do not permit traffic or movement of furniture or equipment in carpeted area for 24 hours after installation. Complete other work which would damage the carpet prior to installation of carpet.

Do not install building construction materials that show visual evidence of biological growth.

3.5 CLEANING AND PROTECTION

Submit three copies of carpet manufacturer's maintenance instructions describing recommended type of cleaning equipment and material, spotting and cleaning methods, and cleaning cycles.

3.5.1 Cleaning

As specified in Section 01 78 00 CLOSEOUT SUBMITTALS. After installation of the carpet, remove debris, scraps, and other foreign matter. Remove soiled spots and adhesive from the face of the carpet with appropriate spot remover. Cut off and remove protruding face yarn. Vacuum carpet clean with a high-efficiency particulate air (HEPA) filtration vacuum.

3.5.2 Protection

Protect the installed carpet from soiling and damage with heavy, reinforced, nonstaining kraft paper, plywood, or hardboard sheets. Lap and secure edges of kraft paper protection to provide a continuous cover. Restrict traffic for at least 48 hours. Remove protective covering when directed by the Contracting Officer.

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SECTION 09 68 00.02 30

CARPETING

11/17

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 ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC 174 (2016) Antimicrobial Activity Assessment of New Carpets

ASTM INTERNATIONAL (ASTM)

ASTM D2859 (2016) Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials

ASTM D3278 (1996; R 2011) Flash Point of Liquids by Small Scale Closed-Cup Apparatus

ASTM D5848 (2010; E 2010) Mass Per Unit Area of Pile Yarn Floor Coverings

ASTM D6859 (2011) Standard Test Method for Pile Thickness of Finished Level Pile Yarn Floor Coverings

ASTM D7330 (2015) Standard Test Method for Assessment of Surface Appearance Change in Pile Floor Coverings Using Standard Reference Scales

ASTM E648 (2017a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source

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

CARPET AND RUG INSTITUTE (CRI)

CRI 104 (2015) Carpet Installation Standard for Commercial Carpet

CRI 105 (2015) Carpet Installation Standard for Residential Carpet

CRI GLP QM	(2017) Green Label Plus Quality Manual
CRI Test Method 103	(2015) Standard Test Method for the Evaluation of Texture Appearance Retention of Carpet Standards Program
SCIENTIFIC CERTIFICATION SYSTEMS (SCS)	
SCS	SCS Global Services (SCS) Indoor Advantage
SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)	
SCAQMD Rule 1113	(2016) Architectural Coatings
SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications
U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)	
16 CFR 1630	Standard for the Surface Flammability of Carpets and Rugs (FF 1-70)
UNDERWRITERS LABORATORIES (UL)	
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" 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

Installation Drawings; G

SD-03 Product Data

Carpet; G

SD-04 Samples

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SD-06 Test Reports

Moisture and Alkalinity Tests; G

SD-07 Certificates

Indoor Air Quality for Carpet

Indoor Air Quality for non-aerosol adhesives

Indoor Air Quality for concrete primer

SD-08 Manufacturer's Instructions

Surface Preparation

SD-10 Operation and Maintenance Data

Carpet Data Package 1; G

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality for Carpet

1.3.1.1 Floor Covering Materials

Provide carpet and cushion products certified to meet indoor air quality requirements by **UL 2818** (GREENGUARD) Gold, **SCS** Global Services Indoor Advantage Gold, **CRI GLP QM** 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.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the site in the manufacturer's original wrappings and packages clearly labeled with the manufacturer's name, brand name, size, dye lot number, and related information. Remove materials from packaging and store them in a clean, dry, well ventilated area (100 percent outside air supply, minimum of 1.5 air changes per hour, and no recirculation), protected from damage, soiling, and moisture, and strong contaminant sources and residues, and maintain at a temperature above 60 degrees F for 2 days prior to installation. Do not store carpet or carpet tiles with materials which have high emissions of volatile organic compounds (VOCs) or other contaminants, including paints and adhesives. Do not store carpet near materials that may off gas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives.

1.5 AMBIENT CONDITIONS

Maintain areas in which carpeting is to be installed at a temperature above 60 degrees F and below 90 degrees F for 2 days before installation, during installation, and for 2 days after installation. Provide temporary ventilation during work of this section. Maintain a minimum temperature of 55 degrees F thereafter for the duration of the contract.

1.6 WARRANTY

Provide manufacturer's standard performance guarantees or warranties including minimum ten year wear warranty, two year material and workmanship and ten year tuft bind and delamination.

1.7 EXTRA MATERIALS

Furnish extra materials from the same product run that match products installed and that are packaged with protective covering for storage; identify protective covering with labels describing contents.

1.7.1 Carpet Tile

Quantity of each type, color and pattern of carpet tile equal to 5 percent of quantity installed.

PART 2 PRODUCTS

2.1 CARPET

Furnish first quality carpet that is free of visual blemishes, streaks, poorly dyed areas, fuzzing of pile yarn, spots or stains, and other physical and manufacturing defects. Provide carpet materials and treatments as reasonably nonallergenic and free of other recognized health hazards. Provide a static control construction on all grade carpets which gives adequate durability and performance. Submit manufacturer's catalog data and printed documentation stating physical characteristics, durability, resistance to fading, and flame resistance characteristics for each type of carpet material and installation accessory. Submit manufacturer's Product Data for Carpet. Also, submit Samples of the following:

- a. Carpet: Two "Production Quality" samples 18 by 18 inches of each carpet proposed for use, showing quality, pattern, and color specified

2.1.1 Basis of Design (CPT-1, CPT-2, CPT-3)

Provide products manufactured by Milliken & Company as indicated on drawings, or comparable products by another manufacturer may be submitted to the Contracting Officer for approval. Manufacturer's products specified are not intended to limit selection of equal products from other manufacturers.

2.1.2 Physical Characteristics for Modular Tile Carpet

2.1.2.1 Carpet Construction

Tufted, textured loop for CPT-1 and CPT-3; tufted, loop pile for CPT-2.

2.1.2.2 Type

Modular tile 19.7 by 19.7 inch square.

2.1.2.3 Pile Fiber

Nylon, Type 6,6.

2.1.2.4 Surface Pile Weight

Minimum 19 ounces per square yard for CPT-1; minimum 28 ounces per square yard for CPT-2; minimum 18.9 ounces per square yard for CPT-3. This does not include weight of backings. Determine weight in accordance with ASTM D5848.

2.1.2.5 Pile Thickness

Minimum 0.08 inch for CPT-1; 0.12 inch for CPT-2; 0.14 inch for CPT-3. Determine height in accordance with ASTM D6859

2.1.2.6 Dye Method

Manufacturer's standard.

2.1.2.7 Backing Materials

Provide primary backing materials like those customarily used and accepted by the trade for each type of carpet. Provide secondary backing to suit project requirements of those customarily used and accepted by the trade for each type of carpet.

2.2 PERFORMANCE REQUIREMENTS

2.2.1 Texture Appearance Retention Rating (TARR)

Provide carpet with a greater than or equal to 3.0 (Heavy) TARR traffic level classification in accordance with ASTM D7330 or CRI Test Method 103.

2.2.2 Flammability and Critical Radiant Flux Requirements

Comply with 16 CFR 1630 or ASTM D2859. Provide carpet in corridors and exits with a minimum average critical radiant flux of 0.45 watts per square centimeter when tested in accordance with ASTM E648.

2.2.3 Antimicrobial

Nontoxic antimicrobial treatment in accordance with AATCC 174 Part I (qualitative), guaranteed by the carpet manufacturer to last the life of the carpet.

2.3 ADHESIVES AND CONCRETE PRIMER

Comply with applicable regulations regarding toxic and hazardous materials. Provide water resistant, mildew resistant, nonflammable, and nonstaining adhesives and concrete primers for carpet installation as required by the carpet manufacturer. Provide release adhesive for modular tile carpet as recommended by the carpet manufacturer. Provide adhesives flashpoint of minimum 140 degrees F in accordance with ASTM D3278. Non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) must meet 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 validation of indoor air quality for non-aerosol adhesives. Concrete primer products used on the interior of the building (defined as inside of the weatherproofing system) must meet 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 1113. Provide validation of indoor air quality for concrete primer.

2.4 MOLDINGS

Refer to Section 09 65 00 RESILIENT FLOORING for tapered moldings.

2.5 COLOR, TEXTURE, AND PATTERN

Provide color, texture, and pattern as indicated.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Do not install carpet on surfaces that are unsuitable and will prevent a proper installation. Prepare subfloor in accordance with flooring manufacturer's recommended instructions. Repair holes, cracks, depressions, or rough areas using material recommended by the carpet or adhesive manufacturer. Free floor of any foreign materials and sweep clean. Before beginning work, test subfloor with glue and carpet to determine "open time" and bond. Submit three copies of the manufacturer's printed Installation instructions for the carpet, including Surface Preparation, seaming techniques, and recommended adhesives and tapes.

3.2 MOISTURE AND ALKALINITY TESTS

Test concrete slab for moisture content and excessive alkalinity in accordance with **CRI 104/CRI 105**. Submit three copies of reports of Moisture and Alkalinity Tests including content of concrete slab stating date of test, person conducting the test, and the area tested.

3.3 PREPARATION OF CONCRETE SUBFLOOR

Do not commence installation of the carpeting until concrete substrate is at least 90 days old. Prepare the concrete surfaces in accordance with the carpet manufacturer's instructions. Match carpet, when required, and adhesives to prevent off-gassing to a type of curing compounds, leveling agents, and concrete sealer.

3.4 INSTALLATION

Isolate area of installation from rest of building. Perform all work by manufacturer's approved installers. Conduct installation in accordance with the manufacturer's **written** instructions, **approved installation drawings** and **CRI 104/CRI 105**. Protect edges of carpet meeting hard surface flooring with molding and install in accordance with the molding manufacturer's **written** instructions. Follow ventilation, personal protection, and other safety precautions recommended by the adhesive manufacturer. Continue ventilation during installation and for at least 72 hours following installation. Do not permit traffic or movement of furniture or equipment in carpeted area for 24 hours after installation. Complete other work which would damage the carpet prior to installation of carpet.

Do not install building construction materials that show visual evidence of biological growth.

3.5 CLEANING AND PROTECTION

Submit three copies of carpet manufacturer's maintenance instructions describing recommended type of cleaning equipment and material, spotting and cleaning methods, and cleaning cycles.

3.5.1 Cleaning

As specified in Section **01 78 00 CLOSEOUT SUBMITTALS**. After installation of the carpet, remove debris, scraps, and other foreign matter. Remove soiled spots and adhesive from the face of the carpet with appropriate spot remover. Cut off and remove protruding face yarn. Vacuum carpet clean **with a high-efficiency particulate air (HEPA) filtration vacuum**.

3.5.2 Protection

Protect the installed carpet from soiling and damage with heavy, reinforced, nonstaining kraft paper, plywood, or hardboard sheets. Lap and secure edges of kraft paper protection to provide a continuous cover. Restrict traffic for at least 48 hours. Remove protective covering when directed by the Contracting Officer.

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SECTION 09 84 20

ACOUSTICAL WALL PANELS

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 E84 (2019b) Standard Test Method for Surface Burning Characteristics of Building Materials

ASTM E90 (2009) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Approved Detail Drawings; G

SD-03 Product Data

Acoustical Wall Panels; G

SD-04 Samples

Acoustical Wall Panels; G

SD-07 Certificates

Acoustical Wall Panels

SD-08 Manufacturer's Instructions

Installation Instructions

SD-11 Closeout Submittals

Warranty

1.3 DELIVERY, STORAGE, AND HANDLING

Protect materials delivered and placed in storage from the weather, humidity and temperature variations, dirt, dust, or other contaminants.

1.4 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a one year period.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

2.1.1 Basis of Design

Provide products manufactured by 3form, Model "Hush Blocks", or comparable products by another manufacturer may be submitted to the Contracting Officer for approval. Manufacturer's products specified are not intended to limit selection of equal products from other manufacturers.

2.1.2 Performance Requirements

Fire-Test-Response Characteristics: Units shall comply with "Surface-Burning Characteristics" criteria below as determined by testing identical products by UL or another qualified testing agency acceptable to authorities having jurisdiction.

- a. Surface Burning Characteristics: Comply with ASTM E84; identify products with appropriate markings of applicable testing agency.
- b. Flame-Spread Index: 25 or less.
- c. Smoke Developed Index: 450 or less.

2.2 ACOUSTICAL WALL PANELS

Provide acoustical wall panel system manufactured to the dimensions and configurations shown on the [approved detail drawings](#); submit drawings showing plan locations, elevations and details of method of application, and shape and thickness of materials. Submit manufacturer's descriptive data and catalog cuts; fabric swatches, minimum 18 inches wide by 24 inches long and 3 samples of each color range specified; and certificates of compliance.

2.2.1 Materials

Panels made of Polyethylene Terephthalate (PET) designed as sound absorptive material to soften reverberation and dampen sound energy. Provide minimum thickness as indicated. Noise Reduction Coefficient (NRC) of 0.80 according to ASTM E90.

Provide all ancillary items, including but not limited to, adhesives, primers, fasteners, Z-clips and trim components, as required for a complete acoustical wall panel system.

2.3 COLOR

As indicated. Color listed is not intended to limit the selection of equal

colors from other manufacturers.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

Surfaces shall be clean, smooth, oil free and prepared in accordance with panel manufacturer's instructions. Do not begin installation until all wet work, such as, plastering, painting, and concrete are completely dry.

3.2 INSTALLATION

Panel installation must be by personnel familiar with and normally engaged in installation of acoustical wall panels. Apply panels in accordance with the manufacturer's written [installation instructions](#).

3.3 CLEANING

Following installation, clean dirty or stained panel surfaces in accordance with manufacturer's instructions and leave free from defects. Remove and replace panels that are damaged, discolored, or improperly installed.

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SECTION 09 90 00

PAINTS AND COATINGS

05/11

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH 0100 (2015; Suppl 2002-2016) Documentation of the Threshold Limit Values and Biological Exposure Indices

ASME INTERNATIONAL (ASME)

ASME A13.1 (2015) Scheme for the Identification of Piping Systems

ASTM INTERNATIONAL (ASTM)

ASTM D235 (2002; R 2012) Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)

ASTM D4263 (1983; R 2012) Indicating Moisture in Concrete by the Plastic Sheet Method

ASTM D4444 (2013) Use and Calibration of Hand-Held Moisture Meters

ASTM D523 (2014; R 2018) Standard Test Method for Specular Gloss

ASTM D6386 (2016) Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting

ASTM F1869 (2016) Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

MASTER PAINTERS INSTITUTE (MPI)

MPI 101 (2012) Primer, Epoxy, Anti-Corrosive, for Metal

MPI 107 (2012) Primer, Rust-Inhibitive, Water Based

MPI 116 (2012) Block Filler, Epoxy

MPI 145 (2012) Latex, Interior, Institutional Low

	Odor/VOC, (MPI Gloss Level 3)
MPI 147	(May 2016) Latex, Interior, Institutional Low Odor/VOC, Semi-Gloss (MPI Gloss Level 5)
MPI 39	(2012) Primer, Latex, for Interior Wood
MPI 4	(2012) Interior/Exterior Latex Block Filler
MPI 45	(2012) Primer Sealer, Interior Alkyd
MPI 47	(2012) Alkyd, Interior, Semi-Gloss (MPI Gloss Level 5)
MPI 50	(2012) Primer Sealer, Latex, Interior
MPI 56	(2012) Varnish, Interior, Polyurethane, Oil Modified, Gloss
MPI 72	(2012) Polyurethane, Two-Component, Pigmented, Gloss (MPI Gloss Level 6-7)
MPI 77	(2012) Epoxy, Gloss
MPI 79	(2012) Primer, Alkyd, Anti-Corrosive for Metal
MPI 90	(2012) Stain, Semi-Transparent, for Interior Wood

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC 7/NACE No.4	(2007; E 2004) Brush-Off Blast Cleaning
SSPC PA 1	(2016) Shop, Field, and Maintenance Coating of Metals
SSPC PA Guide 3	(1982; E 1995) A Guide to Safety in Paint Application
SSPC QP 1	(2012; E 2012) Standard Procedure for Evaluating Painting Contractors (Field Application to Complex Industrial Structures)
SSPC SP 1	(2015) Solvent Cleaning
SSPC SP 10/NACE No. 2	(2007) Near-White Blast Cleaning
SSPC SP 12/NACE No.5	(2002) Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating
SSPC SP 2	(1982; E 2000; E 2004) Hand Tool Cleaning

SSPC SP 3	(1982; E 2004) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning
SSPC 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

U.S. ARMY CORPS OF ENGINEERS (USACE)

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

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD-313	(2014; Rev E) 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

UNDERWRITERS LABORATORIES (UL)

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" 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:

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.

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

Sealant

SD-04 Samples

Color; G

SD-07 Certificates

Applicator's Qualifications

Qualification Testing laboratory for coatings; G

Indoor Air Quality for Paints and Primers

SD-08 Manufacturer's Instructions

Mixing

Manufacturer's Safety Data Sheets

SD-10 Operation and Maintenance Data

Coatings; G

1.3 CERTIFICATES

1.3.1 Indoor Air Quality

Submit required indoor air quality certifications in one submittal package.

1.3.1.1 Paints and Coatings

Provide paint and coating 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.

1.4 APPLICATOR'S QUALIFICATIONS

1.4.1 Contractor Qualification

Submit the name, address, telephone number, FAX number, and e-mail address of the contractor that will be performing all surface preparation and coating application. Submit evidence that key personnel have successfully performed surface preparation and application of coatings on a minimum of three similar projects within the past three years. List information by individual and include the following:

- a. Name of individual and proposed position for this work.
- b. Information about each previous assignment including:

Position or responsibility

Employer (if other than the Contractor)

Name of facility owner

Mailing address, telephone number, and telex number (if non-US) of facility owner

Name of individual in facility owner's organization who can be contacted as a reference

Location, size and description of structure

Dates work was carried out

Description of work carried out on structure

1.4.2 SSPC QP 1 Certification

All contractors and subcontractors that perform surface preparation or coating application must be certified by the Society for Protective Coatings (formerly Steel Structures Painting Council) (SSPC) to the requirements of **SSPC QP 1** prior to contract award, and must remain certified while accomplishing any surface preparation or coating application. If a contractor's or subcontractor's certification expires, the firm will not be allowed to perform any work until the certification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive certification will not be considered and liquidated damages will apply. Notify the Contracting Officer of any change in contractor certification status.

1.5 QUALITY ASSURANCE

1.5.1 Field Samples and Tests

The Contracting Officer may choose up to two coatings that have been delivered to the site to be tested at no cost to the Government. Take samples of each chosen product as specified in the paragraph SAMPLING PROCEDURES. Test each chosen product as specified in the paragraph TESTING PROCEDURE. 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 at no cost to the Government.

1.6 REGULATORY REQUIREMENTS

1.6.1 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.

1.6.2 Lead Content

Do not use coatings having a lead content over 0.06 percent by weight of nonvolatile content.

1.6.3 Chromate Content

Do not use coatings containing zinc-chromate or strontium-chromate.

1.6.4 Asbestos Content

Provide asbestos-free materials.

1.6.5 Mercury Content

Provide materials free of mercury or mercury compounds.

1.6.6 Silica

Provide abrasive blast media containing no free crystalline silica.

1.6.7 Human Carcinogens

Provide materials that do not contain [ACGIH 0100](#) confirmed human carcinogens (A1) or suspected human carcinogens (A2).

1.7 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](#).

1.8 SAFETY AND HEALTH

Apply coating materials using safety methods and equipment in accordance with the following:

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](#) GOVERNMENT 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.

1.8.1 Safety Methods Used During Coating Application

Comply with the requirements of [SSPC PA Guide 3](#).

1.8.2 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.

Submit manufacturer's Safety Data Sheets for coatings, solvents, and other potentially hazardous materials, as defined in **FED-STD-313**.

1.9 ENVIRONMENTAL CONDITIONS

Comply, at minimum, with manufacturer recommendations for space ventilation during and after installation. Isolate area of application from rest of building when applying high-emission paints or coatings.

1.9.1 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.

1.10 **COLOR** SELECTION

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 approximate colors indicated and the product conforms to specified requirements.

Tint each coat progressively darker to enable confirmation of the number of coats.

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.

1.11 LOCATION AND SURFACE TYPE TO BE PAINTED

1.11.1 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.

1.11.1.1 Exterior Painting

Includes new surfaces and existing uncoated surfaces, of the buildings and appurtenances. Also included are existing coated surfaces made bare by cleaning operations.

1.11.1.2 Interior Painting

Includes new surfaces and existing coated surfaces of the buildings and appurtenances as indicated and existing coated surfaces made bare by cleaning operations. Where a space or surface is indicated to be painted, include the following items, unless indicated otherwise.

- a. Exposed columns, girders, beams, joists, and metal deck; and
- b. Other contiguous surfaces.

1.11.2 Painting Excluded

Do not paint the following unless indicated otherwise.

- a. Surfaces concealed and made inaccessible by panelboards, fixed ductwork, machinery, and equipment fixed in place.
- b. Surfaces in concealed spaces. Concealed spaces are defined as enclosed spaces above suspended ceilings, furred spaces, attic spaces, crawl spaces, elevator shafts and chases.
- c. Steel to be embedded in concrete.
- d. Copper, stainless steel, aluminum, brass, and lead except existing coated surfaces.
- e. Hardware, fittings, and other factory finished items.

1.11.3 Mechanical and Electrical Painting

Includes field coating of interior and exterior new surfaces.

- a. Where a space or surface is indicated to be painted, include the following items unless indicated otherwise.
 - (1) Exposed piping, conduit, and ductwork;
 - (2) Supports, hangers, air grilles, and registers;
 - (3) Miscellaneous metalwork and insulation coverings.
- b. Do not paint the following, unless indicated otherwise:
 - (1) New zinc-coated, aluminum, and copper surfaces under insulation
 - (2) New aluminum jacket on piping
 - (3) New interior ferrous piping under insulation.

1.11.3.1 Fire Extinguishing Sprinkler Systems

Clean, pretreat, prime, and paint new fire extinguishing sprinkler systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories. Apply coatings to clean, dry surfaces, using clean brushes. Clean the surfaces to remove dust, dirt, rust, and loose mill scale. Immediately after cleaning, provide the metal surfaces with one coat primer per schedules. Shield sprinkler heads with protective covering while painting is in progress. Upon completion of painting, remove protective covering from sprinkler heads. Remove sprinkler heads which have been painted and replace with new sprinkler heads. Provide primed surfaces with the following:

- a. Piping in Unfinished Areas: Provide primed surfaces with one coat of red alkyd gloss enamel applied to a minimum dry film thickness of 1.0 mil in attic spaces, spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and spaces where walls or ceiling are not painted or not constructed of a prefinished material.
- b. Piping in Finished Areas: Provide primed surfaces with two coats of paint to match adjacent surfaces, except provide valves and operating accessories with one coat of red alkyd gloss enamel applied to a minimum dry film thickness of 1.0 mil. Provide piping with 2 inch wide red enamel bands or self-adhering red plastic bands spaced at maximum of 20 foot intervals throughout the piping systems.

1.11.4 Definitions and Abbreviations

1.11.4.1 Qualification Testing

Qualification testing is the performance of all test requirements listed in the product specification. This testing is accomplished by MPI to qualify each product for the MPI Approved Product List, and may also be accomplished by Contractor's third party testing lab if an alternative to Batch Quality Conformance Testing by MPI is desired.

1.11.4.2 Batch Quality Conformance Testing

Batch quality conformance testing determines that the product provided is the same as the product qualified to the appropriate product specification. This testing must be accomplished by an MPI testing lab.

1.11.4.3 Coating

A film or thin layer applied to a base material called a substrate. A coating may be a metal, alloy, paint, or solid/liquid suspensions on various substrates (such as metals, plastics, wood, paper, leather, cloth). They may be applied by electrolysis, vapor deposition, vacuum, or mechanical means such as brushing, spraying, calendaring, and roller coating. A coating may be applied for aesthetic or protective purposes or both. The term "coating" as used herein includes emulsions, enamels, stains, varnishes, sealers, epoxies, and other coatings, whether used as primer, intermediate, or finish coat. The terms paint and coating are used interchangeably.

1.11.4.4 DFT or dft

Dry film thickness, the film thickness of the fully cured, dry paint or coating.

1.11.4.5 DSD

Degree of Surface Degradation, the MPI system of defining degree of surface degradation. Five (5) levels are generically defined under the Assessment sections in the MPI Maintenance Repainting Manual.

1.11.4.6 EPP

Environmentally Preferred Products, a standard for determining environmental preferability in support of Executive Order 13101.

1.11.4.7 EXT

MPI short term designation for an exterior coating system.

1.11.4.8 INT

MPI short term designation for an interior coating system.

1.11.4.9 micron / microns

The metric measurement for 0.001 mm or one/one-thousandth of a millimeter.

1.11.4.10 mil / mils

The English measurement for 0.001 in or one/one-thousandth of an inch, equal to 25.4 microns or 0.0254 mm.

1.11.4.11 mm

The metric measurement for millimeter, 0.001 meter or one/one-thousandth of a meter.

1.11.4.12 MPI Gloss Levels

MPI system of defining gloss. Seven (7) gloss levels (G1 to G7) are generically defined under the Evaluation sections of the MPI Manuals. Traditionally, Flat refers to G1/G2, Eggshell refers to G3, Semigloss refers to G5, and Gloss refers to G6.

Gloss levels are defined by MPI as follows:

Gloss Level	Description	Units at 60 degrees	Units at 85 degrees
G1	Matte or Flat	0 to 5	10 max
G2	Velvet	0 to 10	10 to 35
G3	Eggshell	10 to 25	10 to 35
G4	Satin	20 to 35	35 min
G5	Semi-Gloss	35 to 70	
G6	Gloss	70 to 85	
G7	High Gloss		

Gloss is tested in accordance with [ASTM D523](#). Historically, the Government has used Flat (G1 / G2), Eggshell (G3), Semi-Gloss (G5), and Gloss (G6).

1.11.4.13 MPI System Number

The MPI coating system number in each Division found in either the MPI Architectural Painting Specification Manual or the Maintenance Repainting Manual and defined as an exterior (EXT/REX) or interior system (INT/RIN). The Division number follows the CSI Master Format.

1.11.4.14 Paint

See Coating definition.

1.11.4.15 REX

MPI short term designation for an exterior coating system used in repainting projects or over existing coating systems.

1.11.4.16 RIN

MPI short term designation for an interior coating system used in repainting projects or over existing coating systems.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to the [coating](#) specifications and standards referenced in PART 3. Submit 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, potlife, and curing and drying times between coats.

Provide certification of [Indoor Air Quality for paints and primers](#).

2.2 HIGH PERFORMANCE COATINGS

2.2.1 Primer, Epoxy, Anti-Corrosive, for Metal

[MPI 101.](#)

2.2.2 Polyurethane, Two-Component, Pigmented, Gloss (Gloss Level 6)

[MPI 72](#)

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 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, 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.

3.3.1 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 or detergent wash in accordance with SSPC SP 1 to remove oil and grease. Where shop coat is missing or damaged, clean according to SSPC SP 2, SSPC SP 3, SSPC SP 6/NACE No.3, or SSPC SP 10/NACE No. 2. Protect shop-coated ferrous surfaces from corrosion by treating and touching up corroded areas immediately upon detection.

3.4.2 Final Ferrous Surface Condition:

For tool cleaned surfaces, the requirements are stated in SSPC SP 2 and SSPC SP 3. Use as a visual reference, photographs in SSPC VIS 3 for the appearance of cleaned surfaces.

For abrasive blast cleaned surfaces, the requirements are stated in 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.

For waterjet cleaned surfaces, the requirements are stated in SSPC SP 12/NACE No.5. 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, steam, or non-alkaline detergent solution in accordance with [SSPC SP 1](#). 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 12/NACE No.5](#) WJ3 to remove loose coating from surfaces with less than 20 percent coating deterioration and no blistering, peeling, or cracking. Use inhibitor as recommended by the coating manufacturer to prevent rusting.

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 Terne-Coated Metal Surfaces

Solvent clean surfaces with mineral spirits, [ASTM D235](#). Wipe dry with clean, dry cloths.

3.4.6 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 surfaces with a solution composed of [1/2 cup](#) trisodium phosphate, [1/4 cup](#) household detergent, and [4 quarts](#) of warm water. Then rinse thoroughly with fresh water. For large areas, water blasting may be used.
 - (2) Fungus and Mold: Wash new, existing coated, surfaces with a solution composed of [1/2 cup](#) trisodium phosphate, [1/4 cup](#) household detergent, [1 quart](#) 5 percent sodium hypochlorite solution and [3 quarts](#) of warm water. Rinse thoroughly with fresh water.
 - (3) Paint and Loose Particles: Remove by wire brushing.

(4) Efflorescence: Remove by scraping or wire brushing followed by washing with a 5 to 10 percent by weight aqueous solution of hydrochloric (muriatic) acid. Do not allow acid to remain on the surface for more than five minutes before rinsing with fresh water. Do not acid clean more than 4 square feet of surface, per workman, at one time.

- c. Cosmetic Repair of Minor Defects: Repair or fill mortar joints and minor defects, including but not limited to spalls, in accordance with manufacturer's recommendations and prior to coating application.
- d. Allowable Moisture Content: Latex coatings may be applied to damp surfaces, but not to surfaces with droplets of water. Do not apply epoxies to damp vertical surfaces as determined by ASTM 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 manufacturers recommendations. Allow surfaces to cure a minimum of 30 days before painting.

3.5.2 Gypsum Board, Plaster, and Stucco

- a. 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 will be water-based.
- b. Repair of Minor Defects: Prior to painting, repair joints, cracks, holes, surface irregularities, and other minor defects with patching plaster or spackling compound and sand smooth.
- c. Allowable Moisture Content: Latex coatings may be applied to damp surfaces, but not surfaces with droplets of water. Do not apply epoxies to damp surfaces as determined by ASTM 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 PREPARATION OF WOOD AND PLYWOOD SURFACES

3.6.1 New Plywood and Wood Surfaces, Except Floors:

- a. Clean wood surfaces of foreign matter.

Surface Cleaning: Verify that surfaces are free from dust and other deleterious substances and in a condition approved by the Contracting Officer prior to receiving paint or other finish. Do not use water to clean uncoated wood. Scrape to remove loose coatings. Lightly sand to roughen the entire area of previously enamel-coated wood surfaces.

- b. Removal of Fungus and Mold: Wash existing coated surfaces with a solution composed of 3 ounces (2/3 cup) trisodium phosphate, 1 ounce (1/3 cup) household detergent, 1 quart 5 percent sodium hypochlorite solution and 3 quarts of warm water. Rinse thoroughly with fresh water.
- c. Do not exceed 12 percent moisture content of the wood as measured by a moisture meter in accordance with ASTM D4444, Method A, unless

otherwise authorized.

- d. Prime or touch up wood surfaces adjacent to surfaces to receive water-thinned paints before applying water-thinned paints.
- e. Cracks and Nailheads: Set and putty stop nailheads and putty cracks after the prime coat has dried.
- f. Cosmetic Repair of Minor Defects:
 - (1) Knots and Resinous Wood: Prior to application of coating, cover knots and stains with two or more coats of 3-pound-cut shellac varnish, plasticized with 5 ounces of castor oil per gallon. Scrape away existing coatings from knotty areas, and sand before treating. Prime before applying any putty over shellacked area.
 - (2) Open Joints and Other Openings: Fill with whiting putty, linseed oil putty. Sand smooth after putty has dried.
 - (3) Checking: Where checking of the wood is present, sand the surface, wipe and apply a coat of pigmented orange shellac. Allow to dry before paint is applied.

3.6.2 Interior Wood Surfaces, Stain Finish

Sand interior wood surfaces to receive stain. Fill oak and other open-grain wood to receive stain with a coat of wood filler not less than 8 hours before the application of stain; remove excess filler and sand the surface smooth.

3.7 APPLICATION

3.7.1 Coating Application

Comply with applicable federal, state and local laws enacted to insure compliance with Federal Clean Air Standards. Apply coating materials in accordance with SSPC PA 1. SSPC PA 1 methods are applicable to all substrates, except as modified herein.

At the time of application, paint must show no signs of deterioration. Maintain uniform suspension of pigments during application.

Unless otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. Use trigger operated spray nozzles for water hoses. 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.

Only apply paints, except water-thinned types to surfaces that are completely free of moisture as determined by sight or touch.

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.

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.

Touch up damaged coatings before applying subsequent coats. Broom clean and clear dust from interior areas before and during the application of coating material.

Apply paint to new fire extinguishing sprinkler systems including valves, piping, conduit, hangers, supports, miscellaneous metal work, and accessories. Shield sprinkler heads with protective coverings while painting is in progress. Remove sprinkler heads which have been painted and replace with new sprinkler heads. For piping in unfinished spaces, provide primed surfaces with one coat of red alkyd gloss enamel to a minimum dry film thickness of 1.0 mil. Unfinished spaces include attic spaces, spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and space where walls or ceiling are not painted or not constructed of a prefinished material. For piping in finished areas, provide prime surfaces with two coats of paint to match adjacent surfaces, except provide valves and operating accessories with one coat of red alkyd gloss enamel. Upon completion of painting, remove protective covering from sprinkler heads.

- a. Drying Time: Allow time between coats, as recommended by the coating manufacturer, to permit thorough drying, but not to present topcoat adhesion problems. Provide each coat in specified condition to receive next coat.
- b. Primers, and Intermediate Coats: Do not allow primers or intermediate coats to dry more than 30 days, or longer than recommended by manufacturer, before applying subsequent coats. Follow manufacturer's recommendations for surface preparation if primers or intermediate coats are allowed to dry longer than recommended by manufacturers of subsequent coatings. Cover each preceding coat or surface completely by ensuring visually perceptible difference in shades of successive coats.
- c. Finished Surfaces: Provide finished surfaces free from runs, drops, ridges, waves, laps, brush marks, and variations in colors.
- d. Thermosetting Paints: Topcoats over thermosetting paints (epoxies and urethanes) should be applied within the overcoating window recommended by the manufacturer.

3.7.2 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 1 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.

3.7.3 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.

3.7.4 Coating Systems

- a. Systems by Substrates: Apply coatings that conform to the respective specifications listed in the following applicable Tables:

Table

Division 3. Exterior Concrete Paint Table
Division 4. Exterior Concrete Masonry Units Paint Table
Division 5. Exterior Metal, Ferrous and Non-Ferrous Paint Table
Division 6. Exterior Wood; Dressed Lumber, Paneling, Plastics
Paint Table
Division 9: Exterior Stucco Paint Table
Division 10. Exterior Cloth Coverings and Bituminous Coated
Surfaces Paint Table

Division 3. Interior Concrete Paint Table
Division 4. Interior Concrete Masonry Units Paint Table
Division 5. Interior Metal, Ferrous and Non-Ferrous Paint Table
Division 6. Interior Wood Paint Table
Division 9: Interior Plaster, Gypsum Board, Textured Surfaces
Paint Table

- b. Minimum Dry Film Thickness (DFT): Apply paints, primers, varnishes, enamels, undercoats, and other coatings to a minimum dry film thickness of 1.5 mil each coat unless specified otherwise in the Tables. Coating thickness where specified, refers to the minimum dry film thickness.
- c. Coatings for Surfaces Not Specified Otherwise: Coat surfaces which have not been specified, the same as surfaces having similar conditions of exposure.
- d. Existing Surfaces Damaged During Performance of the Work, Including New Patches In Existing Surfaces: Coat surfaces with the following:
- (1) One coat of primer.
 - (2) One coat of undercoat or intermediate coat.
 - (3) One topcoat to match adjacent surfaces.
- e. Existing Coated Surfaces To Be Painted: Apply coatings conforming to the respective specifications listed in the Tables herein, except that pretreatments, sealers and fillers need not be provided on surfaces where existing coatings are soundly adhered and in good condition. Do not omit undercoats or primers.

3.8 COATING SYSTEMS FOR METAL

Apply coatings of Tables in Division 5 for Exterior and Interior.

- a. Apply specified ferrous metal primer on the same day that surface is cleaned, to surfaces that meet all specified surface preparation

requirements at time of application.

- b. Inaccessible Surfaces: Prior to erection, use one coat of specified primer on metal surfaces that will be inaccessible after erection.
- c. Shop-primed Surfaces: Touch up exposed substrates and damaged coatings to protect from rusting prior to applying field primer.
- d. Surface Previously Coated with Epoxy or Urethane: Apply MPI 101, 1.5 mils DFT immediately prior to application of epoxy or urethane coatings.
- e. Pipes and Tubing: The semitransparent film applied to some pipes and tubing at the mill is not to be considered a shop coat. 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.

3.9 COATING SYSTEMS FOR CONCRETE AND CEMENTITIOUS SUBSTRATES

Apply coatings of Tables in Division 3, 4 and 9 for Exterior and Interior.

3.10 COATING SYSTEMS FOR WOOD AND PLYWOOD

- a. Apply coatings of Tables in 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.

3.11 PIPING IDENTIFICATION

Piping Identification, Including Surfaces In Concealed Spaces: Provide in accordance with ASME A13.1. Place stenciling in clearly visible locations. On piping not covered by ASME A13.1, stencil approved names or code letters, in letters a minimum of 1/2 inch high for piping and a minimum of 2 inches high elsewhere. Stencil arrow-shaped markings on piping to indicate direction of flow using black stencil paint.

3.12 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.

3.13 WASTE MANAGEMENT

As specified in the Waste Management Plan specified in Section 01 74 19 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT 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.

3.14 PAINT TABLES

All DFT's are minimum values.

3.14.1 Exterior Paint Tables

DIVISION 5: EXTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE

A. New Galvanized surfaces:

1. Pigmented Polyurethane System (EXT 5.3L):

Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI 101

Intermediate Coat: Polyurethane, two-component, pigmented,
(Gloss Level 6), MPI 72

Topcoat: Polyurethane, two-component, pigmented,
(Gloss Level 6), MPI 72

3.14.2 Interior Paint Tables

DIVISION 4: INTERIOR CONCRETE MASONRY UNITS PAINT TABLE

A. New Concrete masonry:

1. Institutional Low Odor / Low VOC Latex

New; MPI INT 4.2E-G3 (Eggshell)

Filler	Primer:	Intermediate:	Topcoat:
MPI 4	N/A	MPI 145	MPI 145

System DFT: 4 mils

Fill all holes in masonry surface

2. Epoxy

MPI INT 4.2G-G6 (Gloss)

Filler:	Primer:	Intermediate:	Topcoat:
MPI 116	N/A	MPI 77	MPI 77

System DFT: 10 mils

Fill all holes in masonry surface

DIVISION 5: INTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE

INTERIOR STEEL / FERROUS SURFACES

A. Metal, Mechanical, Electrical, Fire extinguishing sprinkler systems including valves, conduit, hangers, supports, Surfaces adjacent to painted surfaces (Match surrounding finish), and miscellaneous metal items not otherwise specified except floors:

1. Alkyd

MPI INT 5.1E-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 79	MPI 47	MPI 47

System DFT: 5.25 mils

DIVISION 6: INTERIOR WOOD PAINT TABLE

A. New Wood and plywood not otherwise specified:

DIVISION 6: INTERIOR WOOD PAINT TABLE

1. Alkyd

MPI INT 6.4B-G5 (Semigloss)

Primer: Intermediate: Topcoat:

MPI 45 MPI 47 MPI 47

System DFT: 4.5 mils

2. Institutional Low Odor / Low VOC Latex

New; MPI INT 6.3V-G5 (Semigloss)

Primer: Intermediate: Topcoat:

MPI 39 MPI 147 MPI 147

System DFT: 4 mils

B. New Wood and Plywood, except floors; natural finish or stained:

1. Stained, oil-modified polyurethane

New; MPI INT 6.4E-G6 (Gloss) / Existing MPI RIN 6.4G C6 (gloss)

Stain: Primer: Intermediate: Topcoat:

MPI 90 MPI 56 MPI 56 MPI 56

System DFT: 4 mils

DIVISION 9: INTERIOR PLASTER, GYPSUM BOARD, TEXTURED SURFACES PAINT TABLE

A. New Wallboard not otherwise specified:

1. Institutional Low Odor / Low VOC Latex

New; MPI INT 9.2M-G3 (Eggshell) / Existing; MPI RIN 9.2M-G3 (Eggshell)

Primer: Intermediate: Topcoat:

MPI 50 MPI 145 MPI 145

System DFT: 4 mils

B. New Wallboard in toilets, food-preparation, laundry areas, shower areas, and other high humidity areas not otherwise specified:

1. Epoxy

New; MPI INT 9.2E-G6 (Gloss) / Existing; MPI RIN 9.2D-G6 (Gloss)

Primer: Intermediate: Topcoat:

MPI 50 MPI 77 MPI 77

System DFT: 4 mils

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TOILET COMPARTMENTS

08/17

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 - 2.3.1 Toilet Enclosures
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- 2.4 OVERHEAD-BRACED PARTITIONS
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 - 2.6.2 Finishes No. 5

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TOILET COMPARTMENTS

08/17

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.

ALUMINUM ASSOCIATION (AA)

AA DAF45 (2003; Reaffirmed 2009) Designation System for Aluminum Finishes

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M (2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A167 (2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

ASTM A385/A385M (2017) Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)

INTERNATIONAL CODE COUNCIL (ICC)

ICC A117.1 COMM (2017) Standard And Commentary Accessible and Usable Buildings and Facilities

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-60003 (Basic) Partitions, Toilet, Complete

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

36 CFR 1191 Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Fabrication Drawings

Installation Drawings; G

SD-03 Product Data

Cleaning and Maintenance Instructions

Anchoring Devices and Fasteners

Hardware and Fittings

Brackets

Door Hardware

Pilaster Shoes

Finishes; G

Toilet Partition System; G

Manufacturer's technical data and catalog cuts including installation and cleaning instructions.

SD-04 Samples

Colors and Finishes; G

Hardware and Fittings

Anchoring Devices and Fasteners

SD-07 Certificates

Warranty

SD-10 Operation and Maintenance Data

Cleaning and Maintenance Instructions

1.3 REGULATORY REQUIREMENTS

Conform to **ICC A117.1 COMM** code for access for the handicapped operation of toilet compartment door and hardware.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials in the manufacturer's original unopened packages with the brand, item identification, and project reference clearly marked. Store components in a dry location that is adequately ventilated; free from dust, water, other contaminants, and damage during delivery, storage, and construction.

1.5 WARRANTY

Provide certification or warranties that toilet partition system will be

free of defects in materials, fabrication, finish, and installation and will remain so for a period of not less than 10 years after final acceptance of the work.

PART 2 PRODUCTS

2.1 SYSTEM REQUIREMENTS

Provide a complete and usable [toilet partition system](#) toilet partition system, including toilet enclosures, room entrance screens, urinal screens, system of panels, hardware, and support components. Furnish the partition system from a single manufacturer, with a standard product as shown in the most recent catalog data. Submit [Fabrication Drawings](#) for metal toilet partitions and urinal screens consisting of fabrication and assembly details to be performed in the factory. Submit manufacturer's [Cleaning and Maintenance Instructions](#) with Fabrication Drawings for review.

2.2 MATERIALS

2.2.1 Solid Polyethylene Panels (Finish 5)

Provide high-density polyethylene (HDPE) suitable for exposed application. Waterproof, non-absorbent and graffiti-resistant smooth surface with a Flame Spread Index of 75 or less, and a Smoke Developed Index of 450 or less.

2.2.2 [Anchoring Devices and Fasteners](#)

Provide steel anchoring devices and fasteners hot-dipped galvanized after fabrication, in conformance with [ASTM A385/A385M](#) and [ASTM A123/A123M](#). Conceal all galvanized anchoring devices.

2.2.3 [Brackets](#)

Wall brackets must be two-ear panel brackets, T-style, [1-inch](#) stock. Provide stirrup style panel-to-pilaster brackets.

2.2.4 [Hardware and Fittings](#)

2.2.4.1 General Requirements

Conform hardware for the toilet partition system to [CID A-A-60003](#) for the specified type and style of partitions. Provide hardware finish highly resistant to alkalis, urine, and other common toilet room acids. Comply latching devices and hinges for handicap compartments with [36 CFR 1191](#); provide Type 304 corrosion-resistant stainless steel, [ASTM A167](#) devices and hinges with door latches that operate without either tight grasping or twisting of the wrist of the operator. Submit three samples of each item, including anchoring devices and fasteners. Approved hardware samples may be installed in the work if properly identified.

2.2.4.2 [Finishes](#)

- a. Corrosion-resistant steel shall have a No. 4 finish.
- b. Exposed fasteners must match the hardware and fittings.

2.2.5 Door Hardware

2.2.5.1 Hinges

Hinges must be adjustable to hold in-swinging doors open at any angle up to 90 degrees and outswinging doors to 10 degrees. Provide self-lubricating hinges with the indicated swing. Hinges must be the surface-mounted type.

2.2.5.2 Latch and Pull

Latch and pull must be a combination rubber-faced door strike and keeper equipped with emergency access.

2.2.5.3 Coat Hooks and Door Bumpers

Coat hooks must be combination units with hooks and rubber tipped pins. Provide manufacturer's standard rubber-tipped bumper unit for door swings indicated.

2.3 PARTITION PANELS AND DOORS

Fabricate partition panels and doors not less than 1 inch thick.

2.3.1 Toilet Enclosures

Provide and conform toilet enclosures to CID A-A-60003, Type I, Style C, overhead braced. Furnish width, length, and height of toilet enclosures as shown. Provide a panel width of 1 inch. Finish surface of panels shall be solid polyethylene, Finish 5; water resistant; graffiti resistant; non-absorbent. Reinforce panels indicated to receive toilet paper holders or grab bars for mounting of the items required. Provide grab bars to withstand a bending stress, shear stress, shear force, and a tensile force induced by 250 lbf. Grab bars must not rotate within their fittings.

2.3.2 Urinal Screens

Provide and conform urinal screens to CID A-A-60003, Type III, Style F, wall hung. Provide finish for surface of screens as solid polyethylene, Finish 5; water resistant; graffiti resistant; non-absorbent; with radius beveled edges. Furnish width and height of urinal screens as shown. Provide panel thickness of 1 inch. Secure wall hung urinal screens with 42-inch long, continuous flanges. Fabricate screens from the same types of panels and pilasters as the toilet partitions. Use corrosion-resistant stainless steel fittings and fasteners.

2.4 OVERHEAD-BRACED PARTITIONS

Pilasters must be not less than 1 inch thick. Provide anchoring device at the bottom of the pilaster consisting of a channel-shaped floor stirrup fabricated from not less than 0.0635 inch thick material and a leveling bolt. Secure the stirrup to the pilaster with not less than a 3/16 inch bolt and nut after the pilaster is leveled. Secure the stirrup to the floor with not less than two lead expansion shields and sheetmetal screws. Fabricate overhead brace from a continuous extruded aluminum tube not less than 1 inch wide by 1-1/2 inch high, 0.125-inch wall thickness. Finish must be AA-C22A31 in accordance with AA DAF45. Set and secure brace into the top of each pilaster. Fabricate 3 inch high trim piece at the floor from not less than 0.030 inch thick corrosion-resistant stainless steel.

2.5 PILASTER SHOES

Provide shoes at pilasters to conceal floor-mounted anchorage. Pilaster shoes shall be one piece molded HDPE. Height shall be 3 inches.

2.6 COLORS AND FINISHES

2.6.1 Colors

Provide colors as indicated on drawings. Color of pilaster shoes must match the core of solid plastic compartments and screens. Submit three samples showing a finished edge on two adjacent sides and core construction, each not less than 12-inch square.

2.6.2 Finishes No. 5

Provide solid plastic fabricated of polymer resins (polyethylene) formed under high pressure rendering a single component section not less than one inch thick. Colors must extend throughout the panel thickness. Solid plastic partitions must not show any sign of deterioration when immersed in the following chemicals and maintained at a temperature of 80 degrees F for a minimum of 30 days:

Acetic Acid (80 percent)	Hydrochloric Acid (40 percent)
Acetone	Hydrogen Peroxide (30 percent)
Ammonia (liquid)	Isopropyl Alcohol
Ammonia Phosphate	Lactic Acid (25 percent)
Bleach (12 percent)	Lime Sulfur
Borax	Nicotine
Brine	Potassium Bromide
Caustic Soda	Soaps
Chlorine Water	Sodium Bicarbonate
Citric Acid	Trisodium Phosphate
Copper Chloride	Urea; Urine
Core Oils	Vinegar

PART 3 EXECUTION

3.1 PREPARATION

Take field measurements prior to the preparation of drawing and fabrication to ensure proper fits. Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive work. Verify correct spacing of plumbing fixtures. Verify correct location of built in framing, anchorage, and bracing. Report in writing to Contracting Officer prevailing conditions that will adversely affect satisfactory

execution of the work of this section. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

Do not install items that show visual evidence of biological growth. Install partitions rigid, straight, plumb, and level in accordance with manufacturer's written instructions.

- a. Submit [Installation Drawings](#) for metal toilet partitions and urinal screens showing plans, elevations, details of construction, hardware, reinforcing and blocking, fittings, mountings and escutcheons. Indicate on drawings the type of partition, location, mounting height, cutouts, and reinforcement required for toilet-room accessories.

3.3 OVERHEAD-BRACED PARTITIONS

Secure pilasters to the floor with the anchorage device specified. Make all leveling devices readily accessible for leveling, plumbing, and tightening the installation. Secure overhead brace to the pilaster face with not less than two fasteners per face. Expansion shields must have a minimum [2-inch](#) penetration into the concrete slab. Make tops of doors parallel with the overhead brace when doors are in a closed position.

3.4 FINAL ADJUSTMENT

After completion of the installation, make final adjustments to the pilaster-leveling devices, door hardware, and other working parts of the partition assembly. Doors must have a uniform vertical edge clearance of approximately [3/16 inch](#) and must rest open at approximately 30 degrees when unlatched.

