DEFENSE LOGISTICS AGENCY ENTERPRISE SUPPORT (DES)

DEFENSE DISTRIBUTION DEPOT SUSQUEHANNA PENNSYLVANIA

NEW CUMBERLAND, PA 17070-5002

SPECIFICATIONS

FOR

INSTALL NEW DOCK LEVELERS & ADJUST DOCK HEIGHTS @ DOORS 03 & 04, BUILDING 89, BAY 1, DDSP

PROJECT NO. 3659

FACILITIES ENGINEERING DIVISION

FEBRUARY 2009

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SECTION 01011

SPECIAL REQUIREMENTS

PART 1 GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

1.1.1 Project Description

Provide the necessary material and labor as required by the Plan and Specifications for the following tasks:

- Remove a portion of the concrete dock, install new concrete dock pit, hydraulic dock leveler, door seals and dock bumpers @ doors 03 & 04 of Building 89, Bay 1. Dowel new concrete slab into the existing concrete slab. The door seals shall be manufactured and installed to provide full width trailer access to load and unload the trailers. The door seal head assembly and door seals shall provide a positive seal between internal and external environments due to varying heights of the trailers to minimize heat loss and gain.
- Furnish & Install temporary framework for dust / fume protection / security while working inside the bay.
- Lower the trucks approaches @ doors entrances to get the required dock height.
- Replace the existing bituminous pavement with concrete pavement, applicable pavement joints and traffic zone line paint.
- Provide warning signs & electrical work as detailed in the plan.
- Install new modular trench drains for proper drainage @ the concrete pavements for doors 03 & 04 of Building 89, Bay 1. Connect these drains to the existing 12″ SLCPP storm pipe.
- Provide pipe bollards with base plates on the concrete slab for the safe guard of the heat tunnel assembly inside the bay.

1.1.2 Project Location

The work shall be located at the Defense Distribution Depot Susquehanna, New Cumberland, Pennsylvania, 17070. The exact location of the project area is as shown on Plan and shall be directed by the Contracting Officer.

1.2 SUBMITTALS

Government approval is required for the submittals with a "G" designation; submittals without a "G" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Schedule of Values; G

List of Recycled Materials to be used on the project

SD-11 Closeout Submittals

Dollar Value and Content of Recycled Materials

1.3 EXISTING WORK

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

a. Remove or alter existing work in such a manner as to prevent injury or damage to any portions of the existing work which remain.

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

1.4 LOCATION OF UNDERGROUND FACILITIES

Locations of existing utilities were taken from available records and are approximate only. Location and depth of existing utility lines including services shall be verified by the contractor in advance of the construction as described herein. Extreme care shall be exercised when excavating utility lines and hand excavation only will be permitted in the vicinity of existing pipes and/or conduits. Any damage to utilities shown on the drawings, marked in the field, or designated by u/g warning tape shall be repaired immediately by contractor at no additional cost to the government.

1.4.1 Notification Prior to Excavation

In accordance with the requirements of the Underground Utility Line Protection Act (P.L. 852, No. 287) as amended by the Act (P.L. 1567, No. 199) of November 30, 2004, as amended, the Contractor must contact the PA One Call System at (800) 242-1776 at least three (3) but no more than ten (10) working days in advance of beginning excavation or demolition work.

The Contractor must also provide written notification to the Contracting Officer at least three (3) working days prior to starting excavation work that the PA One Call System has been notified of the proposed activity.

The Contractor is also responsible for marking all utilities encountered during the course of the work not marked by the utility owners.

1.5 GOVERNMENT-FURNISHED EQUIPMENT/MATERIALS

The Contractor, with his own forces, shall transport all Government-furnished equipment/materials described in the Task Order. The equipment/materials will be transported from the Government storage area to the work site indicated on the Task Order.

1.6 ENVIRONMENTAL PROTECTION

1.6.1 Solid, Liquid and Gaseous Contaminants

The Contractor shall be responsible for the proper disposal of all solid, liquid and gaseous contaminants in accordance with all local codes and regulations, together with the following requirements:

a. Discharge gaseous contaminants so that they will be sufficiently diluted with fresh air to reduce the toxicity to an acceptable level.

b. Liquid contaminants may, subject to local utility standards, be diluted with water to a level of quality acceptable in the local sewer system, or shall be disposed of in approved vessels at approved sites.

1.6.2 Disposal of Refuse

Refuse shall be disposed of off site and in accordance with local, state and federal regulations.

1.6.3 Covered Chutes

All chutes for refuse, and the like, shall be covered or of such a design to fully confine the material to prevent the dissemination of dust.

1.7 CONSTRUCTION SITE MAINTENANCE

All supplies and equipment on the project site shall be stored so as to preclude mechanical and climatic damage. The project site shall be maintained in a neat and orderly manner.

1.8 NOISE CONTROL

The Contractor shall comply with all applicable state and local laws, ordinances and regulations relative to noise control.

1.9 SECURITY

The Contractor shall provide adequate protection for all parts of the building wherever work under this contract is performed.

1.9.1 Cameras

Possession or use of cameras on Government property is forbidden without prior written approval by the Security Officer or his designated representative. Requests for possession and/or use of cameras on Government property shall be in writing to the Security Office via the Contracting Officer and contain sufficient information to provide requirements for the use of photographic equipment.

1.10 EQUIPMENT ON THE PROJECT SITE

The Contractor shall cover equipment that is to remain in place within the area of contract operations and protect it against damage or loss. The Contractor shall store equipment that is removed in performance of work where directed or reuse in work as required by drawings and specifications. Equipment temporarily removed shall be protected, cleaned and replaced equal to its condition prior to starting work. Security for equipment or material that is to be reused and is removed for temporary storage shall be the sole responsibility of the Contractor.

1.10.1 Equipment History

a. If any equipment is to be furnished by the Contractor under the contract, the Contractor shall be required to furnish the necessary information on all equipment installed such as compressors, boiler, air conditioners, doors, elevators, fans, fuel and solvent dispensers, heaters, generators, kitchen equipment, drinking fountains, motors, emergency lighting, pumps, refrigerators, sprinklers/fire alarm systems, fire hydrants, dehumidifying units, valves, water heaters, transformers or whatever may apply under the contract. The following information on each piece of equipment shall be required on equipment history forms furnished under this contract:

(i) Building number
(ii) Manufacture number
(iii) Year of manufacture
(iv) Manufacturer model number

(v) Description of equipment
(vi) Serial number
(vii) Location in building
(viii) Size
(ix) Unit of measure
(x) Date installed
(xi) Cost
(xii) Warranty information

b. Copies of these forms will be available from the Contracting Officer's Representative. In addition to furnishing information on the equipment installed, the Contractor shall be entirely responsible for painting a four character identification number on each piece of equipment installed. The identification numbers shall be obtained from the COR and painted on the equipment as directed. Color of paint for identification numbers shall be selected by the COR. Identification numbers must be applied using stencils and free from smudges. The identification letters will vary dependent upon the piece of equipment being marked. Generally, two inch height for the characters will be sufficient. The Government reserves the right to withhold payment until equipment history forms are received and identification numbers are painted on all new equipment.

1.11 TRUCKING

The Contractor shall load all trucks leaving the site with loose debris in a manner that will prevent dropping of materials on streets. The Contractor shall fasten suitable tarpaulins over the load before they enter surrounding streets.

1.12 TOILET FACILITIES

Refer to SECTION 01500 TEMPORARY CONSTRUCTION FACILITIES.

1.13 ELEVATORS

Any temporary use of an existing elevator shall be by arrangement with the COR and subject to his controls. Such use will be of an intermittent nature. The Contractor shall provide and maintain suitable and adequate protection covering for the elevator machinery, the hatchway entrance, and the interior of the elevator during the period of temporary use. Loads in excess of the rated capacity of the elevator will not be permitted. The Government will bear the cost of the electrical current for the operation of the elevator. On completion of the work, the Contractor shall remove the protection coverings together with any resultant dirt and debris, and leave the equipment in a condition equal to that in which he found it.

1.14 SAFETY AND HEALTH

1.14.1 General

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

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910 OSHA General Industry Safety and Health Standards Publication V2206

29 CFR 1926 OSHA Construction Industry Standards

One source of these regulations is OSHA Publication 2207, which includes a combination of both Parts 1910 and 1926 as they relate to construction safety and health. It is for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

40 CFR, Part 61 National Emission Standards for Hazardous Air Pollutants

Federal Standard (Fed Std): Material Safety Data Sheets 313A

Safety and Health Requirements Manual. EM 385-1-1

Use of Asbestos Containing Material. ETL 1110-1-118

Policy and Guidelines for Asbestos Management. DA Circular 40-834

1.14.2 Work Covered by This Section

This section is applicable to all work covered by this Contract.

1.14.3 Definition of Hazardous Materials

Refer to hazardous and toxic materials/substances included in Subparts H and Z of 29 CFR 1910; and to others as additionally defined in Fed Std 313. Those most commonly encountered include asbestos, polychlorinated biphenyls (PCBs), explosives, and radioactive material, but may include others. The most likely products to contain asbestos are sprayed-on fireproofing, insulation, boiler lagging, and pipe covering.

1.14.4 Asbestos

a. THE CONTRACTOR IS WARNED THAT EXPOSURE TO AIRBORNE ASBESTOS HAS BEEN ASSOCIATED WITH FOUR DISEASES: LUNG CANCER, CERTAIN GASTROINTESTINAL CANCERS, PLEURAL OR PERITONEAL MESOTHELIOMA AND ASBESTOSIS. Studies indicate there are significantly increased health dangers to persons exposed to asbestos who smoke, and further, to family members and other persons who become indirectly exposed as a result of the exposed worker bringing asbestos-laden work clothing home to be laundered.

b. The Contractor is advised that friable and/or non-friable asbestos-containing material may be encountered in area(s) where contract work is to be performed. Friable asbestos-containing material means any material that contains more than one percent asbestos by weight that hand pressure can crumble, pulverize or reduce to powder when dry. Non-friable asbestos-containing materials are materials in which asbestos fibers are bound by a matrix material, saturant, impregnant or coating. Non-friable asbestos-containing materials do not normally release airborne asbestos fiber during routine handling and end use. However, excessive fiber concentrations may be produced during uncontrolled abrading, sanding, drilling, cutting, machining, removal, demolition or other similar activities.

c. Care must be taken to avoid releasing, or causing to be released, asbestos fibers into the atmosphere where they may be inhaled or ingested. The Occupational Safety and Health Administration (OSHA) has set standards at 29 CFR 1910.1001 for exposure to airborne concentrations of asbestos fibers, methods of compliance, medical surveillance, housekeeping procedures and others measures must be taken when working with or around asbestos-containing materials. 29 CFR 1910.1001 has been identified as applicable to construction (29 CFR 1926.55 gases, vapors, fumes, dusts and mists). The Environmental

Protection Agency (EPA) has established standards at 40 CFR 61.140-156 for the control of asbestos emissions to the environment and the handling and disposal of asbestos wastes.

d. Friable asbestos containing materials are not permitted by current criteria and shall not be used in new construction or modification projects (ETL 1110-1-118, 27 MAY 1983). Plans and specifications for all new construction and modification projects will be reviewed to insure that the use of friable asbestos-containing materials is not called for.

e. Maintenance, modification or demolition activities where exposure to asbestos dust may occur from previously installed friable or non-friable asbestos-containing material will be identified. All precautions, to include proper work practices, medical surveillance, respiratory protection, industrial hygiene and environmental protection requirements of OSHA (29 CFR 1910.1001), EPA (40 CFR 61.140-156) and DA Circular 40-83-4, as applicable, shall be strictly adhered to.

1.14.5 Safety Assurance

a. Pre-Construction Safety Meeting: Representatives of the Contractor shall meet with the Contracting Officer and his representative(s) prior to the start of repair, alteration or construction activities for the purpose of reviewing the Contractor's safety and health programs and discussing implementation of all safety and health provisions pertinent to the work to be performed under the contract. The Contractor shall be prepared to discuss, in detail, the measures he intends to take in order to control any unsafe or unhealthy conditions associated with the work to be performed under the contract. This meeting may be held in conjunction with the preconstruction conference, if so directed by the Contracting Officer. The conduct of the meeting is not contingent upon a general preconstruction meeting. The level of detail for the safety meeting is dependent upon the nature of the work and the potential inherent hazards. The Contractor's principal on-site representative(s), the general superintendent and his safety representative(s) shall attend this meeting.

b. Compliance With Regulations: All work, including the handling of hazardous materials or the disturbance or dismantling of structures containing hazardous materials shall comply with the applicable requirements of 29 CFR 1926/1910. Work involving the disturbance or dismantling of asbestos or asbestos containing materials; the demolition of structures containing asbestos; and/or the disposal and removal of asbestos, shall also comply with the requirements of 40 CFR, Part 61, Subparts A and B, ETL 1110-1-118 and DA Circular 40-83-4. All work shall comply with applicable state and municipal safety and health requirements. Where there is a conflict between applicable regulations, the most stringent shall apply.

c. Contractor Responsibility: The Contractor shall assume full responsibility and liability for compliance with all applicable regulations pertaining to the health and safety of personnel during the execution of work, and shall hold the Government harmless for any action on his part or that of his employees or subcontractors, which results in illness, injury or death.

d. Inspections, Tests and Reports: The required inspections, tests and reports made by the Contractor, subcontractors, specially trained technicians, equipment manufacturers, and others as required, shall be at the Contractor's expense for line items used during the contract.

(1) Materials and Equipment: Special features, devices, equipment, clothing and similar items used by the Contractor in the execution of work shall comply with the applicable regulations.

(2) Hazardous Materials: The Contractor shall bring to the attention of the Contracting Officer any material suspected of being hazardous which he encounters during execution of the work. A determination will be made by the Contracting Officer as to whether the Contractor shall perform tests to determine if the material is hazardous. If the Contracting Officer directs the Contractor to perform tests, and/or if the material is found hazardous and additional protective measures are needed, a contract change may be required subject to equitable adjustment under the terms of the contract.

1.14.6 Recording and Preserving Historical and Archeological Finds

All items having an apparent historical or archeological interest which are discovered in the course of any construction activities shall be carefully preserved. The Contractor shall leave the archeological find undisturbed and shall immediately report the find to the Contracting Officer so that the proper authorities may be notified.

1.14.7 Contractor Staff

The Contractor shall be required to maintain a dedicated Quality Control position to respond to requirements set forth in this solicitation. The Contractor will not be required to provide an onsite trailer for use as office space during the term of the contract.

1.14.8 Utilities (Work Related)

a. When available, water and electrical services may be used in this work at no cost to the Contractor. The Contractor shall make arrangements for such services with the Contracting Officer or his designated representative.

b. All temporary outages of any utility services required for the performance of work shall be scheduled with the Contracting Officer's Representative (COR) no less than 3 working days in advance of such outages unless otherwise specified in the Task Order.

1.14.9 Standards of Conduct

All Defense Logistics Agency (DLA), Higher Headquarters and Depot regulations pertaining to conduct shall be adhered to by Contractor personnel. Good conduct and judgment is expected of all people entering the installations. Fighting, profane language, reckless driving or failure to respond to direct orders from any depot employee acting in an official capacity (i.e., Security Guards or Firemen) shall be sufficient reason to remove the disorderly individual from the Depot. A list of Depot rules and regulations will be provided to the Contractor during the preconstruction meeting by the Security Office representative.

1.14.10 Additional Requirements

Refer to Section 01525 SAFETY AND OCCUPATIONAL HEALTH REQUIREMENTS.

1.15 SHOP DRAWING REQUIREMENTS

The Contractor will be required to bring all shop drawings to the Contract Kickoff Meeting. This meeting will be scheduled a few weeks after Contract Award to allow the Contractor time to assemble the shop drawings. Shop drawings not provided at the Contract Kickoff Meeting are to be identified in the project submittal schedule.

1.16 BUY RECYCLE PROGRAM

1.16.1 Mandated Requirements

The Contractor shall comply with Public Law 42 U.S.C. 6962, Resource Conservation and Recovery Act, 1994 Resource Conservation and Recovery Act (RCRA) and Presidential Executive Order 12873, Federal Acquisition Recycling, and Waste Prevention, 22 October 1993, relating to specific designated items in this contract for which recycle content standards have been established. Compliance with this program does not relieve the Contractor from meeting all other specification requirements.

1.16.2 Administrative Requirements

Where possible, the contractor shall in performance of the daily activities associated with the contract assignment utilize products containing recycled components in the following categories:

a. Paper and Paper Products
b. Lubricating Oils Containing Re-refined Oil
c. Retread Tires
d. Transportation (traffic control) Products
e. Non-Paper Office Products

1.17 PAYMENTS AND SCHEDULE OF VALUES

1.17.1 Schedule of Values

The Contractor shall submit a schedule of values of the Work including quantities and unit prices, aggregating the Contract Price. This provision applies to lump sum contracts and to lump sum items in unit price contracts. This schedule shall be satisfactory in form and substance to the Contracting Officer and shall subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Upon approval of the schedule of values by the Contracting Officer, it shall be incorporated into the form of application for payment furnished to the Contracting Officer. The schedule shall indicate the percent of work completed for each component during the payment period. No payments will be made until the schedule of values has been submitted and approved by the Contracting Officer.

1.17.2 Application for Payment

The date for presentation of monthly applications for progress payments to the Depot shall be established at the preconstruction conference and will govern all such applications unless modified by the Depot and the Contractor at least twenty days prior thereto.

1.18 CONSTRUCTION PROGRESS SCHEDULE

The Contractor shall prepare and submit a construction progress schedule in accordance with Section 01320, PROJECT SCHEDULE.

PART 2 PRODUCTS

2.1 BUY RECYCLED MATERIALS

The Contractor shall certify the products purchased under the terms of the Contract meet the minimum recycle material standards for each item. The Contractor shall submit a list of the applicable materials to be procured with recycled material intended to be utilized during the course of the Contract and submit with the pre-construction documents. The materials anticipated to be utilized during the course of this Contract that fall under this program are listed below.

a. Cement and Concrete Containing Fly Ash - Section 03300
b. Wood Cellulose Fiber - Section 02480
c. Filter Fabric Fence - Section 02270
d. Geotextiles - Sections 02270 and 02373
e. Plastic Pipe and Fittings - Sections 02721 and 02722
f. Landscaping Products - Sections 02100, 02480

Prior to application for final payment, the Contractor shall provide a report to the COR specifying the dollar value of items purchased that are manufactured with recycled content and the percentage of recycled content for each items.

PART 3 EXECUTION

Not used.

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SECTION 01140

WORK RESTRICTIONS

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Completed Special Access Determination Form; G

1.2 SPECIAL SCHEDULING REQUIREMENTS

a. The DDSP will remain in operation during the entire construction period. The Contractor shall conduct his operations so as to cause the least possible interference with normal operations of the activity.

b. Permission to interrupt any Activity roads and/or utility service shall be requested in writing a minimum of 7 calendar days prior to the desired date of interruption.

c. The work under this contract requires special attention to the scheduling and conduct of the work in connection with existing operations. Identify on the construction schedule each factor which constitutes a potential interruption to operations.

1.3 CONTRACTOR ACCESS AND USE OF PREMISES

1.3.1 Activity Regulations

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

1.3.2 Working Hours

Majority of the work to be performed @ EDC Building 2001 shall be during the regular working hours which consist of an 8 1/2 hour period established by the Contracting Officer, Monday through Friday, normally 0730 to 1630, excluding Government holidays.

1.3.3 Work Outside Regular Hours

Work outside regular working hours requires Contracting Officer approval. Make application 7 calendar days prior to such work to allow arrangements to be made by the Government for inspecting the work in progress, giving the specific dates, hours, location, type of work to be performed, contract

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

1.3.4 Occupied and Existing Building(s)

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

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

Provide dust covers or protective enclosures to protect existing work that remains and Government material located in the work area during the construction period.

Relocate movable furniture away from the Contractor's working area as required to perform the work, protect the furniture, and replace the furniture in its original location(s) upon completion of the work. Leave attached equipment in place, and protect it against damage, or temporarily disconnect, relocate, protect, and reinstall it at the completion of the work.

The Government will remove and relocate other Government property in the areas of the building(s) scheduled to receive work.

1.3.5 Utility Cutovers and Interruptions

a. Make utility cutovers and interruptions after normal working hours or on Saturdays, Sundays, and Government holidays. Conform to procedures required in the paragraph "Work Outside Regular Hours."

b. Ensure that new utility lines are complete, except for the connection, before interrupting existing service.

c. Interruption to water, sanitary sewer, storm sewer, telephone service, electric service, air conditioning, heating, fire alarm, and compressed air shall be considered utility cutovers pursuant to the paragraph entitled "Work Outside Regular Hours."

d. Operation of Station Utilities: The Contractor shall be responsible for the operation of control devices in the DDSP utilities system, including water, sewer, electrical, and steam services. The Government will provide supervision and direct which control devices to operate. The Contractor shall not operate control devices except when the COR is present. The Contractor shall notify the Contracting Officer giving reasonable advance notice when such operation is required.

1.4 SECURITY REQUIREMENTS

1.4.1 Personnel and Vehicle Security

1.4.1.1 Commercial Vehicles

Vehicle passes will be issued to each commercial vehicle that is required for the job, authorizing entry and parking within the DDSP. Every vehicle

entering the DDSP will display the pass on the dashboard or visor (facing outward). The pass will be visible at all times while in the DDSP. Parking is limited to those areas that are specifically identified on the pass. Present adequate justification to the Pass and ID Office via the Contracting Officer if additional passes are required.

1.4.1.2 Parking

Do not park on or block the marked fire lanes or crane rail traveling zones (marked in yellow) at any time. An exception may be made for vehicles which are part of the equipment needed to do the required work.

1.4.1.3 Vehicle Searches

Vehicles are subject to search while entering, remaining in, or leaving the Depot.

1.4.1.4 Areas Not Covered by Contract

Contractor personnel will not be permitted to enter Depot buildings, spaces, and areas not covered by this contract except on prior approval of the Depot department/office/shop having jurisdiction of the areas. Coordinate action with the Contracting officer to obtain such entry approval.

Contractor employees will be allowed to use the following DDSP cafeterias during normal hours of operation:

a. Building 2001 EDC
b. Building 54-3
c. Building 300-Golf Club.

1.4.1.5 Identification Badges

Comply with the following:

a. Submit a Visit Request (VR) and Special Access Determination (SAD) for each person listed to the Security Officer via the Contracting Officer at least 1 week prior to the start date.

b. Employees and representatives requiring access are U.S. citizens or U.S. Nationals.

c. Under no circumstances shall personnel hand carry their own visit request.

d. Employees shall provide documented proof of U.S. citizenship to the Pass and ID Office prior to being issued a Depot badge.

e. Employees shall be available for interviews upon request by the Depot Security Specialist.

f. Employees shall wear and display the Depot badge at all times while entering, remaining in, and exiting Depot spaces and each badge shall be used only by the specific individual named on the badge.

g. Maintain strict accountability over identification badges and passes issued by the Pass and ID Office. Return badges/passes to the Pass Office immediately upon termination of any employee, expiration, completion of contract, or when no longer required.

1.4.2 Photographs

Photography is prohibited on the Depot. When operationally required, submit a written request containing specific justification and details to the Security Officer via the COR.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

--End of Section--

SECTION 01320

PROJECT SCHEDULE

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)

ER 1-1-11	(1995) Progress, Schedules, and Network Analysis Systems

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Construction Project Schedule; G

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

Pursuant to the Contract Clause, SCHEDULE FOR CONSTRUCTION CONTRACTS, a Project Schedule as described below shall be prepared. The scheduling of construction shall be the responsibility of the Contractor. Contractor management personnel shall actively participate in its development. Subcontractors and suppliers working on the project shall also contribute in developing and maintaining an accurate Project Schedule. The approved Project Schedule shall be used to measure the progress of the work, to aid in evaluating time extensions, and to provide the basis of all progress payments.

3.2 BASIS FOR PAYMENT

The schedule shall be the basis for measuring Contractor progress. Lack of an approved schedule or scheduling personnel will result in an inability of the Contracting Officer to evaluate Contractor's progress for the purposes of payment. Failure of the Contractor to provide all information, as specified below, shall result in the disapproval of the entire Project Schedule submission and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes. In the case where Project Schedule revisions have been directed by the Contracting Officer and those revisions have not been included in the Project Schedule, the Contracting

Officer may hold retainage up to the maximum allowed by contract, each payment period, until revisions to the Project Schedule have been made.

3.3 PROJECT SCHEDULE

The computer software system utilized by the Contractor to produce the Project Schedule shall be capable of providing all requirements of this specification. Failure of the Contractor to meet the requirements of this specification shall result in the disapproval of the schedule. Manual methods used to produce any required information shall require approval by the Contracting Officer.

3.3.1 Use of Critical Path Method

The Critical Path Method (CPM) of network calculation shall be used to generate the Project Schedule. The Contractor shall provide the Project Schedule in the Precedence Diagram Method (PDM).

3.3.2 Level of Detail Required

The Project Schedule shall include an appropriate level of detail. Failure to develop or update the Project Schedule or provide data to the Contracting Officer at the appropriate level of detail, as specified by the Contracting Officer, shall result in the disapproval of the schedule. The Contracting Officer will use, but is not limited to, the following conditions to determine the appropriate level of detail to be used in the Project Schedule:

3.3.2.1 Activity Durations

Contractor submissions shall follow the direction of the Contracting Officer regarding reasonable activity durations. Reasonable durations are those that allow the progress of activities to be accurately determined between payment periods.

3.3.2.2 Design and Permit Activities

Design and permitting activities, including necessary conferences and follow-up actions and design package submission dates, shall be integrated into the schedule.

3.3.2.3 Procurement Activities

Tasks related to the procurement of long lead materials or equipment shall be included as separate activities in the project schedule. Long lead materials and equipment are those materials that have a procurement cycle of over 90 days. Examples of procurement process activities include, but are not limited to: submittals, approvals, procurement, fabrication, and delivery.

3.3.2.4 Critical Activities

The following activities shall be listed as separate line activities on the Contractor's project schedule:

a. Submission and approval of design drawings, calculations and specifications.

b. Submission and approval of mechanical/electrical layout drawings.

c. Submission and approval of O&M manuals.

d. Submission and approval of as-built drawings.

e. Submission and approval of 1354 data and installed equipment lists.

f. Submission and approval of testing and air balance (TAB).

g. Submission of specialist TAB specialist design review report.

h. Submission and approval of fire protection specialist.

i. Submission and approval of testing and balancing of HVAC plus commissioning plans and data.

j. Air and water balance dates.

k. HVAC commissioning dates.

l. Controls testing plan.

m. Controls testing.

n. Performance Verification testing.

o. Other systems testing, if required.

p. Pre final inspection

q. Correction of punch list from pre final inspection.

r. Final inspection.

3.3.2.5 Government Activities

Government and other agency activities that could impact progress shall be shown. These activities include, but are not limited to: approvals, design reviews, environmental permit approvals by State regulators, inspections, utility tie-in, Government Furnished Equipment (GFE) and Notice to Proceed (NTP) for phasing requirements.

3.3.2.6 Responsibility

All activities shall be identified in the project schedule by the party responsible to perform the work. Responsibility includes, but is not limited to, the subcontracting firm, Contractor work force, or government agency performing a given task. Activities shall not belong to more than one responsible party. The responsible party for each activity shall be identified by the Responsibility Code.

3.3.2.7 Modification or Claim Number

Any activity that is added or changed by contract modification or used to justify claimed time shall be identified by a mod or claim code that changed

the activity. Activities shall not belong to more than one modification or claim item. The modification or claim number of each activity shall be identified by the Mod or Claim Number. Whenever possible, changes shall be added to the schedule by adding new activities. Existing activities shall not normally be changed to reflect modifications.

3.3.2.8 Phase of Work

All activities shall be identified in the project schedule by the phases of work in which the activity occurs. Activities shall not contain work in more than one phase of work. The project phase of each activity shall be by the unique Phase of Work Code.

3.3.2.9 Category of Work

All Activities shall be identified in the project schedule according to the category of work which best describes the activity. Category of work refers, but is not limited to the procurement chain of activities including such items as design package submissions, design reviews, review conferences, permits, submittals, approvals, procurement, fabrication, delivery, installation, start-up, and testing. The category of work for each activity shall be identified by the Category of Work Code.

3.3.3 Scheduled Project Completion

The schedule interval shall extend from NTP to the contract completion date.

3.3.3.1 Project Start Date

The schedule shall start no earlier than the date on which the NTP was acknowledged. The Contractor shall include as the first activity in the project schedule an activity called "Start Project". The "Start Project" activity shall have an "ES" constraint date equal to the date that the NTP was acknowledged, and a zero day duration.

3.3.3.2 Constraint of Last Activity

Completion of the last activity in the schedule shall be constrained by the contract completion date. The Contractor shall include as the last activity in the project schedule an activity called "End Project". The "End Project" activity shall have an "LF" constraint date equal to the completion date for the project, and a zero day duration.

3.3.3.3 Early Project Completion

In the event the project schedule shows completion of the project prior to the contract completion date, the Contractor shall identify those activities that have been accelerated and/or those activities that are scheduled in parallel to support the Contractor's "early" completion. Contractor shall specifically address each of the activities noted in the narrative report at every project schedule update period to assist the Contracting Officer in evaluating the Contractor's ability to actually complete prior to the contract period.

3.3.4 Interim Completion Dates

Contractually specified interim completion dates shall also be constrained to show negative float if the early finish date of the last activity in that phase falls after the interim completion date.

3.3.4.1 Start Phase

The contractor shall include as the first activity for a project phase an activity called "Start Phase X" where "X" refers to the phase of work. The "Start Phase X" activity shall have an "ES" constraint date equal to the date on which the NTP was acknowledged, and a zero day duration.

3.3.4.2 End Phase

The contractor shall include as the last activity in a project phase an activity called "End Phase X" where "X" refers to the phase of work. The "End Phase X" activity shall have an "LF" constraint date equal to the completion date for the project, and a zero day duration.

3.3.4.3 Phase X

The contractor shall include a hammock type activity for each project phase called "Phase X" where "X" refers to the phase of work. The "Phase X" activity shall be logically tied to the earliest and latest activities in the phase.

3.3.5 Default Progress Data Disallowed

Actual Start and Finish dates shall not be automatically updated by default mechanisms that may be included in scheduling software systems. Actual Start and Finish dates on the schedule shall match those dates provided from Contractor Quality Control Reports. Failure of the Contractor to document the Actual Start and Finish dates on the Daily Quality Control report for every in-progress or completed activity, and failure to ensure that the data contained on the Daily Quality Control reports is the sole basis for schedule updating shall result in the disapproval of the Contractor's schedule and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes.

3.4 PROJECT SCHEDULE SUBMISSIONS

The Contractor shall provide the submissions as described below. The data required for each submission are contained in paragraph SUBMISSION REQUIREMENTS.

3.4.1 Initial Project Schedule Submission

The Initial Project Schedule, defining the Contractor's planned operations for the entire project shall be submitted for approval at the preconstruction conference.

3.4.2 Periodic Schedule Updates

Based on the result of progress meetings, specified in "Periodic Progress Meetings," the Contractor shall submit periodic schedule updates. These submissions shall enable the Contracting Officer to assess Contractor's

progress. If the Contractor fails or refuses to furnish the information and project schedule data, which in the judgment of the Contracting Officer or authorized representative is necessary for verifying the Contractor's progress, the Contractor shall be deemed not to have provided an estimate upon which progress payment may be made.

3.4.3 Standard Activity Coding Dictionary

The Contractor shall use the activity coding structure defined in the Standard Data Exchange Format (SDEF) in ER 1-1-11, Appendix A. This exact structure is mandatory, even if some fields are not used.

3.5 SUBMISSION REQUIREMENTS

The following items shall be submitted by the Contractor for the initial submission, and every periodic project schedule update throughout the life of the project:

3.5.1 Data Disks

Two data disks containing the project schedule shall be provided. Data on the disks shall adhere to the SDEF format specified in ER 1-1-11, Appendix A.

3.5.1.1 File Medium

Required data shall be submitted on CD, unless otherwise approved by the Contracting Officer.

3.5.1.2 Disk Label

A permanent exterior label shall be affixed to each CD submitted. The label shall indicate the type of schedule Initial, Update, or Change), full contract number, project name, project location, data date, name and telephone number of person responsible for the schedule.

3.5.1.3 File Name

Each file submitted shall have a name related to the schedule data date, project name, or contract number. The Contractor shall develop a naming convention that will ensure that the names of the files submitted are unique. The Contractor shall submit the file naming convention to the Contracting Officer for approval.

3.5.2 Narrative Report

A Narrative Report shall be provided with the initial and each update of the project schedule. This report shall be provided as the basis of the Contractor's progress payment request. The Narrative Report shall include: a description of activities, a description of current and anticipated problem areas or delaying factors and their impact, and an explanation of corrective actions taken or required to be taken. The narrative report is expected to relay to the Government, the Contractor's thorough analysis of the schedule output and its plans to compensate for any problems, either current or potential, which are revealed through that analysis.

3.5.3 Approved Changes Verification

Only project schedule changes that have been previously approved by the Contracting Officer shall be included in the schedule submission. The Narrative Report shall reference all changes made since the previous period and relate each change to documented, approved schedule changes.

3.5.4 Network Diagram

3.5.4.1 Continuous Flow

Diagrams shall show a continuous flow form left to right with no arrows from right to left. The activity number, description, duration, and estimated earned value shall be shown in the diagram.

3.5.4.2 Project Milestone Dates

Dates shall be shown on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

3.5.4.3 Critical Path

The critical path shall be clearly shown.

3.5.4.4 Banding

Activities shall be grouped to assist in the understanding of the activity sequence. Typically, this flow will group activities by category of work, work area and/or responsibility.

3.6 PERIODIC PROGRESS MEETINGS

Progress meetings to discuss payment shall include a monthly onsite meeting or other regular intervals mutually agreed to at the preconstruction conference. During this meeting the Contractor shall describe, on an activity by activity basis, all proposed revisions and adjustments to the project schedule required to reflect the current status of the project. The Contracting Officer will approve activity progress, proposed revisions, and adjustments as appropriate.

3.6.1 Meeting Attendance

The Contractor's Project Manager and Scheduler shall attend the regular progress meeting.

3.6.2 Update Submission Following Progress Meeting

A complete update of the project schedule containing all approved progress, revisions, and adjustments, based on the regular progress meeting, shall be submitted not later than 4 working days after the monthly progress meeting.

3.6.3 Progress Meeting Contents

Update information, including Actual Start Dates, Actual Finish Dates, Remaining Durations, and Cost-to-Date shall be subject to the approval of the Contracting Officer. As a minimum, the Contractor shall address the

following items on an activity by activity basis during each progress meeting.

3.6.3.1 Start and Finish Dates

The Actual Start and Actual Finish dates for each activity currently in-progress or completed.

3.6.3.2 Time Completion

The estimated Remaining Duration for each activity in-progress. Time-based progress calculations shall be based on Remaining Duration for each activity.

3.6.3.3 Cost Completion

The earnings for each activity started. Payment will be based on earnings for each in-progress or completed activity. Payment for individual activities will not be made for work that contains quality defects. A portion of the overall project amount may be retained based on delays of activities.

3.6.3.4 Logic Changes

All logic changes pertaining to NTP on change orders, change orders to be incorporated into the schedule, Contractor proposed changes in work sequence, corrections to schedule logic for out-of-sequence progress, lag durations, and other changes that have been made pursuant to contract provisions shall be specifically identified and discussed.

3.6.3.5 Other Changes

Other changes required due to delays in completion of any activity or group of activities include: 1) delays beyond the Contractor's control, such as strikes and unusual weather. 2) delays encountered due to submittals, Government Activities, deliveries or work stoppages which make re-planning the work necessary. 3) Changes required to correct a schedule which does not represent the actual or planned prosecution and progress of the work.

3.7 REQUESTS FOR TIME EXTENSIONS

In the event the Contractor requests an extension of the contract completion date, or any interim milestone date, the Contractor shall furnish the following for a determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract: justification, project schedule data, and supporting evidence as the Contracting Officer may deem necessary. Submission of proof of delay, based on revised activity logic, duration, and costs (updated to the specific date that the delay occurred) is obligatory to any approvals.

3.7.1 Justification of Delay

The project schedule shall clearly display that the Contractor has used, in full, all the float time available for the work involved with this request. The Contracting Officer's determination as to the number of allowable days of contract extension shall be based upon the project schedule updates in

effect for the time period in question, and other factual information. Actual delays that are found to be caused by the Contractor's own actions, which result in the extension of the schedule, will not be a cause for a time extension to the contract completion date.

3.7.2 Submission Requirements

The Contractor shall submit a justification for each request for a change in the contract completion date of under 2 weeks based upon the most recent schedule update at the time of the NTP or constructive direction issued for the change. Such a request shall be in accordance with the requirements of other appropriate Contract Clauses and shall include, as a minimum:

a. A list of affected activities, with their associated project schedule activity number.

b. A brief explanation of the causes of the change.

c. An analysis of the overall impact of the changes proposed.

d. A sub-network of the affected area.

Activities impacted in each justification for change shall be identified by a unique activity code contained in the required data file.

3.7.3 Additional Submission Requirements

For any requested time extension of over 2 weeks, the Contracting Officer may request an interim update with revised activities for a specific change request. The Contractor shall provide this disk within 4 days of the Contracting Officer's request.

3.8 DIRECTED CHANGES

If the NTP is issued for changes prior to settlement of price and/or time, the Contractor shall submit proposed schedule revisions to the Contracting Officer within 2 weeks of the NTP being issued. The proposed revisions to the schedule will be approved by the Contracting Officer prior to inclusion of those changes within the project schedule. If the Contractor fails to submit the proposed revisions, the Contracting Officer may furnish the Contractor with suggested revisions to the project schedule. The Contractor shall include these revisions in the project schedule until revisions are submitted, and final changes and impacts have been negotiated. If the Contractor has any objections to the revisions furnished by the Contracting Officer, the Contractor shall advise the Contracting Officer within 2 weeks of receipt of the revisions. Regardless of the objections, the Contractor shall continue to update the schedule with the Contracting Officer's revisions until a mutual agreement in the revisions is reached. If the Contractor fails to submit alternative revisions within 2 weeks of receipt of the Contracting Officer's proposed revisions, the Contractor will be deemed to have concurred with the Contracting Officer's proposed revisions. The proposed revisions will then be the basis for an equitable adjustment for performance of the work.

3.9 OWNERSHIP OF FLOAT

Float available in the schedule, at any time, shall not be considered for the exclusive use of either the Government or the Contractor.

--End of Section--

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Submittal

Contract Clauses "FAR 52.236-5, Material and Workmanship," paragraph (b) and "FAR 52.236-21, Specifications and Drawings for Construction," paragraphs (d), (e), and (f) apply to all "submittals."

1.1.2 Submittal Descriptions (SD)

Submittals requirements are specified in the technical sections. Submittals are identified by SD numbers and titles as follows. Representative items and/or item descriptions are provided.

SD-01 Pre-Construction Submittals

Certificates of Insurance
Surety Bonds
List of Proposed Subcontractors
List of Proposed Products
Construction Progress Schedule
Submittal Register
Schedule of values
Health and Safety Plan
Work Plan
Quality Control Plan
Environmental Protection Plan

SD-02 Shop Drawings

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

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

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

SD-03 Product Data

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

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

SD-05 Design Data

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

SD-06 Test Reports

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

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

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

Investigation reports

Daily Checklists

Final Acceptance Test and operational test procedure

SD-07 Certificates

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

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

Confined Space Entry Permits

SD-11 Closeout Submittals

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

1.1.3 Approving Authority

Office or designated person authorized to approve submittal.

1.1.4 Work

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

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Submittal Registers; G

1.3 USE OF SUBMITTAL REGISTERS (FORM 4288)

1.3.1 Government-Supplied Information

Submittal Registers will be delivered to the Contractor by the Government in electronic file format. The Submittal Registers will have the following fields completed, to the extent that will be required by the Government during subsequent usage:

a. Column (c): Lists specification section paragraph number under which submittal is required. This listing is only to facilitate locating submitted requirements. Do not consider entries in column (c) as limiting project requirements.

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

c. Columns (e) through (o): Identifies the type of information each submittal shall contain, as identified above in this Section.

d. Columns (p) and (q): Indicates classification of each submittal. Submittals marked “X” in Column (p) must be submitted, but do not required Government review and approval; they are for information only. Submittals marked “X” in Column (q) must be submitted and receive Government review and approval. Prepare and maintain submittal register as the work progresses.

1.3.2 Contractor Use of Submittal Registers

The Contractor shall provide and maintain the following information on each Submittal Register:

a. Column (a) Transmittal Number: Contractor assigned listing of consecutive numbers.

b. Columns (s) through (z): Provide information in Columns (S) through (x) upon submission (or re-submission) to the Government for review. Complete Columns (y) and (z) using information provided on Submittals returned by the Government upon completion of review.

1.3.3 Contractor Action Code and Action Code

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

NR - Not Received
AN - Approved as noted
A - Approved
RR - Disapproved, Revise, and Resubmit

1.3.4 Copies Delivered to the Government

Deliver one (1) copy of updated Submittal Registers to Government with each invoice request. Deliver in electronic format, unless a paper copy is requested by Contracting Officer.

1.4 PROCEDURES FOR SUBMITTALS

1.4.1 Reviewing, Certifying, Approving Authority

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

1.4.2 Constraints

a. Submittals listed or specified in this Contract shall conform to provisions of this Section, unless explicitly stated otherwise.

b. Submittals shall be complete for each definable feature of work; components of definable feature interrelated as a system shall be submitted at same time.

c. When acceptability of a submittal is dependent on conditions, items, or materials included in separate subsequent submittals, submittal will be returned without review.

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

1.4.3 Scheduling

a. Coordinate scheduling, sequencing, preparing and processing of submittals with performance of work so that work will not be delayed by submittal processing. Allow for potential requirements to resubmit.

b. Except as specified otherwise, allow review period, beginning with receipt by Approving Authority, that includes at least 15 working days for submittals for QC Manager approval and 20 working days for submittals for Contracting Officer approval. Period of review for submittals with Contracting Officer approval begins when Government receives submittal from QC organization. Period of review for each re-submittal is the same as for initial submittal.

1.4.4 Variations

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

1.4.4.1 Considering Variations

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

1.4.4.2 Proposing Variations

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

1.4.4.3 Warranting That Variations Are Compatible

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

1.4.4.4 Review Schedule Is Modified

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

1.4.5 Contractor's Responsibilities

a. Determine and verify field measurements, materials, field construction criteria; review each submittal; and check and coordinate each submittal with requirements of the work and contract documents.

b. Transmit submittals to QC organization in accordance with schedule on approved Submittal Register, and to prevent delays in the work, delays to Government, or delays to separate Contractors.

c. Advise Contracting Officer of variation, as required by paragraph entitled "Variations."

d. Correct and resubmit submittal as directed by approving authority. When resubmitting disapproved transmittals or transmittals noted for re-submittal, the Contractor shall provide copy of that previously submitted transmittal including all reviewer comments for use by approving authority. Direct specific attention in writing or on resubmitted submittal, to revisions not requested by approving authority on previous submissions.

e. Furnish additional copies of submittal when requested by Contracting Officer, to a limit of 20 copies per submittal.

f. Complete work which must be accomplished as basis of a submittal in time to allow submittal to occur as scheduled.

g. Ensure no work has begun until submittals for that work have been returned as "approved," or "approved as noted", except to the extent that a portion of work must be accomplished as basis of submittal.

1.4.6 QC Organization Responsibilities

a. Review each submittal; and check and coordinate each submittal with requirements of work and contract documents.

b. Review submittals for conformance with project design concepts and compliance with contract documents.

c. Act on submittals, determining appropriate action based on QC organization's review of submittal.

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

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

d. Ensure that material is clearly legible.

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

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

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

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

Certified by QC Manager _____, Date _____
(Signature)

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

"I hereby certify that the (material) (equipment) (article) shown and marked in this submittal and proposed to be incorporated with contract Number [_____], is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is [_____] approved for use.

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

Approved by QC Manager _____, Date _____
(Signature)

f. Sign certifying statement or approval statement. The person signing certifying statements shall be QC organization member designated in the approved QC plan. The signatures shall be in original ink. Stamped signatures are not acceptable.

g. Update Submittal Register as submittal actions occur and maintain the Submittal Register until final acceptance of all work by Contracting Officer.

h. Retain a copy of approved submittals, including Contractor's copy of approved samples.

1.4.7 Government's Responsibilities

When approving authority is Contracting Officer, the Government will:

a. Note date on which submittal was received from QC manager, on each submittal for which the Contracting Officer is approving authority.

b. Review submittals for approval within scheduling period specified and only for conformance with project design concepts and compliance with contract documents.

c. Identify returned submittals with one of the actions defined in paragraph entitled "Actions Possible" and with markings appropriate for action indicated.

1.4.8 Actions Possible

Submittals will be returned with one of the following notations:

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

b. Submittals marked "approved" "approved as submitted" authorize Contractor to proceed with work covered.

c. Submittals marked "approved as noted" or "approval except as noted; resubmission not required" authorize Contractor to proceed with work as noted provided Contractor takes no exception to the notations.

d. Submittals marked "revise and resubmit" or "disapproved" indicate submittal is incomplete or does not comply with design concept or requirements of the contract documents and shall be resubmitted with appropriate changes. No work shall proceed for this item until re-submittal is approved.

1.5 FORMAT OF SUBMITTALS

1.5.1 Transmittal Form

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

1.5.2 Identifying Submittals

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

a. Project title and location.
b. Construction contract number.
c. Section number of the specification section by which submittal is required.
d. Submittal description (SD) number of each component of submittal.
e. When a resubmission, add alphabetic suffix on submittal description, for example, SD-10A, to indicate resubmission.
f. Name, address, and telephone number of subcontractor, supplier, manufacturer and any other second tier Contractor associated with submittal.

1.6 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.6.1 Government Approved

Government approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Government approval is required for any deviations from the Solicitation or Accepted Proposal and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

1.6.2 Information Only

All submittals not requiring Government approval will be for information only. All submittals not requiring Designer of Record or Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.
All submittals not requiring Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

1.7 APPROVED SUBMITTALS

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

1.8 DISAPPROVED SUBMITTALS

The Contractor shall make all corrections required by the Contracting Officer and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. The Contractor shall make all corrections required by the Contracting Officer, obtain the Designer of Record's approval when applicable, and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. Any "information only" submittal found to contain errors or unapproved deviations from the Solicitation or Accepted Proposal shall be resubmitted as one requiring "approval" action, requiring both Designer of Record and Government approval. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, a notice in accordance with the Contract Clause "Changes" shall be given promptly to the Contracting Officer.

1.9 WITHHOLDING OF PAYMENT

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

1.10 GENERAL

The Contractor shall make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be checked and approved by the Contractor's Quality Control (CQC) System Manager Quality Control (CQC) System Manager and the Designer of Record, if applicable, and each item shall be stamped, signed, and dated by the CQC System Manager indicating action taken. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

1.11 SUBMITTAL REGISTER (FORM 4288)

At the end of this Section is a set of Submittal Registers showing items for which submittals are required by the specifications; this list may not be all inclusive and additional submittals may be required. The set of Submittal Registers provided was developed by the Designer of Record.

The Contractor shall maintain the Submittal Registers for the project in accordance with Section 01451 CONTRACTOR QUALITY CONTROL and also described in this Section. The Government will provide the initial Submittal Registers

in electronic format. Thereafter, the Contractor shall maintain a complete list of all submittals, including completion of all data columns. The Contractor shall track all submittals.

The Submittal Registers provided may not be all inclusive and additional submittals may be required by other parts of the Contract. The Contractor is required to complete the Submittal Registers and submit them to the Contracting Officer for approval within 30 calendar days after Notice to Proceed. The approved Submittal Register will serve as a scheduling document for submittals and will be used to control submittal actions throughout the contract period. The submit dates and need dates used in the Submittal Register shall be coordinated with dates in the Contractor prepared Progress Schedule. Updates to the Submittal Register showing the Contractor Action Codes and actual dates with Government Action Codes and actual dates shall be submitted monthly or until all submittals have been satisfactorily completed. When the Progress Schedule is revised, the Submittal Register shall also be revised and both submitted for approval.

1.12 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (a minimum of 14 calendar days exclusive of mailing time) shall be allowed and shown on the register for review and approval. No delay damages or time extensions will be allowed for time lost in late submittals. An additional 7 calendar days shall be allowed and shown on the register for review and approval of submittals for food service equipment and refrigeration and HVAC control systems.

1.10 TRANSMITTAL FORM (ENG FORM 4025)

The sample Transmittal Form (ENG Form 4025) attached to this Section shall be used for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor. This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item. Only one submittal shall be attached to each transmittal form.

1.11 SUBMITTAL PROCEDURES

Submittals shall be made as follows:

1.11.1 Procedures

The Government will further discuss detailed submittal procedures with the Contractor at the Preconstruction Conference or Post-Award Conference for design-build projects. The Contractor shall submit six copies of Shop Drawings and Product Data for all materials except complex systems at the Preconstruction Conference. Shop drawings and Product Data for complex systems shall be submitted within 30 days of the Preconstruction Conference.

1.11.2 Deviations

For submittals which include proposed deviations requested by the Contractor, the column "variation" of ENG Form 4025 shall be checked. The Contractor shall set forth in writing the reason for any deviations and annotate such

deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

1.12 CONTROL OF SUBMITTALS

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

1.13 GOVERNMENT APPROVED SUBMITTALS

Upon completion of review of submittals requiring Government approval, the submittals will be identified as having received approval by being so stamped and dated. Three copies of the submittal will be retained by the Contracting Officer and one copy of the submittal will be returned to the Contractor. If the Government performs a conformance review of other Designer of Record approved submittals, the submittals will be so identified and returned, as described above.

1.14 INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to 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.

1.15 STAMPS

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements shall be similar to the following:

```
 ____________________________________________________________________
|                              CONTRACTOR                            |
|                              (Firm Name)                           |
|                                                                    |
| _____ Approved                                                     |
|                                                                    |
|                                                                    |
| _____ Approved with corrections as noted on submittal data and/or  |
|       attached sheets(s).                                          |
|                                                                    |
|                                                                    |
| SIGNATURE:  ______________________________________________________ |
|                                                                    |
| TITLE:  __________________________________________________________ |
|                                                                    |
| DATE: _____________________________________________________________ |
|                                                                    |
|____________________________________________________________________|
```

For design-build construction, both the Contractor Quality Control System Manager and the Designer of Record shall stamp and sign to certify that the submittal meets contract requirements.

1.16 BUY RECYCLE PROGRAM

The DDSP actively encourages the use of materials made with recycled content. When submitting shop drawings for materials, list recycled contents contained in these products and services.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATE OF COMPLIANCE *(Read instructions on the reverse side prior to initiating this form)*	DATE	TRANSMITTAL NO.

SECTION I – REQUEST FOR APPROVAL FOR THE FOLLOWING ITEMS *(This section will be initiated by the contractor)*

TO:	FROM:	CONTRACT NO.	CHECK ONE: ☐ THIS IS A NEW TRANSMITTAL ☐ THIS IS A RESUBMITTAL OF TRANSMITTAL _____
SPECIFICATION SECTION NO. *(Cover only one section with each transmittal)*	PROJECT TITLE AND LOCATION: **Install new Dock Levelers & adjust Dock heights @ Doors 03 & 04, Building 89, Bay 1, DDSP, NEW CUMBERLAND, PA**		

ITEM NO.	DESCRIPTION OF ITEM SUBMITTED (Type size, model number/etc.)	MFG. OR CONTR. CAT., CURVE DRAWING OR BROCHURE NO. (See instruction No. 8)	NO. OF COPIES	CONTRACT REFERENCE DOCUMENT		FOR CONTRACTOR USE CODE	VARIATION (See instruction No. 6.)	FOR CE USE CODE
				SPEC. PARA. NO.	DRAWING SHEET NO.			
a.	b.	c.	d.	e.	f.	g.	h.	i.

REMARKS	I certify that the above submitted items have been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as otherwise stated. _____ NAME AND SIGNATURE OF CONTRACTOR

SECTION II – APPROVAL ACTION

ENCLOSURES RETURNED (List by Item No.)	NAME TITLE AND SIGNATURE OF APPROVING AUTHORITY	DATE

SHEET ____ OF ____

ENG Form 4025

INSTRUCTIONS

1. Section I will be initiated by the Contractor in the required number of copies.

2. Each transmittal shall be numbered consecutively in the space provided for the “Transmittal No.”. This number, in addition to the contract number, will form a serial number for identifying each submittal. For new submittals or re-submittals mark the appropriate box; on re-submittals, insert transmittal number of last submission as well as the new submittal number.

3. The “Item No.” will be the same “Transmittal No.” as indicated on the Submittal Register. Only one item no. per transmittal no. will be accepted.

4. Submittals requiring expedition handling will be submitted on separate form.

5. Separate transmittal form will be used for submittals under separate sections of the specifications.

6. A check shall be placed in the “Variation” column when a submittal is not in accordance with the plans and specifications – also, a written statement to that effect shall be included in the space provided for “Remarks”.

7. Form is self-transmittal, letter of transmittal is not required.

8. When a sample of material or Manufacturer’s Certificate of Compliance is transmitted, indicate “Sample” or “Certificate” in column c, Section I.

