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

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

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

1.2.1.2 Working As-Built and Final As-Built Drawings

The Contractor shall revise 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 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 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.

1.2.1.4 Computer Aided Design and Drafting (CADD) Drawings

Only personnel proficient in the preparation of CADD drawings shall be employed to modify the contract drawings or prepare additional new drawings. Additions and corrections to the contract drawings shall be equal in quality and detail to that of the originals. Line colors, line weights, lettering, layering conventions, and symbols shall be the same as the original line colors, line weights, lettering, layering conventions and symbols. If additional drawings are required, they shall be prepared using the specified electronic file format applying the same graphic standards specified for original drawings. The title block and drawing border to be used for any new final as-built drawings shall be identical to that used on the contract drawings. Additions and corrections to the contract drawings shall be accomplished using CADD files. The Contractor will be furnished "as-designed" drawings in AutoCAD. The version of AutoCAD shall be the release that is in use by DDSP at the time of project award. The electronic files will be supplied on compact disc, read-only memory (CD-ROM). The Contractor shall be responsible for providing all program files and hardware necessary to prepare final as-built drawings. The Contracting Officer will review final as-built drawings for accuracy and the Contractor shall make required corrections, changes, additions, and deletions.

a. CADD colors shall be the "base" colors of red, green, and blue. Color code for changes shall be as follows:

   (1) Deletions (red) - Deleted graphic items (lines) shall be colored red with red lettering in notes and leaders.

   (2) Additions (Green) - Added items shall be drawn in green with green lettering in notes and leaders.

   (3) Special (Blue) - Items requiring special information, coordination, or special detailing or detailing notes shall be in blue on layer #63.

b. The Contract Drawing files shall be renamed in a manner related to the contract number as instructed in the Pre-Construction conference. Marked-up changes shall be made only to those renamed files. All changes shall be made on the layer/level as the original item. There shall be no deletions of existing lines.

c. 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.

d. 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 CADD as-built drawings for that phase of work and submit two sets of blue-lined prints of these drawings for Government review and approval. The Government will promptly return one set of prints annotated with any necessary corrections. Within 7 days the Contractor shall revise the CADD files accordingly at no additional

cost and submit one set of final prints for the completed phase of work to the Government. Within 10 days of substantial completion of all phases of work, the Contractor shall submit the final as-built drawing package for the entire project. The submittal shall consist of one set of electronic files on compact disc, read-only memory (CD-ROM), one set of mylars, two sets of blue-line prints and one set of the approved working as-built drawings. They shall be complete in all details and identical in form and function to the contract drawing files supplied by the Government. Any transactions or adjustments necessary to accomplish this are the responsibility of the Contractor. The Government reserves the right to reject any drawing files it deems incompatible with the customer's CADD system. Paper prints, drawing files and storage media submitted will become the property of the Government upon final approval. Failure to submit final as-built drawing files and 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-Air Conditioning Systems

(1) Recreational support.
(2) Air conditioning leak in part of building, if causing damage.
(3) Air conditioning system not cooling properly.

Code 1-Doors

(1) Overhead doors not operational, causing a security, fire, or safety problem.

(2) Interior, exterior personnel doors or hardware, not functioning properly, causing a security, fire, or safety problem.

Code 3-Doors

(1) Overhead doors not operational.
(2) Interior/exterior personnel doors or hardware not functioning properly.

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

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 2-Kitchen Equipment

(1) Dishwasher not operating properly.
(2) All other equipment hampering preparation of a meal.

Code 1-Plumbing

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

Code 2-Plumbing

(1) Flush valves not operating properly.
(2) Fixture drain, supply line to commode, or any water pipe leaking.
(3) Commode leaking at base.

Code 3-Plumbing

Leaky faucets.

Code 3-Interior

(1) Floors damaged.
(2) Paint chipping or peeling.
(3) Casework.

Code 1-Roof Leaks

Temporary repairs will be made where major damage to property is occurring.

Code 2-Roof Leaks

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)

No water to facility.

Code 2-Water (Hot)

No hot water in portion of building listed.

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 MECHANICAL TESTING, ADJUSTING, BALANCING, AND COMMISSIONING

Prior to final inspection and transfer of the completed facility; all reports, statements, certificates, and completed checklists for testing, adjusting, balancing, and commissioning of mechanical systems shall be submitted to and approved by the Contracting Officer as specified in applicable technical specification sections.

1.5 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.

1.5.1 Package Quality

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

1.5.2 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.

1.5.3 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.

1.6 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES

1.6.1 Operating Instructions

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

1.6.1.1 Safety Precautions

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

1.6.1.2 Operator Prestart

Include procedures required to set up and prepare each system for use.