3.5 CLEANING

Clean all surfaces of the work, and adjacent surfaces soiled as a result of the work, in an approved manner compliant with the manufacturer's recommended cleaning and protection from damage procedures until accepted. Remove all equipment, tools, surplus materials, and work debris from the site.

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TOILET ACCESSORIES

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TOILET ACCESSORIES

08/17

PART 1 GENERAL

1.1 SUBMITTALS

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

SD-03 Product Data

Finishes; G

Accessory Items; G

SD-04 Samples

Finishes; G

Accessory Items

SD-07 Certificates

Accessory Items

1.2 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.

1.3 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period from date of final acceptance of the work.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

Provide each accessory item complete with the necessary mounting plates of sturdy construction with corrosion resistant surface.

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.

2.1.2 Finishes

Except where noted otherwise, provide stainless steel, No. 4 satin finish.

2.2 ACCESSORY ITEMS

Conform to the requirements for accessory items specified below. Submit fasteners proposed for use for each type of wall construction, mounting, operation, and cleaning instructions and one sample of each other accessory proposed for use. Incorporate approved samples into the finished work, provided they are identified and their locations noted. Submit certificate for each type of accessory specified, attesting that the items meet the specified requirements.

2.2.1 Grab Bar

Provide an 18 gauge, 1-1/4 inch grab bar OD Type 304 stainless steel. Provide form and length for grab bars 36-inches and 42-inches as indicated. Provide concealed mounting flange. Provide grab with peened non-slip surface. Furnish installed bars capable of withstanding a 500 pound vertical load without coming loose from the fastenings and without obvious permanent deformation. Allow 1-1/2 inch space between wall and grab bar.

2.2.2 Mirrors, Framed, Wall-Mounted

Wall-mounted, stainless steel frame; 1/4 inch tempered float glass with special waterproof back. One piece stainless steel channel frame with beveled front. Galvanized steel back shall have integral horizontal hanging brackets near the top and near the bottom. Size, 24 inches by 36 inches.

2.2.3 Sanitary Napkin Disposer

Construct a Type 304 stainless steel sanitary napkin disposal with removable leak-proof receptacle for disposable liners. Provide fifty disposable liners of the type standard with the manufacturer. Retain receptacle in cabinet by tumbler lock. Provide disposer with a door for inserting disposed napkins, partition mounted and surface mounted, as indicated.

2.2.4 Soap Dispenser

Provide soap dispenser surface mounted, liquid type consisting of a vertical Type 304 stainless steel tank with holding capacity of 40 fluid ounces with a corrosion-resistant all-purpose valve that dispenses liquid soaps, lotions, detergents and antiseptic soaps.

2.2.5 Toilet Tissue Dispenser

Furnish Type II - surface mounted toilet tissue holder with two rolls of standard tissue mounted horizontally. Provide stainless steel, satin finish cabinet.

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. After installation, thoroughly clean exposed surfaces and restore damaged work to its original condition or replace with new work.

3.1.1 Surface Mounted Accessories

Mount on concealed backplates, unless specified otherwise. Conceal fasteners on accessories without backplates. Install accessories with sheet metal screws, PTFE or neoprene sleeves, or lead expansion shields, or with toggle bolts or other approved fasteners as required by the construction. Install backplates in the same manner, or provide with lugs or anchors set in mortar, as required by the construction. Fasten accessories mounted on gypsum board and plaster walls without solid backing into the metal or wood studs or to solid wood blocking secured between wood studs, or to metal backplates secured to metal studs.

3.2 CLEANING

Clean material in accordance with manufacturer's recommendations. Do not use alkaline or abrasive agents. Take precautions to avoid scratching or marring exposed surfaces.

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FIRE EXTINGUISHERS AND CABINETS

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FIRE EXTINGUISHERS AND CABINETS
05/15

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM A1008 (2018) 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 E814 (2013a; R 2017) Standard Test Method for Fire Tests of Penetration Firestop Systems

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10 (2018; TIA 18-1) Standard for Portable Fire Extinguishers

1.2 SUBMITTALS

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

SD-01 Preconstruction Submittals

Product Schedule; G

SD-02 Shop Drawings

Cabinets; G

SD-03 Product Data

Manufacturer's Data; G

SD-07 Certificates

Fire Extinguishers; G

Manufacturer's Warranty with Inspection Tag; G

Cabinets; G

SD-10 Operation and Maintenance Data

Fire Extinguishers, Data Package 1; G

Cabinets, Data Package 1; G

Replacement Parts List; G

1.3 DELIVERY, STORAGE, AND HANDLING

Protect materials from weather, soil, and damage during delivery, storage, and construction.

Deliver materials in their original packages, containers, or bundles bearing the brand name and the name and type of the material.

1.3.1 Product Data

Submit manufacturer's data for each type of Fire Extinguisher and Fire Protection Cabinet required, detailing all related wall mounting and accessories information, complete with manufacturer's warranty with inspection tag.

1.3.2 Product Schedule

Provide coordinated product schedule for fire extinguishers and fire-protection cabinets to ensure proper fit and function. Use same designations indicated on drawings.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.1.1 Portable Fire Extinguishers

Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers". Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

2.1.2 Fire-Rated Fire-Protection Cabinets

Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

2.2 PORTABLE FIRE EXTINGUISHERS

2.2.1 Types

Submit certificates that show fire extinguishers comply with specified performance requirements.

Multipurpose dry-chemical type; UL-rated 4-A:60-B:C, 10-lb.

2.2.2 Material

Provide corrosion-resistant steel or aluminum extinguisher shell.

2.2.3 Accessories

Forged brass valve

Safety release

Pressure gage

2.2.4 Wall Brackets

Manufacturer's standard steel, designed to secure portable fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with red baked enamel finish.

2.2.4.1 Identification

Lettering complying with authorities having jurisdiction for letter style, size, spacing and location. Identify bracket-mounted portable fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface in vertical orientation, unless otherwise indicated.

2.3 FIRE-PROTECTION CABINETS

2.3.1 Cabinet Style

Suitable for fire extinguisher. Components made of cold-rolled steel, ASTM A1008, Commercial Steel, Type B with baked enamel or powder coat; color as selected by Contracting Officer, unless otherwise indicated. Semirecessed with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed square-edge trim face and wall return at outer edge (backbend). Manufacturer's standard door-operating and locking hardware required to suit conditions. Door style shall be fully glazed panel with frame; tempered float glass, clear.

2.3.2 Fire-Rated Cabinets

Fabricate fire-rated cabinets with double wall fabricated from 0.043 inch thick cold-rolled steel sheet lined with minimum 5/8 inch thick fire-barrier material standard with manufacturer. Provide factory-drilled mounting holes. Fire-resistance rating to be the same as walls where installed.

2.3.3 Identification

Lettering complying with authorities having jurisdiction for letter style, size and spacing. Identify portable fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER" in red letter decals applied to cabinet door in vertical orientation.

PART 3 EXECUTION

3.1 INSTALLATION

Comply with the manufacturer's written instructions for all installations.

3.2 PROTECTION

3.2.1 Repairing

Remove and replace damaged and unacceptable portions of completed work with new work at no additional cost to the Government.

Submit [replacement parts list](#) indicating specified items replacement part, replacement cost, and name, address and contact for replacement parts distributor.

3.2.2 Cleaning

Clean all surfaces of the work, and adjacent surfaces which are soiled as a result of the work. Remove from the site all construction equipment, tools, surplus materials and rubbish resulting from the work.

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COUNTERTOPS

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.

ASME INTERNATIONAL (ASME)

ASME B18.6.1 (2016) Wood Screws (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM A325 (2014) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

ASTM A325M (2014) Standard Specification for Structural Bolts, Steel, Heat Treated, 830 MPa Minimum Tensile Strength (Metric)

ASTM F594 (2009; E 2015) Standard Specification for Stainless Steel Nuts

ASTM F836M (2016, E 2018) Standard Specification for Style 1 Stainless Steel Metric Nuts (Metric)

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

INTERNATIONAL CAST POLYMER ALLIANCE of the AMERICAN COMPOSITES MANUFACTURERS ASSOCIATION (ICPA)

ICPA SS-1 (2001) Performance Standard for Solid Surface Materials

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

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS FF-S-325

(Basic; Int Amd 3; Notices 3, 4) Shield,
Expansion; Nail, Expansion; and Nail,
Drive Screw (Devices, Anchoring, Masonry)

UNDERWRITERS LABORATORIES (UL)

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

SD-02 Shop Drawings

Fabrication; G

Installation Drawings; G

SD-03 Product Data

Solid Surfacing Material; G

Adhesives; G

Fasteners; G

Joint Sealants; G

SD-04 Samples

Countertop; G

Backsplash; G

SD-07 Certificates

Indoor Air Quality for Countertop Products

Indoor Air Quality for Mounting and Stone Adhesives

Indoor Air Quality for Joint Sealants

SD-08 Manufacturer's Instructions

Manufacturer's Instructions

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality Certification

Submit required indoor air quality certifications in one submittal package.

1.3.1.1 Countertop Products

Provide countertop 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.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver, store, and handle countertops and backsplash in a manner that will prevent damage and disfigurement.

Provide temporary skids under units.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide the manufacturer's standard type countertops or as indicated on the drawings. Accomplish fastenings to permit removal and replacement of individual countertops without affecting the remainder of the installation.

Submit [manufacturer's instructions](#) for countertops including special provisions required to install equipment components and system packages. Include all special notices detailing impedances, hazards and safety precautions.

Provide countertop products certified to meet the emissions requirements of [CDPH SECTION 01350](#) (limit requirements for either office or classroom spaces regardless of space type). Provide certification or validation of [indoor air quality for countertop products](#).

2.1.1 Design

Provide factory fabricated, prefinished [solid surfacing material](#) countertops in the manufacturer's standard sizes and finishes of the type, design, and configuration indicated. Accomplish fastenings to permit removal and replacement of individual units without affecting the remainder of the installation.

2.1.1.1 Solid Surfacing Material

[Provide solid surface material that is a homogenous filled solid polymer; not coated, laminated or of a composite construction, complying with ICPA SS-1. Horizontal and vertical surface thickness, 3/4 inch, unless otherwise indicated.](#)

- [a. Basis of Design: Provide products by Corian, or comparable products by another manufacturer may be submitted to the Contracting Officer for approval. Manufacturer's products specified are not intended to limit selection of equal products from other manufacturers.](#)

2.2 FABRICATION

2.2.1 Countertop, Backsplash and Window Sills

Provide countertops, backsplash and window sills of specified solid surface material in sizes and configurations indicated on the drawings.

2.2.2 Color, Texture, and Pattern

Select color as indicated on the drawings. Color listed is not intended to limit the selection of equal colors from other manufacturers.

2.3 MATERIALS

2.3.1 Fasteners

Provide fasteners conforming to the following:

- a. Screws: ASME B18.6.1, Group, Type and Class as applicable
- b. Anchoring Devices: FS FF-S-325, Group, Type, and Class as applicable
- c. Toggle Bolts:
 - (1) Wings are two sheet-metal parts of "U" or channel shape. The wings are pivoted either on trunnion nuts or pins and are held normally in open position by a spring or springs placed inside the wing groove.
 - (2) Wing pivots are integral with the trunnion nuts used with the machine screw or threaded stud. Ensure the nut engages not less than two full threads of its screw or stud except in toggle bolts where the wing parts close on the bolt and lock it while being tightened, in which case one full thread engagement is permissible. The trunnion nuts are inserted in place with the pivots passed through the eyes in the wings.
- d. Nuts: ASTM F594, stainless steel
- e. Bolts: ASTM A325, heavy, hexagon head bolts stainless steel
- f. Nuts: ASTM F836M, stainless steel
- g. Bolts: ASTM A325M, heavy, hexagon head bolts stainless steel

2.3.2 Adhesives

Provide mounting and stone adhesives 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 validation of indoor air quality for mounting and stone adhesives.

2.3.2.1 Mounting Adhesives

Provide structural-grade silicone or epoxy adhesives of type recommended by manufacturer for application and conditions of use.

Provide spacers, if required, of type recommended by adhesive manufacturer.

2.3.2.2 Stone Adhesive

Provide epoxy or polyester adhesive of type recommend by manufacturer for application and conditions of use.

If adhesive will be visible in finished work, tint adhesive to match surfacing.

2.3.3 Joint Sealants

Use clear silicone anti-bacterial type sealant of type recommended by manufacturer for application and conditions of use. Provide joint sealant products 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 validation of indoor air quality for joint sealants.

PART 3 EXECUTION

3.1 INSTALLATION

Inspect material for defects prior to installation. Ensure materials throughout bear labels with the same batch number. Visually inspect materials used for adjacent pieces to assure acceptable color match. Inspect in lighting conditions similar to those on the project. Repair or replace damaged materials.

Install countertops plumb with cabinetry level to within 1/16-inch in 10-feet. Level base cabinets by adjusting leveling screws. Scribe and fit scribe strips to irregularities of adjacent surfaces. Gap openings exceeding 0.025-inch are not acceptable.

Submit installation drawings for countertops. Ensure drawings include location of cabinets, details of cabinets related and dimensional positions, and locations for roughing in plumbing, including sinks, faucets, strainers and cocks.

3.1.1 Installation and Adjustment

Install materials in accordance to manufacturer's written instructions. Lift and place to avoid breakage.

Position materials to verify that materials are correctly sized and prepared. Make necessary adjustments.

If jobsite cutting, grinding, or polishing is required, use water-cooled tools, unless otherwise directed by the Contracting Officer. Protect jobsite and surfaces against dust and water. Perform work away from installation site if possible.

3.2 FIELD QUALITY CONTROL

Examine casework grounds and supports for adequate anchorage, foreign material, moisture, and unevenness that could prevent quality casework installation.

Ensure that electrical and plumbing rough-ins for casework are complete.
Do not proceed with installation until defects are corrected.

3.3 ADJUSTING AND CLEANING

3.3.1 Solvent

Use a product recommended by adhesive manufacturer to clean surface of quartz surfacing to assure adhesion of adhesives and sealants.

3.3.2 Cleaning Agents

Use non-abrasive, soft-scrub type kitchen cleaners.

3.3.3 Cleaning

On completion of cabinet installation, touch up marred or abraded finished surfaces. Remove crating and packing materials from premises. Wipe down surfaces to remove fingerprints and markings and leave in clean condition.

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PART 1 GENERAL

1.1 REFERENCES

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

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI 1010 (2002) Self-Contained, Mechanically Refrigerated Drinking-Water Coolers

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z21.10.3/CSA 4.3 (2017) Gas-Fired Water Heaters Vol.III, Storage Water Heaters With Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous

ANSI Z21.22/CSA 4.4 (2015) Relief Valves for Hot Water Supply Systems

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1010 (2004) Performance Requirements for Water Hammer Arresters (ANSI approved 2004)

ASSE 1018 (2001) Performance Requirements for Trap Seal Primer Valves - Potable Water Supplied (ANSI Approved 2002)

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA B300 (2010; Addenda 2011) Hypochlorites

AWWA B301 (2010) Liquid Chlorine

AWWA C203 (2008) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied

AWWA C606 (2015) Grooved and Shouldered Joints

AWWA C651 (2014) Standard for Disinfecting Water Mains

AWWA C652 (2011) Disinfection of Water-Storage Facilities

AMERICAN WELDING SOCIETY (AWS)

AWS A5.8/A5.8M	(2011; Amendment 2012) Specification for Filler Metals for Brazing and Braze Welding
AWS B2.2/B2.2M	(2016) Specification for Brazing Procedure and Performance Qualification

ASME INTERNATIONAL (ASME)

ASME A112.14.1	(2003; R 2017) 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 A112.6.1M	(1997; R 2017) Floor Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use
ASME B1.20.1	(2013) Pipe Threads, General Purpose (Inch)
ASME B16.12	(2009; R 2014) Cast Iron Threaded Drainage Fittings
ASME B16.15	(2013) Cast Copper Alloy Threaded Fittings Classes 125 and 250
ASME B16.18	(2018) Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.21	(2016) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.22	(2013) Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.23	(2011) Cast Copper Alloy Solder Joint Drainage Fittings - DWV
ASME B16.24	(2011) Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 600, 900, 1500, and 2500
ASME B16.29	(2017) Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings - DWV
ASME B16.3	(2016) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.4	(2011) Standard for Gray Iron Threaded Fittings; Classes 125 and 250
ASME B16.5	(2017) Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard

ASME B16.50	(2013) Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings
ASME B16.51	(2013) Copper and Copper Alloy Press-Connect Pressure Fittings
ASME B31.1	(2016; Errata 2016) Power Piping
ASME B31.5	(2016) Refrigeration Piping and Heat Transfer Components
ASME B40.100	(2013) Pressure Gauges and Gauge Attachments
ASME BPVC SEC IV	(2017) BPVC Section IV-Rules for Construction of Heating Boilers
ASME BPVC SEC IX	(2017; Errata 2018) BPVC Section IX-Welding, Brazing and Fusing Qualifications
ASME BPVC SEC VIII D1	(2017) BPVC Section VIII-Rules for Construction of Pressure Vessels Division 1
ASME CSD-1	(2016) Control and Safety Devices for Automatically Fired Boilers

ASTM INTERNATIONAL (ASTM)

ASTM A105/A105M	(2014) Standard Specification for Carbon Steel Forgings for Piping Applications
ASTM A183	(2014) Standard Specification for Carbon Steel Track Bolts and Nuts
ASTM A193/A193M	(2017) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications
ASTM A47/A47M	(1999; R 2018; E 2018) Standard Specification for Ferritic Malleable Iron Castings
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	(2018) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated,

Welded and Seamless

ASTM A536	(1984; R 2014) Standard Specification for Ductile Iron Castings
ASTM A74	(2017) Standard Specification for Cast Iron Soil Pipe and Fittings
ASTM A888	(2018) Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
ASTM B117	(2016) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B152/B152M	(2013) Standard Specification for Copper Sheet, Strip, Plate, and Rolled Bar
ASTM B306	(2013) Standard Specification for Copper Drainage Tube (DWV)
ASTM B32	(2008; R 2014) Standard Specification for Solder Metal
ASTM B370	(2012) Standard Specification for Copper Sheet and Strip for Building Construction
ASTM B42	(2015a) Standard Specification for Seamless Copper Pipe, Standard Sizes
ASTM B43	(2014) Standard Specification for Seamless Red Brass Pipe, Standard Sizes
ASTM B584	(2014) Standard Specification for Copper Alloy Sand Castings for General Applications
ASTM B75/B75M	(2011) Standard Specification for Seamless Copper Tube
ASTM B813	(2016) Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube
ASTM B88	(2016) Standard Specification for Seamless Copper Water Tube
ASTM C1053	(2000; R 2010) Standard Specification for Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications
ASTM C564	(2014) Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants

ASTM D2000	(2012; R 2017) Standard Classification System for Rubber Products in Automotive Applications
ASTM D2235	(2004; R 2016) Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings
ASTM D2564	(2012) Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D2661	(2014; E 2018) Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40, Plastic Drain, Waste, and Vent Pipe and Fittings
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 D2996	(2017) Standard Specification for Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe
ASTM D3138	(2004; R 2016) Standard Specification for Solvent Cements for Transition Joints Between Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Non-Pressure Piping Components
ASTM D3139	(1998; R 2011) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D3212	(2007; R 2013) 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 D4101	(2017) Standard Classification System and Basis for Specification for Polypropylene Injection and Extrusion Materials
ASTM E1	(2014) Standard Specification for ASTM Liquid-in-Glass Thermometers
ASTM F1760	(2016) Standard Specification for Coextruded Poly(Vinyl Chloride) (PVC) Non-Pressure Plastic Pipe Having Reprocessed-Recycled Content

ASTM F2389	(2017a) Standard Specification for Pressure-rated Polypropylene (PP) Piping Systems
ASTM F409	(2017) Standard Specification for Thermoplastic Accessible and Replaceable Plastic Tube and Tubular Fittings
ASTM F477	(2014) Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F493	(2014) Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings
ASTM F628	(2012; E 2013; E 2016; E 2018) Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core
ASTM F891	(2016) Standard Specification for Coextruded Poly (Vinyl Chloride) (PVC) Plastic Pipe with a Cellular Core

CAST IRON SOIL PIPE INSTITUTE (CISPI)

CISPI 301	(2012) 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

INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS (IAPMO)

IAPMO PS 117	(2005b) Press Type Or Plain End Rub Gasketed W/ Nail CU & CU Alloy Fittings 4 Install On CU Tubing
IAPMO UPC	(2003) Uniform Plumbing Code

INTERNATIONAL CODE COUNCIL (ICC)

ICC A117.1 COMM	(2017) Standard And Commentary Accessible and Usable Buildings and Facilities
ICC IPC	(2018) 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 (2013) Standard Marking System for Valves,
Fittings, Flanges and Unions
- MSS SP-58 (2009) Pipe Hangers and Supports -
Materials, Design and Manufacture,
Selection, Application, and Installation
- MSS SP-80 (2013) Bronze Gate, Globe, Angle and Check
Valves

NACE INTERNATIONAL (NACE)

- NACE SP0169 (2015) Control of External Corrosion on
Underground or Submerged Metallic Piping
Systems

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- NEMA MG 1 (2016; SUPP 2016) Motors and Generators
- NEMA MG 11 (1977; R 2012) Energy Management Guide for
Selection and Use of Single Phase Motors

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 90A (2018) Standard for the Installation of
Air Conditioning and Ventilating Systems

NSF INTERNATIONAL (NSF)

- NSF 372 (2016) Drinking Water System Components -
Lead Content
- NSF/ANSI 14 (2017b) Plastics Piping System Components
and Related Materials
- NSF/ANSI 61 (2017) 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. DEPARTMENT OF ENERGY (DOE)

Energy Star

(1992; R 2006) Energy Star Energy
Efficiency Labeling System (FEMP)

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA SM 9223

(2004) Enzyme Substrate Coliform Test

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

40 CFR 141.80

National Primary Drinking Water
Regulations; Control of Lead and Copper;
General Requirements

1.2 SUBMITTALS

Approval is required for all submittals. Submit the following in
accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Plumbing System;

Detail drawings consisting of schedules, performance charts, instructions, diagrams, and other information to illustrate the requirements and operations of systems that are not covered by the Plumbing Code. Detail drawings for the complete plumbing system including piping layouts and locations of connections; dimensions for roughing-in, foundation, and support points; schematic diagrams and wiring diagrams or connection and interconnection diagrams. Detail drawings must indicate clearances required for maintenance and operation. Where piping and equipment are to be supported other than as indicated, details must include loadings and proposed support methods. Mechanical drawing plans, elevations, views, and details, must be drawn to scale.

SD-03 Product Data

Fixtures

List of installed fixtures with manufacturer, model, and flow rate.

Flush Valve Water Closets

WaterSense Label for Flush Valve Water Closet;

Flush Valve Urinals WaterSense Label for Urinal; S

Wall Hung Lavatories

Countertop Lavatories

Kitchen Sinks

Service Sinks

Drinking-Water Coolers;

Energy Star Label for Electric Water Cooler;

Energy Star Label for Wheelchair Electric Water Cooler;

Water Heaters;

Welding

A copy of qualified procedures and a list of names and identification symbols of qualified welders and welding operators.

Details of vibration-absorbing features, including arrangement, foundation plan, dimensions and specifications.

SD-06 Test Reports

Tests, Flushing and Disinfection

Test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, completion and testing of the installed system. Each test report **must** indicate the final position of controls.

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 **must** 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.

1.3 STANDARD PRODUCTS

Specified **materials and equipment** **must** be standard products of a manufacturer regularly engaged in the manufacture of such products. Specified equipment **must** essentially duplicate equipment that has performed satisfactorily at least two years prior to bid opening. 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.

1.3.1 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 **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.

1.3.3 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.

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, "**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.

1.3.4.1 Definitions

For the International Code Council (ICC) Codes referenced in the contract documents, advisory provisions **must** be considered mandatory, the word "should" **must** be 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."

1.3.4.2 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, **must** 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 must be welded in accordance with qualified procedures using performance-qualified welders and welding operators. Procedures and welders must 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 must be notified 24 hours in advance of tests, and the tests must be performed at the work site if practicable. Welders or welding operators must apply their assigned symbols near each weld they make as a permanent record.

1.6 REGULATORY REQUIREMENTS

Unless otherwise required herein, plumbing work must be in accordance with ICC IPC.

1.7 PROJECT/SITE CONDITIONS

The Contractor must 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 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 must be in accordance with TABLES I and II. Pipe schedules must be selected based on service requirements. Pipe fittings must be compatible with the applicable pipe materials. Plastic pipe, fittings, and solvent cement must meet NSF/ANSI 14 and must be NSF listed for the service intended. Plastic pipe, fittings, and solvent cement used for potable hot and cold water service must bear the NSF seal "NSF-PW." Polypropylene pipe and fittings must conform to dimensional requirements of Schedule 40, Iron Pipe size and must comply with NSF/ANSI 14, NSF/ANSI 61 and ASTM F2389. Polypropylene piping that will be exposed to UV light must be provided with a Factory applied UV resistant coating. Pipe threads (except dry seal) must conform to ASME B1.20.1. Grooved pipe couplings and fittings must be from the same manufacturer. Material or equipment containing a weighted average of greater than 0.25 percent lead must not be used in any potable water system intended for human consumption, and must be certified in accordance with NSF/ANSI 61, Annex G or NSF 372. In line devices such as water meters, building valves, check

valves, meter stops, valves, fittings and back flow preventers must 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 must not be installed underground, under concrete floor slabs, or in crawl spaces below kitchen floors. Plastic pipe must not be installed in air plenums. Plastic pipe must not be installed in a pressure piping system in buildings greater than three stories including any basement levels.

2.1.1 Pipe Joint Materials

Grooved pipe and hubless cast-iron soil pipe must not be used underground. Solder containing lead must not be used with copper pipe. Cast iron soil pipe and fittings must be marked with the collective trademark of the Cast Iron Soil Institute. Joints and gasket materials must conform to the following:

- a. Coupling for Cast-Iron Pipe: for hub and spigot type ASTM A74, AWWA C606. For hubless type: CISPI 310
- b. Coupling for Steel Pipe: AWWA C606.
- c. Couplings for Grooved Pipe: Ductile Iron ASTM A536 (Grade 65-45-12) . Copper ASTM A536.
- d. Flange Gaskets: Gaskets must be made of non-asbestos material in accordance with ASME B16.21. Gaskets must be flat, 1/16 inch thick, and contain Aramid fibers bonded with Styrene Butadiene Rubber (SBR) or Nitro Butadiene Rubber (NBR). Gaskets must be the full face or self centering flat ring type. Gaskets used for hydrocarbon service must be bonded with NBR.
- e. Brazing Material: Brazing material must conform to AWS A5.8/A5.8M, BCuP-5.
- f. Brazing Flux: Flux must be in paste or liquid form appropriate for use with brazing material. Flux must be as follows: lead-free; have a 100 percent flushable residue; contain slightly acidic reagents; contain potassium borides; and contain fluorides.
- g. Solder Material: Solder metal must conform to ASTM B32.
- h. Solder Flux: Flux must be liquid form, non-corrosive, and conform to ASTM B813, Standard Test 1.
- i. PTFE Tape: PTFE Tape, for use with Threaded Metal or Plastic Pipe.
- j. Rubber Gaskets for Cast-Iron Soil-Pipe and Fittings (hub and spigot type and hubless type): ASTM C564.
- k. Rubber Gaskets for Grooved Pipe: ASTM D2000, maximum temperature 230 degrees F.
- l. Flexible Elastomeric Seals: ASTM D3139, ASTM D3212 or ASTM F477.

- m. Bolts and Nuts for Grooved Pipe Couplings: Heat-treated carbon steel, [ASTM A183](#).
- n. Solvent Cement for Transition Joints between ABS and PVC Nonpressure Piping Components: [ASTM D3138](#).
- o. Plastic Solvent Cement for ABS Plastic Pipe: [ASTM D2235](#).
- p. Plastic Solvent Cement for PVC Plastic Pipe: [ASTM D2564](#) and [ASTM D2855](#).
- q. Plastic Solvent Cement for CPVC Plastic Pipe: [ASTM F493](#).
- r. Flanged fittings including, but not limited to, flanges, bolts, nuts and bolt patterns must be in accordance with [ASME B16.5](#) class 150 and must have the manufacturer's trademark affixed in accordance with [MSS SP-25](#). Flange material must conform to [ASTM A105/A105M](#). Blind flange material must conform to [ASTM A516/A516M](#) cold service and [ASTM A515/A515M](#) for hot service. Bolts must be high strength or intermediate strength with material conforming to [ASTM A193/A193M](#).
- s. Press fittings for Copper Pipe and Tube: Copper press fittings must conform to the material and sizing requirements of [ASME B16.51](#) and performance criteria of [IAPMO PS 117](#). Sealing elements for copper press fittings must be EPDM, FKM or HNBR. Sealing elements must be factory installed or an alternative supplied fitting manufacturer. Sealing element must be selected based on manufacturer's approved application guidelines.
- t. Copper tubing must conform to [ASTM B88](#), Type K, L or M.
- u. Heat-fusion joints for polypropylene piping: [ASTM F2389](#).

2.1.2 Miscellaneous Materials

Miscellaneous materials must conform to the following:

- a. Copper, Sheet and Strip for Building Construction: [ASTM B370](#).
- b. Hose Clamps: [SAE J1508](#).
- c. Supports for Off-The-Floor Plumbing Fixtures: [ASME A112.6.1M](#).
- d. Plumbing Fixture Setting Compound: A preformed flexible ring seal molded from hydrocarbon wax material. The seal material must be nonvolatile nonasphaltic and contain germicide and provide watertight, gastight, odorproof and verminproof properties.
- e. Hypochlorites: [AWWA B300](#).
- f. Liquid Chlorine: [AWWA B301](#).
- g. Gauges - Pressure and Vacuum Indicating Dial Type - Elastic Element: [ASME B40.100](#).
- h. Thermometers: [ASTM E1](#). Mercury must not be used in thermometers.

2.1.3 Pipe Insulation Material

Insulation must 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 must conform to MSS SP-58.

2.3 VALVES

Valves must be provided on supplies to equipment and fixtures. Valves 2-1/2 inches and smaller must be bronze with threaded bodies for pipe and solder-type connections for tubing. Valves 3 inches and larger must have flanged iron bodies and bronze trim. Pressure ratings must be based upon the application. Grooved end valves may be provided if the manufacturer certifies that the valves meet the performance requirements of applicable MSS standard. Valves must conform to the following standards:

Description	Standard
Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends	MSS SP-110
Bronze Gate, Globe, Angle, and Check Valves	MSS SP-80
Backwater Valves	ASME A112.14.1
Vacuum Relief Valves	ANSI Z21.22/CSA 4.4
Water Heater Drain Valves	ASME BPVC SEC IV, Part HLW-810: Requirements for Potable-Water Heaters Bottom Drain Valve
Trap Seal Primer Valves	ASSE 1018
Temperature and Pressure Relief Valves for Hot Water Supply Systems	ANSI Z21.22/CSA 4.4
Temperature and Pressure Relief Valves for Automatically Fired Hot Water Boilers	ASME CSD-1 Safety Code No., Part CW, Article 5

2.3.1 Wall Faucets

Wall faucets with vacuum-breaker backflow preventer must be brass with 3/4

inch male inlet threads, hexagon shoulder, and 3/4 inch hose connection. Faucet handle must be securely attached to stem.

2.3.2 Thermostatic Mixing Valves

Provide thermostatic mixing valve for electric water heater. Mixing valves, thermostatic type, pressure-balanced or combination thermostatic and pressure-balanced must be line size and must be constructed with rough or finish bodies either with or without plating. The valve must 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 must be of an approved type. The body must be of heavy cast bronze, and interior parts must be brass, bronze, corrosion-resisting steel or copper. The valve must be equipped with necessary stops, check valves, unions, and sediment strainers on the inlets. Mixing valves must maintain water temperature within 5 degrees F of any setting.

2.4 FIXTURES

Water closet replacements in major renovations may have a flush valve of up to 1.6 GPF to accommodate existing plumbing capacity. Fixtures for use by the physically handicapped must be in accordance with ICC A117.1 COMM. Vitreous China, nonabsorbent, hard-burned, and vitrified throughout the body must be provided. No fixture will be accepted that shows cracks, crazes, blisters, thin spots, or other flaws. Fixtures must 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, must be equipped with a trap. Brass expansion or toggle bolts capped with acorn nuts must be provided for supports, and polished chromium-plated pipe, valves, and fittings must be provided where exposed to view. Fixtures with the supply discharge below the rim must be equipped with backflow preventers. Internal parts of flush valves and flushometer valves, pop-up stoppers of lavatory 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 must be suitable for 180 degrees F water temperature.

2.4.1 Automatic Controls

Flushing and faucet systems must consist of solenoid-activated valves with light beam sensors. Flush valve for water closet must include an override pushbutton. Flushing devices must 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 must be 14 to 15 inches, except 17 to 19 inches for wheelchair water closets. Provide wax bowl ring including plastic sleeve. Provide white solid plastic elongated front rim.

Water flushing volume of the water closet and flush valve combination must not exceed 1.28 gallons per flush. Water closets must meet the EPA WaterSense product definition specified in http://www.epa.gov/watersense/partners/product_program_specs.html and must

be EPA WaterSense labeled products. Provide data identifying WaterSense label for flush valve water closet.

Provide large diameter flush valve including angle control-stop valve, vacuum breaker, tail pieces, slip nuts, and wall plates; exposed to view components must be chromium-plated or polished stainless steel. Flush valves must be nonhold-open type. Mount flush valves not less than 11 inches above the fixture. Mounted height of flush valve must not interfere with the hand rail in ADA stalls.

2.4.3 Flush Valve Urinals

ASME A112.19.2/CSA B45.1, white vitreous china, wall-mounted, wall outlet, siphon jet, integral trap, and extended side shields. Provide urinal with the rim 17 inches above the floor. Water flushing volume of the urinal and flush valve combination must not exceed 0.5 gallons per flush. Urinals must meet the specifications of http://www.epa.gov/watersense/partners/product_program_specs.html and must be EPA WaterSense labeled products. Provide data identifying WaterSense label for urinal. 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 must be chromium-plated or polished stainless steel. Flush valves must be nonhold-open type. Mount flush valves not less than 11 inches above the fixture.

2.4.4 Wall Hung Lavatories

ASME A112.19.2/CSA B45.1, white vitreous china, straight back type, minimum dimensions of 19 inches wide by 17 inches front to rear, with supply openings for use with top mounted centerset faucets, and openings for concealed arm carrier installation. Provide lavatory faucets and accessories meeting the flow rate and product requirements of the paragraph LAVATORIES. Provide ASME A112.6.1M concealed chair carriers with vertical steel pipe supports and concealed arms for the lavatory. Mount lavatory with the front rim 34 inches above floor and with 29 inches minimum clearance from bottom of the front rim to floor.

2.4.5 Countertop Lavatories

ASME A112.19.2/CSA B45.1, white vitreous china, self-rimming, minimum dimensions of 19 inches wide by 17 inches front to rear, with supply openings for use with top mounted centerset faucets. Furnish template and mounting kit by lavatory manufacturer. Provide lavatory faucets and accessories meeting the flow rate and product requirements of the paragraph LAVATORIES. Mount counter with the top surface 34 inches above floor and with 29 inches minimum clearance from bottom of the counter face to floor.

2.4.6 Kitchen Sinks

ASME A112.19.3/CSA B45.4, 18 gage stainless steel with integral mounting rim for flush installation, minimum dimensions of 19 inches wide by 18 inches front to rear, single compartment, with undersides fully sound deadened, with supply openings for use with top mounted washerless sink faucets with hose spray, and with 3.5 inch drain outlet. Water flow rate must not exceed 2.2 gpm when measured at a flowing water pressure of 60 psi. Provide stainless steel drain outlets and stainless steel cup strainers. Provide separate 1.5 inch P-trap and drain piping to vertical vent piping from each compartment. Provide top mounted washerless sink faucets with

hose spray.

2.4.7 Service Sinks

ASME A112.19.2/CSA B45.1, white vitreous china with integral back and wall hanger supports, minimum dimensions of 22 inches wide by 20 inches front to rear, with two supply openings in 10 inch high back. Provide floor supported wall outlet cast iron P-trap and stainless steel rim guards as recommended by service sink manufacturer. Provide back mounted washerless service sink faucets with vacuum breaker and 0.75 inch external hose threads.

2.4.8 Drinking-Water Coolers

AHRI 1010 with more than a single thickness of metal between the potable water and the refrigerant in the heat exchanger, wall-hung, bubbler style, air-cooled condensing unit, 4.75 gph minimum capacity, stainless steel splash receptor and basin, and stainless steel cabinet. Bubblers must be controlled by push levers or push bars, front mounted or side mounted near the front edge of the cabinet. Bubbler spouts must be mounted at maximum of 36 inches above floor and at front of unit basin. Spouts must direct water flow at least 4 inches above unit basin and trajectory parallel or nearly parallel to the front of unit. Provide ASME A112.6.1M concealed steel pipe chair carriers. Provide electric water cooler that is Energy Star labeled. Provide data identifying Energy Star label for electric water cooler.

2.4.9 Wheelchair Drinking Water cooler

AHRI 1010, wall-mounted bubbler style with ASME A112.6.1M concealed chair carrier, air-cooled condensing unit, 4.75 gph minimum capacity, stainless steel splash receptor, and all stainless steel cabinet, with 27 inch minimum knee clearance from front bottom of unit to floor and 36 inch maximum spout height above floor. Bubblers must also be controlled by push levers, by push bars, or touch pads one on each side or one on front and both sides of the cabinet. Provide electric water cooler that is Energy Star labeled. Provide data identifying Energy Star label for wheelchair electric water cooler.

2.5 TRAPS

Unless otherwise specified, traps must be plastic per ASTM F409 or copper-alloy adjustable tube type with slip joint inlet and swivel. Traps must be without a cleanout. Tubes must be copper alloy with walls not less than 0.032 inch thick within commercial tolerances, except on the outside of bends where the thickness may be reduced slightly in manufacture by usual commercial methods. Inlets must have rubber washer and copper alloy nuts for slip joints above the discharge level. Swivel joints must be below the discharge level and must be of metal-to-metal or metal-to-plastic type as required for the application. Nuts must have flats for wrench grip. Outlets must have internal pipe thread, except that when required for the application, the outlets must have sockets for solder-joint connections. The depth of the water seal must be not less than 2 inches. The interior diameter must be not more than 1/8 inch over or under the nominal size, and interior surfaces must be reasonably smooth throughout. A copper alloy "P" trap assembly consisting of an adjustable "P" trap and threaded trap wall nipple with cast brass wall flange must be provided for lavatories. The assembly must be a standard manufactured unit and may have a rubber-gasketed swivel joint.

2.6 WATER HEATERS

Water heater types and capacities must be as indicated. Each water heater must have replaceable anodes. Each water heater must have controls with an adjustable range that includes 90 to 160 degrees F.

2.6.1 Instantaneous Water Heater

Heater must be crossflow design with service water in the coil and hot water in the shell. An integral internal controller must be provided, anticipating a change in demand so that the final temperature can be maintained under all normal load conditions. Normal load conditions must be as specified by the manufacturer for the heater. Unit must be manufactured in accordance with ASME BPVC SEC VIII D1, and must be certified for 150 psi working pressure in the shell and 150 psi working pressure in the coils. Heads must be bronze. Coils must be copper. Shell must have metal sheathed fiberglass insulation, combination pressure and temperature relief valve, and thermometer. Insulation must be as specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

2.7 ELECTRICAL WORK

Provide electrical motor driven equipment specified complete with motors, motor starters, and controls as specified herein and in Section 26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL. Provide internal wiring for components of packaged equipment as an integral part of the equipment. Provide single-phase, fractional-horsepower alternating-current motors, including motors that are part of a system, corresponding to the applications in accordance with NEMA MG 11. Provide motors in accordance with NEMA MG 1 and of sufficient size to drive the load at the specified capacity without exceeding the nameplate rating of the motor.

Motors must be rated for continuous duty with the enclosure specified. Motor duty requirements must allow for maximum frequency start-stop operation and minimum encountered interval between start and stop. Motor torque must be capable of accelerating the connected load within 20 seconds with 80 percent of the rated voltage maintained at motor terminals during one starting period. Motor bearings must be fitted with grease supply fittings and grease relief to outside of the enclosure.

Controllers and contactors must 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, must be provided. For packaged equipment, the manufacturer must provide controllers, including the required monitors and timed restart.

Power wiring and conduit for field installed equipment must be provided under and conform to the requirements of Section 26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL.

2.8 MISCELLANEOUS PIPING ITEMS

2.8.1 Escutcheon Plates

Provide one piece or split hinge metal plates for piping entering floors, walls, and ceilings in exposed spaces. Provide chromium-plated or copper alloy plates in finished spaces.

2.8.2 Pipe Sleeves

Provide where piping passes entirely through walls, ceilings, roofs, and floors. Sleeves are not required where drain, waste, and vent (DWV) piping passes through concrete floor slabs located on grade, except where penetrating a membrane waterproof floor.

2.8.2.1 Sleeves in Masonry and Concrete

Provide steel pipe sleeves or schedule 40 PVC plastic pipe sleeves. Sleeves are not required where drain, waste, and vent (DWV) piping passes through concrete floor slabs located on grade. Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in the core-drilled hole are completely grouted smooth.

2.8.2.2 Sleeves Not in Masonry and Concrete

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

2.8.3 Pipe Hangers (Supports)

Provide **MSS SP-58** Type 1 with adjustable type steel support rods, except as specified or indicated otherwise. Attach to steel joists with Type 19 or 23 clamps and retaining straps. Attach to Steel W or S beams with Type 21, 28, 29, or 30 clamps. Attach to steel angles and vertical web steel channels with Type 20 clamp with beam clamp channel adapter. Attach to horizontal web steel channel and wood with drilled hole on centerline and double nut and washer. Attach to concrete with Type 18 insert or drilled expansion anchor. Provide Type 40 insulation protection shield for insulated piping.

2.8.4 Labels

Provide labels for sensor operators at flush valves and faucets. Include the following information on each label:

- a. Identification of the sensor and its operation with graphic description.
- b. Range of the sensor.
- c. Battery replacement schedule.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Piping located in air plenums **must** conform to **NFPA 90A** requirements. Piping located in shafts that constitute air ducts or that enclose air ducts **must** 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 **must** be installed complete with necessary fixtures, fittings, traps, valves, and accessories. Water and drainage piping **must** be extended 5 feet outside the building, unless otherwise indicated. A gate valve or ball valve and drain **must** be installed on the water service line inside the building approximately 6 inches above the floor from point of entry. Piping **must** be connected to the exterior service lines or capped or plugged if the exterior service is not in place. Sewer and water pipes **must** be laid in separate trenches,

except when otherwise shown. Exterior underground utilities must 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 must be marked with a stake or other acceptable means. Valves must 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 must be extended to fixtures, outlets, and equipment. The hot-water and cold-water piping system must 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, must 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 must be anchored to prevent movement.

3.1.1.2 Cutting and Repairing

The work must be carefully laid out in advance, and unnecessary cutting of construction must be avoided. Damage to building, piping, wiring, or equipment as a result of cutting must be repaired by mechanics skilled in the trade involved.

3.1.1.3 Protection of Fixtures, Materials, and Equipment

Pipe openings must be closed with caps or plugs during installation. Fixtures and equipment must be tightly covered and protected against dirt, water, chemicals, and mechanical injury. Upon completion of the work, the fixtures, materials, and equipment must be thoroughly cleaned, adjusted, and operated. Safety guards must be provided for exposed rotating equipment.

3.1.1.4 Mains, Branches, and Runouts

Piping must be installed as indicated. Pipe must be accurately cut and worked into place without springing or forcing. Structural portions of the building must not be weakened. Aboveground piping must 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 must 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 must 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 must not be buried in or under floors unless specifically indicated or approved. Changes in pipe sizes must 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 must 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 must 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 Expansion and Contraction of Piping

Allowance **must** be made throughout for expansion and contraction of water pipe. Each hot-water and hot-water circulation riser **must** have expansion loops or other provisions such as offsets and changes in direction where indicated and required. Risers **must** be securely anchored as required or where indicated to force expansion to loops. Branch connections from risers **must** 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 **must** be anchored to the wall or the supporting construction about midway on the run to force expansion, evenly divided, toward the ends. Sufficient flexibility **must** be provided on branch runouts from mains and risers to provide for expansion and contraction of piping. Flexibility **must** be provided by installing one or more turns in the line so that piping will spring enough to allow for expansion without straining. If mechanical grooved pipe coupling systems are provided, the deviation from design requirements for expansion and contraction may be allowed pending approval of Contracting Officer.

3.1.1.6 Commercial-Type Water Hammer Arresters

Commercial-type water hammer arresters **must** be provided on hot- and cold-water supplies and **must** be located as generally indicated, with precise location and sizing to be in accordance with **PDI WH 201**. Water hammer arresters, where concealed, **must** be accessible by means of access doors or removable panels. Commercial-type water hammer arresters **must** conform to **ASSE 1010**. Vertical capped pipe columns will not be permitted.

3.1.2 Joints

Installation of pipe and fittings **must** 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 **must** be made up with fittings of compatible material and made for the specific purpose intended.

3.1.2.1 Threaded

Threaded joints **must** have American Standard taper pipe threads conforming to **ASME B1.20.1**. Only male pipe threads **must** be coated with graphite or with an approved graphite compound, or with an inert filler and oil, or **must** have a polytetrafluoroethylene tape applied.

3.1.2.2 Mechanical Couplings

Mechanical couplings may be used in conjunction with grooved pipe for aboveground, ferrous or non-ferrous, domestic hot and cold water systems, in lieu of unions, brazed, soldered, welded, flanged, or threaded joints.

Mechanical couplings are permitted in accessible locations including behind access plates. Flexible grooved joints will not be permitted, except as vibration isolators adjacent to mechanical equipment. Rigid grooved joints **must** incorporate an angle bolt pad design which maintains metal-to-metal contact with equal amount of pad offset of housings upon installation to ensure positive rigid clamping of the pipe.

Designs which can only clamp on the bottom of the groove or which utilize

gripping teeth or jaws, or which use misaligned housing bolt holes, or which require a torque wrench or torque specifications will not be permitted.

Grooved fittings and couplings, and grooving tools must be provided from the same manufacturer. Segmentally welded elbows must not be used. Grooves must be prepared in accordance with the coupling manufacturer's latest published standards. Grooving must be performed by qualified grooving operators having demonstrated proper grooving procedures in accordance with the tool manufacturer's recommendations.

The Contracting Officer must be notified 24 hours in advance of test to demonstrate operator's capability, and the test must be performed at the work site, if practical, or at a site agreed upon. The operator must demonstrate the ability to properly adjust the grooving tool, groove the pipe, and to verify the groove dimensions in accordance with the coupling manufacturer's specifications.

3.1.2.3 Unions and Flanges

Unions, flanges and mechanical couplings must not be concealed in walls, ceilings, or partitions. Unions must be used on pipe sizes 2-1/2 inches and smaller; flanges must be used on pipe sizes 3 inches and larger.

3.1.2.4 Grooved Mechanical Joints

Grooves must be prepared according to the coupling manufacturer's instructions. Grooved fittings, couplings, and grooving tools must be products of the same manufacturer. Pipe and groove dimensions must comply with the tolerances specified by the coupling manufacturer. The diameter of grooves made in the field must be measured using a "go/no-go" gauge, vernier or dial caliper, narrow-land micrometer, or other method specifically approved by the coupling manufacturer for the intended application. Groove width and dimension of groove from end of pipe must be measured and recorded for each change in grooving tool setup to verify compliance with coupling manufacturer's tolerances. Grooved joints must not be used in concealed locations.

3.1.2.5 Cast Iron Soil, Waste and Vent Pipe

Bell and spigot compression and hubless gasketed clamp joints for soil, waste and vent piping must be installed per the manufacturer's recommendations.

3.1.2.6 Copper Tube and Pipe

- a. Brazed. Brazed joints must 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 must include the use of copper-phosphorus or copper-phosphorus-silver brazing metal without flux. Brazing of dissimilar metals (copper to bronze or brass) must include the use of flux with either a copper-phosphorus, copper-phosphorus-silver or a silver brazing filler metal.
- b. Soldered. Soldered joints must be made with flux and are only acceptable for piping 2 inches and smaller. Soldered joints must conform to ASME B31.5 and CDA A4015. Soldered joints must not be used in compressed air piping between the air compressor and the receiver.

- c. Copper Tube Extracted Joint. Mechanically extracted joints **must** be made in accordance with **ICC IPC**.
- d. Press connection. Copper press connections **must** be made in **strict** accordance with the manufacturer's installation instructions for manufactured rated size. The joints **must** be pressed using the tool(s) approved by the manufacturer **of that joint**. Minimum distance between fittings **must** be in accordance with the manufacturer's requirements.

3.1.2.7 Plastic Pipe

Acrylonitrile-Butadiene-Styrene (ABS) pipe **must** have joints made with solvent cement. PVC and CPVC pipe **must** have joints made with solvent cement elastomeric, threading, (threading of Schedule 80 Pipe is allowed only where required for disconnection and inspection; threading of Schedule 40 Pipe is not allowed), or mated flanged.

3.1.2.8 Other Joint Methods

3.1.3 Dissimilar Pipe Materials

Connections between ferrous and non-ferrous copper water pipe **must** be made with dielectric unions or flange waterways. Dielectric waterways **must** have temperature and pressure rating equal to or greater than that specified for the connecting piping. Waterways **must** have metal connections on both ends suited to match connecting piping. Dielectric waterways **must** be internally lined with an insulator specifically designed to prevent current flow between dissimilar metals. Dielectric flanges **must** meet the performance requirements described herein for dielectric waterways. Connecting joints between plastic and metallic pipe **must** be made with transition fitting for the specific purpose.