9. U.S. Army Corps of Engineers approving authority will assign action codes as indicated below in space provided in Section I, column I to each item submitted. In addition they will ensure enclosures are indicated and attached to the form prior to return to the contractor. The Contractor will assign action codes as indicated below in Section I, column g, to each item submitted.

THE FOLLOWING ACTION CODES ARE GIVEN TO ITEMS SUBMITTED

A	--	Approved as Submitted	E	--	Disapproved (See attached)
B	--	Approved, except as noted on drawings	F	--	Receipt acknowledged
C	--	Approved, except as noted on drawings. Refer to attached sheet resubmission required	FX	--	Receipt acknowledged, does not comply as noted with contract requirements
			G	--	Other (Specify)
D	--	Will be returned by separate correspondence			

10. Approval of items does not relieve the contractor from complying with all the requirements of the plans and specifications.

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION: Install new Dock Levelers & adjust Dock heights @ Doors 03 & 04, Building 89, Bay 1, DDSP New Cumberland, PA

CONTRACTOR

ACTIVITY NO.	TRANSMITTAL NO.	SPEC SECT	DESCRIPTION OF ITEM SUBMITTED	PARAGRAPH NO.	CLASSIFICATION GOVT OR A/E REVWR	CONTRACTOR SCHEDULE DATES: SUBMIT	CONTRACTOR SCHEDULE DATES: APPROVAL NEEDED BY	CONTRACTOR SCHEDULE DATES: MATERIAL NEEDED BY	CONTRACTOR ACTION: ACTION CODE	CONTRACTOR ACTION: DATE OF ACTION	DATE FWD TO APPR AUTH DATE RCD FROM CONTR	APPROVING AUTHORITY: DATE FWD TO OTHER REVIEWER	APPROVING AUTHORITY: DATE RCD FROM OTH REVIEWER	APPROVING AUTHORITY: ACTION CODE	APPROVING AUTHORITY: DATE OF ACTION	MAILED TO CONTR/ DATE RCD FROM APPR AUTH	REMARKS
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(I)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01011	**SPECIAL REQUIREMENTS**														
			SD-01 Schedule of Values	1.2	G												
			SD-11 List of Recycled Materials	1.2													
		01140	**WORK RESTRICTIONS**														
			SD-01 Special Access Determination Form	1.1	G												
		01320	**PROJECT SCHEDULE**														
			SD-01 Construction Progress Schedule	1.2	G												
		01330	**SUBMITTAL PROCEDURES**														
			SD-01 Preconstruction Submittals														
			Submittal Register	1.8	G												
		01451	**CONSTRUCTION QUALITY CONTROL**														
			SD-01 Construction quality control plan	1.3	G												
		01500	**TEMP. CONST. FACILITIES**														
			SD-01 Preconstruction Submittals														
			Site Plan	1.2	G												
		01525	**SAFETY AND OCCUPATIONAL HEALTH REQTS.**														
			SD-01 Preconstruction Submittals														
			Accident Prevention Plan (APP)	1.6	G												
			Activity Hazard Analysis (AHA)	1.7	G												
			Crane Critical Lift Plan	1.2	G												
			Proof of Current Qualification for Crane Operators	1.2	G												
			Occupant Protection Plan	1.2	G												
			Site Demolition Plan	1.2	G												
			Excavation Plan	1.2	G												
			SD-06 Text Reports														
			Accident Reports (if necessary)	1.11.1	G												
			Crane Reports	1.11.4	G												
			SD-07 Certificates														
			Hot Work Permit	1.12													
		01780	**PROJECT CLOSEOUT**														
			SD-02 Shop Drawings														
			As-Built Drawings	1.2.1	G												
			SD-10 O&M Data														
			Operation and Maintenance Data	1.5	G												
			Warranty/Guaranty	1.3	G												

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION: Install new Dock Levelers & adjust Dock heights @ Doors 03 & 04, Building 89, Bay 1, DDSP New Cumberland, PA

CONTRACTOR

ACTIVITY NO.	TRANSMITTAL NO.	SPEC SECT	DESCRIPTION OF ITEM SUBMITTED	PARAGRAPH NO.	CLASSIFICATION GOVT OR A/E REVWR	CONTRACTOR SCHEDULE DATES: SUBMIT	CONTRACTOR SCHEDULE DATES: APPROVAL NEEDED BY	CONTRACTOR SCHEDULE DATES: MATERIAL NEEDED BY	CONTRACTOR ACTION: ACTION CODE	CONTRACTOR ACTION: DATE OF ACTION	DATE FWD TO APPR AUTH DATE RCD FROM CONTR	APPROVING AUTHORITY: DATE FWD TO OTHER REVIEWER	APPROVING AUTHORITY: DATE RCD FROM OTH REVIEWER	APPROVING AUTHORITY: ACTION CODE	APPROVING AUTHORITY: DATE OF ACTION	MAILED TO CONTR/ DATE RCD FROM APPR AUTH	REMARKS
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		02220	**DEMOLITION**														
			SD-01 Preconstruction Submittals														
			Demolition Plan	1.4	G												
			Notifications	1.4													
			SD-11 Closeout Submittals														
			Bills of Laden	1.4													
		02230	**EXCAVATION AND COMPACTION FOR PVMTS.**														
			SD-06 Test Reports														
			Aggregate Material Tests	1.4	G												
			Compaction Density Reports	1.4													
			SD-07 Certificates														
			Aggregate Certificates	1.4													
		02300	**EARTHWORK**														
			SD-01 Preconstruction Submittals														
			Dewatering Work Plan	1.4	G												
			Procedures for Disp. of Unused/Unsatisf. Materials	1.4	G												
			Prop. Sources of On-Site/Off-Site Borrow Materials	1.4	G												
			Commercial Testing Lab Qualifications	1.4	G												
			SD-06 Test Reports														
			Borrow Material Testing Reports	1.4	G												
		02500	**PAVING AND SURFACING**														
			SD-01 Preconstruction Submittals														
			Testing Laboratory Qualifications	1.4	G												
			SD-02 Shop Drawings														
			Finish Grade Check Drawing Markup/Notes	1.4	G												
			SD-05 Design Data														
			Job Mix Formula: ID-2 Wearing Course	1.4	G												
			Job Mix Formula: BCBC	1.4	G												
			SD-06 Test Reports														
			In-Place Testing Report	1.4	G												
			In-Place Thickness Testing	1.4	G												
			SD-07 Certificates														
			BCBC Certification	1.4	G												
			Wearing Course Certification	1.4	G												
			AC-20 Certification	1.4	G												
			2A Coarse Aggregate Subbase Certification	1.4	G												
		02580	**PAVEMENT MARKINGS**														
			SD-03 Product Data														
			Traffic Zone Paint	1.4	G												

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION: Install new Dock Levelers & adjust Dock heights @ Doors 03 & 04, Building 89, Bay 1, DDSP New Cumberland, PA

CONTRACTOR

ACTIVITY NO.	TRANSMITTAL NO.	SPEC SECT	DESCRIPTION OF ITEM SUBMITTED	PARAGRAPH NO.	CLASSIFICATION GOVT OR A/E REVWR	CONTRACTOR SCHEDULE DATES: SUBMIT	CONTRACTOR SCHEDULE DATES: APPROVAL NEEDED BY	CONTRACTOR SCHEDULE DATES: MATERIAL NEEDED BY	CONTRACTOR ACTION: ACTION CODE	CONTRACTOR ACTION: DATE OF ACTION	DATE FWD TO APPR AUTH DATE RCD FROM CONTR	APPROVING AUTHORITY: DATE FWD TO OTHER REVIEWER	APPROVING AUTHORITY: DATE RCD FROM OTH REVIEWER	APPROVING AUTHORITY: ACTION CODE	APPROVING AUTHORITY: DATE OF ACTION	MAILED TO CONTR/ DATE RCD FROM APPR AUTH	REMARKS
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		03100	**STRUCTURAL CONCRETE FORMWORK**														
			SD-02 Shop Drawings														
			Formwork	1.2	G												
			SD-03 Product Data														
			Form Material	1.2													
			Form Releasing Agents	1.2													
			SD-05 Design Data														
			Form Analysis and Design Calculations	1.2	G												
		03150	**EXP. JT, CONTRACTION JT AND WATERSTOPS**														
			SD-02 Shop Drawings														
			Waterstops	1.3	G												
			SD-03 Product Data														
			Contraction Joint Strips	1.3	G												
			Preformed Expansion Joint Filler	1.3	G												
			Sealant	1.3	G												
			Waterstops	1.3	G												
			SD-07 Certificates														
			Preformed Expansion Joint Filler	1.3	G												
			Sealant	1.3	G												
			Waterstops	1.3	G												
		03200	**CONCRETE REINFORCEMENT**														
			SD-02 Shop Drawings														
			Reinforcement	1.2	G												
			SD-03 Product Data														
			Welding	1.2													
			Dowels	1.2	G												
			Reinforcing Steel	1.2	G												
			Wire Ties	1.2	G												
			Supports	1.2	G												
			Epoxy-Coated Reinforcing Steel	1.2	G												
			Anchors	1.2	G												
			SD-07 Certificates														
			Reinforcing Steel	1.2													

SUBMITTAL REGISTER	CONTRACT NO.
TITLE AND LOCATION: Install new Dock Levelers & adjust Dock heights @ Doors 03 & 04, Building 89, Bay 1, DDSP New Cumberland, PA	CONTRACTOR

ACTIVITY NO.	TRANSMITTAL NO.	SPEC SECT	DESCRIPTION OF ITEM SUBMITTED	PARAGRAPH NO.	CLASSIFICATION GOVT OR A/E REVWR	CONTRACTOR SCHEDULE DATES: SUBMIT	CONTRACTOR SCHEDULE DATES: APPROVAL NEEDED BY	CONTRACTOR SCHEDULE DATES: MATERIAL NEEDED BY	CONTRACTOR ACTION: ACTION CODE	CONTRACTOR ACTION: DATE OF ACTION	DATE FWD TO APPR AUTH DATE RCD FROM CONTR	APPROVING AUTHORITY: DATE FWD TO OTHER REVIEWER	APPROVING AUTHORITY: DATE RCD FROM OTH REVIEWER	APPROVING AUTHORITY: ACTION CODE	APPROVING AUTHORITY: DATE OF ACTION	MAILED TO CONTR/ DATE RCD FROM APPR AUTH	REMARKS
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		03300	**CIP STRUCTURAL CONCRETE**														
			SD-03 Product Data														
			Chemical Admixtures	1.3													
			Curing Materials	1.3	G												
			Non-Shrink Grout	1.3	G												
			Non-Slip Surfacing Material	1.3													
			Latex Modified Agent	1.3													
			Latex Bonding Agent	1.3													
			Floor Hardener	1.3													
			Perimeter Insulation	1.3													
			Vapor Barrier	1.3	G												
			Joint Materials	1.3	G												
			Pigments	1.3													
			SD-05 Design Data														
			Design Mix	1.3	G												
			SD-06 Test Reports														
			Testing & Inspection for Contractor Quality Control	1.3	G												
			SD-07 Certificates														
			Qualification	1.3	G												
			Ready-Mixed Concrete	1.3													
			Documentation from Batch Mixing Plant	1.3													
			SD-11 Closeout Submittals														
			Delivery Tickets	1.3	G												
		03605	**GROUT**														
			SD-03 Product Data														
			Premixed Grout	2.1													
		05090	**WELDING, STRUCTURAL**														
			SD-03 Product Data														
			Welder Qualification	1.4	G												
			Inspector Qualification	1.4													
			SD-06 Test Reports														
			Quality Control	1.4													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION: Install new Dock Levelers & adjust Dock heights @ Doors 03 & 04, Building 89, Bay 1, DDSP New Cumberland, PA

CONTRACTOR

ACTIVITY NO.	TRANSMITTAL NO.	SPEC SECT	DESCRIPTION OF ITEM SUBMITTED	PARAGRAPH NO.	CLASSIFICATION GOVT OR A/E REVWR	CONTRACTOR SCHEDULE DATES: SUBMIT	CONTRACTOR SCHEDULE DATES: APPROVAL NEEDED BY	CONTRACTOR SCHEDULE DATES: MATERIAL NEEDED BY	CONTRACTOR ACTION: ACTION CODE	CONTRACTOR ACTION: DATE OF ACTION	DATE FWD TO APPR AUTH DATE RCD FROM CONTR	APPROVING AUTHORITY: DATE FWD TO OTHER REVIEWER	APPROVING AUTHORITY: DATE RCD FROM OTH REVIEWER	APPROVING AUTHORITY: ACTION CODE	APPROVING AUTHORITY: DATE OF ACTION	MAILED TO CONTR/ DATE RCD FROM APPR AUTH	REMARKS
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		05120	**STRUCTURAL STEEL**														
			SD-02 Shop Drawings														
			Fabrication Drawings	1.4	G												
			SD-03 Product Data														
			Shop Primer	1.4													
			SD-07 Certificates														
			Steel	1.4	G												
			Shop Primer	1.4													
			Welding Electrode and Rods	1.4	G												
			Galvanizing	1.4													
			AISC Quality Certification	1.4													
			Welding Procedures and Qualifications	1.4	G												
		07920	**JOINT SEALANTS**														
			SD-03 Product Data														
			Sealants	2.1	G												
			Primers	2.2													
			Bond Breakers	2.3													
			Backstops	2.4													
			SD-07 Certificates														
			Selanat	3.3.6													
		11161	**DOCK LEVELERS**														
			SD-02 Shop Drawings														
			Detail Drawings	1.3	G												
			Loading Truck Levelers	1.3	G												
			SD-03 Product Data														
			Loading Truck Levelers	1.3	G												
			Light Communication System	1.3	G												
			Integrated Control Panel	1.3	G												
			Exterior Signage	E-101	G												
			SD-07 Certificates														
			Truck Leveler Structural & Deck Plate Tests	1.3	G												
			Truck Leveler Warranties	1.3	G												
			SD-10 Operation and Maintenance Data														
			O&M Instructions	1.3	G												
			Loading Truck Levelers	1.3	G												

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION: Install new Dock Levelers & adjust Dock heights @ Doors 03 & 04, Building 89, Bay 1, DDSP New Cumberland, PA

CONTRACTOR

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(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(I)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		16402	**INTERIOR DISTRIBUTION SYSTEM**														
			SD-03 Product Data														
			Switches	1.3	G												
			Wires and Cables	1.3	G												
			Conduits and Fittings	1.3	G												
			Receptacles	1.3	G												
			Dock Light	E-101	G												
			SD-06 Test Reports														
			600-Volt Wiring Test	1.3	G												
			Grounding Test	1.3	G												
			SD-07 Certificates	1.3	G												
			SD-10 Operation and Maintenance Data-Electrical	1.3	G												

SECTION 01451

CONTRACTOR QUALITY CONTROL

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 basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D 3740	(2001)	Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM E 329	(2002)	Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

U.S. ARMY CORPS OF ENGINEERS (USACE)

ER 1110-1-12	(1993)	Quality Management

1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all costs associated therewith shall be included in the lump-sum price proposal.

1.3 SUBMITTALS

Government approval is required for the submittals with a "G" designation; submittals without a "G" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contractor Quality Control Plan; G

PART 2 PRODUCTS

(NOT APPLICABLE)

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause titled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. The system shall cover all design and construction operations, both onsite and offsite, and shall be keyed to the proposed construction sequence. The site project superintendent will be held responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with

the quality requirements specified in the contract. The site project superintendent in this context shall be the highest level manager responsible for the overall construction activities at the site, including quality and production. The site project superintendent shall maintain a physical presence at the site at all times, except as otherwise acceptable to the Contracting Officer, and shall be responsible for all construction and construction related activities at the site.

3.2 QUALITY CONTROL PLAN

The Contractor shall furnish for review by the Government, at the Preconstruction Conference, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause titled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, tests, records, and forms to be used. The Government will consider an interim plan for the first 15 days of operation. 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 features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

3.2.1 Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all design and construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents, designers of record, consultants, or architect/engineers (AE):

a. A description of the quality control organization.

b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.

c. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, purchasing agents, designers of record, consultants, or architect engineers (AE). These procedures shall be in accordance with Section 01330 SUBMITTAL PROCEDURES.

d. 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 shall be used.)

e. Procedures for tracking design and construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.

f. Reporting procedures, including proposed reporting formats.

g. 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 may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more

than one definable feature under a particular section. This list will be agreed upon during the coordination meeting.

3.2.2 Additional Requirements for Design Quality Control (DQC) Plan

The following additional requirements apply to the Design Quality Control (DQC) plan:

a. The Contractor's QCP Plan shall provide and maintain a Design Quality Control (DQC) Plan as an effective quality control program which will assure that all services required by this design-build contract are performed and provided in a manner that meets professional architectural and engineering quality standards. As a minimum, all documents shall be technically reviewed by competent, independent reviewers identified in the DQC Plan. The same element that produced the product shall not perform the independent technical review (ITR). The Contractor shall correct errors and deficiencies in the design documents prior to submitting them to the Government.

b. The Contractor shall include the design schedule in the master project schedule, showing the sequence of events involved in carrying out the project design tasks within the specific contract period. This should be at a detailed level of scheduling sufficient to identify all major design tasks, including those that control the flow of work. The schedule shall include review and correction periods associated with each item. This should be a forward planning as well as a project monitoring tool. The schedule reflects calendar days and not dates for each activity. If the schedule is changed, the Contractor shall submit a revised schedule reflecting the change within 7 calendar days. The Contractor shall include in the DQC Plan the discipline-specific checklists to be used during the design and quality control of each submittal. These completed checklists shall be submitted at each design phase as part of the project documentation. Example checklists can be found in ER 1110-1-12.

c. The DQC Plan shall be implemented by a Design Quality Control Manager who has the responsibility of being cognizant of and assuring that all documents on the project have been coordinated. This individual shall be a person who has verifiable engineering or architectural design experience and is a registered professional engineer or architect. The Contractor shall notify the Contracting Officer, in writing, of the name of the individual, and the name of an alternate person assigned to the position.

The Contracting Officer will notify the Contractor in writing of the acceptance of the DQC Plan. After acceptance, any changes proposed by the Contractor are subject to the acceptance of the Contracting Officer.

3.2.3 Acceptance of Plan

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

3.2.4 Notification of Changes

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

3.3 QUALITY CONTROL ORGANIZATION

3.3.1 Personnel Requirements

The requirements for the CQC organization are a CQC System Manager, a Design Quality Manager, and sufficient number of additional qualified personnel to ensure safety and contract compliance. The Safety and Health Manager shall receive direction and authority from the CQC System Manager and shall 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 shall maintain 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 shall be subject to acceptance by the Contracting Officer. The Contractor shall provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Complete records of all letters, material submittals, shop drawing submittals, schedules and all other project documentation shall be promptly furnished to the CQC organization by the Contractor. The CQC organization shall be responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

3.3.2 CQC System Manager

The Contractor shall identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a construction person with a minimum of 5 years in related work. This CQC System Manager shall be on the site at all times during construction and shall be employed by the prime Contractor. The CQC System Manager shall be assigned as System Manager but may have duties as project superintendent in addition to quality control. An alternate for the CQC System Manager shall be identified in the plan to serve in the event of the System Manager's absence. The requirements for the alternate shall be the same as for the designated CQC System Manager.

3.3.3 CQC Personnel

In addition to CQC personnel specified elsewhere in the contract, the Contractor shall provide as part of the CQC organization specialized personnel to assist the CQC System Manager for the following areas: materials technician, testing and balancing, and design. These individuals may be employees of the prime or subcontractor; be responsible to the CQC System Manager; be physically present at the construction site during work on their areas of responsibility; have the necessary education and/or experience in accordance with the experience matrix listed herein. These individuals may perform other duties but must be allowed sufficient time to perform their assigned quality control duties as described in the Quality Control Plan.

Experience Matrix

Area	Qualifications
Concrete, Pavements and Soils	Materials Technician with 2 yrs experience for the appropriate area.
Testing, Adjusting and Balancing	Specialist must be a member of AABC or

Personnel	an experienced technician of the firm certified by the NEBB.
Design Quality Control Manager	Registered Architect or Professional Engineer

3.3.4 Organizational Changes

The Contractor shall maintain the CQC staff as appropriate for the work to be performed. When it is necessary to make changes to the CQC staff, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.4 SUBMITTALS AND DELIVERABLES

Submittals, if needed, shall be made as specified in Section 01330 SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals and deliverables are in compliance with the contract requirements.

3.5 CONTROL

Contractor Quality Control 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.

3.6 TESTS

3.6.1 Testing Procedure

The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, the Contractor shall furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. The Contractor shall 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. Results of all tests taken, both passing and failing tests, shall be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test shall be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an offsite or commercial test facility shall be

provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.6.2 Testing Laboratories

3.6.2.1 Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

3.6.2.2 Capability Recheck

If the selected laboratory fails the capability check, the Contractor will be assessed a charge of $500 to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

3.6.3 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.

3.7 COMPLETION INSPECTION

3.7.1 Punch-Out Inspection

Near the end of the work, or any increment of the work established by a time stated in the SPECIAL CONTRACT REQUIREMENTS Clause, "Commencement, Prosecution, and Completion of Work", or by the specifications, the CQC Manager shall conduct an inspection of the work. A punch list of items which do not conform to the approved drawings and specifications shall be prepared and included in the CQC documentation, as required by paragraph DOCUMENTATION. The list of deficiencies shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government Pre-Final inspection.

3.7.2 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. The Contractor's CQC System Manager shall 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. Any items noted on the Pre-Final inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph shall 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.

3.7.3 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall 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 may also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Notice shall be given to the Contracting Officer at least 7 days prior to the final acceptance inspection and shall 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 with the contract clause titled "Inspection of Construction".

3.8 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be on an acceptable form that includes, as a minimum, the following information:

a. Contractor/subcontractor and their area of responsibility.

b. Operating plant/equipment with hours worked, idle, or down for repair.

c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.

d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase shall be identified (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/or specifications.

j. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover

both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished 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, one report shall be prepared and submitted for every 7 days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

3.9 NOTIFICATION OF NONCOMPLIANCE

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

-- End of Section --

SECTION 01500

TEMPORARY CONSTRUCTION FACILITIES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

1.1.1 Site Plan

The Contractor shall prepare a site plan indicating the proposed location and dimensions of any area to be fenced and used by the Contractor, the number of trailers to be used, avenues of ingress/egress to the fenced area and details of the fence installation. Any areas which may have to be graveled to prevent the tracking of mud shall also be identified. The Contractor shall also indicate if the use of a supplemental or other staging area is desired.

1.1.2 Identification of Employees

The Contractor shall be responsible for furnishing to each employee, and for requiring each employee engaged on the work to display identification as approved and directed by the Contracting Officer. Prescribed identification shall immediately be delivered to the Contracting Officer for cancellation upon release of any employee.

1.1.3 Employee Parking

Contractor employees shall park privately owned vehicles in an area designated by the Contracting Officer. Contractor employee parking shall not interfere with existing and established parking requirements of the military installation.

1.2 SUBMITTALS

Government approval is required for the submittals with a "G" designation; submittals without a "G" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Site Plan; G

1.3 AVAILABILITY AND USE OF UTILITY SERVICES

1.3.1 Payment for Utility Services

The Government will make all reasonably required utilities available to the Contractor from existing outlets and supplies at no charge to the Contractor. The Contractor shall carefully conserve any utilities furnished without charge.

1.3.2 Sanitary Facilities

Unless otherwise stated in the Request for Proposal, Contractor's personnel will be permitted to use toilet facilities on the premises subject to regulation and control of the Contracting Officer or his designated representative.

1.3.2.1 When required by the Request for Proposal, the Contractor shall provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer.

1.3.3 Telephone

The Contractor shall make arrangements and pay all costs for telephone facilities desired.

1.4 PROTECTION AND MAINTENANCE OF TRAFFIC

During construction the Contractor shall provide access and temporary relocated roads as necessary to maintain traffic. The Contractor shall 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 and the work, and the erection and maintenance of adequate warning, danger, and direction signs, shall be as required by the State and local authorities having jurisdiction. The traveling public shall be protected from damage to person and property. The Contractor's traffic on roads selected for hauling material to and from the site shall interfere as little as possible with public traffic. The Contractor shall investigate the adequacy of existing roads and the allowable load limit on these roads. The Contractor shall be responsible for the repair of any damage to roads caused by construction operations.

1.4.1 Haul Roads

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

1.4.2 Barricades

The Contractor shall erect and maintain temporary barricades to limit public access to hazardous areas. Such barricades shall be required 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 shall be securely placed, clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

1.5 CONTRACTOR'S TEMPORARY FACILITIES

1.5.1 Storage Area

The Contractor shall construct a temporary 6 foot high chain link fence around trailers and materials. The fence shall include plastic strip inserts, colored green, so that visibility through the fence is obstructed. Fence posts may be driven, in lieu of concrete bases, where soil conditions permit. Trailers, materials, or equipment shall not be placed or stored 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 military boundaries. Trailers, equipment, or materials shall not be open to public view with the exception of those items which are in support of ongoing work on any given day. Materials shall not be stockpiled outside the fence in preparation for the next day's work. Mobile equipment, such as tractors, wheeled lifting equipment, cranes, trucks, and like equipment, shall be parked within the fenced area at the end of each work day.

1.5.2 Supplemental Storage Area

Upon Contractor's request, the Contracting Officer will designate another or supplemental area for the Contractor's use and storage of trailers, equipment, and materials. This area may not be in close proximity of the construction site but shall be within the military boundaries. Fencing of materials or equipment will not be required at this site; however, the Contractor shall be responsible for cleanliness and orderliness of the area used and for the security of any material or equipment stored in this area. Utilities will not be provided to this area by the Government.

1.5.3 Appearance of Trailers

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

1.5.4 Maintenance of Storage Area

Fencing shall be kept in a state of good repair and proper alignment. Should the Contractor elect to traverse, with construction equipment or other vehicles, grassed or unpaved areas which are not established roadways, such areas shall be covered with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways; gravel gradation shall be at the Contractor's discretion. Grass located within the boundaries of the construction site shall be mowed for the duration of the project. Grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers shall be edged or trimmed neatly.

1.5.5 Security Provisions

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

1.6 GOVERNMENT FIELD OFFICE

The Contractor will not be required to provide a field office for Government personnel.

1.7 PLANT COMMUNICATION

Whenever the Contractor has the individual elements of its plant so located that operation by normal voice between these elements is not satisfactory, the Contractor shall install a satisfactory means of communication, such as telephone or other suitable devices. The devices shall be made available for use by Government personnel.

1.8 TEMPORARY PROJECT SAFETY FENCING

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

1.9 CLEANUP

Construction debris, waste materials, packaging material and the like shall be removed from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways shall be cleaned away. Materials resulting from demolition activities which are salvageable shall be stored within the fenced area described above or at the supplemental storage area. Stored material not in trailers, whether new or salvaged, shall be neatly stacked when stored.

1.10 RESTORATION OF STORAGE AREA

Upon completion of the project and after removal of trailers, materials, and equipment from within the fenced area, the fence shall be removed and will become the property of the Contractor. Areas used by the Contractor for the storage of equipment or material, or other use, shall be restored to the original or better condition. Gravel used to traverse grassed areas shall be removed and the area restored to its original condition, including top soil and seeding as necessary.

-- End of Section --

SECTION 01525

SAFETY AND OCCUPATIONAL HEALTH REQUIREMENTS

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 A10.32	Personal Fall Protection - Safety Requirements for Construction and Demolition Operations
ANSI/ASSE A10.34	(2001) Protection of the Public on or Adjacent to Construction Sites
ANSI Z359.1	(1992; R 1999) Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 241	(2000) Safeguarding Construction, Alteration, and Demolition Operations
NFPA 51B	(2003) Fire Prevention During Welding, Cutting, and Other Hot Work
NFPA 70	(2002) National Electrical Code
NFPA 70E	(2004) Electrical Safety in the Workplace

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2003) Safety -- Safety and Health Requirements

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

29 CFR 1910.146	Permit-required Confined Spaces
29 CFR 1926	Safety and Health Regulations for Construction
29 CFR 1926.500	Fall Protection

1.2 SUBMITTALS

Government approval is required for each of the following submittals shown with a "G" designation; submittals not having a "G" designation are for information only. The Contractor shall review the listing provided and prepare submittals as applicable to the proposed work to be performed. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Accident Prevention Plan (APP); G

Activity Hazard Analysis (AHA); G

Crane Critical Lift Plan; G

Proof of current qualification for Crane Operators; G

Occupant Protection Plan; G

Lead Compliance Plan; G

Asbestos Hazard Abatement Plan; G

PCB Plan; G

Site Demolition Plan; G

Excavation Plan; G

SD-06 Test Reports

Reports

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

Accident Reports; G

Monthly Exposure Reports; G

Crane Reports; G

Regulatory Citations and Violations

SD-07 Certificates

Confined Space Entry Permit

Hot work permit

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

1.3 DEFINITIONS

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

1.4 REGULATORY REQUIREMENTS

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

1.5 SITE QUALIFICATIONS, DUTIES AND MEETINGS

1.5.1 Personnel Qualifications

1.5.1.1 Site Safety and Health Officer (SSHO)

The Contractor shall retain a Site Safety and Health Officer (SSHO) for the duration of this contract to perform safety and occupational health management, surveillance, inspections, and safety enforcement for the Contractor. The Site Superintendent or Contractor Quality Control (QC) person shall serve as the on Site Safety and Health Officer. The Site Safety and Health Officer shall report all health and safety issues to the Contractor's General Safety and Health Officer. The SSHO shall meet the following requirements:

Level 2:

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

The Contractor's General Safety and Health Officer may be assigned to oversee multiple contracts and will review all reports and make periodic inspections of the ongoing construction to ensure safety enforcement for the Contractor. The General Safety and Health Officer shall meet the following criteria:

Level 5:

a. An Associate Safety Professional (ASP) Certified Safety Trained Supervisor (STS) and/or Construction Health & Safety Technician (CHST).
b. A minimum of 10 years safety work of a progressive nature with at least 5 years of experience on similar projects.
c. 30-hour OSHA construction safety class or equivalent within the last 5 years.

1.5.1.2 Competent Person for Confined Space Entry

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

1.5.1.3 Crane Operators

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

1.5.2 Personnel Duties

1.5.2.1 Site Safety and Health Officer (SSHO)/Superintendent or Quality Control Person

a. Conduct daily safety and health inspections and maintain a written log which includes area/operation inspected, date of inspection, identified hazards, recommended corrective actions, estimated and actual dates of corrections. Safety inspection logs shall be a part of Contractors' daily quality control report.

b. Maintain applicable safety reference material on the job site.

c. Attend the pre-construction conference, pre-work meetings including preparatory inspection meeting, and periodic in-progress meetings.

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

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

1.5.2.2 General Safety and Health Officer

The Contractor's General Safety and Health Officer shall:

a. Conduct mishap investigations and complete required reports. Maintain the OSHA Form 300 and Daily Production reports for prime and sub-contractors.

b. Implement and enforce accepted APPS and AHAs.

c. Maintain a safety and health deficiency tracking system that monitors outstanding deficiencies until resolution. A list of unresolved safety and health deficiencies shall be posted on the safety bulletin board.

1.5.3 Meetings

1.5.3.1 Preconstruction Conference

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

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

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

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

1.5.3.2 Safety Meetings

Shall be conducted and documented as required by EM 385-1-1. Minutes showing contract title, signatures of attendees and a list of topics discussed shall be attached to the Contractors' daily quality control report.

1.6 ACCIDENT PREVENTION PLAN (APP)

The Contractor shall use a qualified person to prepare the written site-specific APP. Prepare the APP in accordance with the format and requirements of USACE EM 385-1-1 and as supplemented herein. Cover all paragraph and subparagraph elements in USACE EM 385-1-1, Appendix A, "Minimum Basic Outline for Accident Prevention Plan". Specific requirements for some of the APP elements are described below. The APP shall be job-specific and shall address any unusual or unique aspects of the project or activity for which it is written. The APP shall interface with the Contractor's overall safety and health program. Any portions of the Contractor's overall safety and health program referenced in the APP shall be included in the applicable APP element and made site-specific. The Government considers the Prime Contractor to be the "controlling authority" for all work site safety and health of the subcontractors. Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out. The APP shall be signed by the person and firm (senior person) preparing the APP, the Contractor, the on-site superintendent, the designated site safety and health officer and any designated CSP and/or CIH.

Submit the APP to the Contracting Officer 15 calendar days prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP.

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

Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the Contracting Officer, project superintendent, SSHO and quality control manager. Should any hazard become evident, stop work in the area, secure the area, and develop a plan to remove the hazard. Notify the Contracting Officer within 24 hours of discovery. Eliminate/remove the hazard. In the interim, all necessary action shall be taken to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public (as defined by ANSI/ASSE A10.34,) and the environment.

Copies of the accepted plan will be maintained at the Contracting Officer's office and at the job site.

The APP shall be continuously reviewed and amended, as necessary, throughout the life of the contract. Unusual or high-hazard activities not identified in the original APP shall be incorporated in the plan as they are discovered.

1.6.1 EM 385-1-1 Contents

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

a. Crane Critical Lift Plan. Prepare and sign weight handling critical lift plans for lifts over 75 percent of the capacity of the crane or hoist at any radius of lift; lifts involving more than one crane or hoist; lifts of personnel; and lifts involving non-routine rigging or operation, sensitive equipment, or unusual safety risks. The plan shall be submitted 15 calendar days prior to on-site work and include the requirements of USACE EM 385-1-1, paragraph 16.C.18. and the following:

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

b. Occupant Protection Plan. The safety and health aspects of lead-based paint removal.

c. Lead Compliance Plan. The safety and health aspects of lead work.

d. Asbestos Hazard Abatement Plan. The safety and health aspects of asbestos work.

e. PCB Plan. The safety and health aspects of Polychlorinated Biphenyls work. Also, refer to Federal Requirements listed in Section 01575 TEMPORARY ENVIRONMENTAL CONTROLS

f. Site Demolition Plan. The safety and health aspects prepared in accordance with Section 02220 DEMOLITION and referenced sources.

g. Excavation Plan. The safety and health aspects prepared in accordance with Section 02300 EARTHWORK.

1.7 ACTIVITY HAZARD ANALYSIS (AHA)

The Activity Hazard Analysis (AHA) format shall be in accordance with USACE EM 385-1-1. Submit the AHA for review at least 15 calendar days prior to the start of each phase. Format subsequent AHAs as amendments to the APP. The analysis should be used during daily inspections to ensure the implementation and effectiveness of the activity's safety and health controls.

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

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

1.8 DISPLAY OF SAFETY INFORMATION

Within 1 calendar days after commencement of work, erect a safety bulletin board at the job site. The safety bulletin board shall include information and be maintained as required by EM 385-1-1, section 01.A.06. Additional items required to be posted include:

a. Confined space entry permit.
b. Hot work permit.
c. Where a bulletin board is not required Contractor shall retain permits at the work site.

1.9 SITE SAFETY REFERENCE MATERIALS

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

1.10 EMERGENCY MEDICAL TREATMENT

Should an accident occur on site, DDSP emergency medical technician shall respond and provide ambulance services off the Depot. When available the Depot will transport the injured to the nearest public hospital. Otherwise, transport will be provided to the main gate where the injured may be transferred to a public ambulance. This is required for security purposes of the Depot.

1.11 REPORTS

1.11.1 Accident Reports

For recordable injuries and illnesses, and property damage accidents resulting in at least $2,000 in damages, the Prime Contractor shall conduct an accident investigation to establish the root cause(s) of the accident, complete the USACE Accident Report Form 3394 and provide the report to the Contracting Officer within 5 calendar day(s) of the accident. The Contracting Officer will provide copies of any required or special forms.

1.11.2 Accident Notification

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

1.11.3 Monthly Exposure Reports

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

1.11.4 Crane Reports

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

1.12 HOT WORK

Prior to performing "Hot Work" (welding, cutting, etc.) or operating other flame-producing/spark producing devices, a written permit shall be requested from the Contracting Officer. CONTRACTORS ARE REQUIRED TO MEET ALL CRITERIA

BEFORE A PERMIT IS ISSUED. The Contractor will provide at least two (2) twenty (20) pound 4A:20 BC rated extinguishers for normal "Hot Work". All extinguishers shall be current inspection tagged, approved safety pin and tamper resistant seal. It is also mandatory to have a designated FIRE WATCH for any "Hot Work" done at this activity. The Fire Watch shall be trained in accordance with NFPA 51B and remain on-site for a minimum of 30 minutes after completion of the task or as specified on the hot work permit.

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

PART 2 PRODUCTS

2.1 FALL PROTECTION ANCHORAGE

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

PART 3 EXECUTION

3.1 CONSTRUCTION AND/OR OTHER WORK

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

3.1.1 Hazardous Material Exclusions

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

3.1.2 Unforeseen Hazardous Material

The design should have identified materials such as PCB, lead paint, and friable and non-friable asbestos. If material, not indicated, that may be hazardous to human health upon disturbance during construction operations is encountered, stop that portion of work and notify the Contracting Officer immediately. Within 14 calendar days the Government will determine if the material is hazardous. If material is not hazardous or poses no danger, the Government will direct the Contractor to proceed without change. If material is hazardous and handling of the material is necessary to accomplish the work, the Government will issue a modification pursuant to "FAR 52.243-4, Changes" and "FAR 52.236-2, Differing Site Conditions."

3.2 PRE-OUTAGE COORDINATION MEETING

Contractors are required to apply for utility outages at least 7 calendar days in advance. As a minimum, the request should include the location of the outage, utilities being affected, duration of outage and any necessary sketches. Special requirements for electrical outage requests are contained elsewhere in this specification section. Once approved, and prior to beginning work on the utility system requiring shut down, the Contractor shall attend a pre-outage coordination meeting with the Contracting Officer to review the scope of work and the lock-out/tag-out procedures for worker protection. No work will be performed on energized electrical circuits unless proof is provided that no other means exist.

3.3 FALL HAZARD PROTECTION AND PREVENTION PROGRAM

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

3.3.1 Training

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

3.3.2 Fall Protection Equipment and Systems

The Contractor shall enforce use of the fall protection equipment and systems designated for each specific work activity in the Fall Protection and Prevention Plan and/or AHA at all times when an employee is exposed to a fall hazard. Employees shall be protected from fall hazards as specified in EM 385-1-1, section 21. In addition to the required fall protection systems, safety skiff, personal floatation devices, life rings etc., are required when working above or next to water in accordance with USACE EM 385-1-1, paragraphs 05.H. and 05.I. Personal fall arrest systems are required when working from an articulating or extendible boom, swing stages, or suspended platform. In addition, personal fall arrest systems are required when operating other equipment such as scissor lifts if the work platform is capable of being positioned outside the wheelbase. The need for tying-off in such equipment is to prevent ejection of the employee from the equipment during raising, lowering, or travel. Fall protection must comply with 29 CFR 1926.500, Subpart M, USACE EM 385-1-1 and ANSI A10.32.

3.3.2.1 Personal Fall Arrest Equipment

Personal fall arrest equipment, systems, subsystems, and components shall meet ANSI Z359.1. Only a full-body harness with a shock-absorbing lanyard or self-retracting lanyard is an acceptable personal fall arrest body support device. Body belts may only be used as a positioning device system (for uses such as steel reinforcing assembly and in addition to an approved fall arrest system). Harnesses shall have a fall arrest attachment affixed to the body support (usually a Dorsal D-ring) and specifically designated for attachment to the rest of the system. Only locking snap hooks and carabiners shall be used. Webbing, straps, and ropes shall be made of synthetic fiber. The maximum free fall distance when using fall arrest equipment shall not exceed 6 feet. The total fall distance and any swinging of the worker (pendulum-

like motion) that can occur during a fall shall always be taken into consideration when attaching a person to a fall arrest system.

3.3.3 Fall Protection for Roofing Work

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

a. Low Sloped Roofs:

   (1) For work within 6 feet of an edge, on low-slope roofs, personnel shall be protected from falling by use of personal fall arrest systems, guardrails, or safety nets.

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

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

3.3.4 Existing Anchorage

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

3.3.5 Horizontal Lifelines

Horizontal lifelines shall be designed, installed, certified and used under the supervision of a qualified person for fall protection as part of a complete fall arrest system which maintains a safety factor of 2 (29 CFR 1926.500).

3.3.6 Guardrails and Safety Nets

Guardrails and safety nets shall be designed, installed and used in accordance with EM 385-1-1 and 29 CFR 1926 Subpart M.

3.3.7 Rescue and Evacuation Procedures

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

3.4 SCAFFOLDING

Employees shall be provided with a safe means of access to the work area on the scaffold. Climbing of any scaffold braces or supports not specifically designed for access is prohibited. Access to scaffold platforms greater than 6 m (20 feet) in height shall be accessed by use of a scaffold stair system. Vertical ladders commonly provided by scaffold system manufacturers shall not be used for accessing scaffold platforms greater than 6 m (20 feet) in height. The use of an adequate gate is required. Contractor shall ensure that employees are qualified to perform scaffold erection and dismantling. Do not use scaffold without the capability of supporting at least four times the maximum intended load or without appropriate fall protection as delineated in the accepted fall protection and prevention plan. Stationary scaffolds must be attached to structural building components to safeguard against tipping forward or backward. Special care shall be given to ensure scaffold systems are not overloaded. Side brackets used to extend scaffold platforms on self-supported scaffold systems for the storage of material are prohibited. The first tie-in shall be at the height equal to 4 times the width of the smallest dimension of the scaffold base. Work platforms shall be placed on mud sills. Scaffold or work platform erectors shall have fall protection during the erection and dismantling of scaffolding or work platforms that are more than six feet. Delineate fall protection requirements when working above six feet or above dangerous operations in the Fall Protection and Prevention (FP&P) Plan and Activity Hazard Analysis (AHA) for the phase of work.

3.4.1 Stilts

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

3.5 EQUIPMENT

3.5.1 Material Handling Equipment

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

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

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

3.5.2 Weight Handling Equipment

Cranes and derricks shall be equipped as specified in EM 385-1-1, section 16.

3.6 EXCAVATIONS

The competent person shall perform soil classification in accordance with 29 CFR 1926.

3.6.1 Utility Locations

Prior to digging, notify the Contracting Officer at least 3 working days before starting excavation work. All underground utilities in the work area must be positively identified by a private utility locating service in addition to any station locating service and coordinated with the station

utility department. Any markings made during the utility investigation must be maintained throughout the contract.

3.6.2 Utility Location Verification

The Contractor must physically verify underground utility locations by hand digging using wood or fiberglass handled tools when any adjacent construction work is expected to come within three feet of the underground system. Digging within 0.61 m (2 feet) of a known utility must not be performed by means of mechanical equipment; hand digging shall be used. If construction is parallel to an existing utility the utility shall be exposed by hand digging every 30.5 m (100 feet) if parallel within 1.5 m (5 feet) of the excavation.

3.6.3 Shoring Systems

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

3.6.4 Trenching Machinery

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

3.7 UTILITIES WITHIN CONCRETE SLABS

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

3.8.1 Conduct of Electrical Work

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

Plan so that work near energized parts is minimized to the fullest extent possible. Use of electrical outages clear of any energized electrical sources is the preferred method. When working in energized substations, only qualified electrical workers shall be permitted to enter. When work requires Contractor to work near energized circuits as defined by the NFPA 70, high voltage personnel must use personal protective equipment that includes, as a minimum, electrical hard hat, safety shoes, insulating gloves with leather protective sleeves, fire retarding shirts, coveralls, face shields, and safety glasses. In addition, provide electrical arc flash protection for personnel as required by NFPA 70E. Insulating blankets, hearing protection, and switching suits may also be required, depending on the specific job and as delineated in the Contractor's AHA.

3.8.2 Portable Extension Cords

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

3.9 WORK IN CONFINED SPACES

The Contractor shall comply with the requirements in Section 06.I of USACE EM 385-1-1, OSHA 29 CFR 1910.146 and OSHA 29 CFR 1926.21(b) (6). Any potential for a hazard in the confined space requires a permit system to be used.

a. Entry Procedures. Prohibit entry into a confined space by personnel for any purpose, including hot work, until the qualified person has conducted appropriate tests to ensure the confined or enclosed space is safe for the work intended and that all potential hazards are controlled or eliminated and documented. (See Section 06.I.06 of USACE EM 385-1-1 for entry procedures.) All hazards pertaining to the space shall be reviewed with each employee during review of the AHA.

b. Forced air ventilation is required for all confined space entry operations and the minimum air exchange requirements must be maintained to ensure exposure to any hazardous atmosphere is kept below its' action level.

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

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SECTION 01562

DUST PROTECTION

PART 1 GENERAL

1.1 DESRIPTION OF WORK

This specification cover the protection of work areas by the furnishing and installation of a temporary framework covered by polyethylene sheeting around the area where work is being performed or around the area that requires protection.

PART 2 PRODUCTS

2.1 Framework shall be of sturdy wood or metal composition.

2.2 Polyethylene Film shall comply with ASTM D 2103, shall have a minimum density of 0.0910, and impact strength greater than 70.

2.3 Adhesive Tape for sealing seams and edges shall meet the polyethylene manufacturer’s recommendations.

2.4 Sealing Compound shall comply with recommended practices for use of latex compounds as prescribed by ASTM C 790.

PART 3 EXECUTION

3.1 Installation: Dust protection enclosures shall be installed according to the manufacturer’s recommendations.

3.2 Repairs: Any accidental penetrations of the enclosures shall be repaired swiftly and adequately to prevent dust intrusion.

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SECTION 01780

PROJECT CLOSEOUT

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

As-Built Drawings; G

Two (2) sets of red-line markup drawings showing final as-built conditions of the project.

SD-03 Product Data

As-Built Record of Equipment and Materials; G

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

Warranty Management Plan; G

One set of the warranty management plan containing information relevant to the warranty of materials and equipment incorporated into the construction project, including the starting date of warranty of construction. The Contractor shall furnish with each warranty the name, address, and telephone number of each of the guarantor's representatives nearest to the project location.

Warranty Tags

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

Final Cleaning; G

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

1.2 PROJECT RECORD DOCUMENTS

1.2.1 As-Built Drawings

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

1.2.1.1 Government Furnished Materials

One (1) set of Project Construction Drawings, revised to reflect all bid amendments will be provided by the Government at the Pre-Construction Conference. If the Contractor prefers CADD drawings in electronic format, this preference shall be made known to the Construction Officer’s Representative prior to the Pre-Construction Conference. If requested in

accordance with this Section, CADD drawings will be provided on CD Recordable media.

1.2.1.2 Working As-Built and Final As-Built Drawings

The Contractor shall revise two (2) sets of paper drawings by red-line process to show the as-built conditions during the prosecution of the project. These working as-built marked drawings shall be kept current on a weekly basis and at least one (1) set shall be available on the jobsite at all times. Changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction shall be accurately and neatly recorded as they occur by means of details and notes. Final as-built drawings shall be prepared after the completion of each definable feature of work as listed in the Contractor Quality Control Plan (Foundations, Utilities, Structural Steel, etc., as appropriate for the project). The working as-built marked prints and final as-built drawings will be jointly reviewed for accuracy and completeness by the Contracting Officer and the Contractor prior to submission of each monthly pay estimate. If the Contractor fails to maintain the working and final as-built drawings as specified herein, the Contracting Officer will deduct from the monthly progress payment an amount representing the estimated cost of maintaining the as-built drawings. This monthly deduction will continue until an agreement can be reached between the Contracting Officer and the Contractor regarding the accuracy and completeness of updated drawings.

The working and final as-built drawings shall show, but shall not be 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, the as-built drawings shall show, by offset dimensions to two permanently fixed surface features, the end of each run including each change in direction. Valves, splice boxes and similar appurtenances shall be located by dimensioning along the utility run from a reference point. The average depth below the surface of each run shall also be recorded.

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

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

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

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

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

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

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

i. Systems designed or enhanced by the Contractor, such as HVAC controls, fire alarm, fire sprinkler, and irrigation systems.

j. Modifications (change order price shall include the Contractor's cost to change working and final as-built drawings to reflect modifications) and compliance with the following procedures.

(1) Directions in the modification for posting descriptive changes shall be followed.

(2) A Modification Circle shall be placed at the location of each deletion.

(3) For new details or sections which are added to a drawing, a Modification Circle shall be placed by the detail or section title.

(4) For minor changes, a Modification Circle shall be placed by the area changed on the drawing (each location).

(5) For major changes to a drawing, a Modification Circle shall be placed by the title of the affected plan, section, or detail at each location.

(6) For changes to schedules or drawings, a Modification Circle shall be placed either by the schedule heading or by the change in the schedule.

(7) The Modification Circle size shall be 1/2 inch diameter unless the area where the circle is to be placed is crowded. Smaller size circle shall be used for crowded areas.

1.2.1.3 As-Built Drawing Preparation

The as-built drawings shall be modified as may be necessary to correctly show the features of the project as it has been constructed by bringing the contract set into agreement with approved working as-built prints, and adding such additional drawings as may be necessary. These working as-built marked prints shall be neat, legible and accurate. These drawings are part of the permanent records of this project and shall be returned to the Contracting Officer after approval by the Government. Any drawings damaged or lost by the Contractor shall be satisfactorily replaced by the Contractor at no expense to the Government.

a. When final revisions have been completed, the cover sheet drawing shall show the wording "RECORD DRAWING AS-BUILT" followed by the name of the Contractor in letters at least 3/16 inch high. All other contract drawings shall be marked either "AS-Built" drawing denoting no revisions on the sheet or "Revised As-Built" denoting one or more revisions. Original contract drawings shall be dated in the revision block.

b. Within 10 days after Government approval of all of the working as-built drawings for a phase of work, the Contractor shall prepare the final

as-built drawings for that phase of work and submit the drawings for Government review and approval.

c. The Government will promptly return the drawings with any necessary corrections.

d. Within 7 days, the Contractor shall revise the drawings at no additional cost and submit one set of final prints for the completed phase of work to the Government.

e. Within 10 days of substantial completion of all phases of work, the Contractor shall submit the final as-built drawings for the entire project.

f. Paper prints submitted will become the property of the Government upon final approval. Failure to submit final as-built drawing marked prints as specified shall be cause for withholding any payment due the Contractor under this contract. Approval and acceptance of final as-built drawings shall be accomplished before final payment is made to the Contractor.

1.2.1.5 Payment

No separate payment will be made for as-built drawings required under this contract, and all costs accrued in connection with such drawings shall be considered a subsidiary obligation of the Contractor.

1.2.2 As-Built Record of Equipment and Materials

The Contractor shall furnish one copy of preliminary record of equipment and materials used on the project 15 days prior to final inspection. This preliminary submittal will be reviewed and returned 2 days after final inspection with Government comments. Two sets of final record of equipment and materials shall be submitted 10 days after final inspection. The designations shall be keyed to the related area depicted on the contract drawings. The record shall list the following data:

RECORD OF DESIGNATED EQUIPMENT AND MATERIALS DATA

Description	Specification Section	Manufacturer and Catalog, Model, and Serial Number	Composition and Size	Where Used

1.2.3 Final Approved Shop Drawings

The Contractor shall furnish final approved project shop drawings 30 days after transfer of the completed facility.

1.2.4 Construction Contract Specifications

The Contractor shall furnish final as-built construction contract specifications, including modifications thereto, 30 days after transfer of the completed facility.

1.2.5 Real Property Equipment

The Contractor shall furnish a list of installed equipment furnished under this contract. The list shall include all information usually listed on manufacturer's name plate. The "EQUIPMENT-IN-PLACE LIST" shall include, as

applicable, the following for each piece of equipment installed: description of item, location (by room number), model number, serial number, capacity, name and address of manufacturer, name and address of equipment supplier, condition, spare parts list, manufacturer's catalog, and warranty. A draft list shall be furnished at time of transfer. The final list shall be furnished 30 days after transfer of the completed facility.

1.3 WARRANTY MANAGEMENT

1.3.1 Warranty Management Plan

The Contractor shall develop a warranty management plan which shall contain information relevant to the project as described in the following paragraphs. At least 30 days before the planned pre-warranty conference, the Contractor shall submit the warranty management plan for Government approval. The warranty management plan shall include all required actions and documents to assure that the Government receives all warranties to which it is entitled. The plan shall 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 shall include due date and whether item has been submitted or was accomplished. Warranty information made available during the construction phase shall be submitted to the Contracting Officer for approval prior to each monthly pay estimate. Approved information shall be assembled in a binder and shall be turned over to the Government upon acceptance of the work. The construction warranty period shall begin on the date of project acceptance and shall continue for the full product warranty period or a minimum of one (1) year, whichever is longer. If the Government takes possession of any part of the work or equipment before final acceptance, the warranty shall continue for a period of one (1) year from the date the Government takes possession. A joint 4 month and 9 month warranty inspection shall be conducted, measured from time of acceptance, by the Contractor and Contracting Officer.

Information contained in the warranty management plan shall include, but shall not be 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. 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.

c. 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. This shall include one-year overall warranty of construction. Items which have extended warranties shall 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.

d. The Contractor's plans for attendance at the 4 and 9 month post-construction warranty inspections conducted by the Government.

e. Procedure and status of tagging of all equipment covered by extended warranties.

f. Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

1.3.2 Performance Bond

The Contractor's Performance Bond shall 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, the Contractor shall respond in a timely manner. Written verification will follow oral instructions. Failure of the Contractor to respond will be cause for the Contracting Officer to proceed against the Contractor.