1.6.1.3 Startup, Shutdown, and Post-Shutdown Procedures

Provide narrative description for Startup, Shutdown and Post-shutdown operating procedures including the control sequence for each procedure.

1.6.1.4 Normal Operations

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

1.6.1.5 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.

1.6.1.6 Operator Service Requirements

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

1.6.1.7 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.

1.6.2 Preventive Maintenance

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

1.6.2.1 Lubrication Data

Include preventative maintenance lubrication data, in addition to instructions for lubrication provided under paragraph titled "Operator Service Requirements":

a. A table showing recommended lubricants for specific temperature ranges and applications.

b. Charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities.

c. A Lubrication Schedule showing service interval frequency.

1.6.2.2 Preventive Maintenance Plan and Schedule

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

1.6.3 Corrective Maintenance (Repair)

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

1.6.3.1 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.

1.6.3.2 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.

1.6.3.3 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.

1.6.3.4 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.

1.6.3.5 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.

1.6.4 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.

1.6.5 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:

1.6.6 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

1.6.6.1 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.

1.6.6.2 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.

1.6.6.3 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.

1.6.6.4 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.

1.7 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:

1.7.1 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

1.7.2 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

1.7.3 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

1.7.4 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

1.7.5 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

1.8 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.

1.9 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 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.

--- END OF SECTION --

SECTION 15050

BASIC MECHANICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM B 117	(2002) Operating Salt Spray (Fog) Apparatus

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2	(2002) National Electrical Safety Code

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(2003) Motors and Generators
NEMA MG 10	(2001) Energy Management Guide for Selection and Use of Fixed Frequency Medium AC Squirrel-Cage Polyphase Induction Motors
NEMA MG 11	(1977; R 1997; R 2001) Energy Management Guide for Selection and Use of Single Phase Motors

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2005) National Electrical Code

1.2 RELATED REQUIREMENTS

This section applies to all sections of Division 15, "Mechanical" of this project specification, unless specified otherwise in the individual section.

1.3 QUALITY ASSURANCE

1.3.1 Material and Equipment Qualifications

Provide materials and equipment that are standard products of manufacturers regularly engaged in the manufacture of such products, which are of a similar material, design and workmanship. Standard products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2 year period.

1.3.2 Alternative Qualifications

Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.

1.3.3 Service Support

The equipment items shall be supported by service organizations. Submit a certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. These service organizations shall be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.3.4 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.3.5 Modification of References

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction", or words of similar meaning, to mean the Contracting Officer.

1.3.5.1 Definitions

For the International Code Council (ICC) Codes referenced in the contract documents, advisory provisions shall be considered mandatory, the word "should" shall be interpreted as "shall." Reference to the "code official" shall be interpreted to mean the "Contracting Officer." References to the "permit holder" shall be interpreted to mean the "Contractor."

1.3.5.2 Administrative Interpretations

For ICC Codes referenced in the contract documents, the provisions of Chapter 1, "Administrator," do not apply. These administrative requirements are covered by the applicable Federal Acquisition Regulations (FAR) included in this contract and by the authority granted to the Officer in Charge of Construction to administer the construction of this project. References in the ICC Codes to sections of Chapter 1, shall be applied appropriately by the Contracting Officer as authorized by his administrative cognizance and the FAR.

1.4 DELIVERY, STORAGE, AND HANDLING

Handle, store, and protect equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.

1.5 ELECTRICAL REQUIREMENTS

Furnish motors, controllers, disconnects and contactors with their respective pieces of equipment. Motors, controllers, disconnects and contactors shall conform to and have electrical connections provided under Section 16402 INTERIOR DISTRIBUTION SYSTEM. Furnish internal wiring for components of packaged equipment as an integral part of the equipment. Extended voltage range motors will not be permitted. Controllers and contactors shall have a maximum of 120 volt control circuits, and shall have auxiliary contacts for use with the controls furnished. When motors and equipment furnished are larger than sizes indicated, the cost of additional electrical service and related work shall be included under the section that specified that motor or equipment. Power wiring and conduit for field installed equipment shall be provided under and conform to the requirements of Section 16402 INTERIOR DISTRIBUTION SYSTEM and Section 16375 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND, as applicable.