3.1.4 Corrosion Protection for Buried Pipe and Fittings

Ductile iron, cast iron, and steel pipe, fittings, and joints **must** have a protective coating. Additionally, ductile iron, cast iron, and steel pressure pipe **must** have a cathodic protection system and joint bonding. The cathodic protection system, protective coating system, and joint bonding for cathodically protected pipe **must** be in accordance with . Coatings **must** be selected, applied, and inspected in accordance with **NACE SP0169** and as otherwise specified. The pipe **must** be cleaned and the coating system applied prior to pipe tightness testing. Joints and fittings **must** be cleaned and the coating system applied after pipe tightness testing. For tape coating systems, the tape **must** conform to **AWWA C203** and **must** be applied with a 50 percent overlap. Primer utilized with tape type coating systems **must** be as recommended by the tape manufacturer.

3.1.5 Pipe Sleeves and Flashing

Pipe sleeves **must** be furnished and set in their proper and permanent location.

3.1.5.1 Sleeve Requirements

Unless indicated otherwise, provide pipe sleeves meeting the following requirements:

Secure sleeves in position and location during construction. Provide

sleeves of sufficient length to pass through entire thickness of walls, ceilings, roofs, and floors.

A modular mechanical type sealing assembly may be installed in lieu of a waterproofing clamping flange and caulking and sealing of annular space between pipe and sleeve. The seals **must** 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 **must** 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 **must** cause the rubber sealing elements to expand and provide a watertight seal between the pipe and the sleeve. Each seal assembly **must** be sized as recommended by the manufacturer to fit the pipe and sleeve involved.

Sleeves **must** not be installed in structural members, except where indicated or approved. Rectangular and square openings **must** be as detailed. Each sleeve **must** extend through its respective floor, or roof, and **must** 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 **must** extend a minimum of 4 inches above the finished floor.

Unless otherwise indicated, sleeves **must** 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 **must** 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, **must** be sealed as indicated with sealants conforming to ASTM C920. The annular space between pipe and sleeve, between bare insulation and sleeve or between jacket over insulation and sleeve **must** not be sealed for interior walls which are not designated as fire rated.

Sleeves through below-grade walls in contact with earth **must** be recessed 1/2 inch from wall surfaces on both sides. Annular space between pipe and sleeve **must** be filled with backing material and sealants in the joint between the pipe and concrete wall as specified above. Sealant selected for the earth side of the wall **must** be compatible with dampproofing/waterproofing materials that are to be applied over the joint sealant.

3.1.5.2 Flashing Requirements

Pipes passing through roof **must** be installed through a 16 ounce copper flashing, each within an integral skirt or flange. Flashing **must** be suitably formed, and the skirt or flange **must** extend not less than 8 inches from the pipe and **must** be set over the roof or floor membrane in a solid coating of bituminous cement. The flashing **must** extend up the pipe a minimum of 10 inches. For cleanouts, the flashing **must** be turned down into the hub and caulked after placing the ferrule. Pipes passing through pitched roofs **must** 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 **must** be sealed as indicated. Flashing for dry vents **must** 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 **must** be fitted into the sleeve clamping device. Pipes passing through wall waterproofing membrane **must** be sleeved as described above. A waterproofing clamping flange **must** be installed.

3.1.5.3 Waterproofing

Waterproofing at floor-mounted water closets **must** be accomplished by forming a flashing guard from soft-tempered sheet copper. The center of the sheet **must** 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 **must** be embedded in sealant to a depth of approximately 1-1/2 inches; then the sealant **must** be finished off flush to floor level between the flashing guard and drainpipe. The flashing guard of sheet copper **must** extend not less than 8 inches from the drainpipe and **must** 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 **must** be sealed with sealant and the flashing guard **must** 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 **must** be sealed.

3.1.5.4 Optional Counterflashing

Instead of turning the flashing down into a dry vent pipe, or caulking and sealing the annular space between the pipe and flashing or metal-jacket-covered insulation and flashing, counterflashing may be accomplished by utilizing the following:

- a. A standard roof coupling for threaded pipe up to 6 inches in diameter.
- b. A tack-welded or banded-metal rain shield around the pipe.

3.1.5.5 Pipe Penetrations of Slab on Grade Floors

Where pipes, fixture drains, floor drains, cleanouts or similar items penetrate slab on grade floors, except at penetrations of floors with waterproofing membrane as specified in paragraphs FLASHING REQUIREMENTS and WATERPROOFING, a groove 1/4 to 1/2 inch wide by 1/4 to 3/8 inch deep **must** be formed around the pipe, fitting or drain.

3.1.5.6 Pipe Penetrations

Provide sealants for all pipe penetrations. All pipe penetrations **must** be sealed to prevent infiltration of air, insects, and vermin.

3.1.6 Supports

3.1.6.1 General

Hangers used to support piping 2 inches and larger **must** be fabricated to permit adequate adjustment after erection while still supporting the load.

Pipe guides and anchors **must** 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 **must** 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 **must** be used where each pipe crosses the base support member. Spacing of the base support members **must** not exceed the hanger and support spacing required for an individual pipe in the multiple pipe run. Threaded sections of rods **must** not be formed or bent.

3.1.6.2 Pipe Hangers, Inserts, and Supports

Installation of pipe hangers, inserts and supports **must** conform to **MSS SP-58** except as modified herein.

- a. Types 5, 12, and 26 **must** not be used.
- b. Type 3 **must** not be used on insulated pipe.
- c. Type 18 inserts **must** 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 **must** be torqued per **MSS SP-58** and **must** 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 **must** 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 **must** be used on insulated pipe **4 inches** and larger when the temperature of the medium is **60 degrees F** or higher. Type 39 saddles **must** be welded to the pipe.
- h. Type 40 shields **must**:
 - (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 **must** have a density of **8 pcf** or greater.
- i. Horizontal pipe supports **must** be spaced as specified in **MSS SP-58** and a support **must** be installed not over **1 foot** from the pipe fitting joint at each change in direction of the piping. Pipe supports **must** be spaced not over **5 feet** apart at valves. Operating temperatures in determining hanger spacing for PVC or CPVC pipe **must** be **120 degrees F** for PVC and **180 degrees F** for CPVC. Horizontal pipe runs **must** include allowances for expansion and contraction.
- j. Vertical pipe **must** 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 **must** include

allowances for expansion and contraction.

- k. Type 35 guides using steel, reinforced polytetrafluoroethylene (PTFE) or graphite slides **must** be provided to allow longitudinal pipe movement. Slide materials **must** be suitable for the system operating temperatures, atmospheric conditions, and bearing loads encountered. Lateral restraints **must** 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 **must** be the size of the outside diameter of the insulation. The insulation **must** 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 **must** include a pipe cradle, welded to the guide structure and strapped securely to the pipe. The pipe **must** 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 **must** not compress, distort, cut or abrade the piping, and **must** allow free movement of pipe except where otherwise required in the control of expansion/contraction.

3.1.6.3 Structural Attachments

Attachment to building structure concrete and masonry **must** be by cast-in concrete inserts, built-in anchors, or masonry anchor devices. Inserts and anchors **must** be applied with a safety factor not less than 5. Supports **must** not be attached to metal decking. Supports **must** 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 **must** be constructed of ferrous materials only.

3.1.7 Welded Installation

Plumbing pipe weldments **must** be as indicated. Changes in direction of piping **must** 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 **must** 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 **must** conform to ASME B31.1. Weld defects **must** be removed and repairs made to the weld, or the weld joints **must** be entirely removed and rewelded. After filler metal has been removed from its original package, it **must** 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 **must** not be used.

3.1.8 Pipe Cleanouts

Pipe cleanouts **must** 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 **must** 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 **must** be caulked into the hub of the fitting and **must** be flush with the floor. Cleanouts in connection with other pipe, where indicated, **must** be T-pattern, 90-degree branch drainage fittings with cast-brass screw plugs, except plastic plugs **must** be installed in plastic pipe. Plugs **must** be the same size as the pipe up to and including 4 inches. Cleanout tee branches with screw plug **must** be installed at the foot of soil and waste stacks, at the foot of interior downspouts, on each connection to building storm drain where interior downspouts are indicated, and on each building drain outside the building. Cleanout tee branches may be omitted on stacks in single story buildings with slab-on-grade construction or where less than 18 inches of crawl space is provided under the floor. Cleanouts on pipe concealed in partitions **must** be provided with chromium plated bronze, nickel bronze, nickel brass or stainless steel flush type access cover plates. Round access covers **must** 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 **must** have access covers and frames installed flush with the finished wall. Cleanouts installed in finished floors subject to foot traffic **must** 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 **must** not project above the cover surface. Where cleanouts are provided with adjustable heads, the heads **must** be cast iron or plastic.

3.2 FIXTURES AND FIXTURE TRIMMINGS

Polished chromium-plated pipe, valves, and fittings **must** 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 **must** be furnished and installed with fixtures. Where connections between copper tubing and faucets are made by rubber compression fittings, a beading tool **must** be used to mechanically deform the tubing above the compression fitting. Exposed traps and supply pipes for fixtures and equipment **must** be connected to the rough piping systems at the wall, unless otherwise specified under the item. Floor and wall escutcheons **must** be as specified. Drain lines and hot water lines of fixtures for handicapped personnel **must** be insulated and do not require polished chrome finish. Plumbing fixtures and accessories **must** be installed within the space shown.

3.2.1 Fixture Connections

Where space limitations prohibit standard fittings in conjunction with the cast-iron floor flange, special short-radius fittings **must** be provided. Connections between earthenware fixtures and flanges on soil pipe **must** 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 **must** be set the proper distance from floor or wall to make a first-class joint with the closet-setting compound or gasket and fixture used.

3.2.2 Flushometer Valves

Flushometer valves **must** 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 **must** be installed **39 inches** above the floor, except at water closets intended for use by the physically handicapped where flushometer valves **must** 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 **must** be installed on the wide side of the enclosure.

3.2.3 Height of Fixture Rims Above Floor

Lavatories **must** be mounted with rim **31 inches** above finished floor. Wall-hung drinking fountains and water coolers **must** be installed with rim **42 inches** above floor. Wall-hung service sinks **must** be mounted with rim **28 inches** above the floor. Installation of fixtures for use by the physically handicapped **must** be in accordance with **ICC A117.1 COMM.**

3.2.4 Fixture Supports

Fixture supports for off-the-floor lavatories, urinals, water closets, and other fixtures of similar size, design, and use, **must** be of the chair-carrier type. The carrier **must** provide the necessary means of mounting the fixture, with a foot or feet to anchor the assembly to the floor slab. Adjustability **must** be provided to locate the fixture at the desired height and in proper relation to the wall. Support plates, in lieu of chair carrier, **must** be fastened to the wall structure only where it is not possible to anchor a floor-mounted chair carrier to the floor slab.

3.2.4.1 Support for Steel Stud Frame Partitions

Chair carrier **must** be used. The anchor feet and tubular uprights **must** be of the heavy duty design; and feet (bases) **must** be steel and welded to a square or rectangular steel tube upright. Wall plates, in lieu of floor-anchored chair carriers, **must** be used only if adjoining steel partition studs are suitably reinforced to support a wall plate bolted to these studs.

3.2.4.2 Support for Wood Stud Construction

Where floor is a concrete slab, a floor-anchored chair carrier **must** be used. Where entire construction is wood, wood crosspieces **must** be installed. Fixture hanger plates, supports, brackets, or mounting lugs **must** 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 **must** extend the full width of the fixture and **must** be securely supported.

3.2.5 Access Panels

Access panels **must** be provided for concealed valves and controls, or any item requiring inspection or maintenance. Access panels **must** be of sufficient size and located so that the concealed items may be serviced, maintained, or replaced.

3.2.6 Traps

Each trap **must** be placed as near the fixture as possible, and no fixture

must be double-trapped. Traps installed on cast-iron soil pipe must be cast iron. Traps installed on steel pipe or copper tubing must 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 must be of the same material as the pipe.

3.3 IDENTIFICATION SYSTEMS

3.3.1 Identification Tags

Identification tags made of brass, engraved laminated plastic, or engraved anodized aluminum, indicating service and valve number must be installed on valves, except those valves installed on supplies at plumbing fixtures. Tags must be 1-3/8 inch minimum diameter, and marking must be stamped or engraved. Indentations must be black, for reading clarity. Tags must be attached to valves with No. 12 AWG, copper wire, chrome-plated beaded chain, or plastic straps designed for that purpose.

3.4 ESCUTCHEONS

Escutcheons must 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 must be fastened securely to pipe or pipe covering and must be satin-finish, corrosion-resisting steel, polished chromium-plated zinc alloy, or polished chromium-plated copper alloy. Escutcheons must be either one-piece or split-pattern, held in place by internal spring tension or setscrew.

3.5 PAINTING

3.5.1 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.

3.5.1.1 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 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.

3.5.1.2 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 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 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 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.

3.6 TESTS, FLUSHING AND DISINFECTION

3.6.1 Plumbing System

The following tests must be performed on the plumbing system in accordance with IAPMO UPC, except that the drainage and vent system final test must 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 and reasons for choosing this option in lieu of the smoke test to the Contracting Officer for approval.

- a. Drainage and Vent Systems Test. The final test must include a smoke test.
- b. Building Sewers Tests.
- c. Water Supply Systems Tests.

3.6.2 Defective Work

If inspection or test shows defects, such defective work or material must be replaced or repaired as necessary and inspection and tests must be repeated. Repairs to piping must be made with new materials. Caulking of screwed joints or holes will not be acceptable.

3.6.3 System Flushing

3.6.3.1 During Flushing

Before operational tests or disinfection, potable water piping system must be flushed with potable water. Sufficient water must 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) must specify the number of fixtures to be operated during flushing. Contractor must 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 must be responsible for any flood damage resulting from flushing of the system. Flushing must be continued until entrained dirt and other foreign materials have been removed and until discharge water shows no discoloration. All faucets and drinking water fountains, to include any device considered as an end point device by NSF/ANSI 61, Section 9, must be flushed a minimum of 0.25 gallons per 24 hour period, ten times over a 14 day period.

3.6.3.2 After Flushing

System must be drained at low points. Strainer screens must be removed, cleaned, and replaced. After flushing and cleaning, systems must 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 must be repaired by the Contractor. When the system flushing is complete, the hot-water system must be adjusted for uniform circulation. Flushing devices and automatic control systems must be adjusted for proper operation according to manufacturer's instructions. Flow rates on fixtures must not exceed those stated in PART 2 of this Section. Unless more stringent local requirements exist, lead levels must not exceed limits established by 40 CFR 141.80 (c)(1). The water supply to the building must be tested separately to ensure that any lead contamination found during potable water system testing is due to work being performed inside the building.

3.6.4 Operational Test

Upon completion of flushing and prior to disinfection procedures, the Contractor must subject the plumbing system to operating tests to demonstrate satisfactory installation, connections, adjustments, and functional and operational efficiency. Such operating tests must cover a period of not less than 8 hours for each system and must 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.

3.6.5 Disinfection

After all system components are provided and operational tests are complete, the entire domestic hot- and cold-water distribution system **must** be disinfected. Before introducing disinfecting chlorination material, entire system **must** be flushed with potable water until any entrained dirt and other foreign materials have been removed.

Water chlorination procedure **must** be in accordance with **AWWA C651** and **AWWA C652** as modified and supplemented by this specification. The chlorinating material **must** be hypochlorites or liquid chlorine. The chlorinating material **must** be fed into the water piping system at a constant rate at a concentration of at least 50 parts per million (ppm). Feed a properly adjusted hypochlorite solution injected into the system with a hypochlorinator, or inject liquid chlorine into the system through a solution-feed chlorinator and booster pump until the entire system is completely filled.

Test the chlorine residual level in the water at 6 hour intervals for a continuous period of 24 hours. If at the end of a 6 hour interval, the chlorine residual has dropped to less than 25 ppm, flush the piping including tanks with potable water, and repeat the above chlorination procedures. During the chlorination period, each valve and faucet **must** be opened and closed several times.

After the second 24 hour period, verify that no less than 25 ppm chlorine residual remains in the treated system. The 24 hour chlorination procedure **must** be repeated until no less than 25 ppm chlorine residual remains in the treated system.

Upon the specified verification, the system including tanks **must** then be flushed with potable water until the residual chlorine level is reduced to less than one part per million. During the flushing period, each valve and faucet **must** be opened and closed several times.

Take additional samples of water in disinfected containers, for bacterial examination, at locations specified by the Contracting Officer. Test these samples for total coliform organisms (coliform bacteria, fecal coliform, streptococcal, and other bacteria) in accordance with **EPA SM 9223**. The testing method used **must** be EPA approved for drinking water systems and **must** comply with applicable local and state requirements.

Disinfection **must** be repeated until bacterial tests indicate the absence of coliform organisms (zero mean coliform density per 100 milliliters) in the samples for at least 2 full days. The system will not be accepted until satisfactory bacteriological results have been obtained.

3.7 POSTED INSTRUCTIONS

Framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, **must** 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 **must** be prepared in typed form, framed as specified above for the wiring and control diagrams and posted beside the diagrams. The framed

instructions must be posted before acceptance testing of the systems.

3.8 PERFORMANCE OF WATER HEATING EQUIPMENT

Standard rating condition terms are as follows:

EF = Energy factor, minimum overall efficiency.

ET = Minimum thermal efficiency with 70 degrees F delta T.

SL = Standby loss is maximum (Btu/h) based on a 70 degrees F temperature difference between stored water and ambient requirements.

V = Rated volume in gallons

Q = Nameplate input rate in kW (Btu/h)

3.9 TABLES

TABLE I								
PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, VENT AND CONDENSATE DRAIN PIPING SYSTEMS								
Item #	Pipe and Fitting Materials	SERVICE A	SERVICE B	SERVICE C	SERVICE D	SERVICE E	SERVICE F	SERVICE G
1	Cast iron soil pipe and fittings, hub and spigot, ASTM A74 with compression gaskets. Pipe and fittings must 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 must be marked with the CISPI		X	X	X	X		
3	Cast iron drainage fittings, threaded, ASME B16.12 for use with Item 10	X		X	X			

TABLE I								
PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, VENT AND CONDENSATE DRAIN PIPING SYSTEMS								
Item #	Pipe and Fitting Materials	SERVICE A	SERVICE B	SERVICE C	SERVICE D	SERVICE E	SERVICE F	SERVICE G
4	Cast iron screwed fittings (threaded) ASME B16.4 for use with Item 10				X	X		
5	Grooved pipe couplings, ferrous and non-ferrous pipe ASTM A536 And ASTM A47/A47M	X	X		X	X		
6	Ductile iron grooved joint fittings for ferrous pipe ASTM A536 and ASTM A47/A47M for use with Item 5	X	X		X	X		
7	Bronze sand casting grooved joint pressure fittings for non-ferrous pipe ASTM B584, for use with Item 5	X	X		X	X		
8	Wrought copper grooved joint pressure fittings for non-ferrous pipe ASTM B75/B75M C12200, ASTM B152/B152M, C11000, ASME B16.22 ASME B16.22 for use with Item 5	X	X					

TABLE I								
PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, VENT AND CONDENSATE DRAIN PIPING SYSTEMS								
Item #	Pipe and Fitting Materials	SERVICE A	SERVICE B	SERVICE C	SERVICE D	SERVICE E	SERVICE F	SERVICE G
9	Malleable-iron threaded fittings, galvanized ASME B16.3 for use with Item 10				X	X		
10	Steel pipe, seamless galvanized, ASTM A53/A53M, Type S, Grade B	X			X	X		
11	Seamless red brass pipe, ASTM B43				X	X		X
12	Bronzed flanged fittings, ASME B16.24 for use with Items 11 and 14				X	X		X
13	Cast copper alloy solder joint pressure fittings, ASME B16.18 for use with Item 14				X	X		X
14	Seamless copper pipe, ASTM B42						X	X
15	Cast bronze threaded fittings, ASME B16.15				X	X		
16	Copper drainage tube, (DWV), ASTM B306	X*	X	X*	X	X		X
17	Wrought copper and wrought alloy solder-joint drainage fittings. ASME B16.29	X	X	X	X	X		X

TABLE I								
PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, VENT AND CONDENSATE DRAIN PIPING SYSTEMS								
Item #	Pipe and Fitting Materials	SERVICE A	SERVICE B	SERVICE C	SERVICE D	SERVICE E	SERVICE F	SERVICE G
18	Cast copper alloy solder joint drainage fittings, DWV, ASME B16.23	X	X	X	X	X		X
19	Acrylonitrile-Butadiene (ABS) plastic drain, waste, and vent pipe and fittings ASTM D2661, ASTM F628	X	X	X	X	X	X	
20	Polyvinyl Chloride plastic drain, waste and vent pipe and fittings, ASTM D2665, ASTM F891, (Sch 40) ASTM F1760	X	X	X	X	X	X	X
21	Process glass pipe and fittings, ASTM C1053						X	
22	High-silicon content cast iron pipe and fittings (hub and spigot, and mechanical joint), ASTM A518/A518M		X			X	X	
23	Polypropylene (PP) waste pipe and fittings, ASTM D4101						X	
24	Filament-wound reinforced thermosetting resin (RTRP) pipe, ASTM D2996						X	

TABLE I								
PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, VENT AND CONDENSATE DRAIN PIPING SYSTEMS								
Item #	Pipe and Fitting Materials	SERVICE <u>A</u>	SERVICE <u>B</u>	SERVICE <u>C</u>	SERVICE <u>D</u>	SERVICE <u>E</u>	SERVICE <u>F</u>	SERVICE <u>G</u>
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 G - Condensate Drain Aboveground * - Hard Temper								

TABLE III				
STANDARD RATING CONDITIONS AND MINIMUM PERFORMANCE RATINGS FOR WATER HEATING EQUIPMENT				
<u>FUEL</u>	<u>STORAGE CAPACITY GALLONS</u>	<u>INPUT RATING</u>	<u>TEST PROCEDURE</u>	<u>REQUIRED PERFORMANCE</u>
A. STORAGE WATER HEATERS				
Elect.	60 max.		10 CFR 430	EF = 0.93
Elect.	60 min.		10 CFR 430	EF = 0.91
Elect.	20 min.	12 kW max.	10 CFR 430	EF = 0.93-0.00132V minimum
Elect.	20 min.	12 kW max.	ANSI Z21.10.3 (Addenda B)	SL = $20+35x(V^{1/2})$ maximum
Elect. Heat Pump		24 Amps or less and 250 Volts or less	10 CFR 430	EF = 0.93-0.00132V
TERMS: EF = Energy factor, minimum overall efficiency. ET = Minimum thermal efficiency with 70 degrees F delta T. SL = Standby loss is maximum Btu/h based on a 70 degree F temperature difference between stored water and ambient requirements. V = Rated storage volume in gallons Q = Nameplate input rate in Btu/h				

-- End of Section --

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DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

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08/18

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SECTION 23 00 00

AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEMS
08/18

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.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC. (AMCA)

- AMCA 201 (2002; R 2011) Fans and Systems
- AMCA 210 (2016) Laboratory Methods of Testing Fans for Aerodynamic Performance Rating
- AMCA 300 (2014) Reverberant Room Method for Sound Testing of Fans
- AMCA 301 (2014) Methods for Calculating Fan Sound Ratings from Laboratory Test Data

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABMA)

- ABMA 11 (2014) Load Ratings and Fatigue Life for Roller Bearings
- ABMA 9 (2015) Load Ratings and Fatigue Life for Ball Bearings

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

- ASHRAE 62.1 (2010) Ventilation for Acceptable Indoor Air Quality
- ASHRAE 70 (2006; R 2011) Method of Testing for Rating the Performance of Air Outlets and Inlets

ASME INTERNATIONAL (ASME)

- ASME A13.1 (2015) Scheme for the Identification of Piping Systems

ASTM INTERNATIONAL (ASTM)

- ASTM A123/A123M (2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- ASTM A53/A53M (2018) Standard Specification for Pipe,

Steel, Black and Hot-Dipped, Zinc-Coated,
Welded and Seamless

ASTM A924/A924M (2018) Standard Specification for General
Requirements for Steel Sheet,
Metallic-Coated by the Hot-Dip Process

ASTM B117 (2016) Standard Practice for Operating
Salt Spray (Fog) Apparatus

ASTM B209 (2014) Standard Specification for Aluminum
and Aluminum-Alloy Sheet and Plate

ASTM B766 (1986; R 2015) Standard Specification for
Electrodeposited Coatings of Cadmium

ASTM C553 (2013) Standard Specification for Mineral
Fiber Blanket Thermal Insulation for
Commercial and Industrial Applications

ASTM D1654 (2008; R 2016; E 2017) Standard Test
Method for Evaluation of Painted or Coated
Specimens Subjected to Corrosive
Environments

ASTM D3359 (2017) Standard Test Methods for Rating
Adhesion by Tape Test

ASTM D520 (2000; R 2011) Zinc Dust Pigment

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

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1 (2016; SUPP 2016) 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

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 701 (2019) Standard Methods of Fire Tests for
Flame Propagation of Textiles and Films

NFPA 90A (2018) Standard for the Installation of
Air Conditioning and Ventilating Systems

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

SMACNA 1966 (2005) HVAC Duct Construction Standards
Metal and Flexible, 3rd Edition

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168 (2017) Adhesive and Sealant Applications

U.S. DEPARTMENT OF ENERGY (DOE)

Energy Star (1992; R 2006) Energy Star Energy
Efficiency Labeling System (FEMP)

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

40 CFR 82 Protection of Stratospheric Ozone

UNDERWRITERS LABORATORIES (UL)

UL 181 (2013; Reprint Apr 2017) UL Standard for
Safety Factory-Made Air Ducts and Air
Connectors

UL 6 (2007; Reprint Nov 2014) Electrical Rigid
Metal Conduit-Steel

UL 705 (2017; Reprint Oct 2018) UL Standard for
Safety Power Ventilators

UL Bld Mat Dir (updated continuously online) Building
Materials Directory

UL Electrical Constructn (2012) Electrical Construction Equipment
Directory

1.2 SYSTEM DESCRIPTION

Furnish ductwork, piping, fittings, and accessories as required to provide a complete installation. Coordinate the work of the different trades to avoid interference between piping, equipment, structural, and electrical work. Provide complete, in place, all necessary offsets in piping and ductwork, and all fittings, and other components, required to install the work as indicated and specified.

1.2.1 Mechanical Equipment Identification

1.2.1.1 Charts

Provide chart listing of equipment by designation numbers and capacities such as flow rates, pressure and temperature differences, heating and cooling capacities, horsepower, pipe sizes, and voltage and current characteristics.

1.2.2 Service Labeling

Label equipment, including fans, air handlers, terminal units, etc. with labels made of self-sticking, plastic film designed for permanent

installation. Provide labels in accordance with the typical examples below:

SERVICE	LABEL AND TAG DESIGNATION
Booster Fan	BF - See Drawings
Mini-Split System	CU-1 & AHU-4 - See Drawings

Identify similar services with different temperatures or pressures. Where pressures could exceed 125 pounds per square inch, gage, include the maximum system pressure in the label. Label and arrow piping in accordance with the following:

- Each point of entry and exit of pipe passing through walls.
- Each change in direction, i.e., elbows, tees.
- In congested or hidden areas and at all access panels at each point required to clarify service or indicated hazard.
- In long straight runs, locate labels at distances within eyesight of each other not to exceed 75 feet. All labels must be visible and legible from the primary service and operating area.

For Bare or Insulated Pipes	
for Outside Diameters of	Lettering
1/2 thru 1-3/8 inch	1/2 inch

1.2.3 Color Coding

Color coding of all piping systems must be in accordance with ASME A13.1 .

1.3 SUBMITTALS

Contracting Organization approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Insulated Nonmetallic Flexible Duct Runouts

Duct Connectors

Manual Balancing Dampers;

Sound Attenuation Equipment

Diffusers

Registers and Grilles

In-Line Centrifugal Fans

Ceiling Exhaust Fans

Energy Star label for ceiling exhaust fan product; S

Indoor Air Quality for Duct Sealants;

SD-06 Test Reports

Performance Tests;

SD-07 Certificates

Ozone Depleting Substances Technician Certification

SD-08 Manufacturer's Instructions

Manufacturer's Installation Instructions

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals;

Manual Balancing Dampers;

Ceiling Exhaust Fans;

SD-11 Closeout Submittals

Indoor Air Quality During Construction;

1.4 QUALITY ASSURANCE

Except as otherwise specified, approval of materials and equipment is based on manufacturer's published data.

- a. Where materials and equipment are specified to conform to the standards of the Underwriters Laboratories, the label of or listing with reexamination in UL Bld Mat Dir, and UL 6 is acceptable as sufficient evidence that the items conform to Underwriters Laboratories requirements. In lieu of such label or listing, submit a written certificate from any nationally recognized testing agency, adequately equipped and competent to perform such services, stating that the items have been tested and that the units conform to the specified requirements. Outline methods of testing used by the specified agencies.
- b. Where materials or equipment are specified to be constructed or tested, or both, in accordance with the standards of the ASTM International (ASTM), the ASME International (ASME), or other standards, a manufacturer's certificate of compliance of each item is acceptable as proof of compliance.
- c. Conformance to such agency requirements does not relieve the item from compliance with other requirements of these specifications.

1.4.1 Prevention of Corrosion

Protect metallic materials against corrosion. Provide rust-inhibiting treatment and standard finish for the equipment enclosures. Do not use aluminum in contact with earth, and where connected to dissimilar metal. Protect aluminum by approved fittings, barrier material, or treatment.

Provide hot-dip galvanized ferrous parts such as anchors, bolts, braces, boxes, bodies, clamps, fittings, guards, nuts, pins, rods, shims, thimbles, washers, and miscellaneous parts not of corrosion-resistant steel or nonferrous materials in accordance with [ASTM A123/A123M](#) for exterior locations and cadmium-plated in conformance with [ASTM B766](#) for interior locations.

1.4.2 Asbestos Prohibition

Do not use asbestos and asbestos-containing products.

1.4.3 Ozone Depleting Substances Technician Certification

All technicians working on equipment that contain ozone depleting refrigerants must be certified as a Section 608 Technician to meet requirements in [40 CFR 82](#), Subpart F. Provide copies of technician certifications to the Contracting Officer at least 14 calendar days prior to work on any equipment containing these refrigerants.

1.5 DELIVERY, STORAGE, AND HANDLING

Protect stored equipment at the jobsite from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Additionally, cap or plug all pipes until installed.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Provide components and equipment that are "standard products" of a manufacturer regularly engaged in the manufacturing of products that are of a similar material, design and workmanship. "Standard products" is defined as being in satisfactory commercial or industrial use for 2 years before bid opening, including applications of components and equipment under similar circumstances and of similar size, satisfactorily completed by a product that is sold on the commercial market through advertisements, manufacturers' catalogs, or brochures. Products having less than a 2-year field service record are acceptable if a certified record of satisfactory field operation, for not less than 6000 hours exclusive of the manufacturer's factory tests, can be shown. Provide equipment items that are supported by a service organization.

2.2 IDENTIFICATION PLATES

In addition to standard manufacturer's identification plates, provide engraved laminated phenolic identification plates. Identification plates are to designate the function of the equipment. Submit designation with the shop drawings. Install identification plates using a compatible adhesive.

2.3 EQUIPMENT GUARDS AND ACCESS

Fully enclose or guard belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts exposed to personnel contact according to OSHA requirements. Properly guard or cover with insulation of a type specified, high temperature equipment and piping exposed to contact by personnel or where it creates a potential fire hazard.

2.4 ELECTRICAL WORK

- a. Provide motors, controllers, integral disconnects, contactors, and controls with their respective pieces of equipment, except controllers indicated as part of motor control centers. Provide electrical equipment, including motors and wiring, as specified in Section 26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL. Provide manual or automatic control and protective or signal devices required for the operation specified and control wiring required for controls and devices specified, but not shown. For packaged equipment, include manufacturer provided controllers with the required monitors and timed restart.
- b. For single-phase motors, provide high-efficiency type, fractional-horsepower alternating-current motors, including motors that are part of a system, in accordance with NEMA MG 11. Provide premium efficiency type integral size motors in accordance with NEMA MG 1.
- c. For polyphase motors, provide squirrel-cage medium induction motors, including motors that are part of a system, and that meet the efficiency ratings for premium efficiency motors in accordance with NEMA MG 1. Select premium efficiency polyphase motors in accordance with NEMA MG 10.
- d. 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. Provide motors rated for continuous duty with the enclosure specified. Provide motor duty that allows for maximum frequency start-stop operation and minimum encountered interval between start and stop. Provide motor torque capable of accelerating the connected load within 20 seconds with 80 percent of the rated voltage maintained at motor terminals during one starting period. Provide motor starters complete with thermal overload protection and other necessary appurtenances. Fit motor bearings with grease supply fittings and grease relief to outside of the enclosure.

2.5 PAINTING

Paint equipment units in accordance with approved equipment manufacturer's standards unless specified otherwise. Field retouch only if approved. Otherwise, return equipment to the factory for refinishing.

2.6 INDOOR AIR QUALITY

Provide equipment and components that comply with the requirements of ASHRAE 62.1 unless more stringent requirements are specified herein.

2.7 DUCT SYSTEMS

2.7.1 Metal Ductwork

Provide metal ductwork construction, including all fittings and components, that complies with SMACNA 1966, as supplemented and modified by this specification.

- a. Provide radius type elbows with a centerline radius of 1.5 times the width or diameter of the duct where space permits. Otherwise, elbows having a minimum radius equal to the width or diameter of the duct or square elbows with factory fabricated turning vanes are allowed.

- b. Provide sealants that conform to fire hazard classification specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS and are suitable for the range of air distribution and ambient temperatures to which it is exposed. Do not use pressure sensitive tape as a sealant. Provide duct sealant products that meet 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 (HVAC duct sealants are classified as "Other" within the SCAQMD Rule 1168 sealants table). Provide validation of indoor air quality for duct sealants.

2.7.1.1 Insulated Nonmetallic Flexible Duct Runouts

Use flexible duct runouts only where indicated. Runout length is indicated on the drawings, and is not to exceed 5 feet. Provide runouts that are preinsulated, factory fabricated, and that comply with NFPA 90A and UL 181. Provide either field or factory applied vapor barrier. Provide not less than 20 ounce glass fabric duct connectors coated on both sides with neoprene. Where coil induction or high velocity units are supplied with vertical air inlets, use a streamlined, vaned and mitered elbow transition piece for connection to the flexible duct or hose. Provide a die-stamped elbow and not a flexible connector as the last elbow to these units other than the vertical air inlet type. Insulated flexible connectors are allowed as runouts. Provide insulated material and vapor barrier that conform to the requirements of Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS. Do not expose the insulation material surface to the air stream.

2.7.1.2 General Service Duct Connectors

Provide a flexible duct connector approximately 6 inches in width where sheet metal connections are made to fans or where ducts of dissimilar metals are connected. For round/oval ducts, secure the flexible material by stainless steel or zinc-coated, iron clinch-type draw bands. For rectangular ducts, install the flexible material locked to metal collars using normal duct construction methods. Provide a composite connector system that complies with NFPA 701 and is classified as "flame-retardent fabrics" in UL Bld Mat Dir.

2.7.1.3 Aluminum Ducts

ASTM B209, alloy 3003-H14 for aluminum sheet and alloy 6061-T6 or equivalent strength for aluminum connectors and bar stock.

2.7.2 Manual Balancing Dampers

Furnish manual balancing dampers with accessible operating mechanisms. Use chromium plated operators (with all exposed edges rounded) in finished portions of the building. Provide manual volume control dampers that are operated by locking-type quadrant operators. Install dampers that are 2 gauges heavier than the duct in which installed. Unless otherwise indicated, provide opposed blade type multileaf dampers with maximum blade width of 12 inches. Provide access doors or panels for all concealed damper operators and locking setscrews. Provide stand-off mounting brackets, bases, or adapters not less than the thickness of the insulation when the locking-type quadrant operators for dampers are installed on ducts to be thermally insulated, to provide clearance between the duct surface and the operator. Provide stand-off mounting items that are integral with the operator or standard accessory of the damper manufacturer.

2.7.3 Sound Attenuation Equipment

2.7.3.1 System with total pressure of 4 Inch Water Gauge and Lower

Use sound attenuators only where indicated. Provide factory fabricated sound attenuators that are constructed of galvanized steel sheets. Provide attenuator with outer casing that is not less than 22 gauge. Provide fibrous glass acoustical fill. Provide net sound reduction indicated. Obtain values on a test unit not less than 24 by 24 inches outside dimensions made by a certified nationally recognized independent acoustical laboratory. Provide air flow capacity as indicated or required. Provide pressure drop through the attenuator that does not exceed the value indicated, or that is not in excess of 15 percent of the total external static pressure of the air handling system, whichever is less. Acoustically test attenuators with metal duct inlet and outlet sections while under the rated air flow conditions. Include with the noise reduction data the effects of flanking paths and vibration transmission. Construct sound attenuators to be airtight when operating at the internal static pressure indicated or specified for the duct system, but in no case less than 2 inch water gauge.

2.7.4 Diffusers, Registers, and Grilles

Provide factory-fabricated units of corrosion-resistant steel or aluminum that distribute the specified quantity of air evenly over space intended without causing noticeable drafts, air movement faster than 50 fpm in occupied zone, or dead spots anywhere in the conditioned area. Provide outlets for diffusion, spread, throw, and noise level as required for specified performance. Certify performance according to ASHRAE 70. Provide sound rated and certified inlets and outlets according to ASHRAE 70. Provide sound power level as indicated. Provide diffusers and registers with volume damper with accessible operator, unless otherwise indicated; or if standard with the manufacturer, an automatically controlled device is acceptable. Provide opposed blade type volume dampers for all diffusers and registers, except linear slot diffusers. Provide linear slot diffusers with round or elliptical balancing dampers. Where the inlet and outlet openings are located less than 7 feet above the floor, protect them by a grille or screen according to NFPA 90A.

2.7.4.1 Diffusers

Provide diffuser types indicated. Furnish ceiling mounted units with anti-smudge devices, unless the diffuser unit minimizes ceiling smudging through design features. Provide diffusers with air deflectors of the type indicated. Provide air handling troffers or combination light and ceiling diffusers conforming to the requirements of UL Electrical Constructn for the interchangeable use as cooled or heated air supply diffusers or return air units. Install ceiling mounted units with rims tight against ceiling. Provide sponge rubber gaskets between ceiling and surface mounted diffusers for air leakage control. Provide suitable trim for flush mounted diffusers. For connecting the duct to diffuser, provide duct collar that is airtight and does not interfere with volume controller. Provide return or exhaust units that are similar to supply diffusers.

2.7.4.2 Registers and Grilles

Provide units that are four-way directional-control type, except provide return and exhaust registers that are fixed horizontal or vertical louver

type similar in appearance to the supply register face. Furnish registers with sponge-rubber gasket between flanges and wall or ceiling. Install wall supply registers at least 6 inches below the ceiling unless otherwise indicated. Locate return and exhaust registers 6 inches above the floor unless otherwise indicated. Achieve four-way directional control by a grille face which can be rotated in 4 positions or by adjustment of horizontal and vertical vanes. Provide grilles as specified for registers, without volume control damper.

2.8 AIR SYSTEMS EQUIPMENT

2.8.1 Fans

Test and rate fans according to AMCA 210. Calculate system effect on air moving devices in accordance with AMCA 201 where installed ductwork differs from that indicated on drawings. Install air moving devices to minimize fan system effect. Where system effect is unavoidable, determine the most effective way to accommodate the inefficiencies caused by system effect on the installed air moving device. The sound power level of the fans must not exceed 85 dBA when tested according to AMCA 300 and rated in accordance with AMCA 301. Provide all fans with an AMCA seal. Connect fans to the motors directly. Provide fan and motor assemblies with vibration-isolation supports or mountings as indicated. Use vibration-isolation units that are standard products with published loading ratings. Select each fan to produce the capacity required at the fan static pressure indicated. Provide sound power level as indicated. Obtain the sound power level values according to AMCA 300. Provide standard AMCA arrangement, rotation, and discharge as indicated. Provide power ventilators that conform to UL 705 and have a UL label.

2.8.1.1 In-Line Centrifugal Fans

Provide in-line fans with centrifugal backward inclined blades, stationary discharge conversion vanes, internal and external belt guards, and adjustable motor mounts. Mount fans in a welded tubular casing. Mount fans in return duct closest to air handlers. Attach return duct into air handler, fans will operate when air handler operates. Provide a fan that axially flows the air in and out. Streamline inlets with conversion vanes to eliminate turbulence and provide smooth discharge air flow. Enclose and isolate fan bearings and drive shafts from the air stream. Provide precision, self aligning ball or roller type fan bearings that are sealed against dust and dirt and are permanently lubricated. Provide L50 rated bearing life at not less than 200,000 hours as defined by ABMA 9 and ABMA 11.

2.8.2 Ceiling Exhaust Fans

Provide centrifugal type, direct driven suspended cabinet-type ceiling exhaust fans. Provide fans with acoustically insulated housing. Provide chatter-proof backdraft damper. Provide egg-crate design or louver design integral face grille. Mount fan motors on vibration isolators. Furnish unit with mounting flange for hanging unit from above. Provide U.L. listed fans. Provide Energy Star labeled ceiling exhaust fan product. Provide proof of Energy Star label for ceiling exhaust fan product.

2.9 FACTORY PAINTING

Factory paint new equipment, which are not of galvanized construction. Paint with a corrosion resisting paint finish according to ASTM A123/A123M or ASTM A924/A924M. Clean, phosphatize and coat internal and external

ferrous metal surfaces with a paint finish which has been tested according to ASTM B117, ASTM D1654, and ASTM D3359. Submit evidence of satisfactory paint performance for a minimum of 125 hours for units to be installed indoors and 500 hours for units to be installed outdoors. Provide rating of failure at the scribe mark that is not less than 6, average creepage not greater than 1/8 inch. Provide rating of the inscribed area that is not less than 10, no failure. On units constructed of galvanized steel that have been welded, provide a final shop docket of zinc-rich protective paint on exterior surfaces of welds or welds that have burned through from the interior according to ASTM D520 Type I.

Field paint factory painting that has been damaged prior to acceptance by the Contracting Officer in compliance with the requirements of paragraph FIELD PAINTING OF MECHANICAL EQUIPMENT.

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing the work.

3.2 INSTALLATION

- a. Install materials and equipment in accordance with the requirements of the contract drawings and approved manufacturer's installation instructions. Accomplish installation by workers skilled in this type of work. Perform installation so that there is no degradation of the designed fire ratings of walls, partitions, ceilings, and floors.
- b. No installation is permitted to block or otherwise impede access to any existing machine or system. Install all hinged doors to swing open a minimum of 120 degrees. Provide an area in front of all access doors that clears a minimum of 3 feet. In front of all access doors to electrical circuits, clear the area the minimum distance to energized circuits as specified in OSHA Standards, part 1910.333 (Electrical-Safety Related work practices) and an additional 3 feet.
- c. Except as otherwise indicated, install emergency switches and alarms in conspicuous locations. Mount all indicators, to include gauges, meters, and alarms in order to be easily visible by people in the area.

3.2.1 Equipment and Installation

Provide frames and supports for the air handling unit, condenser and dampers. Floor mount or ceiling hang air handling units as indicated. Anchor and fasten as detailed. Set floor-mounted equipment on not less than 6 inch concrete pads or curbs doweled in place unless otherwise indicated.

3.2.2 Flexible Duct

Install pre-insulated flexible duct in accordance with the latest printed instructions of the manufacturer to ensure a vapor tight joint. Provide hangers, when required to suspend the duct, of the type recommended by the duct manufacturer and set at the intervals recommended.

3.2.3 Metal Ductwork

Install according to **SMACNA 1966** unless otherwise indicated. Install duct supports for sheet metal ductwork according to **SMACNA 1966**, unless otherwise specified. Do not use friction beam clamps indicated in **SMACNA 1966**. Anchor risers on high velocity ducts in the center of the vertical run to allow ends of riser to move due to thermal expansion. Erect supports on the risers that allow free vertical movement of the duct. Attach supports only to structural framing members and concrete slabs. Do not anchor supports to metal decking unless a means is provided and approved for preventing the anchor from puncturing the metal decking. Where supports are required between structural framing members, provide suitable intermediate metal framing. Where C-clamps are used, provide retainer clips.

3.2.4 Dust Control

To prevent the accumulation of dust, debris and foreign material during construction, perform temporary dust control protection. Protect the distribution system (supply and return) with temporary seal-offs at all inlets and outlets at the end of each day's work. Keep temporary protection in place until system is ready for startup.

3.2.5 Insulation

Provide thickness and application of insulation materials for ductwork, piping, and equipment according to Section **23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS**.

3.2.6 Duct Test Holes

Provide holes with closures or threaded holes with plugs in ducts and plenums as indicated or where necessary for the use of pitot tube in balancing the air system. Plug insulated duct at the duct surface, patched over with insulation and then marked to indicate location of test hole if needed for future use.

3.3 CUTTING AND PATCHING

Install work in such a manner and at such time that a minimum of cutting and patching of the building structure is required. Make holes in exposed locations, in or through existing floors, by drilling and smooth by sanding. Use of a jackhammer is permitted only where specifically approved. Make holes through masonry walls to accommodate sleeves with an iron pipe masonry core saw.

3.4 CLEANING

Thoroughly clean surfaces of piping and equipment that have become covered with dirt, plaster, or other material during handling and construction before such surfaces are prepared for final finish painting or are enclosed within the building structure. Before final acceptance, clean mechanical equipment, including piping, ducting, and fixtures, and free from dirt, grease, and finger marks. Incorporate housekeeping for field construction work which leaves all furniture and equipment in the affected area free of construction generated dust and debris; and, all floor surfaces vacuum-swept clean.

3.5 PENETRATIONS

Provide sleeves and prepared openings for duct mains, branches, and other penetrating items, and install during the construction of the surface to be penetrated. Cut sleeves flush with each surface. Place sleeves for round duct 15 inches and smaller. Build framed, prepared openings for round duct larger than 15 inches and square, rectangular or oval ducts. Sleeves and framed openings are also required where grilles, registers, and diffusers are installed at the openings. Provide one inch clearance between penetrating and penetrated surfaces except at grilles, registers, and diffusers. Pack spaces between sleeve or opening and duct or duct insulation with mineral fiber conforming with ASTM C553, Type 1, Class B-2.

3.5.1 Sleeves

Fabricate sleeves, except as otherwise specified or indicated, from 20 gauge thick mill galvanized sheet metal. Where sleeves are installed in bearing walls or partitions, provide black steel pipe conforming with ASTM A53/A53M, Schedule 20.

3.5.2 Framed Prepared Openings

Fabricate framed prepared openings from 20 gauge galvanized steel, unless otherwise indicated.

3.5.3 Insulation

Provide duct insulation in accordance with Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS continuous through sleeves and prepared openings except firewall penetrations. Terminate duct insulation at fire dampers and flexible connections. For duct handling air at or below 60 degrees F, provide insulation continuous over the damper collar and retaining angle of fire dampers, which are exposed to unconditioned air.

3.5.4 Closure Collars

Provide closure collars of a minimum 4 inches wide, unless otherwise indicated, for exposed ducts and items on each side of penetrated surface, except where equipment is installed. Install collar tight against the surface and fit snugly around the duct or insulation. Grind sharp edges smooth to prevent damage to penetrating surface. Fabricate collars for round ducts 15 inches in diameter or less from 20 gauge galvanized steel. Fabricate collars for square and rectangular ducts, or round ducts with minimum dimension over 15 inches from 18 gauge galvanized steel. Fabricate collars for square and rectangular ducts with a maximum side of 15 inches or less from 20 gauge galvanized steel. Install collars with fasteners a maximum of 6 inches on center. Attach to collars a minimum of 4 fasteners where the opening is 12 inches in diameter or less, and a minimum of 8 fasteners where the opening is 20 inches in diameter or less.

3.6 FIELD PAINTING OF MECHANICAL EQUIPMENT

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 clean to bare metal on metal surfaces subject to temperatures in excess of 120 degrees F. 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. Provide aluminum or light gray finish coat.

3.6.1 Temperatures less than 120 degrees F

Immediately after cleaning, apply 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 to metal surfaces subject to temperatures less than 120 degrees F.

3.7 TESTING, ADJUSTING, AND BALANCING

The requirements for testing, adjusting, and balancing are specified in Section 23 05 93 TESTING, ADJUSTING AND BALANCING FOR HVAC. Begin testing, adjusting, and balancing only when the air supply and distribution, including controls, has been completed, with the exception of performance tests.

3.8 PERFORMANCE TESTS

After testing, adjusting, and balancing is complete as specified, test each system as a whole to see that all items perform as integral parts of the system and temperatures and conditions are evenly controlled throughout the building. Record the testing during the applicable season. Make corrections and adjustments as necessary to produce the conditions indicated or specified. Conduct capacity tests and general operating tests by an experienced engineer. Provide tests that cover a period of not less than 1 days for each system and demonstrate that the entire system is functioning according to the specifications. Make coincidental chart recordings at points indicated on the drawings for the duration of the time period and record the temperature at space thermostats or space sensors, the humidity at space humidistats or space sensors and the ambient temperature and humidity in a shaded and weather protected area.

Submit test reports for the performance tests in booklet form, upon completion of testing. Document phases of tests performed including initial test summary, repairs/adjustments made, and final test results in the reports.

3.9 CLEANING AND ADJUSTING

Provide a temporary bypass for water coils to prevent flushing water from passing through coils. Inside of units thoroughly clean ducts, plenums, and casing of debris and blow free of small particles of rubbish and dust and then vacuum clean before installing outlet faces. Wipe equipment clean, with no traces of oil, dust, dirt, or paint spots. Provide temporary filters prior to startup of all fans that are operated during construction, and provide new filters after all construction dirt has been removed from the building, and the ducts, plenums, casings, and other items specified have been vacuum cleaned. Perform and document that proper "Indoor Air Quality During Construction" procedures have been followed; provide documentation showing that after construction ends, and prior to occupancy, new filters were provided and installed. Maintain system in this clean condition until final acceptance. Properly lubricate bearings with oil or grease as recommended by the manufacturer. Tighten belts to proper tension. Adjust control valves and other miscellaneous equipment requiring adjustment to setting indicated or directed. Adjust fans to the speed indicated by the manufacturer to meet specified conditions. Maintain

all equipment installed under the contract until close out documentation is received, the project is completed and the building has been documented as beneficially occupied.

