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APPLICATION		REVISION HISTORY					
NEXT ASSY	USED ON	PART NO.	ZONE	REV	DESCRIPTION	DATE	APPROVAL

TECHNICAL SPECIFICATION FOR DRAWING 76K39665

DOCUMENT INFORMATION: (TITLE, NUMBER, REV, DATE)
**MODIFY VEHICLE ASSEMBLY BUILDING HIGH BAY 3 FOR SLS - ELEVATOR LANDINGS,
 PCN 99000.5, REV BASIC, AUGUST 20, 2013**

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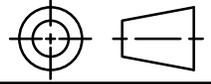


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 Merritt Island, Florida
 Architecture - Engineering and Planning

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	APPROVED A&E PM : R. PRUSS	MODIFY VEHICLE ASSEMBLY BUILDING HIGH BAY 3 FOR SLS ELEVATOR LANDINGS			
SOFTWARE AUTOCAD	NASA PM/LDE: M. HARTNETT				
FILENAME 79K39666_ELEV.dwg		SIZE A	CAGE CODE 22264	DWG NO 79K39666	REV
MATERIAL		SCALE NOTED	UNIT WEIGHT	SHEET 1	OF 182
HEAT TREATMENT	NASA BrMgr: W. SCHROEDER				
FINAL PROTECTIVE FINISH					

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SECTION 01 11 00

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SECTION 01 11 00

SUMMARY OF WORK

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 and information only. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Submit the following items to the Contracting Officer:

Utility Outage Requests; G
Utility Connection Requests; G
Burning Permits; G
Welding Permits; G

1.2 WORK COVERED BY CONTRACT DOCUMENTS

1.2.1 Project Description

The work to be performed under this contract requires providing the labor, equipment, and materials to modify the existing Vehicle Assembly Building (VAB) and construct new elevator landing platforms and related systems for the new Space Launch System (SLS). The primary deconstruction, demolition, and construction site is the VAB at Kennedy Space Center, Florida.

The work consists of demolition of existing structural and component systems; modification and reuse of existing structural components; construction and installation of new structural, mechanical, and electrical materials, systems, and equipment; reinstallation of modified and unmodified systems.

The work consists of removal and storage of existing system components, equipment, and materials for reuse/reinstallation; demolition of system components and structure not to be reused; modification of structural elements and installation of new structural elements; reinstallation of salvaged equipment and materials, and installation of new systems, equipment, and materials.

Demolition and construction will take place in High Bay (HB) 3. A total of eleven new elevator landing platforms and related mechanical and electrical will be constructed. Additional modifications to nine existing elevator landing platforms and related existing systems will also be constructed.

1.3 CONTRACT DRAWINGS

The following drawings accompany this specification and are a part thereof.

Drawing No. 79K39665

Sheets 1 through 35

Five sets of full size contract drawings, maps, and specifications will be furnished to the Contractor without charge. Reference publications will not be furnished.

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

1.4 PROJECT ENVIRONMENTAL GOALS

Contractor shall distribute copies of the Environmental Goals to each subcontractor and the Contracting Officer. The overall goal for design, construction, and operation is to produce a facility that meets the functional program needs and incorporates the principles of sustainability. Specifically:

- a. Preserve and restore the site ecosystem and biodiversity; avoid site degradation and erosion. Minimize offsite environmental impact.
- b. Use the minimum amount of energy, water, and materials feasible to meet the design intent. Select energy and water efficient equipment and strategies.
- c. Use environmentally preferable products and decrease toxicity level of materials used.
- d. Use renewable energy and material resources.
- e. Optimize operational performance (through commissioning efforts) in order to ensure energy efficient equipment operates as intended. Consider the durability, maintainability, and flexibility of facility systems.
- f. Manage construction site and storage of materials to ensure no negative impact on the indoor environmental quality of the facility.
- g. Reduce construction waste through reuse, recycling, and supplier take-back.

1.5 OCCUPANCY OF PREMISES

The VAB will be occupied during performance of work under this Contract.

Before work is started, the Contractor shall arrange with the Contracting Officer a sequence of procedure, means of access, space for storage of materials and equipment, and use of approaches, corridors, and stairways.

1.6 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.

1.7 ON-SITE PERMITS

1.7.1 Utility Outage Requests and Utility Connection Requests

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

The Contractor shall verify the elevations of existing piping, utilities, and any type of underground obstruction not indicated or specified to be removed. But indicated in locations to be transversed by piping, ducts, and other work to be installed. Verify elevations before installing new work closer than nearest manhole or other structure at which an adjustment in grade can be made.

Work shall be scheduled to hold outages to a minimum.

1.7.2 Welding Permits

<u>ACTIVITY</u>	<u>SUBMISSION DATE</u>	<u>SUBMISSION FORM</u>
Burning Permits	24 Hours Prior to Work	Call (321) 861-5050
Welding Permits	24 Hours prior to work	Call (321) 861-5050

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

Burning of trash or rubbish is not permitted on project site.

1.8 SALVAGE MATERIAL AND EQUIPMENT

Items designated by the Contracting Officer to be salvaged shall remain the property of the Government.

The salvaged property shall be segregated, itemized, delivered, and off-loaded at the Government designated storage area located within 10 miles of the construction site.

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

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

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SECTION 01 33 00

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SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

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

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

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

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

Submittals requiring Government approval are to be scheduled and made prior to the acquisition of the material or equipment covered thereby. Pick up and dispose of samples not incorporated into the work in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

1.2 DEFINITIONS

1.2.1 Submittal Descriptions (SD)

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

SD-01 Preconstruction Submittals

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

Certificates of insurance

Surety bonds

List of proposed Subcontractors

List of proposed products

Construction progress schedule

Network Analysis Schedule (NAS)

Submittal register

Schedule of prices

Health and safety plan

Work plan

Quality Control(QC) plan

Environmental protection plan

SD-02 Shop Drawings

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

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

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

SD-03 Product Data

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

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

SD-04 Samples

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

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

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

SD-05 Design Data

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

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

SD-06 Test Reports

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

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

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

Investigation reports.

Daily logs and checklists.

Final acceptance test and operational test procedure.

SD-07 Certificates

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

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

Confined space entry permits.

Text of posted operating instructions.

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and (MSDS) concerning impedances, hazards and safety precautions.

SD-09 Manufacturer's Field Reports

Documentation of the testing and verification actions taken by manufacturer's representative at the job site, in the vicinity of the job site, or on a sample taken from the job site, on a portion of the work, during or after installation, to confirm compliance with manufacturer's standards or instructions. The documentation must be

signed by an authorized official of a testing laboratory or agency and must state the test results; and indicate whether the material, product, or system has passed or failed the test.

Factory test reports.

SD-10 Operation and Maintenance Data

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

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

SD-11 Closeout Submittals

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

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

Interim "DD Form 250" with cost breakout for all assets 30 days prior to facility turnover.

1.2.2 Approving Authority

Office or designated person authorized to approve submittal.

1.2.3 Work

As used in this section, on- and off-site construction required by contract documents, including labor necessary to produce submittals, [except those SD-01 Pre-Construction Submittals noted above](#), construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction.

1.3 SUBMITTALS

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

SD-01 Preconstruction Submittals

Submittal Register; G

1.4 SUBMITTAL REGISTER

Prepare and maintain a submittal register as the work progresses. Use electronic submittal register program furnished by the Contracting Officer or any other format approved by the Contracting Officer. The contracting officer will provide the initial submittal register.

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

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

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SOURCES FOR REFERENCE PUBLICATIONS

PART 1 GENERAL

1.1 REFERENCES

1.2 ORDERING INFORMATION

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SECTION 01 42 00

SOURCES FOR REFERENCE PUBLICATIONS

PART 1 GENERAL

1.1 REFERENCES

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

1.2 ORDERING INFORMATION

The addresses of the standards publishing organizations whose documents are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the specifications with numbers which were not assigned by the standards producing organization must be ordered from the source by title rather than by number.