1.3.3 Pre-Warranty Conference

Prior to contract completion, and at a time designated by the Contracting Officer, the Contractor shall 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 shall be established/reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control completion inspection, the Contractor shall 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, shall be continuously available, and shall 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.

1.3.4 Contractor's Response to Construction Warranty Service Requirements

Following oral or written notification by the Contracting Officer, the Contractor shall respond to construction warranty service requirements in accordance with the "Construction Warranty Service Priority List" and the three categories of priorities listed below. The Contractor shall submit a report on any warranty item that has been repaired during the warranty period. The report shall include the cause of the problem, date reported, corrective action taken, and when the repair was completed. If the Contractor does not perform the construction warranty within the timeframes specified, the Government will perform the work and backcharge the construction warranty payment item established.

a. First Priority Code 1. Perform onsite inspection to evaluate situation, and determine course of action within 4 hours, initiate work within 6 hours and work continuously to completion or relief.

b. Second Priority Code 2. Perform onsite inspection to evaluate situation, and determine course of action within 8 hours, initiate work within 24 hours and work continuously to completion or relief.

c. Third Priority Code 3. All other work to be initiated within 3 work days and work continuously to completion or relief.

d. The "Construction Warranty Service Priority List" is as follows:

Code 1-Electrical
(1) Power failure (entire area or any building operational after 1600 hours).
(2) Security lights
(3) Smoke detectors

Code 2-Electrical
(1) Power failure (no power to a room or part of building).
(2) Receptacle and lights (in a room or part of building).

Code 3-Electrical
(1) Street lights.

Code 1-Gas
(1) Leaks and breaks.
(2) No gas to family housing unit or cantonment area.

Code 1-Heat
(1) Area power failure affecting heat.
(2) Heater in unit not working.

Code 1-Plumbing
(1) Hot water heater failure.
(2) Leaking water supply pipes.

Code 1-Roof Leaks
(1) Temporary repairs will be made where major damage to property is occurring.

Code 2-Roof Leaks

(1) Where major damage to property is not occurring, check for location of leak during rain and complete repairs on a Code 2 basis.

Code 2-Water (Exterior)
(1) No water to facility.

Code 3-All other work not listed above.

1.3.5 Warranty Tags

At the time of installation, each warranted item shall be tagged with a durable, oil and water resistant tag approved by the Contracting Officer. Each tag shall be attached with a copper wire and shall be sprayed with a silicone waterproof coating. The date of acceptance and the QC signature shall remain blank until project is accepted for beneficial occupancy. The tag shall show the following information.

a. Type of product/material_____.

b. Model number_____.

c. Serial number_____.

d. Contract number_____.

e. Warranty period _____ from _____to_____.

f. Inspector's signature_____.

g. Construction Contractor_____.

Address_____.

Telephone number_____.

h. Warranty contact_____.

Address_____.

Telephone number_____.

i. Warranty response time priority code_____.

j. WARNING - PROJECT PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE DURING THE WARRANTY PERIOD.

1.4 SUBMISSION OF OPERATION AND MAINTENANCE DATA

Submit Operation and Maintenance (O&M) Data specifically applicable to this contract and a complete and concise depiction of the provided equipment, product, or system. 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 01330 SUBMITTAL PROCEDURES.

1.4.1 Package Quality

Documents must be fully legible. Poor quality copies and material with hole punches obliterating the text or drawings will not be accepted.

1.4.2 Package Content

Data package content shall be as shown in the paragraph titled "Schedule of Operation and Maintenance Data Packages." Comply with the data package requirements specified in the individual technical sections, including the content of the packages and addressing each product, component, and system designated for data package submission.

1.4.3 Changes to Submittals

Manufacturer-originated changes or revisions to submitted data shall be furnished by the Contractor if a component of an item is so affected subsequent to acceptance of the O&M Data. Changes, additions, or revisions required by the Contracting Officer for final acceptance of submitted data, shall be submitted by the Contractor within 30 calendar days of the notification of this change requirement.

1.5 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES

1.5.1 Operating Instructions

Include specific instructions, procedures, and illustrations for the following phases of operation:

1.5.1.1 Safety Precautions

List personnel hazards and equipment or product safety precautions for all operating conditions.

1.5.1.2 Operator Pre-Start

Include procedures required to 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 narrative description of Normal Operating Procedures. Include Control Diagrams with data to explain operation and control of systems and specific equipment.

1.5.1.5 Emergency Operations

Include Emergency Procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Include Emergency Shutdown Instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance and procedures for emergency operation of all utility systems including required valve positions, valve locations and zones or portions of systems controlled.

1.5.1.6 Operator Service Requirements

Include instructions for services to be performed by the operator such as lubrication, adjustment, inspection, and recording gage readings.

1.5.1.7 Environmental Conditions

Include a list of Environmental Conditions (temperature, humidity, and other relevant data) that are best suited for the operation of each product, component or system. Describe conditions under which the item equipment should not be allowed to run.

1.5.2 Preventive Maintenance

Include the following information for preventive and scheduled maintenance to minimize corrective maintenance and repair.

1.5.2.1 Preventive Maintenance Plan and Schedule

Include manufacturer's schedule for routine preventive maintenance, inspections, tests and adjustments required to ensure proper and economical operation and to minimize corrective maintenance. Provide manufacturer's projection of preventive maintenance work-hours on a daily, weekly, monthly, and annual basis including craft requirements by type of craft. For periodic calibrations, provide manufacturer's specified frequency and procedures for each separate operation.

1.5.3 Corrective Maintenance (Repair)

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

1.5.3.1 Troubleshooting Guides and Diagnostic Techniques

Include step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.

1.5.3.2 Wiring Diagrams and Control Diagrams

Wiring diagrams and control diagrams shall be point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams, number electrical and electronic wiring and pneumatic control tubing and the terminals for each type, identically to actual installation configuration and numbering.

1.5.3.3 Maintenance and Repair Procedures

Include instructions and a list of tools required to repair or restore the product or equipment to proper condition or operating standards.

1.5.3.4 Removal and Replacement Instructions

Include step-by-step procedures and a list required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Instructions shall include a combination of text and illustrations.

1.5.3.5 Spare Parts and Supply Lists

Include lists of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays. Special consideration is required for facilities at remote locations. List spare parts and supplies that have a long lead-time to obtain.

1.5.4 Corrective Maintenance Work-Hours

Include manufacturer's projection of corrective maintenance work-hours including requirements by type of craft. Corrective maintenance that requires completion or participation of the equipment manufacturer shall be identified and tabulated separately.

1.5.5 Appendices

Provide information required below and information not specified in the preceding paragraphs but pertinent to the maintenance or operation of the product or equipment. Include the following:

1.5.6 Parts Identification

Provide identification and coverage for all parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing shall show the index, reference, or key number that will cross-reference the illustrated part to the listed part. Parts shown in the listings shall be grouped by components, assemblies, and subassemblies in accordance with the manufacturer's standard practice. Parts data may cover more than one model or series of equipment, components, assemblies, subassemblies, attachments, or accessories, such as typically shown in a master parts catalog

1.5.6.1 Warranty Information

List and explain the various warranties and include the servicing and technical precautions prescribed by the manufacturers or contract documents in order to keep warranties in force. Include warranty information for primary components such as the compressor of air conditioning system.

1.5.6.2 Personnel Training Requirements

Provide information available from the manufacturer that is needed for use in training designated personnel to properly operate and maintain the equipment and systems.

1.5.6.3 Testing Equipment and Special Tool Information

Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components.

1.5.6.4 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 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

Furnish the O&M data packages specified in individual technical sections. The required information for each O&M data package is as follows:

1.6.1 Data Package 1 for architectural items requiring simple but specific maintenance and replacement.

a. Safety precautions

b. Maintenance and repair procedures

c. Warranty information

d. Contractor information

e. Spare parts and supply list

1.6.2 Data Package 2 for items with motors and a sequence of operation.

a. Safety precautions

b. Normal operations

c. Environmental conditions

d. Lubrication data

e. Preventive maintenance plan and schedule

f. Maintenance and repair procedures

g. Removal and replacement instructions

h. Spare parts and supply list

i. Parts identification

j. Warranty information

k. Contractor information

1.6.3 Data Package 3 for complex equipment having specific troubleshooting sequence but not requiring an operator on watch.

a. Safety precautions

b. Normal operations

c. Emergency operations

d. Environmental conditions

e. Lubrication data

f. Preventive maintenance plan and schedule

g. Troubleshooting guides and diagnostic techniques

h. Wiring diagrams and control diagrams

i. Maintenance and repair procedures

j. Removal and replacement instructions

k. Spare parts and supply list

l. Parts identification

m. Warranty information

n. Testing equipment and special tool information

o. Contractor information

1.6.4 Data Package 4 for an extremely complex piece of equipment, having an extensive sequence of operation, a complex troubleshooting sequence and one requiring frequent operator attention.

a. Safety precautions

b. Operator prestart

c. Startup, shutdown, and post-shutdown procedures

d. Normal operations

e. Emergency operations

f. Operator service requirements

g. Environmental conditions

h. Lubrication data

i. Preventive maintenance plan and schedule

j. Troubleshooting guides and diagnostic techniques

k. Wiring diagrams and control diagrams

l. Maintenance and repair procedures

m. Removal and replacement instructions

n. Spare parts and supply list

o. Corrective maintenance man-hours

p. Parts identification

q. Warranty information

r. Personnel training requirements

s. Testing equipment and special tool information

t. Contractor information

1.6.5 Data Package 5 for electrical equipment, components or systems on which, wiring and control diagrams are needed for operation, maintenance or repair.

a. Safety precautions

b. Operator prestart

c. Start-up, shutdown, and post-shutdown procedures

d. Normal operations

e. Environmental conditions

f. Preventive maintenance plan and schedule

g. Troubleshooting guides and diagnostic techniques

h. Wiring and control diagrams

i. Maintenance and repair procedures

j. Spare parts and supply list

k. Testing equipments and special tools

l. Warranty information

m. Contractor information

1.7 FINAL CLEANING

The premises shall be left broom clean. Stains, foreign substances, and temporary labels shall be removed from surfaces. Carpet and soft surfaces shall be vacuumed. Equipment and fixtures shall be cleaned to a sanitary condition. Filters of operating equipment shall be replaced. Debris shall be removed from roofs, drainage systems, gutters, and downspouts. Paved areas shall be swept and landscaped areas shall be raked clean. The site shall have waste, surplus materials, and rubbish removed. The project area shall have temporary structures, barricades, project signs, and construction facilities removed. A list of completed clean-up items shall be submitted on the day of final inspection.

1.8 PROJECT START-UP

Place the completed Project, equipment and systems into initial operation. The schedule and sequence of the initial operation procedures shall be included in the Construction Progress Schedule. Coordinate the initial operation procedures with other contractors and the Depot's operating personnel.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

SECTION 02220

DEMOLITION

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 A10.6	(1990; R 1998) Safety Requirements for Demolition Operations

PENNSYLVANIA CODE (PA CODE)

25 PA Code	Subpart 123.1 Prohibition of Certain Fugitive Emissions

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

40 CFR 122	EPA Administered Permit Programs: The National Pollutant Discharge Elimination System

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2003) Safety -- Safety and Health Requirements

U.S. DEFENSE LOGISTICS AGENCY (DLA)

DLA 4145.25 (June 2000)	Storage and Handling of Liquefied and Gaseous Compressed Gases and Their Full and Empty Cylinders

U.S. DEPARTMENT OF DEFENSE (DOD)

DOD 4000.25-1-M	(2000) Requisitioning and Issue Procedures
MIL-STD-129 (Rev P)	Military Marking for Shipment and Storage

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

40 CFR 61	SUBPART M National Emission Standard for Asbestos
40 CFR 122	EPA Administered Permit Programs: The National Pollutant Discharge Elimination System
49 CFR 173.301	Shipment of Compressed Gases in Cylinders and Spherical Pressure Vessels

1.2 RELATED SECTIONS

Section 01525: SAFETY AND OCCUPATIONAL HEALTH REQUIREMENTS.

1.3 GENERAL REQUIREMENTS

Do not begin demolition until authorization is received from the Contracting Officer. The work includes demolition, salvage of identified items and materials, and removal of resulting rubbish and debris. Remove rubbish and debris from Government property daily, unless otherwise directed. Materials that cannot be removed daily shall be stored in areas specified by the Contracting Officer. In the interest of occupational safety and health, perform the work in accordance with EM 385-1-1, Section 23, Demolition, Section 01525 SAFETY AND OCCUPATIONAL HEALTH REQUIREMENTS and other applicable Sections.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Demolition plan; G
Notifications

Proposed salvage, demolition and removal procedures for approval before work are started.

SD-11 Closeout Submittals

Bills of Laden

Receipts or bills of laden, as specified.

1.5 DEMOLITION PLAN

Prior to commencing demolition, submit plan for work implementation to include, but not limited to, demolition, removal, salvage, disposal and protection in accordance with all regulatory and safety requirements of this section and Section 01525, SAFETY AND OCCUPATIONAL HEALTH REQUIREMENTS.

1.6 REGULATORY AND SAFETY REQUIREMENTS

Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," conform to the safety requirements contained in ANSI A10.6.

1.6.1 Notifications

1.6.1.1 General Requirements

Furnish timely notification of demolition and renovation projects to Federal, State, regional, and local authorities in accordance with 40 CFR 61-SUBPART M. Notify the Contracting Officer in writing 5 working days prior to the commencement of work in accordance with 40 CFR 61 SUBPART M.

1.7 DUST AND DEBRIS CONTROL

Prevent the spread of dust and debris to occupied portions of the building or anywhere off of the project site and avoid the creation of a nuisance or hazard in the surrounding area to include "outside the fence" as specified in

25 PA Code, Subpart 123.1 and 25 Pa Code, Subpart 123.2. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution and direct discharges to storm water (See 40 CFR 122). Vacuum and dust the work area daily. Sweep pavements as often as necessary to control the spread of debris and mud/dirt.

1.8 PROTECTION

1.8.1 Traffic Control

Where pedestrian and/or vehicular traffic will be impacted during nights and weekends, the Contractor shall provide barricades with flashing lights and plastic mesh fencing on supports a maximum of 8'-0" o.c. Anchor barricades in a manner to prevent displacement.

Flagmen shall be used during all daylight hours of construction/demolition work that affects existing traffic patterns.

1.8.2 Existing Work

Before beginning any demolition work, survey the site and examine the drawings and specifications to determine the extent of the work. Record existing work in the presence of the Contracting Officer showing the condition of structures and other facilities adjacent to areas of alteration or removal. When required by the COR, photographs sized 4 inch will be submitted as a record of existing conditions. Include in the record the elevation of the top of foundation walls, the location and extent of cracks and other damage and description of surface conditions that exist prior to starting work.

1.8.3 Items to Remain in Place

Take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government. Repair or replace damaged items as approved by the Contracting Officer. Coordinate the work of this section with all other work indicated. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements or pavements to remain. Provide new supports and reinforcement for existing construction weakened by demolition or removal work. Repairs, reinforcement, or structural replacement require approval by the Contracting Officer prior to performing such work.

1.8.4 Existing Construction

Do not disturb existing construction beyond the extent indicated or necessary for installation of new construction. Provide temporary shoring and bracing for support of building components to prevent settlement or other movement. Provide protective measures to control accumulation and migration of dust and dirt in all work areas. Remove dust, dirt, and debris from work areas daily.

1.8.5 Weather Protection

For portions of the building to remain, protect building interior and materials and equipment from the weather at all times. Where removal of existing roofing is necessary to accomplish work, have materials and workmen ready to provide adequate and temporary covering of exposed areas.

1.8.6 Trees

Protect trees within the project site which might be damaged during demolition, and which is indicated to be left in place, by a 6 foot high fence. Erect and secure fence a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Replace any tree designated to remain that is damaged during the work under this contract with like-kind or as approved by the Contracting Officer.

1.8.7 Utility Service

As applicable to each project, maintain existing utilities indicated to stay in service and protect against damage during demolition operations.

1.8.8 Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities. Notify Contracting Officer 5 working days prior to disconnection/removal of existing utilities to allow for necessary coordination. Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, must remain standing without additional bracing, shoring, or lateral support until demolished, unless directed otherwise by the Contracting Officer. Ensure that no elements determined to be unstable are left unsupported and place and secure bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

1.8.9 Protection of Personnel

Before, during and after the demolition work the Contractor shall continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the demolition site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

1.9 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

1.10 RELOCATIONS

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

1.11 DEMOLITION PLAN

The Demolition plan shall include, as applicable, procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a disconnection schedule of utility services,

and, a detailed description of methods and equipment to be used for each operation and of the sequence of operations. Include, as applicable, statements affirming Contractor inspection of the existing roof deck and its suitability to perform as a safe working platform or if inspection reveals a safety hazard to workers. State provisions for securing the safety of the workers throughout the performance of the work. Provide procedures for safe conduct of the work in accordance with EM 385-1-1.

1.12 ENVIRONMENTAL PROTECTION

Comply with the Environmental Protection Agency requirements specified.

1.13 USE OF EXPLOSIVES

Use of explosives will not be permitted.

1.14 AVAILABILITY OF WORK AREAS

The project documents will specify the availability of individual work areas, as applicable, if the project is to be performed in phases.

PART 2 PRODUCTS

2.1 FILL MATERIAL

Comply with excavating, backfilling, and compacting procedures for soils used as backfill material to fill basements, voids, depressions or excavations resulting from demolition of structures. Fill material shall be as specified in Section 02221 TRENCHING, BACKFILLING, AND COMPACTION.

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

3.1.1 Structures

a. Where structures are to be removed and not replaced, remove existing structure(s) indicated to bottom of footer or pier. Interior walls shall be fully removed. Basement slabs shall be removed. Sidewalks, curbs, gutters and street light bases shall be removed as indicated.

b. Where structures are to removed and replaced, existing structure shall be removed as required to allow proper construction of new structure and with no visible evidence of demolished structure.

c. Demolish structures in a systematic manner from the top of the structure to the ground. Complete demolition work above each tier or floor before the supporting members on the lower level are disturbed. Demolish concrete and masonry walls in small sections. Remove structural framing members and lower to ground by means of derricks, platforms hoists, or other suitable methods as approved by the Contracting Officer.

d. Locate demolition equipment throughout the structure and remove materials so as to not impose excessive loads to supporting walls, floors, or framing.

3.1.2 Utilities and Related Equipment

3.1.2.1 General Requirements

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the Contracting Officer. Do not interrupt existing utilities serving facilities occupied and used by the Government except when approved in writing and then only after temporary utility services have been approved and provided. Do not begin demolition work until all utility disconnections have been made. Shut off and cap utilities for future use, as indicated. Do not begin demolition until all hazardous materials have been removed. This includes, but is not limited to, asbestos containing materials, mercury lamps, light ballasts, and mercury thermostats.

3.1.2.2 Disconnecting Existing Utilities

Remove existing utilities, as indicated and as may be uncovered by work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Contracting Officer. When utility lines are encountered that are not indicated on the drawings, the Contracting Officer shall be notified prior to further work in that area. Remove meters and related equipment and deliver to a location on the post in accordance with instructions of the Contracting Officer.

3.1.3 Paving, Curbing and Slabs

Remove concrete and asphaltic concrete paving, curbing and slabs including aggregate base as indicated to the depth required for the installation of new surface including properly compacted bedding material. Provide neat saw cuts at limits of pavement removal as indicated.

3.1.4 Roofing

a. As applicable, remove existing roof system and associated components in their entirety down to existing roof deck.

b. Remove built-up or single-ply roofing to effect the connections with new flashing or roofing.

c. Remove gravel surfacing from existing roofing felts for a minimum distance of 18 inches back from the cut. Remove gravel without damaging felts.

d. Cut existing felts, membrane, and/or insulation along straight lines.

e. Remove roofing system and insulation without damaging the roof deck. Sequence work to minimize building exposure between demolition and new roof materials installation.

3.1.4.1 Temporary Roofing

Install temporary roofing and flashing as necessary to maintain a watertight condition throughout the course of the work. Remove temporary work prior to installation of permanent roof system materials unless approved otherwise by the Contracting Officer. Make provisions for worker safety during demolition and installation of new materials as described in paragraphs entitled "Statements" and "Regulatory and Safety Requirements." The Contractor is

responsible for determining the integrity of the existing roof to support foot traffic and construction loads.

3.1.4.2 Reroofing

When removing the existing roofing system from the roof deck, remove only as much roofing as can be recovered by the end of the work day, unless approved otherwise by the Contracting Officer. Do not attempt to open the roof covering system in threatening weather. Reseal all openings prior to suspension of work the same day.

3.1.5 Masonry

Saw cut and remove masonry so as to prevent damage to surfaces to remain and to facilitate the installation of new work. Where new masonry adjoins existing, the new work shall abut or tie into the existing construction as specified for the new work. Provide square, straight edges and corners where existing masonry adjoins new work and other locations.

3.1.6 Concrete

Saw concrete along straight lines to a depth of a minimum 2 inch. Make each cut in walls perpendicular to the face and in alignment with the cut in the opposite face. Break out the remainder of the concrete provided that the broken area is concealed in the finished work, and the remaining concrete is sound. At locations where the broken face cannot be concealed, grind smooth or saw cut entirely through the concrete.

3.1.7 Patching

Where removals leave holes and damaged surfaces exposed in the finished work, patch and repair these holes and damaged surfaces to match adjacent finished surfaces. Where new work is to be applied to existing surfaces, perform removals and patching in a manner to produce surfaces suitable for receiving new work. Finished surfaces of patched area shall be flush with the adjacent existing surface and shall match the existing adjacent surface as closely as possible as to texture and finish. Patching shall be as specified and indicated, and shall include:

a. Concrete and Masonry: Completely fill holes and depressions, caused by previous physical damage or left as a result of removals in existing masonry walls to remain, with an approved masonry patching material, applied in accordance with the manufacturer's printed instructions.

b. Where existing partitions have been removed leaving damaged or missing resilient tile flooring, patch to match the existing floor tile or finish.

c. Patch acoustic lay-in ceiling where partitions have been removed. The transition between the different ceiling heights shall be effected by continuing the higher ceiling level over to the first runner on the lower ceiling and closing the vertical opening with a painted sheet metal strip.

3.1.8 Air Conditioning Equipment

Air conditioning equipment and associated refrigerants shall be removed by the Contractor or the Government as indicated on the drawings. Recover all refrigerants prior to removing air conditioning equipment unless otherwise

indicated. Equipment shall be turned over to the Government or become property of the Contractor which ever is specified in the drawings.

3.1.9 Cylinders and Canisters

Remove all fire suppression system cylinders and canisters and turn over to the Government in accordance with the paragraph entitled "Disposal of Ozone Depleting Substance (ODS)" or they become the property of the Contractor which ever is specified on the drawings.

3.1.10 Mechanical Equipment and Fixtures

3.1.10.1 Ducts

Classify removed duct work as scrap metal.

3.2 CONCURRENT EARTH-MOVING OPERATIONS

Do not begin excavation, filling, and other earth-moving operations that are sequential to demolition work in areas occupied by structures to be demolished until all demolition in the area has been completed and debris removed. Holes, open basements and other hazardous openings shall be filled.

3.3 DISPOSITION OF MATERIAL

3.3.1 Title to Materials

Except for salvaged items specified by the Government prior to demolition, and for materials or equipment scheduled for salvage, all materials and equipment removed and not reused or salvaged, shall become the property of the Contractor and shall be removed from Government property. Title to materials resulting from demolition, and materials and equipment to be removed, is vested in the Contractor upon approval by the Contracting Officer of the Contractor's demolition and removal procedures, and authorization by the Contracting Officer to begin demolition. The Government will not be responsible for the condition or loss of, or damage to, such property after contract award. Materials and equipment shall not be viewed by prospective purchasers or sold on the site.

3.3.2 Reuse of Materials and Equipment

Remove and store materials and equipment indicated to be reused or relocated to prevent damage, and reinstall as the work progresses.

3.3.3 Salvaged Materials and Equipment

Remove materials and equipment that are indicated to be removed by the Contractor and that are to remain the property of the Government, and deliver to a storage site on the Depot, as directed within 2 miles of the work site.

a. Salvage items and material to the maximum extent possible.

b. Material salvaged for the Contractor shall be stored as approved by the Contracting Officer and shall be removed from Government property before completion of the contract. Material salvaged for the Contractor shall not be sold on the site.

c. Salvaged items to remain the property of the Government shall be removed in a manner to prevent damage, and packed or crated to protect the items from damage while in storage or during shipment. Items

damaged during removal or storage shall be repaired or replaced to match existing items. Containers shall be properly identified as to contents.

d. Historical items shall be removed in a manner to prevent damage. The following historical items shall be delivered to the Government for disposition: Corner stones, contents of corner stones, and document boxes wherever located on the site. All historical items to be delivered to the Government shall be indicated on the Project Documents.

e. Capture all Class I and Class II ODS refrigerants in accordance with the Clean Air Act Amendment of 1990, and dispose of or turn in to the Government as directed by the COR. The Government will dispose of Class I and Class II ODS refrigerants as required by 40 CFR 82.

3.3.4 Disposal of Ozone Depleting Substance (ODS)

Class I and Class II ODS are defined in Section, 602(a) and (b), of The Clean Air Act. Prevent discharge of Class I and Class II ODS to the atmosphere. Place recovered ODS in cylinders meeting ARI Guideline K suitable for the type ODS (filled to no more than 80 percent capacity) and provide appropriate labeling. Recovered ODS shall become property of the contractor. Products, equipment and appliances containing ODS in a sealed self-contained system (e.g. residential refrigerators and window air conditioners) shall be turned over to the Government for disposal in accordance with 40 CFR 82 or become property of the Contractor which ever is specified on the drawings.

3.3.4.1 Special Instructions

No more than one type of ODS is permitted in each container. A warning/hazardous label shall be applied to the containers in accordance with Department of Transportation regulations. All cylinders including but not limited to fire extinguishers, spheres, or canisters containing an ODS shall have a tag with the following information:

a. Activity name and unit identification code

b. Activity point of contact and phone number

c. Type of ODS and pounds of ODS contained

3.3.4.2 Fire Suppression Containers

Fire suppression system cylinders and canisters with electrical charges or initiators shall be deactivated prior to turn over to the Government. Also, safety caps shall be used to cover exposed actuation mechanisms and discharge ports on these special cylinders.

3.3.5 Transportation Guidance

Transport of all ODS containers shall be in accordance with MIL-STD-129, DLA 4145.25, Army Regulation 700-68, 49 CFR 173.301, and DOD 4000.25-1-M.

3.3.6 Unsalvageable Material

Concrete, masonry, and other noncombustible material, except concrete permitted to remain in place, shall be disposed of off site, by the Contractor.

3.4 CLEANUP

Debris and rubbish shall be removed from basement and similar excavations. Debris shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Apply local regulations regarding hauling and disposal.

3.5 DISPOSAL OF REMOVED MATERIALS

3.5.1 Special Conditions

Dispose of debris, rubbish, scrap, and other non-salvageable materials resulting from removal operations with all applicable federal, state and local regulations off site. Removed materials shall not be stored on the project site. Obtain bills of laden and track weight of all materials that are recycled as well as all materials that are land filled and turn over to the Government as a part of close-out submittals.

3.5.2 Burning on Government Property

Burning of materials removed from demolished structures will not be permitted on Government property in accordance with 25 PA Code, Subpart 123.1 and 25 PA Code, and Subpart 123.2.

3.5.3 Removal from Government Property

Transport of waste materials removed from demolished structures, except waste soil, from Government property for legal disposal. Dispose of waste soil off depot unless directed otherwise.

3.6 REUSE OF SALVAGED ITEMS

Recondition salvaged materials and equipment designated for reuse before installation. Replace items damaged during removal and salvage operations or restore them as necessary to usable condition.

-- End of Section--

SECTION 02230

EXCAVATION, BACKFILLING AND COMPACTION FOR PAVEMENTS

PART 1 GENERAL

1.1 SUMMARY

The work specified in this Section consists of subgrade preparation including preparing the soil on or over which additional materials will be placed.

1.2 RELATED SECTIONS

Section 02300: Earthwork.

Section 02500: Paving and Surfacing.

Section 03300: Cast-In-Place Structural Concrete.

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 basic design only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 698	Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb (2.49-kg) Rammer and 12-in. (304.8 mm) Drop
ASTM D 1556	Test Method for Density of Soil in Place by the Sand-Cone Method
ASTM D 2167	Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2922	Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3665	Standard Practice for Random Sampling of Construction Materials

COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION (PDT)

The PDT Sections noted herein refer to sections contained in the Commonwealth of PDT Specifications Publication 408, as supplemented. The payment provisions do <u>not</u> apply to work to be performed under this Specifications Section.

Section 703.2 Coarse Aggregate

Section 210 Subgrade

1.4 SUBMITTALS

Government Approval is required for submittals with a “G” designation; submittals not having a “G” designation are for Contractor Quality Control Approval. The followings shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES.

SD-06 Test Reports

Aggregate Material Tests; G

Submit testing laboratory aggregate test reports based on requirements stated under Quality Assurance Article.

Compaction Density Test Reports; G

Compaction density test reports based on method of density determination as specified in Reference Standards and the method as approved by the Contracting Officer.

SD-07 Certificates

Aggregate Certificates; G

Submit to the Contracting Officer’s Field Office a certificate from the aggregate supplier certifying material quality conformity to the requirements stated in the Quality Assurance Article.

1.5 QUALITY ASSURANCE

1.5.1 Laboratory Tests

As a condition of the Contract Documents, the specified aggregate materials shall require advance examination or testing according to methods referenced. Or as required by the Contracting Officer.

Arrange for the testing laboratory to furnish both Contracting Officer and Contractor two copies of test result reports. The same reports will be considered as sufficient evidence to serve as the basis for acceptance or rejection of materials represented.

1.5.2 Aggregate Material Tests

Conduct aggregate quality tests in accordance with the requirements of appropriate Referenced Standard for such materials.

The Contracting Officer reserves the right to accept aggregate materials based on current certification from supplier that the aggregate originates from a source approved by PennDOT (PDT) and that the aggregate complies with specified PennDOT requirements.

1.6 SITE CONDITIONS

1.6.1 Classification of Excavated Materials

No consideration will be given to the nature of materials encountered in site grading operations. Therefore, as unclassified excavation, no additional payment will be made for difficulties occurring in excavating and handling of materials.

1.6.2 Environmental Requirements

Do not perform roadway excavation, backfilling, grading and compaction when soil or weather conditions are unsuitable. Unsuitable conditions include moisture saturated or frozen in place soil and precipitation present on the soil or occurring during the Work.

a. Exercise the necessary means and methods to control dust on the site as well as in the off site work areas where excavation and grading are required.
b. Do not leave the site in a dust producing condition following the work of this Section. Employ a watering schedule to control the dust as required.
c. Do not use frozen material in performing the work or place materials on frozen surfaces.
d. When it is necessary to haul soft or wet soil material over roadways, use suitably tight vehicles to prevent spillage. Clean-up spillage of materials on roadways as caused by hauling with no additional compensation paid.
e. Plan work so as to provide adequate protection during storms with provisions available for preventing flood damage.

1.6.3 Protection

The Contractor shall assume the risks attending the presence or proximity of overhead or underground public utility and private lines, pipes, conduits and support work for same, also existing structures and property of whatever nature, in or over excavations or adjacent to such excavations.

1.6.3.1 Restitution

Complete responsibility for replacement and restitution work of whatever nature to the above stated utilities and such, as damaged or destroyed by work of this Section, rests solely with the Contractor and no additional compensation will be paid.

1.6.3.2 Temporary Protective Construction

Erect and maintain without expense to the Contracting Officer, substantial barricades to exclude pedestrians or vehicles.

1.6.4 Borrow Excavation

When the required quantity of earth fill material exceeds the quantity of suitable on site fill material, provide borrow excavation at no increase in Contract Price.

a. If borrow excavation is needed, notify the Contracting Officer sufficiently in advance to permit the Contracting Officer to verify such need and to view the proposed borrow pit to determine the material suitability.

b. Borrow excavation from outside sources shall be suitable in every respect and will be subject to the Contracting Officer's approval, whose written consent shall be obtained prior to its use.

1.6.5 Unsuitable and Excess Materials

No right of property in materials is granted the Contractor of excess on site materials prior to completion of Site Work. This provision does not relieve the Contractor of his responsibility to remove and dispose of surplus excavated materials.

a. Unsuitable material such as sod, stumps and spongy soil as well as excess rock shall become the property of the Contractor and disposed of in a lawful manner off-site.

1.6.6 Accommodation of Traffic

Do not obstruct other areas not delineated for work, unless the Contracting Officer allows the partial closing of specified areas as determined by the Contracting Officer.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 On-Site Fill

On-site excavated soil or soil-rock mixed materials free of topsoil, vegetation, lumber, metal, and refuse; and free of rock or similar hard objects larger than six inches in greatest dimension. Rock to soil ratio shall not exceed one part rock to three parts soil.

2.1.2 Coarse Aggregate Select Fill

a. PA DOT No. 2A Coarse Aggregate: Aggregate material conforming to PDT Section 703.2 for PennDOT Number 2A.

2.1.3 Flowable Backfill

Flowable backfill in accordance with the requirements of Section 03370, FLOWABLE BACKFILL.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Erosion Control

Implement erosion control measures during performance of work of this Section. Erosion Control as specified in Section 02270.

3.2 CONSTRUCTION

3.2.1 Removing Obstructions

Where rock is encountered at proposed subgrade elevations, remove such for a depth of six inches below proposed subgrade.

3.2.2 Embankment Construction

Construct embankments in accordance with the following paragraphs.

3.2.2.1 Embankment Foundation

Remove existing embankment foundation material when determined unsatisfactory by the Contracting Officer. Refill such areas to original elevation in the same manner specified for formation of embankment. Payment for this additional work will be made by increasing the lump sum price bid in accordance with the general conditions.

a. Scarify embankment foundation surface where embankment three feet or more in height is to be placed. Scarify or otherwise loosen embankment foundation surface to a depth of six inches where embankment less than three feet in height is to be placed.
b. Existing embankment foundations having a slope steeper than four to one shall be plowed to provide embankment binding when required by the Contracting Officer. On steeper slopes the Contracting Officer may require the foundation to be cut into steps or berms.
c. Fill existing natural depressions or such other depressions resulting from the site work to the level of adjacent ground elevation in the same manner specified for formation of embankment prior to starting initial embankment layer.

3.2.3 Paved Area Excavation

Excavate or otherwise remove and satisfactorily dispose of materials located within the limits indicated on the Drawings for roadways.

a. Excavate to paved area subgrade depths required.

b. Excavate subgrade material determined unsatisfactory in the opinion of the Contracting Officer. Backfill such areas to required elevation with Coarse Aggregate Select Fill material.

3.2.4 Paved Area Grading

Shape subgrade of paved area, and also that of intersections, approaches, entrances and adjoining paved areas (if any), to no more than 0.10 foot above or below the elevations indicated on the Drawings.

a. Corrections: Correct subgrade irregularities exceeding previously specified limits to the Contracting Officer's satisfaction either by removing or adding material as required, followed by rolling until satisfactorily compacted.

3.2.5 Subgrade For Paving

Eliminate windrows resulting from grading operations. In addition, in order to minimize the infiltration of water, shape and seal the surface layer, by rolling with a smooth-wheeled roller, at the end of each workday.

a. Prepare the subgrade in accordance with the requirements of PDT Section 210, except compact the subgrade to not less than 95 percent of the maximum dry-weight density determined in accordance with ASTM D 698.
b. For each day's work, the in-place density of the subgrade will be determined at a minimum of three tests along each 100’ station of the baseline of construction. The in-place density will be determined in accordance with ASTM D 1556, D 2167, or D 2922.

3.3 FIELD QUALITY CONTROL

3.3.1 Subgrade Proof Rolling

After removal of topsoil and other overburden, proof roll the subgrade with six passes on a minimum 15-ton single axle pneumatic-tire roller, operated with tire pressures of not less than 90 psi. Operate the roller in a systematic manner to assure the same number of passes over all areas, and at speeds between 2.5 and 3.5 miles per hour.

a. Rutting or pumping shall indicate unsatisfactory material and such material shall require removal as directed by the Contracting Officer and replaced with PA DOT No. 2A Coarse Aggregate.
b. Perform proof rolling only when weather conditions permit. Do not proof roll wet or saturated subgrades. When materials are degraded by proof rolling a wet or saturated subgrade replace such materials as directed by the Contracting Officer with no additional compensation paid.
c. Notify the Contracting Officer two days prior to proof rolling. Perform proof rolling in the presence of the Contracting Officer.

3.3.2 Surface Tolerance

Check finished subgrade for smoothness and elevation in accordance with the following:

a. Use an approved template shaped to conform to the design requirement indicated on the Drawings for checking crown and contour of roadways.
b. Use an approved ten-foot straightedge to check for longitudinal irregularities in the subgrade.
c. Use string lines for controlling the finished elevation of subgrade. Maintain such lines until surface irregularities have been satisfactorily corrected.
d. The moisture content at which the maximum dry density of the Backfill is obtained with a given compactive effort shall be considered the optimum moisture content and determined according to ASTM D 698.
e. If a field test is run and indicates that compaction has not been achieved, then that test does not count toward the testing requirement.

3.4 TESTING

Contractor shall provide testing by an independent testing agency at no additional cost to the Government. Testing shall be performed by an approved commercial testing laboratory. Test Reports will be submitted to the Contracting Officer within 24 hours of the test.

-- END OF SECTION --

SECTION 02300

EARTHWORK

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 136 (1996) Sieve Analysis of Fine and Coarse Aggregates

ASTM D 422 (1963; R 1990) Particle Size Analysis of Soils

ASTM D 1140 (1992) Amount of Material in Soils Finer than the No. 200 (75- micrometer) Sieve

ASTM D 1556 (1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method

ASTM D 1557 (1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ftlb-ft/ft^3)(2,700 kN-m/ m^3)

ASTM D 2167 (1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method

ASTM D 2487 (1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)

ASTM D 2922 (1996) Density of Soil and Soil- Aggregate in Place by Nuclear Methods (Shallow Depth)

ASTM D 2937 (1994) Density of Soil in Place by the Drive-Cylinder Method

ASTM D 3017 (1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

ASTM D 4318 (1995a) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 530/F-93/004 (1993; Rev O; Updates I, II, IIA, IIB, and III) Test Methods for Evaluating Solid Waste (Vol IA, IB, IC, and II) (SW-846)

EPA 600/4-79/020 (1983) Methods for Chemical Analysis of Water and Wastes

Document No. 258-2182-773 (2004) Department of Environmental Protection Bureau of Land Recycling and Waste Management

1.2 RELATED SECTIONS

Section 02230: Excavation, Backfilling and Compaction for Pavements.

1.3 DEFINITIONS

1.3.1 Degree of Compaction

Degree of compaction required 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.

1.4 SUBMITTALS

Government Approval is required for submittals with a “G” designation; submittals not having a “G” designation are for Contractor Quality Control Approval. The followings shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES.

SD-01 Preconstruction Submittals

Dewatering Work Plan; G

Submit work plan for dewatering to the Contracting Officer for approval prior to commencing excavation.

Procedures for disposal of unused satisfactory and unsatisfactory materials; G

Proposed source(s) of on-site or off-site borrow material; G

Procedure and location for disposal of unused satisfactory and unsatisfactory materials. Proposed source of borrow material. Advance notice on the opening of excavation or borrow areas. Advance notice on shoulder construction for rigid pavements.

Commercial Testing Laboratory; G

Qualifications of the commercial testing laboratory or Contractor's testing facilities.

SD-06 Test Reports

On-site and Off-site borrow materials; G

Within 24 hours of conclusion of physical tests, 7 copies of test results, including calibration curves and results of calibration tests.

1.5 CLASSIFICATION OF EXCAVATION

Excavation shall be performed in accordance with the following designations and classifications. The project documents will specify the applicable classification of excavation.

1.5.1 Rock Excavation

Rock excavation shall include hammering, ripping, excavating, grading, and disposing of material classified as rock and shall include the satisfactory removal and disposal of boulders 1/2 cubic yard or more in volume; solid rock; and rock material that is in ledges, bedded deposits, and unstratified masses, which can be removed without systematic drilling and blasting. The removal of any concrete or masonry structures, except pavements, exceeding 1/2 cubic yard in volume that may be encountered in the work shall be included in this classification. If at any time during excavation, including excavation from borrow areas, the Contractor encounters material that may be classified as rock excavation, such material shall be uncovered and the Contracting Officer notified by the Contractor. The Contractor shall not proceed with the excavation of this material until the Contracting Officer has classified the materials as common excavation or rock excavation and has taken cross sections as required. Failure on the part of the Contractor to uncover such material, notify the Contracting Officer, and allow ample time for classification and cross sectioning of the undisturbed surface of such material will cause the forfeiture of the Contractor's right of claim to any classification or volume of material to be paid for other than that allowed by the Contracting Officer for the areas of work in which such deposits occur.

1.5.2 Common Excavation

Common excavation, also referred to as “Unclassified Excavation” shall include the satisfactory removal and disposal of all materials not classified as rock excavation.

1.6 DEWATERING

Keep excavations free from water during the performance of the work. Prior to commencing excavation submit a dewatering work plan for approval. The Plan must provide for the following:

a. Provide and operate dewatering equipment of sufficient capacity for dewatering the excavations.

b. Provide for the disposal of the water removed from excavations in such manner as not to cause injury to the public health, to public or private property, to the work of others, to the portion of the work completed or in progress, nor to cause an impediment to the use of streets, roads and highways.

c. Do not dispose of water in trenches by draining through completed portions of pipelines.

1.7 BLASTING

Blasting will not be permitted.

1.8 UTILIZATION OF EXCAVATED MATERIALS

Unsatisfactory materials removed from excavations shall be disposed of off Depot. Satisfactory material removed from excavations shall be used, insofar as practicable, in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes unless specified otherwise. No satisfactory excavated material shall be wasted without specific written authorization. Satisfactory material authorized to be wasted shall be disposed of in designated areas approved for surplus material

storage or designated waste areas as directed. Newly designated waste areas on Government-controlled land shall be cleared and grubbed before disposal of waste material thereon. Coarse rock from excavations shall be stockpiled and used for constructing slopes or embankments adjacent to streams, or sides and bottoms of channels and for protecting against erosion. No excavated material shall be disposed of 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.

1.9 DEPARTMENT OF ENVIRONMENTAL PROTECTION BUREAU OF LAND RECYCLING AND WASTE MANAGEMENT - CLEAN FILL POLICY

See Department of Environmental Protection Bureau of Land Recycling and Waste Management Document No. 258-2182-773.

1.9.1 Imported Fill

The contractor will perform environmental due diligence to determine whether imported fill is clean or regulated as specified in DEP Clean Fill Policy. The contractor will manage the fill following the guidelines of the policy including the furnishing of any certifications, testing or permits that may be required. Testing that may be required shall be included in the contractor's base bid.

1.9.2 Exported Fill

The contractor will perform environmental due diligence and testing to determine that the excavated material scheduled to be spoiled off site qualifies as clean fill under DEP Clean Fill Policy. Should materials be uncovered that are suspected of being other than clean fill, the contractor will immediately notify the owner. Testing requirements shall be included in the contractor's bid. If evidence of release of regulated substance is found, material shall be disposed of as regulated fill and will be paid for by Change Order.

PART 2 PRODUCTS

2.1 SOIL

2.1.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by ASTM D2487 as GW, GP, and SW and shall be free of trash, debris, roots or other organic matter. Satisfactory materials for grading shall be comprised of stones less than 8 inches, except for fill material for pavements and railroads which shall be comprised of stones less than 3 inches in any dimension.

2.1.2 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. The Contracting Officer shall be notified of any contaminated materials.

2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are non-plastic. Testing required for classifying materials shall be in accordance with ASTM D4318, ASTM C136, ASTM D422, and ASTM D1140.

2.1.4 Topsoil

Material suitable for topsoil obtained from offsite areas and excavations on-site as part of this contract. Topsoil shall consist of acceptable friable loam that is reasonably free of subsoil, clay lumps, brush, roots, weeds, other objectionable vegetation, stones, other foreign material larger than 2 inches in any dimension, litter, and/or other material unsuitable or harmful to plant growth. Topsoil shall contain not less than 2.0% nor more than 10.0% organic matter, as determined in accordance with AASHTO-T194. Provide topsoil meeting the following grading analysis:

Sieve	Min. Percent Passing
2″	100
No. 4	75
No. 10	60

PART 3 EXECUTION

3.1 STRIPPING AND STOCKPILING OF TOPSOIL

Where indicated or directed, topsoil shall be stripped to a depth of 4 inches. Remove stones and other foreign material 1 inch or larger in any dimension. Remove and dispose of unsuitable and surplus material off the installation. Topsoil shall be kept separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 1 inch in diameter, and other materials that would interfere with planting and maintenance operations.

3.2 GENERAL EXCAVATION

The Contractor shall perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Grading shall be in conformity with the typical sections shown and the tolerances specified in paragraph FINISHING. Satisfactory excavated materials shall be transported to and placed in fill or embankment within the limits of the work. Unsatisfactory materials encountered within the limits of the work shall be excavated below grade and replaced with satisfactory materials as directed. Such excavated material and the satisfactory material ordered as replacement shall be included in excavation. Surplus satisfactory excavated material not required for fill or embankment shall be disposed of off the installation. Unsatisfactory excavated material shall be disposed of off the installation. During construction, excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times. No excavated material shall be disposed of to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental of the completed work in any way.

3.2.1 Ditches, Gutters, and Channel Changes

Excavation of ditches, gutters, and channel changes shall be accomplished by cutting accurately to the cross sections, grades, and elevations shown. Ditches and gutters shall not be excavated below grades shown. Excessive open ditch or gutter excavation shall be backfilled with satisfactory, thoroughly compacted, material or with suitable stone or cobble to grades shown. Material excavated shall be disposed of as shown or as directed, except that in no case shall material be deposited less than 4 feet from the edge of a ditch. The Contractor shall maintain excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

3.2.2 Drainage Structures

Excavations shall be made to the lines, grades, and elevations shown, or as directed. Trenches and foundation pits shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Rock or other hard foundation material shall be cleaned of loose debris and cut to a firm, level, stepped, or serrated surface. Loose disintegrated rock and thin strata shall be removed. When concrete or masonry is to be placed in an excavated area, the bottom of the excavation shall not be disturbed. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed. Where pile foundations are to be used, the excavation of each pit shall be stopped at an elevation 1 foot above the base of the footing, as specified, before piles are driven.

3.3 SELECTION OF BORROW MATERIAL

Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Borrow material shall be obtained off the installation and shall meet specification standards established herein for satisfactory materials.

3.4 OPENING AND DRAINAGE OF EXCAVATION AND BORROW PITS

The Contractor shall notify the Contracting Officer sufficiently in advance of the opening of any excavation or borrow pit to permit elevations and measurements of the undisturbed ground surface to be taken. Except as otherwise permitted, borrow pits and other excavation areas shall be excavated providing adequate drainage. Overburden and other spoil material shall be transported and disposed of off the installation. The Contractor shall ensure that excavation of any area, operation of borrow pits, or dumping of spoil material results in minimum detrimental effects on natural environmental conditions.

3.5 GRADING AREAS

Where indicated, work will be divided into grading areas within which satisfactory excavated material shall be placed in embankments, fills, and required backfills. The Contractor shall not haul satisfactory material excavated in one grading area to another grading area except when so directed in writing.

3.6 BACKFILL

Backfill adjacent to any and all types of structures shall be placed and compacted 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.

Ground surface on which backfill is to be placed shall be prepared as specified in paragraph PREPARATION OF GROUND SURFACE FOR EMBANKMENTS. Compaction requirements for backfill materials shall also conform to the applicable portions of paragraphs PREPARATION OF GROUND SURFACE FOR EMBANKMENTS, EMBANKMENTS and SUBGRADE PREPARATION. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.7 PREPARATION OF GROUND SURFACE FOR EMBANKMENTS

3.7.1 General Requirements

Ground surface on which fill is to be placed shall be stripped of live, dead, or decayed vegetation, rubbish, debris, and other unsatisfactory material; plowed, disked, or otherwise broken up to a depth of 12 inches; pulverized; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. The prepared ground surface shall be scarified and moistened or aerated as required just prior to placement of embankment materials to assure adequate bond between embankment material and the prepared ground surface.

3.7.2 Frozen Material

Embankment shall not be placed on a foundation which contains frozen material, or which has been subjected to freeze- thaw action. This prohibition encompasses all foundation types, including the natural ground, all prepared subgrades (whether in an excavation or on an embankment) and all layers of previously placed and compacted earth fill which become the foundations for successive layers of earth fill. All material that freezes or has been subjected to freeze- thaw action during the construction work, or during periods of temporary shutdowns, such as, but not limited to, nights, holidays, weekends, winter shutdowns, or earthwork operations, shall be removed to a depth that is acceptable to the Contracting Officer and replaced with new material. Alternatively, the material will be thawed, dried, reworked, and re-compacted to the specified criteria before additional material is placed. The Contracting Officer will determine when placement of fill shall cease due to cold weather. The Contracting Officer may elect to use average daily air temperatures, and/ or physical observation of the soils for his determination. Embankment material shall not contain frozen clumps of soil, snow, or ice.

3.8 EMBANKMENTS

3.8.1 Earth Embankments

Earth embankments shall be constructed from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 3 inches. The material shall be placed in successive horizontal layers of loose material not more than 6 inches in depth. Each layer shall be spread uniformly on a soil surface that has been moistened or aerated as necessary, and scarified or otherwise broken up so that the fill will bond with the surface on which it is placed. After spreading, each layer shall be plowed, disked, or otherwise broken up; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials. Compaction requirements for the upper portion of

earth embankments forming subgrade for pavements shall be identical with those requirements specified in paragraph SUBGRADE PREPARATION. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.9 SUBGRADE PREPARATION

3.9.1 Construction

Subgrade shall be shaped to line, grade, and cross section, and compacted as specified. This operation shall include plowing, disking, and any moistening or aerating required to obtain specified compaction. Soft or otherwise unsatisfactory material shall be removed and replaced with satisfactory excavated material or other approved material as directed. Rock encountered in the cut section shall be excavated to a depth of 6 inches below finished grade for the subgrade. Low areas resulting from removal of unsatisfactory material or excavation of rock shall be brought up to required grade with satisfactory materials, and the entire subgrade shall be shaped to line, grade, and cross section and compacted as specified. The elevation of the finish subgrade shall not vary more than 0.05 foot from the established grade and cross section.

3.9.2 Compaction

Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel- wheeled rollers, vibratory compactors, or other approved equipment. Except for paved areas and railroads, each layer of the embankment shall be compacted to at least 90 percent of laboratory maximum density.

3.9.3 Subgrade for Pavements

Prepare subgrade for pavements in accordance with the requirements of Section 02230 EXCAVATION, BACKFILLING AND COMPACTION FOR PAVEMENTS.

3.10 FINISHING

The surface of excavations, embankments, and subgrades shall be finished to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. The degree of finish for graded areas shall be within 0.1 foot of the grades and elevations indicated except that the degree of finish for subgrades shall be specified in paragraph SUBGRADE PREPARATION. Gutters and ditches shall be finished in a manner that will result in effective drainage. The surface of areas to be turfed shall be finished to smoothness suitable for the application of turfing materials.

3.11 PLACEMENT OF TOPSOIL

On areas to receive topsoil, the compacted subgrade soil shall be scarified to a 2 inch depth for bonding of topsoil with subsoil. Topsoil then shall be spread evenly to a thickness of 4 inches and graded to the elevations and slopes shown. Topsoil shall not be spread when frozen or excessively wet or dry. Material required for topsoil in excess of that produced by excavation within the grading limits shall be obtained from offsite areas.

Any surplus of topsoil from excavations and grading shall be either removed from the Installation or stockpiled at a location on the installation identified by the Contracting Officer’s Representative site at no increase in contract price.

3.12 TESTING

Testing shall be performed by a commercial testing laboratory approved by the Government. Submit qualifications prior to commencing earthwork activities. Field in-place density shall be determined in accordance with ASTM D 1556, ASTM D 2167 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using only the sand cone method as described in ASTM D 1556. ASTM D 2922results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017; the calibration checks of both the density and moisture gauges shall be made 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, the material shall be removed, replaced and re-compacted to meet specification requirements. Tests on re-compacted areas shall be performed to determine conformance with specification requirements. Inspections and test results shall be certified by a registered professional civil engineer. These certifications shall 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.

3.12.1 Fill and Backfill Material Gradation

One test per excavation. Gradation of fill and backfill material shall be determined in accordance with ASTM C 136, ASTM D 422, or ASTM D 1140.

3.12.2 In-Place Densities

One test per every 100 cubic yards of excavation.

3.12.3 Check Tests on In- Place Densities

If ASTM D 2922 is used, in- place densities shall be checked by ASTM D 1556 as follows: One check test per 100 cubic yards of excavation.

3.12.4 Moisture Contents

In the stockpile, excavation, or borrow areas, a minimum of one test per day per type of material or source of material being placed during stable weather conditions shall be performed. During unstable weather, tests shall be made as dictated by local conditions and approved by the Contracting Officer.

3.12.5 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

3.12.6 Tolerance Tests for Subgrades

Continuous checks on the degree of finish specified in paragraph SUBGRADE PREPARATION shall be made during construction of the subgrades.