3.10 OPERATION AND MAINTENANCE

3.10.1 [Operation and Maintenance Manuals](#)

Submit manuals at least 2 weeks prior to field training.

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SECTION 23 01 30.41

HVAC SYSTEM CLEANING
02/15

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 HEATING, REFRIGERATING AND AIR-CONDITIONING
ENGINEERS (ASHRAE)

ASHRAE 62.1 (2010) Ventilation for Acceptable Indoor
Air Quality

NATIONAL AIR DUCT CLEANERS ASSOCIATION (NADCA)

ACR (2013) Standard for Assessment, Cleaning,
and Restoration of HVAC Systems

NADCA HVAC Inspection Manual (2005) Procedures for Assessing the
Cleanliness of Commercial HVAC Systems

NORTH AMERICAN INSULATION MANUFACTURERS ASSOCIATION (NAIMA)

NAIMA AH112 (1993) Cleaning Fibrous Glass or Lined
Sheet Metal Ducts

NAIMA AH122 (2006) Cleaning Fibrous Insulated Duct
Systems - Recommended Practices

NAIMA AH127 (1999) Facts About the Impact of Duct
Cleaning on Internal Duct Insulation

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

SMACNA 1966 (2005) HVAC Duct Construction Standards
Metal and Flexible, 3rd Edition

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 402-C-01-001 (2001) IAQ Building Education and
Assessment Tool (I-BEAM)

EPA 402-F-91-102 (1991) Building Air Quality: A Guide for
Building Owners and Facility Managers

UNDERWRITERS LABORATORIES (UL)

UL 181 (2013; Reprint Apr 2017) UL Standard for
Safety Factory-Made Air Ducts and Air
Connectors

UL 181A (2013; Reprint Mar 2017) Standard for Safety Closure Systems for Use with Rigid Air Ducts

UL 181B (2013; Reprint Mar 2017) UL Standard for Safety Closure Systems for Use with Flexible Air Ducts and Air Connectors

1.2 DEFINITIONS

1.2.1 NADCA Standards

Perform the services specified here in accordance with the current published standards of the National Air Duct Cleaners Association (ACR and NADCA HVAC Inspection Manual).

- a. All terms in this specification are defined as stated in the NADCA Standards.
- b. Follow NADCA Standards without modification or deviation.

1.3 SUBMITTALS

Contracting Organization approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Record of Existing Conditions

Coordination Plan

NADCA Firm

NADCA Team Assistants

NADCA Air System Cleaning Specialist (ASCS)

NADCA Supervisor Qualifications

Records of Experience in the Field of HVAC System Cleaning

NADCA Work Execution Schedule

SD-03 Product Data

Safety Data Sheets (SDS)

SD-06 Test Reports

Testing Procedures Summary

Gravimetric Analysis

Post-Project Report

1.4 QUALITY CONTROL

1.4.1 NADCA Firm

Submit information certifying that the NADCA firm is a first tier subcontractor who is not affiliated with any other company participating in work on this contract, including furnishing equipment. Further, submit the following, for the firm, to Contracting Officer for approval:

a. Independent NADCA firm:

NADCA Firm: NADCA registration number and expiration date of current certification;

NADCA Supervisor Qualifications: Name and copy of NADCA supervisor certificate and expiration date of current certification.

NADCA Air System Cleaning Specialist (ASCS): Name and documented evidence that the team field leader has satisfactorily performed full-time supervision of HVAC cleaning work in the field for not less than 3 years immediately preceding this contract's bid opening date.

NADCA Team Assistants: Names and documented evidence that each field technician has satisfactorily assisted a NADCA team field leader in performance of HVAC cleaning work in the field for not less than one year immediately preceding this contract's bid opening date.

Current Certificates: Ensure registrations and certifications are current, and valid for the duration of this contract. Renew Certifications which expire prior to completion of the HVAC cleaning work, in a timely manner so that there is no lapse in registration or certification. NADCA agency or NADCA team personnel without a current registration or current certification are not to perform HVAC cleaning work on this contract.

- b. TAB Team Members: NADCA team approved to accomplish work on this contract are full-time employees of the NADCA firm. No other personnel is allowed to do HVAC cleaning work on this contract.
- c. Replacement of NADCA 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.

1.4.2 Experience

Submit **records of experience in the field of HVAC system cleaning**. Bids will only be considered from firms which are regularly engaged in HVAC system maintenance with an emphasis on HVAC system cleaning and decontamination.

1.4.3 Equipment, Materials and Labor

Possess and furnish all necessary equipment, materials and labor to adequately perform the specified services and comply with the applicable provisions of NADCA General Specifications for the Cleaning of Commercial HVAC Systems and **ASHRAE 62.1**.

- a. Assure that all employees have received safety equipment training, medical surveillance programs, individual health protection measures,

and manufacturer's product and Safety Data Sheets (SDS) as required for the work by the U.S. Occupational Safety and Health Administration, and as described by this specification. For work performed in countries outside of the U.S.A., comply with applicable national safety codes and standards.

- b. Maintain a copy of all current SDS documentation and safety certifications at the site at all times, as well as comply with all other site documentation requirements of applicable OSHA programs and this specification.
- c. Submit all [Safety Data Sheets \(SDS\)](#) for all chemical products proposed used in the cleaning process, including all VOC ratings.

1.4.4 Licensing

Provide proof of maintaining the proper license(s), if any, as required to do work in the state of [Florida](#). Comply with all Federal, State and local rules, regulations, and licensing requirements.

1.4.5 Health And Safety

1.4.5.1 Safety Standards

Comply with all applicable Federal, State, and local requirements for protecting the safety of the contractors' employees, building occupants, and the environment. In particular, follow all applicable standards of the Occupational Safety and Health Administration (OSHA) when working in accordance with this specification.

1.4.5.2 Occupant Safety

Employ no processes or materials in such a manner that introduce additional hazards into occupied spaces.

1.4.5.3 Disposal of Debris

Dispose of all debris removed from the HVAC System in accordance with applicable Federal, State and local requirements.

1.5 PROJECT/SITE CONDITIONS

1.5.1 Mechanical Drawings

Obtain one copy of the following documents:

- a. Project drawings and specifications
- b. Approved construction revisions pertaining to the HVAC system
- c. Any existing indoor air quality (IAQ) assessments or environmental reports prepared for the facility.

Submit a [NADCA Work Execution Schedule](#) to the Contracting Officer within 10 working days of the contract award.

1.5.2 Site Conditions

The HVAC system includes any interior surface of the facility's air

distribution system for conditioned spaces and/or occupied zones. This includes the entire heating, air-conditioning and ventilation system from the points where the air enters the system to the points where the air is discharged from the system. The return air grilles, return air ducts (except ceiling plenums and mechanical room) to the air handling unit (AHU), the interior surfaces of the AHU, mixing box, coil compartment, condensate drain pans, humidifiers and dehumidifiers, supply air ducts, fans, fan housing, fan blades, air wash systems, spray eliminators, turning vanes, filters, filter housings, reheat coils, and supply diffusers are all considered part of the HVAC system. The HVAC system may also include other components such as dedicated exhaust and ventilation components and make-up air systems.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Perform the services specified here in accordance with the current published standards of the National Air Duct Cleaners Association (ACR and NADCA HVAC Inspection Manual).

- a. All terms in this specification have their meaning defined as stated in the NADCA Standards.
- b. Follow NADCA Standards with no modifications or deviations being allowed. Remove visible surface contaminants and deposits from within the HVAC system in strict accordance with these specifications.

3.1 PREPARATION

3.1.1 HVAC System Inspections And Site Preparations

3.1.1.1 HVAC System Evaluation

Prior to the commencement of any cleaning work, perform a visual inspection of the HVAC system in the presence of the Contracting Officer to determine appropriate methods, tools, and equipment required to satisfactorily complete this project. Notify the Contracting Officer 10 days prior to the planned inspection.

Document damaged system components found during the inspection and submit to the Contracting Officer, clearly labeled "[Record of Existing Conditions](#)."

3.1.1.2 Site Evaluation and Preparations

Conduct a site evaluation, and establish a specific, [coordination plan](#) which details how each area of the building is protected during the various phases of the project.

3.2 APPLICATION

3.2.1 General HVAC System Cleaning Requirements

3.2.1.1 Containment

Collect debris removed during cleaning and take precautions to ensure that debris is not otherwise dispersed outside the HVAC system during the

cleaning process.

3.2.1.2 Particulate Collection

Where the Particulate Collection Equipment (PCE) is exhausting inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron size (or greater). When the PCE is exhausting outside the building, undertake mechanical cleaning operations only with PCE, including adequate filtration to contain debris removed from the HVAC system. When the PCE is exhausting outside the building, take precautions to locate the equipment down wind and away from all air intakes and other points of entry into the building.

3.2.1.3 Controlling Odors

Take all reasonable measures to control offensive odors and/or mist vapors during the cleaning process.

3.2.1.4 Component Cleaning

Employ cleaning methods such that all HVAC system components are Visibly Clean as defined in applicable standards. Upon completion, return all components to those settings recorded just prior to cleaning operations.

3.2.1.5 Air-Volume Control Devices

Mark the position of dampers and any air-directional mechanical devices inside the HVAC system prior to cleaning and, upon completion, restore to their marked position.

3.2.1.6 Service Openings

Utilize service openings, as required for proper cleaning, at various points of the HVAC system for physical and mechanical entry, and inspection. Utilize the existing service openings already installed in the HVAC system where possible.

Create other openings where needed, created and resealed in conformance with NADCA Standard 05. Place closures so they do not significantly hinder, restrict, alter the air-flow within the system, or compromise the structural integrity of the system. Properly insulate closures to prevent heat loss/gain or condensation on surfaces within the system. Conform construction techniques used in the creation of openings to requirements of applicable building and fire codes, and applicable NFPA, SMACNA and NADCA Standards. Cutting service openings into flexible duct is not permitted. Disconnect flexible duct at the ends as needed for proper cleaning and inspection.

Reseal rigid fiber glass ductboard duct systems in accordance with NAIMA recommended practices; [NAIMA AH112](#), [NAIMA AH122](#), and [NAIMA AH127](#). Only closure techniques which comply with [UL 181](#), [UL 181A](#), or [UL 181B](#) are suitable for fiber glass duct system closures.

Clearly mark all service openings, capable of being re-opened for future inspection or remediation, and report their location in project report documents.

3.2.1.7 Ceiling Sections (Tile)

Carefully remove and reinstall ceiling sections to gain access to HVAC systems during the cleaning process. Replace any damaged ceiling sections caused by the removal at no cost to the Government.

3.2.1.8 Air Distribution Devices (Registers, Grilles and Diffusers)

Clean all air distribution devices.

3.2.1.9 Air Handling Units, Terminal Units, Blowers and Exhaust Fans

Ensure that supply, return, and exhaust fans and blowers are thoroughly cleaned. Areas for cleaning include blowers, fan housings, plenums (except ceiling supply and return plenums), scrolls, blades, or vanes, shafts, baffles, dampers and drive assemblies. Remove all visible surface contamination deposits in accordance with NADCA Standards.

- a. Clean all air handling unit (AHU) internal surfaces, components and condensate collectors and drains.
- b. Assure that a suitable operative drainage system is in place prior to beginning wash down procedures.
- c. Clean all coils and related components, including evaporator fins.

3.2.1.10 Duct Systems

- a. Create service openings in the system as necessary in order to accommodate cleaning of otherwise inaccessible areas.
- b. Mechanically clean all duct systems to remove all visible contaminants, such that the systems are capable of passing NADCA Cleaning Verification Testings Standards.

3.2.2 Mechanical Cleaning Methodology

3.2.2.1 Source Removal Cleaning Methods

Clean the HVAC system using Source Removal mechanical cleaning methods designed to extract contaminants from within the HVAC system and safely remove contaminants from the facility. Select Source Removal methods which will render the HVAC System Visibly Clean and capable of passing NADCA cleaning verification methods Standards and other specified standards and tests, in accordance with all general requirements. Use no cleaning method, or combination of methods, which could potentially damage components of the HVAC system or negatively alter the integrity of the system.

Incorporate the use of vacuum collection devices that are operated continuously during cleaning for all methods used. Connect a vacuum device to the downstream end of the section being cleaned through a predetermined opening. Use a vacuum collection device of sufficient power to render all areas being cleaned under negative pressure, such that containment of debris and the protection of the indoor environment is assured.

Equip all vacuum devices exhausting air inside the building, including hand-held vacuums and wet-vacuums, with HEPA filters (minimum efficiency).

Equip all vacuum devices exhausting air outside the facility with Particulate Collection including adequate filtration to contain Debris removed from the HVAC system, in a manner that does not allow contaminants to re-enter the facility. Release of debris outdoors which violates any outdoor environmental standards, codes or regulations is not allowed.

All methods require mechanical agitation devices to dislodge debris adhered to interior HVAC system surfaces, such that debris may be safely conveyed to vacuum collection devices. Acceptable methods include those which will not potentially damage the integrity of the ductwork, nor damage porous surface materials such as liners inside the ductwork or system components.

3.2.2.2 Methods of Cleaning Fibrous Glass Insulated Components

Thoroughly clean glass thermal insulation elements present in any equipment or ductwork with HEPA vacuuming equipment. Clean while the HVAC system is under constant negative pressure, and not permitted to get wet in accordance with applicable NADCA and NAIMA standards and recommendations.

Do not use cleaning methods that cause damage to fibrous glass components or renders the system capable of passing Cleaning Verification Tests NADCA Standards.

3.2.2.3 Damaged Fibrous Glass Material

If there is any evidence of damage, deterioration, delamination, friable material, mold or fungus growth, or moisture such that fibrous glass materials cannot be restored by cleaning or resurfacing with an acceptable insulation repair coating, identify them to the Contracting Officer for replacement.

When requested or specified, remediate exposed damaged insulation in air handlers and/or ductwork requiring replacement.

3.2.2.4 Replacement Material

If replacement of fiber glass materials is required, conform all materials to applicable industry codes and standards, including those of UL and [SMACNA 1966](#).

3.2.2.5 Cleaning of Coils

Use any cleaning method which renders the coil visibly clean and capable of passing NADCA Coil Cleaning Verification Standards. Coil drain pans are subject to Non-Porous Surfaces Cleaning Verification. Maintain operability of the drain for the condensate at all times. Do not damage, displace, inhibit heat transfer, or cause erosion of the coil surface or fins, and conform to coil manufacturer recommendations when available. Thoroughly rinse coils with clean water to remove any latent residues.

3.2.2.6 Antimicrobial Agents and Coatings

Only apply antimicrobial agents if active fungal growth is reasonably suspected, or where unacceptable levels of fungal contamination have been verified through testing.

Perform application of any antimicrobial agents used to control the growth of fungal or bacteriological contaminants after the removal of surface deposits and debris.

Use only antimicrobial agents registered by the U.S. Environmental Protection Agency (EPA 402-F-91-102) (EPA 402-C-01-001) specifically for use within HVAC system.

Apply antimicrobial agents in strict accordance with manufacturer's instructions.

Use only antimicrobial coating products, for both porous and non-porous surfaces, which are EPA registered, water soluble solutions with supporting efficacy data and SDS records.

Apply antimicrobial coatings according to manufacturer's instructions. Spray coatings directly onto interior ductwork surfaces, rather than "fog" downstream onto surfaces. Achieve a continuous film on the surface treated by the coating application, and apply in strict accordance with manufacturer's minimum millage surface application rate standards for effectiveness.

3.3 FIELD QUALITY CONTROL

3.3.1 CLEANLINESS VERIFICATION

3.3.1.1 General

Verification of HVAC System cleanliness is determined after mechanical cleaning and before the application of any treatment or introduction of any treatment-related substance to the HVAC system, including antimicrobial agents and coatings.

3.3.1.2 Visual Inspection

Visually inspect the HVAC system to ensure that no visible contaminants are present.

If no contaminants are evident through visual inspection, consider the HVAC system clean; however, further verification of the system cleanliness through gravimetric or wipe testing analysis testing may be requested at the discretion of the Contracting Officer.

If visible contaminants are evident through visual inspection, re-clean those portions of the system where contaminants are visible, and subject to re-inspection for cleanliness.

3.3.1.3 Gravimetric Analysis

At the expense of the **Contractor**, test sections of the HVAC system for cleanliness using the NADCA Vacuum Test (gravimetric analysis) as specified in applicable NADCA Standards. Ensure levels of debris collected are equal to or less than acceptable levels defined in applicable NADCA Standards.

If gravimetric analysis determines that levels of debris are equal to or lower than those levels specified, the system is considered clean and to have passed cleanliness verification.

If gravimetric analysis determines that levels of debris exceed those specified in applicable NADCA standards, the system will not be considered clean, and re-cleaning of those sections of the system which failed cleanliness verification will be required at the expense of the HVAC system

cleaning contractor.

Perform cleanliness verification immediately after mechanical cleaning and before the HVAC system is restored to normal operation.

3.3.1.4 Verification of Coil Cleaning

Cleaning is to restore the coil pressure drop to within 10 percent of the pressure drop measured when the coil was first installed. If the original pressure drop is not known, the coil will be considered clean only if the coil is free of foreign matter and chemical residue, based on a thorough visual inspection (see [NADCA HVAC Inspection Manual](#) Standards).

3.3.2 Post-Project Report

At the conclusion of the project, provide a [Testing Procedures Summary](#) and [Post-Project Report](#) indicating the following:

- a. Success of the cleaning project, as verified through visual inspection or gravimetric analysis.
- b. Areas of the system found to be damaged and/or in need of repair.

-- End of Section --

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SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC
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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.

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 1780 (2002) HVAC Systems - Testing, Adjusting
and Balancing, 3rd Edition

SMACNA 1858 (2004) HVAC Sound And Vibration Manual -
First Edition

SMACNA 1972 CD (2012) HVAC Air Duct Leakage Test Manual -
2nd 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 "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 original measurement reported on the TAB Report for a specific parameter."
- h. Season of maximum heating load: The time of year when the outdoor temperature at the project site remains within **plus or minus 30 degrees Fahrenheit** of the project site's winter outdoor design temperature, 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 within **plus or minus 5 degrees Fahrenheit** of the project site's summer outdoor design temperature, throughout the period of TAB data recording.
- 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
- 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

SIMILAR TERMS			
Contract Term	AABC Term	NEBB Term	TABB Term
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 and existing heating, ventilating, and cooling (HVAC) air and water distribution systems including [equipment and performance data](#), ducts, and piping which are located within, on, under, between, and adjacent to buildings.

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 systems (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](#).

1.4 SUBMITTALS

[Approval is required for all submittals.](#) Submit the following in accordance with Section [01 33 00 SUBMITTAL PROCEDURES](#):

[SD-01 Preconstruction Submittals](#)

[Equipment and Performance Data;](#)

[SD-06 Test Reports](#)

[Completed Pre-Final DALT Report;](#)

[Certified Final DALT Report;](#)

[Independent TAB Agency and Personnel Qualifications;](#)

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, or construction. 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.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 WORK DESCRIPTIONS OF PARTICIPANTS

Comply with requirements of this section.

3.2 PRE-DALT/TAB MEETING

Meet with the Contracting Officer's technical representative (COTR) to develop a mutual understanding relative to the details of the DALT work and TAB work requirements. Ensure that the TAB supervisor is present at this meeting. Requirements to be discussed include required submittals, work schedule, and field quality control.

3.3 DALT PROCEDURES

3.3.1 Instruments, Consumables and Personnel

Provide instruments, consumables and personnel required to accomplish the DALT field work. Follow the same basic procedure specified below for TAB Field Work, including maintenance and calibration of instruments, accuracy of measurements, preliminary procedures, field work, workmanship and treatment of deficiencies. Calibrate and maintain instruments in accordance with manufacturer's written procedures.

3.3.2 Advance Notice of Pre-Final DALT Field Work

On completion of the installation of each duct system indicated to be DALT'd, notify the Contracting Officer in writing prior to the COTR's duct selection field visit.

3.3.3 Ductwork To Be DALT'd

From each duct system indicated as subject to DALT, the COTR will randomly select sections of each completed duct system for testing by the Contractor's TAB Firm. The sections selected will not exceed 20 percent of the total measured linear footage of duct systems indicated as subject to DALT. Sections of duct systems subject to DALT will include 20 percent of main ducts, branch main ducts, branch ducts and plenums for supply, return, exhaust, and plenum ductwork.

It is acceptable for an entire duct system to be DALT'd instead of disassembling that system in order to DALT only the 20 percent portion specified above.

3.3.4 DALT Testing

Perform DALT on the HVAC duct sections of each system as selected by the COTR. Use the duct class, seal class, leakage class and the leak test pressure data indicated on the drawings, to comply with the procedures specified in [SMACNA 1972 CD](#).

In spite of specifications of [SMACNA 1972 CD](#) to the contrary, DALT ductwork of construction class of [3-inch](#) water gauge static pressure and below if indicated to be DALT'd. Complete DALT work on the COTR selected ductwork within 48 hours after the particular ductwork was selected for DALT. Separately conduct DALT work for large duct systems to enable the DALT work to be completed in 48 hours.

3.3.5 Completed Pre-Final DALT Report

3.3.6 Quality Assurance - COTR DALT Field Acceptance Testing

In the presence of the COTR and TAB team field leader, verify for accuracy Pre-final DALT Report data selected by the COTR. For each duct system, this acceptance testing **must** be conducted on a maximum of 50 percent of the duct sections DALT'd.

Further, if any data on the Pre-final DALT report form for a given duct section is out-of-tolerance, then field acceptance testing **must** be conducted on data for one additional duct section, preferably in the same duct system, in the presence of the COTR.

3.3.7 Additional COTR Field Acceptance Testing

If any of the duct sections checked for a given system are determined to have a leakage rate measured that exceeds the leakage rate allowed by SMACNA Leak Test Manual for an indicated duct construction class and sealant class, terminate data checking for that section. The associated Pre-final DALT Report data for the given duct system will be disapproved. Make the necessary corrections and prepare a revised Pre-final DALT Report. Reschedule a field check of the revised report data with the COTR.

3.3.8 Certified Final DALT Report

3.3.9 Prerequisite for TAB Field Work

Do not commence TAB field work prior to the completion and approval, for all systems, of the Final DALT Report.

3.4 TAB PROCEDURES

3.4.1 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.

That is, comply with the requirements of **AABC MN-1** 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.

3.4.2 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.

3.4.3 TAB Air Distribution Systems

3.4.3.1 Units With Coils

Report heating and cooling performance capacity tests for hot water, chilled water, DX and steam coils for the purpose of verifying that the coils meet the indicated design capacity. Submit the following data and calculations with the coil test reports:

- a. For air handlers with capacities greater than 7.5 tons (90,000 Btu) cooling, such as factory manufactured units, central built-up units and rooftop units, conduct capacity tests in accordance with AABC MN-4, procedure 3.5, "Coil Capacity Testing."

Do not determine entering and leaving wet and dry bulb temperatures by single point measurement, but by the average of multiple readings in compliance with paragraph 3.5-5, "Procedures", (in subparagraph d.) of AABC MN-4, Procedure 3.5, "Coil Capacity Testing."

Submit part-load coil performance data from the coil manufacturer converting test conditions to design conditions; use the data for the purpose of verifying that the coils meet the indicated design capacity in compliance with AABC MN-4, Procedure 3.5, "Coil Capacity Testing," paragraph 3.5.7, "Actual Capacity Vs. Design Capacity" (in subparagraph c.).

- b. For units with capacities of 7.5 tons (90,000 Btu) or less, such as fan coil units, duct mounted reheat coils associated with VAV terminal units, and unitary units, such as through-the-wall heat pumps:

Determine the apparent coil capacity by calculations using single point measurement of entering and leaving wet and dry bulb temperatures; submit the calculations with the coil reports.

3.4.3.2 Air Handling Units

Air handling unit systems including fans (air handling unit fans, exhaust fans and winter ventilation fans), coils, ducts, plenums, mixing boxes, terminal units, variable air volume boxes, and air distribution devices for supply air, return air, outside air, mixed air relief air, and makeup air.

3.4.3.3 Rooftop Air Conditioning

Rooftop air conditioning systems including fans, coils, ducts, plenums, and air distribution devices for supply air, return air, and outside air.

For refrigeration compressors/condensers/condensing units/evaporators, report data as required by NEBB, AABC, and TABB standard procedures, including refrigeration operational data.

3.4.3.4 Return Air Fans

Return air fan system including fan ducts, plenums, registers, diffusers, grilles, and louvers for supply air, return air, outside air, and mixed air.

3.4.3.5 Exhaust Fans

Exhaust fan systems including fans, ducts, plenums, grilles, and hoods for exhaust air.

3.4.4 TAB Work on Performance Tests Without Seasonal Limitations

3.4.4.1 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.

3.4.4.2 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.

3.4.5 Workmanship

Conduct TAB work on the HVAC systems until measured flow rates are within plus or minus 5 percent of the design flow rates as specified or indicated on the contract documents. 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. If, with these adjustments and equipment changes, the specified or indicated design flow rates cannot be attained, contact the Contracting Officer for direction.

3.4.6 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 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.

3.4.7 TAB Reports

3.4.8 Quality Assurance - COTR TAB Field Acceptance Testing

3.4.8.1 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) 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: 25 percent of the supply fans, exhaust fans, and pumps.

Further, if any data on the TAB Report for Groups 2 through 5 is found not to fall within the range of plus 5 to minus 5 percent of the TAB Report data, additional group data verification is required in the presence of the COTR. Verify TAB Report data for one additional piece of equipment in that group. Continue this additional group data verification until out-of-tolerance data ceases to be found.

3.4.8.2 Additional COTR TAB Field Acceptance Testing

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 TAB Report data, 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.

3.4.8.3 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.

3.5 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.

3.6 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 --

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DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

SECTION 23 07 00

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SECTION 23 07 00

THERMAL INSULATION FOR MECHANICAL SYSTEMS
02/13

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. At the discretion of the Government, the manufacturer of any material supplied will be required to furnish test reports pertaining to any of the tests necessary to assure compliance with the standard or standards referenced in this specification.

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

ASHRAE 90.1 - IP (2013) Energy Standard for Buildings
Except Low-Rise Residential Buildings

ASHRAE 90.2 (2018) Energy Efficient Design of Low-Rise
Residential Buildings

ASTM INTERNATIONAL (ASTM)

ASTM A167 (2011) Standard Specification for
Stainless and Heat-Resisting
Chromium-Nickel Steel Plate, Sheet, and
Strip

ASTM A580/A580M (2018) Standard Specification for
Stainless Steel Wire

ASTM B209 (2014) Standard Specification for Aluminum
and Aluminum-Alloy Sheet and Plate

ASTM C1136 (2017a) Standard Specification for
Flexible, Low Permeance Vapor Retarders
for Thermal Insulation

ASTM C1710 (2011) Standard Guide for Installation of
Flexible Closed Cell Preformed Insulation
in Tube and Sheet Form

ASTM C195 (2007; R 2013) Standard Specification for
Mineral Fiber Thermal Insulating Cement

ASTM C450 (2008) Standard Practice for Fabrication
of Thermal Insulating Fitting Covers for
NPS Piping, and Vessel Lagging

ASTM C534/C534M (2016) Standard Specification for
Preformed Flexible Elastomeric Cellular
Thermal Insulation in Sheet and Tubular

Form

ASTM C552	(2017; E 2018) Standard Specification for Cellular Glass Thermal Insulation
ASTM C647	(2008; R 2013) Properties and Tests of Mastics and Coating Finishes for Thermal Insulation
ASTM C795	(2008; R 2013) Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel
ASTM C916	(2014) Standard Specification for Adhesives for Duct Thermal Insulation
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM C921	(2010) Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation
ASTM D2863	(2017a) Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)
ASTM D5590	(2000; R 2010; E 2012) Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay
ASTM D882	(2012) Tensile Properties of Thin Plastic Sheeting
ASTM E2231	(2018) Standard Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics
ASTM E84	(2019b) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E96/E96M	(2016) Standard Test Methods for Water Vapor Transmission of Materials

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

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide

<http://www.approvalguide.com/>

GREEN SEAL (GS)

GS-36 (2013) Adhesives for Commercial Use

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 2758 (2014) Paper - Determination of Bursting Strength

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

MSS SP-58 (2009) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation

MIDWEST INSULATION CONTRACTORS ASSOCIATION (MICA)

MICA Insulation Stds (8th Ed) National Commercial & Industrial Insulation Standards

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168 (2017) Adhesive and Sealant Applications

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-A-24179 (1969; Rev A; Am 2 1980; Notice 1 1987) Adhesive, Flexible Unicellular-Plastic Thermal Insulation

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

UNDERWRITERS LABORATORIES (UL)

UL 723 (2018) UL Standard for Safety Test for Surface Burning Characteristics of Building Materials

UL 94 (2013; Reprint Sep 2017) UL Standard for Safety Tests for Flammability of Plastic Materials for Parts in Devices and Appliances

1.2 SYSTEM DESCRIPTION

1.2.1 General

Provide field-applied insulation and accessories on mechanical systems as specified herein; factory-applied insulation is specified under the piping, duct or equipment to be insulated.

1.3 SUBMITTALS

Approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Submit the three SD types, SD-02 Shop Drawings, SD-03 Product Data, and SD-08 Manufacturer's Instructions at the same time for each system.

SD-02 Shop Drawings

MICA Plates;

Pipe Insulation Systems and Associated Accessories

Duct Insulation Systems and Associated Accessories

SD-03 Product Data

Pipe Insulation Systems;

Duct Insulation Systems;

Thermal Insulation; Indoor air quality for adhesives;

SD-08 Manufacturer's Instructions

Pipe Insulation Systems;

Duct Insulation Systems;

1.4 QUALITY ASSURANCE

1.4.1 Installer Qualification

Qualified installers must have successfully completed three or more similar type jobs within the last 5 years.

1.5 DELIVERY, STORAGE, AND HANDLING

Materials must be delivered in the manufacturer's unopened containers. Materials delivered and placed in storage must be provided with protection from weather, humidity, dirt, dust and other contaminants. The Contracting Officer may reject insulation material and supplies that become dirty, dusty, wet, or contaminated by some other means. Packages or standard containers of insulation, jacket material, cements, adhesives, and coatings delivered for use, and samples required for approval must have manufacturer's stamp or label attached giving the name of the manufacturer and brand, and a description of the material, date codes, and approximate shelf life (if applicable). Insulation packages and containers must be asbestos free.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Provide materials which are the standard products of manufacturers regularly engaged in the manufacture of such products and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Submit a complete list of materials, including

manufacturer's descriptive technical literature, performance data, catalog cuts, and installation instructions. The product number, k-value, thickness and furnished accessories including adhesives, sealants and jackets for each mechanical system requiring insulation **must** be included. The product data must be copyrighted, have an identifying or publication number, and **must** have been published prior to the issuance date of this solicitation. Materials furnished under this section **must** be submitted together in a booklet.

2.1.1 Insulation System

Provide insulation systems in accordance with the approved MICA National Insulation Standards plates as supplemented by this specification. Provide field-applied insulation for heating, ventilating, and cooling (HVAC) air distribution systems and piping systems that are located within, on, under, and adjacent to buildings; and for plumbing systems. Provide CFC and HCFC free insulation.

2.1.2 Surface Burning Characteristics

Unless otherwise specified, insulation must have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with **ASTM E84**. Flame spread, and smoke developed indexes, **must** be determined by **ASTM E84** or **UL 723**. Test insulation in the same density and installed thickness as the material to be used in the actual construction. Prepare and mount test specimens according to **ASTM E2231**.

2.2 MATERIALS

Provide insulation that meets or exceed the requirements of **ASHRAE 90.2**. Insulation exterior **must** be cleanable, grease resistant, non-flaking and non-peeling. Materials **must** be compatible and **must** not contribute to corrosion, soften, or otherwise attack surfaces to which applied in either wet or dry state. Materials to be used on stainless steel surfaces **must** meet **ASTM C795** requirements. Calcium silicate **must** not be used on chilled or cold water systems. Materials **must** be asbestos free. Provide product recognized under **UL 94** (if containing plastic) and listed in **FM APP GUIDE**.

2.2.1 Adhesives

Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) that meet 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** (HVAC duct sealants must meet limit requirements of "Other" category within **SCAQMD Rule 1168** sealants table). Provide aerosol adhesives used on the interior of the building that meet either emissions requirements of **CDPH SECTION 01350** (use the office or classroom requirements, regardless of space type) or VOC content requirements of **GS-36**. Provide certification or validation of **indoor air quality for adhesives**.

2.2.1.1 Acoustical Lining Insulation Adhesive

Adhesive **must** be a nonflammable, fire-resistant adhesive conforming to **ASTM C916**, Type I.

2.2.1.2 Mineral Fiber Insulation Cement

Cement **must** be in accordance with **ASTM C195**.

2.2.1.3 Lagging Adhesive

Lagging is the material used for **thermal insulation**, especially around a cylindrical object. This may include the insulation as well as the cloth/material covering the insulation. To resist mold/mildew, lagging adhesive **must** meet **ASTM D5590** with 0 growth rating. Lagging adhesives **must** be nonflammable and fire-resistant and **must** have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with **ASTM E84**. Adhesive **must** be **MIL-A-3316**, Class 1, pigmented white and be suitable for bonding fibrous glass cloth to faced and unfaced fibrous glass insulation board; for bonding cotton brattice cloth to faced and unfaced fibrous glass insulation board; for sealing edges of and bonding glass tape to joints of fibrous glass board; for bonding lagging cloth to thermal insulation; or Class 2 for attaching fibrous glass insulation to metal surfaces. Lagging adhesives **must** be applied in strict accordance with the manufacturer's recommendations for pipe and duct insulation.

2.2.1.4 Contact Adhesive

Adhesives may be any of, but not limited to, the neoprene based, rubber based, or elastomeric type that have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with **ASTM E84**. The adhesive **must** not adversely affect, initially or in service, the insulation to which it is applied, nor **must** it cause any corrosive effect on metal to which it is applied. Any solvent dispersing medium or volatile component of the adhesive **must** have no objectionable odor and **must** not contain any benzene or carbon tetrachloride. The dried adhesive **must** not emit nauseous, irritating, or toxic volatile matters or aerosols when the adhesive is heated to any temperature up to **212 degrees F**. The dried adhesive **must** be nonflammable and fire resistant. Flexible Elastomeric Adhesive: Comply with **MIL-A-24179**, Type II, Class I. Provide product listed in **FM APP GUIDE**.

2.2.2 Caulking

ASTM C920, Type S, Grade NS, Class 25, Use A.

2.2.3 Corner Angles

Nominal **0.016 inch** aluminum **1 by 1 inch** with factory applied kraft backing. Aluminum **must** be **ASTM B209**, Alloy 3003, 3105, or 5005.

2.2.4 Fittings

Fabricated Fittings are the prefabricated fittings for flexible elastomeric pipe insulation systems in accordance with **ASTM C1710**. Together with the flexible elastomeric tubes, they provide complete system integrity for retarding heat gain and controlling condensation drip from chilled-water and refrigeration systems. Flexible elastomeric, fabricated fittings provide thermal protection (0.25 k) and condensation resistance (0.05 Water Vapor Transmission factor). For satisfactory performance, properly installed protective vapor retarder/barriers and vapor stops **must** be used on high relative humidity and below ambient temperature applications to reduce movement of moisture through or around the insulation to the colder

interior surface.

2.2.5 Finishing Cement

ASTM C450: Mineral fiber hydraulic-setting thermal insulating and finishing cement. All cements that may come in contact with Austenitic stainless steel must comply with **ASTM C795**.

2.2.6 Fibrous Glass Cloth and Glass Tape

Fibrous glass cloth, with 20X20 maximum mesh size, and glass tape must have maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with **ASTM E84**. Tape must be 4 inch wide rolls. Class 3 tape must be 4.5 ounces/square yard. Elastomeric Foam Tape: Black vapor-retarder foam tape with acrylic adhesive containing an anti-microbial additive.

2.2.7 Staples

Outward clinching type **ASTM A167**, Type 304 or 316 stainless steel.

2.2.8 Jackets

2.2.8.1 Aluminum Jackets

Aluminum jackets must be corrugated, embossed or smooth sheet, 0.016 inch nominal thickness; **ASTM B209**, Temper H14, Temper H16, Alloy 3003, 5005, or 3105. Corrugated aluminum jacket must not be used outdoors. Aluminum jacket securing bands must be Type 304 stainless steel, 0.015 inch thick, 1/2 inch wide for pipe under 12 inch diameter and 3/4 inch wide for pipe over 12 inch and larger diameter. Aluminum jacket circumferential seam bands must be 2 by 0.016 inch aluminum matching jacket material. Bands for insulation below ground must be 3/4 by 0.020 inch thick stainless steel, or fiberglass reinforced tape. The jacket may, at the option of the Contractor, be provided with a factory fabricated Pittsburgh or "Z" type longitudinal joint. When the "Z" joint is used, the bands at the circumferential joints must be designed by the manufacturer to seal the joints and hold the jacket in place.

2.2.8.2 Vapor Barrier/Weatherproofing Jacket

Vapor barrier/weatherproofing jacket must be laminated self-adhesive, greater than 3 plies standard grade, silver, white, black and embossed or greater than 8 ply (minimum 2.9 mils adhesive); with 0.0000 permeability when tested in accordance with **ASTM E96/E96M**, using the water transmission rate test method; heavy duty, white or natural; and UV resistant. Flexible Elastomeric exterior foam with factory applied, UV Jacket made with a cold weather acrylic adhesive. Construction of laminate designed to provide UV resistance, high puncture, tear resistance and excellent Water Vapor Transmission (WVT) rate.

2.2.8.3 Vapor Barrier/Vapor Retarder

Apply the following criteria to determine which system is required.

- a. On ducts, piping and equipment operating below 52 degrees F or located outside must be equipped with a vapor barrier.

2.2.9 Vapor Retarder Required

ASTM C921, Type I, minimum puncture resistance 50 Beach units on all surfaces except concealed ductwork, where a minimum puncture resistance of 25 Beach units is acceptable. Minimum tensile strength, 35 pounds/inch width. ASTM C921, Type II, minimum puncture resistance 25 Beach units, tensile strength minimum 20 pounds/inch width. Jackets used on insulation exposed in finished areas must have white finish suitable for painting without sizing. Based on the application, insulation materials that require manufacturer or fabricator applied pipe insulation jackets are cellular glass, when all joints are sealed with a vapor barrier mastic, and mineral fiber. All non-metallic jackets must have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. Flexible elastomerics require (in addition to vapor barrier skin) vapor retarder jacketing for high relative humidity and below ambient temperature applications.

2.2.9.1 White Vapor Retarder All Service Jacket (ASJ)

ASJ is for use on hot/cold pipes, ducts, or equipment indoors or outdoors if covered by a suitable protective jacket. The product must meet all physical property and performance requirements of ASTM C1136, Type I, except the burst strength must be a minimum of 85 psi. ASTM D2863 Limited Oxygen Index (LOI) must be a minimum of 31.

In addition, neither the outer exposed surface nor the inner-most surface contacting the insulation must be paper or other moisture-sensitive material. The outer exposed surface must be white and have an emittance of not less than 0.80. The outer exposed surface must be paintable.

2.2.9.2 Vapor Retarder/Vapor Barrier Mastic Coatings

2.2.9.2.1 Vapor Barrier

The vapor barrier must be self adhesive (minimum 2 mils adhesive, 3 mils embossed) greater than 3 plies standard grade, silver, white, black and embossed white jacket for use on hot/cold pipes. Permeability must be less than 0.02 when tested in accordance with ASTM E96/E96M. Products must meet UL 723 or ASTM E84 flame and smoke requirements and must be UV resistant.

2.2.9.2.2 Vapor Retarder

The vapor retarder coating must be fire and water resistant and appropriately selected for either outdoor or indoor service. Color must be white. The water vapor permeance of the compound must be 0.013 perms or less at 43 mils dry film thickness as determined according to procedure B of ASTM E96/E96M utilizing apparatus described in ASTM E96/E96M. The coating must be nonflammable, fire resistant type. To resist mold/mildew, coating must meet ASTM D5590 with 0 growth rating. Coating must meet MIL-PRF-19565 Type II (if selected for indoor service) and be Qualified Products Database listed. All other application and service properties must be in accordance with ASTM C647.

2.2.9.3 Laminated Film Vapor Retarder

ASTM C1136, Type I, maximum moisture vapor transmission 0.02 perms, minimum puncture resistance 50 Beach units on all surfaces except concealed ductwork; where Type II, maximum moisture vapor transmission 0.02 perms, a minimum puncture resistance of 25 Beach units is acceptable. Vapor

retarder **must** have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with **ASTM E84**. Flexible Elastomeric exterior foam with factory applied UV Jacket. Construction of laminate designed to provide UV resistance, high puncture, tear resistance and an excellent WVT rate.

2.2.9.4 Polyvinylidene Chloride (PVDC) Film Vapor Retarder

The PVDC film vapor retarder **must** have a maximum moisture vapor transmission of 0.02 perms, minimum puncture resistance of 150 Beach units, a minimum tensile strength in any direction of **30 lb/inch** when tested in accordance with **ASTM D882**, and a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with **ASTM E84**.

2.2.9.5 Polyvinylidene Chloride Vapor Retarder Adhesive Tape

Requirements must meet the same as specified for Laminated Film Vapor Retarder above.

2.2.9.6 Vapor Barrier/Weather Barrier

The vapor barrier **must** be greater than 3 ply self adhesive laminate -white vapor barrier jacket- superior performance (less than 0.0000 permeability when tested in accordance with **ASTM E96/E96M**). Vapor barrier **must** meet **UL 723** or **ASTM E84** 25 flame and 50 smoke requirements; and UV resistant. Minimum burst strength **185 psi** in accordance with **ISO 2758**. Tensile strength **68 lb/inch** width (PSTC-1000). Tape **must** be as specified for laminated film vapor barrier above.

2.2.10 Wire

Soft annealed **ASTM A580/A580M** Type 302, 304 or 316 stainless steel, 16 or 18 gauge.

2.2.11 Insulation Bands

Insulation bands **must** be **1/2 inch** wide; 26 gauge stainless steel.

2.2.12 Sealants

Sealants **must** be chosen from the butyl polymer type, the styrene-butadiene rubber type, or the butyl type of sealants. Sealants **must** have a maximum permeance of 0.02 perms based on Procedure B for **ASTM E96/E96M**, and a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with **ASTM E84**.

2.3 PIPE INSULATION SYSTEMS

Conform insulation materials to Table 1 and minimum insulation thickness as listed in Table 2 and meet or exceed the requirements of **ASHRAE 90.1 - IP**. Limit pipe insulation materials to those listed herein and meeting the following requirements:

2.3.1 Aboveground Cold Pipeline (-30 to 60 deg. F)

Insulation for outdoor, indoor, exposed or concealed applications, **must** be as follows:

2.3.1.1 Flexible Elastomeric Cellular Insulation

Closed-cell, foam- or expanded-rubber materials containing anti-microbial additive, complying with **ASTM C534/C534M**, Grade 1, Type I or II. Type I, Grade 1 for tubular materials. Type II, Grade 1, for sheet materials. Type I and II **must** have vapor retarder/vapor barrier skin on one or both sides of the insulation, and require an additional exterior vapor retarder covering for high relative humidity and below ambient temperature applications.

2.4 DUCT INSULATION SYSTEMS

2.4.1 Factory Applied Insulation

Provide factory-applied **ASTM C552**, cellular glass thermal or **ASTM C534/C534M** Grade 1, Type II, flexible elastomeric closed cell insulation according to manufacturer's recommendations for insulation with insulation manufacturer's standard reinforced fire-retardant vapor barrier, with identification of installed thermal resistance (R) value and out-of-package R value.

2.4.1.1 Rigid Insulation

Calculate the minimum thickness in accordance with **ASHRAE 90.1 - IP**.

2.4.1.2 Blanket Insulation

Calculate minimum thickness in accordance with **ASHRAE 90.1 - IP**.

2.4.2 Duct Insulation Jackets

2.4.2.1 All-Purpose Jacket

Provide insulation with insulation manufacturer's standard reinforced fire-retardant jacket with or without integral vapor barrier as required by the service. In exposed locations, provide jacket with a white surface suitable for field painting.

2.4.2.2 Metal Jackets

2.4.2.2.1 Aluminum Jackets

ASTM B209, Temper H14, minimum thickness of 27 gauge (0.016 inch), with factory-applied polyethylene and kraft paper moisture barrier on inside surface. Provide smooth surface jackets for jacket outside dimension 8 inches and larger. Provide corrugated surface jackets for jacket outside dimension 8 inches and larger. Provide stainless steel bands, minimum width of 1/2 inch.

2.4.2.3 Vapor Barrier/Weatherproofing Jacket

Vapor barrier/weatherproofing jacket **must** be laminated self-adhesive (minimum 2 mils adhesive, 3 mils embossed) less than 0.0000 permeability, (greater than 3 ply, standard grade, silver, white, black and embossed or greater than 8 ply (minimum 2.9 mils adhesive), heavy duty white or natural).

2.5 EQUIPMENT INSULATION SYSTEMS

Insulate equipment and accessories as specified in Tables 5 and 6. In outside locations, provide insulation 1/2 inch thicker than specified. Increase the specified insulation thickness for equipment where necessary to equal the thickness of angles or other structural members to make a smooth, exterior surface. Submit a booklet containing manufacturer's published installation instructions for the insulation systems. The instructions must be copyrighted, have an identifying or publication number, and must have been published prior to the issuance date of this solicitation. A booklet is also required by paragraphs titled: Pipe Insulation Systems and Duct Insulation Systems.

PART 3 EXECUTION

3.1 APPLICATION - GENERAL

Insulation must only be applied to unheated and uncooled piping and equipment. Flexible elastomeric cellular insulation must not be compressed at joists, studs, columns, ducts, hangers, etc. The insulation must not pull apart after a one hour period; any insulation found to pull apart after one hour, must be replaced.

3.1.1 Installation

Except as otherwise specified, material must be installed in accordance with the manufacturer's written instructions. Insulation materials must not be applied until tests specified in other sections of this specification are completed. Material such as rust, scale, dirt and moisture must be removed from surfaces to receive insulation. Insulation must be kept clean and dry. Insulation must not be removed from its shipping containers until the day it is ready to use and must be returned to like containers or equally protected from dirt and moisture at the end of each workday. Insulation that becomes dirty must be thoroughly cleaned prior to use. If insulation becomes wet or if cleaning does not restore the surfaces to like new condition, the insulation will be rejected, and must be immediately removed from the jobsite. Joints must be staggered on multi layer insulation. Mineral fiber thermal insulating cement must be mixed with demineralized water when used on stainless steel surfaces. Insulation, jacketing and accessories must be installed in accordance with MICA Insulation Std plates except where modified herein or on the drawings.

3.1.2 Installation of Flexible Elastomeric Cellular Insulation

Install flexible elastomeric cellular insulation with seams and joints sealed with rubberized contact adhesive. Flexible elastomeric cellular insulation must not be used on surfaces greater than 220 degrees F. Stagger seams when applying multiple layers of insulation. Protect insulation exposed to weather and not shown to have vapor barrier weatherproof jacketing with two coats of UV resistant finish or PVC or metal jacketing as recommended by the manufacturer after the adhesive is dry and cured.

3.1.2.1 Adhesive Application

Apply a brush coating of adhesive to both butt ends to be joined and to both slit surfaces to be sealed. Allow the adhesive to set until dry to touch but tacky under slight pressure before joining the surfaces. Insulation seals at seams and joints must not be capable of being pulled

apart one hour after application. Insulation that can be pulled apart one hour after installation **must** be replaced.

3.1.2.2 Adhesive Safety Precautions

Use natural cross-ventilation, local (mechanical) pickup, and/or general area (mechanical) ventilation to prevent an accumulation of solvent vapors, keeping in mind the ventilation pattern **must** remove any heavier-than-air solvent vapors from lower levels of the workspaces. Gloves and spectacle-type safety glasses are recommended in accordance with safe installation practices.

3.1.3 Welding

No welding **must** be done on **piping, duct** or **equipment** without written approval of the Contracting Officer. The **capacitor discharge welding process** may be used for securing metal fasteners to duct.

3.1.4 Pipes/Ducts/Equipment That Require Insulation

Insulation is required on all **pipes, ducts, or equipment**, except for omitted items as specified.

3.2 PIPE INSULATION SYSTEMS INSTALLATION

3.2.1 Pipe Insulation

3.2.1.1 General

Pipe insulation **must** be installed on aboveground hot and cold pipeline systems as specified below to form a continuous thermal retarder/barrier, including straight runs, fittings and appurtenances unless specified otherwise. Installation **must** be with full length units of insulation and using a single cut piece to complete a run. Cut pieces or scraps abutting each other **must** not be used. Pipe insulation **must** be omitted on the following:

- a. Pipe used solely for fire protection.
- b. Chromium plated pipe to plumbing fixtures. However, fixtures for use by the physically handicapped **must** have the hot water supply and drain, including the trap, insulated where exposed.
- c. Sanitary drain lines.
- d. Air chambers.
- e. Adjacent insulation.
- f. ASME stamps.
- g. Access plates of fan housings.
- h. Cleanouts or handholes.

3.2.1.2 Pipes Passing Through Walls, Roofs, and Floors

Pipe insulation **must** be continuous through the sleeve.

Provide an aluminum jacket or vapor barrier/weatherproofing self adhesive jacket (minimum 2 mils adhesive, 3 mils embossed) less than 0.0000 permeability, greater than 3 ply standard grade, silver, white, black and embossed with factory applied moisture retarder over the insulation wherever penetrations require sealing.