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)
2111 Wilson Blvd, Suite 500
Arlington, VA 22201
Ph: 703-524-8800
Fax: 703-528-3816
E-mail: fdietz@ahrinet.org
Internet: <http://www.ahrinet.org>

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
One East Wacker Drive, Suite 3100
Chicago, IL 60601-2001
Ph: 312-670-2400
Fax: 312-670-5403
Publications: 800-644-2400
E-mail: pubs@aisc.org
Internet: <http://www.aisc.org>

AMERICAN INDUSTRIAL HYGIENE ASSOCIATION (AIHA)
3141 Fairview Park Dr., Suite 777
Falls Church, VA 22042
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Publications: 703-849-8888
E-mail: infonet@aiha.org
Internet: <http://www.aiha.org>

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1140 Connecticut Avenue, NW, Suite 705
Washington, DC 20036

Ph: 202-452-7100
Fax: 202-463-6573
Internet: <http://www.steel.org>

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1711 Arlingate Lane
P.O. Box 28518
Columbus, OH 43228-0518
Ph: 800-222-2768; 614-274-6003
Fax: 614-274-6899
E-mail: webmaster@asnt.org
Internet: <http://www.asnt.org>

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Fax: 847-768-3434
E-mail: customerservice@asse.org
Internet: <http://www.asse.org>

ASME INTERNATIONAL (ASME)
Three Park Avenue
New York, NY 10016-5990
Ph: 212-591-7722
Fax: 212-591-7674
Internet: www.asme.org

AMERICAN WELDING SOCIETY (AWS)
550 N.W. LeJeune Road
Miami, FL 33126
Ph: 800-443-9353 - 305-443-9353
Fax: 305-443-7559
E-mail: info@aws.org
Internet: <http://www.aws.org>

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

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Internet: <http://www.gpoaccess.gov/help>

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)
800 Roosevelt Road, Bldg C, Suite 312
Glen Ellyn, IL 60137
Ph: 630-942-6591
Fax: 630-790-3095
E-mail: wlewis7@cox.net (Vernon Lewis, technical consultant)
Internet: <http://www.naamm.org>

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
1300 North 17th Street, Suite 1847
Rosslyn, VA 22209
Ph: 703-841-3200
Fax: 703-841-5900
E-mail: webmaster@nema.org
Internet: <http://www.nema.org/>

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
1 Batterymarch Park
Quincy, MA 02169-7471
Ph: 617-770-3000
Fax: 617-770-0700
E-mail: webmaster@nfpa.org
Internet: <http://www.nfpa.org>

STEEL DECK INSTITUTE (SDI)
P.O. Box 25
Fox River Grove, IL 60021
Ph: 847-458-4647
Fax: 847-458-4648
E-mail: Steve@sdi.org
Internet: <http://www.sdi.org>

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)
40 24th Street, 6th Floor
Pittsburgh, PA 15222-4656
Ph: 412-281-2331
Fax: 412-281-9992
E-mail: info@sspc.org
Internet: <http://www.sspc.org>

UNDERWRITERS LABORATORIES (UL)
333 Pfingsten Road
Northbrook, IL 60062-2096
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Fax: 847-272-8129
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ENVIRONMENTAL PROTECTION

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.

FLORIDA ADMINISTRATIVE CODE (FAC)

Chapter 62-710	Used Oil Management
Chapter 62-730	Hazardous Waste
Chapter 62-737	Mercury Containing Lamps and Devices Destined for Recycling
Chapter 62-770	Petroleum Contamination Site Clean Up Criteria

JOHN F. KENNEDY SPACE CENTER (KSC)

KNPR 8500.1	(2010; Rev B)KSC Environmental Requirements
NPR 8530.1A	(2009; Change 3) Affirmative Procurement Program and Plan for Environmentally Preferable Products

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

33 CFR 328	Definitions of Waters of the United States
40 CFR 247	Comprehensive Procurement Guideline for Products Containing Recovered Materials
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 273	Standards For Universal Waste Management
40 CFR 279	Standards for the Management of Used Oil

40 CFR 302	Designation, Reportable Quantities, and Notification
40 CFR 355	Emergency Planning and Notification
40 CFR 68	Chemical Accident Prevention Provisions
40 CFR 761	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions

1.2 DEFINITIONS

1.2.1 Biobased Content

"Biobased content" is calculated as the weight of the biobased material divided by the total weight of the product, and is expressed as a percentage by weight.

1.2.2 Biobased Materials

"Biobased Materials" include fuels, chemicals, building materials or electric power or heat produced from biomass as defined by the Biomass R&D Act. Minimum biobased content shall be as defined in the U.S. Farm Bill.

1.2.3 Life-Cycle Cost Analysis

"Life-cycle cost analysis" is a comparison of the amortized annual cost of using a product with respect to a product that it not Comprehensive Procurement Guideline (CPG) compliant, biobased, environmentally preferable, energy-efficient, water-efficient, recycled-content, and non-ozone depleting or are non-toxic or less toxic. Cost under consideration include capital costs, installation costs, operating costs, maintenance costs, and disposal costs discounted over the lifetime of the product.

1.2.4 Environmental Pollution and Damage

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

1.2.5 Environmental Protection

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

1.2.6 Contractor Generated Hazardous Waste

Contractor generated hazardous waste means materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the

Contractor to execute work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e. methyl ethyl ketone, toluene etc.), waste thinners, excess paints, excess solvents, waste solvents, and excess pesticides, and contaminated pesticide equipment rinse water.

1.2.7 Land Application for Discharge Water

The term "Land Application" for discharge water implies that the Contractor must discharge water at a rate which allows the water to percolate into the soil. No sheeting action, soil erosion, discharge into storm sewers, discharge into defined drainage areas, or discharge into the "waters of the United States" must occur. Land Application must be in compliance with applicable Federal, State, and local laws and regulations.

1.2.8 Surface Discharge

The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "waters of the United States" and would require a permit to discharge water from the governing agency.

1.2.9 Waters of the United States

All waters which are under the jurisdiction of the Clean Water Act, as defined in 33 CFR 328.

1.2.10 Wetlands

Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, and bogs. Official determination of whether or not an area is classified as a wetland must be done in accordance with KSC Environmental.

1.3 GENERAL REQUIREMENTS

Minimize environmental pollution and damage that may occur as the result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work must be protected during the entire duration of this contract. Comply with Federal, State, and local environmental laws and regulations. Delays resulting from failure to comply with environmental laws and regulations shall be the Contractor's responsibility.

1.4 SUBCONTRACTORS

Ensure compliance with this section by subcontractors.

1.5 SUBMITTALS

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

SD-01 Preconstruction Submittals

Environmental Protection Plan; G

1.6 ENVIRONMENTAL PROTECTION PLAN

Prior to commencing construction activities or delivery of materials to the site, submit an Environmental Protection Plan for review and approval by the Contracting Officer. The purpose of the Environmental Protection Plan is to present a comprehensive overview of known or potential environmental issues which the Contractor must address during construction. Issues of concern must be defined within the Environmental Protection Plan as outlined in this section. Address each topic at a level of detail commensurate with the environmental issue and required construction task(s). Topics or issues which are not identified in this section, but are considered necessary, must be identified and discussed after those items formally identified in this section. Prior to submittal of the Environmental Protection Plan, meet with the Contracting Officer for the purpose of discussing the implementation of the initial Environmental Protection Plan; possible subsequent additions and revisions to the plan including reporting requirements; and methods for administration of the Contractor's Environmental Plans. The Environmental Protection Plan must be current and maintained onsite by the Contractor.

1.6.1 Compliance

No requirement in this Section will relieve the Contractor of Federal, State, and local environmental protection laws and regulations. During Construction, the Contractor shall be responsible for identifying, implementing, and submitting for approval additional requirements to be included in the Environmental Protection Plan.

1.6.2 Contents

Include in the Environmental Protection Plan, but not limit it to, the following:

- a. Name(s) of person(s) within the Contractor's organization who is(are) responsible for ensuring adherence to the Environmental Protection Plan.
- b. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site, if applicable.
- c. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel.
- d. Description of the Contractor's environmental protection personnel training program.
- e. An erosion and sediment control plan which identifies the type and location of the erosion and sediment controls to be provided. The plan must include monitoring and reporting requirements to assure that the control measures are in compliance with the erosion and sediment control plan, Federal, State, and local laws and regulations. A Storm Water Pollution Prevention Plan (SWPPP) may be substituted for this plan.
- f. Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plan shall include measures to minimize the amount of mud transported onto

paved public roads by vehicles or runoff.