1.6 ELECTRICAL INSTALLATION REQUIREMENTS

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

1.6.1 New Work

Provide electrical components of mechanical equipment, such as motors, motor starters (except starters/controllers which are indicated as part of a motor control center), control or push-button stations, float or pressure switches, solenoid valves, integral disconnects, and other devices functioning to control mechanical equipment, as well as control wiring and conduit for circuits rated 100 volts or less, to conform with the requirements of the section covering the mechanical equipment. Extended voltage range motors shall not be permitted. The interconnecting power wiring and conduit, control wiring rated 120 volts (nominal) and conduit, the motor control equipment forming a part of motor control centers, and the electrical power circuits shall be provided under Division 16, except internal wiring for components of package equipment shall be provided as an integral part of the equipment. When motors and equipment furnished are larger than sizes indicated, provide any required changes to the electrical service as may be necessary and related work as a part of the work for the section specifying that motor or equipment.

1.6.2 Modifications to Existing Systems

Where existing mechanical systems and motor-operated equipment require modifications, provide electrical components under Division 16.

1.6.3 High Efficiency Motors

1.6.3.1 High Efficiency Single-Phase Motors

Unless otherwise specified, single-phase fractional-horsepower alternating-current motors shall be high efficiency types corresponding to the applications listed in NEMA MG 11.

1.6.3.2 High Efficiency Polyphase Motors

Unless otherwise specified, polyphase motors shall be selected based on high efficiency characteristics relative to the applications as listed in NEMA MG 10. Additionally, polyphase squirrel-cage medium induction motors with

continuous ratings shall meet or exceed energy efficient ratings in accordance with Table 12-6C of NEMA MG 1.

1.6.4 Three-Phase Motor Protection

Provide controllers for motors rated one horsepower and larger with electronic phase-voltage monitors designed to protect motors from phase-loss, undervoltage, and overvoltage. Provide protection for motors from immediate restart by a time adjustable restart relay.

1.7 INSTRUCTION TO GOVERNMENT PERSONNEL

When specified in other sections, furnish the services of competent instructors to give full instruction to the designated Government personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the specified equipment or system. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work.

Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section. When more than 4 man-days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for instruction with the equipment or system.

When significant changes or modifications in the equipment or system are made under the terms of the contract, provide additional instruction to acquaint the operating personnel with the changes or modifications.

1.8 ACCESSIBILITY

Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install concealed valves, expansion joints, controls, dampers, and equipment requiring access, in locations freely accessible through access doors.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 PAINTING OF NEW EQUIPMENT

New equipment painting shall be factory applied or shop applied, and shall be as specified herein, and provided under each individual section.

3.1.1 Factory Painting Systems

Manufacturer's standard factory painting systems may be provided subject to certification that the factory painting system applied will withstand 125 hours in a salt-spray fog test, except that equipment located outdoors shall withstand 500 hours in a salt-spray fog test. Salt-spray fog test shall be in accordance with ASTM B 117, and for that test the acceptance criteria shall be as follows: immediately after completion of the test, the paint

shall show no signs of blistering, wrinkling, or cracking, and no loss of adhesion; and the specimen shall show no signs of rust creepage beyond 0.125 inch on either side of the scratch mark.

The film thickness of the factory painting system applied on the equipment shall not be less than the film thickness used on the test specimen. If manufacturer's standard factory painting system is being proposed for use on surfaces subject to temperatures above 120 degrees F, the factory painting system shall be designed for the temperature service.

3.1.2 Shop Painting Systems for Metal Surfaces

Clean, pretreat, prime and paint metal surfaces; except aluminum surfaces need not be painted. Apply coatings to clean dry surfaces. Clean the surfaces to remove dust, dirt, rust, oil and grease by wire brushing and solvent degreasing prior to application of paint, except metal surfaces subject to temperatures in excess of 120 degrees F shall be cleaned to bare metal.

Where more than one coat of paint is specified, apply the second coat after the preceding coat is thoroughly dry. Lightly sand damaged painting and retouch before applying the succeeding coat. Color of finish coat shall be aluminum or light gray.

a. Temperatures Less Than 120 Degrees F: Immediately after cleaning, the metal surfaces subject to temperatures less than 120 degrees F shall receive one coat of pretreatment primer applied to a minimum dry film thickness of 0.3 mil, one coat of primer applied to a minimum dry film thickness of one mil; and two coats of enamel applied to a minimum dry film thickness of one mil per coat.

b. Temperatures Between 120 and 400 Degrees F: Metal surfaces subject to temperatures between 120 and 400 degrees F shall receive two coats of 400 degrees F heat-resisting enamel applied to a total minimum thickness of 2 mils.

c. Temperatures Greater Than 400 Degrees F: Metal surfaces subject to temperatures greater than 400 degrees F shall receive two coats of 600 degrees F heat-resisting paint applied to a total minimum dry film thickness of 2 mils.

3.2 MECHANICAL PAINTING

Any mechanical accessories requiring field painting shall be accomplished in accordance with Section 09900 PAINTS AND COATING.

-- End of Section --