3.2.1.2.1 Penetrate Interior Walls

The aluminum jacket or vapor barrier/weatherproofing - self adhesive jacket (minimum 2 mils adhesive, 3 mils embossed) less than 0.0000 permeability, greater than 3 plies standard grade, silver, white, black and embossed must extend 2 inches beyond either side of the wall and must be secured on each end with a band.

3.2.1.2.2 Penetrating Exterior Walls

Continue the aluminum jacket required for pipe exposed to weather through the sleeve to a point 2 inches beyond the interior surface of the wall.

3.2.1.2.3 Hot Water Pipes Supplying Lavatories or Other Similar Heated Service

Terminate the insulation on the backside of the finished wall. Protect the insulation termination with two coats of vapor barrier coating with a minimum total thickness of 1/16 inch applied with glass tape embedded between coats (if applicable). Extend the coating out onto the insulation 2 inches and seal the end of the insulation. Overlap glass tape seams 1 inch. Caulk the annular space between the pipe and wall penetration with approved fire stop material. Cover the pipe and wall penetration with a properly sized (well fitting) escutcheon plate. The escutcheon plate must overlap the wall penetration at least 3/8 inches.

3.2.1.2.4 Domestic Cold Water Pipes Supplying Lavatories or Other Similar Cooling Service

Terminate the insulation on the finished side of the wall (i.e., insulation must cover the pipe throughout the wall penetration). Protect the insulation with two coats of weather barrier mastic (breather emulsion type weatherproof mastic impermeable to water and permeable to air) with a minimum total thickness of 1/16 inch. Extend the mastic out onto the insulation 2 inches and must seal the end of the insulation. The annular space between the outer surface of the pipe insulation and caulk the wall penetration with an approved fire stop material having vapor retarder properties. Cover the pipe and wall penetration with a properly sized (well fitting) escutcheon plate. The escutcheon plate must overlap the wall penetration by at least 3/8 inches.

3.2.1.3 Pipes Passing Through Hangers

Insulation, whether hot or cold application, must be continuous through hangers. All horizontal pipes 2 inches and smaller must be supported on hangers with the addition of a Type 40 protection shield to protect the insulation in accordance with MSS SP-58. Whenever insulation shows signs of being compressed, or when the insulation or jacket shows visible signs of distortion at or near the support shield, insulation inserts as specified below for piping larger than 2 inches must be installed, or factory insulated hangers (designed with a load bearing core) can be used.

3.2.1.3.1 Horizontal Pipes Larger Than 2 Inches at 60 Degrees F and Above

Supported on hangers in accordance with MSS SP-58, and Section 22 00 00 PLUMBING, GENERAL PURPOSE.

3.2.1.3.2 Horizontal Pipes Larger Than 2 Inches and Below 60 Degrees F

Supported on hangers with the addition of a Type 40 protection shield in accordance with MSS SP-58. An insulation insert of cellular glass, prefabricated insulation pipe hangers, or perlite above 80 degrees F must be installed above each shield. The insert must cover not less than the bottom 180-degree arc of the pipe. Inserts must be the same thickness as the insulation, and must extend 2 inches on each end beyond the protection shield. When insulation inserts are required in accordance with the above, and the insulation thickness is less than 1 inch, wooden or cork dowels or blocks may be installed between the pipe and the shield to prevent the weight of the pipe from crushing the insulation, as an option to installing insulation inserts. The insulation jacket must be continuous over the wooden dowel, wooden block, or insulation insert.

3.2.1.3.3 Vertical Pipes

Supported with either Type 8 or Type 42 riser clamps with the addition of two Type 40 protection shields in accordance with MSS SP-58 covering the 360-degree arc of the insulation. An insulation insert of cellular glass or calcium silicate must be installed between each shield and the pipe. The insert must cover the 360-degree arc of the pipe. Inserts must be the same thickness as the insulation, and must extend 2 inches on each end beyond the protection shield. When insulation inserts are required in accordance with the above, and the insulation thickness is less than 1 inch, wooden or cork dowels or blocks may be installed between the pipe and the shield to prevent the hanger from crushing the insulation, as an option instead of installing insulation inserts. The insulation jacket must be continuous over the wooden dowel, wooden block, or insulation insert. The vertical weight of the pipe must be supported with hangers located in a horizontal section of the pipe. When the pipe riser is longer than 30 feet, the weight of the pipe must be additionally supported with hangers in the vertical run of the pipe that are directly clamped to the pipe, penetrating the pipe insulation. These hangers must be insulated and the insulation jacket sealed as indicated herein for anchors in a similar service.

3.2.1.3.4 Inserts

Covered with a jacket material of the same appearance and quality as the adjoining pipe insulation jacket, overlap the adjoining pipe jacket 1-1/2 inches, and seal as required for the pipe jacket. The jacket material used to cover inserts in flexible elastomeric cellular insulation must conform to ASTM C1136, Type 1, and is allowed to be of a different material than the adjoining insulation material.

3.2.1.4 Flexible Elastomeric Cellular Pipe Insulation

Flexible elastomeric cellular pipe insulation must be tubular form for pipe sizes 6 inches and less. Grade 1, Type II sheet insulation used on pipes larger than 6 inches must not be stretched around the pipe. On pipes larger than 12 inches, the insulation must be adhered directly to the pipe on the lower 1/3 of the pipe. Seams must be staggered when applying multiple layers of insulation. Sweat fittings must be insulated with miter-cut pieces the same size as on adjacent piping. Screwed fittings must

be insulated with sleeved fitting covers fabricated from miter-cut pieces and **must** be overlapped and sealed to the adjacent pipe insulation. Type II requires an additional exterior vapor retarder/barrier covering for high relative humidity and below ambient temperature applications.

3.2.1.5 Pipe Insulation Material and Thickness

Pipe insulation materials must be as listed in Table 1 and must meet or exceed the requirements of ASHRAE 90.1 - IP.

TABLE 1					
Insulation Material for Piping					
Service					
	Material	Specification	Type	Class	VR/VB Req'd
Chilled Water (Supply & Return, Dual Temperature Piping, 40 F nominal)					
	Cellular Glass	ASTM C552	II	2	Yes
	Flexible Elastomeric Cellular	ASTM C534/C534M	I		Yes
Note: VR/VB = Vapor Retarder/Vapor Barrier					

TABLE 2						
Piping Insulation Thickness (inch)						
Do not use integral wicking material in Chilled water applications exposed to outdoor ambient conditions in climatic zones 1 through 4.						
Service						
	Material	Tube And Pipe Size (inch)				
		<1	1-<1.5	1.5-<4	4-<8	> or = >8
Chilled Water (Supply & Return, Dual Temperature Piping, 40 Degrees F nominal)						
	Cellular Glass	1.5	2	2	2.5	3
	Mineral Fiber with Wicking Material	1	1.5	1.5	2	2
	Flexible Elastomeric Cellular	1	1	1	N/A	N/A

3.2.2 Aboveground Cold Pipelines

The following cold pipelines for minus 30 to plus 60 degrees F, **must** be insulated in accordance with Table 2 except those piping listed in subparagraph Pipe Insulation in PART 3 as to be omitted. This includes but is not limited to the following:

- a. Chilled water.
- b. Dual temperature water, i.e. HVAC hot/chilled water.
- c. Air conditioner condensate drains.

3.2.2.1 Insulation Material and Thickness

Insulation thickness for cold pipelines **must** be determined using Table 2.

3.2.2.2 Factory or Field applied Jacket

Insulation **must** be covered with a factory applied vapor retarder jacket/vapor barrier or field applied seal welded PVC jacket or greater than 3 ply laminated self-adhesive (minimum 2 mils adhesive, 3 mils embossed) vapor barrier/weatherproofing jacket - less than 0.0000 permeability, standard grade, silver, white, black and embossed for use with Mineral Fiber, Cellular Glass, and Phenolic Foam Insulated Pipe. Insulation inside the building, to be protected with an aluminum jacket or greater than 3ply vapor barrier/weatherproofing self-adhesive (minimum 2 mils adhesive, 3 mils embossed) product, less than 0.0000 permeability, standard grade, Embossed Silver, White & Black, **must** have the insulation and vapor retarder jacket installed as specified herein. The aluminum jacket or greater than 3ply vapor barrier/weatherproofing self-adhesive (minimum 2 mils adhesive, 3 mils embossed) product, less than 0.0000 permeability, standard grade, embossed silver, White & Black, **must** be installed as specified for piping exposed to weather, except sealing of the laps of the aluminum jacket is not required.

3.2.2.3 Installing Insulation for Straight Runs Hot and Cold Pipe

Apply insulation to the pipe with tight butt joints. Seal all butted joints and ends with joint sealant and seal with a vapor retarder coating, greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape or PVDC adhesive tape.

3.2.2.3.1 Longitudinal Laps of the Jacket Material

Overlap not less than 1-1/2 inches. Provide butt strips 3 inches wide for circumferential joints.

3.2.2.3.2 Laps and Butt Strips

Secure with adhesive and staple on 4 inch centers if not factory self-sealing. If staples are used, seal in accordance with paragraph STAPLES below. Note that staples are not required with cellular glass systems.

3.2.2.3.3 Factory Self-Sealing Lap Systems

May be used when the ambient temperature is between 40 and 120 degrees F during installation. Install the lap system in accordance with manufacturer's recommendations. Use a stapler only if specifically recommended by the manufacturer. Where gaps occur, replace the section or repair the gap by applying adhesive under the lap and then stapling.

3.2.2.3.4 Staples

Coat all staples, including those used to repair factory self-seal lap systems, with a vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape. Coat all seams, except those on factory self-seal systems, with vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape.

3.2.2.3.5 Breaks and Punctures in the Jacket Material

Patch by wrapping a strip of jacket material around the pipe and secure it with adhesive, staple, and coat with vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape. Extend the patch not less than 1-1/2 inches past the break.

3.2.2.3.6 Penetrations Such as Thermometers

Fill the voids in the insulation and seal with vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape.

3.2.2.3.7 Flexible Elastomeric Cellular Pipe Insulation

Install by slitting the tubular sections and applying them onto the piping or tubing. Alternately, whenever possible slide un-slit sections over the open ends of piping or tubing. Secure all seams and butt joints and seal with adhesive. When using self seal products only the butt joints **must** be secured with adhesive. Push insulation on the pipe, never pulled. Stretching of insulation may result in open seams and joints. Clean cut all edges. Rough or jagged edges of the insulation are not be permitted. Use proper tools such as sharp knives. Do not stretch Grade 1, Type II sheet insulation around the pipe when used on pipe larger than 6 inches. On pipes larger than 12 inches, adhere sheet insulation directly to the pipe on the lower 1/3 of the pipe.

3.2.2.4 Insulation for Fittings and Accessories

- a. Pipe insulation **must** be tightly butted to the insulation of the fittings and accessories. The butted joints and ends **must** be sealed with joint sealant and sealed with a vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape.
- b. Precut or preformed insulation **must** be placed around all fittings and accessories and **must** conform to MICA plates except as modified herein: 5 for anchors; 10, 11, and 13 for fittings; 14 for valves; and 17 for flanges and unions. Insulation **must** be the same insulation as the pipe insulation, including same density, thickness, and thermal conductivity. Where precut/preformed is unavailable, rigid preformed pipe insulation sections may be segmented into the shape required. Insulation of the same thickness and conductivity as the adjoining pipe insulation **must** be used. If nesting size insulation is used, the insulation **must** be overlapped 2 inches or one pipe diameter. Elbows insulated using segments **must** conform to MICA Tables 12.20 "Mitered Insulation Elbow". Submit a booklet containing completed MICA Insulation Stds plates detailing each insulating system for each pipe, duct, or equipment insulating system, after approval of materials and prior to applying insulation.

- (1) The MICA plates **must** detail the materials to be installed and the specific insulation application. Submit all MICA plates required showing the entire insulating system, including plates required to show insulation penetrations, vessel bottom and top heads, legs, and skirt insulation as applicable. The MICA plates **must** present all variations of insulation systems including locations, materials, vaporproofing, jackets and insulation accessories.
 - (2) If the Contractor elects to submit detailed drawings instead of edited MICA Plates, the detail drawings **must** be technically equivalent to the edited MICA Plate submittal.
- c. Upon completion of insulation installation on flanges, unions, valves, anchors, fittings and accessories, terminations, seams, joints and insulation not protected by factory vapor retarder jackets or PVC fitting covers **must** be protected with PVDC or greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape or two coats of vapor retarder coating with a minimum total thickness of **1/16 inch**, applied with glass tape embedded between coats. Tape seams **must** overlap **1 inch**. The coating **must** extend out onto the adjoining pipe insulation **2 inches**. Fabricated insulation with a factory vapor retarder jacket **must** be protected with either greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape, standard grade, silver, white, black and embossed or PVDC adhesive tape or two coats of vapor retarder coating with a minimum thickness of **1/16 inch** and with a **2 inch** wide glass tape embedded between coats. Where fitting insulation butts to pipe insulation, the joints **must** be sealed with a vapor retarder coating and a **4 inch** wide ASJ tape which matches the jacket of the pipe insulation.
- d. Anchors attached directly to the pipe **must** be insulated for a sufficient distance to prevent condensation but not less than **6 inches** from the insulation surface.
- e. Insulation **must** be marked showing the location of unions, strainers, and check valves.

3.2.2.5 Optional PVC Fitting Covers

At the option of the Contractor, premolded, one or two piece PVC fitting covers may be used in lieu of the vapor retarder and embedded glass tape. Factory precut or premolded insulation segments **must** be used under the fitting covers for elbows. Insulation segments **must** be the same insulation as the pipe insulation including same density, thickness, and thermal conductivity. The covers **must** be secured by PVC vapor retarder tape, adhesive, seal welding or with tacks made for securing PVC covers. Seams in the cover, and tacks and laps to adjoining pipe insulation jacket, **must** be sealed with vapor retarder tape to ensure that the assembly has a continuous vapor seal.

3.3 DUCT INSULATION SYSTEMS INSTALLATION

Except for oven hood exhaust duct insulation, corner angles **must** be installed on external corners of insulation on ductwork in exposed finished spaces before covering with jacket. Duct insulation **must** be omitted on exposed supply and return ducts in air conditioned spaces where the difference between supply air temperature and room air temperature is less than **15 degrees F** unless otherwise shown. Air conditioned spaces **must** be

defined as those spaces directly supplied with cooled conditioned air (or provided with a cooling device such as a fan-coil unit) and heated conditioned air (or provided with a heating device such as a unit heater, radiator or convector).

3.3.1 Duct Insulation Minimum Thickness

Duct insulation minimum thickness in accordance with Table 4.

Table 4 - Minimum Duct Insulation (inches)	
Cold Air Ducts	2.0
Relief Ducts	1.5
Fresh Air Intake Ducts	1.5
Warm Air Ducts	2.0
Relief Ducts	1.5
Fresh Air Intake Ducts	1.5

3.3.2 Insulation and Vapor Retarder/Vapor Barrier for Cold Air Duct

Insulation and vapor retarder/vapor barrier **must** be provided for the following cold air ducts and associated equipment.

- a. Supply ducts.
- b. Return air ducts.
- c. Relief ducts.
- d. Flexible run-outs (field-insulated).
- e. Plenums.
- f. Duct-mounted coil casings.
- g. Coil headers and return bends.
- h. Coil casings.
- i. Fresh air intake ducts.
- j. Filter boxes.
- k. Mixing boxes (field-insulated).
- l. Supply fans (field-insulated).
- m. Site-erected air conditioner casings.
- n. Ducts exposed to weather.
- o. Combustion air intake ducts.

Insulation for rectangular ducts must be flexible type where concealed, minimum density 3/4 pcf, and rigid type where exposed, minimum density 3 pcf. Insulation for both concealed or exposed round/oval ducts must be flexible type, minimum density 3/4 pcf or a semi rigid board, minimum density 3 pcf, formed or fabricated to a tight fit, edges beveled and joints tightly butted and staggered. Insulation for all exposed ducts must be provided with either a white, paint-able, factory-applied Type I jacket or a field applied vapor retarder/vapor barrier jacket coating finish as specified, the total field applied dry film thickness must be approximately 1/16 inch. Insulation on all concealed duct must be provided with a factory-applied Type I or II vapor retarder/vapor barrier jacket. Duct insulation must be continuous through sleeves and prepared openings except firewall penetrations. Duct insulation terminating at fire dampers, must be continuous over the damper collar and retaining angle of fire dampers, which are exposed to unconditioned air and which may be prone to condensate formation. Duct insulation and vapor retarder/vapor barrier must cover the collar, neck, and any un-insulated surfaces of diffusers, registers and grills. Vapor retarder/vapor barrier materials must be applied to form a complete unbroken vapor seal over the insulation. Sheet Metal Duct must be sealed in accordance with Section 23 00 00 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM.

3.3.2.1 Installation on Concealed Duct

- a. For rectangular, oval or round ducts, flexible insulation must be attached by applying adhesive around the entire perimeter of the duct in 6 inch wide strips on 12 inch centers.
- b. For rectangular and oval ducts, 24 inches and larger insulation must be additionally secured to bottom of ducts by the use of mechanical fasteners. Fasteners must be spaced on 16 inch centers and not more than 16 inches from duct corners.
- c. For rectangular, oval and round ducts, mechanical fasteners must be provided on sides of duct risers for all duct sizes. Fasteners must be spaced on 16 inch centers and not more than 16 inches from duct corners.
- d. Insulation must be impaled on the mechanical fasteners (self stick pins) where used and must be pressed thoroughly into the adhesive. Care must be taken to ensure vapor retarder/vapor barrier jacket joints overlap 2 inches. The insulation must not be compressed to a thickness less than that specified. Insulation must be carried over standing seams and trapeze-type duct hangers.
- e. Where mechanical fasteners are used, self-locking washers must be installed and the pin trimmed and bent over.
- f. Jacket overlaps must be secured with staples and tape as necessary to ensure a secure seal. Staples, tape and seams must be coated with a brush coat of vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate (minimum 2 mils adhesive, 3 mils embossed) - less than 0.0000 perm adhesive tape.
- g. Breaks in the jacket material must be covered with patches of the same material as the vapor retarder jacket. The patches must extend not less than 2 inches beyond the break or penetration in all directions and must be secured with tape and staples. Staples and tape joints must be sealed with a brush coat of vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate (minimum 2 mils adhesive, 3 mils

embossed) - less than 0.0000 perm adhesive tape.

- h. At jacket penetrations such as hangers, thermometers, and damper operating rods, voids in the insulation **must** be filled and the penetration sealed with a brush coat of vapor retarder coating or PVDC adhesive tape greater than 3 ply laminate (minimum 2 mils adhesive, 3 mils embossed) - less than 0.0000 perm adhesive tape.
- i. Insulation terminations and pin punctures **must** be sealed and flashed with a reinforced vapor retarder coating finish or tape with a brush coat of vapor retarder coating.. The coating **must** overlap the adjoining insulation and un-insulated surface 2 inches. Pin puncture coatings **must** extend 2 inches from the puncture in all directions.
- j. Where insulation standoff brackets occur, insulation **must** be extended under the bracket and the jacket terminated at the bracket.

3.3.3 Ducts Handling Air for Dual Purpose

For air handling ducts for dual purpose below and above 60 degrees F, ducts **must** be insulated as specified for cold air duct.

3.3.4 Duct Test Holes

After duct systems have been tested, adjusted, and balanced, breaks in the insulation and jacket **must** be repaired in accordance with the applicable section of this specification for the type of duct insulation to be repaired.

-- End of Section --

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DECENTRALIZED UNITARY HVAC EQUIPMENT
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PART 1 GENERAL

1.1 REFERENCES

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

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI 700	(2016) Specifications for Fluorocarbon Refrigerants
ANSI/AHRI 210/240	(2008; Add 1 2011; Add 2 2012) Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment
ANSI/AHRI 460	(2005) Performance Rating of Remote Mechanical-Draft Air-Cooled Refrigerant Condensers

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

ANSI/ASHRAE 15 & 34	(2016) ANSI/ASHRAE Standard 15-Safety Standard for Refrigeration Systems and ANSI/ASHRAE Standard 34-Designation and Safety Classification of Refrigerants
ASHRAE 15 & 34	(2013) ASHRAE Standard 34-2016 Safety Standard for Refrigeration Systems/ASHRAE Standard 34-2016 Designation and Safety Classification of Refrigerants-ASHRAE Standard 34-2016
ASHRAE 52.2	(2012) Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size
ASHRAE 55	(2010) Thermal Environmental Conditions for Human Occupancy
ASHRAE 62.1	(2010) Ventilation for Acceptable Indoor Air Quality
ASHRAE 90.1 - IP	(2013) Energy Standard for Buildings Except Low-Rise Residential Buildings

AMERICAN WELDING SOCIETY (AWS)

AWS Z49.1 (2012) Safety in Welding and Cutting and Allied Processes

ASME INTERNATIONAL (ASME)

ASME B16.22 (2013) Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

ASME B16.26 (2013) Standard for Cast Copper Alloy Fittings for Flared Copper Tubes

ASME B31.5 (2016) Refrigeration Piping and Heat Transfer Components

ASME BPVC SEC IX (2017; Errata 2018) BPVC Section IX-Welding, Brazing and Fusing Qualifications

ASME BPVC SEC VIII D1 (2017) BPVC Section VIII-Rules for Construction of Pressure Vessels Division 1

ASTM INTERNATIONAL (ASTM)

ASTM B62 (2017) Standard Specification for Composition Bronze or Ounce Metal Castings

ASTM B75/B75M (2011) Standard Specification for Seamless Copper Tube

ASTM B117 (2016) Standard Practice for Operating Salt Spray (Fog) Apparatus

ASTM B280 (2018) Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service

ASTM D520 (2000; R 2011) Zinc Dust Pigment

ASTM E84 (2019b) Standard Test Method for Surface Burning Characteristics of Building Materials

ASTM E2129 (2010) Standard Practice for Data Collection for Sustainability Assessment of Building Products

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1 (2016; SUPP 2016) Motors and Generators

NEMA MG 2 (2014) Safety Standard for Construction and Guide for Selection, Installation and Use of Electric Motors and Generators

UNDERWRITERS LABORATORIES (UL)

UL 586 (2009; Reprint Dec 2017) UL Standard for

Safety High-Efficiency Particulate, Air
Filter Units

UL 900 (2015) Standard for Air Filter Units

UL 1995 (2015) UL Standard for Safety Heating and
Cooling Equipment

1.2 SUBMITTALS

Contracting Organization approval is required for all submittals. Submit
the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Spare Parts

Posted Instructions

Coil Corrosion Protection

System Performance Tests

Inventory

Environmental Data

Supplied Products

Manufacturer's Standard Catalog Data

SD-06 Test Reports

Refrigerant Tests, Charging, and Start-Up; G

System Performance Tests; G

SD-07 Certificates

Service Organizations

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals; G

SD-11 Closeout Submittals

Ozone Depleting Substances; S

1.3 QUALITY ASSURANCE

Carefully investigate the plumbing, fire protection, electrical, structural
and finish conditions that would affect the work to be performed and
arrange such work accordingly, furnishing required offsets, fittings, and
accessories to meet such conditions. Submit drawings consisting of:

- a. Equipment layouts which identify assembly and installation details.
- b. Plans and elevations which identify clearances required for maintenance

and operation.

- c. Wiring diagrams which identify each component individually and interconnected or interlocked relationships between components.
- d. Foundation drawings, bolt-setting information, and foundation bolts prior to concrete foundation construction for equipment indicated or required to have concrete foundations.
- e. Details, if piping and equipment are to be supported other than as indicated, which include loadings and type of frames, brackets, stanchions, or other supports.
- f. Automatic temperature control diagrams and control sequences.
- g. Installation details which includes the amount of factory set superheat and corresponding refrigerant pressure/temperature.
- h. Equipment schedules

1.4 DELIVERY, STORAGE, AND HANDLING

Protect stored items from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Properly protect and care for all material both before and during installation. Submit an [inventory](#) of all the stored items. Replace any materials found to be damaged, at no additional cost to the Government. During installation, cap piping and similar openings capped to keep out dirt and other foreign matter.

1.5 ENVIRONMENTAL REQUIREMENTS

For proper Indoor Environmental Quality, maintain pressure within the building as indicated. Ventilation must meet or exceed [ASHRAE 62.1](#) and all published addenda. Meet or exceed filter media efficiency as tested in accordance with [ASHRAE 52.2](#). Thermal comfort must meet or exceed [ASHRAE 55 AFGM 2016-01](#).

1.6 WARRANTY

Provide equipment with the Manufacturer's Standard Warranty.

PART 2 PRODUCTS

2.1 ENERGY EFFICIENCY REQUIREMENTS

42 USC 8259b requires the procurement of energy efficient products in product categories covered by the Energy Star program or the Federal Energy Management Program for designated products. A list of covered product categories is available from the Federal Energy Management Web site at <http://energy.gov/eere/femp/covered-product-categories>. [A list of qualified light commercial products is available at http://www.energystar.gov/productfinder/product/certified-light-commercial-hvac/results](#).

Submit Material, Equipment, and Fixtures List of all [supplied products](#) within a covered product category, including manufacturer's catalog numbers, specification and drawing reference number, warranty information, fabrication site, and energy performance data. [For product categories covered by the Energy Star program, submit documentation that the product is Energy Star-qualified.](#) For product categories covered by the Federal

Energy Management Program, submit documentation that the product meets or exceeds FEMP-designated efficiency requirements.

2.2 MATERIALS

Provide [Manufacturer's standard catalog data](#), at least 5 weeks prior to the purchase or installation of a particular component, highlighted to show material, size, options, performance charts and curves, etc. in adequate detail to demonstrate compliance with contract requirements. Data includes manufacturer's recommended installation instructions and procedures. If vibration isolation is specified for a unit, include vibration isolator literature containing catalog cuts and certification that the isolation characteristics of the isolators provided meet the manufacturer's recommendations. Submit data for each specified component. Minimum efficiency requirements must be in accordance with [ASHRAE 90.1 - IP](#).

2.2.1 Standard Products

Provide materials and equipment that are standard products of a manufacturer regularly engaged in the manufacturing of such products, which are of a similar material, design and workmanship. The standard products must have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2 year use includes applications of equipment and materials under similar circumstances and of similar size. The 2 years' experience must be satisfactorily completed by a product which has been sold or is offered for sale on the commercial market through advertisements, manufacturer's catalogs, or brochures. Products having less than a 2 year field service record will be acceptable if a certified record of satisfactory field operation, for not less than 6000 hours exclusive of the manufacturer's factory tests, can be shown. Products must be supported by a service organization. Ensure system components are environmentally suitable for the indicated geographic locations.

2.2.2 Product Sustainability Criteria

2.2.2.1 Energy Efficient Equipment

Provide equipment meeting the efficiency requirements as stated within this section.

2.2.2.2 Electrical Equipment / Motors

Provide electrical equipment, motors, motor efficiencies, and wiring which are in accordance with Section [26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL](#). Electrical motor driven equipment specified must be provided complete with motors, motor starters, and controls. Electrical characteristics must be as shown, and unless otherwise indicated, all motors of [1 horsepower](#) and above with open, dripproof, totally enclosed, or explosion proof fan cooled enclosures, must be the premium efficiency type in accordance with [NEMA MG 1](#). Field wiring must be in accordance with manufacturer's instructions. Each motor must conform to [NEMA MG 1](#) and [NEMA MG 2](#) and be of sufficient size to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor. Motors must be continuous duty with the enclosure specified. Motor starters must be provided complete with thermal overload protection and other appurtenances necessary for the motor control indicated. Motors must be furnished with a magnetic across-the-line or reduced voltage type starter as required by the manufacturer. Motor duty requirements must allow for maximum frequency

start-stop operation and minimum encountered interval between start and stop. Motors must be sized for the applicable loads. Motor torque must be capable of accelerating the connected load within 20 seconds with 80 percent of the rated voltage maintained at motor terminals during one starting period. Motor bearings must be fitted with grease supply fittings and grease relief to outside of enclosure. 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, must be provided.

2.2.2.3 Ozone Depleting Substances

Unitary air conditioning equipment must not use CFC-based refrigerants. Refrigerant may be an approved alternative refrigerant in accordance with EPA's Significant New Alternative Policy (SNAP) listing.

2.2.2.4 Local/Regional Materials

Use materials or products extracted, harvested, or recovered, as well as manufactured, within a 500 mile radius from the project site, if available from a minimum of three sources.

2.2.2.5 Environmental Data

Submit Table 1 of ASTM E2129 for the following products: Refrigerant and Oil.

2.2.3 Nameplates

Major equipment including compressors, condensers, receivers, heat exchanges, fans, and motors must have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment. Plates must be durable and legible throughout equipment life and made of stainless steel. Fix plates in prominent locations with nonferrous screws or bolts.

2.2.4 Safety Devices

Exposed moving parts, parts that produce high operating temperature, parts which may be electrically energized, and parts that may be a hazard to operating personnel must be insulated, fully enclosed, guarded, or fitted with other types of safety devices. Safety devices must be installed so that proper operation of equipment is not impaired. Welding and cutting safety requirements must be in accordance with AWS Z49.1.

2.3 EQUIPMENT

2.3.1 Mini-Split-System Air Conditioners

2.3.1.1 Small-Capacity Split-System Air-Conditioners (Not Exceeding 65,000 Btu/hr)

Provide an air-cooled, split system which employs a remote condensing unit, a separate wall mounted indoor unit, and interconnecting refrigerant piping. Provide the air conditioning type unit conforming to applicable Underwriters Laboratories (UL) standards including UL 1995. Unit must be rated in accordance with ANSI/AHRI 210/240. Provide indoor unit with necessary fans, air filters, and galvanized steel cabinet construction. The remote unit must be as specified in paragraph CONDENSING UNIT. Provide double-width, double inlet, forward curved backward inclined, or airfoil

blade, centrifugal scroll type evaporator or supply fans. Provide the manufacturer's standard condenser or outdoor fans for the unit specified and may be propeller type. Fan and condenser motors must have totally enclosed enclosures. Design unit to operate at outdoor ambient temperatures up to 115 degrees F.

2.3.1.1.1 Energy Efficiency

Provide unit with an Energy Star label.

2.3.1.1.2 Air-to-Refrigerant Coil

Provide condensing coils with copper tubes of 3/8 inch minimum diameter with copper fins that are mechanically bonded or soldered to the tubes. Casing must be aluminum. Avoid contact of dissimilar metals. Test coils in accordance with ASHRAE 15 & 34 at the factory and ensure suitability for the working pressure of the installed system. Dehydrate and seal each coil testing and prior to evaluation and charging.

Coat condenser and evaporator coil with a uniformly applied epoxy electrodeposition, phenolic, or vinyl type coating to all coil surface areas without material bridging between fins. Apply coating at either the coil or coating manufacturer's factory. Coating process must ensure complete coil encapsulation and be capable of withstanding a minimum 1,000 hours exposure to the salt spray test specified in ASTM B117 using a 5 percent sodium chloride solution.

2.3.1.1.3 Refrigeration Circuit

Refrigerant-containing components must comply with ASHRAE 15 & 34 and be factory tested, cleaned, dehydrated, charged, and sealed. Provide each unit with a factory operating charge of refrigerant and oil or a holding charge. Field charge unit shipped with a holding charge. Provide refrigerant charging valves. Provide filter-drier in liquid line to prevent freeze-up in event of loss of water flow during heating cycle.

2.3.1.1.4 Unit Controls

Provide unit internally prewired with a 24 volt control circuit powered by an internal transformer. Provide terminal blocks for power wiring and external control wiring. Internally protect unit by fuses or a circuit breaker in accordance with UL 1995. Equip units with three-phase power with phase monitoring protection to protect against problems caused by phase loss, phase imbalance and phase reversal.

2.3.1.1.5 Condensing Coil

Provide coils with copper tubes of 3/8 inch minimum diameter with copper fins that are mechanically bonded or soldered to the tubes. Protect coil in accordance with paragraph CORROSION PROTECTION. Provide galvanized steel or aluminum casing. Avoid contact of dissimilar metals. Test coils in accordance with ANSI/ASHRAE 15 & 34 at the factory and ensure suitability for the working pressure of the installed system. Dehydrate and seal each coil after testing and prior to evaluation and charging. Provide separate expansion devices for each compressor circuit.

2.3.1.1.6 Remote Condenser or Condensing Unit

Fit each remote condenser coil fitted with a manual isolation valve and an

access valve on the coil side. Saturated refrigerant condensing temperature must not exceed 120 degrees F at 104 degrees F ambient. Provide unit with low ambient condenser controls to ensure proper operation in an ambient temperature of 20degrees F. Provide fan and cabinet construction as specified in paragraph UNITARY EQUIPMENT ACCESSORIES. Fan and condenser motors must have totally enclosed enclosures.

2.3.1.1.6.1 Air-Cooled Condenser

Provide Unit in accordance with ANSI/AHRI 460 and conform to the requirements of UL 1995. Provide factory fabricated, tested, packaged, and self-contained unit; complete with casing, propeller type fans, heat rejection coils, connecting piping and wiring, and all necessary accessories.

2.3.1.1.7 Air Filters

Provide filters of the cleanable type that are capable of filtering the entire air supply. Mount filter(s) integral within the unit and make accessible. 1 inch MERV 8, provide throwaway filter on all units below 6 Tons.

Provide filter rack that can be converted to 2.0 inch capability. Filters must have an average dust spot efficiency of 90-95 percent and an average arrestance of 90 percent when tested in accordance with ASHRAE 52.2. Provide UL Class 1 filters.

2.3.1.1.8 Fans

Provide direct driven, statically and dynamically balanced, propeller type fans. Design the outdoor fan so that condensate will evaporate without drip, splash, or spray on building exterior. Provide indoor fan with a minimum two-speed motor with built-in overload protection. Fan motors must be the inherently protected, permanent split-capacitor type.

2.4 COMPONENTS

2.4.1 Refrigerant and Oil

Refrigerant must be one of the fluorocarbon gases. Refrigerants must have number designations and safety classifications in accordance with ASHRAE 15 & 34. Refrigerants must meet the requirements of AHRI 700 as a minimum. Provide a complete charge of refrigerant for the installed system as recommended by the manufacturer. Lubricating oil must be of a type and grade recommended by the manufacturer for each compressor. Where color leak indicator dye is incorporated, charge must be in accordance with manufacturer's recommendation.

2.4.2 Fans

Fan wheel shafts must be supported by either maintenance-accessible lubricated antifriction block-type bearings, or permanently lubricated ball bearings. Unit fans must be selected to produce the cfm required at the fan total pressure. Motor starters, if applicable, must be magnetic across-the-line type with a totally enclosed enclosure. Thermal overload protection must be of the manual or automatic-reset type. Fan wheels or propellers must be constructed of aluminum or galvanized steel. Centrifugal fan wheel housings must be of galvanized steel, and both centrifugal and propeller fan casings must be constructed of aluminum or

galvanized steel. Steel elements of fans, except fan shafts, must be hot-dipped galvanized after fabrication or fabricated of mill galvanized steel. Mill-galvanized steel surfaces and edges damaged or cut during fabrication by forming, punching, drilling, welding, or cutting must be recoated with an approved zinc-rich compound. Fan wheels or propellers must be statically and dynamically balanced. Direct-drive fan motors must be of the multiple-speed variety. The sheave size must be selected so that the fan speed at the approximate midpoint of the sheave adjustment will produce the specified air quantity. Centrifugal scroll-type fans must be provided with streamlined orifice inlet and V-belt drive. Each drive will be independent of any other drive. Propeller fans must be direct-drive drive type with fixed pitch blades. V-belt driven fans must be mounted on a corrosion protected drive shaft supported by either maintenance-accessible lubricated antifriction block-type bearings, or permanently lubricated ball bearings. Each drive will be independent of any other drive. Drive bearings must be protected with water slingers or shields.

2.4.3 Air Filters

Provide filters to filter outside air and return air and locate inside air conditioners. Provide cleanable (reusable) type. Filters must conform to [UL 900](#), Class 1 or Class 2. Polyurethane filters cannot be used on units with multiframe filters.

Air filters must be listed in accordance with requirements of [UL 900](#), except high efficiency particulate air filters of 99.97 percent efficiency by the DOP Test Method must be as listed under the label service and must meet the requirements of [UL 586](#).

2.4.3.1 Sectional Cleanable Filters

Provide sufficient oil to coat filters six times based on [1 pint](#) of oil per each [10 square feet](#) of filter area. Provide washing and charging tanks for cleaning and coating filters. Filters must have a MERV of 8 when tested in accordance with [ASHRAE 52.2](#).

Cleanable filters must be [1 inches](#) thick. Viscous adhesive must be provided in [5 gallon](#) containers in sufficient quantity for 12 cleaning operations and not less than [one quart](#) for each filter section. One washing and charging tank must be provided for every 100 filter sections or fraction thereof. Each washing and charging unit must consist of a tank and single drain rack mounted on legs. Drain rack must be provided with dividers and partitions to properly support the filters in the draining position.

2.4.4 Refrigerant Piping

Refrigerant piping, valves, fittings, and accessories must be in accordance with ASHRAE 15 & 34 and ASME B31.5, except as specified herein. Refrigerant piping, valves, fittings, and accessories must be compatible with the fluids used and capable of withstanding the pressures and temperatures of the service. Refrigerant piping, valves, and accessories used for refrigerant service must be cleaned, dehydrated, and sealed (capped or plugged) prior to shipment from the manufacturer's plant.

2.4.4.1 Copper Tubing

Copper tubing must conform to ASTM B280 annealed or hard drawn as

required. Copper tubing must be soft annealed where bending is required and hard drawn where no bending is required. Soft annealed copper tubing must not be used in sizes larger than 1-3/8 inches. Joints must be brazed except that joints on lines 7/8 inch and smaller may be flared. Cast copper alloy fittings for flared copper tube must conform to ASME B16.26 and ASTM B62. Wrought copper and bronze solder-joint pressure fittings must conform to ASME B16.22 and ASTM B75/B75M. Joints and fittings for brazed joint must be wrought-copper or forged-brass sweat fittings. Cast sweat-type joints and fittings must not be allowed for brazed joints. Brass or bronze adapters for brazed tubing may be used for connecting tubing to flanges and to threaded ends of valves and equipment.

2.4.5 Temperature Controls

Temperature controls must be fully coordinated with and integrated into the existing air-conditioning system.

2.5 FINISHES

2.5.1 Coil Corrosion Protection

Provide coil with a uniformly applied epoxy electrodeposition, phenolic, or vinyl type coating to all coil surface areas without material bridging between fins. Submit product data on the type coating selected, the coating thickness, the application process used, the estimated heat transfer loss of the coil, and verification of conformance with the salt spray test requirement. Coating must be applied at either the coil or coating manufacturer's factory. Coating process must ensure complete coil encapsulation. Coating must be capable of withstanding a minimum 1,000 hours exposure to the salt spray test specified in ASTM B117 using a 5 percent sodium chloride solution.

2.5.2 Equipment and Components Factory Coating

Unless otherwise specified, equipment and component items, when fabricated from ferrous metal, must be factory finished with the manufacturer's standard finish, except that items located outside of buildings must have weather resistant finishes that will withstand 500 hours exposure to the salt spray test specified in ASTM B117 using a 5 percent sodium chloride solution. Immediately after completion of the test, the specimen must show no signs of blistering, wrinkling, cracking, or loss of adhesion and no sign of rust creepage beyond 1/8 inch on either side of the scratch mark. Cut edges of galvanized surfaces where hot-dip galvanized sheet steel is used must be coated with a zinc-rich coating conforming to ASTM D520, Type I.

Where stipulated in equipment specifications of this section, coat finned tube coils of the affected equipment as specified below. Apply coating at the premises of a company specializing in such work. Degrease and prepare for coating in accordance with the coating applicator's procedures for the type of metals involved. Completed coating must show no evidence of softening, blistering, cracking, crazing, flaking, loss of adhesion, or "bridging" between the fins.

2.5.3 Factory Applied Insulation

Refrigeration equipment must be provided with factory installed insulation on surfaces subject to sweating including the suction line piping. Where

motors are the gas-cooled type, factory installed insulation must be provided on the cold-gas inlet connection to the motor in accordance with manufacturer's standard practice. Factory insulated items installed outdoors are not required to be fire-rated. As a minimum, factory insulated items installed indoors must have a flame spread index no higher than 75 and a smoke developed index no higher than 150. Factory insulated items (no jacket) installed indoors and which are located in air plenums, in ceiling spaces, and in attic spaces must have a flame spread index no higher than 25 and a smoke developed index no higher than 50. Flame spread and smoke developed indexes must be determined by [ASTM E84](#). Insulation must be tested in the same density and installed thickness as the material to be used in the actual construction. Material supplied by a manufacturer with a jacket must be tested as a composite material. Jackets, facings, and adhesives must have a flame spread index no higher than 25 and a smoke developed index no higher than 50 when tested in accordance with [ASTM E84](#).

2.6 TESTS, INSPECTIONS, AND VERIFICATIONS

All manufactured units must be inspected and tested, and documentation provided to demonstrate that each unit is in compliance with ANSI/AHRI and UL requirements and that the minimum efficiency requirements of [ASHRAE 90.1 - IP](#) have been met.

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with all details of the work, perform Verification of Dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

3.2 INSTALLATION

Perform work in accordance with the manufacturer's published diagrams, recommendations, and equipment warranty requirements. Where equipment is specified to conform to the requirements of [ASME BPVC SEC VIII D1](#) and [ASME BPVC SEC IX](#), the design, fabrication, and installation of the system must conform to [ASME BPVC SEC VIII D1](#) and [ASME BPVC SEC IX](#).

3.2.1 Equipment

Provide refrigeration equipment conforming to [ASHRAE 15 & 34](#). Provide necessary supports for all equipment, appurtenances, and pipe as required, including frames or supports for compressors, pumps, cooling towers, condensers, and similar items. Isolate compressors from the building structure. If mechanical vibration isolators are not provided, provide vibration absorbing foundations. Each foundation must include isolation units consisting of machine and floor or foundation fastenings, together with intermediate isolation material. Other floor-mounted equipment must be set on not less than a [6 inch](#) concrete pad doweled in place.

3.3 CLEANING AND ADJUSTING

Equipment must be wiped clean, with all traces of oil, dust, dirt, or paint spots removed. Temporary filters must be provided for all fans that are operated during construction, and new filters must be installed after all construction dirt has been removed from the building. System must be maintained in this clean condition until final acceptance. Bearings must be properly lubricated with oil or grease as recommended by the

manufacturer. Belts must be tightened to proper tension. Control valves and other miscellaneous equipment requiring adjustment must be adjusted to setting indicated or directed. Fans must be adjusted to the speed indicated by the manufacturer to meet specified conditions. Testing, adjusting, and balancing must be as specified in Section 23 05 93 TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS.

3.4 OPERATION AND MAINTENANCE MANUALS

- a. Submit the field posted instructions, at least 2 weeks prior to construction completion, including equipment layout, wiring and control diagrams, piping, valves and control sequences, and typed condensed operation instructions. The condensed operation instructions must include preventative maintenance procedures, methods of checking the system for normal and safe operation, and procedures for safely starting and stopping the system. The posted instructions must be framed under glass or laminated plastic and be posted where indicated by the Contracting Officer.
- b. The posted instructions must cover all of the items contained in the approved operation and maintenance manuals as well as demonstrations of routine maintenance operations. Submit 6 complete copies of an operation manual in bound 8-1/2 by 11 inch booklets listing step-by-step procedures required for system startup, operation, abnormal shutdown, emergency shutdown, and normal shutdown at least 4 weeks prior to the first training course. The booklets must include the manufacturer's name, model number, and parts list. The manuals must include the manufacturer's name, model number, service manual, and a brief description of all equipment and their basic operating features.
- c. Submit routine maintenance procedures, possible breakdowns and repairs, and a trouble shooting guide. The manuals must include piping and equipment layouts and simplified wiring and control diagrams of the system as installed.

3.5 REFRIGERANT TESTS, CHARGING, AND START-UP

Split-system refrigerant piping systems must be tested and charged as specified in Section 23 05 93 TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS. Packaged refrigerant systems which are factory charged must be checked for refrigerant and oil capacity to verify proper refrigerant levels in accordance with manufacturer's recommendations. Following charging, packaged systems must be tested for leaks with a halide torch or an electronic leak detector. Submit 6 copies of each test containing the information described below in bound 8-1/2 by 11 inch booklets. Individual reports must be submitted for the refrigerant system tests.

- a. The date the tests were performed.
- b. A list of equipment used, with calibration certifications.
- c. Initial test summaries.
- d. Repairs/adjustments performed.
- e. Final test results.

3.5.1 Refrigerant Leakage

If a refrigerant leak is discovered after the system has been charged, the leaking portion of the system must immediately be isolated from the remainder of the system and the refrigerant pumped into the system receiver or other suitable container. Under no circumstances must the refrigerant

be discharged into the atmosphere.

3.5.2 Contractor's Responsibility

Take steps, at all times during the installation and testing of the refrigeration system, to prevent the release of refrigerants into the atmosphere. The steps must include, but not be limited to, procedures which will minimize the release of refrigerants to the atmosphere and the use of refrigerant recovery devices to remove refrigerant from the system and store the refrigerant for reuse or reclaim. At no time must more than **3 ounces** of refrigerant be released to the atmosphere in any one occurrence. Any system leaks within the first year must be repaired in accordance with the requirements herein at no cost to the Government including material, labor, and refrigerant if the leak is the result of defective equipment, material, or installation.

3.6 SYSTEM PERFORMANCE TESTS

Before each refrigeration system is accepted, conduct tests to demonstrate the general operating characteristics of all equipment by a registered professional engineer or an approved manufacturer's start-up representative experienced in system start-up and testing, at such times as directed. Six copies of the report provided in bound **8-1/2 by 11 inch** booklets. The report must document compliance with the specified performance criteria upon completion and testing of the system. The report must indicate the number of days covered by the tests and any conclusions as to the adequacy of the system.

For equipment providing heating and cooling the system performance tests must be performed during the heating and cooling seasons.

- a. Submit a schedule, at least 2 weeks prior to the start of related testing, for the system performance tests. The schedules must identify the proposed date, time, and location for each test. Tests must cover a period of not less than 48 hours for each system and must demonstrate that the entire system is functioning in accordance with the drawings and specifications.
- b. Make corrections and adjustments, as necessary, tests must be re-conducted to demonstrate that the entire system is functioning as specified. Prior to acceptance, install and tighten service valve seal caps and blanks over gauge points. Replace any refrigerant lost during the system startup.
- c. If tests do not demonstrate satisfactory system performance, correct deficiencies and retest the system. Conduct tests in the presence of the Contracting Officer. Water and electricity required for the tests will be furnished by the Government. Provide all material, equipment, instruments, and personnel required for the test.
- d. Coordinate field tests with Section **23 05 93 TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS**. Submit 6 copies of the report provided in bound **8-1/2 by 11 inch** booklets. The report must document compliance with the specified performance criteria upon completion and testing of the system. The report must indicate the number of days covered by the tests and any conclusions as to the adequacy of the system. Submit the report including the following information (where values are taken at least three different times at outside dry-bulb temperatures that are at least **5 degrees F** apart):

- (1) Date and outside weather conditions.
- (2) The load on the system based on the following:
 - (a) The refrigerant used in the system.
 - (b) Condensing temperature and pressure.
 - (c) Suction temperature and pressure.
 - (d) Ambient, condensing and coolant temperatures.
 - (e) Running current, voltage and proper phase sequence for each phase of all motors.
- (3) The actual on-site setting of operating and safety controls.
- (4) Thermostatic expansion valve superheat - value as determined by field test.
- (5) Subcooling.
- (6) High and low refrigerant temperature switch set-points
- (7) Low oil pressure switch set-point.
- (8) Defrost system timer and thermostat set-points.
- (9) Moisture content.
- (10) Capacity control set-points.
- (11) Field data and adjustments which affect unit performance and energy consumption.
- (12) Field adjustments and settings which were not permanently marked as an integral part of a device.

3.7 MAINTENANCE

3.7.1 EXTRA MATERIALS

Submit [spare parts](#) data for each different item of equipment specified, after approval of detail drawings and not later than 2 months prior to the date of beneficial occupancy. Include in the data a complete list of parts and supplies, with current unit prices and source of supply, a recommended spare parts list for 1 year of operation, and a list of the parts recommended by the manufacturer to be replaced on a routine basis.