- g. Work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas including methods for protection of features to be preserved within authorized work areas.
- h. The Contractor's spill control plan shall include the procedures, instructions, and reports in accordance with the contract clause "spill" to be used in the event of an unforeseen spill of a substance regulated by 40 CFR 68, 40 CFR 302, 40 CFR 355, or regulated under State or Local laws and regulations. The Contractor's spill control plan supplements the requirements of KNPR 8500.1, Rev B, KSC Requirements. Include in this plan, as a minimum:
 - (1) The name of the individual who shall report spills or hazardous substance releases and who shall follow up with complete documentation. This individual shall immediately notify the Contracting Officer and the Environmental Assurance Branch in addition to the legally required Federal, State, and local reporting channels (including the National Response Center 1-800-424-8802) if a reportable quantity is released to the environment. Include in the plan a list of the required reporting channels and telephone numbers.
 - (2) The name and qualifications of the individual who shall be responsible for implementing and supervising the containment and cleanup.
 - (3) Training requirements for Contractor's personnel and methods of accomplishing the training.
 - (4) A list of materials and equipment to be immediately available at the job site, tailored to cleanup work of the potential hazard(s) identified.
 - (5) The names and locations of suppliers of containment materials and locations of additional fuel oil recovery, cleanup, restoration, and material-placement equipment available in case of an unforeseen spill emergency.
 - (6) The methods and procedures to be used for expeditious contaminant cleanup.
- i. A Non-hazardous Solid Waste Disposal Plan identifying methods and locations for solid waste disposal including clearing debris and schedules for disposal.
 - (1) Identify subcontractors responsible for the transportation and disposal of solid waste. Submit licenses or permits for solid waste disposal sites that are not a commercial operating facility.
 - (2) Evidence of the disposal facility's acceptance of the solid waste must be attached to this plan during the construction. Attach a copy of each of the Non-hazardous Solid Waste Diversion Reports to the disposal plan. Non-hazardous Solid Waste Diversion Reports shall be submitted using KSC Form 7-648NS (Rev. 12/08) to the Contracting Officer by December 31 of each year or at the closeout of the project, whichever occurs first.

- (3) Indicate in the report the total amount of waste generated and total amount of waste diverted in cubic yards or tons along with the percent that was diverted.
 - (4) A recycling and solid waste minimization plan with a list of measures to reduce consumption of energy and natural resources. Detail in the plan the Contractor's actions to comply with and to participate in Federal, State, Regional, and local government sponsored recycling programs to reduce the volume of solid waste at the source.
- j. A Hazardous Waste Management Plan that identifies processes, operations and safety procedures that are site specific for the location and nature of hazardous and controlled waste, which includes and not limited to chemicals, paints, removed paints and coatings, solvents, aerosol cans, petroleum, oil and lubricant (POL) products, lamps, ballasts, mercury switches, etc. and their containers, as defined in 40 CFR 261, 40 CFR 273, 40 CFR 279, or 40 CFR 761.
 - k. An Air Pollution Control Plan detailing provisions to assure that dust, debris, materials, trash, etc., do not become air borne and travel off the project site.
 - l. A Contaminant Prevention Plan that: identifies potentially hazardous substances to be used on the job site; identifies the intended actions to prevent introduction of such materials into the air, water, or ground; and details provisions for compliance with Federal, State, and local laws and regulations for storage and handling of these materials. In support of KNPR 8500.1, Rev B, KSC Requirements., a copy of the Material Safety Data Sheets (MSDS) and the maximum quantity of each hazardous material to be onsite must be included in the contaminant prevention plan. Update the plan as new hazardous materials are brought onsite or removed from the site.
 - m. A waste water management plan that identifies the methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines. If a settling/retention pond is required, the plan must include the design of the pond including drawings, removal plan, and testing requirements for possible pollutants. If land application will be the method of disposal for the waste water, the plan must include a sketch showing the location for land application along with a description of the pretreatment methods to be implemented. If surface discharge will be the method of disposal, include a copy of the permit and associated documents as an attachment prior to discharging the waste water. If disposal is to a sanitary sewer, the plan must include documentation that the Waste Water Treatment Plant Operator has approved the flow rate, volume, and type of discharge.

1.6.3 Appendix

Attach to the Environmental Protection Plan, as an appendix, copies of environmental permits, permit application packages, approvals to construct, notifications, certifications, reports, and termination documents.

1.7 PROTECTION FEATURES

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS. Prior to start of onsite construction activities, the Contractor and the Contracting Officer will make a joint condition survey. Immediately following the survey, the Contractor shall prepare a brief report including a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. This survey report will be signed by both the Contractor and the Contracting Officer upon mutual agreement as to its accuracy and completeness. The Contractor must protect those environmental features included in the survey report and indicated on the drawings, regardless of interference which their preservation may cause to the work under the contract.

1.8 ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

Deviations from the drawings, plans and specifications, requested by the Contractor and which may have an environmental impact, will be subject to approval by the Contracting Officer and may require an extended review, processing, and approval time. The Contracting Officer reserves the right to disapprove alternate methods, even if they are more cost effective, if the Contracting Officer determines that the proposed alternate method will have an adverse environmental impact.

1.9 NOTIFICATION

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

PART 2 PRODUCTS

2.1 OBJECTIVE

Government procurement policy is to acquire goods and services through the use of sustainable environmental practices, including acquisition of biobased content/material, environmentally preferable, energy-efficient, water-efficient, recycled-content, and non-ozone depleting or are non-toxic or less toxic alternatives where such products and services meet agency performance requirements.

2.2 SUSTAINABLE ACQUISITION

The Contractor shall consider products that have a lesser or reduced adverse effect on human health and the environment, and provide products and materials with the least effect on the environment, determined by

life-cycle cost analysis or other methods in accordance with [NPR 8530.1A](#) Affirmative Procurement Program and Plan for Environmentally Preferable Products. These comparisons shall consider raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance and disposal of products.

The Contractor shall ensure that products and materials being purchased comply, to the greatest extent practicable, with specific requirements regarding environmental attributes. These attributes include:

- a. EPA's CPG and recommendations concerning EPA's list of designated products listed in [40 CFR 247](#).
- b. Biobased products as defined by the United States Department of Agriculture.
- c. Energy-efficiency requirements regarding Energy Star.

2.2.1 Prohibited Materials

The use of the following materials is prohibited:

- a. Products containing asbestos
- b. Products containing urea formaldehyde
- c. Products containing polychlorinated biphenyls
- d. Products containing chlorinated fluorocarbons
- e. Solder or flux containing more than 0.2 percent lead and domestic water pipe or pipe fittings containing more than 8 percent lead
- f. Paint containing more than 0.06 percent lead

2.2.2 EPA Designated Items Incorporated in the Work

Various sections of the specifications contain requirements for materials that have been designated by EPA in [40 CFR 247](#) as being products which are or can be made with recovered or recycled materials. These items, when incorporated into the work under this contract, shall contain at least the specified percentage of recycled or recovered materials unless adequate justification (non-availability) for non-use is provided. When a designated item is specified as an option to a non-designated item, the designated item requirements apply only if the designated item is used in the work.

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

2.2.3 Waiver

Procurement of EPA-designated (CPG) materials which do not meet the minimum recovered material standards require a waiver, approved by the Environmental Manager. A request for Waiver Form (KSC 28-825 NS) must be submitted for the purchase of items that are on the CPG list but are replaced with items that do not meet minimum standards.

PART 3 EXECUTION

3.1 LAND RESOURCES

Confine activities to areas defined by the drawings and specifications.

Identify land resources to be preserved within the work area prior to the beginning of construction. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without approval, except in areas indicated on the drawings or specified to be cleared. Ropes, cables, or guys will not be fastened to or attached to trees for anchorage unless specifically authorized. Provide effective protection for land and vegetation resources, as defined in the following subparagraphs. Remove stone, soil, or other materials displaced into uncleared areas.

3.1.1 Work Area Limits

Mark the areas that need not be disturbed under this contract prior to commencing construction activities. Mark or fence isolated areas within the general work area which are not to be disturbed. Protect monuments and markers before construction operations commence. Where construction operations are to be conducted during darkness, markers must be visible in the dark. The Contractor's personnel must be knowledgeable of the purpose for marking and protecting particular objects.

3.1.2 Landscape

Trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings to be preserved must be clearly identified by marking, fencing, or wrapping with boards, or other approved techniques. Restore landscape features damaged or destroyed during construction operations outside the limits of the approved work area.

3.1.3 Erosion and Sediment Controls

The Contractor shall be responsible for providing erosion and sediment control measures in accordance with Federal, State, and local laws and regulations is the Contractor's responsibility. Select and maintain the erosion and sediment controls such that water quality standards are not violated as a result of construction activities. The area of bare soil exposed by construction operations should be kept to a minimum. The Contractor shall construct or install temporary and permanent erosion and sediment control best management practices (BMPs). BMPs may include, but not be limited to, vegetation cover, stream bank stabilization, slope stabilization, silt fences, construction of terraces, interceptor channels, sediment traps, inlet and outfall protection, diversion channels, and sedimentation basins. The Contractor's best management practices must also be in accordance with the National Pollutant Discharge Elimination System (NPDES) Storm Water Pollution Prevention Plan (SWPPP) which may be reviewed at the NASA Environmental Assurance Branch. Remove temporary measures after the area has been stabilized.