3.13 SUBGRADE AND EMBANKMENT PROTECTION

During construction, embankments and excavations shall be kept shaped and drained. Ditches and drains along subgrade shall be maintained to drain effectively at all times. The finished subgrade shall not be disturbed by traffic or other operation and shall be protected and maintained by the Contractor in a satisfactory condition until ballast, subbase, base, or pavement is placed. The storage or stockpiling of materials on the finished subgrade will not be permitted. No subbase, base course, ballast, or pavement shall be laid until the subgrade has been checked and approved, and in no case shall subbase, base, surfacing, pavement, or ballast be placed on a muddy, spongy, or frozen subgrade.

--End of Section--

SECTION 02500

PAVING AND SURFACING

PART 1 GENERAL

1.1 SUMMARY

The work specified in this Section consists of constructing bituminous concrete paving.

1.2 RELATED SECTIONS

Section 02230: Excavation, Backfilling and Compaction for Pavement

Section 03300: Cast-In-Place Structural Concrete.

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 basic design only.

ASTM INTERNATIONAL (ASTM)

ASTM D 979 (2001) Standard Practice for Sampling Bituminous Paving Mixtures

ASTM D 2950 (2005) Density of Bituminous Concrete in Place by Nuclear Methods

ASTM D 3666 (2005) Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

ASTM D 2922 Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION (PDT)

The PDT Sections noted herein refer to sections contained in the Commonwealth of PDT Specifications Publication 408, as supplemented. The payment provisions do <u>not</u> apply to work to be performed under this Specifications Section.

Section 210 Subgrade

Section 401 Bituminous Concrete Base Course

Section 403 Recycled Plant-Mixed Bituminous Concrete Courses

Section 420 Bituminous Wearing Course ID-2 and Bituminous Wearing Course ID-2, RPS

Section 460 Bituminous Tack Coat

Section 461 Bituminous Prime Coat

Section 470 Bituminous Seal Coat

Section 480 Bituminous Surface Treatment

Section 703 Aggregates

1.4 SUBMITTALS

Government Approval is required for submittals with a “G” designation; submittals not having a “G” designation are for Contractor Quality Control Approval. The followings shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES.

SD-01 Preconstruction Submittals

Testing Laboratory; G

Qualifications to perform tests required by this Section.

SD-02 Shop Drawings

Finish Grade Check Drawing Markup and Field Notes; G

SD-05 Design Data

Job Mix Formula; G

Submit a job-mix formula, within two (2) years of the intended date of placement, for approval by the Government prior to preparing and placing the bituminous mixture. Design mix using procedures contained in PennDOT Section 401. Job-mix formulas shall indicate physical properties of the mixes as shown by tests made by a commercial laboratory approved by the Contracting Officer, using materials identical to those to be provided on this project.

ID-2 Wearing Course; G
BCBC; G

Submit data to substantiate compliance with applicable PennDOT sections.

SD-06 Test Reports

In-Place Density Testing Report (All test locations, results and averages);G

In-Place Thickness Testing (All test locations and results);G

SD-07 Certificates

The Contractor shall submit material certificates from the supplier certifying material quality conformity to the requirements stated herein. The materials include, but not limited to, the following:

BCBC; G
ID-2 Wearing Course; G
AC-20; G
2A Coarse Aggregate Subbase; G

Qualifications to perform tests require in accordance with this section.

1.5 QUALITY ASSURANCE

1.5.1 Source Quality Control

Maintain the quality of work by using the products of a qualified bituminous concrete producer and qualified plant operating workmen.

Use products of a bituminous concrete bulk producer regularly engaged in production of hot-mix, hot-laid bituminous concrete conforming to the standards referenced herein.

Use materials conforming to the requirements of the Commonwealth of Pennsylvania Department of Transportation Specifications Publication 408, as supplemented.

1.5.2 Workmen Qualifications:

Provide at least one person thoroughly trained and experienced in the skills required and who readily understands the design and is completely familiar with the application of bituminous concrete paving work.

During progress of bituminous concrete paving work the trained person shall be present to direct the performance of work.

For actual finishing of bituminous concrete surfaces and operation of the equipment, use only personnel thoroughly trained and experienced in the skills required.

1.5.3 Field Quality Control

Employ a commercial laboratory approved by the Contracting Officer to perform testing. The laboratory used to perform all sampling and testing shall meet the requirements of ASTM D 3666. A certification signed by the manager of the laboratory stating that it meets these requirements or clearly listing all deficiencies shall be submitted to the Contracting Officer prior to the start of construction. The certification shall contain as a minimum:

a. Qualifications of personnel; laboratory manager, supervising technician, and testing technicians.
b. A listing of equipment to be used during field quality control testing.
c. A copy of the laboratory's quality control system.
d. Evidence of participation in the AASHTO Materials Reference Laboratory (AMRL) program.

1.5.3.1 Sampling and Testing

The Contractor shall perform all quality control sampling and testing applicable to these specifications and as set forth in the Quality Control Program. The testing program shall include, but shall not be limited to, tests for in-place density, grade and smoothness. A Quality Control Testing Plan shall be developed as part of the Quality Control Program. Perform the following sampling and testing:

1.5.3.1.1 In-Place Density

The Contractor shall conduct any necessary testing to ensure the specified density is achieved. A nuclear gauge shall be used to monitor pavement density in accordance with ASTM D 2950.

Maximum allowable deficiency at any point, excluding joints, shall not be more than 2 percent less than the specified density for any course. The average density of each course, excluding joints, shall be not less than the specified density. Joint densities shall not be more than 2 percent less than specified course densities and are not included when calculating average course densities. When the deficiency exceeds the specified tolerances, correct each such representative area or areas by removing the deficient pavement and replacing with new pavement.

a. Frequency of Testing

Take samples and tests at not less than frequency specified hereinafter; for each day's work as a minimum; each change in the mix or equipment; and as often as directed. Accomplish sampling in accordance with ASTM D 979.

For each 1,200 square feet of bituminous mixture placed, with a minimum of two (2) samples being required for any paved area. Determine the representative density by averaging the density of four (4) tests obtained as described above. If less than four tests are taken for small areas, the average density shall include all results obtained.

1.5.3.1.2 In-Place Thickness

Take field samples for thickness of the completed pavements. Furnish tools, labor and material for samples, and satisfactory replacement of pavement.

The maximum allowable deficiency at any point shall not be more than 1/4 inch less than the thickness for the indicated course. The results of thickness tests shall not be averaged. Where a deficiency exceeds the specified tolerances, correct each such representative area or areas by removing the deficient pavement and replacing with new pavement.

a. Frequency of Testing

Take samples and tests at not less than frequency specified hereinafter; for each day's work as a minimum; each change in the mix or equipment; and as often as directed. Accomplish sampling in accordance with ASTM D 979.

For each 2,400 square feet of bituminous mixture placed, with a minimum of one (1) sample being required for any paved area.

1.5.3.1.3 Smoothness

Straightedge test the compacted surface of binder, and wearing courses as work progresses. Apply straightedge parallel with and at right angles to the centerline after final rolling. Unevenness of binder courses shall not vary more than 1/4 inch in 10 feet; variations in the wearing course shall not vary more than 1/8 inch in 10 feet. Correct each portion of the pavement showing irregularities greater than that specified.

1.5.3.1.4 Finished Grades

Finish grades of each course placed shall not vary from the finish elevations, profiles, and cross sections indicated by more than 1/2 inch. Finished surface of the final wearing course will be tested by the Contracting Officer by running lines of levels at intervals of 25 feet longitudinally and transversely to determine elevations of completed pavement. Within 45 days after completion of final placement, perform a level

survey at the specified grid spacing and plot the results on a plan drawn to the same scale as the drawings. Elevations not in conformance with the specified tolerance shall be noted on the plan in an approved manner. The survey shall be performed by a registered land surveyor. The Contracting Officer will inform the Contractor in writing of paved areas that fail to meet the final grades indicated within the specified tolerances. Correct deficient paved areas by removing existing work and replacing with new materials that meet the specifications. Skin patching for correcting low areas is prohibited.

1.5.3.1.5 Finish Surface Texture of Wearing Course

Visually check final surface texture for uniformity and reasonable compactness and tightness. Final wearing course with a surface texture having undesirable irregularities such as segregation, cavities, pulls or tears, checking, excessive exposure of coarse aggregates, sand streaks, indentations, ripples, or lack of uniformity shall be removed and replaced with new materials.

1.6 PROJECT CONDITIONS

1.6.1 Environmental Requirements

1.6.1.1 Dust Control

Provide effective dust control by sprinkling water, by the use of calcium chloride, or by other methods as approved by the Contracting Officer. Use dust control measures where and when, and in a manner as required by the Contracting Officer.

1.6.1.2 Temperature Limitations

Terminate placement of bituminous concrete surface courses of permanent pavement based on temperature as described below.

Do not install aggregate courses when ambient temperature is below or is expected to fall below freezing.

Do not use aggregate containing frost nor place aggregate courses on frozen subgrade.

Do not place bituminous concrete surface courses of permanent pavement when the ambient temperature is 40 degrees F. or lower.

1.6.2 Protection

The Contractor shall assume responsibility for any injury or damage resulting from lack of required maintenance or repairs during Guarantee Period. The Contractor shall indemnify and save harmless the Owner and Contracting Officer from loss by reason of suit or action at law, based upon occurrence or omission occurring during this period.

Protect and maintain cut pavement edges until permanent replacement paving is placed.

Protect paved surfaces outside of the pavement removal limits. Repair pavement outside removal limits, as may be damaged by construction operations, at no increase in Contract Price.

Use such means as necessary to protect and maintain pavement materials before, during, and after installation to protect the installed work and materials of other trades.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Subbase

Composed of Coarse Aggregate Type C (or better) stone conforming to PDT Section 703.2, No. 2A aggregate.

2.1.2 Bituminous Material

2.1.2.1 Asphalt Cement

Class AC-20 conforming to PDT Bulletin 25.

2.1.2.2 Bituminous Tack Coat

Class E-1, E-6 or E-8 emulsified asphalt conforming to PDT Bulletin 25.

2.1.2.3 Bituminous Prime Coat

Conforming to bituminous material requirements of PDT Section 461.2(a).

2.1.3 Bituminous Pavement Materials

2.1.3.1 Bituminous Concrete Base Course

Hot mixed, hot laid, BCBC conforming to PDT Section 401.

2.1.3.2 Binder Course

Hot mixed, hot laid, Bituminous Binder Course ID-2 conforming to PDT Section 421, using asphalt cement.

2.1.3.3 Wearing Course

Hot mixed, hot laid, Bituminous Wearing Course ID-2: Conforming to PDT Section 420.

2.1.3.4 Bituminous Surface Treatment

Conforming to PDT Section 480.

2.2 PAVEMENT MIXES

2.2.1 Composition of Mixtures

Binder and wearing course mixture composition shall conform to the requirements of PDT Section 401.

2.2.2 Job Mix Formula

Establish a job-mix formula prior to beginning work, which shall not be changed during the progress of work without the Contracting Officer's approval. Job-mixing tolerances shall not be presumed to permit acceptance

of materials whose gradations fall outside the master ranges set in the specified PDT Sections.

The approved job-mix formula shall lie within the specification limits and be suitable for the layer thickness and other conditions prevailing. It shall not be changed after work has started without the approval of the Contracting Officer.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Subgrade Preparation

Just prior to subbase installation perform grading and finish rolling.

Perform subgrade preparation only after site grading, trenching, etc., have been completed and accepted by the Contracting Officer. Construct in accordance with provisions of Section 02230 EXCAVATION, BACKFILLING, AND COMPACTION FOR PAVEMENTS and PennDOT Section 210.

The moisture content of the subgrade material at the time of compaction shall not exceed two percentage points above the optimum moisture content.

Subgrade Over Trenches: Backfill and compact trenches as specified in Section 02221, TRENCHING, BACKFILLING AND COMPACTION.

3.1.2 Existing Pavement Interface

At joints between existing pavements and new paving work, sawcut and neatly trim the edges of all existing adjacent pavements in a manner subject to the Contracting Officer’s approval.

3.1.2.1 Joint Treatment

Provide an application of Class AC-20 petroleum asphalt cement at the locations where new bituminous paving joins existing bituminous paving and concrete curbs.

3.1.3 Subbase Construction

Install coarse aggregate Subbase in accordance with PDT Section 350. Install Subbase to after compaction thickness indicated on the Drawings.

3.2 PAVING INSTALLATION

3.2.1 General Requirements

Methods of preparing paving mixture, placing paving mixture, compaction, and protection of in-place bituminous concrete pavement shall comply with PDT Sections 305.3 and 401.3. The specified thicknesses are the compacted thicknesses.

Install surface course of replacement pavement with top surface flush with surface of adjacent pavement.

Install permanent replacement paving over areas where the paving has been removed.

3.2.2 Bituminous Concrete Base Course

Construct in accordance with the requirements of PDT Section 401.

3.2.3 Bituminous binder course FB-2(leveling course)

Construct in accordance with the requirements of PDT Section 431.

3.2.4 Bituminous Concrete Wearing Course

ID-2, construct in accordance with the requirements of PDT Section 420. Use Bituminous Tack Coat material to seal joints in wearing courses as specified in PDT Section 401.3(j)3.

3.2.5 Bituminous Surface Treatment

Construct in accordance with the requirements of PDT Section 480.

3.2.6 Joint Sealing

Where bituminous paving and concrete pad, curbs and aprons meet apply a sealing coat consisting of an application of Class AC-20 petroleum asphalt cement in accordance with PDT Section 401(j)3.

3.3 MAINTENANCE

3.3.1 Maintenance Period

Without an increase in Contract Price, maintain the work done under this Section for a period as stated in the Agreement after the date of the Owner's approval of the Substantial Completion Certificate issued by the Contracting Officer. Maintenance shall include the repair or removal and replacement of such work, which has failed, or wherever surface depressions have developed. Materials and methods used to repair or replace such work shall conform to the applicable requirements of this Section.

3.3.2 Maintenance by Owner

Should the Contractor fail to perform required maintenance or repairs within three days after receiving written notice from the Owner or Contracting Officer, the Owner may perform such maintenance or repairs and deduct the cost thereof from monies due or to become due the Contractor.

-- End of Section --

SECTION 02580

PAVEMENT MARKINGS

PART 1 GENERAL

1.1 SUMMARY

The work specified in this Section consists of providing pavement markings and striping.

1.2 RELATED SECTIONS

Section 02500: Paving and Surfacing

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 basic design only.

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION (PDT)

The PDT Sections noted herein refer to sections contained in the Commonwealth of PDT Specifications Publication 408, as supplemented. The payment provisions do not apply to work to be performed under this Specifications Section.

Section 962	Waterborne Pavement Markings
Section 960	Hot Thermoplastic Pavement Markings
Section 963	Pavement Marking Removal
Bulletin 15	Approved Construction Materials (Vendors)

1.4 SUBMITTALS

Government Approval is required for submittals with a “G” designation; submittals not having a “G” designation are for Contractor Quality Control Approval. The followings shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES.

SD-03 Product Data

Traffic Zone Paint; G
Thermoplastic Pavement Marking; G

Submit catalog cuts and other such data as required to provide complete descriptive information.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

Deliver material in factory-sealed containers plainly marked as follows

a. Manufacturers name and address
b. Location of plant
c. Material
d. Color of material
e. Amount of contents
f. Date of manufacture and lot number

1.6 JOB CONDITIONS

a. Environmental Requirements, Traffic zone paint

Apply only when ambient air temperature is above 41º F and temperature of surface to be painted is above 45º F unless otherwise directed by the Contracting Officer.

1.6.2 Paint Application Limitations

Adhere to manufacturer's data on air and surface temperature limits and relative humidity during application and curing of coatings.

a. Do not spray paint when wind velocity is above 15 mph.
b. Schedule painting work to avoid dust and airborne contaminants.
c. Apply paint during daylight hours only.

1.6.3 Paint Products Storage

Take necessary precautions to ensure safe storage and use of paint materials and the prompt and safe disposal of waste. Store paint products protected from weather when these products may be affected by freezing.

PART 2 PRODUCTS

2.1 TRAFFIC ZONE PAINT

a. Waterborne Traffic Paint with reflective glass beads in accordance with the requirements of PennDOT 408, Section 962. Provide materials from a source listed in PennDOT Bulletin 15.

b. Colors: Yellow, White and Blue as indicated herein or on the Standard Drawings.

2.2 THERMOPLASTIC PAVEMENT MARKING

a. Hot Thermoplastic striping material with reflective glass beads in accordance with the requirements of PennDOT 408, Section 960. Provide materials from a source listed in PennDOT Bulletin 15.

b. Colors: Yellow or white as indicated herein or on the Standard Drawings.

PART 3 EXECUTION

3.1 GENERAL

a. Layout of Work

Layout lane widths, parking spaces and crosswalks in accordance with regulations of jurisdictional authorities and as shown.

b. Width and Color of Lines for Pavement Striping

Apply lines for pavement striping as follows:

Width

i. Parking space markings: 4″
ii. Lane striping: 4″
iii. Solid crosswalk lines: 6″
iv. Solid stop lines: 18″

Color

i. White, except handicap parking and loading areas.
ii. Blue for handicap parking and loading areas.
iii. Yellow for center lines.

c. Allowable Tolerances

Traffic-zone paint

Width of lines not to vary from specified width by more than 0.10 inch in each 12 inches.

3.2 SURFACE PREPARATION

The Contracting Officer shall determine the need for cleaning prior to painting operation. Satisfactorily clean and dry the roadway surfaces. Blow or sweep free of loose dirt and other debris.

3.3 APPLICATION

a. Traffic Zone Paint

In accordance with the requirements of PennDOT Publication 408, Section 962.

b. Thermoplastic Material

In accordance with the requirements of PennDOT Publication 408, Section 960.

3.4 REMOVAL OF EXISTING PAVEMENT MARKINGS

a. Remove existing waterborne and thermoplastic pavement markings in accordance with the requirements of PennDOT Publication 408, Section 963.

-- End of Section --

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SECTION 03100

STRUCTURAL CONCRETE FORMWORK

PART 1 GENERAL

1.1 REFERENCES

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

ACI INTERNATIONAL (ACI)

ACI 347 (2001) Guide to Formwork for Concrete

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4 (1995) Basic Hardboard

ASTM INTERNATIONAL (ASTM)

ASTM C 578 (2003a) Rigid, Cellular Polystyrene Thermal Insulation

U.S. DEPARTMENT OF COMMERCE (DOC)

PS1 (1995) Construction and Industrial Plywood (APA V995)

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Formwork; G

Drawings showing details of formwork, including dimensions of fiber voids, joints, supports, studding and shoring, and sequence of form and shoring removal.

SD-03 Product Data

Form Materials

Manufacturer's data including literature describing form materials, accessories, and form releasing agents.

Fiber Voids; G

Fiber Void Retainers; G

Form Releasing Agents

Manufacturer's recommendation on method and rate of application of form releasing agents.

SD-05 Design Data

Form Analysis & Design Calculations; G

Design analysis and calculations for form design and methodology used in the design.

SD-07 Certificates

Fiber Voids

Certificates attesting that fiber voids conform to the specified requirements.

1.3 DESIGN

Formwork shall be designed in accordance with methodology of ACI 347 for anticipated loads, lateral pressures, and stresses. Forms shall be capable of producing a surface which meets the requirements of the class of finish specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. Forms shall be capable of withstanding the pressures resulting from placement and vibration of concrete.

1.4 STORAGE AND HANDLING

Fiber voids shall be stored above ground level in a dry location. Fiber voids shall be kept dry until installed and overlaid with concrete.

PART 2 PRODUCTS

2.1 FORM MATERIALS

2.1.1 Forms for Class A and Class B Finish

Forms for Class A and Class B finished surfaces shall be plywood panels conforming to PS1, Grade B-B concrete form panels, Class I or II. Other form materials or liners may be used provided the smoothness and appearance of concrete produced will be equivalent to that produced by the plywood concrete form panels. Forms for round columns shall be the prefabricated seamless type.

2.1.2 Forms for Class C Finish

Forms for Class C finished surfaces shall be shiplap lumber; plywood conforming to PS1, Grade B-B concrete form panels, Class I or II; tempered concrete form hardboard conforming to AHA A135.4; other approved concrete form material; or steel, except that steel lining on wood sheathing shall not be used. Forms for round columns may have one vertical seam.

2.1.3 Forms for Class D Finish

Forms for Class D finished surfaces, except where concrete is placed against earth, shall be wood or steel or other approved concrete form material.

2.1.4 Retain-In-Place Metal Forms

Retain-in-place metal forms for concrete slabs and roofs shall be as specified in Section 05310 STEEL DECKS.

2.1.5 Pan-Form Units

Pan-form units for one-way or two-way concrete joist and slab construction shall be factory-fabricated units of the approximate section indicated. Units shall consist of steel or molded fiberglass concrete form pans. Closure units shall be furnished as required.

2.1.6 Form Ties

Form ties shall be factory-fabricated metal ties, shall be of the removable or internal disconnecting or snap-off type, and shall be of a design that will not permit form deflection and will not spall concrete upon removal. Solid backing shall be provided for each tie. Except where removable tie rods are used, ties shall not leave holes in the concrete surface less than 1/4 inch nor more than 1 inch deep and not more than 1 inch in diameter. Removable tie rods shall be not more than 1-1/2 inches in diameter.

2.1.7 Form Releasing Agents

Form releasing agents shall be commercial formulations that will not bond with, stain or adversely affect concrete surfaces. Agents shall not impair subsequent treatment of concrete surfaces depending upon bond or adhesion nor impede the wetting of surfaces to be cured with water or curing compounds.

2.1.8 Fiber Voids

Fiber voids shall be the product of a reputable manufacturer regularly engaged in the commercial production of fiber voids. The voids shall be constructed of double faced, corrugated fiberboard. The corrugated fiberboard shall be fabricated of standard kraft paper liners, impregnated with paraffin, and laminated with moisture resistant adhesive, and shall have a board strength of 275 psi. Voids which are impregnated with paraffin after construction, in lieu of being constructed with paraffin impregnated fiberboard, are acceptable. Voids shall be designed to support not less than 1000 psf. To prevent separation during concrete placement fiber voids shall be assembled with steel or plastic banding at 4 feet on center maximum, or by adequate stapling or gluing as recommended by the manufacturer. Fiber voids placed under concrete slabs and that are 8 inches in depth may be heavy duty "waffle box" type, constructed of paraffin impregnated corrugated fiberboard.

2.2 FIBER VOID RETAINERS

2.2.1 Polystyrene Rigid Insulation

Polystyrene rigid insulation shall conform to ASTM C 578, Type V, VI, or VII, square edged. Size shall be 1-1/2 inches thick by 16 inches in height by 3 feet in length, unless otherwise indicated.

2.2.2 Precast Concrete

Precast concrete units shall have a compressive strength of not less than 2500 psi, reinforced with 6 inch by 6 inch by W1.4 WWF wire mesh, and 12 inches (height) by 3 feet (length) by 1-5/8 inches (thickness) in size unless indicated.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Formwork

Forms shall be mortar tight, properly aligned and adequately supported to produce concrete surfaces meeting the surface requirements specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE and conforming to construction tolerance given in TABLE 1. Where concrete surfaces are to have a Class A or Class B finish, joints in form panels shall be arranged as approved. Where forms for continuous surfaces are placed in successive units, the forms shall fit over the completed surface to obtain accurate alignment of the surface and to prevent leakage of mortar. Forms shall not be reused if there is any evidence of surface wear and tear or defects which would impair the quality of the surface. Surfaces of forms to be reused shall be cleaned of mortar from previous concreting and of all other foreign material before reuse. Form ties that are to be completely withdrawn shall be coated with a non-staining bond breaker.

3.1.2 Fiber Voids

Voids shall be placed on a smooth firm dry bed of suitable material, to avoid being displaced vertically, and shall be set tight, with no buckled cartons, in order that horizontal displacement cannot take place. Each section of void shall have its ends sealed by dipping in paraffin, with any additional cutting of voids at the jobsite to be field dipped in the same type of sealer, unless liners and flutes are completely impregnated with paraffin. Prior to placing reinforcement, the entire formed area for slabs shall be covered with a 4 x 8 feet minimum flat sheet of fiber void corrugated fiberboard. Joints shall be sealed with a moisture resistant tape having a minimum width of 3 inches. If voids are destroyed or damaged and are not capable of supporting the design load, they shall be replaced prior to placing of concrete.

3.1.3 Fiber Void Retainers

Fiber void retainers shall be installed, continuously, on both sides of fiber voids placed under grade beams in order to retain the cavity after the fiber voids biodegrade.

3.2 CHAMFERING

Except as otherwise shown, external corners that will be exposed shall be chamfered, beveled, or rounded by moldings placed in the forms.

3.3 COATING

Forms for Class A and Class B finished surfaces shall be coated with a form releasing agent before the form or reinforcement is placed in final position. The coating shall be used as recommended in the manufacturer's printed or written instructions. Forms for Class C and D finished surfaces may be wet with water in lieu of coating immediately before placing concrete, except that in cold weather with probable freezing temperatures, coating shall be mandatory. Surplus coating on form surfaces and coating on reinforcing steel and construction joints shall be removed before placing concrete.

3.4 REMOVAL OF FORMS

Forms shall be removed preventing injury to the concrete and ensuring the complete safety of the structure. Formwork for columns, walls, side of beams and other parts not supporting the weight of concrete may be removed when the concrete has attained sufficient strength to resist damage from the removal operation but not before at least 24 hours has elapsed since concrete placement. Supporting forms and shores shall not be removed from beams, floors and walls until the structural units are strong enough to carry their own weight and any other construction or natural loads. Supporting forms or shores shall not be removed before the concrete strength has reached 70 percent of design strength, as determined by field cured cylinders or other approved methods. This strength shall be demonstrated by job-cured test specimens, and by a structural analysis considering the proposed loads in relation to these test strengths and the strength of forming and shoring system. The job-cured test specimens for form removal purposes shall be provided in numbers as directed and shall be in addition to those required for concrete quality control. The specimens shall be removed from molds at the age of 24 hours and shall receive, insofar as possible, the same curing and protection as the structures they represent.

TABLE 1

TOLERANCES FOR FORMED SURFACES

1.	Variations from the plumb:	In any 10 feet of length ---------- 1/4 inch
	a. In the lines and surfaces of columns, piers, walls and in arises	Maximum for entire length ---------- 1 inch
	b. For exposed corner columns, control-joint grooves, and other conspicuous lines	In any 20 feet of length ---------- ---- 1/4 inch Maximum for entire length---------- 1/2 inch
2.	Variation from the level or from the grades indicated on the drawings:	In any 10 feet of length ----------1/4 inch In any bay or in any 20 feet of length---------- 3/8 inch
	a. In slab soffits, ceilings, beam soffits, and in arises, measured before removal of supporting shores	Maximum for entire length ---------- 3/4 inch
	b. In exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines	In any bay or in any 20 feet of length ---------- ----- 1/4 inch Maximum for entire length---------- 1/2 inch
3.	Variation of the linear building lines from established position in plan	In any 20 feet --------- 1/2 inch Maximum ----------1 inch
4.	Variation of distance between walls, columns, partitions	1/4 inch per 10 feet of distance, but not more than 1/2 inch in any one bay, and not more than 1 inch total variation

5.	Variation in the sizes and locations of sleeves, floor openings, and wall opening	Minus ---------- 1/4 inch Plus ---------- 1/2 inch
6.	Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls	Minus ---------- 1/4 inch Plus ---------- 1/2 inch
7.	Footings:	
	a. Variation of dimensions in plan	Minus ---------- 1/2 inch Plus ---------- 2 inches when formed or plus 3 inches when placed against unformed excavation
	b. Misplacement of eccentricity	2 percent of the footing width in the direction of misplacement but not more than 2 inches
	c. Reduction in thickness of specified thickness	Minus ---------- 5 percent
8.	Variation in steps:	Riser ---------- 1/8 inch
	a. In a flight of stairs	Tread ---------- 1/4 inch
	b. In consecutive steps	Riser ---------- 1/16 inch Tread ---------- 1/8 inch

-- End of Section --

SECTION 03150

EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS

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 111 (1983; R 2000) Inorganic Matter or Ash in Bituminous Materials

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4 (1995) Basic Hardboard

ASTM INTERNATIONAL (ASTM)

ASTM A 1011/A 1011M (2003a) Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High Strength Low-Alloy and High-Strength Low-Alloy With Improved Formability

ASTM A 109/A 109M (2003) Steel, Strip, Carbon (0.25 Maximum Percent), Cold-Rolled

ASTM A 167 (1999) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

ASTM A 480/A 480M (2003b) General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip

ASTM B 152/B 152M (2000) Copper Sheet, Strip, Plate, and Rolled Bar

ASTM B 370 (1998) Copper Sheet and Strip for Building Construction

ASTM C 919 (2002) Use of Sealants in Acoustical Applications

ASTM C 920 (2002) Elastomeric Joint Sealants

ASTM D 1751 (1999) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)

ASTM D 1752 (1984; R 1996e1) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

ASTM D 1854 (2002) Jet-Fuel-Resistant Concrete Joint Sealer, Hot-Applied Elastic Type

ASTM D 2628 (1991; R 1998) Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements

ASTM D 2835 (1989; R 1998) Lubricant for Installation of Preformed Compression Seals in Concrete Pavements

ASTM D 4 (1986; R 1998) Bitumen Content

ASTM D 412 (1998a; R 2002e1) Vulcanized Rubber and Thermoplastic Elastomers - Tension

ASTM D 471 (1998e1) Rubber Property - Effect of Liquids

ASTM D 5249 (1995; R 2000) Backer Material for Use with Cold-and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints

ASTM D 5329 (2004) Sealants and Fillers, Hot-Applied, for Joints and Cracks in Asphaltic and Portland Cement Concrete Pavements

ASTM D 6690 (2006) Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

ASTM D 6 (1995; R 2000e1) Loss on Heating of Oil and Asphaltic Compounds

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 513 (1974) Specifications for Rubber Waterstops

COE CRD-C 572 (1974) Specifications for Polyvinylchloride Waterstops

1.2 RELATED SECTIONS

1.2.1 Section 03300: Cast-In-Place Structural Concrete.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Waterstops; G

Shop drawings and fabrication drawings provided by the manufacturer or prepared by the Contractor.

SD-03 Product Data

Contraction Joint Strips; G
Preformed Expansion Joint Filler; G
Sealant; G
Waterstops; G

Manufacturer's literature, including safety data sheets. Manufacturer's recommended instructions for installing preformed fillers, field-molded sealants; preformed compression seals; and waterstops; and for splicing non-metallic waterstops.

SD-07 Certificates

Preformed Expansion Joint Filler; G
Sealant; G
Waterstops; G

Certificates of compliance stating that the joint filler and sealant materials and waterstops conform to the requirements specified.

1.4 DELIVERY AND STORAGE

Material delivered and placed in storage shall be stored off the ground and protected from moisture, dirt, and other contaminants. Sealants shall be delivered in the manufacturer's original unopened containers. Sealants whose shelf life has expired shall be removed from the site.

PART 2 PRODUCTS

2.1 CONTRACTION JOINT STRIPS

Contraction joint strips shall be 1/8 inch thick tempered hardboard conforming to AHA A135.4, Class 1. In lieu of hardboard strips, rigid polyvinylchloride (PVC) or high impact polystyrene (HIPS) insert strips specifically designed to induce controlled cracking in slabs on grade may be used. Such insert strips shall have removable top section.

2.2 PREFORMED EXPANSION JOINT FILLER

Expansion joint filler shall be preformed material conforming to ASTM D 1751or ASTM D 1752. Unless otherwise indicated, filler material shall be 3/8 inch thick and of a width applicable for the joint formed. Backer material, when required, shall conform to ASTM D 5249.

2.3 SEALANT

Joint sealant shall conform to the following:

2.3.1 Preformed Polychloroprene Elastomeric Type

ASTM D 2628.

2.3.2 Lubricant for Preformed Compression Seals

ASTM D 2835.

2.3.3 Hot-Poured Type

ASTM D 6690 tested in accordance with ASTM D 5329.

2.3.4 Field-Molded Type

ASTM C 920, Type M, Grade P or NS, Class 25, Use T for horizontal joints. Type M, Grade NS, Class 25, Use NT for vertical joints. Bond breaker material shall be polyethylene tape, coated paper, metal foil or similar type

materials. The back-up material shall be compressible, non-shrink, non-reactive with sealant, and non-absorptive material type such as extruded butyl or polychloroprene rubber.

2.3.5 Hot-Applied Jet-Fuel Resistant Type

ASTM D 1854 tested in accordance with ASTM D 5329.

2.4 WATERSTOPS

Intersection and change of direction waterstops shall be shop fabricated.

2.4.1 Flexible Metal

Copper waterstops shall conform to ASTM B 152/B 152M and ASTM B 370, O60 soft anneal temper and 20 oz mass per sq ft sheet thickness. Stainless steel waterstops shall conform to ASTM A 167 and ASTM A 480/A 480M, UNS S30453 (Type 304L), and 20 gauge thick strip.

2.4.2 Rigid Metal

Flat steel waterstops shall conform to ASTM A 109/A 109M, No. 2 (half hard) temper, No. 2 edge, No. 1 (matte or dull) finish or ASTM A 1011/A 1011M, Grade 40.

2.4.3 Non-Metallic Materials

Non-metallic waterstops shall be manufactured from a prime virgin resin; reclaimed material is not acceptable. The compound shall contain plasticizers, stabilizers, and other additives to meet specified requirements. Rubber waterstops shall conform to COE CRD-C 513. Polyvinylchloride waterstops shall conform to COE CRD-C 572. Thermoplastic elastomeric rubber waterstops shall conform to ASTM D 471.

2.4.4 Non-Metallic Hydrophilic

Swellable strip type compound of polymer modified chloroprene rubber that swells upon contact with water shall conform to ASTM D 412 as follows: Tensile strength 420 psi minimum; ultimate elongation 600 percent minimum. Hardness shall be 50 minimum on the type A durometer and the volumetric expansion ratio in distilled water at 70 degrees F shall be 3 to 1 minimum.

2.4.5 Preformed Elastic Adhesive

Preformed plastic adhesive waterstops shall be produced from blends of refined hydrocarbon resins and plasticizing compounds reinforced with inert mineral filler, and shall contain no solvents, asbestos, irritating fumes or obnoxious odors. The compound shall not depend on oxidizing, evaporating, or chemical action for its adhesive or cohesive strength.

2.4.5.1 Chemical Composition

The chemical composition of the sealing compound shall meet the requirements shown below:

COMPONENT	MIN.	PERCENT BY WEIGHT	
		MAX.	TEST
Bitumen (Hydrocarbon plastic)	50	70	ASTM D 4
Inert Mineral Filler	30	50	AASHTO T 111
Volatile Matter		2	ASTM D 6

2.4.5.2 Adhesion Under Hydrostatic Pressure

The sealing compound shall not leak at the joints for a period of 24 hours under a vertical 6 foot head pressure. In a separate test, the sealing compound shall not leak under a horizontal pressure of 10 psi which is reached by slowly applying increments of 2 psi every minute.

2.4.5.3 Sag of Flow Resistance

Sagging shall not be detected when tested as follows: Fill a wooden form 1 inch wide and 6 inches long flush with sealing compound and place in an oven at 135 degrees F in a vertical position for 5 days.

2.4.5.4 Chemical Resistance

The sealing compound when immersed separately in a 5% solution of caustic potash, a 5% solution of hydrochloric acid, 5% solution of sulfuric acid and a saturated hydrogen sulfide solution for 30 days at ambient room temperature shall show no visible deterioration.

PART 3 EXECUTION

3.1 JOINTS

Joints shall be installed at locations and at maximum spacing as determined by the Government based on specific project requirements.

3.1.1 Contraction Joints

Contraction joints may be constructed by inserting tempered hardboard strips or rigid PVC or HIPS insert strips into the plastic concrete using a steel parting bar, when necessary, or by cutting the concrete with a saw after concrete has set. Joints shall be approximately 1/8 inch wide and shall extend into the slab one-fourth the slab thickness, minimum, but not less than 1 inch.

3.1.1.1 Joint Strips

Strips shall be of the required dimensions and as long as practicable. After the first floating, the concrete shall be grooved with a tool at the joint locations. The strips shall be inserted in the groove and depressed until the top edge of the vertical surface is flush with the surface of the slab. The slab shall be floated and finished as specified. Working of the concrete adjacent to the joint shall be the minimum necessary to fill voids and consolidate the concrete. Where indicated, the top portion of the strip shall be sawed out after the curing period to form a recess for sealer. The removable section of PVC or HIPS strips shall be discarded and the insert left in place. True alignment of the strips shall be maintained during insertion.

3.1.1.2 Sawed Joints

Joint sawing shall be early enough to prevent uncontrolled cracking in the slab, but late enough that this can be accomplished without appreciable spalling. Concrete sawing machines shall be adequate in number and power, and with sufficient replacement blades to complete the sawing at the required rate. Joints shall be cut to true alignment and shall be cut in sequence of concrete placement. Sludge and cutting debris shall be removed.

3.1.2 Expansion Joints

Preformed expansion joint filler shall be used in expansion and isolation joints in slabs around columns and between slabs on grade and vertical surfaces where indicated. The filler shall extend the full slab depth, unless otherwise indicated. The edges of the joint shall be neatly finished with an edging tool of 1/8 inch radius, except where a resilient floor surface will be applied. Where the joint is to receive a sealant, the filler strips shall be installed at the proper level below the finished floor with a slightly tapered, dressed and oiled wood strip temporarily secured to the top to form a recess to the size shown on the drawings. The wood strip shall be removed after the concrete has set. Contractor may opt to use a removable expansion filler cap designed and fabricated for this purpose in lieu of the wood strip. The groove shall be thoroughly cleaned of laitance, curing compound, foreign materials, protrusions of hardened concrete, and any dust which shall be blown out of the groove with oil-free compressed air.

3.1.3 Joint Sealant

Sawed contraction joints and expansion joints in slabs shall be filled with joint sealant, unless otherwise shown. Joint surfaces shall be clean, dry, and free of oil or other foreign material which would adversely affect the bond between sealant and concrete. Joint sealant shall be applied as recommended by the manufacturer of the sealant.

3.1.3.1 Joints with Preformed Compression Seals

Compression seals shall be installed with equipment capable of installing joint seals to the prescribed depth without cutting, nicking, twisting, or otherwise distorting or damaging the seal or concrete and with no more than 5 percent stretching of the seal. The sides of the joint and, if necessary, the sides of the compression seal shall be covered with a coating of lubricant. Butt joints shall be coated with liberal applications of lubricant.

3.1.3.2 Joints with Field-Molded Sealant

Joints shall not be sealed when the sealant material, ambient air, or concrete temperature is less than 40 degrees F. When the sealants are meant to reduce the sound transmission characteristics of interior walls, ceilings, and floors the guidance provided in ASTM C 919 shall be followed. Joints requiring a bond breaker shall be coated with curing compound or with bituminous paint. Bond breaker and back-up material shall be installed where required. Joints shall be primed and filled flush with joint sealant in accordance with the manufacturer's recommendations.

3.2 WATERSTOPS, INSTALLATION AND SPLICES

Waterstops shall be installed at the locations shown to form a continuous water-tight diaphragm. Adequate provision shall be made to support and completely protect the waterstops during the progress of the work. Any waterstop punctured or damaged shall be repaired or replaced. Exposed waterstops shall be protected during application of form release agents to

avoid being coated. Suitable guards shall be provided to protect exposed projecting edges and ends of partially embedded waterstops from damage when concrete placement has been discontinued. Splices shall be made by certified trained personnel using approved equipment and procedures.

3.2.1 Copper and Stainless Steel

Splices in copper waterstops shall be lap joints made by brazing. Splices in stainless steel waterstops shall be welded using a TIG or MIG process utilizing a weld rod to match the stainless. All welds shall not be annealed to maintain physical properties. Carbon flame shall not be used in the annealing process. Damaged waterstops shall be repaired by removing damaged portions and patching. Patches shall overlap a minimum of 1 inch onto undamaged portion of the waterstop.

3.2.2 Flat Steel

Splices in flat steel waterstops shall be properly aligned, butt welded, and cleaned of excessive material.

3.2.3 Non-Metallic

Fittings shall be shop made using a machine specifically designed to mechanically weld the waterstop. A miter guide, proper fixturing (profile dependant), and portable power saw shall be used to miter cut the ends to be joined to ensure good alignment and contact between joined surfaces. The splicing of straight lengths shall be done by squaring the ends to be joined. Continuity of the characteristic features of the cross section of the waterstop (ribs, tabular center axis, protrusions, etc.) shall be maintained across the splice.

3.2.3.1 Rubber Waterstop

Splices shall be vulcanized or shall be made using cold bond adhesive as recommended by the manufacturer. Splices for TPE-R shall be as specified for PVC.

3.2.3.2 Polyvinyl Chloride Waterstop

Splices shall be made by heat sealing the adjacent waterstop edges together using a thermoplastic splicing iron utilizing a non-stick surface specifically designed for waterstop welding. The correct temperature shall be used to sufficiently melt without charring the plastic. The spliced area, when cooled, shall show no signs of separation, holes, or other imperfections when bent by hand in as sharp an angle as possible.

3.2.3.3 Quality Assurance

Edge welding will not be permitted. Centerbulbs shall be compressed or closed when welding to non-centerbulb type. Waterstop splicing defects which are unacceptable include, but are not limited to the following: 1) Tensile strength less than 80 percent of parent section. 2) Free lap joints. 3) Misalignment of centerbulb, ribs, and end bulbs greater than 1/16 inch. 4) Misalignment which reduces waterstop cross section more than 15 percent. 5) Bond failure at joint deeper than 1/16 inch or 15 percent of material thickness. 6) Misalignment of waterstop splice resulting in misalignment of waterstop in excess of 1/2 inch in 10 feet. 7) Visible porosity in the weld area, including pin holes. 8) Charred or burnt material. 9) Bubbles or inadequate bonding. 10) Visible signs of splice separation when cooled splice is bent by hand at a sharp angle.

3.2.4 Non-Metallic Hydrophilic Waterstop Installation

Ends to be joined shall be miter cut with sharp knife or shears. The ends shall be adhered with cyanacryiate (super glue) adhesive. When joining hydrophilic type waterstop to PVC waterstop, the hydrophilic waterstop shall be positioned as shown on the drawings. A liberal amount of a single component hydrophilic sealant shall be applied to the junction to complete the transition.

3.2.5 Preformed Plastic Adhesive Installation

The installation of preformed plastic adhesive waterstops shall be a prime, peel, place and pour procedure. Joint surfaces shall be clean and dry before priming and just prior to placing the sealing strips. The end of each strip shall be spliced to the next strip with a 1 inch overlap; the overlap shall be pressed firmly to release trapped air. During damp or cold conditions the joint surface shall be flashed with a safe, direct flame to warm and dry the surface adequately; the sealing strips shall be dipped in warm water to soften the material to achieve maximum bond to the concrete surface.

3.3 CONSTRUCTION JOINTS

Construction joints are specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE except that construction joints coinciding with expansion and contraction joints shall be treated as expansion or contraction joints as applicable.

-- End of Section --

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 REFERENCES

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

ACI INTERNATIONAL (ACI)

ACI 318/318R (2002) Building Code Requirements for Structural Concrete and Commentary

AMERICAN WELDING SOCIETY (AWS)

AWS D1.4 (1998) Structural Welding Code - Reinforcing Steel

ASTM INTERNATIONAL (ASTM)

ASTM A 184/A 184M (2001) Fabricated Deformed Steel Bar Mats for Concrete Reinforcement

ASTM A 185 (2002) Steel Welded Wire Reinforcement, Plain, for Concrete

ASTM A 53 (1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A 615/A 615M (2004b) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

ASTM A 668/A 668M (2004) Steel Forgings, Carbon and Alloy, for General Industrial Use

ASTM A 675/A 675M (1990a; R 2000) Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties

ASTM A 706/A 706M (2003) Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement

ASTM A 767/A 767M (2000b) Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement

ASTM A 775/A 775M (2001) Epoxy-Coated Reinforcing Steel Bars

ASTM A 82 (2002) Steel Wire, Plain, for Concrete Reinforcement

ASTM A 884/A 884M (2002) Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement

ASTM C 109 (2005) Compressive Strength of Hydraulic Cement Mortars (Using 2-In. or 50-mm Cube Specimens

ASTM C 348 (2002) Flexural Strength of Hydraulic-Cement Mortars

ASTM C 496 (2004) Splitting Tensile Strength of Cylindrical Concrete Specimens

ASTM C 882 (2005) Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear

ASTM D 3963 (2001) Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars

ASTM F 593 (2002e2) Stainless Steel Bolts, Hex Cap Screws, and Studs

ASTM F 1554 (2004) Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

CRSI 1MSP (2001) Manual of Standard Practice

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Reinforcement; G

Detail drawings showing reinforcing steel placement, schedules, sizes, grades, and splicing and bending details. Drawings shall show support details including types, sizes, spacing, and cover.

SD-03 Product Data

Welding
Dowels; G
Reinforcing Steel; G
Welded Wire Fabric; G
Wire Ties; G
Supports; G
Epoxy-Coated Reinforcing Steel; G
Anchors; G

A list of qualified welder’s names.

SD-07 Certificates

Reinforcing Steel

Certified copies of mill reports attesting that the reinforcing steel furnished contains no less than 25 percent recycled scrap steel and meets the requirements specified herein, prior to the installation of reinforcing steel.

1.3 WELDING

Welders shall be qualified in accordance with AWS D1.4. Qualification test shall be performed at the worksite and the Contractor shall notify the Contracting Officer 24 hours prior to conducting tests. Special welding procedures and welders qualified by others may be accepted as permitted by AWS D1.4.

1.4 DELIVERY AND STORAGE

Reinforcement and accessories shall be stored off the ground on platforms, skids, or other supports.

PART 2 PRODUCTS

2.1 DOWELS

Dowels shall conform to ASTM A 675/A 675M, Grade 80. Steel pipe conforming to ASTM A 53, Schedule 80, may be used as dowels provided the ends are closed with metal or plastic inserts or with mortar.

2.2 FABRICATED BAR MATS

Fabricated bar mats shall conform to ASTM A 184/A 184M.

2.3 REINFORCING STEEL

Reinforcing steel shall be deformed bars conforming to ASTM A 615/A 615M or ASTM A 706/A 706M, grades and sizes as indicated. Cold drawn wire used for spiral reinforcement shall conform to ASTM A 82. In highly corrosive environments or when directed by the Contracting Officer, reinforcing steel shall conform to ASTM A 767/A 767M or ASTM A 775/A 775M as appropriate.

2.4 WELDED WIRE FABRIC

Welded wire fabric shall conform to ASTM A 185. When directed by the Contracting Officer for special applications, welded wire fabric shall conform to ASTM A 884/A 884M.

2.5 WIRE TIES

Wire ties shall be 16 gauge or heavier black annealed steel wire.

2.6 SUPPORTS

Bar supports for formed surfaces shall be designed and fabricated in accordance with CRSI 1MSP and shall be steel or precast concrete blocks. Precast concrete blocks shall have wire ties and shall be not less than 4 inches square when supporting reinforcement on ground. Precast concrete block shall have compressive strength equal to that of the surrounding concrete. Where concrete formed surfaces will be exposed to weather or where surfaces are to be painted, steel supports within 1/2 inch of concrete surface shall be galvanized, plastic protected or of stainless steel. Concrete supports used in concrete exposed to view shall have the same color and texture as the finish surface. For slabs on grade, supports shall be precast concrete blocks, plastic coated steel fabricated with bearing plates, or specifically designed wire-fabric supports fabricated of plastic.

2.7 SYNTHETIC FIBER REINFORCEMENT

Synthetic fiber shall be polypropylene with a denier less than 100 and a nominal fiber length of 2 inches.

2.8 REBAR SPLICING COUPLER

Designed to meet ACI 318 Building Code Requirements in axial tension for the grade of reinforcing bar specified. Standard couplers machined from AISI 11L37 or 11L44 cold rolled material and are designed for connections to taper threaded bar ends where one bar can be turned.

2.8.1 Internal Coupler Protector

Provide coupler manufacturers plastic internal coupler protector where couplers are provided for anticipated future additions.

2.8.2 Bar End Protectors

Plastic solid sleeve for placement over bar ends to protect threading from damage, contamination and rust.

2.9 EPOXY-COATED REINFORCING STEEL

Conforming to ASTM A 615/A 615M, Grade 60, Deformed steel reinforcing bars with protective epoxy coating applied by the electrostatic spray method meeting requirements of ASTM D 3963.

2.9.1 Field Applied Repair Material

Compatible with factory applied epoxy coating and not harmfully reactive with concrete. Coating material shall comply with prequalification requirements of Annex A1 of ASTM D 3963.

2.10 ANTI-CORROSION COATING

A two-component, polymer-modified, cementitious coating formulated to inhibit the corrosion of reinforcing steel and having the following properties in the cured material:

a. Compressive Strength at 28 Days: 10,200 psi. minimum, ASTM C 109.
b. Splitting Tensile Strength at 28 Days: 600 psi. minimum, ASTM C 496.
c. Flexural Strength: 1,250 psi. minimum, ASTM C 348.
d. Bond Strength at 14 Days: 1700 psi. minimum after 24 hours open time, ASTM C 882.
e. The epoxy resin/Portland cement adhesive shall not produce a vapor barrier.
f. The material shall be proven to prevent the corrosion of reinforcing steel when tested under the procedure as established by the Federal Highway Administration Program.

2.11 ANCHORS

Anchor bolt sizing to be as shown on Drawings. Anchor bolt sizes not shown on Drawings shall be as recommended by manufacturer of equipment being anchored. Minimum anchor bolt embedment is 6 inches. Provide a minimum of 1/2" bolt projection beyond anchor bolt nut. Furnish flat washer with each anchor bolt. Unless otherwise indicated, all anchor bolts to be embedded type. Set prior to concrete placement.

2.11.1 Stainless Steel Anchor Bolts

ASTM F 593

2.11.2 Galvanized Anchor Bolts

ASTM F 1554

2.11.3 Headed Stud Type Concrete Anchors

Cold finish carbon steel conforming to ASTM A 668/A 668M Class Designation B; similar to Nelson Stud Welding Systems.

2.12 STEEL GRID CONCRETE FLOOR ARMORING

Hexagonal cellular mesh grating panels of 3/4-inch deep, 2.95 psf mild carbon steel. Rectangular slots provided in each hexagonal face to promote castable flow between individual cells.

2.12.1 Lance Design

A metal projection into the castable material within each hexagonal cell provides additional reinforcement and bonding.

2.12.2 Clinched Construction

Bars are mechanically locked together with lugs which protrude through slots on adjacent bars, and bent over.

2.12.3 Anchors

Provide manufacturers standard floor armor anchors of type consistent with design application, placed every 12-inches around panel and spaced on 18-inch random centers within panel expanse.

PART 3 EXECUTION

3.1 REINFORCEMENT

Reinforcement shall be fabricated to shapes and dimensions shown and shall conform to the requirements of ACI 318/318R. Reinforcement shall be cold bent unless otherwise authorized. Bending may be accomplished in the field or at the mill. Bars shall not be bent after embedment in concrete. Safety caps shall be placed on all exposed ends of vertical concrete reinforcement bars that pose a danger to life safety. Wire tie ends shall face away from the forms.

3.1.1 Placement

Reinforcement shall be free from loose rust and scale, dirt, oil, or other deleterious coating that could reduce bond with the concrete. Reinforcement shall be placed in accordance with ACI 318/318R at locations shown plus or minus one bar diameter. Reinforcement shall not be continuous through expansion joints and shall be as indicated through construction or contraction joints. Concrete coverage shall be as indicated or as required by ACI 318/318R. If bars are moved more than one bar diameter to avoid interference with other reinforcement, conduits or embedded items, the resulting arrangement of bars, including additional bars required to meet structural requirements, shall be approved before concrete is placed.

3.1.2 Splicing

Splices of reinforcement shall conform to ACI 318/318R and shall be made only as required or indicated. Splicing shall be by lapping or by mechanical or welded butt connection; except that lap splices shall not be used for bars larger than No. 11 unless otherwise indicated. Welding shall conform to AWS D1.4. Welded butt splices shall be full penetration butt welds. Lapped bars shall be placed in contact and securely tied or spaced transversely apart to permit the embedment of the entire surface of each bar in concrete. Lapped bars shall not be spaced farther apart than one-fifth the required length of lap or 6 inches. Mechanical butt splices shall be in accordance with the recommendation of the manufacturer of the mechanical splicing device. Butt splices shall develop 125 percent of the specified minimum yield tensile strength of the spliced bars or of the smaller bar in transition splices. Bars shall be flame dried before butt splicing. Adequate jigs and clamps or other devices shall be provided to support, align, and hold the longitudinal centerline of the bars to be butt spliced in a straight line.

3.2 WELDED-WIRE FABRIC PLACEMENT

Welded-wire fabric shall be placed in slabs as indicated. Fabric placed in slabs on grade shall be continuous between expansion, construction, and contraction joints. Fabric placement at joints shall be as indicated. Lap splices shall be made in such a way that the overlapped area equals the distance between the outermost crosswires plus 2 inches. Laps shall be staggered to avoid continuous laps in either direction. Fabric shall be wired or clipped together at laps at intervals not to exceed 4 feet. Fabric shall be positioned by the use of supports.