3.7.2 Maintenance Service

Submit a certified list of qualified permanent [service organizations](#), which includes their addresses and qualifications, for support of the equipment. The service organizations must be reasonably convenient to the equipment installation and be able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

-- End of Section --

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COMMON WORK RESULTS FOR ELECTRICAL
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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 A641/A641M (2009a; R 2014) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire

ASTM A653/A653M (2018) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A1008/A1008M (2016) 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 B633 (2019) Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel

ASTM D709 (2017) Standard Specification for Laminated Thermosetting Materials

ELECTRONIC INDUSTRIES ALLIANCE (EIA)

EIA 480 (1981) Toggle Switches

ILLUMINATING ENGINEERING SOCIETY (IES)

IES LM-79 (2008) Electrical and Photometric Measurements of Solid-State Lighting Products

IES LM-80 (2015) Measuring Lumen Maintenance of LED Light Sources

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE Stds Dictionary (2009) IEEE Standards Dictionary: Glossary of Terms & Definitions

INTERNATIONAL CODE COUNCIL (ICC)

ICC/ANSI A117.1 (2009) Accessible and Usable Buildings and

Facilities

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI Z535.1	(2017) Safety Colors
ANSI/NEMA OS 2	(2013) Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports
NEMA AB 3	(2013) Molded Case Circuit Breakers and Their Application
NEMA C82.77	(2002) Harmonic Emission Limits - Related Power Quality Requirements for Lighting Equipment
NEMA FB 1	(2014) Standard for Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable
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 SSL 1	(2010) Electronic Drivers for Led Devices, Arrays, or Systems
NEMA WD 1	(1999; R 2015) Standard for General Color Requirements for Wiring Devices
NEMA WD 6	(2016) Wiring Devices Dimensions Specifications

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2017; ERTA 1-2 2017; TIA 17-1; TIA 17-2; TIA 17-3; TIA 17-4; TIA 17-5; TIA 17-6; TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10; TIA 17-11; TIA 17-12; TIA 17-13; TIA 17-14; TIA 17-15; TIA 17-16; TIA 17-17) National Electrical Code
NFPA 70E	(2018; TIA 18-1; TIA 81-2) Standard for Electrical Safety in the Workplace
NFPA 780	(2017) Standard for the Installation of Lightning Protection Systems

UNDERWRITERS LABORATORIES (UL)

UL 1	(2005; Reprint Aug 2017) UL Standard for Safety Flexible Metal Conduit
UL 20	(2010; Reprint Feb 2012) General-Use Snap Switches

UL 489	(2016) UL Standard for Safety Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
UL 498	(2017; Reprint Dec 2018) UL Standard for Safety Attachment Plugs and Receptacles
UL 6	(2007; Reprint Nov 2014) Electrical Rigid Metal Conduit-Steel
UL 797	(2007; Reprint Mar 2017) UL Standard for Safety Electrical Metallic Tubing -- Steel
UL 870	(2016) UL Standard for Safety Wireways, Auxiliary Gutters, and Associated Fittings
UL 1449	(2014; Reprint Jul 2017) UL Standard for Safety Surge Protective Devices
UL 1598	(2008; Reprint Oct 2012) Luminaires
UL 8750	(2015; Reprint Aug 2018) 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, are as defined in **IEEE Stds Dictionary**.
- b. The technical sections referred to herein are those specification sections that describe products, installation procedures, and equipment operations and that refer to this section for detailed description of submittal types.

1.3 SUBMITTALS

Government approval is required for **all** submittals. Submit the following in accordance with Section **01 33 00 SUBMITTAL PROCEDURES**:

SD-03 Product Data

Conduits and Raceways

Wire and Cable

Splices and Connectors

Switches

Receptacles

Outlet Boxes, Pull Boxes and Junction Boxes

Circuit Breakers

Lighting Fixtures

Led Exit Lights

Surge Protective Devices

SD-06 Test Reports

Continuity Test

Phase-Rotation Tests

Insulation Resistance Test

PART 2 PRODUCTS

2.1 EQUIPMENT

Provide the standard cataloged materials and equipment of manufacturers regularly engaged in the manufacture of the products

2.1.1 Conduits and Raceways

2.1.1.1 Rigid Steel Conduit

Provide hot dipped galvanized rigid steel conduit complying with [UL 6](#). Except where installed underground, or in corrosive areas, provide polyvinylchloride (PVC), or painted with bitumastic coated rigid steel conduit in accordance with [NEMA RN 1](#).

Use threaded fittings for rigid steel conduit.

Use solid gaskets. Ensure conduit fittings with blank covers have gaskets, except in clean, dry areas or at the lowest point of a conduit run where drainage is required.

Provide covers with captive screws and are accessible after the work has been completed.

2.1.1.2 Electrical Metallic Tubing (EMT)

Ensure EMT is in accordance with [UL 797](#) and is zinc coated steel. Provide zinc-coated couplings and connectors that are raintight, gland compression type with insulation throat. Crimp, spring, or setscrew type fittings are not acceptable.

2.1.1.3 Flexible Metallic Conduit

Ensure flexible metallic conduit is galvanized steel and complies with [UL 1](#).

Ensure fittings for flexible metallic conduit are specifically designed for such conduit.

Provide liquidtight flexible metallic conduit with a protective jacket of PVC extruded over a flexible interlocked galvanized steel core to protect wiring against moisture, oil, chemicals, and corrosive fumes.

Ensure fittings for liquidtight flexible metallic conduit are specifically designed for such conduit.

2.1.1.4 Wireways and Auxiliary Gutters

Ensure wireways and auxiliary gutters are a minimum 4 by 4-inch trade size conforming to UL 870.

2.1.1.5 Surface Raceways and Assemblies

Ensure surface metal raceways and multi-outlet assemblies conform to NFPA 70, and have receptacles conforming to NEMA WD 1, Type 5-20R.

2.1.2 Wire and Cable

Use copper 600-volt type THHN/THWN-2 for conductors installed in conduit. Ensure all conductors AWG No. 8 and larger, are stranded. All conductors smaller than AWG No. 8 are solid.

Ensure conductors installed in plenums are marked plenum rated.

2.1.3 Switches

2.1.3.1 Safety Switches

Ensure safety switches comply with NEMA KS 1, and are the heavy-duty type with enclosure, voltage, current rating, number of poles, and fusing as indicated on the drawings. Ensure switch construction is such that, when the switch handle in the "ON" position, the cover or door cannot be opened. Cover release device is coinproof and so constructed that an external tool is used to open the cover. Make provisions to lock the handle in the "OFF" position. Ensure the switch is not capable of being locked in the "ON" position.

Provide NEMA 4X, 304/304L stainless steel switch enclosures for switches located outside or on building exteriors. Provide switches of the quick-make, quick-break type and terminal lugs for use with copper conductors.

Ensure safety color coding for identification of safety switches conforms to ANSI Z535.1.

2.1.3.2 Toggle Switches

Ensure toggle switches comply with EIA 480, NEMA WD 1, and UL 20 control Light Emitting Diode (LED), and fluorescent lighting fixtures and are the heavy duty, general purpose, noninterchangeable flush-type.

Provide commercial grade toggle switches, single pole and three way two-position devices totally enclosed with bodies of thermoplastic or thermoset plastic and mounting strap with grounding screw rated 20 amperes at 120 or 277 volts as required, 60 hertz alternating current (ac) only with white thermoplastic handles, screw-type and side-wired terminals.

Ensure all toggle switches are products of the same manufacturer.

2.1.4 Receptacles

Provide commercial grade, NEMA 5-20R receptacles, totally enclosed with bodies of thermoplastic or thermoset plastic and mounting strap with grounding screw rated 20A, 125 VAC, 2-pole, 3-wire duplex conforming to NEMA WD 1, NEMA WD 6, and UL 498 with white thermoplastic bodies,

screw-type and side-wired terminals.

2.1.5 Outlet Boxes, Pull Boxes and Junction Boxes

Ensure outlet boxes for use with conduit systems are in accordance with NEMA FB 1 and ANSI/NEMA OS 2 and are not less than 1-1/2 inches deep. Furnish all pull and junction boxes with screw-fastened covers.

2.1.6 Circuit Breakers

Provide circuit breakers that conform to UL 489 and NEMA AB 3 with frame trip ratings as indicated.

Provide bolt-on type, molded-case, manually operated, trip-free circuit breakers, with inverse-time thermal-overload protection and instantaneous magnetic short-circuit protection. Completely enclose circuit breakers in a molded case, with a factory-sealed, calibrated sensing element to prevent tampering.

Provide an instantaneous thermal-magnetic tripping element that is adjustable and accessible from the front of the breaker on frame sizes larger than 250 Amperes.

Provide sufficient interrupting capacity of the panel and lighting branch circuit breakers to successfully interrupt the maximum short-circuit current imposed on the circuit at the breaker terminals. Provide circuit breaker interrupting capacities with a minimum of 22,000 Amperes and that conform to NEMA AB 3. Series rating of circuit breakers or overcurrent protective devices to achieve indicated interrupt rating is not permitted.

Provide the common-trip-type multipole circuit breakers having a single operating handle and a two-position on/off indication. Provide circuit breakers with temperature compensation for operation in an ambient temperature of 104 degrees F. Provide circuit breakers that have root mean square (rms) symmetrical interrupting ratings sufficient to protect the circuit being supplied. Interrupting ratings may have selective-type tripping (time delay, magnetic, thermal, or ground fault).

Provide a phenolic-composition breaker body capable of having such accessories as handle-extension, handle-locking, and padlocking devices attached where required.

2.1.7 Surge Protective Devices

Provide Type 1 or Type 2 surge protective devices (SPD) which comply with UL 1449 at equipment as indicated in the project drawings. Provide surge protectors integral to equipment being protected.

Provide the following modes of protection:

FOR SINGLE PHASE AND THREE PHASE WYE CONNECTED SYSTEMS-
Phase to phase (L-L)
Each phase to neutral (L-N)

SPDs: provide with a minimum surge current rating of 80,000 amperes for L-L mode minimum and 40,000 amperes for other modes (L-N).

Provide SPDs per NFPA 780 for the lightning protection system.

Maximum L-N Voltage Protection Rating:

1,200V for 480Y/277V, three phase system

Maximum L-L Voltage Protection Rating:

1,200V for 480Y/277V, three phase system

The minimum MCOV (Maximum Continuous Operating Voltage) rating for L-N mode of operation: 120 percent of nominal voltage for 240 volts and below; 115 percent of nominal voltage above 240 volts to 480 volts.

2.1.8 Lighting Fixtures

Manufacturers and catalog numbers shown on the drawings are indicative of the general type desired and are not intended to restrict the selection to fixtures of any particular manufacturer. Fixtures with the same salient features and equivalent light distribution and brightness characteristics, of equal finish and quality, are acceptable. Provide fixtures of the proper type and wattage as indicated in drawings.

UL 1598, NEMA C82.77, and UL 8750. Provide lighting fixtures as indicated in luminaire schedule and NL plates or details on project plans. Provide lighting fixtures complete with light sources of quantity, type, and wattage indicated. Provide all lighting fixtures of the same type by the same manufacturer. Lighting fixtures must be specifically designed for use with the driver, ballast or generator and light source provided.

2.1.8.1 LED Lighting Fixtures

Provide lighting fixtures complete with power supplies (drivers) and light sources. Provide design information including lumen output and design life of fixtures in luminaire schedule on project plans for LED lighting fixtures.

LED lighting fixtures must also meet the following minimum requirements:

- a. Lighting fixtures must have a minimum 5 year manufacturer's warranty.
- b. Lighting fixtures drive current value must be identical to that provided by test data for luminaire in question.
- c. Lighting fixtures must be tested to IES LM-79 and IES LM-80 standards, with the results provided with the product data as required in the Submittals paragraph of this specification.
- d. Lighting fixture must have dual drivers.

LED drivers must meet NEMA SSL 1, UL 8750. LED drivers must be electronic, UL Class 1, constant-current type and comply with the following requirements:

- a. Output power (watts) and luminous flux (lumens) as shown in luminaire schedule for each luminaire type to meet minimum luminaire efficacy (LE) value provided.
- b. Operable at input voltage of 120-277 volts at 60 hertz.
- c. Minimum 5 year manufacturer's warranty.

- d. RoHS compliant.
- e. UL listed for dry or damp locations typical of interior installations.

2.1.9 LED Exit Lights

Provide exit signs consuming a maximum of five watts total.

Provide in UV-stable, thermo-plastic housing with using clear polycarbonate housing, configured for ceiling mounting. Provide 6 inch high, 3/4 inch stroke red lettering on face of sign. Provide chevrons on either side of lettering to indicate direction. Provide single or double face as specified in drawings. Provide self-diagnostic circuitry integral to emergency LED driver.

2.1.10 Light Fixture Support Hardware

- a. Wire: ASTM A641/A641M; Galvanized, soft tempered steel, minimum 0.11 inches in diameter, or galvanized, braided steel, minimum 0.08 inches in diameter.
- b. Threaded Rods: Threaded steel rods, 3/16 inch diameter, zinc or cadmium coated.
- c. 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.

2.1.11 Manufacturer's Nameplate

Ensure each item of equipment has 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 is not acceptable.

PART 3 EXECUTION

3.1 PREPARATION

Prior to beginning work, de-energize all items to be removed or demolished. Perform Lockout/Tagout in accordance with OSHA 29 CFR 1910.147 and the latest revision of NFPA 70E.

Protect metallic materials against corrosion. Provide equipment enclosures with the standard finish by the manufacturer. Except where other equivalent protective treatment is specifically approved in writing or as indicated in project drawings, provide hot-dip galvanized ferrous metals for items such as, anchors, bolts, braces, boxes, bodies, clamps, fittings, guards, nuts, pins, rods, shims, thimbles, washers, and miscellaneous items not made of corrosion-resistant steel.

3.2 INSTALLATION

3.2.1 General Equipment Installation

Install all equipment in accordance with the manufacturer's instructions.

3.2.2 Conduits, Raceways and Fittings

Ensure that conduit runs between outlet and outlet, between fitting and fitting, or between outlet and fitting does not contain more than the equivalent of three 90-degree bends, including those bends located immediately at the outlet or fitting.

Do not install crushed or deformed conduit. Avoid trapped conduit runs where possible. Take care to prevent the lodgment of foreign material in the conduit, boxes, fittings, and equipment during the course of construction. Clear any clogged conduit of obstructions or replace conduit.

Conduit and raceway runs concealed in or behind walls, above ceilings, or exposed on walls and ceilings 5 feet or more above finished floors and not subject to mechanical damage may be electrical metallic tubing (EMT).

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

3.2.2.1 Rigid Steel Conduit

Make field-made bends and offsets with approved Hickey bending tool or conduit bending machine. Use long radius conduit for elbows larger than 2-1/2 inches.

Provide a flush coupling for all conduit stubbed-up through concrete floors for connections to free-standing equipment with the exception of motor-control centers, cubicles, and other such items of equipment, when the floor slab is of sufficient thickness. Otherwise, provide a floor box set flush with the finished floor. For conduits installed for future use, terminate with a coupling and plug; set flush with the floor.

3.2.2.2 Electrical Metallic Tubing (EMT)

Ground EMT in accordance with NFPA 70, using pressure grounding connectors especially designed for EMT.

3.2.2.3 Flexible Metallic Conduit

Use flexible metallic conduit to connect recessed fixtures from outlet boxes in ceilings, transformers, and other approved assemblies.

Use bonding wires in flexible conduit as specified in NFPA 70, for all circuits. Flexible conduit is not considered a ground conductor.

Make electrical connections to vibration-isolated equipment with flexible metallic conduit.

Use liquidtight flexible metallic conduit in wet and oily locations and to complete the connection to motor-driven equipment.

The maximum length for a single run of FMC is 6 linear feet.

3.2.2.4 Rigid Nonmetallic Conduit

Ensure rigid PVC conduit is direct buried.

Install a green insulated copper grounding conductor in conduit with conductors and solidly connect to ground at each end. Size grounding wires

in accordance with NFPA 70.

3.2.2.5 Wireway and Auxiliary Gutter

Bolt together straight sections and fittings to provide a rigid, mechanical connection and electrical continuity. Close dead ends of wireways and auxiliary gutters. Plug all unused conduit openings.

Support wireways for overhead distribution and control circuits at maximum 5-foot intervals.

Ensure auxiliary gutters used to supplement wiring spaces for equipment not contained in a single enclosure contains no switches, overcurrent devices, appliances, or apparatus and is not more than 30 feet long.

3.2.2.6 Surface Raceways and Assemblies

Mount surface raceways plumb and level, with the base and cover secured. Minimum circuit run is three-wire, with one wire designated as ground.

3.2.2.7 Splices and Connectors

Make all splices in AWG No. 8 and smaller with approved indentor crimp-type connectors and compression tools.

Make all splices in AWG No. 6 and larger with insulated mechanical lugs

3.2.3 Wiring

Color code feeder and branch circuit conductors as follows:

CONDUCTOR	COLOR AC
Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Equipment Grounds	Green

Use conductors up to and including AWG No. 2 that are manufactured with colored insulating materials. For conductors larger than AWG No. 2, have ends identified with color plastic tape in outlet, pull, or junction boxes.

Splice in accordance with the NFPA 70. Provide conductor identification within each enclosure where a tap, splice, or termination is made and at the equipment terminal of each conductor. Match terminal and conductor identification as indicated.

Where several feeders pass through a common pullbox, tag the feeders to clearly indicate the electrical characteristics, circuit number, and panel designation.

3.2.4 Safety Switches

Securely fasten switches to the supporting structure or wall, utilizing a minimum of four 1/4 inch bolts. Do not use sheet metal screws and small machine screws for mounting. Do not mount switches in an inaccessible location or where the passageway to the switch may become obstructed. Mounting height 5 feet above floor level, when possible.

3.2.5 Wiring Devices

3.2.5.1 Wall Switches and Receptacles

Install wall switches and receptacles so that when device plates are applied, the plates are aligned vertically to within 1/16 inch.

Bond ground terminal of each flush-mounted receptacle to the outlet box with an approved green bonding jumper when used with dry wall type construction.

3.2.5.2 Device Plates

Ensure device plates for switches are suitably engraved with a description of the loads when not within sight of the loads controlled.

Mark device plates and receptacle cover plates for receptacles other than 125-volt, single-phase, duplex, convenience outlets. Show the circuit number, voltage, frequency, phasing, and amperage available at the receptacle. Use self-adhesive labels having 1/4 inch embossed letters.

Similarly mark device plates for convenience outlets indicating the supply panel and circuit number.

3.2.6 Boxes and Fittings

Provide pullboxes where necessary in the conduit system to facilitate conductor installation. For conduit runs longer than 100 feet or with more than three right-angle bends, install a pullbox at a convenient intermediate location.

Securely mount boxes and enclosures to the building structure using supports that are independent of the conduit entering or leaving the boxes.

Select the mounting height of wall-mounted outlet and switch boxes, as measured between the bottom of the box and the finished floor, in accordance with ICC/ANSI A117.1 and as follows:

LOCATION	MOUNTING HEIGHT (inches)
Receptacles in offices	18
Receptacles in corridors	18
Receptacles in shops and laboratories	48
Receptacles in rest rooms	48

LOCATION	MOUNTING HEIGHT (inches)
Switches for light control	48

3.2.7 Lamps and Lighting Fixtures

Install new lamps of the proper type and wattage in each fixture. Securely fasten fixtures and supports to structural members and install parallel and perpendicular to major axes of structures.

3.2.8 Field Fabricated Nameplates

Ensure nameplates conform to **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 identifies the function and, when applicable, the position. Provide nameplates that are melamine plastic, **0.125-inch** thick, white with black center core and a matte finish surface with square corners. Accurately align lettering and engrave into the core. Minimum size of nameplates is **1 by 2.5 inches**. Lettering is a minimum of **0.25-inch** high normal block style.

3.2.9 Identification Plates and Warnings

Provide identification plates for lighting and power panelboards, motor control centers, all line voltage heating and ventilating control panels, fire detector and sprinkler alarms, door bells, pilot lights, disconnect switches, manual starting switches, and magnetic starters. Attach identification plates to process control devices and pilot lights.

Install identification plates for all line voltage enclosed circuit breakers, identifying the equipment served, voltage, phase(s) and power source. For circuits 480 volts and above, install conspicuously located warning signs in accordance with OSHA requirements.

3.3 FIELD QUALITY CONTROL

After completion of the installation and splicing, and prior to energizing the conductors, perform wire and cable continuity and insulation tests as herein specified before the conductors are energized.

Provide all necessary test equipment, labor, and personnel to perform the tests, as herein specified.

Isolate completely all wire and cable from all extraneous electrical connections at cable terminations and joints. Use substation and switchboard feeder breakers, disconnects in combination motor starters, circuit breakers in panel boards, and other disconnecting devices to isolate the circuits under test.

Perform **insulation-resistance test** on each field-installed conductor with respect to ground and adjacent conductors. Applied potential is 1000 volts dc for 600 volt rated cable. Take readings after 1 minute and until the reading is constant for 15 seconds. Minimum insulation-resistance values is not less than and 100 Megohms for 600 volt rated cable. For circuits with conductor sizes **AWG No. 8** and smaller insulation resistance testing is not required.

Perform [continuity test](#) to insure correct cable connection end-to-end (i.e correct phase conductor, grounded conductor, and grounding conductor wiring). Repair and verify any damages to existing or new electrical equipment resulting from mis-wiring. Receive approval for all repairs prior to commencement of the repair.

Conduct [phase-rotation tests](#) on all three-phase circuits using a phase-rotation indicating instrument. Perform phase rotation of electrical connections to connected equipment in a clockwise direction, facing the source.

Submit test reports in accordance with referenced standards in this section.

Final acceptance requires the successful performance of wire and cable under test. Do not energize any conductor until the final test reports are reviewed and approved.

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ELECTRICITY METERING
02/11

PART 1 GENERAL

1.1 REFERENCES

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

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

- IEEE C2 (2017; Errata 1-2 2017; INT 1 2017)
National Electrical Safety Code
- IEEE C37.90.1 (2013) Standard for Surge Withstand
Capability (SWC) Tests for Relays and
Relay Systems Associated with Electric
Power Apparatus
- IEEE C57.13 (2016) Requirements for Instrument
Transformers
- IEEE Stds Dictionary (2009) IEEE Standards Dictionary: Glossary
of Terms & Definitions

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

- NETA ATS (2017; Errata 2017) Standard for
Acceptance Testing Specifications for
Electrical Power Equipment and Systems

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 70 (2017; ERTA 1-2 2017; TIA 17-1; TIA 17-2;
TIA 17-3; TIA 17-4; TIA 17-5; TIA 17-6;
TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10;
TIA 17-11; TIA 17-12; TIA 17-13; TIA
17-14; TIA 17-15; TIA 17-16; TIA 17-17)
National Electrical Code

1.2 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, will be as defined in IEEE Stds Dictionary.

1.3 SUBMITTALS

Government approval is required for all submittals.

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

SD-02 Shop Drawings

Installation Drawings

SD-03 Product Data

Electricity Meters

Current transformer

Potential transformer

SD-06 Test Reports

Acceptance checks and tests

System functional verification

Building meter installation sheet, per building

Completed meter installation schedule

Completed meter data schedule

Meter configuration template

Contractor must fill in the meter configuration template and submit to the Activity for concurrence.

Meter configuration report

The meter configuration report must be submitted as a Technical Data Package.

SD-10 Operation and Maintenance Data

Electricity Meters and Accessories, Data Package 5

SD-11 Closeout Submittals

System functional verification

Configuration Software

1.4 QUALITY ASSURANCE

1.4.1 Installation Drawings

Drawings must be provided in hard-copy and electronic format, and must include but not be limited to the following:

- a. Wiring diagrams with terminals identified of advanced meter, current transformers, potential transformers and communications interfaces.
- b. One-line diagram, including meters, switch(es), current transformers, potential transformers, communications interfaces, and fuses.

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 1 year prior to bid opening. The 1-year period **must** include applications of equipment and materials under similar circumstances and of similar size. The product, or an earlier release of the product, **must** have been on sale on the commercial market through advertisements, manufacturers catalogs, or brochures during the prior 1-year 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.

1.4.3 Material and Equipment Manufacturing Data

Products manufactured more than 1 year prior to date of delivery to site **must** not be used, unless specified otherwise.

1.5 MAINTENANCE

1.5.1 Additions to Operation and Maintenance Data

Include the following on the actual **electricity meters and accessories** provided:

- a. A condensed description of how the system operates
- b. Block diagram indicating major assemblies
- c. Troubleshooting information
- d. Preventive maintenance
- e. Prices for spare parts and supply list

1.6 WARRANTY

The equipment items and software **must** be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment and software on a regular and emergency basis during the warranty period of the contract.

1.7 SYSTEM DESCRIPTION

1.7.1 System Requirements

Electricity metering, consisting of meters and associated equipment, will be used to record the electricity consumption and other values as described in the requirements that follow and as shown on the drawings. Communication system requirements are contained in a separate specification section as identified in paragraph entitled "Communications Interfaces".

1.7.2 Selection Criteria

Metering components and software are part of a system that includes the physical meter, data recorder function and communications method. Every building site identified **must** include sufficient metering components to

measure the electrical parameters identified and to store and communicate the values as required.

Contractor **must** verify that the metering system installed on any building site is compatible with the facility-wide or base-wide communication and meter reading protocol system.

PART 2 PRODUCTS

2.1 ELECTRICITY METERS AND ACCESSORIES

2.1.1 Physical and Common Requirements

- a. Provide metering system components in accordance with the **requirements** in this specification. Provide **Meter configuration template**.
- c. Meter **must** have NEMA 1 enclosure for surface mounting with bottom or rear penetrations.
- d. Surge withstand capability **must** conform to **IEEE C37.90.1**.
- e. Use #12 SIS (XHHW, or equivalent) wiring with ring lugs for all meter connections. Color code and mark the conductors as follows:
 - (1) Red - Phase A CT - C1
 - (2) Orange - Phase B CT - C2
 - (3) Brown - Phase C CT - C3
 - (4) Gray with white stripe - neutral current return - C0
 - (5) Black - Phase A voltage - V1
 - (6) Yellow - Phase B voltage - V2
 - (7) Blue - Phase C voltage - V3
 - (8) White - Neutral voltage

2.1.2 Potential Transformer Requirements

- a. Meter **must** be capable of connection to the service voltage phases and magnitude being monitored. If the meter is not rated for the service voltage, provide suitable potential transformers to send an acceptable voltage to the meter.
- b. Voltage input **must** be optically isolated to 2500 volts DC from signal and communications outputs. Components **must** meet or exceed **IEEE C37.90.1**.
- c. Provide one fuse per phase, Class RK type, to protect the voltage input to the meter. Size fuses as recommended by the meter manufacturer. Fusing **must** either be inside the secondary compartment of the transformer or inside the same enclosure as the CT shorting device.

2.1.3 Current Transformer Requirements

- a. Current transformer **must** be installed with a rating as shown in the schedule.
- b. Current transformers **must** have an Accuracy Class of 0.3 (with a maximum error of plus/minus 0.3 percent at 5.0 amperes) when operating within the specified rating factor.
- c. Current transformers **must** be solid-core, bracket-mounted for new

installations using ring-tongue lugs for electrical connections. Current transformers **must** be accessible and the associated wiring **must** be installed in an organized and neat workmanship arrangement. Current transformers that are retrofitted onto existing switchgear busbar can be a busbar split-core design.

d. Current transformers **must** have:

- (1) Insulation Class: All 600 volt and below current transformers **must** be rated 10 KV BIL.
- (2) Frequency: Nominal 60 Hz.
- (3) Burden: Burden class **must** be selected for the load.
- (4) Phase Angle Range: 0 to 60 degrees.

e. Meter **must** accept current input from standard instrument transformers (5A secondary current transformers).

f. Current inputs **must** have a continuous rating in accordance with **IEEE C57.13**.

g. Provide one single-ratio current transformer for each phase per power transformer with characteristics listed in the following table.

Single-Ratio Current Transformer Characteristics				
kVA	Sec. Volt	CT Ratio	RF	Meter Accuracy
500	208Y/120	600/5	1.33	0.2%, Utility Grade

2.1.4 Electricity Meters Requirements

Provide one of the following PAFB Automatic Meter Reading System (AMRS) platform compatible electric meters or approved equal:

- a. Schneider Electric PM5560
- b. Schneider Electric PM8000
- c. EIG Nexus Shark 1500

Meters must have Modbus TCP/IP data output communications capability for Ethernet Network Connection to current PAFB AMRS. Meters must be installed indoors in an electrical room and be wired to the base SCADA network via LAN connection.

2.1.4.1 AMRS Requirements

The AMRS Compliant Electric Meter must meet the following requirements:

- a. Utility Grade, 0.2% Accuracy or better
- b. Poly Phase (three voltages and three currents)
- c. Transformer grade (Three 5A Current Transformer inputs)

- d. Internal Storage for Recording two values or channels for 90 Days, configurable using manufacture supplied configuration software. Must support Interval consumption (15 Minutes) and Demand (15 minute Block Average)
- e. Clear and concise manufacturer's published procedure or method for extracting the internally recorded values, register sets (buffer) or channel data via Modbus and Ethernet
- f. Support Time of Use Recording
- g. Onboard Ethernet Communications, Base 10/100 with RJ45 connector or pigtail with receptacle connector
- h. MODBUS/TCP communication protocol
- i. Front Display with ability to display all measured values
- j. Meter internal real time clock that can be set via the Ethernet Network
- k. Minimum of two external dry contact inputs that will count pluses from other devices
- l. Minimum of one external RS485 serial port (not including the optical serial RS232 port) for communicating to wired MODBUS RTU Slave Meters on this external serial bus

2.1.4.2 Meter Profile

The AMRS Compliant Electric Meter must have the following profile:

Measured Parameter	Meter-Typical	AMRS Namespace
Voltage Phase A-N or A-B	Volts AB	VOLTS_PH_AB
Voltage Phase B-N or B-C	Volts BC	VOLTS_PH_BC
Voltage Phase C-N or C-A	Volts CA	VOLTS_PH_CA
Current Phase A	IA	CUR_PH_A
Current Phase B	IB	CUR_PH_B
Current Phase C	IC	CUR_PH_C
Current Phase N, Calculated	INc	CUR_NEUT
Power Active, Total	Watts Total	PWR_WATTS_POLY
Power Reactive, Total	VAR Total	PWR_VAR_POLY
Power Apparent, Total	VA Total	PWR_VA_POLY
Power Factor Total, COS	PF	PF_POLY
Frequency in HZ	Frequency	FREQ

Measured Parameter	Meter-Typical	AMRS Namespace
Demand, Block Average (15 Minute) (BWA)	KW	DEMAND_KW
Energy, KWH (Active or Real)	WH Quadrant 1 or(1+4)	ENERGY_KWH
Pulse Aggregation, Unscaled	Aggregator 1	Pulse_1_raw
Pulse Aggregation, Unscaled	Aggregator 2	Pulse_2_raw
Pulse Aggregation, Unscaled	Aggregator 3	Pulse_2_raw
Pulse Aggregation, Unscaled	Aggregator 4	Pulse_3_raw

2.1.4.3 Stored Data

The AMRS Compliant Electric Meter must store the following data:

Measured Parameter	Meter-Typical	AMRS Namespace
Consumption Interval (15-minutes)	Interval	Calculated (delta value Internal to CEM object)
Demand	Block Average	Calculated (total and peak)

2.1.5 Disconnect Method

- Provide a 10-pole safety disconnect complete with isolation devices for the voltage and current transformer inputs, including a shorting means for the current transformers.
- Disconnecting wiring blocks **must** be provided between the current transformer and the meter. A shorting mechanism **must** be built into the wiring block to allow the current transformer wiring to be changed without removing power to the transformer. The wiring blocks **must** be located where they are accessible without the necessity of disconnecting power to the transformer.
- Voltage monitoring circuits **must** be equipped with disconnect switches to isolate the meter base or socket from the voltage source.

2.1.6 Installation Methods

- Transformer Mounted. Meter base **must** be located outside on the secondary side of the pad-mounted transformer.
- Stand Mounted Adjacent to Transformer. Meter base **must** be mounted on a structural steel pole approximately 4 feet from the transformer pad. This can be used for multiple meters associated with a single transformers.
- Building Mounted. Meter base **must** be mounted on the interior of the building in an electrical room near the service entrance.

- d. Panel Mounted. Meter **must** be mounted where directed.
- e. Commercial meter pedestal ("PED" in Metering Systems Schedule).

PART 3 EXECUTION

3.1 INSTALLATION

Electrical installations **must** conform to **IEEE C2**, **NFPA 70** (National Electrical Code), and to the requirements specified herein. Provide new equipment and materials unless indicated or specified otherwise.

3.1.1 Configuration Software

The standard meter **must** include the latest available version of firmware and software. Meter **must** either be programmed at the factory or **must** be programmed in the field. Meters **must** have a password that **must** be provided to the contracting officer upon project completion. When field programming is performed, turn field programming device over to the Contracting Officer at completion of project. When interfacing software is used for a meter that is different than the existing meters in use at the Activity, turn the software over to the Contracting Officer at completion of the project.

3.2 FIELD QUALITY CONTROL

Perform the following acceptance checks and tests on all installed meters.

3.2.1 Performance of Acceptance Checks and Tests

Perform in accordance with the manufacturer's recommendations and include the following visual and mechanical inspections and electrical tests, performed in accordance with **NETA ATS**.

a. Meter Assembly

(1) Visual and mechanical inspection.

- (a) Compare equipment nameplate data with specifications and approved shop drawings.
- (b) Inspect physical and mechanical condition. Confirm the meter is firmly seated in the socket, the socket is not abnormally heated, the display is visible, and the ring and seal on the cover are intact.
- (c) Inspect all electrical connections to ensure they are tight. For Class 200 services, verify tightness of the service conductor terminations for high resistance using low-resistance ohmmeter, or by verifying tightness of accessible bolted electrical connections by calibrated torque-wrench method.
- (d) Record model number, serial number, firmware revision, software revision, and rated control voltage.
- (e) Verify operation of display and indicating devices.
- (f) Record password and user log-in for each meter.

- (g) Verify grounding of metering enclosure.
 - (h) Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements. Verify that the CT ratio and the PT ratio are properly included in the meter multiplier or the programming of the meter. Confirm that the multiplier is provided on the meter face or on the meter.
 - (i) Provide [building meter installation sheet, per building](#) for each facility.
 - (j) Provide the [completed meter installation schedule](#) for the installation.
 - (k) Provide the [completed meter data schedule](#) for the installation.
- (2) Electrical tests.
- (a) Apply voltage or current as appropriate to each analog input and verify correct measurement and indication.
 - (b) Confirm correct operation and setting of each auxiliary input/output feature including mechanical relay, digital, and analog.
 - (c) After initial system energization, confirm measurements and indications are consistent with loads present.
 - (d) Make note of, and report, any "Error-Code" or "Caution-Code" on the meter's display.
- (3) Provide [meter configuration report](#).

b. Current Transformers

- (1) Visual and mechanical inspection.
- (a) Compare equipment nameplate data with specification and approved shop drawings.
 - (b) Inspect physical and mechanical condition.
 - (c) Verify correct connection, including polarity.
 - (d) Inspect all electrical connections to ensure they are tight.
 - (e) Verify that required grounding and shorting connections provide good contact.
- (2) Electrical Tests.
- Verify proper operation by reviewing the meter configuration report.

c. Potential Transformers

- (1) Visual and mechanical inspection.

- (a) Verify potential transformers are rigidly mounted.
- (b) Verify potential transformers are the correct voltage.
- (c) Verify that adequate clearances exist between the primary and secondary circuit.

(2) Electrical Tests.

- (a) Verify by the meter configuration report that the polarity and phasing are correct.

3.2.2 System Functional Verification

Verify that the installed meters are working correctly in accordance with the meter configuration report:

- a. The correct meter form is installed.
- b. All voltage phases are present.
- c. Phase rotation is correct.
- d. Phase angles are correct.
- e. The new meter accurately measures power magnitude and direction, and can communicate as required by paragraph entitled "Communications Interfaces".

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SECTION 27 10 00

BUILDING TELECOMMUNICATIONS CABLING SYSTEM
08/11

PART 1 GENERAL

1.1 REFERENCES

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

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100 (2000; Archived) The Authoritative
Dictionary of IEEE Standards Terms

NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION (NECA)

NECA/BICSI 568 (2006) Standard for Installing Building
Telecommunications Cabling

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2017; ERTA 1-2 2017; TIA 17-1; TIA 17-2;
TIA 17-3; TIA 17-4; TIA 17-5; TIA 17-6;
TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10;
TIA 17-11; TIA 17-12; TIA 17-13; TIA
17-14; TIA 17-15; TIA 17-16; TIA 17-17)
National Electrical Code

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-568-C.1 (2009; Add 2 2011; Add 1 2012) Commercial
Building Telecommunications Cabling
Standard

TIA-568-C.2 (2009; Errata 2010; Add 2 2014; Add 1
2016) Balanced Twisted-Pair
Telecommunications Cabling and Components
Standards

TIA-568-C.3 (2008; Add 1 2011) Optical Fiber Cabling
Components Standard

TIA-569 (2015d) Commercial Building Standard for
Telecommunications Pathways and Spaces

U.S. FEDERAL COMMUNICATIONS COMMISSION (FCC)

FCC Part 68 Connection of Terminal Equipment to the
Telephone Network (47 CFR 68)

UNDERWRITERS LABORATORIES (UL)

UL 1286 (2008; Reprint Jan 2018) UL Standard for

Safety Office Furnishings

UL 1863 (2004; Reprint Sep 2016) UL Standard for Safety Communication Circuit Accessories

UL 514C (2014; Reprint Nov 2018) UL Standard for Safety Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers

1.2 RELATED REQUIREMENTS

Section 26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL applies to this section with additions and modifications specified herein.

1.3 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in this specification must be as defined in IEEE 100 and herein.

1.4 SYSTEM DESCRIPTION

The building telecommunications must include permanently installed telecommunications outlet assemblies, conduit, raceway, and pull strings only. Backbone and horizontal telecommunications cabling, final terminations, and testing is not within the scope of this project and will be installed/performed by others.

1.5 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Telecommunications outlet/connector assemblies

1.6 QUALITY ASSURANCE

1.6.1 Telecommunications Contractor Qualifications

Work under this section must be performed by the approved electrical contractor.

1.6.1.1 Minimum Manufacturer Qualifications

Manufacturers must have a minimum of 3 years experience in the manufacturing, assembly, and factory testing of components which comply with TIA-568-C.1, TIA-568-C.2 and TIA-568-C.3.

1.6.2 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.6.3 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products **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 **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.

1.6.3.1 Material and Equipment Manufacturing Date

Products manufactured more than 1 year prior to date of delivery to site **must** not be used, unless specified otherwise.

1.7 DELIVERY AND STORAGE

Provide protection from weather, moisture, extreme heat and cold, dirt, dust, and other contaminants for telecommunications cabling and equipment placed in storage.

1.8 ENVIRONMENTAL REQUIREMENTS

Connecting hardware **must** be rated for operation under ambient conditions of 32 to 140 degrees F and in the range of 0 to 95 percent relative humidity, noncondensing.

1.9 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 COMPONENTS

Components **must** be UL or third party certified. Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations, submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. The certificate **must** state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard. Provide a complete system of telecommunications cabling and pathway components using star topology. Provide support structures and pathways, complete with outlets, cables, connecting hardware and telecommunications cabinets/racks. Cabling and interconnecting hardware and components for telecommunications systems **must** be UL listed or third party independent testing laboratory certified, and **must** comply with NFPA 70 and conform to the requirements specified herein.

2.2 TELECOMMUNICATIONS PATHWAY

Provide telecommunications pathways in accordance with TIA-569. Provide system furniture pathways in accordance with UL 1286. Coordinate system furniture requirements with contracting officer.

2.3 TELECOMMUNICATIONS OUTLET/CONNECTOR ASSEMBLIES

2.3.1 Outlet/Connector Copper

Outlet/connectors must comply with FCC Part 68, TIA-568-C.1, and TIA-568-C.2. UTP outlet/connectors must be UL 1863 listed, non-keyed, 8-pin modular, constructed of high impact rated thermoplastic housing and must be third party verified and must comply with TIA-568-C.2 Category 6 requirements. UTP outlet/connectors must comply with TIA-568-C.2 for 200 mating cycles.

2.3.2 Cover Plates

Telecommunications cover plates must comply with UL 514C, and TIA-568-C.1, TIA-568-C.2, ; flush design constructed of high impact thermoplastic material white in color.

PART 3 EXECUTION

3.1 INSTALLATION

Install outlet/connector assemblies, and associated hardware in accordance with NECA/BICSI 568, TIA-568-C.1, TIA-568-C.2, TIA-568-C.3, TIA-569, NFPA 70, and UL standards as applicable. Provide outlet inserts to Contracting Officer.

3.1.1 Pathway Installations

Provide in accordance with UFC 3-580-01, TIA-569 and NFPA 70. Install 1 inch conduit from each data outlet to 4 inches above drop ceiling. Install insulating bushings on conduit end and pull string in all empty conduits. Installation of pathways as specified in Section 26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL.

3.1.2 Pull Cords

Nylon Pull cords must be installed in conduit serving telecommunications outlets that do not have cable installed.

-- End of Section --

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FIRE DETECTION AND ALARM SYSTEM, ADDRESSABLE
08/09

PART 1 GENERAL

1.1 REFERENCES

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

ACOUSTICAL SOCIETY OF AMERICA (ASA)

ASA S3.41 (2015) Audible Emergency Evacuation Signal
(ASA 96)

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41.1 (2002; R 2008) Guide on the Surges
Environment in Low-Voltage (1000 V and
Less) AC Power Circuits

IEEE C62.41.2 (2002) Recommended Practice on
Characterization of Surges in Low-Voltage
(1000 V and Less) AC Power Circuits

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 1221 (2019) Standard for the Installation,
Maintenance and Use of Emergency Services
Communications Systems

NFPA 70 (2017; ERTA 1-2 2017; TIA 17-1; TIA 17-2;
TIA 17-3; TIA 17-4; TIA 17-5; TIA 17-6;
TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10;
TIA 17-11; TIA 17-12; TIA 17-13; TIA
17-14; TIA 17-15; TIA 17-16; TIA 17-17)
National Electrical Code

NFPA 72 (2016; Errata 1 2018) National Fire Alarm
and Signaling Code

NFPA 90A (2018) Standard for the Installation of
Air Conditioning and Ventilating Systems

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

47 CFR 15 Radio Frequency Devices

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UL 1242 (2006; Reprint Mar 2014) Standard for
Electrical Intermediate Metal Conduit --
Steel

UL 1971	(2002; Reprint Oct 2008) Signaling Devices for the Hearing Impaired
UL 268	(2016; Reprint Jul 2016) UL Standard for Safety Smoke Detectors for Fire Alarm Systems
UL 268A	(2008; Reprint Oct 2014) Smoke Detectors for Duct Application
UL 38	(2008; Reprint Nov 2013) Manual Signaling Boxes for Fire Alarm Systems
UL 464	(2016; Reprint Sep 2017) UL Standard for Safety Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories
UL 521	(1999; Reprint Dec 2017) UL Standard for Safety Heat Detectors for Fire Protective Signaling Systems
UL 6	(2007; Reprint Nov 2014) Electrical Rigid Metal Conduit-Steel
UL 797	(2007; Reprint Mar 2017) UL Standard for Safety Electrical Metallic Tubing -- Steel
UL 864	(2014; Reprint Mar 2018) UL Standard for Safety Control Units and Accessories for Fire Alarm Systems

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings

SD-03 Product Data

Storage Batteries

Special Tools and Spare Parts

Technical Data and Computer Software

Training

Testing

Battery Charger

Addressable Manual Pull Stations

Fire Detecting Devices

Notification Appliances

Fire Detection And Alarm System Peripheral Equipment

Transmitters

SD-06 Test Reports

Testing

SD-07 Certificates

Qualifications

SD-10 Operation and Maintenance Data

Operating and Maintenance Instructions

1.3 QUALITY ASSURANCE

1.3.1 Qualifications

Submit proof of qualifications for required personnel. The installer **must** submit proof of experience for the Professional Engineer, fire alarm technician, and the installing company.

1.3.1.1 Engineer and Technician

- a. Registered Professional Engineer with verification of experience and at least 4 years of current experience in the design of the fire protection and detection systems.
- b. National Institute for Certification in Engineering Technologies (NICET) qualifications as an engineering technician in fire alarm systems program with verification of experience and current NICET certificate.
- c. The Registered Professional Engineer may perform all required items under this specification. The NICET Fire Alarm Technician **must** perform only the items allowed by the specific category of certification held.

1.3.1.2 Installer

The installing Contractor **must** provide the following: NICET Fire Alarm Technicians to perform the installation of the system. A NICET Level 3 Fire Alarm Technician **must** supervise the installation of the fire alarm system. NICET Level 2 or higher Fire Alarm Technician **must** install and terminate fire alarm devices, cabinets and panels. An electrician or NICET Level 1 Fire Alarm Technician **must** install conduit for the fire alarm system. The Fire Alarm technicians installing the equipment **must** be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

1.3.1.3 Fire Protection Engineer

Installations needing designs or modifications of fire detection, fire alarm, or fire suppression systems require the services and review of a qualified fire protection engineer. For the purposes of meeting this

requirement, a qualified fire protection engineer is defined as an individual meeting one of the following conditions:

- a. An engineer having a Bachelor of Science or Masters of Science Degree in Fire Protection Engineering from an accredited university engineering program, plus a minimum of 2 years' work experience in fire protection engineering.
- b. A registered professional engineer (P.E.) in fire protection engineering.
- c. A registered PE in a related engineering discipline and member grade status in the National Society of Fire Protection Engineers.
- d. An engineer with a minimum of 10 years' experience in fire protection engineering and member grade status in the National Society of Fire Protection Engineers.

1.3.2 Detail Drawings

Submit detail drawings consisting of a complete list of equipment and material, including manufacturer's descriptive and technical literature, catalog cuts, and installation instructions. Note that the contract drawings show layouts based on typical audible appliances. Check the layout based on the actual audible devices to be installed and make any necessary revisions in the detail drawings. The detail drawings **must** also contain complete wiring and schematic diagrams for the equipment furnished, equipment layout, and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Detail drawings and detailed point-to-point wiring diagram **must** be prepared and signed by a Registered Professional Engineer or a NICET Level 3 Fire Alarm Technician showing points of connection. Diagram **must** include connections between system devices, appliances, control panels, supervised devices, and equipment that is activated or controlled by the panel.

1.4 TECHNICAL DATA AND COMPUTER SOFTWARE

Technical data and computer software (meaning technical data which relates to computer software) which is specifically identified in this project, and which may be defined/required in other specifications, **must** be delivered, strictly in accordance with the CONTRACT CLAUSES, and in accordance with the Contract Data Requirements List, DD Form 1423. Data delivered **must** be identified by reference to the particular specification paragraph against which it is furnished. Data to be submitted **must** include complete system, equipment, and software descriptions. Descriptions **must** show how the equipment will operate as a system to meet the performance requirements of this contract. The data package **must** also include the following:

- a. Identification of programmable portions of system equipment and capabilities.
- b. Description of system revision and expansion capabilities and methods of implementation detailing both equipment and software requirements.
- c. Provision of operational software data on all modes of programmable portions of the fire alarm and detection system.
- d. Description of Fire Alarm Control Panel equipment operation.

- e. Description of auxiliary and remote equipment operations.
- f. Library of application software.
- g. Operation and maintenance manuals as specified in SD-19 of the Submittals paragraph.

1.5 DELIVERY, STORAGE, AND HANDLING

Protect equipment delivered and placed in storage from the weather, humidity and temperature variation, dirt, dust, and any other contaminants.

1.6 SPECIAL TOOLS AND SPARE PARTS

Submit spare parts data for each different item of material and equipment specified, not later than 3 months prior to the date of beneficial occupancy. Data **must** include a complete list of parts and supplies with the current unit prices and source of supply and a list of the parts recommended by the manufacturer to be replaced after 1 year of service. Furnish software, connecting cables, proprietary equipment and two spare fuses of each type and size required, necessary for the maintenance, testing, and reprogramming of the equipment. Two percent of the total number of each different type of detector, but no less than two each, **must** be furnished. Mount spare fuses in the fire alarm panel.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

The fire detection and alarm system and the central reporting system **must** be a complete, supervised fire alarm reporting system configured in accordance with **NFPA 72**; exceptions are acceptable as directed by the Contracting Officer. Furnish equipment compatible and UL listed, FM approved, or approved or listed by a nationally recognized testing laboratory in accordance with the applicable NFPA standards. Locks **must** be keyed alike. Provide four keys for the system. Furnish tags with stamped identification number for keys and locks.

2.1.1 Operation

Activate the system into the alarm mode by actuation of any alarm initiating device. The system will remain in the alarm mode until the initiating device is reset and the fire alarm control panel is reset and restored to normal. Alarm and supervisory initiating devices **must** be individually addressable. Alarm initiating devices **must** be connected to signal line circuits (SLC), **Class B**, in accordance with **NFPA 72**. Connect alarm notification appliances to notification appliance circuits (NAC), **Class B** in accordance with **NFPA 72**. Provide a looped conduit system so that if the conduit and all conductors within are severed at any point, all NAC and SLC will remain functional. The conduit loop requirement is not applicable to the signal transmission link from the local panels (at the protected premises) to the Supervising Station (fire station, fire alarm central communication center). Textual, audible, and visual appliances and systems **must** comply with **NFPA 72**. Fire alarm system components requiring power, except for the control panel power supply, **must** operate on 24 Volts dc. Addressable system **must** be microcomputer (microprocessor or microcontroller) based with a minimum word size of eight bits and **must** provide the following features:

- a. Sufficient memory to perform as specified and as shown for addressable system.
- b. Individual identity of each addressable device for the following conditions: alarm; trouble; open; short; and appliances missing/failed remote detector - sensitivity adjustment from the panel for smoke detectors.
- c. Capability of each addressable device being individually disabled or enabled from the panel.
- d. Size each SLC to provide 40 percent addressable expansion without hardware modifications to the panel.

2.1.1.2 Operational Features

The system **must** have the following operating features:

- a. Monitor electrical supervision of **SLC**, and NAC.
- b. Monitor electrical supervision of the primary power (ac) supply, battery voltage, placement of alarm zone module (card, PC board) within the control panel, and transmitter tripping circuit integrity.
- c. A trouble buzzer and trouble LED/LCD (light emitting diode/liquid crystal diode) to activate upon a single break, open, or ground fault condition which prevents the required normal operation of the system. The trouble signal **must** also operate upon loss of primary power (ac) supply, low battery voltage, removal of alarm zone module (card, PC board), and disconnection of the circuit used for transmitting alarm signals off-premises. Submit Voltage drop calculations for notification appliance circuits to indicate that sufficient voltage is available for proper appliance operation. A trouble alarm silence switch **must** be provided which will silence the trouble buzzer, but will not extinguish the trouble indicator LED/LCD. Subsequent trouble and supervisory alarms **must** sound the trouble signal until silenced. After the system returns to normal operating conditions, the trouble buzzer **must** again sound until the silencing switch returns to normal position, unless automatic trouble reset is provided.
- d. A one person test mode. Activating an initiating device in this mode will activate an alarm for a short period of time, then automatically reset the alarm, without activating the transmitter during the entire process.
- e. A transmitter disconnect switch to allow testing and maintenance of the system without activating the transmitter but providing a trouble signal when disconnected and a restoration signal when reconnected.
- f. Evacuation alarm silencing switch which, when activated, will silence alarm devices, but will not affect the indicating LED/LCD displays on the control panel nor the operation of the transmitter. This switch **must** be over-ridden upon activation of a subsequent alarm from an unalarmed device and the NAC devices will be activated.
- g. Electrical supervision for circuits used for supervisory signal services (i.e., sprinkler systems, valves, etc.). Supervision **must** detect any open, short, or ground.