3.1.4 Contractor Facilities and Work Areas

Place field offices, staging areas, stockpile storage, and temporary buildings in areas designated on the drawings or as directed by the Contracting Officer. Temporary movement or relocation of Contractor facilities will be made only when approved.

3.2 WATER RESOURCES

Monitor all water areas affected by construction activities to prevent pollution of surface and ground waters. Do not apply toxic or hazardous chemicals to soil or vegetation.

3.2.1 Wetlands

Do not enter, disturb, destroy, or allow discharge of contaminants into wetlands.

3.3 AIR RESOURCES

Equipment operation, activities, or processes shall be in accordance with Federal and State air emission and performance laws and standards.

3.3.1 Particulates

Dust particles; aerosols and gaseous by-products from construction activities; and processing and preparation of materials must be controlled at all times, including weekends, holidays and hours when work is not in progress. Maintain work areas within or outside the project boundaries free from particulates which would cause the Federal, State, and local air pollution standards to be exceeded or which would cause a hazard or a nuisance. Perform particulate control as the work proceeds and whenever a particulate nuisance or hazard occurs. Comply with State and local visibility regulations.

3.3.2 Burning

Burning is prohibited on the Government premises.

3.4 CHEMICAL MATERIALS MANAGEMENT AND WASTE DISPOSAL

Contractor shall develop and maintain procedures, instructions, and reports to be used in the event of an unforeseen spill of a substance regulated by 40 CFR 68, 40 CFR 302, 40 CFR 355, and/or regulated under State or local laws and regulations (e.g. Chapter 62-770, F.A.C.). The procedures, instructions, and reports shall supplement the requirements of KNPR 8500.1, Rev. B, KSC Requirements. At a minimum, the Contractor shall:

- (1) Identify the individual who will report any spills, or hazardous substance releases and who will follow up with complete documentation. This individual will immediately notify the Contracting Officer and the Environmental Assurance Branch in addition to the legally required Federal, State, and local reporting channels (including the National Response Center at 1-800-424-8802) if the reportable quantity is released to the environment. Provide a list of the required reporting channels and telephone numbers.
- (2) Identify the individual (including qualifications) who will be responsible for the implementing and supervising spill containment and cleanup.
- (3) Identify training requirements including the name(s) and qualifications of individuals responsible for training Contractor personnel. Include a description of the methods to accomplish the training requirements.
- (4) Identify the materials and equipment to be immediately available at the job site, tailored to contain and cleanup identified spill hazards.
- (5) Identify the names and locations of suppliers of containment materials and locations of additional fuel recovery, cleanup, restoration, and material-placement equipment available in the event of an unforeseen spill emergency.
- (6) Identify methods and procedures to be used for expeditious contaminant containment cleanup.

Contractor shall develop and maintain procedures to assure dust, debris, materials, trash, etc. do not become airborne and travel off the project site.

Contractor shall identify potentially hazardous substances to be used on the job site; identify the intended actions to prevent introduction of such materials into the air, water, or ground; and detail provisions for compliance with Federal, State, and local laws and regulations for storage and handling of identified potentially hazardous substances. In support of KNPR 8500.1, Rev. B, KSC Requirements, copies of Material Safety Data Sheets (MSDS) and the maximum quantities of each hazardous material to be onsite at any given time must be maintained onsite.

Disposal of wastes will be as directed below, unless otherwise specified in other sections or shown on the drawings.

3.4.1 Solid Wastes

Solid wastes (excluding clearing debris) shall be placed in containers which are emptied on a regular schedule. Handling, storage, and disposal must be conducted to prevent contamination. Employ segregation measures so that no hazardous or toxic waste will become co-mingled with solid waste.

Waste items not requiring special handling, or which cannot be resold or recycled, shall be disposed of in receptacles slated for disposal in either the KSC landfill or the Brevard County landfill. The physical dimensions of the waste shall be within the handling capabilities of the landfill disposal equipment. The physical dimensions for the landfill handling capabilities are 8 feet in length x 8 feet in width.

The KSC landfill is an unlined Class III landfill with permit restrictions and limited capacity. The landfill is opened Tuesdays and Thursdays between 7:30am to 11:00am and 12:00pm to 3:00pm. Only the following items listed will be accepted at the landfill:

- (1) Asphalt: Asphalt removed from parking lots, driveways and roadways.
- (2) Blast Media: The blast media must be as free from debris as possible and determined non-hazardous for acceptance into the KSC landfill. The Spent Sandblast Media Disposal Form must accompany the blast media to the landfill and will be reviewed by the landfill operator. Blasting media determined to be hazardous waste must be managed as hazardous waste.
- (3) Carpeting: Carpet may be disposed of in the KSC landfill.
- (4) Construction and Demolition Debris: Materials considered not water soluble and non-hazardous in nature, including but not limited to steel, brick, glass, concrete, asphalt, pipe, gypsum wallboard and lumber. This includes rocks, soils, tree remains and other vegetative matter, which normally results from land clearing or development. Scrap metal from demolition projects should be managed according to guidance provided in this section for recyclable material.
- (5) Fiberglass: Fiberglass is accepted.
- (6) Glass (except for Light Bulbs or Lamps): Glass is accepted.

(7) Non-Friable Asbestos: Also referred to as Non-Regulated Asbestos Containing Materials (NRACM) are handled on a case-by-case basis. KSC policy allows for the disposal of NRACM only. In order to dispose of non-friable asbestos, the Contractor shall complete and submit the KSC/Schwartz Road Landfill Non-Friable Asbestos Form 28-1024, which can be obtained from the Contracting Officer or the Contracting Officer's designee. The form shall be sent to NASA EAB, TA-BIB through the Contracting Officer.

The following scheduling procedures shall be followed before NRACM wastes are accepted at the landfill:

- a. The waste generator/hauler shall make arrangements with the landfill operator a minimum of 24 hours before disposal of NRACM waste and shall inform the operator of the quantity of the waste and the scheduled date the shipment will arrive at the landfill.
- b. NRACM will be accepted at the landfill with prior arrangement with the scale house attendant (minimum of 24 hours notification) Tuesdays or Thursdays during regular landfill hours, but will not be accepted later than 1400 hours.

(8) Pallets (Unserviceable Wood and Plastics): Pallets that are not reusable or recycled are accepted.

(9) Wood: Miscellaneous non-pressure treated wood items are accepted.

(10) Yard Waste (Vegetation): Vegetation from maintenance activities is accepted.

The following wastes are not authorized for disposal at the KSC landfill:

(1) Any waste not permitted by DEP regulations to be disposed of in a Class III landfill as defined in Rule 62-701.200(14) FAC.

(2) Putrescible (brown bag) office waste.

(3) Chromated Copper Arsenate (CCA) treated wood.

(4) Liquid or non-liquid polychlorinated biphenyls (PCBs) (with exception of PCB Bulk Product Waste).

(5) Friable Asbestos.

(6) Hazardous wastes as specified by the U.S. Environmental Protection Agency (EPA); EPA defines hazardous waste as those wastes that exhibit flammability, corrosivity, reactivity, and/or toxicity characteristics; (Per EPA's list of hazardous wastes, 40 CFR 261, Subpart D, and most recent revision thereof).

(7) Biomedical waste.

(8) Liquid wastes, including oil (containerized or non-containerized).

(9) Lead-acid batteries.

(10) Tires, other than "shredded waste tires".

(11) White goods (i.e. appliances).

(12) Unpainted Concrete: Unpainted concrete shall be stockpiled at the Diverted Aggregate Recycling and Collection Yard (DARCY) located at the KSC landfill.

3.4.2 Chemicals and Chemical Wastes

Dispense chemicals ensuring no spillage to the ground or water. Perform and document periodic inspections of dispensing areas to identify leakage and initiate corrective action. This documentation will be periodically reviewed by the Government. Collect chemical waste in corrosion resistant, compatible containers. Collection drums must be monitored and removed to a staging or storage area when contents are within 6 inches of the top. Wastes shall be classified, managed, stored, and disposed of in accordance with KNPR 8500.1 KSC Environmental Requirements as well as Federal, State, and local laws and regulations.