3.3 DOWEL INSTALLATION

Dowels shall be installed in slabs on grade at locations indicated and at right angles to joint being doweled. Dowels shall be accurately positioned and aligned parallel to the finished concrete surface before concrete placement. Dowels shall be rigidly supported during concrete placement. One end of dowels shall be coated with a bond breaker.

3.4 PLACING EPOXY-COATED REINFORCEMENT

In general, install in accordance with ASTM D 3963, and the following additional requirements.

1. The Contracting Officer shall have the option to reject reinforcing steel where the allowable patching area of in-place reinforcing steel exceeds 5 percent of the total bar surface area.

2. Use epoxy-coated wire ties in reinforcing steel installation and perform wire tying in such manner as to not cut or otherwise damage the epoxy coating.

3.5 ANCHOR BOLTS SETTING

Set at locations indicated on Drawings and secure in place to prevent movement during concrete pours.

3.6 ANTI-CORROSION COATING APPLICATION

Prior to application of anti-corrosion coating, mechanically clean reinforcing steel to remove rust and bond-breaking/inhibiting matter. Used blast cleaning methods or other mechanical means such as will completely

prepare the reinforcing steel surface to meet the coating manufacturer's requirements. Mix and apply the coating in accordance with the limitations and precautions in the manufacturer's current printed literature.

3.7 STEEL GRID CONCRETE FLOOR ARMORING INSTALLATION

Install where indicated on the Drawings in accordance with manufacturer's installation instructions and the following additional requirements:

a. Place steel grid floor armoring on previously poured concrete base.

b. Place first panel in one corner with clinching lugs facing area to be armored.

c. Panels must be placed with lugs facing the same way.

d. Do not anchor panels until a line has been taken to check that the first few panels lie true with the boundary walls. When this is checked, clinch panels together, anchor and continue to lay panels, checking, clinching and anchoring until complete area is filled.

e. Cut steel grid panel, where full panel cannot be used, with bolt cutters or cutting torch in the field.

f. Place reduced aggregate concrete, gunned or hand troweled into the hexagonal cells.

g. Work reduced aggregate concrete completely into each hexagon cell to eliminate voids.

h. Screed concrete 1/16-inch above steel grid to allow for shrinking and to ensure a complete fill.

-- End of Section --

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SECTION 03300

CAST-IN-PLACE STRUCTURAL CONCRETE

PART 1 GENERAL

1.1 REFERENCES

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

ACI INTERNATIONAL (ACI)

ACI 117	(1990) Standard Tolerances for Concrete Construction and Materials & Commentary
ACI 211.1	(1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 214.3R	(1988; R 1997) Simplified Version of the Recommended Practice for Evaluation of Strength Test Results of Concrete
ACI 301	(1999) Specifications for Structural Concrete for Buildings
ACI 303R	(1991) Guide to Cast-In-Place Architectural Concrete Practice
ACI 304	Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete
ACI 305R	(1999) Hot Weather Concreting
ACI 306R	Cold Weather Concreting
ACI 308	Standard Practice for Curing Concrete
ACI 315	Details and Detailing of Concrete Reinforcement
ACI 318/318R	(2002) Building Code Requirements for Structural Concrete and Commentary
ACI 347	Formwork for Concrete

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 182	(1991; R 2000) Burlap Cloth Made from Jute or Kenaf

ASTM INTERNATIONAL (ASTM)

ASTM A 82	Specification for Cold-Drawn Steel Wire for Concrete Reinforcement

ASTM A 615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C 156	Test Method for Water Retention By Concrete Curing Materials
ASTM C 191	(2004) Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle
ASTM C 596	(2001) Standard Test Method for Drying Shrinkage of Mortar Containing Hydraulic Cement
ASTM C 827	(2005) Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Contentious Mixtures
ASTM C 1017/C 1017M	(1998) Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C 1059	(1999) Latex Agents for Bonding Fresh to Hardened Concrete
ASTM C 1064/C 1064M	(2003) Temperature of Freshly Mixed Portland Cement Concrete
ASTM C 1077	(2003) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM C 1107	(2002) Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
ASTM C 1240	(2003a) Silica Fume for Use as a Mineral Admixture in Hydraulic-Cement Concrete, Mortar and Grout
ASTM C 131	(2003) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(2001) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 143/C 143M	(2003) Slump of Hydraulic Cement Concrete
ASTM C 150	(2005) Portland Cement
ASTM C 171	(2003) Sheet Materials for Curing Concrete
ASTM C 172	(1999) Sampling Freshly Mixed Concrete
ASTM C 173	(1994ael) Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C 192/C 192M	(2002) Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 231	(2003) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	(2001) Air-Entraining Admixtures for Concrete

ASTM C 309	(2003) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 31/C 31M	(2003a) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(2003) Concrete Aggregates
ASTM C 39/C 39M	(2003) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 42/C 42M	(2003) Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C 494/C 494M	(1999ae1) Chemical Admixtures for Concrete
ASTM C 552	(2000e1) Cellular Glass Thermal Insulation
ASTM C 578	(2005) Rigid, Cellular Polystyrene Thermal Insulation
ASTM C 591	(2001) Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C 595	(2003) Blended Hydraulic Cements
ASTM C 618	(2003) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C 78	(2002) Flexural Strength of Concrete (Using Simple Beam With Third-Point Loading)
ASTM C 881	(1999) Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C 882	Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete
ASTM C 937	(1997) Grout Fluidifier for Pre-placed Aggregate Concrete
ASTM C 94/C 94M	(2003a) Ready-Mixed Concrete
ASTM C 940	(1998a) Expansion and Bleeding of Freshly Mixed Grouts for Pre-placed Aggregate Concrete in the Laboratory
ASTM C 979	(2005) Pigments for Integrally Colored Concrete
ASTM C 989	(1999) Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
ASTM D 570	Test Method for Water Absorption of Plastics
ASTM D 638	Test Method for Tensile Properties of Plastics
ASTM D 695	Test Method for Compressive Properties of Rigid Plastics
ASTM D 732	Test Method for Shear Strength of Plastics by Punch Tool

ASTM D 790	Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D 1751	(1999) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
ASTM D 75	(2003) Sampling Aggregates
ASTM E 96	(2005) Water Vapor Transmission of Materials

NATIONAL READY MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA QC 3	(2002) Quality Control Manual: Section 3, Plant Certifications Checklist: Certification of Ready Mixed Concrete Production Facilities
NRMCA TMMB 100	(2001) Truck Mixer, Agitator and Front Discharge Concrete Carrier Standards

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 104	(1980) Method of Calculation of the Fineness Modulus of Aggregate
COE CRD-C 400	(1963) Requirements for Water for Use in Mixing or Curing Concrete
COE CRD-C 521	(1981) Standard Test Method for Frequency and Amplitude of Vibrators for Concrete
COE CRD-C 540	(2001) Standard Specification for Non-bituminous Inserts for Contraction Joints in Portland Cement Concrete Airfield Pavements, Sawable Type
COE CRD-C 572	(1974) Specifications for Polyvinylchloride Waterstops
COE CRD-C 621	Standard Specifications for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)(same as ASTM C 1107)
COE CRD-C 94	(1966) Specification for Surface Retarders

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION (PENNDOT)

Pub. 408	Specifications as amended

1.2 RELATED SECTIONS

Section 03100: Structural Concrete Formwork.

Section 03150: Expansion Joints, Contraction Joints, and Waterstops.

Section 03200: Concrete Reinforcement.

Section 07920: Joint Sealants.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Chemical Admixtures
Curing Materials; G
Non-shrink Grout; G
Non-slip Surfacing Material
Latex Modified Concrete
Latex Bonding Agent
Epoxy Resin
Floor Hardener
Perimeter Insulation
Vapor Barrier
Joint Materials; G
Pigments

Manufacturer's descriptive product data and current specifications including installation instructions.

SD-05 Design Data

Design Mix; G

The results of trial mixture design studies along with a statement giving the maximum nominal coarse aggregate size and the proportions of ingredients that will be used in the manufacture of each strength or class of concrete, at least 14 days prior to commencing concrete placing operations. Aggregate weights shall be based on the saturated surface dry condition. The statement shall be accompanied by test results from an approved independent commercial testing laboratory, showing that mixture design studies have been made with materials proposed for the project and that the proportions selected will produce concrete of the qualities indicated. No substitutions shall be made in the materials used in the mixture design studies without additional tests to show that the quality of the concrete is satisfactory.

SD-06 Test Reports

Testing and Inspection for Contractor Quality Control; G

Certified copies of laboratory test reports, including mill tests and all other test data, for portland cement, blended cement, pozzolan, ground granulated blast furnace slag, silica fume, aggregate, admixtures, and curing compound proposed for use on this project.

SD-07 Certificates

Qualifications; G

Written documentation for Contractor Quality Control personnel.

Ready-Mixed Concrete

Documentation from batch mixing plant certifying manufacture and delivery in accordance with ASTM C94.

SD-11 Closeout Submittals

Delivery tickets for each load of concrete; G

Tickets shall be signed by the Contractor's representative, noted as to time and place of pour and kept in a record at the site. Records shall be available for inspection upon request by the Contracting Officer. Information presented on the ticket shall include the tabulation covered by ASTM C 94, 16.1.1 through 16.2.8, as well as any additional information the local codes may require.

1.4 QUALIFICATIONS

Contractor Quality Control personnel assigned to concrete construction shall be American Concrete Institute (ACI) Certified Workmen in one of the following grades or shall have written evidence of having completed similar qualification programs:

Concrete Field Testing Technician, Grade I
Concrete Laboratory Testing Technician, Grade I or II
Concrete Construction Inspector, Level II
Concrete Transportation Construction Inspector or Reinforced Concrete Special Inspector, Jointly certified by American Concrete Institute (ACI), Building Official and Code Administrators International (BOCA), International Conference of Building Officials (ICBO), and Southern Building Code Congress International (SBCCI).

The foreman or lead journeyman of the flatwork finishing crew shall have similar qualification for ACI Concrete Flatwork Technician/Finisher or equal, with written documentation.

1.5 QUALITY ASSURANCE

1.5.1 Testing Agency

Provide the services of an agency regularly performing work conforming to The American Society for Testing and Materials ASTM E 329, Recommended Practice for Inspection and Testing Agencies for Concrete and Steel in Construction.

1.5.2 Source Quality Control

Laboratory tests shall be in accordance with the General Conditions, materials stated herein require advance examination or testing according to methods referenced, or as required by the Contracting Officer.

1.5.3 Pre-installation Meeting

A pre-installation meeting with the Contracting Officer will be required at least 10 days prior to start of construction. The Contractor shall be responsible for calling the meeting; the Project Superintendent and active installation personnel shall be present.

1.6 GENERAL REQUIREMENTS

1.6.1 Tolerances

Except as otherwise specified herein, tolerances for concrete batching, mixture properties, and construction as well as definition of terms and application practices shall be in accordance with ACI 117. Level and grade tolerance measurements of slabs shall be made as soon as possible after finishing; when forms or shoring are used, the measurements shall be made prior to removal.

1.6.1.1 Floors by the Straightedge System

The flatness of the floors shall be carefully controlled and the tolerances shall be measured by the straightedge system as specified in paragraph 4.5.7 of ACI 117, using a 10 foot straightedge, within 72 hours after floor slab installation and before shores and/or forms are removed. The tolerances listed on the drawings shall be met at any and every location at which the straightedge can be placed.

1.6.2 Strength Requirements and w/c Ratio

1.6.2.1 Strength Requirements

Provide only Class A concrete, unless indicated otherwise on the drawings.

Specified compressive strength (f'c) shall be indicated on the drawings.

Minimum cement contents shall be 564 lbs./cu. yd. for 4,000 psi concrete and 540 lbs./cu. yd. for 3500 psi concrete at 28 days.

Concrete slabs on-grade shall have a 28-day flexural strength of 4000 psi. Concrete made with high-early strength cement shall have a 7-day strength equal to the specified 28-day strength for concrete made with Type I or II portland cement. Compressive strength shall be determined in accordance with ASTM C 39/C 39M. Flexural strength shall be determined in accordance with ASTM C 78.

a. Evaluation of Concrete Compressive Strength. Compressive strength specimens (6 by 12 inch cylinders) shall be fabricated by the Contractor and laboratory cured in accordance with ASTM C 31/C 31M and tested in accordance with ASTM C 39/C 39M. The strength of the concrete will be considered satisfactory so long as the average of all sets of three consecutive test results equals or exceeds the specified compressive strength f'c and no individual test result falls below the specified strength f'c by more than 500 psi. A "test" is defined as the average of two companion cylinders, or if only one cylinder is tested, the results of the single cylinder test. Additional analysis or testing, including taking cores and/or load tests may be required at the Contractor's expense when the strength of the concrete in the structure is considered potentially deficient.

b. Investigation of Low-Strength Compressive Test Results. When any strength test of standard-cured test cylinders falls below the specified strength requirement by more than 500 psi or if tests of field-cured cylinders indicate deficiencies in protection and curing, steps shall be taken to assure that the load-carrying capacity of the structure is not jeopardized. When the strength of concrete in place is considered potentially deficient, cores shall be obtained and tested in accordance with ASTM C 42/C 42M. At least three representative cores shall be taken from each member or area of concrete in place that

is considered potentially deficient. The location of cores will be determined by the Contracting Officer to least impair the strength of the structure. Concrete in the area represented by the core testing will be considered adequate if the average strength of the cores is equal to at least 85 percent of the specified strength requirement and if no single core is less than 75 percent of the specified strength requirement. Non-destructive tests (tests other than test cylinders or cores) shall not be used as a basis for acceptance or rejection. The Contractor shall perform the coring and repair the holes. Cores will be tested by the Government.

c. Load Tests. If the core tests are inconclusive or impractical to obtain or if structural analysis does not confirm the safety of the structure, load tests may be directed by the Contracting Officer in accordance with the requirements of ACI 318/318R. Concrete work evaluated by structural analysis or by results of a load test as being understrength shall be corrected in a manner satisfactory to the Contracting Officer. All investigations, testing, load tests, and correction of deficiencies shall be performed by and at the expense of the Contractor and must be approved by the Contracting Officer, except that if all concrete is found to be in compliance with the drawings and specifications, the cost of investigations, testing, and load tests will be at the expense of the Government.

d. Evaluation of Concrete Flexural Strength. Flexural strength specimens (beams) shall be fabricated by the Contractor and laboratory cured in accordance with ASTM C 31/C 31M and tested in accordance with ASTM C 78. The strength of the concrete will be considered satisfactory so long as the average of all sets of three consecutive test results equals or exceeds the specified flexural strength and no individual test result falls below the specified flexural strength by more than 50 psi. A "test" is defined as the average of two companion beams. Additional analysis or testing, including taking cores and/or load tests may be required at the Contractor's expense when the strength of the concrete in the slab is considered potentially deficient.

1.6.2.2 Water-Cement Ratio

Maximum water-cement ratio (w/c) for normal weight concrete shall be as indicated on the drawings.

These w/c's may cause higher strengths than that required above for compressive or flexural strength. The maximum w/c required will be the equivalent w/c as determined by conversion from the weight ratio of water to cement plus pozzolan, silica fume, and ground granulated blast furnace slag (GGBF slag) by the weight equivalency method as described in ACI 211.1. In the case where silica fume or GGBF slag is used, the weight of the silica fume and GGBF slag shall be included in the equations of ACI 211.1 for the term P which is used to denote the weight of pozzolan.

1.6.3 Air Entrainment

All normal weight concrete shall be air entrained to contain between 4 and 7 percent total air, except that when the nominal maximum size coarse aggregate is 3/4 inch or smaller it shall be between 4.5 and 7.5 percent. Concrete with specified strength over 5000 psi may have 1.0 percent less air than specified above. Specified air content shall be attained at point of placement into the forms. Air content for normal weight concrete shall be determined in accordance with ASTM C 231.

1.6.4 Slump

Slump of the concrete, as delivered to the point of placement into the forms, shall be within the following limits. Slump shall be determined in accordance with ASTM C 143/C 143M.

Structural Element	Slump	
	Minimum	Maximum
Walls, columns and beams	2 in.	4 in.
Foundation walls, substructure walls, footings, slabs	1 in.	3 in.
Any structural concrete approved for placement by pumping:		
At pump	2 in.	6 in.
At discharge of line	1 in.	4 in.

1.6.5 Concrete Temperature

The temperature of the concrete as delivered shall not exceed 90 degrees F. When the ambient temperature during placing is 40 degrees F or less, or is expected to be at any time within 6 hours after placing, the temperature of the concrete as delivered shall be between 55 and 75 degrees F.

1.6.6 Size of Coarse Aggregate

The largest feasible nominal maximum size aggregate (NMSA) specified in paragraph AGGREGATES shall be used in each placement. However, nominal maximum size of aggregate shall not exceed any of the following: three-fourths of the minimum cover for reinforcing bars, three-fourths of the minimum clear spacing between reinforcing bars, one-fifth of the narrowest dimension between sides of forms, or one-third of the thickness of slabs or toppings.

1.7 MIXTURE PROPORTIONS

Concrete shall be composed of Portland cement, other cementitious and pozzolanic materials as specified, aggregates, water and admixtures as specified.

1.7.1 Design Mix

Contractor to submit a design mix for each type and application of concrete required for the specific project demonstrating compliance with all aspects of this specification. The submission shall state the specific use for the proposed design mix and the specification section numbers which the mix design satisfies. The submission shall also demonstrate the mix shall meet the specified compressive strength. Any change to the source of materials will require the submission of a new mix design. Any change to the design mix after approval is received shall be approved by the COR.

1.7.2 Proportioning Studies for Normal Weight Concrete

Trial design batches, mixture proportioning studies, and testing requirements for various classes and types of concrete specified shall be the responsibility of the Contractor. Except as specified for flexural strength concrete, mixture proportions shall be based on compressive strength as determined by test specimens fabricated in accordance with ASTM C 192/C 192M and tested in accordance with ASTM C 39/C 39M. Samples of all materials used

in mixture proportioning studies shall be representative of those proposed for use in the project and shall be accompanied by the manufacturer's or producer's test reports indicating compliance with these specifications. Trial mixtures having proportions, consistencies, and air content suitable for the work shall be made based on methodology described in ACI 211.1, using at least three different water-cement ratios for each type of mixture, which will produce a range of strength encompassing those required for each class and type of concrete required on the project. The maximum water-cement ratios required in subparagraph Water-Cement Ratio will be the equivalent water-cement ratio as determined by conversion from the weight ratio of water to cement plus pozzolan, silica fume, and ground granulated blast furnace slag (GGBF slag) by the weight equivalency method as described in ACI 211.1. In the case where silica fume or GGBF slag is used, the weight of the silica fume and GGBF slag shall be included in the equations in ACI 211.1 for the term P, which is used to denote the weight of pozzolan. If pozzolan is used in the concrete mixture, the minimum pozzolan content shall be 15 percent by weight of the total cementitious material, and the maximum shall be 35 percent. Laboratory trial mixtures shall be designed for maximum permitted slump and air content. Separate sets of trial mixture studies shall be made for each combination of cementitious materials and each combination of admixtures proposed for use. No combination of either shall be used until proven by such studies, except that, if approved in writing and otherwise permitted by these specifications, an accelerator or a retarder may be used without separate trial mixture study. Separate trial mixture studies shall also be made for concrete for any conveying or placing method proposed which requires special properties and for concrete to be placed in unusually difficult placing locations. The temperature of concrete in each trial batch shall be reported. For each water-cement ratio, at least three test cylinders for each test age shall be made and cured in accordance with ASTM C 192/C 192M. They shall be tested at 7 and 28 days in accordance with ASTM C 39/C 39M. From these test results, a curve shall be plotted showing the relationship between water-cement ratio and strength for each set of trial mix studies. In addition, a curve shall be plotted showing the relationship between 7 day and 28 day strengths. Each mixture shall be designed to promote easy and suitable concrete placement, consolidation and finishing, and to prevent segregation and excessive bleeding.

1.7.3 Proportioning Studies for Flexural Strength Concrete

Trial design batches, mixture proportioning studies, and testing requirements shall conform to the requirements specified in paragraph Proportioning Studies for Normal Weight Concrete, except that proportions shall be based on flexural strength as determined by test specimens (beams) fabricated in accordance with ASTM C 192/C 192M and tested in accordance with ASTM C 78. Procedures given in ACI 211.1 shall be modified as necessary to accommodate flexural strength.

1.7.4 Average Compressive Strength Required for Mixtures

The mixture proportions selected during mixture design studies shall produce a required average compressive strength (f'cr) exceeding the specified compressive strength (f'c) by the amount indicated below. This required average compressive strength, f'cr, will not be a required acceptance criteria during concrete production. However, whenever the daily average compressive strength at 28 days drops below f'cr during concrete production, or daily average 7-day strength drops below a strength correlated with the 28-day f'cr, the mixture shall be adjusted, as approved, to bring the daily average back up to f'cr. During production, the required f'cr shall be

adjusted, as appropriate, based on the standard deviation being attained on the job.

1.7.4.1 Computations from Test Records

Where a concrete production facility has test records, a standard deviation shall be established in accordance with the applicable provisions of ACI 214.3R. Test records from which a standard deviation is calculated shall represent materials, quality control procedures, and conditions similar to those expected; shall represent concrete produced to meet a specified strength or strengths (f'c) within 1,000 psi of that specified for proposed work; and shall consist of at least 30 consecutive tests. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days. Required average compressive strength f'cr used as the basis for selection of concrete proportions shall be the larger of the equations that follow using the standard deviation as determined above:

f'cr = f'c + 1.34S where units are in psi

f'cr = f'c + 2.33S - 500 where units are in psi

Where S = standard deviation

Where a concrete production facility does not have test records meeting the requirements above but does have a record based on 15 to 29 consecutive tests, a standard deviation shall be established as the product of the calculated standard deviation and a modification factor from the following table:

NUMBER OF TESTS	MODIFICATION FACTOR FOR STANDARD DEVIATION
15	1.16
20	1.08
25	1.03
30 or more	1.00

1.7.4.2 Computations without Previous Test Records

When a concrete production facility does not have sufficient field strength test records for calculation of the standard deviation, the required average strength f'cr shall be determined as follows:

a. If the specified compressive strength f'c is less than 3,000 psi,

   f'cr = f'c + 1000 psi

b. If the specified compressive strength f'c is 3,000 to 5,000 psi,

   f'cr = f'c + 1,200 psi

c. If the specified compressive strength f'c is over 5,000 psi,

   f'cr = f'c + 1,400 psi

1.7.5 Average Flexural Strength Required for Mixtures

The mixture proportions selected during mixture design studies for flexural strength mixtures and the mixture used during concrete production shall be designed and adjusted during concrete production as approved, except that the overdesign for average flexural strength shall simply be 15 percent greater than the specified flexural strength at all times.

1.7.6 Mix Design for Bonded Topping for Heavy Duty Floors

The concrete mix design for bonded topping for heavy duty floors shall contain the greatest practical proportion of coarse aggregate within the specified proportion limits. The mix shall be designed to produce concrete having a 28-day strength of at least 5000 psi. Concrete for the topping shall consist of the following proportions, by weight:

1.00 part Portland cement
1.15 to 1.25 parts fine aggregate
1.80 to 2.00 parts coarse aggregate

Maximum w/c shall be 0.33. The topping concrete shall not be air-entrained. The concrete shall be mixed so as to produce a mixture of the driest consistency possible to work with a sawing motion of the strike-off and which can be floated and compacted as specified without producing water or excess cement at the surface. In no case shall slump exceed 1 inch as determined by ASTM C 143/C 143M.

1.8 STORAGE OF MATERIALS

Cement, pigments and other cementitious materials shall be stored in weathertight buildings, bins, or silos which will exclude moisture and contaminants and keep each material completely separated. Aggregate stockpiles shall be arranged and used in a manner to avoid excessive segregation and to prevent contamination with other materials or with other sizes of aggregates. Aggregate shall not be stored directly on ground unless a sacrificial layer is left undisturbed. Reinforcing bars and accessories shall be stored above the ground on platforms, skids or other supports. Other materials shall be stored in such a manner as to avoid contamination and deterioration. Admixtures which have been in storage at the project site for longer than 6 months or which have been subjected to freezing shall not be used unless retested and proven to meet the specified requirements. Materials shall be capable of being accurately identified after bundles or containers are opened.

1.9 GOVERNMENT ASSURANCE INSPECTION AND TESTING

Day-to day inspection and testing shall be the responsibility of the Contractor Quality Control (CQC) staff. However, representatives of the Contracting Officer can and will inspect construction as considered appropriate and will monitor operations of the Contractor's CQC staff. Government inspection or testing will not relieve the Contractor of any of his CQC responsibilities.

1.9.1 Materials

The Government will sample and test aggregates, cementitious materials, other materials, and concrete to determine compliance with the specifications as considered appropriate. The Contractor shall provide facilities and labor as may be necessary for procurement of representative test samples. Samples of

aggregates will be obtained at the point of batching in accordance with ASTM D 75. Other materials will be sampled from storage at the jobsite or from other locations as considered appropriate. Samples may be placed in storage for later testing when appropriate.

1.9.2 Fresh Concrete

Fresh concrete will be sampled as delivered in accordance with ASTM C 172 and tested in accordance with these specifications, as considered necessary.

1.9.3 Hardened Concrete

Tests on hardened concrete will be performed by the Government when such tests are considered necessary.

1.9.4 Inspection

Concrete operations may be tested and inspected by the Government as the project progresses. Failure to detect defective work or material will not prevent rejection later when a defect is discovered nor will it obligate the Government for final acceptance.

PART 2 PRODUCTS

2.1 CEMENTITIOUS MATERIALS

Cementitious Materials shall be Portland cement and shall conform to appropriate specifications listed below. Use of cementitious materials in concrete which will have surfaces exposed in the completed structure shall be restricted so there is no change in color, source, or type of cementitious material.

2.1.1 Portland Cement

ASTM C 150, Type I low alkali with a maximum 15 percent amount of tricalcium aluminate.

2.1.2 High-Early-Strength Portland Cement

ASTM C 150, Type III with tricalcium aluminate limited to 8 percent, low alkali. Type III cement shall be used only in isolated instances and only when approved in writing.

2.1.3 Blended Cements

ASTM C 595, Type IP, IP (MS), IS, IS (MS).

2.1.4 Pozzolan (Fly Ash)

ASTM C 618, Class C or F with the optional requirements for multiple factor, drying shrinkage, and uniformity from Table 2A of ASTM C 618. Requirement for maximum alkalies from Table 1A of ASTM C 618 shall apply. If pozzolan is used, it shall never be less than 15 percent nor more than 35 percent by weight of the total cementitious material. The Contractor shall comply with EPA requirements in accordance with Section 01011 SPECIAL REQUIREMENTS.

2.1.5 Ground Granulated Blast-Furnace (GGBF) Slag

ASTM C 989, Grade 120.

2.1.6 Silica Fume

Silica fume shall conform to ASTM C 1240. Available alkalies shall conform to the optimal limit given in Table 2 of ASTM C 1240. Silica fume may be furnished as a dry, densified material or as a slurry. In accordance with paragraph Technical Service for Specialized Concrete, the Contractor shall provide at no cost to the Government the services of a manufacturer's technical representative experienced in mixing, proportioning, placement procedures, and curing of concrete containing silica fume.

2.2 AGGREGATES

Aggregates shall conform to the following.

2.2.1 Fine Aggregate

Fine aggregate shall conform to the quality and gradation requirements of ASTM C 33.

2.2.2 Coarse Aggregate

Coarse aggregate shall conform to ASTM C 33, Class 5S, size designation.

2.2.3 Materials for Bonded Topping for Heavy Duty Floors

In addition to the requirements specified above, coarse aggregate used for this purpose shall be a well graded, hard, sound diabase, trap rock, emery, granite or other natural or manufactured aggregate having equivalent hardness and wearing qualities and shall have a percentage of loss not to exceed 30 after 500 revolutions when tested in accordance with ASTM C 131. Gradation of the aggregates when tested in accordance with ASTM C 136 shall be as follows:

Coarse Aggregate Gradation Table	
Sieve Size	Cumulative Percent By Weight Passing
3/4 in.	100
1/2 in.	50-100
3/8 in.	25-50
No. 4	0-15
No. 8	0-8

Fine Aggregate Gradation Table	
Sieve Size	Cumulative Percent By Weight Passing
3/8 in.	100
No. 4	95-100
No. 8	65-80
No. 16	45-65
No. 30	25-45
No. 50	5-15
No. 100	0-5

2.3 CHEMICAL ADMIXTURES

Chemical admixtures, when required or permitted, shall conform to the appropriate specification listed. Admixtures shall be furnished in liquid form and of suitable concentration for easy, accurate control of dispensing. Calcium chloride is not permitted as an admixture.

2.3.1 Air-Entraining Admixture

ASTM C 260 and shall consistently entrain the air content in the specified ranges under field conditions.

Maximum Size Coarse Aggregate (in.)	Air content (% by Vol)
1-1/2	5 ±1
3/4 or 1	6 ±1
3/8 or 1/2	7-1/2 ±1

Do not provide the air-entrained concrete where a hardener is indicated on the Drawings or specified herein.

2.3.2 Accelerating Admixture

ASTM C 494/C 494M, Type E, except that calcium chloride or admixtures containing calcium chloride shall not be used.

2.3.3 Water-Reducing or Retarding Admixture

ASTM C 494/C 494M, Type A (Water Reducing Admixture) and Type D (Water Reducing and Retarding Admixture), except that the 6-month and 1-year compressive and flexural strength tests are waived. When high temperatures occur or placing conditions dictate, a change from Type A to Type D may be required.

2.3.4 High-Range Water Reducer

ASTM C 494/C 494M, Type F or G, except that the 6-month and 1-year strength requirements are waived. The admixture shall be used only when approved in writing, such approval being contingent upon particular mixture control as described in the Contractor's Quality Control Plan and upon performance of separate mixture design studies.

2.3.5 Surface Retarder

COE CRD-C 94.

2.3.6 Expanding Admixture

Aluminum powder type expanding admixture conforming to ASTM C 937.

2.3.7 Other Chemical Admixtures

Chemical admixtures for use in producing flowing concrete shall comply with ASTM C 1017/C 1017M, Type I or II. These admixtures shall be used only when approved in writing, such approval being contingent upon particular mixture control as described in the Contractor's Quality Control Plan and upon performance of separate mixture design studies.

2.4 CURING MATERIALS

2.4.1 Impervious-Sheet

Impervious-sheet materials shall conform to ASTM C 171, type optional, except, that polyethylene sheet shall not be used.

2.4.2 Membrane-Forming Compound

Membrane-Forming curing compound shall conform to ASTM C 309, Type 1-D or 2, except that only a styrene acrylate or chlorinated rubber compound meeting Class B requirements shall be used for surfaces that are to be painted or are to receive bituminous roofing, or waterproofing, or floors that are to receive adhesive applications of resilient flooring. The curing compound selected shall be compatible with any subsequent paint, roofing, waterproofing, or flooring specified. Non-pigmented compound shall contain a fugitive dye, and shall have the reflective requirements in ASTM C 309 waived.

2.4.2.1 Acceptable Manufacturers

a. Master Builders; Master Kure
b. Euclid Chemical Company; Kurez Formula E-100
c. L & M Construction Chemicals, Inc.; L & M Cure
d. Or approved equal

2.4.3 Burlap and Cotton Mat

Burlap and cotton mat used for curing shall conform to AASHTO M 182.

2.5 PIGMENTS FOR INTEGRALLY COLORED CONCRETE

ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, non-fading, and resistant to lime and other alkalis. If pigments are to be added to mix at Site, furnish pigments in pre-measured Mix-Ready disintegrating bags to minimize job site waste.

2.5.1 Acceptable Manufacturers

a. Bayer Corporation.
b. ChemMasters.
c. Conspec Marketing & Manufacturing Co., Inc.; a Dayton Superior Company.
d. Davis Colors.
e. Elementis Pigments, Inc.
f. Hoover Color Corporation.
g. Lambert Corporation.
h. Scofield, L. M. Company.
i. Solomon Colors.

2.5.2 Colors

Provide colors for selection by the Contracting Officer from the manufacturer’s standard color line. Dosage rate for pigment shall be designated by the manufacturer.

2.5.3 Curing Compound for Colored Concrete

Curing compound shall comply with ASTM C309 and be approved by pigment manufacturer for use with colored concrete.

2.5.4 Sealants

Provide in color matching colored concrete.

2.6 WATER

Water for mixing and curing shall be fresh, clean, potable, and free of injurious amounts of oil, acid, salt, or alkali, except that non-potable water may be used if it meets the requirements of COE CRD-C 400.

2.7 NON-SHRINK GROUT

Factory premixed material containing no corrosive irons, aluminums, chemicals or gypsums. Non-shrink grout shall conform to ASTM C 1107, and shall be a commercial formulation suitable for the proposed application.

2.7.1 Shrinkage

Grouts containing water reducers, accelerators, or fluidifiers shall have no drying shrinkage greater than the equivalent sand, cement and water mix as tested per ASTM C 596.

Grout shall be non-shrink before initial set and show no expansion after set as tested per ASTM C 827.

2.7.2 Type

Use Type I (Normal) cement for grout applications not in contact with sewage.

Use Type II (Sulfate Resistant) cement for grout applications in contact with sewage.

2.7.3 Minimum Properties

Grout shall be certified to maintain initial placement volume or expand after set and meet the following minimum properties when tested in accordance with Corp of Engineers Specification COE CRD-C 621 for Type D non-shrink grout.

Setting Time: ASTM C191	Initial	2 hours (Approx)
	Final	3 hours (Approx)
Expansion:		0.10% - 0.4% Maximum
Compressive Strength: CDR-C621	1 day	4,000 psi
	7 days	7,000 psi
	28 days	10,000 psi - 10,800 psi

2.7.4 Acceptable Manufacturer

U.S. Grout Corporation; FIVE STAR, or equal.

Initial set of grout not less than 60 minutes per ASTM C 191 Test.

2.8 NONSLIP SURFACING MATERIAL

Non-slip surfacing material shall consist of 55 percent, minimum, aluminum oxide or silicon-dioxide abrasive ceramically bonded together to form a homogeneous material sufficiently porous to provide a good bond with portland cement paste; or factory-graded emery aggregate consisting of not less than 45 percent aluminum oxide and 25 percent ferric oxide. The aggregate shall be well graded from particles retained on the No. 30 sieve to particles passing the No. 8 sieve.

2.9 LATEX MODIFIED CONCRETE

Latex Modified Concrete, 1.25 inch depth, shall meet the requirements of PDT Specifications Pub. 408 Section 1042 Latex Modified Mortar or Concrete Wearing Surface.

2.10 LATEX BONDING AGENT

Latex agents for bonding fresh to hardened concrete shall conform to ASTM C 1059.

2.11 EPOXY RESIN

Epoxy resins for use in repairs shall conform to ASTM C 881, Type V, Grade 2. Class as appropriate to the existing ambient and surface temperatures.

2.12 EMBEDDED ITEMS

Embedded items shall be of the size and type indicated or as needed for the application. Dovetail slots shall be galvanized steel. Inserts for shelf angles and bolt hangers shall be of malleable iron or cast or wrought steel.

2.13 FLOOR HARDENER

Floor hardener shall be a colorless aqueous solution containing zinc silicofluoride, magnesium silicofluoride, or sodium silicofluoride. These silicofluorides can be used individually or in combination. Proprietary hardeners may be used if approved in writing by the Contracting Officer.

2.14 PERIMETER INSULATION

Perimeter insulation shall be polystyrene conforming to ASTM C 578, Type II; polyurethane conforming to ASTM C 591, Type II; or cellular glass conforming to ASTM C 552, Type I or IV. The Contractor shall comply with EPA requirements in accordance with Section 01011 SPECIAL REQUIREMENTS, paragraph 1.16 Buy Recycle Program.

2.15 VAPOR BARRIER

Vapor barrier shall be polyethylene sheeting with a minimum thickness of 6 mils or other equivalent material having a vapor permeance rating not exceeding 0.5 perms as determined in accordance with ASTM E 96.

2.16 JOINT MATERIALS

2.16.1 Joint Fillers, Sealers, and Waterstops

Expansion joint fillers shall be preformed materials conforming to ASTM D 1751. Materials for waterstops shall be in accordance with Section 03150 EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS. Materials for and sealing of joints shall conform to the requirements of Section 07920 JOINT SEALANTS.

2.16.2 Contraction Joints in Slabs

Sawable type contraction joint inserts shall conform to COE CRD-C 540. Non-sawable joint inserts shall have sufficient stiffness to permit placement in plastic concrete without undue deviation from a straight line and shall conform to the physical requirements of COE CRD-C 540, with the exception of

Section 3.4 "Resistance to Sawing". Plastic inserts shall be polyvinyl chloride conforming to the materials requirements of COE CRD-C 572.

PART 3 EXECUTION

3.1 PREPARATION FOR PLACING

Before commencing concrete placement, the following shall be performed. Surfaces to receive concrete shall be clean and free from frost, ice, mud, and water. Forms shall be in place, cleaned, coated, and adequately supported, in accordance with Section 03100 STRUCTURAL CONCRETE FORMWORK. Reinforcing steel shall be in place, cleaned, tied, and adequately supported, in accordance with Section 03200 CONCRETE REINFORCEMENT. Transporting and conveying equipment shall be in-place, ready for use, clean, and free of hardened concrete and foreign material. Equipment for consolidating concrete shall be at the placing site and in proper working order. Equipment and material for curing and for protecting concrete from weather or mechanical damage shall be at the placing site, in proper working condition and in sufficient amount for the entire placement. When hot, windy conditions during concreting appear probable, equipment and material shall be at the placing site to provide windbreaks, shading, fogging, or other action to prevent plastic shrinkage cracking or other damaging drying of the concrete.

3.1.1 Foundations

3.1.1.1 Concrete on Earth Foundations

Earth (subgrade, base, or subbase courses) surfaces upon which concrete is to be placed shall be clean, damp, and free from debris, frost, ice, and standing or running water. Prior to placement of concrete, the foundation shall be well drained and shall be satisfactorily graded and uniformly compacted.

3.1.1.2 Preparation of Rock

Rock surfaces upon which concrete is to be placed shall be free from oil, standing or running water, ice, mud, drummy rock, coating, debris, and loose, semidetached or unsound fragments. Joints in rock shall be cleaned to a satisfactory depth, as determined by the Contracting Officer, and to firm rock on the sides. Immediately before the concrete is placed, rock surfaces shall be cleaned thoroughly by the use of air-water jets or sandblasting as specified below for Previously Placed Concrete. Rock surfaces shall be kept continuously moist for at least 24 hours immediately prior to placing concrete thereon. All horizontal and approximately horizontal surfaces shall be covered, immediately before the concrete is placed, with a layer of mortar proportioned similar to that in the concrete mixture. Concrete shall be placed before the mortar stiffens.

3.1.2 Previously Placed Concrete

Concrete surfaces to which additional concrete is to be bonded shall be prepared for receiving the next horizontal lift by cleaning the construction joint surface with either air-water cutting, sandblasting, high-pressure water jet, or other approved method. Concrete at the side of vertical construction joints shall be prepared as approved by the Contracting Officer. Air-water cutting shall not be used on formed surfaces or surfaces congested with reinforcing steel. Regardless of the method used, the resulting surfaces shall be free from all laitance and inferior concrete so that clean

surfaces of well bonded coarse aggregate are exposed and make up at least 10-percent of the surface area, distributed uniformly throughout the surface. The edges of the coarse aggregate shall not be undercut. The surface of horizontal construction joints shall be kept continuously wet for the first 12 hours during the 24-hour period prior to placing fresh concrete. The surface shall be washed completely clean as the last operation prior to placing the next lift. For heavy duty floors and two-course floors a thin coat of neat cement grout of about the consistency of thick cream shall be thoroughly scrubbed into the existing surface immediately ahead of the topping placing. The grout shall be a 1:1 mixture of portland cement and sand passing the No. 8 sieve. The topping concrete shall be deposited before the grout coat has had time to stiffen.

3.1.2.1 Bonding New Concrete to Existing Concrete

Roughen existing concrete in the area of bonding to produce exposed aggregate and an absolutely uncontaminated concrete surface. Apply Epoxy Bonding Compound over existing prepared concrete in accordance with manufacturer’s instructions.

3.1.2.2 Air-Water Cutting

Air-water cutting of a fresh concrete surface shall be performed at the proper time and only on horizontal construction joints. The air pressure used in the jet shall be 100 psi plus or minus, 10 psi, and the water pressure shall be just sufficient to bring the water into effective influence of the air pressure. When approved by the Contracting Officer, a surface retarder complying with the requirements of COE CRD-C 94 may be applied to the surface of the lift in order to prolong the period of time during which air-water cutting is effective. After cutting, the surface shall be washed and rinsed as long as there is any trace of cloudiness of the wash water. Where necessary to remove accumulated laitance, coatings, stains, debris, and other foreign material, high-pressure water jet or sandblasting shall be used as the last operation before placing the next lift.

3.1.2.3 High-Pressure Water Jet

A stream of water under a pressure of not less than 3,000 psi shall be used for cutting and cleaning. Its use shall be delayed until the concrete is sufficiently hard so that only the surface skin or mortar is removed and there is no undercutting of coarse-aggregate particles. If the water jet is incapable of a satisfactory cleaning, the surface shall be cleaned by sandblasting.

3.1.2.4 Wet Sandblasting

Wet sandblasting shall be used after the concrete has reached sufficient strength to prevent undercutting of the coarse aggregate particles. After wet sandblasting, the surface of the concrete shall then be washed thoroughly to remove all loose materials.

3.1.2.5 Waste Disposal

The method used in disposing of waste water employed in cutting, washing, and rinsing of concrete surfaces shall be such that the waste water does not stain, discolor, or affect exposed surfaces of the structures, or damage the environment of the project area. The method of disposal shall be subject to approval.

3.1.2.6 Preparation of Previously Placed Concrete

Concrete surfaces to which other concrete is to be bonded shall be abraded in an approved manner that will expose sound aggregate uniformly without damaging the concrete. Laitance and loose particles shall be removed. Surfaces shall be thoroughly washed and shall be moist but without free water when concrete is placed.

3.1.3 Vapor Barrier

Vapor barrier shall be provided beneath the interior on-grade concrete floor slabs. The greatest widths and lengths practicable shall be used to eliminate joints wherever possible. Joints shall be lapped a minimum of 12 inches. Torn, punctured, or damaged vapor barrier material shall be removed and new vapor barrier shall be provided prior to placing concrete. For minor repairs, patches may be made using laps of at least 12 inches. Lapped joints shall be sealed and edges patched with pressure-sensitive adhesive or tape not less than 2 inches wide and compatible with the membrane. Vapor barrier shall be placed directly on underlying subgrade, base course, or capillary water barrier, unless it consists of crushed material or large granular material which could puncture the vapor barrier. In this case, the surface shall be choked with a light layer of sand, as approved, before placing the vapor barrier. A 2 inch layer of compacted, clean concrete sand (fine aggregate) shall be placed on top of the vapor barrier before placing concrete. Concrete placement shall be controlled so as to prevent damage to the vapor barrier, or any covering sand.

3.1.4 Perimeter Insulation

Perimeter insulation shall be installed at locations indicated. Adhesive shall be used where insulation is applied to the interior surface of foundation walls and may be used for exterior application.

3.1.5 Embedded Items

Before placement of concrete, care shall be taken to determine that all embedded items are firmly and securely fastened in place as indicated on the drawings, or required. Conduit and other embedded items shall be clean and free of oil and other foreign matter such as loose coatings or rust, paint, and scale. The embedding of wood in concrete will be permitted only when specifically authorized or directed. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable materials to prevent the entry of concrete into voids. Welding shall not be performed on embedded metals within 1 feet of the surface of the concrete. Tack welding shall not be performed on or to embedded items.

3.2 CONCRETE PRODUCTION

3.2.1 Batching, Mixing, and Transporting Concrete

Concrete shall be furnished from a ready-mixed concrete plant. Ready-mixed concrete shall be batched, mixed, and transported in accordance with ASTM C 94/C 94M, except as otherwise specified. Truck mixers, agitators, and non-agitating transporting units shall comply with NRMCA TMMB 100. Ready-mix plant equipment and facilities shall be certified in accordance with NRMCA QC 3. Approved batch delivery tickets shall be furnished for each load of ready-mixed concrete.

3.3 TRANSPORTING CONCRETE TO PROJECT SITE

Concrete shall be transported to the placing site in truck mixers, conforming to NRMCA TMMB 100 or by approved pumping equipment. Non-agitating equipment, other than pumps, shall not be used for transporting lightweight aggregate concrete.

3.4 CONVEYING CONCRETE ON SITE

Concrete shall be conveyed from mixer to forms as rapidly as possible and within the time interval specified by methods which will prevent segregation or loss of ingredients using following equipment. Conveying equipment shall be cleaned before each placement.

3.4.1 Buckets

The interior hopper slope shall be not less than 58 degrees from the horizontal, the minimum dimension of the clear gate opening shall be at least 5 times the nominal maximum-size aggregate, and the area of the gate opening shall not be less than 2 square feet. The maximum dimension of the gate opening shall not be greater than twice the minimum dimension. The bucket gates shall be essentially grout tight when closed and may be manually, pneumatically, or hydraulically operated except that buckets larger than 2 cubic yards shall not be manually operated. The design of the bucket shall provide means for positive regulation of the amount and rate of deposit of concrete in each dumping position.

3.4.2 Transfer Hoppers

Concrete may be charged into non-agitating hoppers for transfer to other conveying devices. Transfer hoppers shall be capable of receiving concrete directly from delivery vehicles and shall have conical-shaped discharge features. The transfer hopper shall be equipped with a hydraulically operated gate and with a means of external vibration to effect complete discharge. Concrete shall not be held in non-agitating transfer hoppers more than 30 minutes.

3.4.3 Trucks

Truck mixers operating at agitating speed or truck agitators used for transporting plant-mixed concrete shall conform to the requirements of ASTM C 94/C 94M. Non-agitating equipment shall be used only for transporting plant-mixed concrete over a smooth road and when the hauling time is less than 15 minutes. Bodies of non-agitating equipment shall be smooth, watertight, metal containers specifically designed to transport concrete, shaped with rounded corners to minimize segregation, and equipped with gates that will permit positive control of the discharge of the concrete.

3.4.4 Chutes

When concrete can be placed directly from a truck mixer, agitator, or non-agitating equipment, the chutes normally attached to this equipment by the manufacturer may be used. A discharge deflector shall be used when required by the Contracting Officer. Separate chutes and other similar equipment will not be permitted for conveying concrete.

3.4.5 Belt Conveyors

Belt conveyors shall be designed and operated to assure a uniform flow of concrete from mixer to final place of deposit without segregation of ingredients or loss of mortar and shall be provided with positive means, such as discharge baffle or hopper , for preventing segregation of the concrete at the transfer points and the point of placing. Belt conveyors shall be constructed such that the idler spacing shall not exceed 36 inches. The belt speed shall be a minimum of 300 feet per minute and a maximum of 750 feet per minute. If concrete is to be placed through installed horizontal or sloping reinforcing bars, the conveyor shall discharge concrete into a pipe or elephant truck that is long enough to extend through the reinforcing bars.

3.4.6 Concrete Pumps

Concrete may be conveyed by positive displacement pump when approved. The pumping equipment shall be piston or squeeze pressure type; pneumatic placing equipment shall not be used. The pipeline shall be rigid steel pipe or heavy-duty flexible hose. The inside diameter of the pipe shall be at least 3 times the nominal maximum-size coarse aggregate in the concrete mixture to be pumped but not less than 4 inches. Aluminum pipe shall not be used.

3.5 PLACING CONCRETE

Mixed concrete shall be discharged within 1-1/2 hours or before the mixer drum has revolved 300 revolutions, whichever comes first after the introduction of the mixing water to the cement and aggregates. When the concrete temperature exceeds 85 degrees F, the time shall be reduced to 45 minutes. Concrete shall be placed within 15 minutes after it has been discharged from the transporting unit. Concrete shall be handled from mixer or transporting unit to forms in a continuous manner until the approved unit of operation is completed. Adequate scaffolding, ramps and walkways shall be provided so that personnel and equipment are not supported by in-place reinforcement. Placing will not be permitted when the sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper consolidation, finishing and curing. Sufficient placing capacity shall be provided so that concrete can be kept free of cold joints.

3.5.1 Depositing Concrete

Concrete shall be deposited as close as possible to its final position in the forms, and there shall be no vertical drop greater than 4 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. Depositing of the concrete shall be so regulated that it will be effectively consolidated in horizontal layers not more than 12 inches thick, except that all slabs shall be placed in a single layer. Concrete to receive other construction shall be screeded to the proper level. Concrete shall be deposited continuously in one layer or in layers so that fresh concrete is deposited on in-place concrete that is still plastic. Fresh concrete shall not be deposited on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within the section. Concrete that has surface dried, partially hardened, or contains foreign material shall not be used. When temporary spreaders are used in the forms, the spreaders shall be removed as their service becomes unnecessary. Concrete shall not be placed in slabs over columns and walls until concrete in columns and walls has been in-place at least two hours or until the concrete begins to lose its plasticity. Concrete for beams, girders, brackets, column capitals, haunches, and drop panels shall be placed at the same time as concrete for adjoining slabs.

3.5.2 Consolidation

Immediately after placing, each layer of concrete shall be consolidated by internal vibrators, except for slabs 4 inches thick or less. The vibrators shall at all times be adequate in effectiveness and number to properly consolidate the concrete; a spare vibrator shall be kept at the jobsite during all concrete placing operations. The vibrators shall have a frequency of not less than 10,000 vibrations per minute, an amplitude of at least 0.025 inch, and the head diameter shall be appropriate for the structural member and the concrete mixture being placed. Vibrators shall be inserted vertically at uniform spacing over the area of placement. The distance between insertions shall be approximately 1-1/2 times the radius of action of the vibrator so that the area being vibrated will overlap the adjacent just-vibrated area by a reasonable amount. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the preceding layer if there is such. Vibrator shall be held stationary until the concrete is consolidated and then vertically withdrawn slowly while operating. Form vibrators shall not be used unless specifically approved and unless forms are constructed to withstand their use. Vibrators shall not be used to move concrete within the forms. Slabs 4 inches and less in thickness shall be consolidated by properly designed vibrating screeds or other approved technique. Excessive vibration of lightweight concrete resulting in segregation or flotation of coarse aggregate shall be prevented. Frequency and amplitude of vibrators shall be determined in accordance with COE CRD-C 521. Grate tampers ("jitterbugs") shall not be used.

3.5.3 Cold Weather Requirements

Special protection measures, approved by the Contracting Officer, shall be used if freezing temperatures are anticipated before the expiration of the specified curing period. The ambient temperature of the air where concrete is to be placed and the temperature of surfaces to receive concrete shall be not less than 40 degrees F. The temperature of the concrete when placed shall be not less than 50 degrees F nor more than 75 degrees F. Heating of the mixing water or aggregates will be required to regulate the concrete placing temperature. Materials entering the mixer shall be free from ice, snow, or frozen lumps. Salt, chemicals or other materials shall not be incorporated in the concrete to prevent freezing. Upon written approval, an accelerating admixture conforming to ASTM C 494/C 494M, Type E may be used, provided it contains no calcium chloride. Calcium chloride shall not be used. The concrete temperature at time of delivery to the forms shall conform to the temperatures listed in the Table below.

Minimum Concrete Temp.
(°F)

Air Temp. (°F)	Sections w/ Least Dimension < 12″	Sections w/ Least Dimension >= 12″
30-45	60	50
0-30	65	55

3.5.4 Hot Weather Requirements

When the ambient temperature during concrete placing is expected to exceed 85 degrees F, the concrete shall be placed and finished with procedures previously submitted and as specified herein. The concrete temperature at time of delivery to the forms shall not exceed the temperature shown in the table below when measured in accordance with ASTM C 1064/C 1064M. Cooling of the mixing water or aggregates or placing concrete in the cooler part of the day may be required to obtain an adequate placing temperature. A retarder may be used, as approved, to facilitate placing and finishing. Steel forms and reinforcements shall be cooled as approved prior to concrete placement when steel temperatures are greater than 120 degrees F. Conveying and placing equipment shall be cooled if necessary to maintain proper concrete-placing temperature.

Maximum Allowable Concrete Placing Temp. (°F)

Relative Humidity During Time of Concrete Placement (%)	Maximum Allowable Concrete Temp. (°F)
> 60	90
40-60	85
< 40	80

3.5.5 Prevention of Plastic Shrinkage Cracking

During hot weather with low humidity, and particularly with appreciable wind, as well as interior placements when space heaters produce low humidity, the Contractor shall be alert to the tendency for plastic shrinkage cracks to develop and shall institute measures to prevent this. Particular care shall be taken if plastic shrinkage cracking is potentially imminent and especially if it has developed during a previous placement. Periods of high potential for plastic shrinkage cracking can be anticipated by use of Fig. 2.1.5 of ACI 305R. In addition the concrete placement shall be further protected by erecting shades and windbreaks and by applying fog sprays of water, sprinkling, ponding or wet covering. Plastic shrinkage cracks that occur shall be filled by injection of epoxy resin as directed, after the concrete hardens. Plastic shrinkage cracks shall never be troweled over or filled with slurry.