- h. Confirmation or verification of all smoke detectors. The control panel **must** interrupt the transmission of an alarm signal to the system control panel for a factory preset period. This interruption period **must** be adjustable from 1 to 60 seconds and be factory set at 20 seconds. Immediately following the interruption period, a confirmation period **must** be in effect during which time an alarm signal, if present, will be sent immediately to the control panel. Fire alarm devices other than smoke detectors **must** be programmed without confirmation or verification.
- i. The fire alarm control panel **must** provide supervised addressable relays for HVAC shutdown. An override at the HVAC panel **must** not be provided.
- l. The control panel and field panels **must** be software reprogrammable to enable expansion or modification of the system without replacement of hardware or firmware. Examples of required changes are: adding or deleting devices or zones; changing system responses to particular input signals; programming certain input signals to activate auxiliary devices.
- n. **SLC** and **NAC** **must** be arranged as indicated on the contract drawings.

2.1.3 Alarm Functions

An alarm condition on a circuit **must** automatically initiate the following functions:

- a. Transmission of signals over the station radio fire reporting system. .
- b. Visual indications of the alarmed devices on the fire alarm control panel display and on the remote audible/visual display.
- c. Continuous sounding or operation of alarm notification appliances only in designated areas as required by **ASA S3.41**.
- d. Operation of the smoke control system.
- e. Deactivation of the air handling units throughout the building.

2.1.4 Primary Power

Operating power **must** be provided as required by paragraph Power Supply for the System. Transfer from normal to emergency power or restoration from emergency to normal power **must** be fully automatic and not cause transmission of a false alarm. Loss of ac power **must** not prevent transmission of a signal via the fire reporting system upon operation of any initiating circuit.

2.1.5 Battery Backup Power

Battery backup power **must** be through use of rechargeable, sealed-type storage batteries and battery charger.

2.2 CONTROL PANEL

Control Panel **must** comply with the applicable requirements of **UL 864**. Panel **must** be modular, installed in a surface mounted steel cabinet with

hinged door and cylinder lock. Control panel **must** be a clean, uncluttered, and orderly assembled panel containing components and equipment required to provide the specified operating and supervisory functions of the system. The panel **must** have prominent rigid plastic, phenolic or metal identification plates for LED/LCDs, SLC, controls, meters, fuses, and switches.

- a. Nameplates for fuses **must** also include ampere rating. The LED/LCD displays **must** be located on the exterior of the cabinet door or be visible through the cabinet door. Control panel switches **must** be within the locked cabinet. A suitable means (single operation) **must** be provided for testing the control panel visual indicating devices (meters or LEDs/LCDs). Meters and LEDs **must** be plainly visible when the cabinet door is closed. Signals and LEDs/LCDs **must** be provided to indicate any alarm, supervisory or trouble condition on the system.
- b. Each SLC **must** be powered and supervised so that a signal on one device does not prevent the receipt of signals from other devices. Loss of power, including batteries, **must** not require the manual reloading of a program. Upon restoration of power, startup **must** be automatic, and **must** not require any manual operation. The loss of primary power or the sequence of applying primary or emergency power **must** not affect the transmission of alarm, supervisory or trouble signals.
- c. Visual annunciation **must** be provided for LED/LCD visual display as an integral part of the control panel and **must** identify with a word description and id number each device. Cabinets **must** be provided with ample gutter space to allow proper clearance between the cabinet and live parts of the panel equipment. If more than one modular unit is required to form a control panel, the units **must** be installed in a single cabinet large enough to accommodate units. Cabinets **must** be painted red .

2.2.1 Remote System Audible/Visual Display

Audible appliance **must** have a minimum sound level output rating of 85 dBA at 10 feet and operate in conjunction with the panel integral display. The audible device **must** be silenced by a system silence switch on the remote system. The audible device **must** be silenced by the system silence switch located at the remote location, but **must** not extinguish the visual indication. The remote LED/LCD visual display **must** provide identification, consisting of the word description and id number for each device as displayed on the control panel. A rigid plastic, phenolic or metal identification sign which reads "Fire Alarm System Remote Display" **must** be provided at the remote audible/visual display. The remote visual appliance located with the audible appliance **must** not be extinguished until the trouble or alarm has been cleared.

2.2.2 Circuit Connections

Connect circuit conductors entering or leaving the panel to screw-type terminals with each conductor and terminal marked for identification.

2.2.3 System Expansion and Modification Capabilities

Provide, as part of this contract, any equipment and software needed by qualified technicians to implement future changes to the fire alarm system.

2.2.4 Addressable Control Module

The control module **must** be capable of operating as a relay (dry contact form C) for interfacing the control panel with other systems. The module **must** be UL listed as compatible with the control panel. The indicating device or the external load being controlled **must** be configured as a Class B notification appliance circuits. The system **must** be capable of supervising, audible, visual and dry contact circuits. The control module **must** have both an input and output address. The supervision **must** detect a short on the supervised circuit and **must** prevent power from being applied to the circuit. The control model **must** provide address setting means compatible with the control panel's SLC supervision and store an internal identifying code. The control module **must** contain an integral LED that flashes each time the control module is polled.

2.2.5 Addressable Initiating Device Circuits Module

Configure the initiating device being monitored as a Class B SLC circuits. The system **must** be capable of defining any module as an alarm module and report alarm trouble, loss of polling, or as a supervisory module, and reporting supervisory short, supervisory open or loss of polling. The module **must** be UL listed as compatible with the control panel. The monitor module **must** provide address setting means compatible with the control panel's SLC supervision and store an internal identifying code. Monitor module **must** contain an integral LED that flashes each time the monitor module is polled. Pull stations with a monitor module in a common backbox are not required to have an LED.

2.3 STORAGE BATTERIES

Submit substantiating battery calculations for supervisory and alarm power requirements. Ampere-hour requirements for each system component and each panel component, and the battery recharging period **must** be included. Provide storage batteries which are 24 Vdc sealed, lead-calcium type requiring no additional water with ample capacity, with primary power disconnected, to operate the fire alarm system for a period of 72 hours. Following this period of battery operation, the batteries **must** have ample capacity to operate all components of the system, including all alarm signaling devices in the total alarm mode for a minimum period of 15 minutes. Locate batteries in a separate battery cabinet. Provide batteries with overcurrent protection in accordance with NFPA 72. Separate battery cabinets **must** have a lockable, hinged cover similar to the fire alarm panel. The lock **must** be keyed the same as the fire alarm control panel. Paint the cabinets to match the fire alarm control panel.

2.4 BATTERY CHARGER

Battery charger **must** be completely automatic, 24 Vdc with high/low charging rate, capable of restoring the batteries from full discharge (18 Volts dc) to full charge within 48 hours. A pilot light indicating when batteries are manually placed on a high rate of charge **must** be provided as part of the unit assembly, if a high rate switch is provided. Locate charger in control panel cabinet or in a separate battery cabinet.

2.5 ADDRESSABLE MANUAL PULL STATIONS

Addressable manual pull stations **must** conform to the applicable requirements of UL 38. Manual pull stations **must** be connected into signal line circuits. Stations **must** be installed on surface mounted outlet

boxes. Manual stations **must** be mounted at 48 inches. Stations **must** be double action type. Stations **must** be finished in red, with raised letter operating instructions of contrasting color. Stations requiring the breaking of glass or plastic panels for operation are not acceptable. Stations employing glass rods are not acceptable. The use of a key or wrench **must** be required to reset the station. Gravity or mercury switches are not acceptable. Switches and contacts **must** be rated for the voltage and current upon which they operate. Addressable pull stations **must** be capable of being field programmed, **must** latch upon operation and remain latched until manually reset. Stations **must** have a separate screw terminal for each conductor. Surface mounted boxes **must** be matched and painted the same color as the fire alarm manual stations .

2.6 FIRE DETECTING DEVICES

Fire detecting devices **must** comply with the applicable requirements of NFPA 72, NFPA 90A, UL 268, UL 268A, and UL 521. The detectors **must** be provided as indicated. Detector base **must** have screw terminals for making connections. No solder connections will be allowed. Detectors located in concealed locations (above ceiling, raised floors, etc.) **must** have a remote visible indicator LED/LCD. Addressable fire detecting devices, except flame detectors, **must** be dynamically supervised and uniquely identified in the control panel. All fire alarm initiating devices **must** be individually addressable, except where indicated. Installed devices **must** conform to NFPA 70 hazard classification of the area where devices are to be installed.

2.6.1 Heat Detectors

Design heat detectors for detection of fire by combination fixed temperature and rate-of-rise principle . Heat detector spacing **must** be rated in accordance with UL 521. Detectors located in areas subject to moisture, exterior atmospheric conditions, or hazardous locations as defined by NFPA 70 , **must** be types approved for such locations. Heat detectors located in attic spaces or similar concealed spaces below the roof **must** be intermediate temperature rated.

2.6.1.1 Combination Fixed-Temperature and Rate-of-Rise Detectors

Detectors **must** be designed for surface outlet box mounting and supported independently of wiring connections. Contacts **must** be self-resetting after response to rate-of-rise principle. Under fixed temperature actuation, the detector **must** have a permanent external indication which is readily visible. Detector units located in boiler rooms, showers, or other areas subject to abnormal temperature changes **must** operate on fixed temperature principle only. The UL 521 test rating for the fixed temperature portion **must** be 135 degrees F . The UL 521 test rating for the Rate-of-Rise detectors **must** be rated for 50 by 50 ft.

2.6.2 Smoke Detectors

Design smoke detectors for detection of abnormal smoke densities. Smoke detectors **must** be photoelectric type. Detectors **must** contain a visible indicator LED/LCD that shows when the unit is in alarm condition. Detectors **must** not be adversely affected by vibration or pressure. Detectors **must** be the plug-in type in which the detector base contains terminals for making wiring connections. Detectors that are to be installed in concealed (above false ceilings, etc.) locations **must** be provided with a remote indicator LED/LCD suitable for mounting in a finished, visible location.

2.6.2.1 Photoelectric Detectors

Detectors **must** operate on a light scattering concept using an LED light source. Failure of the LED **must** not cause an alarm condition. Detectors **must** be factory set for sensitivity and **must** require no field adjustments of any kind. Detectors **must** have an obscuration rating in accordance with **UL 268**. Addressable smoke detectors **must** be capable of having the sensitivity being remotely adjusted by the control panel.

2.6.2.2 Duct Detectors

Duct-mounted photoelectric smoke detectors **must** be furnished and installed where indicated and in accordance with **NFPA 90A**. Units **must** consist of a smoke detector as specified in paragraph Photoelectric Detectors, mounted in a special housing fitted with duct sampling tubes. Detector circuitry **must** be mounted in a metallic enclosure exterior to the duct. Detectors **must** have a manual reset. Detectors **must** be rated for air velocities that include air flows between **500 and 4000 fpm**. Detectors **must** be powered from the fire alarm panel. Sampling tubes **must** run the full width of the duct. The duct detector package **must** conform to the requirements of **NFPA 90A**, **UL 268A**, and **must** be UL listed for use in air-handling systems. The control functions, operation, reset, and bypass **must** be controlled from the fire alarm control panel. Lights to indicate the operation and alarm condition; and the test and reset buttons **must** be visible and accessible with the unit installed and the cover in place. Detectors mounted above **6 feet** and those mounted below **6 feet** that cannot be easily accessed while standing on the floor, **must** be provided with a remote detector indicator panel containing test and reset switches. Remote lamps and switches as well as the affected fan units **must** be properly identified in etched plastic placards. Detectors **must** have auxiliary contacts to provide control, interlock, and shutdown functions. The detectors **must** be supplied by the fire alarm system manufacturer to ensure complete system compatibility.

2.7 NOTIFICATION APPLIANCES

Audible **speaker** appliances **must** conform to the applicable requirements of **UL 464**. Devices **must** be connected into notification appliance circuits. Devices **must** have a separate screw terminal for each conductor. Audible appliances **must** generate a unique audible sound from other devices provided in the building and surrounding area. Surface mounted audible appliances **must** be painted red. Recessed audible appliances **must** be installed with a grill that is painted red.

2.7.1 Speakers

Speakers must be surface mounted, with the matching mounting back box surface mounted vibrating type suitable for use in an electrically supervised circuit. **All speakers must be 0.5 watt minimum with field adjustments capability and adjusted to achieve sound levels in accordance with NFPA 72.** **Speakers must** produce a sound rating of at least **75 dBA at 10 feet**. Horns used in exterior locations **must** be specifically listed or approved for outdoor use and be provided with metal housing and protective grilles.

2.7.2 Visual Notification Appliances

Visual notification appliances **must** conform to the applicable requirements

of UL 1971 and the contract drawings. Appliances must have clear high intensity optic lens, xenon flash tubes, and output white light. Strobe flash rate must be between 1 to 3 flashes per second and a minimum of 15 candela. Strobe must be surface mounted.

2.7.3 Combination Audible/Visual Notification Appliances

Combination audible/visual notification appliances must provide the same requirements as individual units except they must mount as a unit in standard backboxes. Units must be factory assembled. Any other audible notification appliance employed in the fire alarm systems must be approved by the Contracting Officer.

2.7.4 Voice Evacuation System

The voice evacuation system must provide for one-way voice communications, routing and pre-amplification of digital alarm tones and voice (digital and analog) messages. The system must be configured for messages (Custom and prerecorded) and tones as indicated on the drawings. The following electronic tones must be available from the amplifier: Slow Whoop, High/Low, Horn, Chime, Beep, Stutter, Wail and Bell. The system must have a microphone and allow for general paging within the space. Operation must be either manually from a control switch or automatically from the fire alarm control panel. Reset must be accomplished by the fire alarm control panel during panel reset.

2.8 FIRE DETECTION AND ALARM SYSTEM PERIPHERAL EQUIPMENT

2.8.1 Conduit

Conduit and fittings must comply with NFPA 70, UL 6, UL 1242, and UL 797.

2.8.2 Wiring

Wiring must conform to NFPA 70. Wiring for 120 Vac power must be No. 12 AWG minimum. The SLC wiring must be copper cable in accordance with the manufacturers requirements. Wiring for fire alarm dc circuits must be No. 16 AWG minimum. Voltages must not be mixed in any junction box, housing, or device, except those containing power supplies and control relays. Wiring must conform to NFPA 70. System field wiring must be solid copper and installed in metallic conduit or electrical metallic tubing, except that rigid plastic conduit may be used under slab-on-grade. Conductors must be color coded. Conductors used for the same functions must be similarly color coded. Wiring code color must remain uniform throughout the circuit. Pigtail or T-tap connections to initiating device circuits, supervisory alarm circuits, and notification appliance circuits are prohibited. T-tapping using screw terminal blocks is allowed for style 5 addressable systems.

2.9 TRANSMITTERS

2.9.1 Radio Alarm Transmitters

Transmitters must be compatible with the Monaco D-21 radio transiever system at PAFB. Each radio alarm transmitter must be the manufacturer's recognized commercial product, completely assembled, wired, factory tested, and delivered ready for installation and operation. Transmitters must be provided in accordance with applicable portions of NFPA 72, NFPA 1221, and 47 CFR 15. Transmitter electronics module must be contained within the

physical housing as an integral, removable assembly. At the Contractors option, and if UL listed, the transmitter may be housed in the same panel as the fire alarm control panel.

2.9.1.1 Transmitter Power Supply

Each radio alarm transmitter **must** be powered by a combination of locally available 120-volt ac power and a sealed, lead-calcium battery.

2.9.1.1.1 Operation

Each transmitter **must** operate from 120-volt ac power. In the event of 120-volt ac power loss, the transmitter **must** automatically switch to battery operation. Switchover **must** be accomplished with no interruption of protective service, and **must** automatically transmit a trouble message. Upon restoration of ac power, transfer back to normal ac power supply **must** also be automatic.

2.9.1.1.2 Battery Power

Transmitter standby battery capacity **must** provide sufficient power to operate the transmitter in a normal standby status for a minimum of 72 hours and be capable of transmitting alarms during that period.

2.9.1.2 Radio Alarm Transmitter Housing

Transmitter housing **must** be NEMA Type 1. The housing **must** contain a lock that is keyed identical to the fire alarm system for the building. Radio alarm transmitter housing **must** be factory painted with a suitable priming coat and not less than two coats of a hard, durable weatherproof enamel.

2.9.1.3 Antenna

Provide omnidirectional, coaxial, halfwave dipole antennas for radio alarm transmitters with a driving point impedance to match transmitter output. The antenna and antenna mounts **must** be corrosion resistant and designed to withstand wind velocities of 100 mph. Antennas **must** not be mounted to any portion of the building roofing system.

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with details of the work, verify dimensions in the field and advise the Contracting Officer of any discrepancy before performing the work.

3.2 INSTALLATION

Install all work as shown, in accordance with NFPA 70 and NFPA 72, and in accordance with the manufacturer's diagrams and recommendations, unless otherwise specified. Smoke detectors **must** not be installed until construction is essentially complete and the building has been thoroughly cleaned.

3.2.1 Power Supply for the System

Provide a single dedicated circuit connection for supplying power from a branch circuit to each building fire alarm system. The power **must** be

supplied as shown on the drawings. The power supply **must** be equipped with a locking mechanism and marked in red with the words "FIRE ALARM CIRCUIT CONTROL".

3.2.2 Wiring

Conduit size for wiring **must** be in accordance with **NFPA 70**. Wiring for the fire alarm system **must** not be installed in conduits, junction boxes, or outlet boxes with conductors of lighting and power systems. Not more than two conductors **must** be installed under any device screw terminal. The wires under the screw terminal **must** be straight when placed under the terminal then clamped in place under the screw terminal. The wires **must** be broken and not twisted around the terminal. Circuit conductors entering or leaving any mounting box, outlet box enclosure, or cabinet **must** be connected to screw terminals with each terminal and conductor marked in accordance with the wiring diagram. Connections and splices **must** be made using screw terminal blocks. The use of wire nut type connectors in the system is prohibited. Wiring within any control equipment **must** be readily accessible without removing any component parts. The fire alarm equipment manufacturer's representative **must** be present for the connection of wiring to the control panel.

3.2.3 Control Panel

The control panel and its assorted components **must** be mounted so that no part of the enclosing cabinet is less than **12 inches** nor more than **78 inches** above the finished floor. Manually operable controls **must** be between **36 and 42 inches** above the finished floor. Panel **must** be installed to comply with the requirements of **UL 864**.

3.2.4 Detectors

Detectors **must** be located and installed in accordance with **NFPA 72**. Detectors **must** be connected into signal line circuits or initiating device circuits as indicated on the drawings. Detectors **must** be at least **12 inches** from any part of any lighting fixture. Detectors **must** be located at least **3 feet** from diffusers of air handling systems. Each detector **must** be provided with appropriate mounting hardware as required by its mounting location. Detectors which mount in open space **must** be mounted directly to the end of the stubbed down rigid conduit drop. Conduit drops **must** be firmly secured to minimize detector sway. Where length of conduit drop from ceiling or wall surface exceeds **3 feet**, sway bracing **must** be provided. Detectors installed in concealed locations (above ceiling, raised floors, etc.) **must** have a remote visible indicator LED/LCD in a finished, visible location.

3.2.5 Notification Appliances

Notification appliances **must** be mounted **80 inches** above the finished floor or **6 inches** below the ceiling, whichever is lower.

3.2.6 Annunciator Equipment

Annunciator equipment **must** be mounted where indicated on the drawings.

3.2.7 Addressable Initiating Device Circuits Module

The initiating device circuits module **must** be used to connect supervised conventional initiating devices (water flow switches, water pressure

switches, manual fire alarm stations, high/low air pressure switches, and tamper switches). The module **must** mount in an electrical box adjacent to or connected to the device it is monitoring and **must** be capable of Style B supervised wiring to the initiating device. In order to maintain proper supervision, there **must** be no T-taps allowed on style B lines. Addressable initiating device circuits modules **must** monitor only one initiating device each. Contacts in suppression systems and other fire protection subsystems **must** be connected to the fire alarm system to perform supervisory and alarm functions as specified in , as indicated on the drawings and as specified herein.

3.2.8 Addressable Control Module

Addressable and control modules **must** be installed in the outlet box or adjacent to the device they are controlling. If a supplementary suppression releasing panel is provided, then the monitor modules **must** be mounted in a common enclosure adjacent to the suppression releasing panel and both this enclosure and the suppression releasing panel **must** be in the same room as the releasing devices. All interconnecting wires **must** be supervised unless an open circuit or short circuit abnormal condition does not affect the required operation of the fire alarm system. If control modules are used as interfaces to other systems, such as HVAC or elevator control, they **must** be within the control panel or immediately adjacent to it. Control modules that control a group of notification appliances **must** be adjacent to the first notification appliance in the notification appliance circuits. Control modules that connect to devices **must** supervise the notification appliance circuits. Control modules that connect to auxiliary systems or interface with other systems (non-life safety systems) and where not required by NFPA 72, **must** not require the secondary circuits to be supervised. Contacts in suppression systems and other fire protection subsystems **must** be connected to the fire alarm system to perform required alarm functions as specified in , as indicated on the drawings and as specified herein.

3.3 OVERVOLTAGE AND SURGE PROTECTION

3.3.1 Power Line Surge Protection

All equipment connected to alternating current circuits **must** be protected from surges in accordance with IEEE C62.41.1/IEEE C62.41.2 B3 combination waveform and NFPA 70. Fuses **must** not be used for surge protection. The surge protector **must** be rated for a maximum let thru voltage of 350 Volts ac (line-to-neutral) and 350 Volt ac (neutral-to-ground).

3.3.2 Low Voltage DC Circuits Surge Protection

All SLC, NAC, and communication cables/conductors, except fiber optics, **must** have surge protection installed at each point where it exits or enters a building. Equipment **must** be protected from surges in accordance with IEEE C62.41.1/IEEE C62.41.2 B3 combination waveform and NFPA 70. The surge protector **must** be rated to protect the 24 Volt dc equipment. The maximum dc clamping voltages **must** be 36 V (line-to-ground) and 72 Volt dc (line-to-line).

3.3.3 Signal Line Circuit Surge Protection

All SLC cables/conductors, except fiber optics, **must** have surge protection/isolation circuits installed at each point where it exits or enters a building. The circuit **must** be protected from surges in accordance

with IEEE C62.41.1/IEEE C62.41.2 B3 combination waveform and NFPA 70. The surge protector/isolator must be rated to protect the equipment.

3.4 GROUNDING

Grounding must be provided by connecting to building ground system.

3.5 TRAINING

Submit lesson plans, operating instructions, maintenance procedures, and training data, furnished in manual format, for the training courses. The operations training must familiarize designated government personnel with proper operation of the fire alarm system. Conduct the course in the building where the system is installed or as designated by the Contracting Officer.

- a. The instructions must cover items contained in the operating and maintenance instructions. In addition, training must be provided on performance of expansions or modifications to the fire detection and alarm system. The training period for system expansions and modifications must consist of at least 1 training days (8 hours per day) and must start after the system is functionally completed but prior to final acceptance tests.
- b. The maintenance training course must provide the designated Government personnel adequate knowledge required to diagnose, repair, maintain, and expand functions inherent to the system. Provide training course for the maintenance staff. The training period for systems maintenance must consist of 2 training days (8 hours per day) and must start after the system is functionally completed but prior to final acceptance tests. Six copies of maintenance manual listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. The manuals must include conduit layout, equipment layout and simplified wiring, and control diagrams of the system as installed. The manuals must include complete procedures for system revision and expansion, detailing both equipment and software requirements. Original and backup copies of all software delivered for this project must be provided, on each type of media utilized. Manuals must be approved prior to training.
- c. The training period for systems operation must consist of 1 training days (8 hours per day) and must start after the system is functionally completed but prior to final acceptance tests. Six copies of operating manual outlining step-by-step procedures required for system startup, operation, and shutdown. The manual must include the manufacturer's name, model number, service manual, parts list, and complete description of equipment and their basic operating features.

3.6 TESTING

Notify the Contracting Officer at least 10 days before the preliminary and acceptance tests are to be conducted. Perform the tests in accordance with the approved test procedures in the presence of the Contracting Officer. The control panel manufacturer's representative must be present to supervise tests. Furnish instruments and personnel required for the tests.

- a. Submit detailed test procedures, prepared and signed by a Registered Professional Engineer or a NICET Level 3 Fire Alarm Technician, for the fire detection and alarm system 60 days prior to performing system

tests.

- b. Submit test reports, in booklet form, showing field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Each test report **must** document readings, test results and indicate the final position of controls. Include the **NFPA 72** Certificate of Completion and **NFPA 72** Inspection and Testing Form, with the appropriate test reports.

3.6.1 Preliminary Tests

Upon completion of the installation, subject the system to functional and operational performance tests including tests of each installed initiating and notification appliance, when required. Tests **must** include the meggering of system conductors to determine that the system is free from grounded, shorted, or open circuits. Conduct the megger test prior to the installation of fire alarm equipment. If deficiencies are found, corrections **must** be made and the system **must** be retested to assure that it is functional. After completing the preliminary testing complete and submit the **NFPA 72**, Certificate of Completion and Testing Form.

3.6.2 Acceptance Test

Acceptance testing **must** not be performed until the Contractor has completed and submitted the Certificate of Completion. Conduct testing in accordance with **NFPA 72**. The recommended tests in **NFPA 72** are considered mandatory and **must** verify that previous deficiencies have been corrected. The Fire alarm Technician supervising the installation of the fire alarm system **must** attend the testing of the system. The test **must** include all requirements of **NFPA 72** and the following:

- a. Test of each function of the control panel.
- b. Test of each circuit in both trouble and normal modes.
- c. Tests of each alarm initiating devices in both normal and trouble conditions.
- d. Tests of each control circuit and device.
- e. Tests of each alarm notification appliance.
- f. Tests of the battery charger and batteries.
- g. Complete operational tests under emergency power supply.
- h. Visual inspection of wiring connections.
- i. Opening the circuit at each alarm initiating device and notification appliance to test the wiring supervisory feature.
- j. Ground fault.
- k. Short circuit faults.
- l. Stray voltage.
- m. Loop resistance.

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DIVISION 31 - EARTHWORK

SECTION 31 00 00

EARTHWORK

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SECTION 31 00 00

EARTHWORK

08/08

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO T 180 (2017) Standard Method of Test for
Moisture-Density Relations of Soils Using
a 4.54-kg (10-lb) Rammer and a 457-mm
(18-in.) Drop

AASHTO T 224 (2010) Standard Method of Test for
Correction for Coarse Particles in the
Soil Compaction Test

ASTM INTERNATIONAL (ASTM)

ASTM C136/C136M (2014) Standard Test Method for Sieve
Analysis of Fine and Coarse Aggregates

ASTM D1140 (2017) Standard Test Methods for
Determining the Amount of Material Finer
than 75- μ m (No. 200) Sieve in Soils by
Washing

ASTM D1556/D1556M (2015; E 2016) Standard Test Method for
Density and Unit Weight of Soil in Place
by Sand-Cone Method

ASTM D1557 (2012; E 2015) Standard Test Methods for
Laboratory Compaction Characteristics of
Soil Using Modified Effort (56,000
ft-lbf/ft³) (2700 kN-m/m³)

ASTM D2487 (2011) Soils for Engineering Purposes
(Unified Soil Classification System)

ASTM D4318 (2017) Standard Test Methods for Liquid
Limit, Plastic Limit, and Plasticity Index
of Soils

ASTM D6938 (2017a) Standard Test Method for In-Place
Density and Water Content of Soil and
Soil-Aggregate by Nuclear Methods (Shallow
Depth)

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 600/4-79/020

(1983) Methods for Chemical Analysis of Water and Wastes

EPA SW-846.3-3

(1999, Third Edition, Update III-A) Test Methods for Evaluating Solid Waste: Physical/Chemical Methods

1.2 DEFINITIONS

1.2.1 Satisfactory Materials

Satisfactory materials comprise any materials classified by [ASTM D2487](#) as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP. Satisfactory materials for grading comprise stones less than [8 inches](#), except for fill material for pavements which comprise stones less than [3 inches](#) in any dimension.

1.2.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory which contains root and other organic matter or frozen material. Notify the Contracting Officer when encountering any contaminated materials.

1.2.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in [ASTM D2487](#) as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic. Perform testing, required for classifying materials, in accordance with [ASTM D4318](#), [ASTM C136/C136M](#) and [ASTM D1140](#).

1.2.4 Degree of Compaction

Degree of compaction required, except as noted in the second sentence, is expressed as a percentage of the maximum density obtained by the test procedure presented in [ASTM D1557](#) abbreviated as a percent of laboratory maximum density. Since [ASTM D1557](#) applies only to soils that have 30 percent or less by weight of their particles retained on the [3/4 inch](#) sieve, express the degree of compaction for material having more than 30 percent by weight of their particles retained on the [3/4 inch](#) sieve as a percentage of the maximum density in accordance with [AASHTO T 180](#) and corrected with [AASHTO T 224](#). To maintain the same percentage of coarse material, use the "remove and replace" procedure as described in NOTE 8 of Paragraph 7.2 in [AASHTO T 180](#).

1.2.5 Topsoil

Material suitable for topsoils obtained from offsite areas is defined as: Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than [one inch](#) diameter, brush, weeds, toxic substances, and other material detrimental to plant growth. Amend topsoil pH range to obtain a pH of 5.5 to 7.

1.2.6 Unstable Material

Unstable materials are too wet to properly support the utility pipe, conduit, or appurtenant structure.

1.2.7 Select Granular Material

1.2.7.1 General Requirements

Select granular material consist of materials classified as GW, GP, SW, SP, or by [ASTM D2487](#) where indicated.

1.2.8 Initial Backfill Material

Initial backfill consists of select granular material or satisfactory materials free from rocks [2 inches](#) or larger in any dimension or free from rocks of such size as recommended by the pipe manufacturer, whichever is smaller. When the pipe is coated or wrapped for corrosion protection, free the initial backfill material of stones larger than [2 inches](#) in any dimension or as recommended by the pipe manufacturer, whichever is smaller.

1.3 SYSTEM DESCRIPTION

1.3.1 Classification of Excavation

No consideration will be given to the nature of the materials, and all excavation will be designated as unclassified excavation.

1.3.1.1 Common Excavation

Include common excavation with the satisfactory removal and disposal of all materials not classified as rock excavation.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section [01 33 00](#) SUBMITTAL PROCEDURES:

[SD-03 Product Data](#)

[Utilization of Excavated Materials](#)

[SD-06 Test Reports](#)

[Testing](#)

[Borrow Site Testing](#)

[SD-07 Certificates](#)

[Testing](#)

PART 2 PRODUCTS

2.1 REQUIREMENTS FOR OFFSITE SOILS

Test offsite soils brought in for use as backfill for Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethyl Benzene, and Xylene (BTEX) and full Toxicity Characteristic Leaching Procedure (TCLP) including ignitability, corrosivity and reactivity. Backfill **must** contain a maximum of 100 parts per million (ppm) of total petroleum hydrocarbons (TPH) and a maximum of 10 ppm of the sum of Benzene, Toluene, Ethyl Benzene, and Xylene (BTEX) and **must** pass the TCPL test. Determine TPH concentrations by using EPA 600/4-79/020 Method 418.1. Determine BTEX concentrations by using EPA SW-846.3-3 Method 5030/8020. Perform TCLP in accordance with EPA SW-846.3-3 Method 1311.

Provide Borrow Site Testing for TPH, BTEX and TCLP from a composite sample of material from the borrow site, with at least one test from each borrow site. Do not bring material onsite until tests have been approved by the Contracting Officer.

PART 3 EXECUTION

3.1 GENERAL EXCAVATION

Perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Perform the grading in accordance with the typical sections shown and the tolerances specified in paragraph FINISHING. Transport satisfactory excavated materials and place in fill or embankment within the limits of the work. Excavate unsatisfactory materials encountered within the limits of the work below grade and replace with satisfactory materials as directed. Include such excavated material and the satisfactory material ordered as replacement in excavation. Dispose surplus satisfactory excavated material not required for fill or embankment in areas approved for surplus material storage or designated waste areas. Dispose unsatisfactory excavated material in designated waste or spoil areas. During construction, perform excavation and fill in a manner and sequence that will provide proper drainage at all times. Excavate material required for fill or embankment in excess of that produced by excavation within the grading limits from the borrow areas indicated or from other approved areas selected by the Contractor as specified.

3.1.1 Drainage

Provide for the collection and disposal of surface and subsurface water encountered during construction. Completely drain construction site during periods of construction to keep soil materials sufficiently dry. Construct storm drainage features at the earliest stages of site development, and throughout construction grade the construction area to provide positive surface water runoff away from the construction activity or provide temporary ditches, swales, and other drainage features and equipment as required to maintain dry soils. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified herein. It is the responsibility of the Contractor to assess the soil and ground water conditions presented by the plans and specifications and to employ necessary measures to permit construction to proceed.

3.1.2 Underground Utilities

The Contractor is responsible for movement of construction machinery and equipment over pipes and utilities during construction. Excavation made with power-driven equipment is not permitted within 2 feet of known Government-owned utility or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the contract excavation until approval for backfill is granted by the Contracting Officer. Report damage to utility lines or subsurface construction immediately to the Contracting Officer.

3.2 GRADING AREAS

Where indicated, divide work into grading areas within which satisfactory excavated material will be placed in embankments, fills, and required backfills. Do not haul satisfactory material excavated in one grading area to another grading area except when so directed in writing. Place and grade stockpiles of satisfactory as specified. Keep stockpiles in a neat and well drained condition, giving due consideration to drainage at all times. Clear, grub, and seal by rubber-tired equipment, the ground surface at stockpile locations; separately stockpile excavated satisfactory and unsatisfactory materials. Protect stockpiles of satisfactory materials from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, remove and replace such material with satisfactory material from approved sources.

3.3 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE

Do not excavate to final grade until just before concrete is to be placed. Only use excavation methods that will leave the foundation rock in a solid and unshattered condition. Roughen the level surfaces, and cut the sloped surfaces, as indicated, into rough steps or benches to provide a satisfactory bond. Protect shales from slaking and all surfaces from erosion resulting from ponding or water flow.

3.4 GROUND SURFACE PREPARATION

3.4.1 General Requirements

Remove and replace unsatisfactory material with satisfactory materials, as directed by the Contracting Officer, in surfaces to receive fill or in excavated areas. Scarify the surface to a depth of 6 inches before the fill is started. Plow, step, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that the fill material will bond with the existing material. When subgrades are less than the specified density, break up the ground surface to a minimum depth of 6 inches, pulverizing, and compacting to the specified density. When the subgrade is part fill and part excavation or natural ground, scarify the excavated or natural ground portion to a depth of 12 inches and compact it as specified for the adjacent fill.

3.5 UTILIZATION OF EXCAVATED MATERIALS

Dispose unsatisfactory materials removing from excavations into designated waste disposal or spoil areas. Use satisfactory material removed from

excavations, insofar as practicable, in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes. Submit procedure and location for disposal of unused satisfactory material. [Submit proposed source of borrow material](#). Do not waste any satisfactory excavated material without specific written authorization. Dispose of satisfactory material, authorized to be wasted, in designated areas approved for surplus material storage or designated waste areas as directed. Clear and grub newly designated waste areas on Government-controlled land before disposal of waste material thereon. Stockpile and use coarse rock from excavations for constructing slopes or embankments adjacent to streams, or sides and bottoms of channels and for protecting against erosion. Do not dispose excavated material to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

3.6 BACKFILLING AND COMPACTION

Place backfill adjacent to any and all types of structures, in successive horizontal layers of loose materia not more than [8 inches](#) in depth. Compact to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials, to prevent wedging action or eccentric loading upon or against the structure. Backfill material must be within the range of -2 to +2 percent of optimum moisture content at the time of compaction.

Prepare ground surface on which backfill is to be placed and provide compaction requirements for backfill materials in conformance with the applicable portions of paragraphs GROUND SURFACE PREPARATION. Finish compaction by steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.7 SUBGRADE PREPARATION

3.7.1 Construction

Shape subgrade to line, grade, and cross section, and compact as specified. Include plowing, disking, and any moistening or aerating required to obtain specified compaction for this operation. Remove soft or otherwise unsatisfactory material and replace with satisfactory excavated material or other approved material as directed. Excavate rock encountered in the cut section to a depth of [6 inches](#) below finished grade for the subgrade. Bring up low areas resulting from removal of unsatisfactory material or excavation of rock to required grade with satisfactory materials, and shape the entire subgrade to line, grade, and cross section .

3.7.2 Compaction

Finish compaction by steel-wheeled rollers, vibratory compactors, or other approved equipment. Except for paved areas and railroads, compact each layer of the embankment to at least [95](#) percent of laboratory maximum density.

3.7.2.1 Subgrade for Pavements

Compact subgrade for pavements to at least [95](#)percentage laboratory maximum density for the depth below the surface of the pavement shown.

3.8 FINISHING

Finish the surface of excavations, embankments, and subgrades to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. Provide the degree of finish for graded areas within 0.1 foot of the grades and elevations indicated except that the degree of finish for subgrades specified in paragraph SUBGRADE PREPARATION.

3.8.1 Subgrade and Embankments

During construction, keep embankments and excavations shaped and drained. Maintain ditches and drains along subgrade to drain effectively at all times. Do not disturb the finished subgrade by traffic or other operation. Protect and maintain the finished subgrade in a satisfactory condition until ballast, subbase, base, or pavement is placed. Do not permit the storage or stockpiling of materials on the finished subgrade. Do not lay subbase, base course, ballast, or pavement until the subgrade has been checked and approved, and in no case place subbase, base, surfacing, pavement, or ballast on a muddy, spongy, or frozen subgrade.

3.8.2 Grading Around Structures

Construct areas within 5 feet outside of each building and structure line true-to-grade, shape to drain, and maintain free of trash and debris until final inspection has been completed and the work has been accepted.

3.9 TESTING

Perform testing by a Corps validated commercial testing laboratory or the Contractor's validated testing facility. Submit qualifications of the Corps validated commercial testing laboratory or the Contractor's validated testing facilities. If the Contractor elects to establish testing facilities, do not permit work requiring testing until the Contractor's facilities have been inspected, Corps validated and approved by the Contracting Officer.

- a. Determine field in-place density in accordance with ASTM D6938. When ASTM D6938 is used, check the calibration curves and adjust using only the sand cone method as described in ASTM D1556/D1556M. ASTM D6938 results in a wet unit weight of soil in determining the moisture content of the soil when using this method.
- b. Check the calibration curves furnished with the moisture gauges along with density calibration checks as described in ASTM D6938; check the calibration of both the density and moisture gauges at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, remove the material, replace and recompact to meet specification requirements.
- c. Perform tests on recompacted areas to determine conformance with specification requirements. Appoint a registered professional civil engineer to certify inspections and test results. These certifications must state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate

time, will be the minimum acceptable for each type operation.

3.9.1 Fill and Backfill Material Gradation

One test per 200 cubic yards stockpiled or in-place source material. Determine gradation of fill and backfill material in accordance with ASTM C136/C136M.

3.9.2 In-Place Densities

- a. One test per 200 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines.
- b. One test per 200 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by hand-operated machines.
- c. One test per 50 linear feet, or fraction thereof, of each lift of embankment or backfill for roads.

3.9.3 Check Tests on In-Place Densities

If ASTM D6938 is used, check in-place densities by ASTM D1556/D1556M as follows:

- a. One check test per lift for each 1,000 square feet, or fraction thereof, of each lift of fill or backfill compacted by other than hand-operated machines.
- b. One check test per lift for each 1.000 square feet, of fill or backfill areas compacted by hand-operated machines.
- c. One check test per lift for each 50 linear feet, or fraction thereof, of embankment or backfill for roads .

3.9.4 Moisture Contents

In the stockpile, excavation, or borrow areas, perform a minimum of two tests per day per type of material or source of material being placed during stable weather conditions. During unstable weather, perform tests as dictated by local conditions and approved by the Contracting Officer.

3.9.5 Optimum Moisture and Laboratory Maximum Density

Perform tests for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 200 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

3.9.6 Tolerance Tests for Subgrades

Perform continuous checks on the degree of finish specified in paragraph SUBGRADE PREPARATION during construction of the subgrades.

3.10 DISPOSITION OF SURPLUS MATERIAL

Remove surplus material or other soil material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber from Government property and delivered to a licensed/permitted facility or to a

location approved by the Contracting Officer.

-- End of Section --



HAZMAT REPORT

SXHT 12-1042, Repair Building 402, 45 SW-JA
Relocation

Cape Canaveral Air Force Station

11/21/2019

100% Design Submittal

Contract Number FA2521-18-D-0002

Prime Consultant:

Rhodes+Brito Architects
605 E. Robinson Street, Suite 750
Orlando, FL 32801

Sub-Consultants:

Nelson Engineering Co.
5455 N Courtenay Pkwy
Merritt Island, FL 32953

Cape Design Engineering Co.
775 E. Merritt Island Causeway, Suite 230
Merritt Island, FL 32952



rhodes + brito
ARCHITECTS

Home Office | The Day Building | 605 East Robinson Street, Suite 750 | Orlando, FL 32801
TRACES Office | 14655 S.C. Phillips Parkway FAC 1708 | Hangar R, Southside CCAFS, FL 32920

Pb**3**
Environmental Monitoring, LLC.

March 18, 2019

Client: Sunrise Systems of Brevard, Inc.
280 N. Burnett Rd.
Cocoa, FL 32926

Project: Credit Union Renovation
Building 402
PAFB, FL

This report has been prepared for the exclusive use of Sunrise Systems of Brevard, Inc. for the expressed purpose of providing them with an understanding of the potential for occupational exposure to the agents listed in this report at the assessed property. We are not responsible for changes in applicable regulatory standards, practices or regulations following performance of services. Any reliance on the report by a third party is at such party's sole risk. Any republication of this report shall be in full or listed as a extract of the full report.

According to your instructions **PbO₃** Environmental Monitoring, LLC. has completed a lead-based paint survey at the subject property (Project). The following pages of this report contain the results of this inspection. This inspection report presents data that describes the location of the paint samples identified only within the project scope. This report is to be used as a program-planning tool for any proposed renovation or demolition activities scheduled at this facility. This survey was conducted on site by an EPA/AHERA trained professional inspector.

Suspect materials not previously identified in this report may be encountered during any renovation or demolition. These materials should be assumed containing lead-based paint until sample collection and subsequent analysis prove otherwise.

This report is intended for the exclusive use of our client. The findings are relevant to the conditions observed during the physical process of performing the Inspection. These findings should not be treated as absolute nor should they be relied upon to represent conditions at significantly later dates.

PbO₃ Environmental Monitoring, LLC.



Robert Rasmussen
Building Inspector

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Credit Union Renovation

Bldg. 402

PAFB, FL

1.0 Introduction

At the request of Sunrise Systems, Mr. Robert Rasmussen¹ of PbO3 Environmental Monitoring, LLC. Conducted a limited lead-based paint (LBP) survey of bulk paint at the Credit Union Building # 402 at Patrick Air Force Base. The purpose of the survey was to assess the potential impact of Lead and LBP on the interior building components that may be impacted or disturbed during the proposed renovation of the building. On March 12th, 2019, Mr. Robert Rasmussen conducted a surface by surface investigation using a Niton XRF (X-Ray Fluorescent) and collected bulk samples of suspect LBP (paint chips) to be analyzed for lead content. Following the receipt of the analyses, this report was prepared.

¹ - Robert Rasmussen, Florida EPA Certified Lead-Based Paint Risk Assessor No.: FL-R-6731-1.

2.0 Background

2.1 Background on Lead (CAS 7439-92-1)

Lead, represented by the notation Pb, is a blueish-white, silvery, gray, very soft, odorless metal. It is derived from mineral ores and minerals such as Galena (PbS, 87% wt Pb), anglesite (PbSO₄, 68% wt Pb), and cerrusite (PbCO₃, 77% wt Pb). Lead and lead compounds have been used in storage batteries, gasoline (for anti-knocking), (mostly organo-metallic color and brighteners) pigments in dyes and glazes, pigments and driers in paints (Red lead, white lead, litharge, and blue lead were the common forms), ammunition, solders, plumbing, cable coverings, bearings, caulking, radiation barriers, and noise and vibration reduction barriers.

2.2 Lead-Based Paint (LBP)

Since 1977 paint, newly manufactured paint was permitted to contain no more than 0.06% (600 ppm) lead in residential paints but warehouse stores of LBP continued to be used through the early 80's. LBP before 1977 contained as much as 50% lead with 20% being common.

For in-place coatings, Lead-Based Paint is defined as any paint or other surface coatings that contain lead equal to or exceeding 1.0 milligram per square centimeter (1 mg/cm²) or 0.5 percent by weight or 5,000 parts per million (ppm) by weight.

2.2 Routes of Exposure

Routes of exposure for lead are inhalation, ingestion, and skin absorption. Exposure includes occupational such as that during processing or remediating lead compounds, or non-occupational exposure from bullets, ceramic glazes on fine china and cookware (especially for exported items) and other pottery, printing ink, cosmetics, toys, and drinking water. Although this report focuses on potential occupational exposure, non-occupational may significantly contribute to total exposure and thus should be considered in any assessment.

2.3 Generally Recognized Health Effects from Lead Exposure

The acute (short-term) effects of lead exposure include damage to the brain (encephalopathy), reversible kidney damage, decreased appetite, insomnia, headache, muscle and joint pain, colic, constipation, as well as anemia. Chronic effects are more deleterious and include weakness, weight loss, nausea, vomiting, blue-black dot-like pigmentation on the gums, severe headache, and abdominal cramps. Lead concentrates and remains in the bone for many years. Lead has been determined to be toxic and cause hyper activity in children, severe mental retardation, blindness, miscarriages in women, and in rare cases death.

2.4 Expected Work Exposures

Exposure to lead varies greatly and therefore the dose that the body receives varies greatly. The overall dose during exposure to paint containing lead is affected by the duration of exposure, the route of exposure, the distance from the source of lead, the size and form of lead, protection measures and work habits, equipment and tools used, etc.

Credit Union Renovation

Bldg. 402

PAFB, FL

Some typical exposures during lead-based paint removal are:

<u>Task/activity</u>	<u>Concentration</u>
Propane Torch	4,200-10,900 ug/m ³
Grinding	2,000-11,000 ug/m ³
Cleanup and wet washdown	190-750 ug.m ³
Ripout of baseboards and window trim	9-50 ug/m ³
Sandblasting of paint	50-10,000 ug/m ³
Manual scraping wetted loose paint	2-19 ug/m ³
Welding	< 10-19,500 ug/m ³

Result from spot work (vac-blast, grinding, cutting, torching) conducted on Launch Pads, the VAB, and Hangers, etc. over the past 22 years that we have measured have ranged from below detectable limits to 862 ug/m³ indicating highly variable control; however, no evaluation has been conducted to determine the amount of lead in paint to correlate with these results.

2.5 Occupational Regulations & Exposure Limits

OSHA construction regulations for lead are contained in 29 CFR 1962.62 and were created to protect workers from adverse exposure to lead. The regulations require that a number of procedures and processes be followed where lead exposure (of any amount) occurs. These range from air monitoring to medical surveillance.

As indicated in the OSHA Compliance Directive², “For all occupational exposure to lead occurring in the course of construction work, the **standard does not specify a minimum amount or concentration of lead that triggers a determination that lead is present** and the potential for occupational exposure exists. However, if the employer has appropriately tested all potential sources of lead (e.g., tested all layers of paints and coatings that may be disturbed) utilizing a valid detection method for the presence of lead and found **no detectable levels of lead, the standard does not apply.**” So unless the results are below detectable limits, the applicability of the regulations is determined by airborne exposure potential.

Currently, OSHA has specified an 8-Hour time-weighted-average permissible exposure limit (PEL-TWA) of 50 ug/m³ and an action limit of 30ug/m³. Exceeding the action limit triggers the use of certain engineering and work practice controls while exceeding the PEL is not legally permissible. The American Conference of Government Industrial Hygienist (ACGIH) also has suggested an 8-Hour TWA Threshold Limit Value (TLV-TWA) of 50 ug/m³. The National Institute for Occupational Safety and Health (NIOSH) has also suggested a 10-Hour TWA Recommended Exposure Limit (REL-TWA) of <100 ug.m³.

Some other air standard do exist, such as Federal Ambient Air Quality (outside air) standards. The standard for lead in ambient air, otherwise known as the National Ambient Air Quality Standard (NAAQS), is 1.5 ug.m3 based on a 24-Hour average. These are not relevant to worker exposure, but may be relevant to emissions as a result of disturbing LBP.

² OSHA. OSHA Instruction CPL 2-2.58, Subject: 29 CFR 1926.62, Lead Exposure in Construction; Interim Final Rule—Inspection and Compliance Procedures. Washington, DC; USDOL. 1993

Credit Union Renovation

Bldg. 402

PAFB, FL

2.6 Lead-Based Paint Surface Concentration Clearance Levels

EPA has only designated standards for child-occupied housing. These levels are 40 ug/ft² for the Floors, 250 ug/ft² for Window Sills and 400 ug/ft² for Window Troughs. These are applicable for residential housing, not occupational settings.

The Steel Structures Painting Council (SPC) has presented one option for clearance that of wipe sampling to determine appropriate completion. Their C2 ^{METHOD} for clearance considers those surfaces containing more than 860 ug/100cm² (approx. 8,000 ug/ft²) as being in need of further cleaning.