3.4.3 Contractor Generated Hazardous Wastes/Excess Hazardous Materials

Hazardous and controlled waste shall be managed in accordance with all applicable statutes, rules, orders, and regulations which may include but are not limited to 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 273, 40 CFR 279, 40 CFR 761, and KNPR 8500.1 KSC Environmental Requirements. Inorganic Zinc (IOZ) paint waste shall be separated from all other hazardous and controlled wastes and managed in accordance with KNPR 8500.1, Rev. B and the associated KSC Environmental Fact Sheet. In no case shall the Contractor or the Contractor's representative transport hazardous waste from KSC.

The Contractor shall be responsible for identifying processes and operations and the location and nature of all potentially hazardous and controlled waste including chemicals, paints, removed paints and coatings, solvents, aerosol cans, petroleum, oil and lubricant (POL) products, lamps, mercury switches, etc. and their containers, as defined in 40 CFR 261, 40 CFR 273, 40 CFR 279, or 40 CFR 761. The Contractor shall prepare copies of Material Safety Data Sheets (MSDS) and a completed KSC Form 25-551 "Process Waste Questionnaire" (PWQ) for each material which may be generated as a waste and provide these to the Contracting Officer (CO) thirty (30) days before the start of the waste generation process. No substances shall be delivered to KSC without the appropriate Material Safety Data Sheets.

The Contractor shall obtain a Technical Response Package (TRP) from the CO within thirty (30) days after receipt of the PWQ. The TRP will contain a hazard determination and analytical, packaging, labeling, and disposal requirements according to KNPR 8500.1 (as revised) and will provide site-specific waste management requirements to be followed by the Contractor.

The Government will provide DOT-compliant storage containers and labels. The CO will arrange for the containers to be available at the KSC Supply Building, M6-744, at the request of the Contractor. The Contractor shall request storage containers in writing from the CO a minimum of three (3) days before the required need date. The Contractor shall be responsible for transporting the containers from Building M6-744 to the project site. The Contractor shall establish an on-site satellite waste accumulation area within 50 feet (ft) of and within sight of any point where hazardous or controlled wastes may be generated. If a satellite accumulation area must

be more than 50 ft from the point of generation, or out of sight of the generator, the Contractor shall provide a written request to the CO thirty (30) days before the start of the waste generating process. The CO will send a notification to the NASA Environmental Assurance Branch (EAB), TA-A4B, for their review and concurrence. The Contractor shall not place the satellite site in service before receiving written approval of the variance. The Contractor shall store potential or identified hazardous and/or controlled wastes in the appropriate properly labeled containers inside the accumulation area in accordance with [KNPR 8500.1](#), Rev. B (as revised).

The Environmental Protection Agency (EPA) has set the following standards for wastes collected at satellite accumulation areas:

- a. Hazardous wastes at satellite accumulation areas must be collected in approved containers.
- b. No more than 55 gallons per waste stream of hazardous waste or 1 quart per stream of acutely hazardous wastes may be accumulated.
- c. Containers must be labeled with the words "Hazardous Waste" and with other words which identify the contents of the drum.
- d. The waste being placed in the container must be compatible with the container.
- e. A container holding hazardous waste must be always be kept closed during accumulation except when adding or removing waste.
- f. The site must be equipped with emergency equipment per 40 CFR 265.32.
- g. A written contingency plan must be maintained for the site.
- h. Personnel generating and managing the waste must have hazardous waste training per [40 CFR 265.16](#). The Contracting Officer may be any time during the course of the contract performance period require the Contractor to provide individual training records for any employee involved in the performance of this contract, and the contents of the course of courses completed to satisfy the training requirements. Attendance at KSC Training Course QG-211 "Hazardous Waste Management" will satisfy the above training requirements.

If more than 55 gallons per waste stream of hazardous waste are generated at a satellite accumulation site, documentation, including the waste type, quantity, locations and organization responsible for the waste shall be provided on KSC Form 28-809 "Waste Support Request", to the Contracting Officer Waste Management. The Contractor shall fax the waste support request to the Contracting Officer and KSC Waste Management at fax 867-9390.

If a hazardous/non-hazardous waste determination cannot be made by process knowledge and no MSDS is available for the waste stream, the container of waste shall be marked with a Hazardous Waste Determination In Progress (HWDIP) label until chemical analysis is completed. At the request of the Contractor, the CO will provide any analytical support required by the TRP. The CO will arrange for all sampling and testing of potentially hazardous or controlled waste.

Universal Waste (UW) - The EPA established Universal Waste regulations

to ease the requirements for managing hazardous wastes that can be recycled. Items which meet the definition of UW can be collected and managed under requirements found in 40 CFR 273 and Chapter 62-730 and Chapter 62-737, FAC. Waste streams currently adopted by the State for management as UW are batteries, mercury-containing lamps and devices, and certain pesticides.

UW generators are called handlers and must comply with the following requirements:

- a. Handlers shall manage UW using the PWQ/TRP.
- b. Handlers shall manage UW in a way that prevents releases to the environment. Non-leaking containers in good condition shall be used if the UW is damaged or leaking.
- c. Handlers shall use the KSC Universal Waste Label and shall not accumulate universal wastes for more than six months.
- d. Handlers shall clearly show the length of time that the wastes have been accumulated by marking or labeling the container with the earliest date that the waste was generated or received.
- e. Handlers shall be familiar with proper waste handling and emergency response procedures. Attendance at the KSC training course QG-299 "Universal Waste Rule" will satisfy the above.

Used Oil - Any lubricant that has been refined from crude oil (or synthetic oil) that has been "used", and as a result of such use is contaminated by physical or chemical impurities shall be considered Used Oil. Used oil is managed according to regulations established in 40 CFR 279 and Chapter 62-710, FAC. The following waste generator standards shall apply to the management of used oil:

- a. Used oil containers, tanks and associated piping must be marked "Used Oil".
- b. Used oil containers, tanks and associated piping must be in good condition with no severe rusting, structural defects, deterioration, or leaks.
- c. Used oil containers must be kept in secondary containment.
- d. Containers storing used oil must be sealed or otherwise protected from the weather and stored on an oil-impermeable surface such as polyethylene sheeting, rigid plastic secondary containment, or epoxy-coated concrete.

Within 48 hours of having waste ready for disposal, the Contractor shall contact the CO to have KSC Waste Management pick-up and remove hazardous waste. Documentation including the waste type, quantity, locations, and organization responsible for the waste will be provided on KSC Form 28-809 "Waste Support Request" to KSC Waste Management when requesting waste disposal. The Contractor shall fax the waste support request to the Contracting Officer and to KSC Waste Management at fax 867-9390.

3.4.4 Fuel and Lubricants

Storage, fueling and lubrication of equipment and motor vehicles must be conducted in a manner that affords the maximum protection against spill and evaporation. Manage and store fuel, lubricants and oil in accordance with Federal, State, Regional, and local laws and regulations.

3.4.5 Waste Water

Disposal of waste water will be as specified below.

- a. Waste water from construction activities, such as onsite material processing, concrete curing, foundation and concrete clean-up, water used in concrete trucks, forms, etc. will not be allowed to enter water ways or to be discharged prior to being treated to remove pollutants. Dispose of the construction related waste water off-Government property in accordance with Federal, State, Regional and Local laws and regulations.
- b. Water generated from the flushing of lines after disinfection or disinfection in conjunction with hydrostatic testing shall be discharged into the sanitary sewer with prior approval from the Institutional Services Contractor (ISC). To obtain approval, the Contractor shall submit a PWQ for the wastewater to IHA Waste Management..

3.5 RECYCLING AND WASTE MINIMIZATION

3.5.1 Reuse

First consideration shall be given to salvage for reuse since little or no re-processing is necessary for this method, and less pollution is created when items are reused in their original form. Sale or donation of waste suitable for reuse shall be considered. Salvaged materials, other than those specified in other sections to be salvaged and reinstalled, shall not be used in this project.

3.5.2 Recycle

Waste materials not suitable for reuse, but having value as being recyclable, shall be made available for recycling whenever economically feasible. For additional information, please contact the NASA/KSC Recycling Manager.

The Contractor shall participate in State and local government sponsored recycling programs. The Contractor is further encouraged to minimize solid waste generation throughout the duration of the project in accordance with environmental contract clause, Article J-8-21. Concrete that can be recycled shall be sent to the DARC. The DARC can accept unpainted concrete (free of staining) without analytical testing. DARC can also accept painted or coated concrete as long as one of the three conditions below is met:

- Total Metal and PCB laboratory analytical results do not exceed the Florida Department of Environmental Protection (FDEP) Soil Cleanup Target Levels, Residential, as referenced in Table II of Chapter 62-777 Florida Administrative Code.
- Paint and coating MSDS indicate products do not contain heavy metals or PCBs.
- Total PCB concentration is less than 50 ppm and the paint/coating is completely removed from the concrete.