3.5.6 Placing Concrete in Congested Areas

Special care shall be used to ensure complete filling of the forms, elimination of all voids, and complete consolidation of the concrete when placing concrete in areas congested with reinforcing bars, embedded items, waterstops and other tight spacing. An appropriate concrete mixture shall be used, and the nominal maximum size of aggregate (NMSA) shall meet the specified criteria when evaluated for the congested area. Vibrators with heads of a size appropriate for the clearances available shall be used, and the consolidation operation shall be closely supervised to ensure complete and thorough consolidation at all points. Where necessary, splices of reinforcing bars shall be alternated to reduce congestion. Where two mats of closely spaced reinforcing are required, the bars in each mat shall be placed in matching alignment to reduce congestion. Reinforcing bars may be temporarily crowded to one side during concrete placement provided they are returned to exact required location before concrete placement and consolidation are completed.

3.6 JOINTS

Joints shall be located and constructed as indicated or approved. Joints not indicated on the drawings shall be located and constructed to minimize the impact on the strength of the structure. In general, such joints shall be located near the middle of the spans of supported slabs, beams, and girders unless a beam intersects a girder at this point, in which case the joint in the girder shall be offset a distance equal to twice the width of the beam. Joints in walls and columns shall be at the underside of floors, slabs, beams, or girders and at the tops of footings or floor slabs, unless otherwise approved. Joints shall be perpendicular to the main reinforcement. All reinforcement shall be continued across joints; except that reinforcement or other fixed metal items shall not be continuous through expansion joints, or through construction or contraction joints in slabs on grade. Reinforcement shall be 2 inches clear from each joint. Except where otherwise indicated, construction joints between interior slabs on grade and vertical surfaces shall consist of 30 pound asphalt-saturated felt, extending for the full depth of the slab. The perimeters of the slabs shall be free of fins, rough edges, spalling, or other unsightly appearance. Reservoir for sealant for construction and contraction joints in slabs shall be formed to the dimensions shown on the drawings by removing snap-out joint-forming inserts, by sawing sawable inserts, or by sawing to widen the top portion of sawed joints. Joints to be sealed shall be cleaned and sealed as indicated and in accordance with Section 07920 JOINT SEALANTS.

3.6.1 Construction Joints

For concrete other than slabs on grade, construction joints shall be located so that the unit of operation does not exceed maximum spacing provided by the Government. Concrete shall be placed continuously so that each unit is monolithic in construction. Fresh concrete shall not be placed against adjacent hardened concrete until it is at least 24 hours old. Construction joints shall be located as indicated or approved. Where concrete work is interrupted by weather, end of work shift or other similar type of delay, location and type of construction joint shall be subject to approval of the Contracting Officer. Unless otherwise indicated and except for slabs on grade, reinforcing steel shall extend through construction joints. Construction joints in slabs on grade shall be keyed or doweled as shown. Concrete columns, walls, or piers shall be in place at least 2 hours, or until the concrete begins to lose its plasticity, before placing concrete for beams, girders, or slabs thereon. In walls having door or window openings, lifts shall terminate at the top and bottom of the opening. Other lifts shall terminate at such levels as to conform to structural requirements or architectural details. Where horizontal construction joints in walls or columns are required, a strip of 1 inch square-edge lumber, beveled and oiled to facilitate removal, shall be tacked to the inside of the forms at the construction joint. Concrete shall be placed to a point 1 inch above the underside of the strip. The strip shall be removed 1 hour after the concrete has been placed, and any irregularities in the joint line shall be leveled off with a wood float, and all laitance shall be removed. Prior to placing additional concrete, horizontal construction joints shall be prepared as specified in paragraph Previously Placed Concrete.

3.6.2 Contraction Joints in Slabs on Grade

Contraction joints shall be located and detailed as shown on the drawings. Contraction Joints shall be produced by forming a weakened plane in the concrete slab by sawing a continuous slot with a concrete saw. Regardless of

method used to produce the weakened plane, it shall be 1/4 the depth of the slab thickness and between 1/8 and 3/16 inch wide. For saw-cut joints, cutting shall be timed properly with the set of the concrete. Cutting shall be started as soon as the concrete has hardened sufficiently to prevent raveling of the edges of the saw cut. Cutting shall be completed before shrinkage stresses become sufficient to produce cracking. Reservoir for joint sealant shall be formed as previously specified.

3.6.3 Expansion Joints

Installation of expansion joints and sealing of these joints shall conform to the requirements of Section 03150 EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS and Section 07920 JOINT SEALANTS.

3.6.4 Waterstops

Waterstops shall be installed in conformance with the locations and details shown on the drawings using materials and procedures specified in Section 03150 EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS.

3.6.5 Dowels and Tie Bars

Dowels and tie bars shall be installed at the locations shown on the drawings and to the details shown, using materials and procedures specified in Section 03200 CONCRETE REINFORCEMENT and herein. Conventional smooth "paving" dowels shall be installed in slabs using approved methods to hold the dowel in place during concreting within a maximum alignment tolerance of 1/8 inch in 12 inches. "Structural" type deformed bar dowels, or tie bars, shall be installed to meet the specified tolerances. Care shall be taken during placing adjacent to and around dowels and tie bars to ensure there is no displacement of the dowel or tie bar and that the concrete completely embeds the dowel or tie bar and is thoroughly consolidated.

3.7 FINISHING FORMED SURFACES

Forms, form materials, and form construction are specified in Section 03100 STRUCTURAL CONCRETE FORMWORK. Finishing of formed surfaces shall be as specified herein. Unless another type of architectural or special finish is specified, surfaces shall be left with the texture imparted by the forms except that defective surfaces shall be repaired. Unless painting of surfaces is required, uniform color of the concrete shall be maintained by use of only one mixture without changes in materials or proportions for any structure or portion of structure that requires a Class A or B finish. Except for major defects, as defined hereinafter, surface defects shall be repaired as specified herein within 24 hours after forms are removed. Repairs of the so-called "plaster-type" will not be permitted in any location. Tolerances of formed surfaces shall conform to the requirements of ACI 117. These tolerances apply to the finished concrete surface, not to the forms themselves; forms shall be set true to line and grade. Form tie holes requiring repair and other defects whose depth is at least as great as their surface diameter shall be repaired as specified in paragraph Damp-Pack Mortar Repair. Defects whose surface diameter is greater than their depth shall be repaired as specified in paragraph Repair of Major Defects. Repairs shall be finished flush with adjacent surfaces and with the same surface texture. The cement used for all repairs shall be a blend of job cement with white cement proportioned so that the final color after curing and aging will be the same as the adjacent concrete. Concrete with excessive honeycomb, or other defects which affect the strength of the member, will be rejected. Repairs shall be demonstrated to be acceptable and free from cracks or loose or

drummy areas at the completion of the contract and, for Class A and B Finishes, shall be inconspicuous. Repairs not meeting these requirements will be rejected and shall be replaced.

3.7.1 Class A Finish and Class B Finish

Class A or Class B finish is required as indicated on the drawings. Fins, ravelings, and loose material shall be removed, all surface defects over 1/2 inch in diameter or more than 1/2 inch deep, shall be repaired and, except as otherwise indicated or as specified in Section 03100 STRUCTURAL CONCRETE FORMWORK, holes left by removal of form ties shall be reamed and hammer packed with stiff mortar of same mix and ingredients of surrounding concrete. Prepare mortar not more than 30 minutes prior to use. Defects more than 1/2 inch in diameter shall be cut back to sound concrete, but in all cases at least 1 inch deep. The Contractor shall prepare a sample panel for approval (as specified in PART 1) before commencing repair, showing that the surface texture and color match will be attained. Metal tools shall not be used to finish repairs in Class A surfaces.

3.7.2 Class C and Class D Finish

Class C or Class D finish is required as indicated on the drawings. Fins, ravelings, and loose material shall be removed, and, except as otherwise indicated or as specified in Section 03100 STRUCTURAL CONCRETE FORMWORK, holes left by removal of form ties shall be reamed and filled. Honeycomb and other defects more than 1/2 inch deep or more than 2 inches in diameter shall be repaired. Defects more than 2 inches in diameter shall be cut back to sound concrete, but in all cases at least 1 inch deep.

3.7.3 Architectural and Special Finishes

3.7.3.1 Smooth Finish

After other concrete construction is complete in each overall separate contiguous area of the structure, smooth finish shall be applied to exposed vertical surfaces of concrete structures down to 1 foot below finished grade elevation and any other areas indicated on the drawings. A mortar mix consisting of one part Portland cement and two parts well-graded sand passing a No. 30 sieve, with water added to give the consistency of thick paint, shall be used. Where the finished surface will not receive other applied surface, white cement shall be used to replace part of the job cement to produce an approved color, which shall be uniform throughout the surfaces of the structure. After the surface has been thoroughly wetted and allowed to approach surface dryness, the mortar shall be vigorously applied to the area by clean burlap pads or by cork or wood-floating, to completely fill all surface voids. Excess grout shall be scraped off with a trowel. As soon as it can be accomplished without pulling the mortar from the voids, the area shall be rubbed with burlap pads having on their surface the same sand-cement mix specified above but without any mixing water, until all of the visible grout film is removed. The burlap pads used for this operation shall be stretched tightly around a board to prevent dishing the mortar in the voids. The finish of any area shall be completed in the same day, and the limits of a finished area shall be made at natural breaks in the surface. The surface shall be continuously moist cured for 48 hours commencing immediately after finishing operations in each area. The temperature of the air adjacent to the surface shall be not less than 50 degrees F for 24 hours prior to, and 48 hours after, the application. In hot, dry weather the smooth finish shall be applied in shaded areas or at night, and shall never be applied when there is significant hot, dry wind.

3.7.3.2 Exposed Coarse-Aggregate Finish

Coarse aggregate shall consist of material, shall meet the specified quality requirements, and grading as indicated on the drawings. Coarse aggregate shall be exposed by an approved method. The finish shall be as depicted on a preconstruction test panel fabricated by the Contractor.

3.7.3.3 Sandblast Finish

The concrete surface shall be blasted at an approved age with approved wet sandblasting procedures to obtain a medium finish which will match the descriptive photographs in ACI 303R. The finish shall be similar to and shall closely match the finish on the approved preconstruction test panel fabricated by the Contractor.

3.8 REPAIRS

3.8.1 Damp-Pack Mortar Repair

Form tie holes requiring repair and other defects whose depth is at least as great as their surface diameter but not over 4 inches shall be repaired by the damp-pack mortar method. Form tie holes shall be reamed and other similar defects shall be cut out to sound concrete. The void shall then be thoroughly cleaned, thoroughly wetted, brush-coated with a thin coat of neat cement grout and filled with mortar. Mortar shall be a stiff mix of 1 part Portland cement to 2 parts fine aggregate passing the No. 16 mesh sieve, and minimum amount of water. Only sufficient water shall be used to produce a mortar which, when used, will stick together on being molded into a ball by a slight pressure of the hands and will not exude water but will leave the hands damp. Mortar shall be mixed and allowed to stand for 30 to 45 minutes before use with remixing performed immediately prior to use. Mortar shall be thoroughly tamped in place in thin layers using a hammer and hardwood block. Holes passing entirely through walls shall be completely filled from the inside face by forcing mortar through to the outside face. All holes shall be packed full. Damp-pack repairs shall be moist cured for at least 48 hours.

3.8.2 Repair of Major Defects

Major defects will be considered to be those more than 1/2 inch deep or, for Class A and B finishes, more than 1/2 inch in diameter and, for Class C and D finishes, more than 2 inches in diameter. Also included are any defects of any kind whose depth is over 4 inches or whose surface diameter is greater than their depth. Major defects shall be repaired as specified below.

3.8.2.1 Surface Application of Mortar Repair

Defective concrete shall be removed, and removal shall extend into completely sound concrete. Approved equipment and procedures which will not cause cracking or microcracking of the sound concrete shall be used. If reinforcement is encountered, concrete shall be removed so as to expose the reinforcement for at least 2 inches on all sides. All such defective areas greater than 12 square inches shall be outlined by saw cuts at least 1 inch deep. Defective areas less than 12 square inches shall be outlined by a 1 inch deep cut with a core drill in lieu of sawing. All saw cuts shall be straight lines in a rectangular pattern in line with the formwork panels. After concrete removal, the surface shall be thoroughly cleaned by high pressure washing to remove all loose material. Surfaces shall be kept

continually saturated for the first 12 of the 24 hours immediately before placing mortar and shall be damp but not wet at the time of commencing mortar placement. The Contractor, at his option, may use either hand-placed mortar or mortar placed with a mortar gun. If hand-placed mortar is used, the edges of the cut shall be perpendicular to the surface of the concrete. The prepared area shall be brush-coated with a thin coat of neat cement grout. The repair shall then be made using a stiff mortar, preshrunk by allowing the mixed mortar to stand for 30 to 45 minutes and then remixed, thoroughly tamped into place in thin layers. If hand-placed mortar is used, the Contractor shall test each repair area for drumminess by firm tapping with a hammer and shall inspect for cracks, both in the presence of the Contracting Officer's representative, immediately before completion of the contract, and shall replace any showing drumminess or cracking. If mortar placed with a mortar gun is used, the gun shall be a small compressed air-operated gun to which the mortar is slowly hand fed and which applies the mortar to the surface as a high-pressure stream, as approved. Repairs made using shotcrete equipment will not be accepted. The mortar used shall be the same mortar as specified for damp-pack mortar repair. If gun-placed mortar is used, the edges of the cut shall be beveled toward the center at a slope of 1:1. All surface applied mortar repairs shall be continuously moist cured for at least 7 days. Moist curing shall consist of several layers of saturated burlap applied to the surface immediately after placement is complete and covered with polyethylene sheeting, all held closely in place by a sheet of plywood or similar material rigidly braced against it. Burlap shall be kept continually wet.

3.8.2.2 Repair of Deep and Large Defects

Deep and large defects will be those that are more than 6 inches deep and also have an average diameter at the surface more than 18 inches or that are otherwise so identified by the Project Office. Such defects shall be repaired as specified herein or directed, except that defects which affect the strength of the structure shall not be repaired and that portion of the structure shall be completely removed and replaced. Deep and large defects shall be repaired by procedures approved in advance including forming and placing special concrete using applied pressure during hardening. Preparation of the repair area shall be as specified for surface application of mortar. In addition, the top edge (surface) of the repair area shall be sloped at approximately 20 degrees from the horizontal, upward toward the side from which concrete will be placed. The special concrete shall be a concrete mixture with low water content and low slump, and shall be allowed to age 30 to 60 minutes before use. Concrete containing a specified expanding admixture may be used in lieu of the above mixture; the paste portion of such concrete mixture shall be designed to have an expansion between 2.0 and 4.0 percent when tested in accordance with ASTM C 940. A full width "chimney" shall be provided at the top of the form on the placing side to ensure filling to the top of the opening. A pressure cap shall be used on the concrete in the chimney with simultaneous tightening and re-vibrating the form during hardening to ensure a tight fit for the repair. The form shall be removed after 24 hours and immediately the chimney shall be carefully chipped away to avoid breaking concrete out of the repair; the surface of the repair concrete shall be dressed as required.

3.9 COLORED CONCRETE

Perform work in accordance with ACI 301, Section 6 - Architectural Concrete. Mix pigments in accordance with manufacturer's instructions. Mix until pigments are uniformly dispersed throughout mixture and disintegrating bags, if used, have disintegrated.

Apply curing compound in accordance with manufacturer's instructions.

Minor variations in appearance of colored concrete, which are similar to natural variations in color and appearance of un-pigmented concrete, are acceptable.

3.10 FINISHING UNFORMED SURFACES

The finish of all unformed surfaces shall meet the requirements of paragraph Tolerances in PART 1, when tested as specified herein.

3.10.1 General

The ambient temperature of spaces adjacent to unformed surfaces being finished and of the base on which concrete will be placed shall be not less than 50 degrees F. In hot weather all requirements of paragraphs Hot Weather Requirements and Prevention of Plastic Shrinkage Cracking shall be met. Unformed surfaces that are not to be covered by additional concrete or backfill shall have a float finish, with additional finishing as specified below, and shall be true to the elevation shown on the drawings. Surfaces to receive additional concrete or backfill shall be brought to the elevation shown on the drawings, properly consolidated, and left true and regular. Unless otherwise shown on the drawings, exterior surfaces shall be sloped for drainage, as directed. Where drains are provided, interior floors shall be evenly sloped to the drains. Joints shall be carefully made with a jointing or edging tool. The finished surfaces shall be protected from stains or abrasions. Grate tampers or "jitterbugs" shall not be used for any surfaces. The dusting of surfaces with dry cement or other materials or the addition of any water during finishing shall not be permitted. If bleedwater is present prior to finishing, the excess water shall be carefully dragged off or removed by absorption with porous materials such as burlap. During finishing operations, extreme care shall be taken to prevent over finishing or working water into the surface; this can cause "crazing" (surface shrinkage cracks which appear after hardening) of the surface. Any slabs with surfaces which exhibit significant crazing shall be removed and replaced. During finishing operations, surfaces shall be checked with a 10 foot straightedge, applied in both directions at regular intervals while the concrete is still plastic, to detect high or low areas.

3.10.2 Rough Slab Finish

As a first finishing operation for unformed surfaces and as final finish for slabs to receive mortar setting beds, the surface shall receive a rough slab finish prepared as follows. Areas indicated on the drawings shall receive only a rough slab finish. The concrete shall be uniformly placed across the slab area, consolidated as previously specified, and then screeded with straightedge strikeoffs immediately after consolidation to bring the surface to the required finish level with no coarse aggregate visible. Side forms and screed rails shall be provided, rigidly supported, and set to exact line and grade. Allowable tolerances for finished surfaces apply only to the hardened concrete, not to forms or screed rails. Forms and screed rails shall be set true to line and grade. "Wet screeds" shall not be used.

3.10.3 Floated Finish

Slabs to receive more than a rough slab finish shall next be given a wood float finish. Other areas as indicated on the drawings shall be given only a float finish. The screeding shall be followed immediately by darbying or

bull floating before bleeding water is present, to bring the surface to a true, even plane. Then, after the concrete has stiffened so that it will withstand a man's weight without imprint of more than 1/4 inch and the water sheen has disappeared, it shall be floated to a true and even plane free of ridges. Floating shall be performed by use of suitable hand floats or power driven equipment. Sufficient pressure shall be used on the floats to bring a film of moisture to the surface. Hand floats shall be made of wood, magnesium, or aluminum. Lightweight concrete or concrete that exhibits stickiness shall be floated with a magnesium float. Care shall be taken to prevent over-finishing or incorporating water into the surface.

3.10.4 Troweled Finish

Areas as indicated on the drawings shall be given a trowel finish. After floating is complete and after the surface moisture has disappeared, unformed surfaces shall be steel-troweled to a smooth, even, dense finish, free from blemishes including trowel marks. In lieu of hand finishing, an approved power finishing machine may be used in accordance with the directions of the machine manufacturer. Additional trowelings shall be performed, either by hand or machine until the surface has been troweled 3 times, with waiting period between each. Care shall be taken to prevent blistering and if such occurs, troweling shall immediately be stopped and operations and surfaces corrected. A final hard steel troweling shall be done by hand, with the trowel tipped, and using hard pressure, when the surface is at a point that the trowel will produce a ringing sound. The finished surface shall be thoroughly consolidated and shall be essentially free of trowel marks and be uniform in texture and appearance. The concrete mixture used for troweled finished areas shall be adjusted, if necessary, in order to provide sufficient fines (cementitious material and fine sand) to finish properly.

3.10.5 Superflat Finish

Areas as indicated on the drawings shall be constructed as superflat floors. Extreme care shall be taken to meet specified tolerances. If necessary, special heavy duty, laser guided machines built especially for this work shall be used and shall have experienced, factory-trained operators. Finishing operations shall include use of long-handled 10 foot "highway type" cutting straightedges plus any other tools necessary to meet the surface tolerance requirements. Surface finish shall conform to paragraph Troweled Finish.

3.10.6 Non-Slip Finish

Non-slip floors shall be constructed in accordance with the following subparagraphs.

3.10.6.1 Broomed

Sidewalks and areas as indicated on the drawings shall be given a broomed finish. After floating, the surface shall be lightly steel troweled, and then carefully scored by pulling a coarse fiber push-type broom across the surface. Brooming shall be transverse to traffic or at right angles to the slope of the slab. After the end of the curing period, the surface shall be vigorously broomed with a coarse fiber broom to remove all loose or semi-detached particles.

3.10.6.2 Abrasive Aggregate

Areas as indicated on the drawings shall be given an abrasive aggregate finish. The concrete surface shall be given a float finish. Abrasive aggregate shall then immediately be uniformly sprinkled over the floated surface at a total rate of not less than 0.25 psf spread in two applications at right angles to each other. The surface shall then be troweled to a smooth, even finish that is uniform in texture and appearance and free from blemishes including trowels marks. Immediately after curing, cement paste and laitance covering the abrasive aggregate shall be removed by steel brushing, rubbing with abrasive stone, or sandblasting to expose the abrasive particles.

3.10.7 Heavy Duty Floors

Areas as indicated on the drawings shall have heavy duty floors constructed as follows:

3.10.7.1 General

Heavy duty floor shall be constructed by placing a heavy duty bonded topping on a base slab which has had a rough slab finish left 2 inches below final grade. Concrete in the base slab shall be thoroughly hardened but not more than 30 hours old. The temperature of the fresh concrete topping shall not vary more than 10 degrees F plus or minus from the temperature of the base slab. The ambient temperature of the space adjacent to the concrete placement and of the base slab shall be between 50 and 90 degrees F.

3.10.7.2 Preparation of Base Slab

The base slab shall be kept continuously damp until topping is placed. The surface of the base slab shall be thoroughly cleaned with an air-water jet immediately before placing the topping. A thin coat of neat cement grout of about the consistency of thick cream shall be thoroughly scrubbed into the existing surface immediately ahead of the overlay placing. At the time the neat cement grout is placed, the existing concrete surface shall be damp but shall have no free water present. The overlay concrete shall be deposited before the grout coat has had time to stiffen.

3.10.7.3 Placing and Finishing

Concrete shall be placed, as nearly as practicable in final position, in a uniform layer. The overlay shall be placed and screeded slightly above the required finished grade, compacted by rolling with rollers weighing not less than 10 pounds per linear 1 inch of roller width or by approved tamping equipment and finish screeded to established grade. Grid type tampers shall not be used. The concrete, while still green but sufficiently hardened to bear a person's weight without deep imprint, shall be floated to a true even plane with no coarse aggregate visible. Floating shall be performed with an approved disc-type mechanical float which has integral impact mechanism. The surface of the overlay shall then be left undisturbed until the concrete has hardened enough to prevent excess fines from being worked to the top. Joints shall be formed to match those in the base slab.

3.10.7.4 Curing and Protection

Concrete shall be maintained in a moist condition and shall be protected against rapid temperature change, mechanical injury, and injury from rain or flowing water, for a curing period of not less than 10 days. Concrete shall be maintained in a moist condition at temperatures above 50 and below 90

degrees F throughout the specified curing period. Concrete shall be protected from a temperature change greater than 5 degrees F per hour and from rapid drying for the first 24 hours following the removal of temperature protection. Curing activities shall begin as soon as free water has disappeared from the concrete surface after placing and finishing. Curing shall be moist curing accomplished by the following method. Surfaces shall be covered with a double layer of burlap, wetted before placing, and overlapped at least 6 inches. Burlap shall be kept continually wet and in intimate contact with the surface. Burlap shall be kept covered with a polyethylene sheeting at least 4 mils thick. All traffic shall be kept from the floor during the curing period and heavy traffic shall be kept off till 28-day age.

3.10.8 Two-Course Floor Construction

Areas as indicated on the drawings shall have floors constructed with two-course construction. Two-course floor shall be constructed by placing a bonded topping on the thoroughly hardened concrete base slab which has been left with a rough slab finish left 2 inches below final grade as shown on the drawings. Topping shall be applied at an approved time late in the contract period. The floor topping mixture shall have a specified compressive strength of 5000 psi at 28 days, a 2 inch maximum slump, 1/2 inch maximum size coarse aggregate, and shall be proportioned to obtain required finishability. The surface of the base slab shall be thoroughly cleaned by sandblasting or high-pressure water jet immediately before placing topping. The temperature of the fresh concrete topping shall not vary more than 10 degrees F plus or minus from the temperature of the base slab. The ambient temperature of the space adjacent to the concrete placement and of the base slab shall be between 50 and 90 degrees F. The base slab shall be kept continuously wet for the first 12 hours during the 24 hour period immediately prior to placing the finished floor. After all free water has evaporated or has been removed from the surface, a grout shall be scrubbed in. The grout shall be a 1:1 mixture of Portland cement and sand passing the No. 8 sieve mixed to a creamlike consistency. The grout shall be scrubbed into the surface just ahead of the concrete topping placing operation. While the grout is still damp, the top course shall be spread and screeded and darbied or bull floated. When the surface moisture has disappeared, the surface shall then be floated with disc-type power float with integral impact mechanism followed by a minimum of two power trowelings. Trowel marks left by the machine shall be removed by a final, hard steel troweling by hand. Joints shall be formed to match those in the base slab. Concrete shall be maintained in a moist condition and shall be protected against rapid temperature change, mechanical injury, and injury from rain or water, for a curing period of not less than 10 days. Concrete shall be maintained in a moist condition at temperatures above 50 and below 90 degrees F throughout the specified curing period. Concrete shall be protected from a temperature change greater than 5 degrees F per hour and from rapid drying for the first 24 hours following the removal of temperature protection. Curing activities shall be started immediately as soon as free water has disappeared from the surface of the concrete after placing and finishing. Curing shall be moist curing accomplished by the following method. Surfaces shall be covered with a double layer of burlap, wetted before placing, and overlapped at least 6 inches. Burlap shall be kept continually wet and in intimate contact with the surface. Burlap shall be kept covered with a polyethylene sheeting at least 4 mils thick. All traffic shall be kept from the topping during the curing period.

3.11 FLOOR HARDENER

Areas as indicated on the drawings shall be treated with floor hardener. Floor hardener shall be applied after the concrete has been cured and then air dried for 28 days. Three coats shall be applied, each the day after the preceding coat was applied. For the first application, one pound of the silocofluoride shall be dissolved in one gallon of water. For subsequent applications, the solution shall be two pounds of silicofluoride to each gallon of water. Floor should be mopped with clear water shortly after the preceding application has dried to remove encrusted salts. Proprietary hardeners shall be applied in accordance with the manufacturer's instructions. During application, area should be well ventilated. Precautions shall be taken when applying silicofluorides due to the toxicity of the salts. Any compound that contacts glass or aluminum should be immediately removed with clear water.

3.12 EXTERIOR SLAB AND RELATED ITEMS

3.12.1 Pavements

Pavements shall be constructed where shown on the drawings. After forms are set and underlying material prepared as specified, the concrete shall be placed uniformly throughout the area and thoroughly vibrated. As soon as placed and vibrated, the concrete shall be struck off and screeded to the crown and cross section and to such elevation above grade that when consolidated and finished, the surface of the pavement will be at the required elevation. The entire surface shall be tamped with the strike off, or consolidated with a vibrating screed, and this operation continued until the required compaction and reduction of internal and surface voids are accomplished. Care shall be taken to prevent bringing excess paste to the surface. Immediately following the final consolidation of the surface, the pavement shall be floated longitudinally from bridges resting on the side forms and spanning but not touching the concrete. If necessary, additional concrete shall be placed and screeded, and the float operated until a satisfactory surface has been produced. The floating operation shall be advanced not more than half the length of the float and then continued over the new and previously floated surfaces. After finishing is completed but while the concrete is still plastic, minor irregularities and score marks in the pavement surface shall be eliminated by means of long-handled cutting straightedges. Straightedges shall be 12 feet in length and shall be operated from the sides of the pavement and from bridges. A straightedge operated from the side of the pavement shall be equipped with a handle 3 feet longer than one-half the width of the pavement. The surface shall then be tested for trueness with a 12 foot straightedge held in successive positions parallel and at right angles to the center line of the pavement, and the whole area covered as necessary to detect variations. The straightedge shall be advanced along the pavement in successive stages of not more than one-half the length of the straightedge. Depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. Projections above the required elevation shall also be struck off and refinished. The straightedge testing and finishing shall continue until the entire surface of the concrete is true. Before the surface sheen has disappeared and well before the concrete becomes non-plastic, the surface of the pavement shall be given a non-slip sandy surface texture by use of a burlap drag. A strip of clean, wet burlap from 3 to 5 feet wide and 2 feet longer than the pavement width shall be carefully pulled across the surface. Edges and joints shall be rounded with an edger having a radius of 1/8 inch. Curing shall be as specified.

3.12.2 Sidewalks

Concrete shall be 4 inches minimum thickness. Contraction joints shall be provided at 5 feet spaces unless otherwise indicated. Contraction joints shall be cut 1 inch deep with a jointing tool after the surface has been finished. Transverse expansion joints 1/2 inch thick shall be provided at changes in direction and where sidewalk abuts curbs, steps, rigid pavement, or other similar structures. Sidewalks shall be given a lightly broomed finish. A transverse slope of 1/4 inch per foot shall be provided, unless otherwise indicated. Variations in cross section shall be limited to 1/4 inch in 5 feet.

3.12.3 Curbs and Gutters

Concrete shall be formed, placed, and finished by hand using a properly shaped "mule" or constructed using a slipform machine specially designed for this work. Contraction joints shall be cut 3 inches deep with a jointing tool after the surface has been finished. Expansion joints (1/2 inch wide) shall be provided at 100 feet maximum spacing unless otherwise indicated. Exposed surfaces shall be finished using a stiff bristled brush.

3.12.4 Pits and Trenches

Pits and trenches shall be constructed as indicated on the drawings. Bottoms and walls shall be placed monolithically or waterstops and keys, shall be provided as approved.

3.13 CURING AND PROTECTION

3.13.1 General

Concrete shall be cured by an approved method for the period of time given below:

Concrete with Type III Cement	3 days
All other concrete	7 days

Immediately after placement, concrete shall be protected from premature drying, extremes in temperatures, rapid temperature change, mechanical injury and damage from rain and flowing water for the duration of the curing period. Air and forms in contact with concrete shall be maintained at a temperature above 50 degrees F for the first 3 days and at a temperature above 32 degrees F for the remainder of the specified curing period. Exhaust fumes from combustion heating units shall be vented to the outside of the enclosure, and heaters and ducts shall be placed and directed so as not to cause areas of overheating and drying of concrete surfaces or to create fire hazards. Materials and equipment needed for adequate curing and protection shall be available and at the site prior to placing concrete. No fire or excessive heat, including welding, shall be permitted near or in direct contact with the concrete at any time. Except as otherwise permitted by paragraph Membrane Forming Curing Compounds, moist curing shall be provided for any areas to receive floor hardener, any paint or other applied coating, or to which other concrete is to be bonded. Concrete containing silica fume shall be initially cured by fog misting during finishing, followed immediately by continuous moist curing. Except for plastic coated burlap, impervious sheeting alone shall not be used for curing.

3.13.2 Moist Curing

Concrete to be moist-cured shall be maintained continuously wet for the entire curing period, commencing immediately after finishing. If water or

curing materials used stain or discolor concrete surfaces which are to be permanently exposed, the concrete surfaces shall be cleaned as approved. When wooden forms are left in place during curing, they shall be kept wet at all times. If steel forms are used in hot weather, non-supporting vertical forms shall be broken loose from the concrete soon after the concrete hardens and curing water continually applied in this void. If the forms are removed before the end of the curing period, curing shall be carried out as on unformed surfaces, using suitable materials. Surfaces shall be cured by ponding, by continuous sprinkling, by continuously saturated burlap or cotton mats, or by continuously saturated plastic coated burlap. Burlap and mats shall be clean and free from any contamination and shall be completely saturated before being placed on the concrete. The Contractor shall have an approved work system to ensure that moist curing is continuous 24 hours per day.

3.13.3 Membrane Forming Curing Compounds

Membrane forming curing compounds shall be used only on surfaces indicated on the drawings. Concrete in the following areas may be cured with a pigmented curing compound in lieu of moist curing. Membrane curing shall not be used on surfaces that are to receive any subsequent treatment depending on adhesion or bonding to the concrete, including surfaces to which a smooth finish is to be applied or other concrete to be bonded. However, a styrene acrylate or chlorinated rubber compound meeting ASTM C 309, Class B requirements, may be used for surfaces which are to be painted or are to receive bituminous roofing or waterproofing, or floors that are to receive adhesive applications of resilient flooring. The curing compound selected shall be compatible with any subsequent paint, roofing, waterproofing or flooring specified. Membrane curing compound shall not be used on surfaces that are maintained at curing temperatures with free steam. Curing compound shall be applied to formed surfaces immediately after the forms are removed and prior to any patching or other surface treatment except the cleaning of loose sand, mortar, and debris from the surface. All surfaces shall be thoroughly moistened with water. Curing compound shall be applied to slab surfaces as soon as the bleeding water has disappeared, with the tops of joints being temporarily sealed to prevent entry of the compound and to prevent moisture loss during the curing period. The curing compound shall be applied in a two-coat continuous operation by approved motorized power-spraying equipment operating at a minimum pressure of 75 psi, at a uniform coverage of not more than 400 square feet per gallon for each coat, and the second coat shall be applied perpendicular to the first coat. Concrete surfaces which have been subjected to rainfall within 3 hours after curing compound has been applied shall be re-sprayed by the method and at the coverage specified. Surfaces on which clear compound is used shall be shaded from direct rays of the sun for the first 3 days. Surfaces coated with curing compound shall be kept free of foot and vehicular traffic, and from other sources of abrasion and contamination during the curing period.

3.13.4 Ponding or Immersion

Concrete shall be continually immersed throughout the curing period. Water shall not be more than 20 degrees F less than the temperature of the concrete.

3.13.5 Cold Weather Curing and Protection

When the daily ambient low temperature is less than 32 degrees F the temperature of the concrete shall be maintained above 40 degrees F for the first seven days after placing. During the period of protection removal, the

air temperature adjacent to the concrete surfaces shall be controlled so that concrete near the surface will not be subjected to a temperature differential of more than 25 degrees F as determined by suitable temperature measuring devices furnished by the Contractor, as required, and installed adjacent to the concrete surface and 2 inches inside the surface of the concrete. The installation of the thermometers shall be made by the Contractor as directed.

3.14 SETTING BASE PLATES AND BEARING PLATES

After being properly positioned, column base plates, bearing plates for beams and similar structural members, and machinery and equipment base plates shall be set to the proper line and elevation with damp-pack bedding mortar, except where non-shrink grout is indicated. The thickness of the mortar or grout shall be approximately 1/24 the width of the plate, but not less than 3/4 inch. Concrete and metal surfaces in contact with grout shall be clean and free of oil and grease, and concrete surfaces in contact with grout shall be damp and free of laitance when grout is placed. Non-shrink grout shall be used where indicated on the drawings.

3.14.1 Damp-Pack Bedding Mortar

Damp-pack bedding mortar shall consist of 1 part cement and 2-1/2 parts fine aggregate having water content such that a mass of mortar tightly squeezed in the hand will retain its shape but will crumble when disturbed. The space between the top of the concrete and bottom of the bearing plate or base shall be packed with the bedding mortar by tamping or ramming with a bar or rod until it is completely filled.

3.14.2 Non-shrink Grout

Non-shrink grout shall be a ready-mixed material requiring only the addition of water. Water content shall be the minimum that will provide a flowable mixture and completely fill the space to be grouted without segregation, bleeding, or reduction of strength.

3.14.2.1 Mixing and Placing of Non-shrink Grout

Mixing and placing shall be in conformance with the material manufacturer's instructions and as specified therein. Ingredients shall be thoroughly dry-mixed before adding water. After adding water, the batch shall be mixed for 3 minutes. Batches shall be of size to allow continuous placement of freshly mixed grout. Grout not used within 30 minutes after mixing shall be discarded. The space between the top of the concrete or machinery-bearing surface and the plate shall be filled solid with the grout. Forms shall be of wood or other equally suitable material for completely retaining the grout on all sides and on top and shall be removed after the grout has set. The placed grout shall be carefully worked by rodding or other means to eliminate voids; however, overworking and breakdown of the initial set shall be avoided. Grout shall not be re-tempered or subjected to vibration from any source. Where clearances are unusually small, placement shall be under pressure with a grout pump. Temperature of the grout, and of surfaces receiving the grout, shall be maintained at 65 to 85 degrees F until after setting.

3.14.2.2 Treatment of Exposed Surfaces

For metal-oxidizing non-shrink grout, exposed surfaces shall be cut back 1 inch and immediately covered with a parge coat of mortar consisting of 1 part portland cement and 2-1/2 parts fine aggregate by weight, with sufficient

water to make a plastic mixture. The parge coat shall have a smooth finish. For other mortars or grouts, exposed surfaces shall have a smooth-dense finish and be left untreated. Curing shall comply with paragraph CURING AND PROTECTION.

3.15 TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL

The Contractor shall perform the inspection and tests described below and, based upon the results of these inspections and tests, shall take the action required and shall submit specified reports. When, in the opinion of the Contracting Officer, the concreting operation is out of control, concrete placement shall cease and the operation shall be corrected. The laboratory performing the tests shall be onsite and shall conform with ASTM C 1077. Materials may be subjected to check testing by the Government from samples obtained at the manufacturer, at transfer points, or at the project site. The Government will inspect the laboratory, equipment, and test procedures prior to start of concreting operations and at least once per week thereafter for conformance with ASTM C 1077.

3.15.1 Grading and Corrective Action

3.15.1.1 Fine Aggregate

At least once during each shift when the concrete plant is operating, there shall be one sieve analysis and fineness modulus determination in accordance with ASTM C 136 and COE CRD-C 104 for the fine aggregate or for each fine aggregate if it is batched in more than one size or classification. The location at which samples are taken may be selected by the Contractor as the most advantageous for control. However, the Contractor is responsible for delivering fine aggregate to the mixer within specification limits. When the amount passing on any sieve is outside the specification limits, the fine aggregate shall be immediately re-sampled and retested. If there is another failure on any sieve, the fact shall immediately be reported to the Contracting Officer, concreting shall be stopped, and immediate steps taken to correct the grading.

3.15.1.2 Coarse Aggregate

At least once during each shift in which the concrete plant is operating, there shall be a sieve analysis in accordance with ASTM C 136 for each size of coarse aggregate. The location at which samples are taken may be selected by the Contractor as the most advantageous for production control. However, the Contractor shall be responsible for delivering the aggregate to the mixer within specification limits. A test record of samples of aggregate taken at the same locations shall show the results of the current test as well as the average results of the five most recent tests including the current test. The Contractor may adopt limits for control coarser than the specification limits for samples taken other than as delivered to the mixer to allow for degradation during handling. When the amount passing any sieve is outside the specification limits, the coarse aggregate shall be immediately re-sampled and retested. If the second sample fails on any sieve, that fact shall be reported to the Contracting Officer. Where two consecutive averages of 5 tests are outside specification limits, the operation shall be considered out of control and shall be reported to the Contracting Officer. Concreting shall be stopped and immediate steps shall be taken to correct the grading.

3.15.2 Quality of Aggregates

Thirty days prior to the start of concrete placement, the Contractor shall perform all tests for aggregate quality required by ASTM C 33. In addition, after the start of concrete placement, the Contractor shall perform tests for aggregate quality at least every three months, and when the source of aggregate or aggregate quality changes. Samples tested after the start of concrete placement shall be taken immediately prior to entering the concrete mixer.

3.15.3 Scales, Batching and Recording

The accuracy of the scales shall be checked by test weights prior to start of concrete operations and at least once every three months. Such tests shall also be made as directed whenever there are variations in properties of the fresh concrete that could result from batching errors. Once a week the accuracy of each batching and recording device shall be checked during a weighing operation by noting and recording the required weight, recorded weight, and the actual weight batched. At the same time, the Contractor shall test and ensure that the devices for dispensing admixtures are operating properly and accurately. When either the weighing accuracy or batching accuracy does not comply with specification requirements, the plant shall not be operated until necessary adjustments or repairs have been made. Discrepancies in recording accuracies shall be corrected immediately.

3.15.4 Batch-Plant Control

The measurement of concrete materials including cementitious materials, each size of aggregate, water, and admixtures shall be continuously controlled. The aggregate weights and amount of added water shall be adjusted as necessary to compensate for free moisture in the aggregates. The amount of air-entraining agent shall be adjusted to control air content within specified limits. A report shall be prepared indicating type and source of cement used, type and source of pozzolan or slag used, amount and source of admixtures used, aggregate source, the required aggregate and water weights per cubic yard, amount of water as free moisture in each size of aggregate, and the batch aggregate and water weights per cubic yard for each class of concrete batched during each day's plant operation.

3.15.5 Concrete Mixture

a. Air Content Testing. Air content tests shall be made when test specimens are fabricated. In addition, at least two tests for air content shall be made on randomly selected batches of each separate concrete mixture produced during each 8-hour period of concrete production. Additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Tests shall be made in accordance with ASTM C 231 for normal weight concrete and ASTM C 173 for lightweight concrete. Test results shall be plotted on control charts which shall at all times be readily available to the Government and shall be submitted weekly. Copies of the current control charts shall be kept in the field by testing crews and results plotted as tests are made. When a single test result reaches either the upper or lower action limit, a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the air content of the batch to plot on both the air content and the control chart for range, and for determining need for any remedial action. The result of each test, or average as noted in the previous sentence, shall be plotted on a separate control chart for each mixture on which an "average line" is set at the midpoint of the specified air content range from paragraph Air

Entrainment. An upper warning limit and a lower warning limit line shall be set 1.0 percentage point above and below the average line, respectively. An upper action limit and a lower action limit line shall be set 1.5 percentage points above and below the average line, respectively. The range between each two consecutive tests shall be plotted on a secondary control chart for range where an upper warning limit is set at 2.0 percentage points and an upper action limit is set at 3.0 percentage points. Samples for air content may be taken at the mixer, however, the Contractor is responsible for delivering the concrete to the placement site at the stipulated air content. If the Contractor's materials or transportation methods cause air content loss between the mixer and the placement, correlation samples shall be taken at the placement site as required by the Contracting Officer, and the air content at the mixer controlled as directed.

b. Air Content Corrective Action. Whenever points on the control chart for percent air reach either warning limit, an adjustment shall immediately be made in the amount of air-entraining admixture batched. As soon as practical after each adjustment, another test shall be made to verify the result of the adjustment. Whenever a point on the secondary control chart for range reaches the warning limit, the admixture dispenser shall be recalibrated to ensure that it is operating accurately and with good reproducibility. Whenever a point on either control chart reaches an action limit line, the air content shall be considered out of control and the concreting operation shall immediately be halted until the air content is under control. Additional air content tests shall be made when concreting is restarted.

c. Slump Testing. In addition to slump tests which shall be made when test specimens are fabricated, at least four slump tests shall be made on randomly selected batches in accordance with ASTM C 143/C 143M for each separate concrete mixture produced during each 8-hour or less period of concrete production each day. Also, additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Test results shall be plotted on control charts which shall at all times be readily available to the Government and shall be submitted weekly. Copies of the current control charts shall be kept in the field by testing crews and results plotted as tests are made. When a single slump test reaches or goes beyond either the upper or lower action limit, a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the slump of the batch to plot on both the control charts for slump and the chart for range, and for determining need for any remedial action. Limits shall be set on separate control charts for slump for each type of mixture. The upper warning limit shall be set at 1/2 inch below the maximum allowable slump specified in paragraph Slump in PART 1 for each type of concrete and an upper action limit line and lower action limit line shall be set at the maximum and minimum allowable slumps, respectively, as specified in the same paragraph. The range between each consecutive slump test for each type of mixture shall be plotted on a single control chart for range on which an upper action limit is set at 2 inches. Samples for slump shall be taken at the mixer. However, the Contractor is responsible for delivering the concrete to the placement site at the stipulated slump. If the Contractor's materials or transportation methods cause slump loss between the mixer and the placement, correlation samples shall be taken at the placement site as required by the Contracting Officer, and the slump at the mixer controlled as directed.

d. Slump Corrective Action. Whenever points on the control charts for slump reach the upper warning limit, an adjustment shall immediately be made in the batch weights of water and fine aggregate. The adjustments are to be made so that the total water content does not exceed that amount allowed by the maximum w/c ratio specified, based on aggregates which are in a saturated surface dry condition. When a single slump reaches the upper or lower action limit, no further concrete shall be delivered to the placing site until proper adjustments have been made. Immediately after each adjustment, another test shall be made to verify the correctness of the adjustment. Whenever two consecutive individual slump tests, made during a period when there was no adjustment of batch weights, produce a point on the control chart for range at or above the upper action limit, the concreting operation shall immediately be halted, and the Contractor shall take appropriate steps to bring the slump under control. Additional slump tests shall be made as directed.

e. Temperature. The temperature of the concrete shall be measured when compressive strength specimens are fabricated. Measurement shall be in accordance with ASTM C 1064/C 1064M. The temperature shall be reported along with the compressive strength data.

f. Strength Specimens. At least one set of test specimens shall be made, for compressive or flexural strength as appropriate, on each different concrete mixture placed during the day for each 500 cubic yards or portion thereof of that concrete mixture placed each day. Additional sets of test specimens shall be made, as directed by the Contracting Officer, when the mixture proportions are changed or when low strengths have been detected. A truly random (not haphazard) sampling plan shall be developed by the Contractor and approved by the Contracting Officer prior to the start of construction. The plan shall assure that sampling is done in a completely random and unbiased manner. A set of test specimens for concrete with a 28-day specified strength per paragraph Strength Requirements in PART 1 shall consist of four specimens, two to be tested at 7 days and two at 28 days. A set of test specimens for concrete with a 90-day strength per the same paragraph shall consist of six specimens, two tested at 7 days, two at 28 days, and two at 90 days. Test specimens shall be molded and cured in accordance with ASTM C 31/C 31M and tested in accordance with ASTM C 39/C 39M for test cylinders and ASTM C 78 for test beams. Results of all strength tests shall be reported immediately to the Contracting Officer. Obtain composite samples in accordance with ASTM C172. Quality control charts shall be kept for individual strength "tests", ("test" as defined in paragraph Strength Requirements in PART 1) moving average of last 3 "tests" for strength, and moving average for range for the last 3 "tests" for each mixture. The charts shall be similar to those found in ACI 214.3R.

3.15.6 Inspection Before Placing

Foundations, construction joints, forms, and embedded items shall be inspected by the Contractor in sufficient time prior to each concrete placement in order to certify to the Contracting Officer that they are ready to receive concrete. The results of each inspection shall be reported in writing.

3.15.7 Placing

The placing foreman shall supervise placing operations, shall determine that the correct quality of concrete or grout is placed in each location as specified and as directed by the Contracting Officer, and shall be responsible for measuring and recording concrete temperatures and ambient temperature hourly during placing operations, weather conditions, time of placement, volume placed, and method of placement. The placing foreman shall not permit batching and placing to begin until it has been verified that an adequate number of vibrators in working order and with competent operators are available. Placing shall not be continued if any pile of concrete is inadequately consolidated. If any batch of concrete fails to meet the temperature requirements, immediate steps shall be taken to improve temperature controls.

3.15.8 Vibrators

The frequency and amplitude of each vibrator shall be determined in accordance with COE CRD-C 521 prior to initial use and at least once a month when concrete is being placed. Additional tests shall be made as directed when a vibrator does not appear to be adequately consolidating the concrete. The frequency shall be determined while the vibrator is operating in concrete with the tachometer being held against the upper end of the vibrator head while almost submerged and just before the vibrator is withdrawn from the concrete. The amplitude shall be determined with the head vibrating in air. Two measurements shall be taken, one near the tip and another near the upper end of the vibrator head, and these results averaged. The make, model, type, and size of the vibrator and frequency and amplitude results shall be reported in writing. Any vibrator not meeting the requirements of paragraph Consolidation, shall be immediately removed from service and repaired or replaced.

3.15.9 Curing Inspection

a. Moist Curing Inspections. At least once each shift, and not less than twice per day on both work and non-work days, an inspection shall be made of all areas subject to moist curing. The surface moisture condition shall be noted and recorded.

b. Moist Curing Corrective Action. When a daily inspection report lists an area of inadequate curing, immediate corrective action shall be taken, and the required curing period for those areas shall be extended by 1 day.

c. Membrane Curing Inspection. No curing compound shall be applied until the Contractor has verified that the compound is properly mixed and ready for spraying. At the end of each operation, the Contractor shall estimate the quantity of compound used by measurement of the container and the area of concrete surface covered, shall compute the rate of coverage in square feet per gallon, and shall note whether or not coverage is uniform.

d. Membrane Curing Corrective Action. When the coverage rate of the curing compound is less than that specified or when the coverage is not uniform, the entire surface shall be sprayed again.

e. Sheet Curing Inspection. At least once each shift and once per day on non-work days, an inspection shall be made of all areas being cured using impervious sheets. The condition of the covering and the tightness of the laps and tapes shall be noted and recorded.

f. Sheet Curing Corrective Action. When a daily inspection report lists any tears, holes, or laps or joints that are not completely closed, the tears and holes shall promptly be repaired or the sheets replaced, the joints closed, and the required curing period for those areas shall be extended by 1 day.

3.15.10 Cold-Weather Protection

At least once each shift and once per day on non-work days, an inspection shall be made of all areas subject to cold-weather protection. Any deficiencies shall be noted, corrected, and reported.

3.15.11 Mixer Uniformity

a. Stationary Mixers. Prior to the start of concrete placing and once every 6 months when concrete is being placed, or once for every 75,000 cubic yards of concrete placed, whichever results in the shortest time interval, uniformity of concrete mixing shall be determined in accordance with ASTM C 94/C 94M.

b. Truck Mixers. Prior to the start of concrete placing and at least once every 6 months when concrete is being placed, uniformity of concrete mixing shall be determined in accordance with ASTM C 94/C 94M. The truck mixers shall be selected randomly for testing. When satisfactory performance is found in one truck mixer, the performance of mixers of substantially the same design and condition of the blades may be regarded as satisfactory.

c. Mixer Uniformity Corrective Action. When a mixer fails to meet mixer uniformity requirements, either the mixing time shall be increased, batching sequence changed, batch size reduced, or adjustments shall be made to the mixer until compliance is achieved.

3.15.12 Reports

All results of tests or inspections conducted shall be reported informally as they are completed and in writing daily. A weekly report shall be prepared for the updating of control charts covering the entire period from the start of the construction season through the current week. During periods of cold-weather protection, reports of pertinent temperatures shall be made daily. These requirements do not relieve the Contractor of the obligation to report certain failures immediately as required in preceding paragraphs. Such reports of failures and the action taken shall be confirmed in writing in the routine reports. The Contracting Officer has the right to examine all contractor quality control records.

-- End of Section --

SECTION 03605

GROUT

PART 1 DESCRIPTION OF WORK:

This specification covers the furnishing and installation of grout for bases and joints. Products shall match existing materials and /or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be required to support the work.

PART 2 PRODUCTS:

2.1 Premixed Grout shall contain cement, sand and admixtures to produce a non-shrinking grout with the addition of potable water. Expansion shall be limited to 0.10% at 20 days.

2.1.1 Metallic grout shall be non-rusting, containing finely graded metallic aggregate with a compressive strength of 12,000 psi at 28 days.

2.1.2 Non-metallic grout shall have a compressive strength of not less than 6,000 psi at 28 days.

2.1.3 Fluid grout shall be a non-metallic grout with flowable consistency.

2.2 Field-Mixed Grout shall contain one part cement to three parts sand by volume, with the water content such that a mass of mortar tightly squeezed in the hand will retain its shape but will crumble when disturbed.

PART 3 EXECUTION:

3.1 Base plates shall be grouted with non-shrinking grout. Grout shall be placed so that all spaces and cavities below the top of base plates are completely filled without voids. Forms shall be provided where structural components of base plates will not confine the non-shrinking grout.

3.2 Joints shall be filled with field-mixed grout by tamping or ramming with a bar or rod until the joint is completely filled. Grout surface shall be smooth-finished and level with the adjoining material.

--END OF SECTION--

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SECTION 05090

WELDING, STRUCTURAL

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 335	(1989) Structural Steel Buildings Allowable Stress Design and Plastic Design

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ASNT RP SNT-TC-1A	(2001) Recommended Practice

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(1998) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS A3.0	(2001) Standard Welding Terms and Definitions
AWS D1.1/D1.1M	(2002) Structural Welding Code - Steel
AWS Z49.1	(1999) Safety in Welding, Cutting and Allied Processes

1.2 DEFINITIONS

Definitions of welding terms shall be in accordance with AWS A3.0.

1.3 GENERAL REQUIREMENTS

The design of welded connections shall conform to AISC 335 unless otherwise indicated or specified. Material with welds will not be accepted unless the welding is specified or indicated on the drawings or otherwise approved. Welding shall be as specified in this section, except where additional requirements are shown on the drawings or are specified in other sections. Welding shall not be started until welding procedures, inspectors, nondestructive testing personnel, welders, welding operators, and tackers have been qualified and the submittals approved by the Contracting Officer. Qualification testing shall be performed at or near the work site. Each Contractor performing welding shall maintain records of the test results obtained in welding procedure, welder, welding operator, and tacker performance qualifications.