OSHA in their Compliance Instruction (C.L. 2-2.58) have stated that, “OSHA recommends the use of HUD’s recommended level for acceptable decontamination of 200 ug/ft² (21.5 ug/100 cm²) for floors in evaluating cleanliness of change areas, storage facilities, and lunchrooms/eating areas.” More recently than this OSHA document are revisions of the HUD cleanup for floors to 100 ug/ft² from 200 ug/ft², and in 2017 lowering it to 40ug/ft². These levels were designed to protect children, not adults. However, the OSHA levels for Cloakrooms and Lunchrooms appears reasonable given the intent to have a clean place to eat.

For industrial settings, we recommend the SPC levels for clearance after a project (e.G., 8,000 ug/ft²) and 200 ug/ft² for decon floors and “clean” areas.

2.7 Lead in Soil Clearance Levels

As soil may naturally contain 10-25 ug/g (ppm) of lead, some lead is expected to remain. With no apparent sources of dust, household dust concentrations are about 100 ug/g (ppm). EPA on Superfund sites has used 600 mg/kg (ppm) as a clearance limit for lead contamination in soil, however, a more recent EPA memorandum has selected 400 ppm as an appropriate level for residential (not industrial) reuse cleanup criteria. Contaminated soil is not an issue here but is useful with regard to understanding that some level may remain in varying situations.

Credit Union Renovation

Bldg. 402

PAFB, FL

3.0 Sampling Methods and Analysis

A Niton XRF (X-Ray Fluorescent) was used to analyze the different painted surfaces within the building. Bulk Sampling was then conducted of select paint chips that tested negative for the presence of lead with the use of the XRF. Samples were collected per EPA TSCA 403, Sampling Guidance for Identifying Lead-Based Paint Hazards, 1998. A total of 5 paint chip samples were collected.

Samples were sent to Environmental Hazards Services, L.L.C. (EHS), 7469 Whitepine Rd. N. Chesterfield, VA 23237, for analysis. EHS is an ELLAP accredited lab for Lead.

Samples were prepared by ASTM Method E1979-12 “Standard Practice for Ultrasonic Extraction of Paint, Dust, Soil and Air Samples for Subsequent Determination of Lead”, and analyzed by EPA, Method 7000 B, Flame Atomic Absorption Spectrophotometry, Revision 2, February 2007 (referred to as Flame AA).

Credit Union Renovation
Bldg. 402
PAFB, FL
4.0 Sample Results

4.1 Paint Chips Samples



Environmental Hazards Services, L.L.C.
7469 Whitepine Rd
Richmond, VA 23237
Telephone: 800.347.4010

Lead Paint Chip Analysis Report

Report Number: 19-03-01934

Client: PbO3 Environmental Monitoring, LLC
P.O. Box 236754
Cocoa, FL 32923

Received Date: 03/15/2019
Analyzed Date: 03/18/2019
Reported Date: 03/18/2019

Project/Test Address: Renovation; Bldg 402 PAFB FL; Office Side Of Bldg
Collection Date: 03/12/2019

Client Number:
201413

Fax Number:
321-507-4914

Laboratory Results

Lab Sample Number	Client Sample Number	Collection Location	Pb (ug/g) ppm	% Pb by Wt.	Narrative ID
19-03-01934-001	402-L-04	BEIGE PAINT ON DRYWALL HALLWAY	<44	<0.0044	
19-03-01934-002	402-L-05	BEIGE PAINT ON METAL DOOR FRAME RM 106	380	0.038	

Preparation Method: ASTM E-1979-17
Analysis Method: EPA SW846 7000B

Reviewed By Authorized Signatory:

Melissa Kanode

Missy Kanode
QA/QC Clerk

The HUD lead guidelines for lead paint chips are 0.50% by Weight, 5000 ppm, or 1.0 mg/cm². The Reporting Limit (RL) for samples prepared by ASTM E-1979-17 is 10.0 ug Total Pb. The RL for samples prepared by EPA SW846 3050B is 25.0 ug Total Pb. Paint chip area and results are calculated based on area measurements determined by the client. All internal quality control requirements associated with this batch were met, unless otherwise noted.

The condition of the samples analyzed was acceptable upon receipt per laboratory protocol unless otherwise noted on this report. Results represent the analysis of samples submitted by the client. Sample location, description, area, etc., was provided by the client. Results reported above in mg/cm³ are calculated based on area supplied by client. This report shall not be reproduced except in full, without the written consent of the Environmental Hazards Service, L.L.C.

ELLAP Accreditation through AIHA-LAP, LLC (100420), NY ELAP #11714.

LEGEND	Pb= lead	ug = microgram	ppm = parts per million
	ug/g = micrograms per gram	Wt. = weight	

Pb₃ ENVIRONMENTAL MONITORING, LLC.

P.O. Box 236754 Cocoa, Florida 32723 TEL: (321) 507-4748; FAX: (321) 507-4914 rrasmussen72@gmail.com

CHAIN OF CUSTODY DOCUMENT

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Environmental Hazards Services, L.L.C.
7469 Whitepine Rd
Richmond, VA 23237
Telephone: 800.347.4010

Lead Paint Chip Analysis Report

Report Number: 19-03-01939

Client: PbO3 Environmental Monitoring, LLC
P.O. Box 236754
Cocoa, FL 32923

Received Date: 03/15/2019
Analyzed Date: 03/15/2019
Reported Date: 03/15/2019

Project/Test Address: Renovation; Bldg 402 PAFB FL; Bank Side Of Bldg
Collection Date: 03/12/2019

Client Number:
201413

Laboratory Results

Fax Number:
321-507-4914

Lab Sample Number	Client Sample Number	Collection Location	Pb (ug/g) ppm	% Pb by Wt.	Narrative ID
19-03-01939-001	402-L-01	BEIGE PAINT ON METAL WEST DOOR IN LOBBY	<47	<0.0047	
19-03-01939-002	402-L-02	BLUE PAINT ON DRYWALL EAST WALL IN LOBBY	<45	<0.0045	
19-03-01939-003	402-L-03	GREEN PAINT ON METAL SAFE CEILING	1400	0.14	

Environmental Hazards Services, L.L.C

Client Number: 201413

Report Number: 19-03-01939

Project/Test Address: Renovation; Bldg 402 PAFB FL; Bank Side Of Bldg

Lab Sample Number	Client Sample Number	Collection Location	Pb (ug/g) ppm	% Pb by Wt.	Narrative ID

Preparation Method: ASTM E-1979-17

Analysis Method: EPA SW846 7000B

Reviewed By Authorized Signatory:



Deborah Britt

QA/QC Clerk

The HUD lead guidelines for lead paint chips are 0.50% by Weight, 5000 ppm, or 1.0 mg/cm². The Reporting Limit (RL) for samples prepared by ASTM E-1979-17 is 10.0 ug Total Pb. The RL for samples prepared by EPA SW846 3050B is 25.0 ug Total Pb. Paint chip area and results are calculated based on area measurements determined by the client. All internal quality control requirements associated with this batch were met, unless otherwise noted.

The condition of the samples analyzed was acceptable upon receipt per laboratory protocol unless otherwise noted on this report. Results represent the analysis of samples submitted by the client. Sample location, description, area, etc., was provided by the client. Results reported above in mg/cm³ are calculated based on area supplied by client. This report shall not be reproduced except in full, without the written consent of the Environmental Hazards Service, L.L.C.

ELLAP Accreditation through AIHA-LAP, LLC (100420), NY ELAP #11714.

LEGEND	Pb= lead	ug = microgram	ppm = parts per million
	ug/g = micrograms per gram	Wt. = weight	

ACCOUNT No. 201413

Pb●₃ ENVIRONMENTAL MONITORING, LLC.

P.O. Box 236754 Cocoa, Florida 32723 TEL: (321) 507-4748; FAX: (321) 507-4914 rrasmussen72@gmail.com

CHAIN OF CUSTODY DOCUMENT

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Credit Union Renovation
Bldg. 402
PAFB, FL
4.2 XRF Data

Credit Union Renovation
Bldg. 402
PAFB, FL

Reading No	Time	COMPONENT	FEATURE	SUBSTRATE	COLOR	SIDE	CONDITION	ROOM	Results	PbC	SITE
3	3/12/2019 9:06	CALIBRATE							Positive	1	Bank
4	3/12/2019 9:06	CALIBRATE							Positive	1.6	Bank
5	3/12/2019 9:07	CALIBRATE							Negative	0	Bank
6	3/12/2019 9:08	WALL	WALL	DRYWALL	MULTI	A	INTACT	LOBBY	Negative	0.01	Bank
7	3/12/2019 9:08	WALL	WALL	DRYWALL	MULTI	B	INTACT	LOBBY	Negative	0.01	Bank
8	3/12/2019 9:08	WALL	WALL	DRYWALL	MULTI	C	INTACT	LOBBY	Negative	0	Bank
9	3/12/2019 9:09	WALL	WALL	DRYWALL	BLUE	D	INTACT	LOBBY	Negative	0	Bank
10	3/12/2019 9:09	DOOR	CASING	METAL	BROWN	A	INTACT	LOBBY	Negative	0	Bank
11	3/12/2019 9:10	DOOR	CASING	METAL	BEIGE	B	INTACT	LOBBY	Negative	0	Bank
12	3/12/2019 9:10	DOOR	DOOR	METAL	BEIGE	B	INTACT	LOBBY	Negative	0	Bank
13	3/12/2019 9:11	WALL	WALL	DRYWALL	MULTI	A	INTACT	DRIVE THRU	Negative	0	Bank
14	3/12/2019 9:11	WALL	WALL	DRYWALL	MULTI	B	INTACT	DRIVE THRU	Negative	0.04	Bank
15	3/12/2019 9:12	WALL	WALL	DRYWALL	MULTI	C	INTACT	DRIVE THRU	Negative	0	Bank
16	3/12/2019 9:12	WALL	WALL	DRYWALL	MULTI	D	INTACT	DRIVE THRU	Negative	0	Bank
17	3/12/2019 9:13	CEILING	WALL	METAL	GREEN	A	INTACT	SAFE	Negative	0.03	Bank
18	3/12/2019 9:14	WALL	WALL	DRYWALL	WHITE	A	INTACT	OFFICE	Negative	0.09	Bank
19	3/12/2019 9:14	WALL	WALL	DRYWALL	WHITE	B	INTACT	OFFICE	Negative	0.01	Bank
20	3/12/2019 9:14	WALL	WALL	DRYWALL	WHITE	C	INTACT	OFFICE	Negative	0.1	Bank
21	3/12/2019 9:14	WALL	WALL	DRYWALL	WHITE	D	INTACT	OFFICE	Negative	0.03	Bank
22	3/12/2019 9:15	WALL	WALL	DRYWALL	MULTI	A	INTACT	BREAK RM	Negative	0	Bank
23	3/12/2019 9:15	WALL	WALL	DRYWALL	MULTI	B	INTACT	BREAK RM	Negative	0	Bank
24	3/12/2019 9:16	WALL	WALL	DRYWALL	MULTI	C	INTACT	BREAK RM	Negative	0	Bank
25	3/12/2019 9:16	WALL	WALL	DRYWALL	MULTI	D	INTACT	BREAK RM	Negative	0	Bank
26	3/12/2019 9:17	CALIBRATE							Positive	1.1	Bank
31	3/12/2019 9:18	CALIBRATE							Positive	1.6	Bank
32	3/12/2019 9:18	CALIBRATE							Negative	0	Bank
33	3/12/2019 10:04	WALL	WALL	DRYWALL	BEIGE	A	INTACT	101	Negative	0	Office
34	3/12/2019 10:04	WALL	WALL	DRYWALL	BEIGE	B	INTACT	101	Negative	0	Office
35	3/12/2019 10:04	WALL	WALL	DRYWALL	BEIGE	D	INTACT	101	Negative	0	Office
36	3/12/2019 10:05	DOOR	CASING	METAL	BEIGE	B	INTACT	101	Negative	0.01	Office
37	3/12/2019 10:05	WALL	WALL	DRYWALL	BEIGE	B	INTACT	106	Negative	0	Office
38	3/12/2019 10:05	WALL	WALL	DRYWALL	BEIGE	C	INTACT	106	Negative	0	Office
39	3/12/2019 10:06	DOOR	CASING	METAL	BEIGE	C	INTACT	106	Negative	0	Office
40	3/12/2019 10:06	WALL	WALL	DRYWALL	BEIGE	B	INTACT	115	Negative	0	Office
41	3/12/2019 10:06	WALL	WALL	DRYWALL	BEIGE	D	INTACT	115	Negative	0	Office
42	3/12/2019 10:07	DOOR	CASING	METAL	BEIGE	A	INTACT	115	Negative	0	Office
43	3/12/2019 10:07	WALL	WALL	DRYWALL	BEIGE	A	INTACT	113	Negative	0	Office
44	3/12/2019 10:08	WALL	WALL	DRYWALL	BEIGE	C	INTACT	113	Negative	0	Office
45	3/12/2019 10:08	DOOR	CASING	METAL	BEIGE	A	INTACT	113	Negative	0	Office
46	3/12/2019 10:08	WALL	WALL	DRYWALL	BEIGE	A	INTACT	110	Negative	0	Office

Credit Union Renovation
Bldg. 402
PAFB, FL

Reading No	Time	COMPONENT	FEATURE	SUBSTRATE	COLOR	SIDE	CONDITION	ROOM	Results	PbC	SITE
47	3/12/2019 10:09	WALL	WALL	DRYWALL	BEIGE	B	INTACT	110	Negative	0	Office
48	3/12/2019 10:09	DOOR	CASING	METAL	BEIGE	D	INTACT	110	Negative	0	Office
49	3/12/2019 10:09	WALL	WALL	DRYWALL	BEIGE	B	INTACT	112	Negative	0	Office
50	3/12/2019 10:10	WALL	WALL	DRYWALL	BEIGE	D	INTACT	112	Negative	0	Office
51	3/12/2019 10:10	DOOR	CASING	METAL	BEIGE	D	INTACT	112	Negative	0	Office
52	3/12/2019 10:11	WALL	WALL	DRYWALL	BEIGE	B	INTACT	TRAINING RM	Negative	0	Office
53	3/12/2019 10:11	WALL	WALL	DRYWALL	BEIGE	C	INTACT	TRAINING RM	Negative	0	Office
54	3/12/2019 10:12	DOOR	CASING	METAL	BEIGE	A	INTACT	TRAINING RM	Negative	0	Office
55	3/12/2019 10:12	DOOR	DOOR	WOOD	BEIGE	A	INTACT	TRAINING RM	Negative	0.01	Office
56	3/12/2019 10:13	WALL	WALL	DRYWALL	BEIGE	C	INTACT	120	Negative	0	Office
57	3/12/2019 10:13	WALL	WALL	DRYWALL	BEIGE	D	INTACT	120	Negative	0	Office
58	3/12/2019 10:13	DOOR	CASING	METAL	BEIGE	C	INTACT	120	Negative	0.01	Office
59	3/12/2019 10:14	DOOR	DOOR	WOOD	BEIGE	C	INTACT	120	Negative	0	Office
60	3/12/2019 10:15	CALIBRATE							Positive	1.1	Office
61	3/12/2019 10:15	CALIBRATE							Positive	1.5	Office
62	3/12/2019 10:15	CALIBRATE							Negative	0	Office

Credit Union Renovation

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5.0 Discussion

It appears that the paint is not considered to be lead-based paint (LBP) according to the EPA.

There are OSHA construction regulations for lead in 29 CFR 1926.62 that were created to protect workers from adverse exposure to lead. The regulations require that a number of procedures and processes be followed where lead exposure (of any amount) occurs – OSHA considers it the employer's responsibility to show that overexposure is not occurring. These steps range from air monitoring to medical surveillance. Certain activities in the lead standard even specifically require assuming substantial exposure unless otherwise proved (e.g., monitoring), such as manual demolition of drywall, manual scraping, manual sanding, heat gun applications, power tool cleaning, etc.

In addition, OSHA in their Compliance Instruction (C.L 2-2.58) have stated that, "OSHA recommends the use of HUD's recommended level for acceptable decontamination of 200 ug/ft² (21.5 ug/100 cm²) for floors in evaluating cleanliness of change areas, storage facilities, and lunchrooms/eating areas."

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6.0 Recommendation

We recommend:

1. Notify owner of the results of this inspection.

“ A copy of this summary must be provided to new lessees (tenants) and purchasers of this property under Federal law (24 CFR part 35 and 40 CFR part 745) before they become obligated under a lease or sales contract. The complete report must also be provided to new purchasers and it must be made available to new tenants. Landlords (lessors) and sellers are also required to distribute an educational pamphlet approved by the U.S. Environmental Protection Agency and include standard warning language in their leases or sales contracts to ensure that parents have information they need to protect their children from lead-based paint hazards”¹

¹ U.S. Department of Housing and Urban Development – “Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing”- Chapter 7

Pb**3** **Environmental Monitoring, LLC.**

Report No: ACM-152-03-21-19-01

March 21, 2019

Client: Sunrise Systems of Brevard, Inc.
280 N. Burnett Rd.
Cocoa, FL 32926

Attn: Bob Crowe

Project: Asbestos Survey for Renovation
Credit Union Renovation
Bldg. 402
PAFB, FL

According to your instructions **PbO₃** Environmental Monitoring, LLC. has completed an ASBESTOS SURVEY at the subject property (Project). The following pages of this report contain the results of this Inspection. This limited asbestos inspection report presents data that describes the location of asbestos-containing material (ACM) identified in the subject property. This report is to be used as a program-planning tool for the proposed demolition, renovation, and construction and/or maintenance activities scheduled at this facility. This survey was conducted on site by EPA/AHERA trained professional inspector(s).

This report is intended for the exclusive use of our client. The findings are relevant to the conditions observed during the physical process of performing the Inspection. These findings should not be treated as absolute nor should they be relied upon to represent conditions at significantly later dates.

PbO₃ Environmental Monitoring, LLC.

Robert Rasmussen
AHERA Building Inspector
Asbestos License # ZA527



March 27, 2019
Peter Swarr, PE #44159FL
LAC #63

1.1 INTRODUCTION

PbO₃ was contracted by our client to conduct an Asbestos Survey of suspect asbestos containing materials found in the subject property.

- 1) Identify suspect asbestos-containing materials that would be disturbed during select renovations to this structure.
- 2) The structure was separated into two spaces. An office space with access from the east side of the building, and the Bank (Credit Union) with access from the south and west side of the structure.
- 3) Roofing was not sampled as directed on the site walk-thru, this is **assumed positive for asbestos containing material**.

1.2 INSPECTION AND SAMPLING PROCEDURE

PbO₃ inspection and sample collection procedures are based on the Environmental Protection Agency (EPA) protocols.

An initial facility walk through is conducted to familiarize the inspector with the facility layout. The facility is then divided into functional spaces and suspect homogeneous materials are selected for bulk sampling. Samples are collected and placed into separate, sealed plastic bags. Each sample is individually numbered and sample information is entered onto a Field Data Sheet. Sample tools are decontaminated after sample collection. The samples are delivered to an accredited laboratory for analysis, accompanied by a completed Chain of Custody Form.

Suspect materials are divided into three categories: surfacing materials (such as plaster and surface coatings), thermal system insulation (TSI) (such as mudded TSI fittings, duct insulation, and pipe insulation), and miscellaneous material (such as floor tile, drywall, and mastic). Asbestos-containing materials (ACM) are classified according to:

Friability	* Friable
	* Non-friable

Friable asbestos-containing material (ACM), is defined as any material containing more than one percent (1%) asbestos as determined using the method specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, Polarized Light Microscopy (PLM), that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure. (Sec. 61.141)

Nonfriable ACM is any material containing more than one percent (1%) asbestos as determined using the method specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, Polarized Light Microscopy (PLM), that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure. EPA also defines two categories of nonfriable ACM, Category I and Category II nonfriable ACM, which are described later in this guidance.

"Regulated Asbestos-Containing Material" (RACM) is (a) friable asbestos material, (b) Category I nonfriable ACM that has become friable, (c) Category I nonfriable ACM that will be or has been subjected to sanding, grinding, cutting or abrading, or (d) Category II nonfriable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations.

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The EPA's National Emission Standard for Hazardous Air Pollutants (NESHAP) regulations and the Florida Department of Environmental Protection (FDEP) Asbestos program regulate the removal and disposal of asbestos-containing building materials (any material containing more than 1% asbestos).

Asbestos NESHAP regulations must be followed for demolitions and/or renovations of facilities with at least **80 linear meters (260 linear feet)** of regulated asbestos-containing materials (RACM) on pipes, **15 square meters (160 square feet)** of regulated asbestos-containing materials on other facility components, or at least **one cubic meter (35 cubic feet)** of facility components where the amount of RACM previously removed from pipes and other facility components could not be measured before stripping.

1.3 METHODS OF LABORATORY ANALYSIS

Samples are analyzed in accordance with AHERA requirements using the following reference methods:

- EPA Interim Method for the Detection of Asbestos in Bulk Insulation Samples (EPA 600/M4-82020, December 1982).
- McCrone Research Institute's The Asbestos Particle Atlas.

All bulk samples are analyzed using PLM visual area estimate (VAE). Friable materials containing asbestos estimated at less than ten percent by PLM-VAE may be reanalyzed by PLM point counting. Additional treatment and tests may be used as required to accurately define composition (i.e., ashing, extractions, and TEM). All bulk sample laboratory reports are verified through an established quality assurance (QA) procedure.

1.4 QUALITY CONTROL PROCEDURES

Laboratories accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) analyze all samples. These laboratories participate in the NVLAP, as well as the American Industrial Hygiene Association (AIHA) Bulk Asbestos Sample Quality Assurance Program. **PbO₃** verifies all sample data for accuracy by cross-referencing Field Data Sheets, Chain of Custody Forms, and field notes.

1.5 DETERMINATION OF ACM CLASSIFICATION

The positive identification of asbestos in a material or product can only be made through laboratory analysis. Visual inspection or common knowledge is not a positive test. The asbestos content of a suspect material is determined by collecting a bulk sample and having it analyzed by PLM. The PLM technique determines the specific type of asbestos present in the bulk sample and VAE provides an estimate of the percentage of asbestos.

The EPA National Emission Standards for Hazardous Air Pollutants (NESHAP) - National Emission Standard for Asbestos (40 CFR Part 61, subpart M) defines a non-friable asbestos-containing material as any material with an asbestos content greater than one percent as determined by PLM analysis. A friable material estimated to

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contain less than ten percent asbestos as determined by PLM-VAE must be analyzed by PLM point counting and determined to contain less than one- percent asbestos in order to be considered a non-regulated ACM.

A clarification memorandum issued by the EPA regarding the NESHAP regulation included the following statement: The parties legally responsible for a building (owner or operator) may take a conservative approach to being regulated by the NESHAP. The responsible party - may choose to act as though the building material is an asbestos-containing material (greater than 1%) at any level of asbestos content (even less than 1% asbestos).

Thus, if the analyst detects asbestos in the sample and estimates the amount to be less than 1% by visual estimation, the parties legally responsible (owner or operator) of the building may elect to assume the amount to be greater than 1% and treat the material as regulated asbestos containing material or require verification of the amount by point counting.

1.6 INSPECTION LIMITS

PbO₃ has performed the Client requested tasks in a thorough and professional manner consistent with commonly accepted standard industry practices, using state of the art practices and best available known technology, as of the date of the assessment. **PbO₃** cannot guarantee and does not warrant that this Asbestos Survey has identified all adverse environmental factors and/or conditions affecting the subject properties on the date of the Assessment. **PbO₃** cannot and will not warrant that this Asbestos Survey that was requested by the client will satisfy the dictates of, or provide a legal defense in connection with, any environmental laws or regulations. It is the responsibility of the client to know and abide by all applicable laws, regulations, and standards. The results reported and conclusions reached by **PbO₃** are solely for the benefit of the client. The results and opinions in this report, based solely upon the conditions found on the property as of the date of the Assessment, will be valid only as of the date of the Assessment. Please note that the test results relate only to those homogeneous materials tested. If conditions, or materials, other than those addressed in this report are encountered during the planned demolition activities, PbO₃ should be contacted to assess the potential impact of these materials or conditions relative to the findings or recommendations included herein. The survey was performed by observing suspect materials throughout the structure where accessible. We must emphasize that it is not possible to look within every location of a building. The visual survey documents only general locations of suspect materials but does not determine exact boundaries. Concealed locations of asbestos may exist at the subject property, and the levels may vary from those stated in this report. There may be variations in the composition of materials which appear similar. Materials may be hidden from view and not accessible. Hypothetical examples include floor tile hidden under carpeting, and not detected by our typical examination of the area under the carpet at a corner(s) or existing hole(s), an abandoned length of insulated pipe hidden within a finished wall, an asbestos-cement sewer vent pipe in the wall behind a toilet, asbestos paper/felt between hardwood flooring and the sub-floor or old vinyl floor tile covered over with plywood and newer flooring materials. No attempt was made to disassemble equipment or demolish structural elements and finishes as this is beyond the scope of our authorized services. Visual observations were made only at safe and convenient locations, due to these limitations, wall voids, flooring under carpet, building cavities and mechanical equipment, and other areas may contain unreported asbestos-containing materials. Suspect materials not previously identified in this report may be encountered during any demolition activity. These materials should be assumed asbestos containing material until sample collection and subsequent analysis prove otherwise. Unsafe structures should be assumed to contain asbestos materials unless the suspect material is noted as sampled. All fire doors should be assumed asbestos containing material since disassembly of locks and/or other work to access the door insulation is not possible.

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We generally assume that roofing material, vinyl flooring and floor mastic contains asbestos, as asbestos roofing material, asbestos vinyl flooring and asbestos floor mastic are very common unless noted as sampled. Location and sampling of underground items, such as asbestos-cement pipes, would have been outside of the scope of the survey. Cloth jacketed electrical wiring if present, should be assumed asbestos containing material.

Electrical wiring is typically not sampled unless the electrical system has been verified by our client as de-energized. Swimming pools are not tested unless they are accessible and drained. Swimming pools should be assumed an asbestos containing material.

EPA 6001R-93/116 is the specified method for analysis of bulk material samples for asbestos under the EPA Asbestos Hazard Emergency Response Act, there have been reports that this method may not identify asbestos when fiber sizes are extremely small or if they are bound in a resinous material. Such materials include floor tile, mastic and asphaltic roofing. Currently, reanalysis by Transmission Electron Microscopy (TEM) to verify results of <1 % or "None Detected" for these materials is recommended.

Quantities shown in this survey are estimates, actual quantities may vary. Field verification is the responsibility of the contractor. Contractors are responsible for their own verification of quantities prior to bid submittal.

Suspect materials not previously identified in this report may be encountered during any renovation and/or maintenance activities. These materials should be assumed asbestos containing material until sample collection and subsequent analysis prove otherwise.

1.7 INSPECTION DATE AND INSPECTOR INFORMATION:

PbO₃ employee Robert Rasmussen inspected the facility on March 12, 2019.

2.0 FACILITY CONSTRUCTION INFORMATION:

The structure is a CMU block building on a concrete slab with an asphalt built-up roof.

2.1 FACILITY MAINTENANCE AND/OR RENOVATION HISTORY

Unknown

2.2 SUSPECT MATERIAL SUMMARY

- Drywall & Joint Compound
- Exterior Awning Popcorn Texture
- Acoustical Ceiling Tile
- Plaster Ceiling
- 12"x 12" Vinyl Floor Tile and associated Mastic
- Cove Base Mastic
- Sink Insulation

2.3 RESULTS

There was a total of Fifty (50) samples (including sub-samples) analyzed by EPA Method 600/M4/82/020R-93/116. Based upon our visual observations, bulk sampling of suspect materials and subsequent microscopic analysis, we have determined that **Asbestos Minerals were detected in the samples analyzed.**

Sample No.	Location	Asbestos Component	Asbestos Qty	Friable	Approximate Amount
402-02	Bank Side Break Room	Joint Compound	2% Chrysolite	Yes	Thru-Out Bank Side
402-13	Exterior Awning	Exterior Awning Popcorn Texture	2% Chrysolite	Yes	Underside of All Exterior Awnings

2.4 SUMMARY AND CONCLUSIONS

PbO₃ was contracted by our client to conduct an Asbestos Survey of suspect asbestos containing materials found in the subject property.

Regulated Friable Asbestos Containing Material was detected in the Exterior Awning Popcorn and Drywall Joint Compound on the Bank side.

2.5 RECOMMENDATIONS

Suspect materials not previously identified in this report may be encountered during any renovation and/or maintenance activities. These materials should be assumed asbestos containing material until sample collection and subsequent analysis prove otherwise.

Quantities shown in this survey are estimates, actual quantities may vary. Field verification is the responsibility of the contractor. All estimated area measurements of ACM flooring are calculated as single layer only. Contractors are responsible for their own verification of quantities prior to bid submittal.

That this survey be used to identify asbestos containing material and components prior to any planned renovation.

Disturbances to the Friable Asbestos Popcorn Ceilings and Drywall Joint Compound:

- Should be performed by a Florida Licensed Asbestos Abatement Contractor.
- U.S. Occupational Safety and Health Administration (OSHA) regulations apply to the disturbance of material; containing any percentage of asbestos fibers as outlined in 29 CFR 1926.1101-OSHA's Asbestos Standard for the Construction Industry. The contractor will need to comply with the specific training, duties and responsibilities outlined in this CFR.

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- OSHA 29 CFR 1910.1001. OSHA 29 CFR 1910.1001 requires the communication of information concerning asbestos hazards. Employees engaged in work activities with installed ACM may be exposed to asbestos fibers. The owner or operator should take the necessary steps to reduce the potential for disturbance.

General Recommendations

The EPA's National Emission Standard for Hazardous Air Pollutants (NESHAP) regulations and the Florida Department of Environmental Protection (DEP) Asbestos program regulate the removal and disposal of asbestos-containing building materials. The Florida Department of Environmental Protection (DEP) administers an asbestos removal program under Chapter 62-257, Florida Administrative Code. The Asbestos NESHAP has been adopted by reference in section 62-204.800, Florida Administrative Code. The program's intent is to minimize the release of asbestos fibers during activities involving the processing, handling, and disposal of asbestos-containing material.

The regulations of these agencies require the removal of friable asbestos-containing materials prior to extensive renovation or demolition projects, and the removal of non-friable asbestos-containing materials that may be rendered friable in the course of renovation or demolition projects.

Only a Florida licensed asbestos contractor using properly trained, certified, and licensed asbestos workers can perform asbestos removal projects in Florida. Air monitoring during and after abatement activities is also recommended to document the fiber levels inside and outside the abatement work area.

The asbestos NESHAP requires that an asbestos trained person be on site i.e. 40 CFR 61.145 (c) (8) states in part "no RACM shall be stripped, removed, or otherwise handled or disturbed at a facility regulated by this section unless at least one on-site representative, such as a foreman or management level person or other authorized person, trained in the provisions of this regulation and the means of complying with them is present."

DEP recommends that this "trained person" be on site when non-friable ACM is present so that developing problems can be caught early and corrected without delay. In addition, the regulations require the owner of the building and/or the operator to notify the applicable DEP District Office or Local Pollution Control Agency before any demolition, or before renovations of buildings that contain a certain threshold amount of asbestos or asbestos containing materials.

Florida requires the submission of a 10-Day Notification for all renovations and demolitions of facilities with at least 260 linear feet of regulated asbestos-containing materials (RACM), 160 square feet of regulated asbestos containing materials on other facility components, or at least one cubic meter (35 cubic feet) off facility components. Asbestos waste requires disposal at an approved solid waste disposal facility. Local agencies may also have specific requirements for demolition/renovation projects involving asbestos-containing building materials.

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PAFB, FL

Appendix A Laboratory Results



Environmental Hazards Services, L.L.C.

7469 Whitepine Rd

Richmond, VA 23237

Telephone: 800.347.4010

Asbestos Bulk Analysis Report

Report Number: 19-03-01942

Client: PbO3 Environmental Monitoring, LLC
P.O. Box 236754
Cocoa, FL 32923

Received Date: 03/15/2019
Analyzed Date: 03/18/2019
Reported Date: 03/19/2019

Project/Test Address: Renovation; Bldg 402 PAFB, FL; Bank Side Of Bldg

Client Number:
201413

Fax Number:
321-507-4914

Laboratory Results

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
19-03-01942-001A	402-01	Drywall	Gray Powder; Brown Fibrous; Inhomogeneous	NAD	20% Cellulose 80% Non-Fibrous
No joint compound present.					
19-03-01942-002A	402-02	Drywall	Gray Powder; Brown Fibrous; Inhomogeneous	NAD	20% Cellulose 80% Non-Fibrous
19-03-01942-002B	402-02	Joint Comp.	Tan Granular; Homogeneous	2% Chrysotile	98% Non-Fibrous
				Total Asbestos: 2%	
19-03-01942-003A	402-03	Drywall	Gray Powder; Brown Fibrous; Inhomogeneous	NAD	20% Cellulose 80% Non-Fibrous
19-03-01942-003B	402-03	Joint Comp.		Did Not Analyze (Positive Stop)	

Environmental Hazards Services, L.L.C

Client Number: 201413

Report Number: 19-03-01942

Project/Test Address: Renovation; Bldg 402 PAFB, FL; Bank
Side Of Bldg

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
19-03-01942-004A	402-04	Tile	Gray Vinyl; Homogeneous	NAD	100% Non-Fibrous
19-03-01942-004B	402-04	Mastic	Yellow Adhesive; Homogeneous	NAD	2% Cellulose 98% Non-Fibrous
19-03-01942-005A	402-05	Tile	Gray Vinyl; Homogeneous	NAD	100% Non-Fibrous
19-03-01942-005B	402-05	Mastic	Yellow Adhesive; Homogeneous	NAD	3% Cellulose 97% Non-Fibrous
19-03-01942-006A	402-06	Tile	Gray Vinyl; Homogeneous	NAD	100% Non-Fibrous
19-03-01942-006B	402-06	Mastic	Yellow Adhesive; Homogeneous	NAD	2% Cellulose 98% Non-Fibrous
19-03-01942-007	402-07		Brown Fibrous; White Paint; Inhomogeneous	NAD	65% Cellulose 5% Fibrous Glass 30% Non-Fibrous
19-03-01942-008	402-08		Brown Fibrous; White Paint; Inhomogeneous	NAD	65% Cellulose 5% Fibrous Glass 30% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 201413

Report Number: 19-03-01942

Project/Test Address: Renovation; Bldg 402 PAFB, FL; Bank
Side Of Bldg

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
19-03-01942-009	402-09		Brown Fibrous; White Paint; Inhomogeneous	NAD	65% Cellulose 5% Fibrous Glass 30% Non-Fibrous
19-03-01942-010	402-10		Gray Granular; Homogeneous	NAD	100% Non-Fibrous
19-03-01942-011	402-11		Gray Granular; Homogeneous	NAD	100% Non-Fibrous
19-03-01942-012	402-12		Gray Granular; Homogeneous	NAD	100% Non-Fibrous
19-03-01942-013	402-13		Tan Granular; Homogeneous	2% Chrysotile	98% Non-Fibrous
				Total Asbestos: 2%	
19-03-01942-014	402-14			Did Not Analyze (Positive Stop)	
19-03-01942-015	402-15			Did Not Analyze (Positive Stop)	
19-03-01942-016	402-16		Brown Adhesive; Homogeneous	NAD	1% Cellulose 99% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 201413

Report Number: 19-03-01942

Project/Test Address: Renovation; Bldg 402 PAFB, FL; Bank
Side Of Bldg

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
19-03-01942-017	402-17		Brown Adhesive; Homogeneous	NAD	1% Cellulose 99% Non-Fibrous
19-03-01942-018	402-18		Brown Adhesive; Homogeneous	NAD	2% Cellulose 98% Non-Fibrous

QC Sample: 27-M12009-3

QC Blank: SRM 1866 Fiberglass

Reporting Limit: 1% Asbestos

Method: EPA Method 600/R-93/116, EPA Method 600/M4-82-020

Analyst: Christian H. Schaible

Reviewed By Authorized Signatory:



Missy Kanode
QA/QC Clerk

The condition of the samples analyzed was acceptable upon receipt per laboratory protocol unless otherwise noted on this report. Each distinct component in an inhomogeneous sample was analyzed separately and reported as a composite. Results represent the analysis of samples submitted by the client. Sample location, description, area, volume, etc., was provided by the client. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of the Environmental Hazards Service, L.L.C. California Certification #2319 NY ELAP #11714 NVLAP #101882-0 VELAP 460172. All information concerning sampling location, date, and time can be found on Chain-of-Custody. Environmental Hazards Services, L.L.C. does not perform any sample collection.

Environmental Hazards Services, L.L.C. recommends reanalysis by point count (for more accurate quantification) or Transmission Electron Microscopy (TEM), (for enhanced detection capabilities) for materials regulated by EPA NESHAP (National Emission Standards for Hazardous Air Pollutants) and found to contain less than ten percent (<10%) asbestos by polarized light microscopy (PLM). Both services are available for an additional fee.

400 Point Count Analysis, where noted, performed per EPA Method 600/R-93/116 with a Reporting Limit of 0.25%.

* All California samples analyzed by Polarized Light Microscopy, EPA Method 600/M4-82-020, Dec. 1982.

LEGEND: NAD = no asbestos detected

ACCOUNT NO. 201413

Pb03 ENVIRONMENTAL MONITORING, LLC.

P.O. Box 236754 Cocoa, Florida 32723 TEL: (321) 507-4748; FAX: (321) 507-4914 rtasmussen72@gmail.com

CHAIN OF CUSTODY DOCUMENT

PAGE 1 of 1

Project Number:		Project Name: <u>Renovation</u>		Lab Name: <u>Environmental Hazards Services LLC</u>	
Project Address: <u>Big 402 PAFB, FL</u>		Address: <u>7469 Whitepine Road</u>		N. Chesterfield, VA 23237	
Client Name: <u>Sunrise Systems</u>		Turnaround: <u>Same Day</u> 24 Hrs 48 Hrs 3 Days <u>X</u>		Phone: 1-800-347-4010 ext 116	
Inspector: <u>R. Raswussen</u>		Analysis Type: <u>Asbestos Bulk</u> <u>X</u> Positive Stop <u>X</u>		Other <u>Lead</u> <u>OTHER</u>	
Date	Sample Number	Description	Location	Comments/Measurements	
3-12	402-01	Drywall w/ Joint Compound	Lobby		
	02	1	Break Room		
	03	1	Drive-Thru Tellers Office		
	04	Vinyl Floor Tile Gray	Break Room	12"x12" 240 ² ft	
	05	1			
	06	1			
	07	Acoustic Ceiling Tile	Break Room	2'x2'	
	08	1	Lobby		
	09	1	Drive-Thru Tellers Office		
	10	Plaster Ceiling			
	11	1			
	12	1			
	13	Ext. Awning Texture	South side of Bldg		
	14	1	East		
	15	1			
	16	Cave Base Mastic	Safe		
	17	1	Lobby		
	18	1	Drive-Thru Teller Office		
Relinquished By: <u>[Signature]</u>		Date: <u>3-12-19</u>		Time: <u></u>	
Received By: <u>T. M...</u>		Date: <u>3/15/19</u>		Time: <u>11c</u>	



Due Date:
03/20/2019
(Wednesday)
AE

18 PM



Environmental Hazards Services, L.L.C.

7469 Whitepine Rd

Richmond, VA 23237

Telephone: 800.347.4010

Asbestos Bulk Analysis Report

Report Number: 19-03-01943

Client: PbO3 Environmental Monitoring, LLC
P.O. Box 236754
Cocoa, FL 32923

Received Date: 03/15/2019

Analyzed Date: 03/18/2019

Reported Date: 03/19/2019

Project/Test Address: Renovation; Bldg 402 PAFB, FL; Office Side Of Bldg

Client Number:

201413

Fax Number:

321-507-4914

Laboratory Results

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
19-03-01943-001A	402-19	Drywall	Gray Powder; Brown Fibrous; Inhomogeneous	NAD	20% Cellulose 80% Non-Fibrous
19-03-01943-001B	402-19	Joint Comp.	White Granular; White Paint; Inhomogeneous	NAD	100% Non-Fibrous
19-03-01943-002A	402-20	Drywall	Gray Powder; Brown Fibrous; Inhomogeneous	NAD	20% Cellulose 80% Non-Fibrous
19-03-01943-002B	402-20	Joint Comp.	White Granular; Homogeneous	NAD	100% Non-Fibrous
19-03-01943-003A	402-21	Drywall	Gray Powder; Brown Fibrous; Inhomogeneous	NAD	20% Cellulose 80% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 201413

Report Number: 19-03-01943

Project/Test Address: Renovation; Bldg 402 PAFB, FL; Office
Side Of Bldg

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
19-03-01943-003B	402-21	Joint Comp.	White Granular; White Paint; Inhomogeneous	NAD	100% Non-Fibrous
19-03-01943-004A	402-22	Tile	Tan Vinyl; Homogeneous	NAD	100% Non-Fibrous
19-03-01943-004B	402-22	Mastic	Green Adhesive; Homogeneous	NAD	4% Cellulose 96% Non-Fibrous
19-03-01943-005A	402-23	Tile	Tan Vinyl; Homogeneous	NAD	100% Non-Fibrous
19-03-01943-005B	402-23	Mastic	Green Adhesive; Homogeneous	NAD	4% Cellulose 96% Non-Fibrous
19-03-01943-006A	402-24	Tile	Tan Vinyl; Homogeneous	NAD	100% Non-Fibrous
19-03-01943-006B	402-24	Mastic	Green Adhesive; Homogeneous	NAD	4% Cellulose 96% Non-Fibrous
19-03-01943-007A	402-25	Tile	White Vinyl; Homogeneous	NAD	100% Non-Fibrous
19-03-01943-007B	402-25	Mastic	Yellow Adhesive; Homogeneous	NAD	2% Cellulose 98% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 201413

Report Number: 19-03-01943

Project/Test Address: Renovation; Bldg 402 PAFB, FL; Office
Side Of Bldg

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
19-03-01943-008A	402-26	Tile	White Vinyl; Homogeneous	NAD	100% Non-Fibrous
19-03-01943-008B	402-26	Mastic	Yellow Adhesive; Homogeneous	NAD	2% Cellulose 98% Non-Fibrous
19-03-01943-009A	402-27	Tile	White Vinyl; Homogeneous	NAD	100% Non-Fibrous
19-03-01943-009B	402-27	Mastic	Yellow Adhesive; Homogeneous	NAD	2% Cellulose 98% Non-Fibrous
19-03-01943-010	402-28		Yellow Adhesive; Homogeneous	NAD	1% Cellulose 99% Non-Fibrous
19-03-01943-011	402-29		Tan Adhesive; Homogeneous	NAD	1% Cellulose 99% Non-Fibrous
19-03-01943-012	402-30		Tan Adhesive; Homogeneous	NAD	100% Non-Fibrous
19-03-01943-013	402-31		Tan Adhesive; Homogeneous	NAD	13% Cellulose 87% Non-Fibrous

Environmental Hazards Services, L.L.C

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Side Of Bldg

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
19-03-01943-014	402-32		Tan Adhesive; Homogeneous	NAD	13% Cellulose 87% Non-Fibrous
19-03-01943-015	402-33		Tan Adhesive; Homogeneous	NAD	13% Cellulose 87% Non-Fibrous
19-03-01943-016	402-34		Brown Fibrous; White Paint; Inhomogeneous	NAD	65% Cellulose 5% Fibrous Glass 30% Non-Fibrous
19-03-01943-017	402-35		Brown Fibrous; White Paint; Inhomogeneous	NAD	65% Cellulose 5% Fibrous Glass 30% Non-Fibrous
19-03-01943-018	402-36		Brown Fibrous; White Paint; Inhomogeneous	NAD	65% Cellulose 5% Fibrous Glass 30% Non-Fibrous

Environmental Hazards Services, L.L.C

Client Number: 201413

Report Number: 19-03-01943

Project/Test Address: Renovation; Bldg 402 PAFB, FL; Office
Side Of Bldg

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials

QC Sample: 27-M12009-3

QC Blank: SRM 1866 Fiberglass

Reporting Limit: 1% Asbestos

Method: EPA Method 600/R-93/116, EPA Method 600/M4-82-020

Analyst: Christian H. Schaible

Reviewed By Authorized Signatory:



Missy Kanode
QA/QC Clerk

The condition of the samples analyzed was acceptable upon receipt per laboratory protocol unless otherwise noted on this report. Each distinct component in an inhomogeneous sample was analyzed separately and reported as a composite. Results represent the analysis of samples submitted by the client. Sample location, description, area, volume, etc., was provided by the client. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of the Environmental Hazards Service, L.L.C. California Certification #2319 NY ELAP #11714 NVLAP #101882-0 VELAP 460172. All information concerning sampling location, date, and time can be found on Chain-of-Custody. Environmental Hazards Services, L.L.C. does not perform any sample collection.

Environmental Hazards Services, L.L.C. recommends reanalysis by point count (for more accurate quantification) or Transmission Electron Microscopy (TEM), (for enhanced detection capabilities) for materials regulated by EPA NESHAP (National Emission Standards for Hazardous Air Pollutants) and found to contain less than ten percent (<10%) asbestos by polarized light microscopy (PLM). Both services are available for an additional fee.

400 Point Count Analysis, where noted, performed per EPA Method 600/R-93/116 with a Reporting Limit of 0.25%.

* All California samples analyzed by Polarized Light Microscopy, EPA Method 600/M4-82-020, Dec. 1982.

LEGEND: NAD = no asbestos detected

ACCOUNT NO. 201413

Pb3 ENVIRONMENTAL MONITORING, LLC.
P.O. Box 236754 Cocoa, Florida 32723 TEL: (321) 507-4748; FAX: (321) 507-4914 trasmussen72@gmail.com

CHAIN OF CUSTODY DOCUMENT

PAGE 1 of 1

Project Number:		Lab Name: Environmental Hazards Services LLC	
Project Name: Renovation 402 PAFB, FL		Address: 7469 Whitepine Road N. Chesterfield, VA 23237 Phone: 1-800-347-4010 ext 116	
Project Address: Bldg 402 PAFB, FL Office side of Bldg.		Turnaround: Same Day 24 Hrs 48Hrs 3 Days X	
Client Name: Sunrise Systems		Analysis Type: Asbestos Bulk X Positive Stop X Lead OTHER	
Inspector: R. Rasmussen		Location: Comments/Measurements	

Date	Sample Number	Description	Location	Comments/Measurements
3-12	402-19	Drywall w/ Joint Compound	Rm 107	
	20		Rm 111	
	21		Training Rm	
	22	Vinyl Floor Tile Tan	Break Rm	12"x12" 165' ft.
	23			
	24		Training Rm	12"x12" 420' ft.
	25			
	26			
	27			
	28	Cove Base Masking	East Entrance Rm 101	
	29		North Hallway	
	30		West Hallway	
	31	Sink Insulation	Break Rm	
	32			
	33		Rm 115	
	34	Acoustic Ceiling Tile	Rm 113	
	35		North Hallway	
	36			

Relinquished By: *[Signature]*

Received By: *[Signature]*

Date: 3-12-19 Time: 11:00

Date: 3/15/19 Time: 11:00

Due Date: 03/20/2019 (Wednesday) AE

18 RN

Asbestos Survey for Renovation
Credit Union Renovation
Bldg. 402
PAFB, FL

Appendix B Certificates

THE ASBESTOS INSTITUTE

Certifies that

Robert Rasmussen

has attended and received instruction in the EPA approved course

AHERA Building Inspector Refresher

on

July 30, 2018

and successfully completed and passed the competency exam.

4644-7395-073018

Date of Examination:

30-Jul-2018

Date of Expiration:

30-Jul-2019



William T. Cavness
Director



Approved Instructor

THE ASBESTOS INSTITUTE

20033 N. 19th Ave, Building 6, Phoenix, AZ 85027
602-864-6564 — www.theasbestosinstitute.com

This training meets all requirements for asbestos certification under Toxic Substance Control Act Title II.



RICK SCOTT, GOVERNOR

JONATHAN ZACHEM, SECRETARY



STATE OF FLORIDA
DEPARTMENT OF BUSINESS AND PROFESSIONAL REGULATION
ASBESTOS LICENSING UNIT

THE ASBESTOS BUSINESS ORGANIZATION HEREIN IS LICENSED UNDER THE
PROVISIONS OF CHAPTER 469, FLORIDA STATUTES

PBO3 ENVIRONMENTAL MONITORING, LLC

PETER C SWARR
2442 URANUS DR
COCOA FL 32926

LICENSE NUMBER: ZA527

EXPIRATION DATE: NOVEMBER 30, 2019

Always verify licenses online at MyFloridaLicense.com



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United States Department of Commerce
National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 101882-0

Environmental Hazards Services, L.L.C.
N. Chesterfield, VA

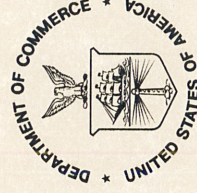
is accredited by the National Voluntary Laboratory Accreditation Program for specific services,
listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated January 2009).

2019-01-01 through 2019-12-31

Effective Dates

A handwritten signature in black ink, appearing to read "Peter S. Lamm".
For the National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Environmental Hazards Services, L.L.C.

7469 Whitepine Road
N. Chesterfield, VA 23237-2261
Ms. Julie Dickerson
Phone: 804-275-4788 Fax: 804-275-4907
Email: jdickerson@leadlab.com
<http://www.leadlab.com>

ASBESTOS FIBER ANALYSIS

NVLAP LAB CODE 101882-0

Bulk Asbestos Analysis

Code

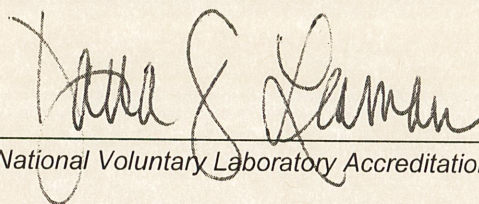
Description

18/A01

EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples

18/A03

EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials



For the National Voluntary Laboratory Accreditation Program