The contractor shall manage recyclable concrete in accordance with [KNPR 8500.1](#) Rev. B and the DARC Fact Sheet.

3.6 NON-HAZARDOUS SOLID WASTE DIVERSION REPORT

The Contractor shall maintain an inventory of non-hazardous solid waste diversion and disposal of construction and demolition debris.

Non-hazardous Solid Waste Diversion Reports shall be submitted using KSC Form 7-648NS (Rev. 12/08) to the Contracting Officer by December 31 of each year or the closeout of the project, whichever comes first. Include the following in the report:

- a. Construction and Demolition (C&D) Debris Disposed = _____ in cubic yards or tons, as appropriate.
- b. Construction and Demolition (C&D) Debris Recycled = _____ in cubic yards or tons, as appropriate.
- c. Total C&D Debris Generated = _____ in cubic yards or tons, as appropriate.
- d. Waste Sent to Waste-To-Energy Incineration Plant (This amount should not be included in the recycled amount) = _____ in cubic yards or tons, as appropriate.

3.7 BIOLOGICAL RESOURCES

Minimize interference with, disturbance to, and damage to fish, wildlife, and plants including their habitat. The protection of threatened and endangered animal and plant species, including their habitat, is the Contractor's responsibility in accordance with Federal, State, Regional, and local laws and regulations.

3.8 TRAINING OF CONTRACTOR PERSONNEL

The Contractor's personnel must be trained in environmental protection and pollution control. Conduct environmental protection/pollution control meetings for personnel prior to commencing construction activities. Additional meetings must be conducted for new personnel and when site conditions change. Include in the training and meeting agenda: methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, wetlands, and endangered species and their habitat that are known to be in the area.

3.9 MONITORING WELLS

The Contractor shall locate monitoring wells at or adjacent to the project site during the preconstruction survey described in 1.7 of this Section. The Contractor shall protect and prevent the disturbance of these monitoring wells during construction. Disturbance or destruction of any monitoring well during construction shall be replaced at the Contractors expense. Monitoring wells shall be replaced in accordance with the St. Johns River Water Management District, the Florida Department of Environmental Protection and the Contracting Officer's procedures and requirements.

3.10 POST CONSTRUCTION CLEANUP

The Contractor will clean up areas used for construction in accordance with Contract Clause: "Cleaning Up". Unless otherwise instructed in writing by the Contracting Officer, obliterate signs of temporary construction

facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. The disturbed area must be graded, filled and the entire area seeded unless otherwise indicated.

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SECTION 02 41 00

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.

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI Guideline K (2009) Guideline for Containers for Recovered Non-Flammable Fluorocarbon Refrigerants

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.6 (2006) Safety Requirements for Demolition Operations

JOHN F. KENNEDY SPACE CENTER (KSC)

KNPR 8715.7 (Rev. A-1) KSC Construction Contractor Safety and Health Practices and Procedural Requirements

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

40 CFR 61 National Emission Standards for Hazardous Air Pollutants

40 CFR 82 Protection of Stratospheric Ozone

1.2 PROJECT DESCRIPTION

1.2.1 Demolition/Deconstruction Plan

Prepare a [Demolition Plan](#) and submit proposed demolition, and removal procedures for approval before work is started. Include in the plan procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a disconnection schedule of utility services, a detailed description of methods and equipment to be used for each operation and of the sequence of operations. [Identify components and materials to be salvaged for reuse or recycling with reference to paragraph Existing Facilities to be Removed.](#) [Append tracking forms for all removed materials indicating type, quantities, condition, destination, and end use.](#) Coordinate with Waste Management Plan. Include 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

KNPR 8715.7, Rev A-1. Plan shall be approved by Contracting Officer prior to work beginning.

1.2.2 General Requirements

Do not begin demolition until authorization is received from the Contracting Officer. The work of this section is to be performed in a manner that maximizes salvage and recycling of materials. Remove rubbish and debris from the project site; do not allow accumulations inside or outside the buildings. The work includes demolition, salvage of identified items and materials, and removal of resulting rubbish and debris. Remove rubbish and debris from Government property daily, unless otherwise directed. Store materials that cannot be removed daily in areas specified by the Contracting Officer. In the interest of occupational safety and health, perform the work in accordance with KNPR 8715.7, Rev. A-1.

1.3 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, deconstruction, or demolition work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition, deconstruction, or removal work. Repairs, reinforcement, or structural replacement require approval by the Contracting Officer prior to performing such work.

1.3.1 Existing Construction Limits and Protection

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

1.3.2 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.

1.3.3 Utility Service

Maintain existing utilities indicated to stay in service and protect against damage during demolition and deconstruction operations. Prior to start of work, the Government will disconnect and seal utilities serving each area of alteration or removal upon written request from the Contractor.

1.3.4 Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or

connections for electrical and mechanical utilities. Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, must remain standing without additional bracing, shoring, or lateral support until demolished or deconstructed, unless directed otherwise by the Contracting Officer. Ensure that no elements determined to be unstable are left unsupported and place and secure bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract.

1.4 BURNING

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

1.5 AVAILABILITY OF WORK AREAS

Areas in which the work is to be accomplished will be available in accordance with the following schedule:

Schedule	
Area	Date

1.6 SUBMITTALS

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

SD-01 Preconstruction Submittals

Existing Conditions; G

SD-07 Certificates

Demolition Plan; G

Notification; G

SD-11 Closeout Submittals

Receipts

1.7 QUALITY ASSURANCE

Submit timely notification of demolition projects to Federal, State, regional, and local authorities in accordance with 40 CFR 61, Subpart M. Notify the the Contracting Officer in writing 10 working days prior to the commencement of work in accordance with 40 CFR 61, Subpart M. Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," conform to the safety requirements contained in ASSE/SAFE A10.6. Comply with the Environmental Protection Agency requirements specified. Use of explosives will not be

permitted.

1.7.1 Dust and Debris Control

Prevent the spread of dust and debris to occupied portions of the building and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution. Vacuum and dust the work area daily. Sweep pavements as often as necessary to control the spread of debris that may result in foreign object damage.

1.8 PROTECTION

1.8.1 Protection of Personnel

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

The Contractor shall protect personnel from demolition activities impacting paints and coatings that contain hazardous metals and Polychlorinated Biphenyls (PCBs). Equipment, work practices and controls to prevent exposure to workers, adjacent unprotected personnel and the environment shall be described in the Hazardous Metal and PCB Compliance and Health and Safety Plan submitted in accordance with Section 02 83 13.00 20 Hazardous Metals and Polychlorinated Biphenyls (PCBs) in Construction. Establish and implement a respiratory protection program as required in accordance with Section 02 83 13.00 20 Hazardous Metals and Polychlorinated Biphenyls (PCBs) in Construction.

1.9 RELOCATIONS

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

1.10 EXISTING CONDITIONS

Before beginning any demolition or deconstruction work, survey the site and examine the drawings and specifications to determine the extent of the work. Record existing conditions in the presence of the Contracting Officer showing the condition of structures and other facilities adjacent to areas of alteration or removal. Photographs sized 4 inch will be acceptable as a record of existing conditions. Include in the record the elevation of the top of foundation walls, finish floor elevations, possible conflicting electrical conduits, plumbing lines, alarms systems, the location and extent of existing cracks and other damage and description of surface conditions that exist prior to before starting work. It is the Contractor's responsibility to verify and document all required outages which will be required during the course of work, and to note these outages on the record document. Submit survey results.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

Inspect and evaluate existing structures onsite for reuse. Existing construction scheduled to be removed for reuse shall be disassembled. Dismantled and removed materials are to be separated, set aside, and prepared as specified, and stored or delivered to a collection point for reuse, remanufacture, recycling, or other disposal, as specified. Materials shall be designated for reuse onsite whenever possible.

3.1.1 Structures

- a. Remove existing structures indicated to be removed to grade. Interior walls, other than retaining walls and partitions, shall be removed to top of concrete slab on ground.
- b. Demolish Deconstruct 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.
- c. Locate demolition and deconstruction 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 or deconstruction work until all utility disconnections have been made. Shut off and cap utilities for future use, as indicated.