1.3.1 Pre-erection Conference

A pre-erection conference shall be held, prior to the start of the field welding, to bring all affected parties together and to gain a naturally clear understanding of the project and the Welding Procedure Specifications (WPS) which the Contractor shall develop and submit for all welding, including welding done using prequalified procedures. Attendees shall include all Contractor's welding production and inspection personnel and appropriate Government personnel. Items for discussion could include: responsibilities of various parties; welding procedures and processes to be followed; welding sequence (both within a joint and joint sequence within the building); inspection requirements and procedures, both visual and ultrasonic; welding schedule; fabrication of mock-up model; and other items deemed necessary by the attendees.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Welder, Welding Operator, and Tacker Qualification
Inspector Qualification

Copies of the welder, welding operator, or tacker qualification test records.

SD-06 Test Reports

Quality Control

A quality assurance plan and records of tests and inspections.

1.5 WELDER, WELDING OPERATOR, AND TACKER QUALIFICATION

Each welder, welding operator, and tacker assigned to work on this contract shall be qualified in accordance with the applicable requirements of AWS D1.1/D1.1M and as specified in this section. Welders, welding operators, and tackers who make acceptable procedure qualification test welds will be considered qualified for the welding procedure used.

1.5.1 Previous Personnel Qualifications

At the discretion of the Contracting Officer, welders, welding operators, and tackers qualified by test within the previous 6 months may be accepted for this contract without requalification if all the following conditions are met:

a. Copies of the welding procedure specifications, the procedure qualification test records, and the welder, welding operator, and tacker qualification test records are submitted and approved in accordance with the specified requirements for detail drawings.

b. Testing was performed by an approved testing laboratory, technical consultant, or the Contractor's approved quality control organization.

c. The previously qualified welding procedure conforms to the requirements of this specification and is applicable to welding conditions encountered under this contract.

d. The welder, welding operator, and tacker qualification tests conform to the requirements of this specification and are applicable to welding conditions encountered under this contract.

1.5.2 Certificates

Before assigning any welder, welding operator, or tacker to work under this contract, the Contractor shall submit the names of the welders, welding operators, and tackers to be employed, and certification that each individual is qualified as specified. The certification shall state the type of welding and positions for which the welder, welding operator, or tacker is qualified, the code and procedure under which the individual is qualified, the date qualified, and the name of the firm and person certifying the qualification tests. The certification shall be kept on file, and 3 copies shall be furnished. The certification shall be kept current for the duration of the contract.

1.5.3 Renewal of Qualification

Requalification of a welder or welding operator shall be required under any of the following conditions:

a. It has been more than 6 months since the welder or welding operator has used the specific welding process for which he is qualified.

b. There is specific reason to question the welder or welding operator's ability to make welds that meet the requirements of these specifications.

c. The welder or welding operator was qualified by an employer other than those firms performing work under this contract, and a qualification test has not been taken within the past 12 months. Records showing periods of employment, name of employer where welder, or welding operator, was last employed, and the process for which qualified shall be submitted as evidence of conformance.

d. A tacker who passes the qualification test shall be considered eligible to perform tack welding indefinitely in the positions and with the processes for which he is qualified, unless there is some specific reason to question the tacker's ability. In such a case, the tacker shall be required to pass the prescribed tack welding test.

1.6 INSPECTOR QUALIFICATION

Inspector qualifications shall be in accordance with AWS D1.1/D1.1M. Nondestructive testing personnel shall be qualified in accordance with the requirements of ASNT RP SNT-TC-1A for Levels I or II in the applicable nondestructive testing method. The inspector may be supported by assistant welding inspectors who are not qualified to ASNT RP SNT-TC-1A, and assistant inspectors may perform specific inspection functions under the supervision of the qualified inspector.

1.7 SYMBOLS

Symbols shall be in accordance with AWS A2.4, unless otherwise indicated.

1.8 SAFETY

Safety precautions during welding shall conform to AWS Z49.1.

PART 2 PRODUCTS

2.1 WELDING EQUIPMENT AND MATERIALS

All welding equipment, electrodes, welding wire, and fluxes shall be capable of producing satisfactory welds when used by a qualified welder or welding operator performing qualified welding procedures. All welding equipment and materials shall comply with the applicable requirements of AWS D1.1/D1.1M.

PART 3 EXECUTION

3.1 WELDING OPERATIONS

Electrode	Voltage Limits	Travel Speed Limits
E6010	28 - 32	125 - 380 mm/minute (5 - 15 inch/minute)
E6011	28 - 32	150 - 300 mm/minute (6 - 12 inch/minute)
E6013	22 - 26	200 - 360 mm/minute (8 - 14 inch/minute)
E7018	25 - 28	150 - 510 mm/minute (6 - 20 inch/minute)
E7024	26 - 32	200 - 410 mm/minute (8 - 16 inch/minute)
E8018	22 - 28	200 - 510 mm/minute (8 - 20 inch/minute)
E11018	25 - 30	150 - 410 mm/minute (6 - 16 inch/minute)

3.1.1 Requirements

Workmanship and techniques for welded construction shall conform to the requirements of AWS D1.1/D1.1M and AISC 335. When AWS D1.1/D1.1M and the AISC 335 specification conflict, the requirements of AWS D1.1/D1.1M shall govern.

3.1.2 Identification

Welds shall be identified in one of the following ways:

a. Written records shall be submitted to indicate the location of welds made by each welder, welding operator, or tacker.

b. Each welder, welding operator, or tacker shall be assigned a number, letter, or symbol to identify welds made by that individual. The Contracting Officer may require welders, welding operators, and tackers to apply their symbol next to the weld by means of rubber stamp, felt-tipped marker with waterproof ink, or other methods that do not cause an indentation in the metal. For seam welds, the identification mark shall be adjacent to the weld at 3 foot intervals. Identification with die stamps or electric etchers shall not be allowed.

3.2 QUALITY CONTROL

Testing shall be done by an approved inspection or testing laboratory or technical consultant; or if approved, the Contractor's inspection and testing personnel may be used instead of the commercial inspection or testing laboratory or technical consultant. The Contractor shall perform visual inspections of all field and shop welds. Radiographic, ultrasonic, magnetic particle, and dye penetrant inspection shall be used at Contractor's option to determine conformance with paragraph STANDARDS OF ACCEPTANCE. Procedures and techniques for inspection shall be in accordance with applicable requirements of AWS D1.1/D1.1M, except that in radiographic inspection only film types designated as "fine grain," or "extra fine," shall be employed.

3.3 STANDARDS OF ACCEPTANCE

Dimensional tolerances for welded construction, details of welds, and quality of welds shall be in accordance with the applicable requirements of AWS D1.1/D1.1M and the contract drawings. Nondestructive testing shall be by visual inspection and at least one of the following methods: radiographic, ultrasonic, magnetic particle, or dye penetrant. The minimum extent of nondestructive testing shall be random 33 percent of welds or joints, as indicated on the drawings.

3.3.1 Nondestructive Examination

The welding shall be subject to inspection and tests in the mill, shop, and field. Inspection and tests in the mill or shop will not relieve the Contractor of the responsibility to furnish weldments of satisfactory quality. When materials or workmanship do not conform to the specification requirements, the Government reserves the right to reject material or workmanship or both at any time before final acceptance of the structure containing the weldment.

3.3.2 Destructive Tests

When metallographic specimens are removed from any part of a structure, the Contractor shall make repairs. The Contractor shall employ qualified welders or welding operators, and shall use the proper joints and welding procedures, including peening or heat treatment if required, to develop the full strength of the members and joints cut and to relieve residual stress.

3.4 GOVERNMENT INSPECTION AND TESTING

In addition to the inspection and tests performed by the Contractor for quality control, the Government will perform inspection and testing for acceptance to the extent determined by the Contracting Officer. The costs of such inspection and testing will be borne by the Contractor if unsatisfactory welds are discovered, or by the Government if the welds are satisfactory. The work may be performed by the Government's own forces or under a separate contract for inspection and testing. The Government reserves the right to perform supplemental nondestructive and destructive tests to determine compliance with paragraph STANDARDS OF ACCEPTANCE.

3.5 CORRECTIONS AND REPAIRS

When inspection or testing indicates defects in the weld joints, the welds shall be repaired using a qualified welder or welding operator as applicable. Corrections shall be in accordance with the requirements of AWS D1.1/D1.1M and the specifications. Defects shall be repaired in accordance with the approved procedures. Defects discovered between passes shall be repaired before additional weld material is deposited. Wherever a defect is removed and repair by welding is not required, the affected area shall be blended into the surrounding surface to eliminate sharp notches, crevices, or corners. After a defect is thought to have been removed, and before rewelding, the area shall be examined by suitable methods to ensure that the defect has been eliminated. Repair welds shall meet the inspection requirements for the original welds. Any indication of a defect shall be regarded as a defect, unless reevaluation by nondestructive methods or by surface conditioning shows that no unacceptable defect is present.

-- End of Section --

SECTION 05120

STRUCTURAL STEEL

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 HB-17 (2002) Standard Specifications for Highway Bridges

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 303 (2000) Code of Standard Practice for Steel Buildings and Bridges

AISC 316 (1989) ASD Manual of Steel Construction

AISC 317 (1992) ASD Manual of Steel Construction, Vol II: Connections

AISC 325 (2001) LRFD Manual of Steel Construction

AISC 326 (2002) Detailing for Steel Construction

AISC 335 (1989) Structural Steel Buildings Allowable Stress Design and Plastic Design

AISC 341 (2002) Seismic Provisions for Structural Steel Buildings

AISC 348 (2000) Structural Joints Using ASTM A325 or A490 Bolts

AISC 350 (1999) Load and Resistance Factor Design (LRFD)Specification for Structural Steel Buildings

AISC 810 (1997) Design Guide 10: Erection Bracing of Low-Rise Structural Steel Frames/Fisher and West

AISC FCD (1995a) AISC Quality Certification Program

AISC M018L (1999) LRFD Manual of Steel Construction, Metric Conversion Volume I

AISC M019L (1999) LRFD Manual of Steel Construction, Metric Conversion Volume II

AISC S340 (1992) Metric Properties of Structural Shapes with Dimensions According to ASTM A6M

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION (AREMA)

AREMA Manual (2003) Manual for Railway Engineering

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4 (1998) Standard Symbols for Welding, Brazing and Nondestructive Examination

AWS D1.1/D1.1M (2002) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME B46.1 (1995) Surface Texture, (Surface Roughness, Waviness and Lay)

ASTM INTERNATIONAL (ASTM)

ASTM A 108 (1999) Steel Bars, Carbon, Cold-Finished, Standard Quality

ASTM A 123/A 123M (2002) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 143 (2003) Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement

ASTM A 153/A 153M (2003) Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A 242/A 242M (2003a) High-Strength Low-Alloy Structural Steel

ASTM A 307 (2002) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength

ASTM A 325 (2002) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

ASTM A 325M (2003) Structural Bolts, Steel, Heat Treated, 830 Mpa Minimum Tensile Strength (Metric)

ASTM A 36/A 36M (2003a) Carbon Structural Steel

ASTM A 490 (2002) Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength

ASTM A 500 (2003) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

ASTM A 501 (2001) Hot-Formed Welded and Seamless Carbon Steel Structural Tubing

ASTM A 514/A 514M (2000a) High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding

ASTM A 529/A 529M (2003) High-Strength Carbon-Manganese Steel of Structural Quality

ASTM A 53 (1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A 563 (2000) Carbon and Alloy Steel Nuts

ASTM A 572/A 572M (2003a) High-Strength Low-Alloy Columbium-Vanadium Structural Steel

ASTM A 588/A 588M (2003) High-Strength Low-Alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point to 4 in. (100 mm) Thick

ASTM A 6/A 6M (2003a) General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling

ASTM A 618 (2001) Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing

ASTM A 668/A 668M (2003) Steel Forgings, Carbon and Alloy, for General Industrial Use

ASTM A 709/A 709M (2003a) Carbon and High-Strength Low-Alloy Structural Steel Shapes, Plates, and Bars and Quenched-and-Tempered Alloy Structural Steel Plates for Bridges

ASTM A 780 (2001) Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings

ASTM A 852/A 852M (2003) Quenched and Tempered Low-Alloy Structural Steel Plate with 70 ksi (485 MPa) Minimum Yield Strength to 4 in. (100 mm) Thick

ASTM A 992/A 992M (2002) Steel for Structural Shapes for Use in Building Framing

ASTM B 695 (2000) Coatings of Zinc Mechanically Deposited on Iron and Steel

ASTM C 1107 (2002) Packaged Dry, Hydraulic-Cement Grout(Nonshrink)

ASTM C 827 (2001a) Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures

ASTM F 436 (2003) Hardened Steel Washers

ASTM F 844 (2000) Washers, Steel, Plain (Flat), Unhardened for General Use

ASTM F 959 (2002) Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners

CRANE MANUFACTURERS ASSOCIATION OF AMERICA (CMAA)

CMAA 70 (2000) Top Running and Bridge and Gantry Type Multiple Girder Electric Overhead Traveling Cranes, No. 70

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC PA 1 (2000) Shop, Field, and Maintenance Painting

SSPC PS 13.01 (1982; R 2000) Epoxy-Polyamide Painting System

SSPC Paint 25 (1997; R 2000) Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II

SSPC SP 3 (1982; R 2000) Power Tool Cleaning

SSPC SP 6 (2000) Commercial Blast Cleaning

1.2 SYSTEM DESCRIPTION

Provide the structural steel system, including galvanizing, complete and ready for use. Structural steel systems including design, materials, installation, workmanship, fabrication, assembly, erection, inspection, quality control, and testing shall be provided in accordance with AISC 316 and AISC 317 except as modified in this contract.

1.3 MODIFICATIONS TO REFERENCES

In AISC 316, AISC 317, AISC 335, AISC 303, AISC 348, and AISC S340, except as modified in this section, shall be considered a part of AISC 316 and AISC 317 and is referred to in this section as AISC 316 and AISC 317.

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. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fabrication drawings including description of connections

SD-03 Product Data

Shop primer

Load indicator washers

Include test report for Class B primer.

SD-06 Test Reports

Class B coating

Bolts, nuts, and washers

Supply the certified manufacturer's mill reports which clearly show the applicable ASTM mechanical and chemical requirements together with the actual test results for the supplied fasteners.

SD-07 Certificates

Steel

Bolts, nuts, and washers

Shop primer

Welding electrodes and rods

Non shrink grout

Galvanizing

AISC Quality Certification

Overhead, top running crane rail beam

Welding procedures and qualifications

1.5 AISC QUALITY CERTIFICATION

Work shall be fabricated in an AISC certified Category Sbd fabrication plant.

1.6 SEISMIC PROVISIONS

In addition to AISC 325, the structural steel system shall be provided in accordance with AISC 341.

1.7 QUALITY ASSURANCE

1.7.1 Drawing Requirements

Submit fabrication drawings for approval prior to fabrication. Prepare in accordance with AISC 326, AISC 316 and AISC 317. Drawings shall not be reproductions of contract drawings. Include complete information for the fabrication and erection of the structure's components, including the location, type, and size of bolts, welds, member sizes and lengths, connection details, blocks, copes, and cuts. Use AWS A2.4 standard welding symbols.

1.7.2 Certifications

1.7.2.1 Overhead, Top Running Crane Rail Beam

Submit written field survey results for overhead, top running crane rail beam verifying tolerance requirements, area out of tolerance and proposed corrective measures.

1.7.2.2 Erection Plan

Submit for record purposes. Indicate the sequence of erection, temporary shoring and bracing, and a detailed sequence of welding, including each welding procedure required.

1.7.2.3 Welding Procedures and Qualifications

Prior to welding, submit certification for each welder stating the type of welding and positions qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualification tests. If the qualification date of the welding operator is more than one-year old, the welding operator's qualification certificate shall be accompanied by a current certificate by the welder attesting to the fact that he has been engaged in welding since the date of certification, with no break in welding service greater than 6 months.

PART 2 PRODUCTS

2.1 STEEL

2.1.1 Structural Steel

ASTM A 36/A 36M.

2.1.2 High-Strength Structural Steel

2.1.2.1 Low-Alloy Steel

ASTM A 572/A 572M, ASTM A 992/A 992M, ASTM A 709/A 709M.

2.1.2.2 Quenched and Tempered Alloy Steel

ASTM A 514/A 514M.

2.1.2.3 Quenched and Tempered Low-Alloy Steel
ASTM A 852/A 852M, 70 ksi.

2.1.3 Weathering Structural Steel

ASTM A 242/A 242M, Type 1; ASTM A 588/A 588M.

2.1.4 Structural Grade Carbon-Manganese Steel
ASTM A 529/A 529M, high strength carbon-manganese steel of structural quality.

2.1.5 Structural Shapes for Use in Building Framing

Wide flange shapes, ASTM A 992/A 992M.

2.1.6 Structural Steel Tubing

ASTM A 500, Grade B.

2.1.7 Steel Pipe

ASTM A 53, Type E or S, Grade B, weight class STD.

2.2 BOLTS, NUTS, AND WASHERS

Provide the following unless indicated otherwise.

2.2.1 Structural Steel

2.2.1.1 Bolts

ASTM A 307, Grade A. The bolt heads and the nuts of the supplied fasteners must be marked with the manufacturer's identification mark, the strength grade and type specified by ASTM specifications.

2.2.1.2 Nuts

ASTM A 563, Grade and Style for applicable ASTM bolt standard recommended.

2.2.1.3 Washers

ASTM F 844 washers for ASTM A 307 bolts, and ASTM F 436 washers for ASTM A 325 and ASTM A 490 bolts.

2.2.2 High-Strength Structural Steel

2.2.2.1 Bolts

ASTM A 325, Type 1, ASTM A 490, Type 1 or 2.

2.2.2.2 Nuts

ASTM A 563, Grade and Style as specified in the applicable ASTM bolt standard.

2.2.2.3 Washers

ASTM F 436, plain carbon steel.

2.2.3 Weathering Structural Steel

2.2.3.1 Bolts

ASTM A 325, Type 3; ASTM A 490, Type 3.

2.2.3.2 Nuts

ASTM A 563, heavy hex style, Grade DH3, except Grade C3 may be furnished for ASTM A 325bolts.

2.2.3.3 Washers

ASTM F 436, weathering steel.

2.2.4 Foundation Anchorage

2.2.4.1 Bolts

ASTM A 307.

2.2.4.2 Nuts

ASTM A 563, Grade A, hex style.

2.2.4.3 Washers

ASTM F 844.

2.2.5 Load Indicator Washers

ASTM F 959.

2.2.6 Load Indicator Bolts

ASTM A 325, Type 1; ASTM A 490, Type 1, with a manufactured notch between the bolt tip and threads. The bolt shall be designed to react to the opposing rotational torques applied by the installation wrench, with the bolt tip automatically shearing off when the proper tension is obtained.

2.2.7 Self-Locking Nuts

Provide nuts with a locking pin set in the nut. The locking pin shall slide along the bolt threads, and by reversing the direction of the locking pin, the nut shall

be removed without damaging the nut or bolt. Provide stainless steel locking pins.

2.3 STRUCTURAL STEEL ACCESSORIES

2.3.1 Welding Electrodes and Rods

AWS D1.1/D1.1M.

2.3.2 Non shrink Grout

ASTM C 1107, with no ASTM C 827 shrinkage. Grout shall be nonmetallic.

2.3.3 Welded Shear Stud Connectors

AWS D1.1/D1.1M.

2.3.4 Pins and Rollers

ASTM A 668/A 668M, Class C, D, F, or G; ASTM A 108, Grades 1016 to 1030. Provide as specified in AASHTO HB-17, Division II, Sections 10.26 and 10.27, except provide pins in lengths to extend a minimum of 0.25 inch beyond the outside faces of the connected parts.

2.4 SHOP PRIMER

SSPC Paint 25, (alkyd primer) or SSPC PS 13.01 epoxy-polyamide, green primer (Form 150) type 1, except provide a Class B coating in accordance with AISC 316 and AISC 317 for slip critical joints. Primer shall conform to Federal, State, and local VOC regulations. If flash rusting occurs, re-clean the surface prior to application of primer.

2.5 GALVANIZING

ASTM A 123/A 123M or ASTM A 153/A 153M, as applicable, unless specified otherwise galvanize after fabrication where practicable.

2.6 OVERHEAD, TOP RUNNING CRANE RAIL

AISC 316 and AISC 317 crane rail section and bolted joints. Provide rail fasteners and a minimum rail length of 10 feet.

2.7 FABRICATION

2.7.1 Markings

Prior to erection, members shall be identified by a painted erection mark. Connecting parts assembled in the shop for reaming holes in field connections shall be match marked with scratch and notch marks. Do not locate erection markings on areas to be welded. Do not locate match markings in areas that will decrease member strength or cause stress concentrations.

2.7.2 Shop Primer

Shop prime structural steel, except as modified herein, in accordance with SSPC PA 1. Do not prime steel surfaces embedded in concrete, galvanized surfaces, surfaces to receive epoxy coatings, or surfaces within 0.5 inch of the toe of the

welds prior to welding. Slip critical surfaces shall be primed with a Class B coating. Prior to assembly, prime surfaces which will be concealed or inaccessible after assembly. Do not apply primer in foggy or rainy weather; when the ambient temperature is below 45 degrees F or over 95 degrees F; or when the primer may be exposed to temperatures below 40 degrees F within 48 hours after application, unless approved otherwise by the Contracting Officer.

2.7.2.1 Cleaning

SSPC SP 6, except steel exposed in spaces above ceilings, attic spaces, furred spaces, and chases that will be hidden to view in finished construction may be cleaned to SSPC SP 3 when recommended by the shop primer manufacturer. Maintain steel surfaces free from rust, dirt, oil, grease, and other contaminants through final assembly.

2.7.2.2 Primer

Apply primer to a minimum dry film thickness of 2.0 mil except provide the Class B coating for slip critical joints in accordance with the coating manufacturer's recommendations. Repair damaged primed surfaces with an additional coat of primer.

2.7.3 Epoxy Coated Surfaces

Surfaces to receive epoxy coatings shall be cleaned and prepared in accordance with the manufacturer's recommendations.

2.7.4 Surface Finishes

ASME B46.1 maximum surface roughness of 125 for pin, pinholes, and sliding bearings, unless indicated otherwise.

PART 3 EXECUTION

3.1 FABRICATION

Fabrication shall be in accordance with the applicable provisions of AISC 316. Fabrication and assembly shall be done in the shop to the greatest extent possible. The fabricating plant shall be certified under the AISC FCD for Category A, Conventional Steel Building Structures. Compression joints depending on contact bearing shall have a surface roughness not in excess of 500 micro inches as determined by ASME B46.1, and ends shall be square within the tolerances for milled ends specified in ASTM A 6/A 6M. Structural steelwork, except surfaces of steel to be encased in concrete, surfaces to be field welded, surfaces to be fire proofed, and contact surfaces of friction-type high-strength bolted connections shall be prepared for painting in accordance with endorsement "P" of AISC FCD and primed with the specified paint.

3.2 INSTALLATION

3.2.1 Overhead, Top Running Cranes

Runway rails and beams shall be provided in accordance with AISC 316 and AISC 317 and CMAA 70, except that in case of conflict, the requirements of CMAA 70 shall govern. In addition, provide a maximum vertical difference of 0.03 inch in the

elevation between adjacent runway rail tops and adjacent runway beam tops at joints. Provide adjustable runway support connections to allow placement of the crane rails and beams to the tolerances specified. Stagger runway rail joints a minimum of one foot, except that the stagger shall not be the same as the crane wheel spacing.

3.3 ERECTION

a: Erection of structural steel, except as indicated in item b. below, shall be in accordance with the applicable provisions of AISC 316. Erection plan shall be reviewed, stamped and sealed by a licensed structural engineer.

b. For low-rise structural steel buildings (60 feet tall or less and a maximum of 2 stories), the erection plan shall conform to AISC 303 and the structure shall be erected in accordance with AISC 810.

Provide for drainage in structural steel. After final positioning of steel members, provide full bearing under base plates and bearing plates using non shrink grout. Place non shrink grout in accordance with the manufacturer's instructions.

3.3.1 STORAGE

Material shall be stored out of contact with the ground in such manner and location as will minimize deterioration.

3.4 CONNECTIONS

Except as modified in this section, connections not detailed shall be designed in accordance with AISC 335. Build connections into existing work. Do not tighten anchor bolts set in concrete with impact torque wrenches. Punch, sub punch and ream, or drill bolt holes. Bolts, nuts, and washers shall be clean of dirt, rust and lubricated immediately prior to installation.

3.4.1 Common Grade Bolts

ASTM A 307 bolts shall be tightened to a "snug tight" fit. "Snug tight" is the tightness that exists when plies in a joint are in firm contact. If firm contact of joint plies cannot be obtained with a few impacts of an impact wrench, or the full effort of a man using a spud wrench, contact the Contracting Officer for further instructions.

3.4.2 High-Strength Bolts

ASTM A 325 and ASTM A 490 bolts shall be fully tensioned to 70 percent of their minimum tensile strength. Bolts shall be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, bolts shall then be fully tensioned, progressing from the most rigid part of a connection to the free edges.

3.4.2.1 Installation of Load Indicator Washers (LIW)

ASTM F 959, Where possible, the LIW shall be installed under the bolt head and the nut shall be tightened. If the LIW is installed adjacent to the turned element, provide a flat ASTM F 436 washer between the LIW and nut when the nut is turned for tightening, and between the LIW and bolt head when the bolt head is

turned for tightening. In addition to the LIW, provide flat ASTM F 436 washers under both the bolt head and nut when ASTM A 490 bolts are used.

3.5 WELDING

AWS D1.1/D1.1M. Grind exposed welds smooth as indicated. Provide AWS D1.1/D1.1M qualified welders, welding operators, and tackers.

The contractor shall develop and submit the Welding Procedure Specifications (WPS) for all welding, including welding done using pre-qualified procedures. Pre-qualified procedures may be submitted for information only; however, procedures that are not pre-qualified shall be submitted for approval.

3.5.1 Removal of Temporary Welds, Run-Off Plates, and Backing Strips

3.6 SHOP PRIMER REPAIR

Repair shop primer in accordance with the paint manufacturer's recommendation for surfaces damaged by handling, transporting, cutting, welding, or bolting.

3.6.1 Field Priming

Field priming of steel exposed to the weather, or located in building areas without HVAC for control of relative humidity. After erection, the field bolt heads and nuts, field welds, and any abrasions in the shop coat shall be cleaned and primed with paint of the same quality as that used for the shop coat.

3.7 GALVANIZING REPAIR

Provide as indicated or specified. Galvanize after fabrication where practicable. Repair damage to galvanized coatings using ASTM A 780 zinc rich paint for galvanizing damaged by handling, transporting, cutting, welding, or bolting. Do not heat surfaces to which repair paint has been applied.

3.8 FIELD QUALITY CONTROL

Perform field tests, and provide labor, equipment, and incidentals required for testing. The Contracting Officer shall be notified in writing of defective welds, bolts, nuts, and washers within 7 working days of the date of weld inspection.

3.8.1 Welds

3.8.1.1 Visual Inspection

AWS D1.1/D1.1M. Furnish the services of AWS-certified welding inspectors for fabrication and erection inspection and testing and verification inspections. Welding inspectors shall visually inspect and mark welds, including fillet weld end returns.

3.8.1.2 Nondestructive Testing

AWS D1.1/D1.1M. Test locations shall be selected by the Contracting Officer. If more than 20 percent of welds made by a welder contain defects identified by testing, then all welds made by that welder shall be tested by radiographic or ultrasonic testing, as approved by the Contracting Officer. When all welds made by an individual welder are required to be tested, magnetic particle testing shall

be used only in areas inaccessible to either radiographic or ultrasonic testing. Retest defective areas after repair.

a. Testing frequency: Provide the following types and number of tests:

Test Type	Number of Tests
Radiographic	__0__
Ultrasonic	__0__
Magnetic Particle	__0__
Dye Penetrant	__1__

3.8.2 Load Indicator Washers

3.8.2.1 Load Indicator Washer Compression

Load indicator washers shall be tested in place to verify that they have been compressed sufficiently to provide the 0.015 inch gap when the load indicator washer is placed under the bolt head and the nut is tightened, and to provide the 0.005 inch gap when the load indicator washer is placed under the turned element, as required by ASTM F 959.

3.8.2.2 Load Indicator Gaps

In addition to the above testing, an independent testing agency as approved by the Contracting Officer shall test in place the load indicator gapson 20 percent of the installed load indicator washers to verify that the ASTM F 959 load indicator gaps have been achieved. If more than 10 percent of the load indicators tested have not been compressed sufficiently to provide the average gaps required by ASTM F 959, then all in place load indicator washers shall be tested to verify that the ASTM F 959 load indicator gaps have been achieved. Test locations shall be selected by the Contracting Officer.

3.8.3 Overhead, Top Running Crane Rails and Beams

Runway rails and beams shall be surveyed horizontally and vertically after installation to verify compliance with the tolerance requirements of CMAA 70 and the additional tolerance requirements specified in this section. After each survey, submit a written report to the Contracting Officer with the following information: field survey results, tolerance requirements, areas out of tolerance, and proposed corrective measures. Proposed corrective measures shall be approved by the Contracting Officer. Following completion of corrective measures, areas that were previously out of tolerance shall be re-surveyed and another written report shall be furnished to the Contracting Officer. Field surveys shall be performed and sealed by a registered land surveyor.

3.8.4 High-Strength Bolts

3.8.4.1 Testing Bolt, Nut, and Washer Assemblies

Test a minimum of 3 bolt, nut, and washer assemblies from each mill certificate batch in a tension measuring device at the job site prior to the beginning of bolting start-up. Demonstrate that the bolts and nuts, when used together, can develop tension not less than the provisions specified in AISC 348 Table 4,

depending on bolt size and grade. The bolt tension shall be developed by tightening the nut. A representative of the manufacturer or supplier shall be present to ensure that the fasteners are properly used, and to demonstrate that the fastener assemblies supplied satisfy the specified requirements.

3.8.4.2 Inspection

Inspection procedures shall be in accordance with AISC 348, Section 9. Confirm and report to the Contracting Officer that the materials meet the project specification and that they are properly stored. Confirm that the faying surfaces have been properly prepared before the connections are assembled. Observe the specified job site testing and calibration, and confirm that the procedure to be used provides the required tension. Monitor the work to ensure the testing procedures are routinely followed on joints that are specified to be fully tensioned.

3.8.4.3 Testing

The Government has the option to perform nondestructive tests on 5 percent of the installed bolts to verify compliance with pre-load bolt tension requirements. The nondestructive testing will be done in-place using an ultrasonic measuring device or any other device capable of determining in-place pre-load bolt tension. The test locations shall be selected by the Contracting Officer. If more than 10 percent of the bolts tested contain defects identified by testing, then all bolts used from the batch from which the tested bolts were taken, shall be tested. Retest new bolts after installation.

3.8.5 Testing for Embrittlement

ASTM A 143 for steel products hot-dip galvanized after fabrication.

3.9 SPECIAL INSPECTION AND TESTING FOR SEISMIC-RESISTING SYSTEMS

Special inspections and testing for seismic-resisting systems and components shall be done in accordance with Section 01452A SPECIAL INSPECTION FOR SEISMIC-RESISTING SYSTEMS.

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SECTION 07920

JOINT SEALANTS

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM C 734	(2001) Low-Temperature Flexibility of Latex Sealants after Artificial Weathering
ASTM C 919	(2002) Use of Sealants in Acoustical Applications
ASTM C 920	(2002) Elastomeric Joint Sealants
ASTM D 1056	(2000) Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D 217	(2002) Cone Penetration of Lubricating Grease
ASTM E 84	(2003) Surface Burning Characteristics of Building 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. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Sealants; G

Primers

Bond breakers

Backstops

Manufacturer's descriptive data including storage requirements, shelf life, curing time, instructions for mixing and application, and primer data (if required). A copy of the Material Safety Data Sheet shall be provided for each solvent, primer or sealant material.

SD-07 Certificates

Sealant

Certificates of compliance stating that the materials conform to the specified requirements.

1.3 ENVIRONMENTAL CONDITIONS

The ambient temperature shall be within the limits of 40 and 90 degrees F when sealant is applied.

1.4 DELIVERY AND STORAGE

Deliver materials to the job site in unopened manufacturers' external shipping containers, with brand names, date of manufacture, color, and material designation clearly marked thereon. Elastomeric sealant containers shall be labeled to identify type, class, grade, and use. Carefully handle and store materials to prevent inclusion of foreign materials or subjection to sustained temperatures exceeding 90 degrees F or less than 0 degrees F.

PART 2 PRODUCTS

2.1 SEALANTS

Provide sealant that has been tested and found suitable for the substrates to which it will be applied.

2.1.1 Interior Sealant

ASTM C 920, Type S or M, Grade NS, Class 12.5, Use NT. Location(s) and color(s) of sealant shall be as follows:

	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
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 nonplaner tile surfaces meet.	White
g.	Joints formed between tile floors and tile base cove; joints between tile and dissimilar materials; joints occurring where substrates change.	White

h.	Behind escutcheon plates at valve pipe penetrations and showerheads in showers.	White

2.1.2 Exterior Sealant

For joints in vertical surfaces, provide ASTM C 920, Type S or M, Grade NS, Class 25, Use NT. For joints in horizontal surfaces, provide ASTM C 920, Type S or M, Grade P, Class 25, Use T. Location(s) and color(s) of sealant shall be as follows:

	LOCATION	COLOR
a.	Joints and recesses formed where frames and subsills of windows, doors, louvers, and vents adjoin masonry, concrete, or metal frames. Use sealant at both exterior and interior surfaces of exterior wall penetrations.	Match adjacent surface color
b.	Joints between new and existing exterior masonry walls.	As selected
c.	Masonry joints where shelf angles occur.	As selected
d.	Joints in wash surfaces of stonework.	As selected
e.	Expansion and control joints.	Gray
f.	Interior face of expansion joints in exterior concrete or masonry walls where metal expansion joint covers are not required.	Gray
g.	Voids where items pass through exterior walls.	As selected
h.	Metal reglets, where flashing is inserted into masonry joints, and where flashing is penetrated by coping dowels.	Gray
i.	Metal-to-metal joints where sealant is indicated or specified.	As selected
j.	Joints between ends of gravel stops, fascias, copings, and adjacent walls.	As selected

2.1.3 Floor Joint Sealant

ASTM C 920, Type S or M, Grade P, Class 25, Use T. Location(s) and color(s) of sealant shall be as follows:

	LOCATION	COLOR
a.	Seats of metal thresholds for exterior doors.	Gray
b.	Control and expansion joints in floors,	As selected

slabs, ceramic tile, and walkways.

2.1.4 Acoustical Sealant

Rubber or polymer-based acoustical sealant conforming to ASTM C 919 shall have a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E 84. Acoustical sealant shall have a consistency of 250 to 310 when tested in accordance with ASTM D 217, and shall remain flexible and adhesive after 500 hours of accelerated weathering as specified in ASTM C 734, and shall be non-staining.

2.2 PRIMERS

Provide a nonstaining, quick-drying type and consistency recommended by the sealant manufacturer for the particular application.

2.3 BOND BREAKERS

Provide the type and consistency recommended by the sealant manufacturer to prevent adhesion of the sealant to backing or to bottom of the joint.

2.4 BACKSTOPS

Provide glass fiber roving or neoprene, butyl, polyurethane, or polyethylene foams free from oil or other staining elements as recommended by sealant manufacturer. Backing shall be 25 to 33 percent oversize for closed cell and 40 to 50 percent oversize for open cell material, unless otherwise indicated. Backstop material shall be compatible with sealant. Do not use oakum and other types of absorptive materials as backstops.

2.4.1 Rubber

Cellular rubber sponge backing shall be ASTM D 1056, Type 2, closed cell, Class A, round cross section.

2.5 CLEANING SOLVENTS

Provide type(s) recommended by the sealant manufacturer except for aluminum and bronze surfaces that will be in contact with sealant.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Surfaces shall be clean, dry to the touch, and free from dirt frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter that would tend to destroy or impair adhesion. Oil and grease shall be removed with solvent and surfaces shall be wiped dry with clean cloths. When resealing an existing joint, remove existing calk or sealant prior to applying new sealant. For surface types not listed below, the sealant manufacturer shall be contacted for specific recommendations.

3.1.1 Steel Surfaces

Remove loose mill scale by sandblasting or, if sandblasting is impractical or would damage finish work, scraping and wire brushing. Remove protective coatings by sandblasting or using a residue-free solvent.

3.1.2 Aluminum or Bronze Surfaces

Remove temporary protective coatings from surfaces that will be in contact with sealant. When masking tape is used as a protective coating, remove tape and any residual adhesive just prior to sealant application. For removing protective coatings and final cleaning, use nonstaining solvents recommended by the manufacturer of the item(s) containing aluminum or bronze surfaces.

3.1.3 Concrete and Masonry Surfaces

Where surfaces have been treated with curing compounds, oil, or other such materials, the materials shall be removed by sandblasting or wire brushing. Laitance, efflorescence and loose mortar shall be removed from the joint cavity.

3.1.4 Wood Surfaces

Wood surfaces to be in contact with sealants shall be free of splinters and sawdust or other loose particles.

3.2 SEALANT PREPARATION

Do not add liquids, solvents, or powders to the sealant. Mix multicomponent elastomeric sealants in accordance with manufacturer's instructions.

3.3 APPLICATION

3.3.1 Joint Width-To-Depth Ratios

a. Acceptable Ratios:

JOINT WIDTH	JOINT DEPTH Minimum	JOINT DEPTH 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, or stone:		
1/4 inch (minimum)	1/4 inch	1/4 inch
Over 1/4 inch to 1/2 inch	1/4 inch	Equal to width
Over 1/2 inch to 2 inches	1/2 inch	5/8 inch
Over 2 inches	(As recommended by sealant manufacturer)	

b. Unacceptable Ratios: Where joints of acceptable width-to-depth ratios have not been provided, clean out joints to acceptable depths and grind or cut to acceptable widths without damage to the adjoining work. Grinding shall not be required on metal surfaces.

3.3.2 Masking Tape

Masking tape shall be placed on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or sealant smears. Masking tape shall be removed within 10 minutes after joint has been filled and tooled.

3.3.3 Backstops

Install backstops dry and free of tears or holes. Tightly pack the back or bottom of joint cavities with backstop material to provide a joint of the depth specified. Install backstops in the following locations:

a. Where indicated.

b. Where backstop is not indicated but joint cavities exceed the acceptable maximum depths specified in paragraph entitled, "Joint Width-to-Depth Ratios."

3.3.4 Primer

Immediately prior to application of the sealant, clean out loose particles from joints. Where recommended by sealant manufacturer, apply primer to joints in concrete masonry units, wood, and other porous surfaces in accordance with sealant manufacturer's instructions. Do not apply primer to exposed finish surfaces.

3.3.5 Bond Breaker

Provide bond breakers to the back or bottom of joint cavities, as recommended by the sealant manufacturer for each type of joint and sealant used, to prevent sealant from adhering to these surfaces. Carefully apply the bond breaker to avoid contamination of adjoining surfaces or breaking bond with surfaces other than those covered by the bond breaker.

3.3.6 Sealants

Provide a sealant compatible with the material(s) to which it is applied. Do not use a sealant that has exceeded shelf life or has jelled and can not be discharged in a continuous flow from the gun. Apply the sealant in accordance with the manufacturer's instructions with a gun having a nozzle that fits the joint width. Force sealant into joints to fill the joints solidly without air pockets. Tool sealant after application to ensure adhesion. Sealant shall be uniformly smooth and free of wrinkles. Upon completion of sealant application, roughen partially filled or unfilled joints, apply sealant, and tool smooth as specified. Sealer shall be applied over the sealant when and as specified by the sealant manufacturer.

3.4 PROTECTION AND CLEANING

3.4.1 Protection

Protect areas adjacent to joints from sealant smears. Masking tape may be used for this purpose if removed 5 to 10 minutes after the joint is filled.

3.4.2 Final Cleaning

Upon completion of sealant application, remove remaining smears and stains and leave the work in a clean and neat condition.

a. Masonry and Other Porous Surfaces: Immediately scrape off fresh sealant that has been smeared on masonry and rub clean with a solvent as recommended by the sealant manufacturer. Allow excess sealant to cure for 24 hour then remove by wire brushing or sanding.

b. Metal and Other Non-Porous Surfaces: Remove excess sealant with a solvent-moistened cloth.

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SECTION 10430

EXTERIOR SIGNAGE

PART 1 GENERAL

1.1 REFERENCES

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

ALUMINUM ASSOCIATION (AA)

AA DAF-45	(2003) Designation System for Aluminum Finishes

AMERICAN WELDING SOCIETY (AWS)

AWS C1.1M/C1.1	(2000) Resistance Welding
AWS D1.1/D1.1M	(2006) Structural Welding Code - Steel
AWS D1.2	(2003) Structural Welding Code - Aluminum

ASTM INTERNATIONAL (ASTM)

ASTM A 1011/A 1011M	(2005) Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High Strength Low-Alloy and High-Strength Low-Alloy With Improved Formability
ASTM A 123/A 123M	(2002) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 36/A 36M	(2005) Carbon Structural Steel
ASTM A 653/A 653M	(2004a) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 924/A 924M	(2004) General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B 108	(2003a) Aluminum-Alloy Permanent Mold Castings
ASTM B 209	(2004) Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 221	(2005) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B 26/B 26M	(2005) Aluminum-Alloy Sand Castings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Approved Detail Drawings; G

Drawings showing elevations of each type of sign; dimensions, details, and methods of mounting or anchoring; shape and thickness of materials; and details of construction. A schedule showing the location, each sign type, and message shall be included.

SD-03 Product Data

Modular Exterior Signage System

Manufacturer's descriptive data and catalog cuts.

Installation

Manufacturer's installation instructions and cleaning instructions.

Exterior Signage; G

Exterior signage schedule in electronic media with spread sheet format. Spread sheet shall include sign location, sign type, and message.

Wind Load Requirements

Design analysis and supporting calculations performed in support of specified signage.

SD-04 Samples

Exterior Signage; G

One 12 inch length of framing for illuminated signs. One sample of each type of sign. Each sample shall consist of a complete sign panel with letters and symbols. Samples may be installed in the work, provided each sample is identified and location recorded. Three color samples for each material requiring color and 12 inch square sample of sign face color sample.

SD-10 Operation and Maintenance Data

Protection and Cleaning

Three copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. The instructions shall include simplified diagrams for the equipment as installed.

1.3 GENERAL

All exterior signage shall be provided by a single manufacturer. Exterior signage shall be of the design, detail, sizes, types, and message content shown on the drawings, shall conform to the requirements specified, and shall be provided at the locations indicated. Signs shall be complete with lettering, framing as detailed and related components for a complete installation.

1.4 WIND LOAD REQUIREMENTS

Exterior signage shall be designed to withstand 90 mph wind load.

1.5 CHARACTER PROPORTIONS AND HEIGHTS

Letters and numbers on indicated signs for handicapped-accessible buildings shall have a width-to-height ratio between 3:5 and 1:1 and a stroke-width-to-height ratio between 1:5 and 1:10. Characters and numbers on indicated signs shall be sized according to the viewing distance from which they are to be read. The minimum height is measured using an upper case letter "X". Lower case characters are permitted.

1.6 QUALIFICATIONS

Signs, plaques, and dimensional letters shall be the standard product of a manufacturer regularly engaged in the manufacture of the products. Items of equipment shall essentially duplicate equipment that has been in satisfactory use at least 2 years prior to bid opening.

1.7 DELIVERY AND STORAGE

Materials shall be wrapped for shipment and storage, delivered to the jobsite in manufacturer's original packaging, and stored in a clean, dry area in accordance with manufacturer's instructions.

1.8 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period shall be provided.

PART 2 PRODUCTS

2.1 MODULAR EXTERIOR SIGNAGE SYSTEM

Exterior signage shall consist of a system of coordinated directional, identification, and regulatory type signs located where shown. Dimensions, details, materials, message content, and design of signage shall be as shown.

2.1.1 Free-Standing Base Mount Pylon/Monolith Type Signs

2.1.1.1 Framing

Interior framing shall consist of existing wood columns as shown on Plan. Framing members shall be designed to permit access to electrical equipment and panel removal. Mounting shall be provided as shown on Plan.

2.1.1.2 Exterior Sheeting Panels

Modular panels shall be provided in sizes shown on Plan. Panels shall be fabricated a minimum of 0.090 inch thick aluminum or steel. Panels shall be attached to framing system. Top and end panels shall be removable and shall be secured by 3/16 inch socket head jack nuts. Finish for metal panels shall be two-component acrylic polyurethane.

2.1.1.3 Mounting

Mounting shall be provided as show on Plan.

2.1.1.4 Finishes

Base finish shall be two-component acrylic polyurethane. Metal panel system finish shall be baked enamel or two-component acrylic polyurethane.

2.1.2 Panel and Post/Panel Type Signs

2.1.2.1 Posts

One-piece aluminum or galvanized steel posts shall be provided with minimum 0.125 inch wall thickness. Posts shall be designed to accept panel framing system described. The post shall be designed to permit attachment of panel framing system without exposed fasteners. Caps shall be provided for each post.

2.1.2.2 Panel Framing System

Panel framing consisting of aluminum sections and interlocking track components shall be designed to interlock with posts with concealed fasteners.

2.1.2.3 Panels

Modular message panels shall be provided in sizes shown on drawings. Panels shall be fabricated a minimum of 0.125 inch aluminum. Panels shall be heliarc welded to framing system.

2.1.2.4 Finishes

Post finish shall be two-component acrylic polyurethane. Metal panel system finish shall be baked enamel or two-component acrylic polyurethane.

2.1.2.5 Mounting

Permanent mounting shall be provided by embedding posts in concrete foundation as shown. Removable mounting shall be provided by a steel sleeve embedded in concrete.

2.2 GRAPHICS FOR EXTERIOR SIGNAGE SYSTEMS

2.2.1 Graphics

Signage graphics shall conform to the following:

a. Message shall be applied to panel using the silkscreen process. Silkscreened images shall be executed with photo screens prepared from original art. Hand cut screens will not be accepted. Original art shall be defined as artwork that is a first generation pattern of the original specified art. Edges and corners shall be clean. Rounded corners, cut or ragged edges, edge buildup, bleeding or surfaces pinholes will not be accepted.

2.2.2 Messages

See Government directive for message content. Typeface: Helvetica medium. Type size as directed by the Government.

2.3 DIMENSIONAL BUILDING LETTERS

2.3.1 Fabrication

Letters shall be fabricated from cast aluminum. Letters shall be cleaned by chemical etching or cleaned ultrasonically in a special degreasing bath. Letters shall be packaged for protection until installation.

2.3.2 Typeface

Typeface shall be Helvetica medium.

2.3.3 Size

Letter size shall be as directed by the Government.

2.3.4 Finish

Anodized aluminum finish shall be provided.

2.3.5 Mounting

Threaded studs of number and size as recommended by manufacturer, shall be used for concealed anchorage. Letters which project from the building line shall have stud spacer sleeves. Letters, studs, and sleeves shall be of the same material. Templates for mounting shall be supplied.

2.4 ALUMINUM ALLOY PRODUCTS

Aluminum alloy products shall conform to ASTM B 209 for sheet or plate, ASTM B 221 for extrusions and ASTM B 26/B 26M or ASTM B 108 for castings. Aluminum extrusions shall be provided at least 1/8 inch thick and aluminum plate or sheet at least 16 gauge thick. Welding for aluminum products shall conform to AWS C1.1M/C1.1.

2.5 ANODIC COATING

Anodized finish shall conform to AA DAF-45 as follows:

Clear (natural) designation AA-M10-C22-A31, Architectural Class II 0.4 mil or thicker.

2.6 STEEL PRODUCTS

Structural steel products shall conform to ASTM A 36/A 36M. Sheet and strip steel products shall conform to ASTM A 1011/A 1011M. Welding for steel products shall conform to AWS D1.2.

2.7 ANCHORS AND FASTENERS

Exposed anchor and fastener materials shall be compatible with metal to which applied and shall match in color and finish and shall be non-rusting, non-corroding, and non-staining. Exposed fasteners shall be tamper-proof.

2.8 SHOP FABRICATION AND MANUFACTURE

2.8.1 Factory Workmanship

Work shall be assembled in the shop, as far as practical, ready for installation at the site. Work that cannot be shop assembled shall be given a trial fit in the shop to ensure proper field assembly. Holes for bolts and screws shall be drilled or punched. Drilling and punching shall produce clean, true lines and surfaces. Welding to or on structural steel shall be in accordance with AWS D1.1/D1.1M. Welding shall be continuous along the entire area of contact. Exposed welds shall be ground smooth. Exposed surfaces of work shall have a smooth finish and exposed riveting shall be flush. Fastenings shall be concealed where practical. Items specified to be galvanized shall be by hot-dip process after fabrication if practical. Galvanization shall be in accordance with ASTM A 123/A 123M and ASTM A 653/A 653M, as applicable. Other metallic coatings of steel sheet shall be in accordance with ASTM A 924/A 924M. Joints exposed to the weather shall be formed to exclude water. Drainage and weep holes shall be included as required to prevent condensation buildup.

2.8.2 Dissimilar Materials

Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of asphalt varnish or a coat of zinc-molybdate primer to prevent galvanic or corrosive action.

2.8.3 Shop Painting

Surfaces of miscellaneous metal work, except nonferrous metal, corrosion resisting steel, and zinc-coated work, shall be given one coat of zinc-molybdate primer or an approved rust-resisting treatment and metallic primer in accordance with manufacturer's standard practice. Surfaces of items to be embedded in concrete shall not be painted. Upon completion of work, damaged surfaces shall be recoated.

2.9 COLOR, FINISH, AND CONTRAST

Color shall be as directed by the Government. For buildings required to be handicapped-accessible, the characters and background of signs shall be eggshell, matte, or other non-glare finish. Characters and symbols shall contrast with their background - either light characters on a dark background or dark characters on a light background.

PART 3 EXECUTION

3.1 INSTALLATION

Signs, plaques, or dimensional letters shall be installed in accordance with approved manufacturer's instructions at locations shown on the approved detail drawings. Signs shall be installed plumb and true at mounting heights indicated, and by method shown or specified. Signs mounted on other surfaces shall not be installed until finishes on such surfaces have been completed.

3.1.1 Anchorage

Anchorage and fastener materials shall be in accordance with approved manufacturer's instructions for the indicated substrate. Anchorage not otherwise specified or indicated shall include slotted inserts, expansion shields, and powder-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; lag bolts and screws for wood.

3.1.2 Protection and Cleaning

The work shall be protected against damage during construction. Hardware and electrical equipment shall be adjusted for proper operation. Glass, frames, and other sign surfaces shall be cleaned in accordance with manufacturer's instructions. After signs are completed and inspected, the Contractor shall cover all project identification, directional, and other signs which may mislead the public. Covering shall be maintained until instructed to be removed by the Contracting Officer or until the facility is to be opened for business. Signs shall be cleaned, as required, at time of cover removal.

3.2 FIELD PAINTED FINISH

Miscellaneous metals and frames shall be field painted in accordance with Section 09900 PAINTS AND COATINGS. Anodized metals, masonry, and glass shall be protected from paint. Finish shall be free of scratches or other blemishes.

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SECTION 11161

DOCK LEVELERS (HYDRAULIC)

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.

AMERICAL NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI MH30.1-(2000) For the Safety, Performance, and Testing of Dock Leveling Devices

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

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

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

NEMA MG 1 (1998) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2002) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 943 (1993; Rev thru Apr 2002) Ground-Fault Circuit-Interrupters

1.2 DEFINITIONS

1.2.1 Industrial Dock Leveler

A manufactured structure designed to span and compensate space and height differentials between a loading dock and freight carrier to facilitate safe, efficient, freight transfer.

1.2.2 Adjustable Loading Ramp

Synonym for Fixed Type Industrial Dock Leveler.

1.2.3 Fixed Type Industrial Dock Leveler

A dock leveler that is permanently affixed to the dock structure, and incorporating an electro-hydraulic system, recessed into dock face further than 15 inch to position the dock leveler with respect to the freight carrier at the lip end while being fixed at the opposite hinged end.

1.2.4 Velocity Fuse

A valve or similar device that goes into the hydraulic line. If the dock leveler becomes inadvertently or accidentally unsupported, this fuse will freeze the movement of the fully loaded dock leveler within 4 inches of the dock leveler original position on the carrier.

1.2.5 Carrier

A wheeled, enclosed trailer or container that, when attached to a heavy-duty truck or van, is used to carry bulk freight over long distances.

1.2.6 Uncontrolled Drop

Unrestricted downward travel of a loaded dock leveler, resulting from the sudden loss of support, as might occur when a carrier is pulled out from under the dock leveling device.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the government.

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Dock Leveler; G
Light Communication System; G
Integrated Control Panel; G

Detail drawings depicting materials, dimensions, tolerances, surface finishes, hardnesses, flush edge angles, method of mounting, and anchoring, information on signs and control panels, control schematics and diagram.

SD-03 Product Data

Loading Dock Levelers; G
Dock Bumpers; G
Light Communication System; G
Integrated Control Panel; G

Data including a complete list of equipment and materials, manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts, *wiring diagrams*, and installation instructions.

SD-07 Certificates

Dock Leveler Structural & Deck Plate Tests; G

A signed and sealed statement by the independent registered professional engineer of record, with a completed “ANSI MH30.1, Appendix A, Submittal Form”, all structural drawings, and manufacturer specifications attached, verifying that the dock leveler submitted for approval, make and mode number indicated, has been tested in accordance with ANSI MH30.1 and has passed the structural and deck plate tests for the specified test load.