3.1.2.2 Disconnecting Existing Utilities

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

3.1.3 Chain Link Fencing

Remove chain link fencing, gates and other related salvaged items scheduled for removal and transport to designated areas. Remove gates as whole units. Cut chain link fabric to 25 foot lengths and store in rolls off the

ground.

3.1.4 Paving and Slabs

Sawcut concrete and asphaltic concrete paving and slabs as indicated to a depth below grade. Provide neat sawcuts at limits of pavement removal as indicated. Pavement and slabs designated to be recycled and utilized in this project shall be moved, ground and stored as directed by the Contracting Officer. Pavement and slabs not to be used in this project shall be removed from the Installation at Contractor's expense.

3.1.5 Masonry

Sawcut 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 indicated. 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 Structural Steel

Dismantle structural steel at field connections and in a manner that will prevent bending or damage. Salvage for recycle structural steel, steel joists, girders, angles, plates, columns and shapes. Flame-cutting torches are permitted when other methods of dismantling are not practical. Transport steel joists and girders as whole units and not dismantled. Transport structural steel shapes to a designated storage area as directed by the Contracting Officer, stacked according to size, type of member and length, and stored off the ground, protected from the weather.

3.1.8 Miscellaneous Metal

Salvage shop-fabricated items such as access doors and frames, steel gratings, metal ladders, wire mesh partitions, metal railings, metal windows and similar items as whole units. Salvage light-gage and cold-formed metal framing, such as steel studs, steel trusses, metal gutters, roofing and siding, metal toilet partitions, toilet accessories and similar items. Recycle scrap metal as part of demolition and deconstruction operations. Provide separate containers to collect scrap metal and transport to a scrap metal collection or recycling facility, in accordance with the Waste Management Plan.

3.1.9 Patching

Where removals leave holes and damaged surfaces exposed in the finished work, patch and repair these holes and damaged surfaces to match adjacent finished surfaces, using on-site materials when available. Where new work is to be applied to existing surfaces, perform removals and patching in a manner to produce surfaces suitable for receiving new work. Finished surfaces of patched area shall be flush with the adjacent existing surface

and shall match the existing adjacent surface as closely as possible as to texture and finish. Patching shall be as specified and indicated, and shall include:

- a. Concrete and Masonry: Completely fill holes and depressions, left as a result of removals in existing masonry walls to remain, with an approved masonry patching material, applied in accordance with the manufacturer's printed instructions.
- b. Where existing partitions have been removed leaving damaged or missing resilient tile flooring, patch to match the existing floor tile.
- 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.

3.1.10 Air Conditioning Equipment

Remove air conditioning, refrigeration, and other equipment containing refrigerants without releasing chlorofluorocarbon refrigerants to the atmosphere in accordance with the Clean Air Act Amendment of 1990. Recover all refrigerants prior to removing air conditioning, refrigeration, and other equipment containing refrigerants and dispose of in accordance with the paragraph entitled "Disposal of Ozone Depleting Substance (ODS)." Turn in salvaged Class I ODS refrigerants as specified in paragraph, "Salvaged Materials and Equipment."

3.1.11 Cylinders and Canisters

Remove all fire suppression system cylinders and canisters and dispose of in accordance with the paragraph entitled "Disposal of Ozone Depleting Substance (ODS)."

3.1.12 Locksets on Swinging Doors

Remove all locksets from all swinging doors indicated to be removed and disposed of. Deliver the locksets and related items to a designated location for receipt by the Contracting Officer after removal.

3.1.13 Mechanical Equipment and Fixtures

Disconnect mechanical hardware at the nearest connection to existing services to remain, unless otherwise noted. Disconnect mechanical equipment and fixtures at fittings. Remove service valves attached to the unit. Salvage each item of equipment and fixtures as a whole unit; listed, indexed, tagged, and stored. Salvage each unit with its normal operating auxiliary equipment. Transport salvaged equipment and fixtures, including motors and machines, to a designated storage area as directed by the Contracting Officer. Do not remove equipment until approved. Do not offer low-efficiency equipment for reuse; provide to recycling service for disassembly and recycling of parts.

3.1.13.1 Preparation for Storage

Remove water, dirt, dust, and foreign matter from units; tanks, piping and fixtures shall be drained; interiors, if previously used to store flammable, explosive, or other dangerous liquids, shall be steam cleaned.

Seal openings with caps, plates, or plugs. Secure motors attached by flexible connections to the unit. Change lubricating systems with the proper oil or grease.

3.1.13.2 Piping

Disconnect piping at unions, flanges and valves, and fittings as required to reduce the pipe into straight lengths for practical storage. Store salvaged piping according to size and type. If the piping that remains can become pressurized due to upstream valve failure, end caps, blind flanges, or other types of plugs or fittings with a pressure gage and bleed valve shall be attached to the open end of the pipe to ensure positive leak control. Carefully dismantle piping that previously contained gas, gasoline, oil, or other dangerous fluids, with precautions taken to prevent injury to persons and property. Store piping outdoors until all fumes and residues are removed. Box prefabricated supports, hangers, plates, valves, and specialty items according to size and type. Wrap sprinkler heads individually in plastic bags before boxing. Classify piping not designated for salvage, or not reusable, as scrap metal.

3.1.13.3 Ducts

Classify removed duct work as scrap metal.

3.1.13.4 Fixtures, Motors and Machines

Remove and salvage fixtures, motors and machines associated with plumbing, heating, air conditioning, refrigeration, and other mechanical system installations. Salvage, box and store auxiliary units and accessories with the main motor and machines. Tag salvaged items for identification, storage, and protection from damage. Classify broken, damaged, or otherwise unserviceable units and not caused to be broken, damaged, or otherwise unserviceable as debris to be disposed of by the Contractor.

3.1.14 Electrical Equipment and Fixtures

Salvage motors, motor controllers, and operating and control equipment that are attached to the driven equipment. Salvage wiring systems and components. Box loose items and tag for identification. Disconnect primary, secondary, control, communication, and signal circuits at the point of attachment to their distribution system.

3.1.14.1 Fixtures

Remove and salvage electrical fixtures. Salvage unprotected glassware from the fixture and salvage separately. Salvage incandescent, mercury-vapor, and fluorescent lamps and fluorescent ballasts manufactured prior to 1978, boxed and tagged for identification, and protected from breakage.

3.1.14.2 Electrical Devices

Remove and salvage switches, switchgear, transformers, conductors including wire and nonmetallic sheathed and flexible armored cable, regulators, meters, instruments, plates, circuit breakers, panelboards, outlet boxes, and similar items. Box and tag these items for identification according to type and size.

3.1.14.3 Wiring Ducts or Troughs

Remove and salvage wiring ducts or troughs. Dismantle plug-in ducts and wiring troughs into unit lengths. Remove plug-in or disconnecting devices from the busway and store separately.

3.1.14.4 Conduit and Miscellaneous Items

Salvage conduit except where embedded in concrete or masonry. Consider corroded, bent, or damaged conduit as scrap metal. Sort straight and undamaged lengths of conduit according to size and type. Classify supports, knobs, tubes, cleats, and straps as debris to be removed and disposed.

3.1.15 Elevators and Hoists

Remove elevators, hoists, and similar conveying equipment and salvage as whole units, to the most practical extent. Remove and prepare items for salvage without damage to any of the various parts. Salvage and store rails for structural steel with the equipment as an integral part of the unit.

3.1.16 Items With Unique/Regulated Disposal Requirements

Remove and dispose of items with unique or regulated disposal requirements in the manner dictated by law or in the most environmentally responsible manner.

3.2 DISPOSITION OF MATERIAL

3.2.1 Title to Materials

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

3.2.2 Reuse of Materials and Equipment

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

3.2.3 Salvaged Materials and Equipment

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

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

- b. Store all materials salvaged for the Contractor as approved by the Contracting Officer and remove from Government property before completion of the contract. On site sales of salvaged material is prohibited.
- c. Remove salvaged items to remain the property of the Government 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 must be repaired or replaced to match existing items. Properly identify the contents of containers. .
- d. Remove the following items reserved as property of the using service prior to commencement of work under this contract: .
- e. Remove historical items in a manner to prevent damage. Deliver the following historical items to the Government for disposition: Corner stones, contents of corner stones, and document boxes wherever located on the site.
- f. Remove and capture all Class I ODS refrigerants in accordance with the Clean Air Act Amendment of 1990, and turn in to the Commanding Officer.