Dock Leveler Manufacturer’s Authorized Installer and Service Organization; G

Statement on the manufacturer's letterhead and signed by the responsible official of manufacturer of the dock leveler, indicating the individual authorized to represent the manufacturer for the installation and service of the dock leveler system, light communication system, and freight carrier restraining device.

Dock Leveler Manufacturer’s Representative; G

Statement on the manufacturer's letterhead and signed by the responsible official of manufacturer of the dock leveler, indicating the individual authorized to represent the manufacturer for the supervision of the installation, the testing, and the adjustment of the dock leveler system, light communication system, and freight carrier restraining device, as well as operation and maintenance instruction to government personnel. The statement must be dated after award of project contract and clearly name the project.

Dock Leveler Warranties; G

At the completion of the installation and field tests, the manufacturer shall submit a signed 10 year structural warranty and a signed parts warranty.

Light Communication System; G

At the completion of the installation and field tests, the manufacturer shall submit a signed warranty.

Dock Leveler Safety System

Statement on the manufacturer's letterhead and signed by the responsible official of the manufacturer of the dock leveler, verifying that the dock leveler, submitted for approval, make and mode number indicated, with the safety system clearly described, has been tested for the gross vehicle weight specified, and stating the safety system will freeze the movement of the fully loaded dock leveler within 4 inches of the dock leveler original position on the carrier.

SD-09 Manufacturer's Field Reports

Dock Leveler, Light Communication System, and Freight Carrier Restraining Device Field Tests; G

Documentation of the testing and verification actions taken by the manufacturer’s representative to confirm compliance with government requirements for the field tests.

SD-10 Operation and Maintenance Data (Revised 30 MAR 05)

Loading Dock Levelers; G

Three copies of operation and three copies of maintenance manuals for the equipment furnished. One complete set shall be furnished prior to performance testing and the remainder shall be furnished upon acceptance. Operating manuals shall detail the step-by-step procedures required for system startup,

operation, and shutdown. Operating manuals shall include tables to identify the operating range and grade (slope) for all variations of length or configuration of the dock leveler. Operating manuals shall define and identify the maximum uncontrolled drop encountered upon sudden removal of support while within the working range of the equipment and include the procedure for placing the dock leveler out of service until the dock is inspected and repaired if necessary. Operating manuals shall include the manufacturer's name, model number, parts list, and brief description of all equipment and their basic operating features. Maintenance manuals shall list routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. Maintenance manuals shall include piping and equipment layout and simplified wiring and control diagrams of the system as installed. After approval of the detail drawings, and not later than 1 month prior to the date of beneficial occupancy, spare parts data for each different item of material and equipment specified are required. The data shall include a complete list of parts and supplies, with current unit prices and source of supply and a list of the parts recommended by the manufacturer to be replaced at recommended intervals of service.

1.4 GENERAL REQUIREMENTS

Materials and equipment shall be the standard products of a dock leveler manufacturer regularly engaged in the manufacture of the products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Equipment shall be installed and supported by a service organization that is authorized by the manufacturer for such, and is in the opinion of the Contracting Officer, reasonably convenient to the site (i. e. within a 50 mile radius).

1.5 NAMEPLATE and CAUTION PLATE

Attach corrosion-resistant metal plate securely and legibly on the exterior surface of the dock leveler. Include the following information indented or embossed on the plate:

a. Description of the equipment.
b. Name and address of the manufacturer.
c. Serial and model number.
d. Capacity in kilograms/ pounds.
e. Shipping weight.
f. Date of manufacture (month and year).

Attach corrosion-resistant metal plate to the dock leveler control box describing procedures for the safe operation and service of the equipment, procedures to follow in the event of uncontrolled drop, and warnings or cautions of hazardous procedures.

1.6 DELIVERY AND STORAGE

Provide metal, waterproofed tags and markings. Equipment delivered and placed in storage, shall be stored with protection from the weather, humidity and temperature variation, dirt, dust, or other contaminants.

1.7 MANUFACTURER'S REPRESENTATIVE

Furnish the services of a fixed type industrial dock leveler technician, experienced in the installation and operation of the type of system being

provided, to supervise the installation, testing, and adjustment of the system, as well as operation and maintenance instruction to government personnel.

1.8 QUALITY ASSURANCE

1.8.1 Detail Drawings

Submit drawings with complete wiring, schematic diagrams, and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Detail drawings shall show proposed layout and anchorage of equipment and appurtenances. Detail drawings shall show the concrete pit details including flush edge angles, dock bumpers, and sloped pit bottom; method of mounting and anchoring; and location of control stations and disconnect switches.

1.8.2 As-Built Drawings

Submit record as-built drawings, including mechanical and electrical components, testing and acceptance (one copy sepia transparency) for each industrial dock leveler.

1.8.3 Verification of Dimensions

After becoming familiar with all details of the work, the Contractor shall verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

1.9 Testing

The dock leveler shall pass the ANSI MH30.1 structural and deck plate tests for a minimum test load of 8,346 kilograms (18,400 pounds).

1.10 Warranty

Provide manufacturer’s standard 10 year structural warranty and manufacturer’s standard parts warranty for the parts not covered by the structural warranty for the dock leveler.

PART 2 PRODUCTS

2.1 LOADING DOCK LEVELERS

Loading dock levelers shall be permanent type, and shall have minimum performance characteristics based on the following:

a. Service Period:

(1) Number of shift operations shall be 3.
(2) Maximum number of trucks per shift opening shall be 5.
(3) Maximum number of days per week shall be 7.

b. Fork Lift Loads:

(1) Leveler shall be designed to accommodate 4 wheel fork trucks.
(2) Leveler shall be designed to handle 18,400 pounds gross vehicle weight (i.e. the weight of the vehicle plus the maximum load carried).

(3) Load leveler design shall be based on 32 cycles per loading/unloading operation per truck.

Loading dock leveler shall be electro-hydraulic type with electric motor and hydraulic pump operating a hydraulic cylinder that adjusts dock leveler board position. Make provision for maintenance access to understructure and lifting mechanism. Provide steel tread plate safety lip and platform, hinged and supported from beneath by steel framework that contains lifting, positioning, and lowering assembly. Ensure that platform surface is flush with surrounding floor surface of loading dock when not in service. Provide integral positive restraint when leveler is in maintenance position.

2.1.1 Environmental Requirements

Design, fabricate, and finish loading ramp to permit washing with water and detergents, and operating in an ambient temperature from minus 10 degrees F to 110 degrees F.

2.1.2 Dock Leveler Height Adjustment

Provide a ramp whose incline can be adjusted to suit the height of the freight carrier. Allow the loading ramp a minimum of 24 inches of vertical adjustment. Height adjustments shall be divided 12 inches above and 12 inches below the dock level to provide coverage between 38 inches and 62 inches above grade.

2.1.3 Dock Leveler Extension and Retraction

Extend non-fixed end of the dock leveler from a retracted position behind the line of the loading dock platform bumpers to at least 12 inches beyond the forward edge of the dock platform bumpers so as to rest on the bed of the freight carrier. Taper the width of the forward edge, width not to exceed 81 inches. The difference in length of the platform from its fully retracted position to its fully extended position shall be practically constant throughout the ramp, including the ramp extension.

2.1.4 Loading Ramp Compensation

Provide automatic compensation with ramp platform loaded or unloaded for the following:

2.1.4.1 Freight Carrier Out of Level

Out of level freight carrier bed condition (difference in elevation from side to side at the rear of the carrier bed): Allow a minimum correction of 1 inch for each 18 inches and maximum 4 inch correction over the width of the ramp. Ensure the rear edge of the ramp parallel with the rear of the frame in order to prevent tripping or be a pinching hazard.

2.1.4.2 Loading and Unloading of the Freight Carrier

When the lip is extended so as to rest on the bed of motor truck or trailer, provide compensation of 4 inches for carrier spring deflection so that contact will be maintained between lip and carrier bed.

2.1.5 Safety System

Provide velocity fuse, ball check-valve, or other device to automatically prevent an uncontrolled drop of the fully loaded dock leveler; system will stop the dock leveler within 4 inches of the dock leveler original position on the carrier, should the freight carrier move away from the dock leaving the lip unsupported. Provide dock face with laminated rubber, tire-fabric or equivalent dock bumpers recommended by the dock leveler manufacturer.

2.1.6 Capacity

Load carrying capacity of the ramp shall provide for the service period and fork lift loads indicated in “2.1 LOADING DOCK LEVELERS”. Adequacy shall be validated by successful completion of the ANSI MH30.1 structural and deck plate tests, and “3.3 Field Tests”.

2.1.7 Ramp Load Carrying Surface

The live load carrying surface of the ramp shall be a minimum 6 feet wide and a minimum 7 feet long with the dock leveler lip retracted.

2.2 OPERATION

2.2.1 Pushbutton

Provide each dock leveler with a pushbutton station to activate motor, pump, and valves. Heavy-duty dust tight and oil tight type rated in accordance with NEMA ICS 2, Part ICS2-216 for alternating current. To prevent accidental operation and damage, ensure each button to be recessed in its station or be protected by a peripheral collar (ring) or shroud. Indelibly identify each pushbutton by means of cast or etched letters on the station. Provide emergency "STOP" button of momentary type with manual reset. This stop button shall stop all dock leveler movement, regardless of the position of the ramp or lip at the time the "STOP" button is depressed. Pushbutton station and emergency “STOP” button shall be included in the Control Panel as described in paragraph 2.7.

2.2.2 Hinged Lip Ramp Movement

Apply continuous pressure on the push button(s) to raise the loading ramp and extend the lip, release of button(s) causes ramp and lip to lower onto the bed of the freight carrier. Prior to truck departure, store the dock leveler; storage to include automatic return of safety lip to the stored position. The ramp, in its stored position, shall have the capability of being lowered to a fully supported, below dock-level position, without extending the lip of the ramp to service truck end loads which may be lower than loading dock surface position. Allow 4 to 6 seconds to fully extend or retract the lip.

2.2.3 Limit Switches

Provide a Limit switch/interlock device that shall allow for operation of the dock leveler only when the overhead door is fully opened.

2.3 CONSTRUCTION AND MATERIALS

Construct all load carrying parts of forged or welded steel. Burrs and sharp edges that offer hazards to operating or maintenance personnel shall be removed.

2.3.1 Structure

The entire live load carrying surface of the ramp and rear attachment shall be not less than 1/4 inch thick, 55 ksi minimum yield strength, low alloy, nonskid steel tread plate. Provide minimum 5/8 inch vertical projections on the live load carrying surface. Edge of the ramp extension or lip over the freight carrier shall be beveled to a maximum of 20 degrees with a maximum edge thickness of ¼". Design load carrying surfaces to permit free movement of powered hand or platform trucks, low lift pallet trucks, and fork lift trucks. Fabricate lip hinge of not less than 1/4 inch wall seamless steel tubing.

2.3.2 Toe Guards or Skirts

Provide sides or edges, except front and rear edges, of the ramps which rise above the surrounding loading dock with sheet carbon steel skirts or toe guards of minimum 14 U.S.S. gage nominal thickness. Toe guards or skirts shall be smooth faced and mounted flush with the edges of the ramp surface. Ensure sufficient depth of toe guards or skirts to protect the full operating range of dock travel. Ensure the construction capable of resisting a minimum lateral force of 10 pounds with a maximum deflection of 1/2 inch.

2.3.3 Safety Lip

The ramp extension or lip shall provide a 7" high barrier against accidental fork lift roll-off, when the dock leveler is in the stored position. The barrier shall be full width and shall stop a minimum 10,000 lb. load at 4 mph.

2.3.4 Positive Restraint

Provide integral positive restraint when leveler is in maintenance position. Restraining means shall be permanently attached to the dock leveler and be capable of supporting the weight of the unloaded platform.

2.4 ELECTRO-HYDRAULIC SYSTEM

Provide a separate and complete system for each dock leveler. Include an electric motor, motor drive, hydraulic pump, hydraulic ram, pressure relief valve, fluid reservoir, strainer, filter, hydraulic control-valve cylinders, hose, piping, fittings, and hydraulic fluid. Incorporate a means for filling and draining hydraulic fluid. Design cylinders, pump, and control valves to withstand not less than 150 percent of the design operating pressure. Provide hydraulic hose, fittings, pipe, and tubing with working pressures based upon a minimum 4 to 1 safety factor of bursting pressure.

2.5 ELECTRICAL REQUIREMENTS

Electrical characteristics shall be 208 volt, three phase, and 60 Hz alternating current power supply. Provide all electrical equipment on the loading ramp. Provide interconnecting wiring for components of packaged equipment as an integral part of the equipment. Include motor, switches, junction box, conduit, wiring cables, panel enclosed control station, motor controller, heater coils, timer, transformer, terminal blocks, and fuses. Provide NEMA ICS 6, Type 4, electrical enclosures. Color code all wiring. Electrical work shall conform to Section 16415A ELECTRICAL WORK, INTERIOR.

2.5.1 Motor

Conform to NEMA MG 1 and continuous duty or 60-minute time rated, industrial type, single speed rated for operating conditions. Provide electrical insulation systems conforming to NEMA MG 1, Class B. Provide permanently lubricated antifriction ball or roller bearings. Each electro hydraulic loading dock leveler shall be equipped with a totally enclosed non-ventilated (TENV) squirrel cage induction electric motor

2.5.2 Controls

NEMA ICS 2, size 0 controller for heavy industrial service. Provide an electrically operated, full magnetic, nonreversing type controller for the motor. Equip all control enclosures with locks and keys.

2.5.3 Transformer

Totally enclosed, self-cooled, dry type; feed the transformer from the load side of the main disconnecting device. Incorporate circuit breakers with ground fault interrupting protection conforming to UL 943.

2.6 Light Communication System

Manually operated inside and outside light package with inside and outside signs, all components UL listed. System shall be ADA compliant for "4.28.2 Audible Alarms", "4.28.3 Visual Alarms", and "4.30 Signs". Clearly visible green and red lights in polypropylene housing. Lights shall utilize LED lamps. Electrical characteristics shall be 120 volt, single phase, and 60 hertz. Operation of lights shall be controlled by push button by the dock attendant. Lights and signs (i.e. straight and mirror image) communicate to both the inside and outside dock positions, to provide instruction to dock workers as to safe entry into trailers, and to trailer drivers as to safe movement to or away from the dock position; inside lights are in the opposing mode to the outside lights. Provide caution signs as needed to satisfy the requirements of this specification section, and as shown on drawings.

2.7 CONTROL PANEL

Provide integrated control panel for control of dock leveler including limit switch/interlock device, light communication systems. The interior light communication system shall be integral to the integrated control panel and shall include signage to “ENTER ON GREEN ONLY”.

PART 3 EXECUTION

3.1 INSTALLATION

Install and adjust the dock leveler, and light communication system in accordance with NFPA 70, the manufacturer's approved detail drawings, and as-built system assembly drawings. Install controls so operator can see dock leveler while manipulating controls.

3.1.1 Pit

Do not pour the pit for the adjustable loading ramp until the design and detail drawings have been approved. Check and verify appropriate measurements at the building. Pit shall be dimensioned as required by the dock leveler

manufacturer and shall be built within the manufacturer’s allowable dimensional tolerances.

3.2 CLEANING, TREATMENT AND PAINTING

In accordance with manufacturer's standard practice, shop clean, treat and paint ferrous surfaces including platform, lip, frame, springs, motor, pump, cylinders, valves, and any other non-cadmium plated or non-galvanized surface (but not including bearings, gear contact surfaces, parts protected by lubrication, or other surfaces not usually painted or coated). Ferrous surfaces shall be cleaned, shot penned, and the base metal protected with an application of 99.9% pure zinc coating with a thickness of 0.010 mm to 0.012 mm, in accordance with ANSI/ANS C2.18-93 and the base metal protected with an application of Rustoleum paint with a thickness of 0.062 mm to 0.075 mm (2.5 to 3 mils) followed by a final coat of standard primer with a thickness of 0.062 to 0.075 mm (2.5 to 3 mils). Nonferrous parts shall be protected against corrosion as necessary.

3.2.1 Workmanship

Conduct field touch-up work as to avoid damaging other surfaces and public property in the area. Do not apply field applied paint during foggy, damp, rainy weather, or the ambient temperatures below 7 degrees C (45 degrees F) and above 35 degrees C (95 degrees F).

3.2.2 Dissimilar Metals Protection

Insulate control surfaces by electrolytically inactive materials.

3.2.3 Finish Coat Color

Brilliant yellow and black. Paint 3 inch wide black and yellow diagonal stripes on all vertical surfaces of pit, skirts, and platform edges exposed above adjacent surfaces at any ramp position. Paint similar stripes on top of ramp surfaces in 6 inch wide band around outside edges (except for fixed edge).

3.3 FIELD TESTS

The government will provide the material for the loads, the material handling equipment, the various freight carriers and personnel to operate such. Contractor is fully responsible to provide other personnel and for the administration and direction of the tests. Examine the installation of the dock leveler, and light communication system, correct defects, make adjustments, and repeat tests under the cognizance of the Contracting Officer and the dock leveler manufacturer to insure proper operation of all systems, and to achieve compliance with test requirements. The Contracting Officer shall certify the test load.

3.3.1 Roll-Over Load Tests

Move roll-over load of 20,000 pounds over the dock leveler between the bed of a freight carrier and the building loading dock surface for 10 cycles. With the ramp extension retracted and the ramp platform leveled with the building loading dock surface, run a 28,000 pound roll-over load over the ramp in various directions for 20 cycles. No permanent deformation or hydraulic system leakage shall occur subsequent to examination after these roll-over tests.

3.3.2 Acceptance Tests

Perform an acceptance test in the presence of the dock leveler manufacturer and the Contracting Officer subsequent to the successful completion of the roll-over load test. Conduct operation of the equipment through all of its motions and specified checks as follows: (a) extend lip to rest on a variety of freight carriers with beds to 12 inches above and 12 inches below dock level; (b) test level compensation of the ramp, loaded with a minimum of 7000 lbs; and (c) test proper compensation (float) for various compression of counter springs, with ramp loaded and unloaded.

3.4 INSTRUCTION TO GOVERNMENT PERSONNEL

Upon completion of the work and at a time designated by the Contracting Officer, the services of a competent technician regularly employed or authorized by the manufacturer of the dock leveler shall be provided for instructing government personnel in the proper operation, maintenance, safety, and emergency procedures of the dock leveler, light communication system and restraining device. The period of instruction shall be not less than one or more than two eight-hour working days. The training shall be conducted at the job site. The Contractor shall submit Operating and Maintenance Instructions as specified in the Submittals paragraph.

-- End of Section --

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SECTION 16402

INTERIOR DISTRIBUTION SYSTEM

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C80.5 (1994)	Aluminum Rigid Conduit (ARC)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 1 (2001)	Hard-Drawn Copper Wire
ASTM B 8 (1999)	Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM D 709 (2001)	Laminated Thermosetting Materials

ELECTRONIC INDUSTRIES ASSOCIATION (EIA) / TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

EIA TIA/EIA-568-B.1	(2001; Addendum 2001) Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements (ANSI/TIA/EIA-568-B.1)
EIA TIA/EIA-569-A	(1998; Addendum 2000, 2001) Commercial Building Standards for Telecommunications Pathways and Spaces (ANSI/TIA/EIA-569-A)
TIA J-STD-607-A	(2002) Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2 (2002)	National Electrical Safety Code (IEEE)
IEEE C12.7 (1993)	Watthour Meter Sockets (ANSI/IEEE)
IEEE STD 81 (1983)	Guide for Measuring Earth Resistivity Ground Impedance and Earth Surface Potentials of a Ground System (Part 1)
IEEE Std 100 (2000)	Dictionary of Electrical and Electronics Terms (IEEE)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250 (2003)	Enclosures for Electrical Equipment (1000 Volts Maximum)

NEMA BU 1(1999)	Busways
NEMA C12.1 (2001)	Electric Meters; Code for Electricity Metering
NEMA C80.1 (1994)	Rigid Steel Conduit - Zinc Coated
NEMA C80.3 (1994)	Electrical Metallic Tubing - Zinc Coated (EMT)
NEMA FU 1(2002)	Low Voltage Cartridge Fuses
NEMA ICS 1 (2000)	Industrial Control and Systems General Requirements
NEMA ICS 2 (2000)	Industrial Control and Systems Controllers, Contactors, and Overload Relays, Rated 600 Volts
NEMA ICS 3 (1993; R 2000)	Industrial Control and System Factory Built Assemblies
NEMA ICS 4 (2000)	Industrial Control Products and Systems Terminal Blocks
NEMA ICS 6 (1993; R 2001)	Industrial Control and Systems Enclosures
NEMA KS 1(2001)	Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)
NEMA MG 1(2003)	Motors and Generators
NEMA MG 10 (2001)	Energy Management Guide for Selection and Use of Fixed Medium AC Squirrel Cage Polyphase Induction Motors
NEMA MG 11 (2001)	Energy Management Guide for Selection and Use of Single-Phase Motors
NEMA RN 1 (1998)	Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
NEMA ST 20 (1992; R 1997)	Dry-Type Transformers for General Applications
NEMA TC 2(1998)	Electrical Polyvinyl Chloride (PVC) Tubing and Conduit
NEMA TC 3(1999)	PVC Fittings for Use with Rigid PVC Conduit and Tubing
NEMA TP 1(2002)	Guide for Determining Energy Efficiency for Distribution Transformers
NEMA VE 1(2002)	Metal Cable Tray Systems
NEMA WD 1(1999)	General Color Requirements for Wiring Devices

NEMA WD 6(2002)	Wiring Devices - Dimensional Specifications
NEMA Z535.4 (2002)	Product Safety Signs and Labels

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS (2003)	Acceptance Testing Specifications

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (Latest Edition)	National Electrical Code
NFPA 70E (2009)	Electrical Safety Requirements for Employee Workplaces
NFPA 780 (2000)	Installation of Lightning Protection Systems

UNDERWRITERS LABORATORIES (UL)

UL 1 (2000)	Flexible Metal Conduit
UL 4 (1996; R 2001)	Armored Cable
UL 5 (1996; R 2001)	Surface Metal Raceways and Fittings
UL 6 (2000; Rev thru May 2003)	Rigid Metal Conduit
UL 6A (2000; Bul. 2002)	Electrical Rigid Metal Conduit - Aluminum, Bronze and Stainless Steel
UL 20 (2000; R 2002, Bul. 2002)	General-Use Snap Switches
UL 2043 (1996; R 2001, Bul. 2001)	Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
UL 44 (1999; Rev thru May 2002)	Thermoset-Insulated Wires and Cables
UL 50 (1995; Rev thru Sep 2003)	Enclosures for Electrical Equipment
UL 67 (1993; Rev thru Nov 2003)	Panelboards
UL 83 (1998; R 2001, Bul. 2002)	Thermoplastic-Insulated Wires and Cables
UL 198C (1986; R 1998)	High-Interrupting-Capacity Fuses, Current-Limiting Types
UL 198E (1988; R 1988)	Class R Fuses
UL 198H (1988; R 1993)	Class T Fuses
UL 360 (1996; R 2001, Bul. 2002)	Liquid-Tight Flexible Steel Conduit
UL 467 (1993; Rev thru Feb 2001)	Grounding and Bonding Equipment

UL 486A	(1997; R 2001, Bul. 2002, 2003)	Wire Connectors and Soldering Lugs for Use with Copper Conductors
UL 486B	(1997; R 2001, Bul. 2002, 2003)	Wire Connectors for Use with Aluminum Conductors
UL 486C	(2000; R 2002)	Splicing Wire Connectors
UL 489	(2002; Rev thru May 2003)	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
UL 498	(2001; R 2002)	Attachment Plugs and Receptacles
UL 506	(2000; Bul. 2002 and 2003)	Specialty Transformers
UL 508	(1999; R 2002, Bul. 2003)	Industrial Control Equipment
UL 510	(1994; R 1998)	Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
UL 512	(1993; R 1999)	Fuseholders
UL 514A	(1996; R 2001, Bul. 2002)	Metallic Outlet Boxes
UL 514B	(1997; R 2002, Bul. 2002)	Fittings for Cable and Conduit
UL 514C	(1996; R 2002)	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL 651	(1995; R 2002)	Schedule 40 and 80 Rigid PVC Conduit
UL 674	(1994; Rev thru Oct 1998)	Electric Motors and Generators for Use in Division 1 Hazardous (Classified) Locations
UL 698	(1995; Rev thru Mar 1999)	Industrial Control Equipment for Use in Hazardous (Classified) Locations
UL 719	(2002)	Nonmetallic-Sheathed Cables
UL 797	(2000; Rev thru May 2003)	Electrical Metallic Tubing -- Steel
UL 817	(1994); Rev thru May 1999)	Cord Sets and Power Supply Cords
UL 845	(1995; Rev thru Apr 2004)	Motor Control Centers
UL 854	(1999; R 2002)	Service-Entrance Cables
UL 857	(2001; R 2002)	Busways
UL 869A	(1998; Bul. 2002)	Reference Standard for Service Equipment
UL 870	(1995; R 1999, Bul. 2002)	Wireways, Auxiliary Gutters, and Associated Fittings
UL 877	(1993; Rev thru Nov 1999)	Circuit Breakers and Circuit-Breaker Enclosures for Use in Hazardous (Classified) Locations

UL 886	(1994; R 1999, Bul. 2002)	Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations
UL 943	(1993; R 2002, Bul. 2002)	Ground-Fault Circuit-Interrupters
UL 984	(1996, Bul. 2001)	Hermetic Refrigerant Motor-Compressors
UL 1010	(1995; R 1999, Bul. 2002)	Receptacle-Plug Combinations for Use in Hazardous (Classified) Locations
UL 1063	(1993; Rev. thru Oct 1994)	Machine-Tool Wire and Cables
UL 1242	(2000; Rev thru May 2003)	Electrical Intermediate Metal Conduit -- Steel
UL 1449	(1996; R 2002)	Transient Voltage Surge Suppressors
UL 1561	(1999; R 2001)	Dry-Type General Purpose and Power Transformers
UL 1569	(1999; R 2001, Bul. 2001, 2002)	Metal-Clad Cables
UL 1699	(1999; R 2002, Bul. 2002, 2003)	Arc-Fault Circuit-Interrupters

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

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

1.2 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE Std 100.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Switches; G
Wires & Cables; G
Conduit & Fittings; G
Receptacles; G
Dock Light; G
Submittals shall include performance and characteristic curves.

SD-06 Test Reports

600-volt wiring test; G
Grounding system test; G

SD-10 Operation and Maintenance Data

Electrical Systems, Data Package 5; G

Submit operation and maintenance data in accordance with Section 01780, PROJECT CLOSEOUT and as specified herein.

1.4 QUALITY ASSURANCE

1.4.1 Fuses

Submit coordination data as specified in paragraph, FUSES of this section.

1.4.2 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.

1.4.3 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.4.3.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.4.3.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

1.5 MAINTENANCE

1.5.1 Electrical Systems

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

a. Single line diagram of the "as-built" building electrical system.

b. Schematic diagram of electrical control system (other than HVAC, covered elsewhere).

c. Manufacturers' operating and maintenance manuals on active electrical equipment.

1.6 WARRANTY

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials, equipment, and devices shall, as a minimum, meet requirements of UL, where UL standards are established for those items, and requirements of NFPA 70.

2.2 CONDUIT AND FITTINGS

Shall conform to the following:

2.2.1 Rigid Metallic Conduit

2.2.1.1 Rigid, Threaded Zinc-Coated Steel Conduit

NEMA C80.1, UL 6.

2.2.2 Intermediate Metal Conduit (IMC)

UL 1242, zinc-coated steel only.

2.2.3 Electrical, Zinc-Coated Steel Metallic Tubing (EMT)

UL 797, NEMA C80.3.

2.2.4 Plastic-Coated Rigid Steel and IMC Conduit

NEMA RN 1, Type 40(40 mils thick).

2.2.5 Flexible Metal Conduit

UL 1.

2.2.5.1 Liquid-Tight Flexible Metal Conduit, Steel

UL 360.

2.2.6 Fittings for Metal Conduit, EMT, and Flexible Metal Conduit

UL 514B. Ferrous fittings shall be cadmium or zinc-coated in accordance with UL 514B.

2.2.6.1 Fittings for Rigid Metal Conduit and IMC

Threaded-type. Split couplings unacceptable.

2.2.6.2 Fittings for EMT

Steel compression type.

2.7 OUTLET BOXES AND COVERS

UL 514A, cadmium- or zinc-coated, if ferrous metal. UL 514C, if nonmetallic.

2.8 CABINETS, JUNCTION BOXES, AND PULL BOXES

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

2.9 WIRES AND CABLES

Wires and cables shall meet applicable requirements of NFPA 70 and UL for type of insulation, jacket, and conductor specified or indicated. Wires and cables manufactured more than 12 months prior to date of delivery to site shall not be used.

2.9.1 Conductors

Conductors No. 8 AWG and larger diameter shall be stranded. Conductors No. 10 AWG and smaller diameter shall be solid, except that conductors for remote control, alarm, and signal circuits, classes 1, 2, and 3, shall be stranded unless specifically indicated otherwise. Conductor sizes and ampacities shown are based on copper. All conductors shall be copper.

2.9.1.1 Minimum Conductor Sizes

Minimum size for branch circuits shall be No. 12 AWG; for Class 1 remote-control and signal circuits, No. 14 AWG; for Class 2 low-energy, remote-control and signal circuits, and No. 16 AWG for Class 3 low-energy, remote-control, alarm and signal circuits, No. 22 AWG.

2.9.2 Color Coding

Provide for service, feeder, branch, control, and signaling circuit conductors. Color shall be green for grounding conductors and white for neutrals; except where neutrals of more than one system are installed in same raceway or box, other neutrals shall be white with a different colored (not green) stripe for each. Color of ungrounded conductors in different voltage systems shall be as follows:

a. 208/120 volt, three-phase

   (1) Phase A - black
   (2) Phase B - red
   (3) Phase C - blue

b. 480/277 volt, three-phase

   (1) Phase A - brown
   (2) Phase B - orange
   (3) Phase C - yellow

c. 120/240 volt, single phase: Black and red

d. On three-phase, four-wire delta system, high leg shall be orange, as required by NFPA 70.

2.9.3 Insulation

Unless specified or indicated otherwise or required by NFPA 70, power and lighting wires shall be 600-volt, Type THWN/THHN conforming to UL 83 or Type XHHW conforming to UL 44, except that grounding wire may be type TW conforming to UL 83; remote-control and signal circuits shall be Type TW or TF, conforming to UL 83. Where lighting fixtures require 90-degree Centigrade (C) conductors, provide only conductors with 90-degree C insulation or better.

2.9.4 Bonding Conductors

ASTM B 1, solid bare copper wire for sizes No. 8 AWG and smaller diameter; ASTM B 8, Class B, stranded bare copper wire for sizes No. 6 AWG and larger diameter.

2.10 SPLICES AND TERMINATION COMPONENTS

UL 486A and UL 486B, as applicable, for wire connectors and UL 510 for insulating tapes. Connectors for No. 10 AWG and smaller diameter wires shall be insulated, pressure-type in accordance with UL 486A or UL 486C. Provide solderless terminal lugs on stranded conductors.

2.11 DEVICE PLATES

Provide UL listed, one-piece device plates for outlets to suit the devices installed. For metal outlet boxes, plates on unfinished walls shall be of zinc-coated sheet steel or cast metal having round or beveled edges. For nonmetallic boxes and fittings, other suitable plates may be provided. Plates on finished walls shall be satin finish stainless steel or brushed-finish aluminum, minimum 0.03 inch thick. Screws shall be machine-type with countersunk heads in color to match finish of plate. Sectional type device plates will not be permitted. Plates installed in wet locations shall be gasketed and UL listed for "wet locations."

2.12 SWITCHES

2.12.1 Breakers Used as Switches

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

2.12.2 Disconnect Switches

NEMA KS 1. Provide heavy duty-type switches where indicated, where switches are rated higher than 240 volts, and for double-throw switches. Fused switches shall utilize Class R fuseholders and fuses, unless indicated otherwise. Switches serving as motor-disconnect means shall be horsepower rated. Provide switches in NEMA enclosure as indicated per NEMA ICS 6.

2.13 FUSES

NEMA FU 1. Provide complete set of fuses for each fusible switch. Time-current characteristics curves of fuses serving motors or connected in series with circuit breakers or other circuit protective devices shall be coordinated for proper operation. Submit coordination data for approval. Fuses shall have voltage rating not less than circuit voltage.

2.13.1 Fuseholders

Provide in accordance with UL 512.

2.13.2 Cartridge Fuses, Current Limiting Type (Class R)

UL 198E, Class as indicated. Associated fuseholders shall be Class R only.

2.13.3 Cartridge Fuses, High-Interrupting Capacity, Current Limiting Type (Classes J, L, and CC)

UL 198C, Class J for zero to 600 amperes, Class L for 601 to 6,000 amperes, and Class CC for zero to 30 amperes.

2.13.4 Cartridge Fuses, Current Limiting Type (Class T)

UL 198H, Class T for zero to 1,200 amperes, 300 volts; and zero to 800 amperes, 600 volts.

2.14 PANELBOARDS

2.14.1 Circuit Breakers

UL 489, thermal magnetic-type having a minimum short-circuit current rating equal to the short-circuit current rating of the panelboard in which the circuit breaker shall be mounted. Breaker terminals shall be UL listed as suitable for type of conductor provided. Where indicated on the drawings, provide circuit breakers with shunt trip devices. Series rated circuit breakers and plug-in circuit breakers are unacceptable.

2.14.1.1 Multipole Breakers

Provide common trip-type with single operating handle. Breaker design shall be such that overload in one pole automatically causes all poles to open. Maintain phase sequence throughout each panel so that any three adjacent breaker poles are connected to Phases A, B, and C, respectively.

2.15 LOCKOUT REQUIREMENTS

Provide disconnecting means capable of being locked out for machines and other equipment to prevent unexpected startup or release of stored energy in accordance with 29 CFR 1910.147. Mechanical isolation of machines and other equipment shall be in accordance with requirements of Division 15, "Mechanical."

2.16 GROUNDING AND BONDING EQUIPMENT

2.17.1 Ground Rods

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

2.17.2 Ground Bus

A copper ground bus shall be provided in the electrical equipment rooms as indicated.

2.18 HAZARDOUS LOCATIONS

Electrical materials, equipment, and devices for installation in hazardous locations, as defined by NFPA 70, shall be specifically approved by Underwriters' Laboratories, Inc., or Factory Mutual for particular "Class," "Division," and "Group" of hazardous locations involved. Boundaries and classifications of hazardous locations shall be as indicated. Equipment in

hazardous locations shall comply with UL 877 for circuit breakers, UL 886 for outlet boxes and fittings, UL 1010 for receptacles, UL 674 for motors, and UL 698 for industrial controls.

2.19 MANUFACTURER'S NAMEPLATE

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

2.20 FIELD FABRICATED NAMEPLATES

ASTM D 709. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, 0.125 inch thick, white with black center core. Provide red laminated plastic label with white center core where indicated. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be one by 2.5 inches. Lettering shall be a minimum of 0.25 inch high normal block style.

2.21 WARNING SIGNS

Provide warning signs for flash protection in accordance with NFPA 70E and NEMA Z535.4 for switchboards, panelboards, industrial control panels, and motor control centers that are in other than dwelling occupancies and are likely to require examination, adjustment, servicing, or maintenance while energized. Provide field installed signs to warn qualified persons of potential electric arc flash hazards when warning signs are not provided by the manufacturer. The marking shall be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

2.22 FIRESTOPPING MATERIALS

Provide firestopping around electrical penetrations in accordance with Section 07840, FIRESTOPPING.

2.23 WIREWAYS

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

2.24 FACTORY APPLIED FINISH

Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA 250 corrosion-resistance test and the additional requirements as specified herein. Interior and exterior steel surfaces of equipment enclosures shall be thoroughly cleaned and then receive a rust-inhibitive phosphatizing or equivalent treatment prior to painting. Exterior surfaces shall be free from holes, seams, dents, weld marks, loose scale or other imperfections. Interior surfaces shall receive not less than one coat of corrosion-resisting paint in accordance with the manufacturer's standard practice. Exterior surfaces shall be primed, filled where necessary, and given not less than two coats baked enamel with semigloss finish. Equipment located indoors shall be ANSI Light Gray, and equipment

located outdoors shall be ANSI Light Gray. Provide manufacturer's coatings for touch-up work and as specified in paragraph FIELD APPLIED PAINTING.

PART 3 EXECUTION

3.1 INSTALLATION

Electrical installations, including weatherproof and hazardous locations and ducts, plenums and other air-handling spaces, shall conform to requirements of NFPA 70 and IEEE C2 and to requirements specified herein.

3.1.1 Hazardous Locations

Work in hazardous locations, as defined by NFPA 70, shall be performed in strict accordance with NFPA 70 for particular "Class," "Division," and "Group" of hazardous locations involved. Provide conduit and cable seals where required by NFPA 70. Conduit shall have tapered threads.

3.1.2 Wiring Methods

Provide insulated conductors installed in rigid steel conduit, IMC, or EMT, except where specifically indicated or specified otherwise or required by NFPA 70 to be installed otherwise. Grounding conductor shall be separate from electrical system neutral conductor. Provide insulated green equipment grounding conductor for circuit(s) installed in conduit and raceways. Shared neutral, or multi-wire branch circuits, are not permitted with arc-fault circuit interrupters. Minimum conduit size shall be 1/2 inch in diameter for low voltage lighting and power circuits. Vertical distribution in multiple story buildings shall be made with metal conduit in fire-rated shafts. Metal conduit shall extend through shafts for minimum distance of 6 inches. Conduit which penetrates fire-rated walls, fire-rated partitions, or fire-rated floors shall be firestopped in accordance with Section 07840, FIRESTOPPING.

3.1.2.1 Pull Wire

Install pull wires in empty conduits. Pull wire shall be plastic having minimum 200-pound force tensile strength. Leave minimum 36 inches of slack at each end of pull wire.

3.1.3 Conduit Installation

Unless indicated otherwise, conceal conduit under floor slabs and within finished walls, ceilings, and floors. Keep conduit minimum 6 inches away from parallel runs of flues and steam or hot water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit will be visible after completion of project. Run conduits in crawl space or under floor slab as if exposed.

3.1.3.1 Restrictions Applicable to EMT

a. Do not install underground.

b. Do not encase in concrete, mortar, grout, or other cementitious materials.

c. Do not use in areas subject to severe physical damage including but not limited to equipment rooms where moving or replacing equipment could physically damage the EMT.

d. Do not use in hazardous areas.

e. Do not use outdoors.

f. Do not use in fire pump rooms.

g. Do not use when the enclosed conductors must be shielded from the effects of High-altitude Electromagnetic Pulse (HEMP).

3.1.3.2 Restrictions Applicable to Flexible Conduit

Use only as specified in paragraph FLEXIBLE CONNECTIONS. Do not use when the enclosed conductors must be shielded from the effects of High-altitude Electromagnetic Pulse (HEMP).

3.1.3.3 Underground Conduit Other Than Service Entrance

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

3.1.3.4 Conduit Installed Under Floor Slabs

Conduit run under floor slab shall be located a minimum of 12 inches below the vapor barrier. Seal around conduits at penetrations thru vapor barrier.

3.1.3.5 Conduit Through Floor Slabs

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

3.1.3.6 Conduit Installed in Concrete Floor Slabs

PVC, Type EPC-40, unless indicated otherwise. Locate so as not to adversely affect structural strength of slabs. Install conduit within middle one-third of concrete slab. Do not stack conduits. Space conduits horizontally not closer than three diameters, except at cabinet locations. Curved portions of bends shall not be visible above finish slab. Increase slab thickness as necessary to provide minimum one inch cover over conduit. Where embedded conduits cross building and/or expansion joints, provide suitable watertight expansion/deflection fittings and bonding jumpers. Expansion/deflection fittings shall allow horizontal and vertical movement of raceway. Conduit larger than one inch trade size shall be parallel with or at right angles to main reinforcement; when at right angles to reinforcement, conduit shall be close to one of supports of slab. Where nonmetallic conduit is used, raceway shall be converted to plastic coated rigid steel before rising above floor, unless specifically indicated.

3.1.3.7 Stub-Ups

Provide conduits stubbed up through concrete floor for connection to free-standing equipment with adjustable top or coupling threaded inside for plugs, set flush with finished floor. Extend conductors to equipment in rigid steel conduit, except that flexible metal conduit may be used 6 inches above floor. Where no equipment connections are made, install screwdriver-operated threaded flush plugs in conduit end.

3.1.3.8 Conduit Support

Support conduit by pipe straps, wall brackets, hangers, or ceiling trapeze. Fasten by wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; and by machine screws, welded threaded studs, or spring-tension clamps on steel work. Threaded C-clamps may be used on rigid steel conduit only. Do not weld conduits or pipe straps to steel structures. Load applied to fasteners shall not exceed one-fourth proof test load. Fasteners attached to concrete ceiling shall be vibration resistant and shock-resistant. Holes cut to depth of more than 1 1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete joints shall not cut main reinforcing bars. Fill unused holes. In partitions of light steel construction, use sheet metal screws. In suspended-ceiling construction, run conduit above ceiling. Do not support conduit by ceiling support system. Conduit and box systems shall be supported independently of both (a) tie wires supporting ceiling grid system, and (b) ceiling grid system into which ceiling panels are placed. Supporting means shall not be shared between electrical raceways and mechanical piping or ducts. Installation shall be coordinated with above-ceiling mechanical systems to assure maximum accessibility to all systems. Spring-steel fasteners may be used for lighting branch circuit conduit supports in suspended ceilings in dry locations. Support exposed risers in wire shafts of multistory buildings by U-clamp hangers at each floor level and at 10 foot maximum intervals. Where conduit crosses building expansion joints, provide suitable watertight expansion fitting that maintains conduit electrical continuity by bonding jumpers or other means. For conduits greater than 2 1/2 inches inside diameter, provide supports to resist forces of 0.5 times the equipment weight in any direction and 1.5 times the equipment weight in the downward direction.

3.1.3.9 Directional Changes in Conduit Runs

Make changes in direction of runs with symmetrical bends or cast-metal fittings. Make field-made bends and offsets with hickey or conduit-bending machine. Do not install crushed or deformed conduits. Avoid trapped conduits. Prevent plaster, dirt, or trash from lodging in conduits, boxes, fittings, and equipment during construction. Free clogged conduits of obstructions.

3.1.3.10 Locknuts and Bushings

Fasten conduits to sheet metal boxes and cabinets with two locknuts where required by NFPA 70, where insulated bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, use at least minimum single locknut and bushing. Locknuts shall have sharp edges for digging into wall of metal enclosures. Install bushings on ends of conduits, and provide insulating type where required by NFPA 70.

3.1.3.11 Flexible Connections

Provide flexible steel conduit between 3 and 6 feet in length for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for motors. Install flexible conduit to allow 20 percent slack. Minimum flexible steel conduit size shall be 1/2 inch diameter. Provide liquidtight flexible conduit in wet and damp locations and in fire pump rooms for equipment subject to vibration, noise transmission, movement or motors. Provide separate ground conductor across flexible connections.

3.1.4 Boxes, Outlets, and Supports

Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways shall be cast-metal, hub-type when located in wet locations, when surface mounted on outside of exterior surfaces, or when surface mounted on interior walls exposed up to 7 feet above floors and walkways, and when specifically indicated. Boxes in other locations shall be sheet steel, except that aluminum boxes may be used with aluminum conduit, and nonmetallic boxes may be used with nonmetallic sheathed cable conduit system. Each box shall have volume required by NFPA 70 for number of conductors enclosed in box. Boxes for mounting lighting fixtures shall be minimum 4 inches square, or octagonal, except that smaller boxes may be installed as required by fixture configurations, as approved. Boxes for use in masonry-block or tile walls shall be square-cornered, tile-type, or standard boxes having square-cornered, tile-type covers. Provide gaskets for cast-metal boxes installed in wet locations and boxes installed flush with outside of exterior surfaces. Provide separate boxes for flush or recessed fixtures when required by fixture terminal operating temperature; fixtures shall be readily removable for access to boxes unless ceiling access panels are provided. Support boxes and pendants for surface-mounted fixtures on suspended ceilings independently of ceiling supports. Fasten boxes and supports with wood screws on wood, with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel. In open overhead spaces, cast boxes threaded to raceways need not be separately supported except where used for fixture support; support sheet metal boxes directly from building structure or by bar hangers. Where bar hangers are used, attach bar to raceways on opposite sides of box, and support raceway with approved-type fastener maximum 24 inches from box. When penetrating reinforced concrete members, avoid cutting reinforcing steel.

3.1.4.1 Boxes

Boxes for use with raceway systems shall be minimum 1 1/2 inches deep, except where shallower boxes required by structural conditions are approved. Boxes for other than lighting fixture outlets shall be minimum 4 inches square, except that 4 by 2 inch boxes may be used where only one raceway enters outlet. Telecommunications outlets shall be a minimum of 4 inches square by 2 1/8 inches deep, except for wall mounted telephones and outlet boxes for handicap telephone stations. Mount outlet boxes flush in finished walls.

3.1.4.2 Pull Boxes

Construct of at least minimum size required by NFPA 70 of code-gauge aluminum or galvanized sheet steel, except where cast-metal boxes are required in locations specified herein. Provide boxes with screw-fastened covers. Where several feeders pass through common pull box, tag feeders to indicate clearly electrical characteristics, circuit number, and panel designation.

3.1.4.3 Extension Rings

Extension rings are not permitted for new construction. Use only on existing boxes in concealed conduit systems where wall is furred out for new finish.

3.1.5 Mounting Heights

Mount panelboards, enclosed circuit breakers, motor controller and disconnecting switches so height of operating handle at its highest position is maximum 78 inches above floor. Mount lighting switches and handicapped

telecommunications stations 48 inches above finished floor. Mount receptacles and telecommunications outlets 18 inches above finished floor, unless otherwise indicated. Wall-mounted telecommunications outlets shall be mounted at height indicated. Mount other devices as indicated. Measure mounting heights of wiring devices and outlets in non-hazardous areas to center of device or outlet. Measure mounting heights of receptacle outlet boxes in the hazardous area 18 to the bottom of the outlet box.

3.1.6 Conductor Identification

Provide conductor identification within each enclosure where tap, splice, or termination is made. For conductors No. 6 AWG and smaller diameter, color coding shall be by factory-applied, color-impregnated insulation. For conductors No. 4 AWG and larger diameter, color coding shall be by heat shrink-type sleeves. Identify control circuit terminations in accordance with Section 15951, DIRECT DIGITAL CONTROL FOR HVAC SYSTEMS.

3.1.6.1 Marking Strips

White or other light-colored plastic marking strips, fastened by screws to each terminal block, shall be provided for wire designations. The wire numbers shall be made with permanent ink. The marking strips shall be reversible to permit marking both sides, or two marking strips shall be furnished with each block. Marking strips shall accommodate the two sets of wire numbers. Each device to which a connection is made shall be assigned a device designation in accordance with NEMA ICS 1 and each device terminal to which a connection is made shall be marked with a distinct terminal marking corresponding to the wire designation used on the Contractor's schematic and connection diagrams. The wire (terminal point) designations used on the Contractor's wiring diagrams and printed on terminal block marking strips may be according to the Contractor's standard practice; however, additional wire and cable designations for identification of remote (external) circuits shall be provided for the Government's wire designations. Prints of the marking strips drawings submitted for approval will be so marked and returned to the Contractor for addition of the designations to the terminal strips and tracings, along with any rearrangement of points required.

3.1.7 Splices

Make splices in accessible locations. Make splices in conductors No. 10 AWG and smaller diameter with insulated, pressure-type connector. Make splices in conductors No. 8 AWG and larger diameter with solderless connector, and cover with insulation material equivalent to conductor insulation.

3.1.8 Covers and Device Plates

Install with edges in continuous contact with finished wall surfaces without use of mats or similar devices. Plaster fillings are not permitted. Install plates with alignment tolerance of 1/16 inch. Use of sectional-type device plates are not permitted. Provide gasket for plates installed in wet locations.

3.1.9 Electrical Penetrations

Seal openings around electrical penetrations through fire resistance-rated walls, partitions, floors, or ceilings in accordance with Section 07840, FIRESTOPPING.

3.1.10 Grounding and Bonding

Provide In accordance with NFPA 70 and NFPA 780. Ground exposed, non-current-carrying metallic parts of electrical equipment, access flooring support system, metallic raceway systems, grounding conductor in metallic and nonmetallic raceways, telecommunications system grounds, grounding conductor of nonmetallic sheathed cables, and neutral conductor of wiring systems. Make ground connection at main service equipment, and extend grounding conductor to point of entrance of metallic water service. Make connection to water pipe by suitable ground clamp or lug connection to plugged tee. If flanged pipes are encountered, make connection with lug bolted to street side of flanged connection. Supplement metallic water service grounding system with additional made electrode in compliance with NFPA 70. Make ground connection to driven ground rods on exterior of building. Interconnect all grounding media in or on the structure to provide a common ground potential. This shall include lightning protection, electrical service, telecommunications system grounds, as well as underground metallic piping systems. Interconnection to the gas line shall be made on the customer's side of the meter. Use main size lightning conductors for interconnecting these grounding systems to the lightning protection system. In addition to the requirements specified herein, provide telecommunications grounding in accordance with TIA J-STD-607-A. Where ground fault protection is employed, ensure that connection of ground and neutral does not interfere with correct operation of fault protection.

3.1.10.1 Ground Rods

Provide cone pointed ground rods. The resistance to ground shall be measured using the fall-of-potential method described in IEEE STD 81. The maximum resistance of a driven ground shall not exceed 25 ohms under normally dry conditions. If this resistance cannot be obtained with a single rod, install additional rods not less than 6 feet on centers. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, notify the Contracting Officer who will decide on the number of ground rods to add.

3.1.10.2 Grounding Connections

Make grounding connections which are buried or otherwise normally inaccessible, excepting specifically those connections for which access for periodic testing is required, by exothermic weld or compression connector.

a. Make exothermic welds strictly in accordance with the weld manufacturer's written recommendations. Welds which are "puffed up" or which show convex surfaces indicating improper cleaning are not acceptable. Mechanical connectors are not required at exothermic welds.

b. Make compression connections using a hydraulic compression tool to provide the correct circumferential pressure. Tools and dies shall be as recommended by the manufacturer. An embossing die code or other standard method shall provide visible indication that a connector has been adequately compressed on the ground wire.

3.1.10.3 Ground Bus

A copper ground bus shall be provided in the electrical equipment rooms as indicated. Noncurrent-carrying metal parts of electrical equipment shall be effectively grounded by bonding to the ground bus. The ground bus shall be bonded to both the entrance ground, and to a ground rod or rods as specified above having the upper ends terminating approximately 4 inches above the floor. Connections and splices shall be of the brazed, welded, bolted, or pressure-connector type, except that pressure connectors or bolted connections shall be used for connections to removable equipment. For raised

floor equipment rooms in computer and data processing centers, a minimum of 4, one at each corner, ground buses shall be provided and connected to the building grounding system. Connections shall be bolted type in lieu of thermoweld, so they can be changed as required by additions and/or alterations.

3.1.10.4 Resistance

Maximum resistance-to-ground of grounding system shall not exceed 5 ohms under dry conditions. Where resistance obtained exceeds 5 ohms, contact Contracting Officer for further instructions.

3.1.11 Equipment Connections

Provide power wiring for the connection of motors and control equipment under this section of the specification. Except as otherwise specifically noted or specified, automatic control wiring, control devices, and protective devices within the control circuitry are not included in this section of the specifications but shall be provided under the section specifying the associated equipment.

3.1.12 Government-Furnished Equipment

Contractor shall make connections to Government-furnished equipment to make equipment operate as intended, including providing miscellaneous items such as plugs, receptacles, wire, cable, conduit, flexible conduit, and outlet boxes or fittings.

3.1.13 Repair of Existing Work

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

3.1.13.1 Workmanship

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

3.1.13.2 Existing Concealed Wiring to be Removed

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

3.1.13.3 Removal of Existing Electrical Distribution System

Removal of existing electrical distribution system equipment shall include equipment's associated wiring, including conductors, cables, exposed conduit, surface metal raceways, boxes, and fittings, back to equipment's power source as indicated.

3.1.13.4 Continuation of Service

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

3.2 FIELD FABRICATED NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

3.3 WARNING SIGN MOUNTING

Provide the number of signs required to be readable from each accessible side. Space the signs in accordance with NFPA 70E.

3.4 FIELD APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be as specified in Section 09900, PAINTS AND COATINGS.

3.5 FIELD QUALITY CONTROL

Furnish test equipment and personnel and submit written copies of test results. Give Contracting Officer 5 working days notice prior to each test.

3.5.1 Devices Subject to Manual Operation

Each device subject to manual operation shall be operated at least five times, demonstrating satisfactory operation each time.

3.5.2 600-Volt Wiring Test

Test wiring rated 600 volt and less to verify that no short circuits or accidental grounds exist. Perform insulation resistance tests on wiring No. 6 AWG and larger diameter using instrument which applies voltage of approximately 500 volts to provide direct reading of resistance. Minimum resistance shall be 250,000 ohms.

3.5.3 Grounding System Test

Test grounding system to ensure continuity, and that resistance to ground is not excessive. Test each ground rod for resistance to ground before making connections to rod; tie grounding system together and test for resistance to ground. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall. Submit written results of each test to Contracting Officer, and indicate location of rods as well as resistance and soil conditions at time measurements were made.

-- End of Section --

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