3.2.4 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 [AHRI Guideline K](#) suitable for the type ODS (filled to no more than 80 percent capacity) and provide appropriate labeling. Recovered ODS shall be turned over to the Contracting Officer. Products, equipment and appliances containing ODS in a sealed, self-contained system (e.g. residential refrigerators and window air conditioners) shall be disposed of in accordance with [40 CFR 82](#). Submit [Receipts](#) or bills of lading, as specified. Submit a shipping receipt or bill of lading for all containers of ozone depleting substance (ODS) shipped to the Defense Depot, Richmond, Virginia.

3.2.4.1 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
- d. Date of shipment

3.2.4.2 Fire Suppression Containers

Deactivate fire suppression system cylinders and canisters with electrical charges or initiators prior to shipment. Also, safety caps must be used to cover exposed actuation mechanisms and discharge ports on these special cylinders.

3.2.5 Unsalvageable and Non-Recyclable Material

Dispose of unsalvageable and non-recyclable noncombustible material in the disposal area located on the plans. The fill in the disposal area shall remain below elevation and after disposal is completed, the disposal area shall be uniformly graded to drain.

3.3 CLEANUP

Remove debris and rubbish from basement and similar excavations. Remove and transport the debris in a manner that prevents spillage on streets or adjacent areas. Apply local regulations regarding hauling and disposal.

3.4 DISPOSAL OF REMOVED MATERIALS

3.4.1 Regulation of Removed Materials

Dispose of debris, rubbish, scrap, and other nonsalvageable materials resulting from removal operations with all applicable federal, state and local regulations as contractually specified in the Waste Management Plan.

3.4.2 Burning on Government Property

Burning of materials removed from demolished structures will not be permitted on Government property.

3.4.3 Removal to Spoil Areas on Government Property

Transport noncombustible materials removed from demolition and deconstruction structures to designated spoil areas on Government property.

3.4.4 Removal from Government Property

Transport waste materials removed from demolished and deconstructed structures, except waste soil, from Government property for legal disposal. Dispose of waste soil as directed.

3.5 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 --

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HAZARDOUS METALS AND POLYCHLORINATED BIPHENYLS (PCBs) IN CONSTRUCTION

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 INDUSTRIAL HYGIENE ASSOCIATION (AIHA)

AIHA Z88.6 (2006) Respiratory Protection - Respirator Use-Physical Qualifications for Personnel

JOHN F. KENNEDY SPACE CENTER (KSC)

KNPR 1840.19 (2011; Rev C-1) KSC Industrial Hygiene Programs

KNPR 8500.1 (2010; Rev B) KSC Environmental Requirements

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

29 CFR 1926.103 Respiratory Protection

29 CFR 1926.1126 Chromium (VI)

29 CFR 1926.1127 Cadmium

29 CFR 1926.21 Safety Training and Education

29 CFR 1926.33 Access to Employee Exposure and Medical Records

29 CFR 1926.55 Gases, Vapors, Fumes, Dusts, and Mists

29 CFR 1926.59 Hazard Communication

29 CFR 1926.62 Lead

29 CFR 1926.65 Hazardous Waste Operations and Emergency Response

40 CFR 260 Hazardous Waste Management System: General

40 CFR 261 Identification and Listing of Hazardous Waste

40 CFR 262 Standards Applicable to Generators of Hazardous Waste

40 CFR 263 Standards Applicable to Transporters of Hazardous Waste

40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 761	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR 178	Specifications for Packagings

UNDERWRITERS LABORATORIES (UL)

UL 586	(2009) Standard for High-Efficiency Particulate, Air Filter Units
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1.2 DEFINITIONS

1.2.1 Action Level

Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air averaged over an 8 hour period.

Employee exposure, without regard to use of respirators, to an airborne concentration of cadmium or chromium (VI) of 2.5 micrograms per cubic meter of air averaged over an 8 hour period.

1.2.2 Area Sampling

Sampling of hazardous metals and PCB concentrations within the control area and inside the physical boundaries which is representative of the airborne hazardous metals and PCB concentrations but is not collected in the breathing zone of personnel (approximately 5 to 6 feet above the floor).

1.2.3 Cadmium Permissible Exposure Limit (PEL)

Five micrograms per cubic meter of air as an 8 hour time-weighted average as determined by 29 CFR 1926.1127.

1.2.4 Chromium (VI) Permissible Exposure Limit (PEL)

Five micrograms per cubic meter of air as an 8 hour time weighted average as determined by 29 CFR 1926.1126.

1.2.5 Competent Person (CP)

As used in this section, refers to a person employed by the Contractor who is trained in the recognition and control of hazardous metals and PCB hazards in accordance with current Federal, State, and local regulations

and has the authority to take prompt corrective actions to control the hazard. A Certified Industrial Hygienist (CIH) certified by the American Board of Industrial Hygiene or a Certified Safety Professional (CSP) certified by the Board of Certified Safety Professionals is the best choice.

1.2.6 Contaminated Room

Refers to a room for removal of contaminated personal protective equipment (PPE).

1.2.7 Decontamination Shower Facility

A facility that encompasses a clean clothing storage room, and contaminated clothing storage and disposal rooms, with a shower facility in between.

1.2.8 Hazardous Metal

Metals and metal compounds that negatively affect human health. Hazardous metal include but are not limited to lead, cadmium, chromium (VI) and mercury.

1.2.9 High Efficiency Particulate Arrestor (HEPA) Filter Equipment

HEPA filtered vacuuming equipment with a [UL 586](#) filter system capable of collecting and retaining lead-contaminated particulate. A high efficiency particulate filter demonstrates at least 99.97 percent efficiency against 0.3 micron or larger size particles.

1.2.10 Lead

Metallic lead, inorganic lead compounds, and organic lead soaps. Excludes other forms of organic lead compounds.

1.2.11 Control Area

A system of control methods to prevent the spread of hazardous metals and PCB dust, paint chips or debris to adjacent areas that may include temporary containment, floor or ground cover protection, physical boundaries, and warning signs to prevent unauthorized entry of personnel. HEPA filtered local exhaust equipment may be used as engineering controls to further reduce personnel exposures or building/outdoor environmental contamination.

1.2.12 Lead Permissible Exposure Limit (PEL)

Fifty micrograms per cubic meter of air as an 8 hour time weighted average as determined by [29 CFR 1926.62](#). If an employee is exposed for more than eight hours in a work day, the PEL shall be determined by the following formula:

$$\text{PEL (micrograms/cubic meter of air)} = 400/\text{No. hrs worked per day}$$

1.2.13 Material Containing Lead/Paint with Lead (MCL/PWL)

Material, including paint, which contains lead as determined by the testing laboratory using a valid test method. The requirements of this section does not apply if no detectable levels of lead are found using a quantitative method for analyzing paint or MCL using laboratory instruments with specified limits of detection (usually 0.01 percent). An X-Ray

Fluorescence (XRF) instrument is not considered a valid test method.

1.2.14 Mercury Permissible Exposure Limit (PEL)

0.1 milligrams per cubic meter of air as an 8 hour time weighted average as determined by 29 CFR 1926.55.

1.2.15 PCB Permissible Exposure Limit (PEL)

Five hundred micrograms per cubic meter of air as an 8 hour time weighted average as identified in 29 CFR 1926.55.

1.2.16 Personal Sampling

Sampling of airborne hazardous metal and PCB concentrations within the breathing zone of an employee to determine the 8 hour time weighted average concentration in accordance with 29 CFR 1926.62, 29 CFR 1926.55, 29 CFR 1926.1126 and 29 CFR 1926.1127. Samples shall be representative of the employees' work tasks. Breathing zone shall be considered an area within a hemisphere, forward of the shoulders, with a radius of 6 to 9 inches and centered at the nose or mouth of an employee.

1.2.17 Physical Boundary

Area physically roped or partitioned off around lead control area to limit unauthorized entry of personnel.

1.3 DESCRIPTION

1.3.1 Description of Work

Construction activities impacting PWL or material containing hazardous metals and PCBs which are covered by this specification include the demolition or removal of material containing hazardous metal and PCBs in paints and coatings, located on support structures in the Vehicle Assembly Building Highway 3 and as indicated on the drawings.

1.3.2 Coordination with Other Work

The contractor shall coordinate with work being performed in adjacent areas. Coordination procedures shall be explained in the Plan and shall describe how the Contractor will prevent hazardous metal and PCB exposure to other contractors or Government personnel performing work unrelated to hazardous metal and PCB activities.

1.4 SUBMITTALS

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

SD-01 Preconstruction Submittals

Occupational and Environmental Assessment Data Report (if objective data is used to justify excluding the initial occupational exposure assessment); G

Hazardous Metal and PCB Compliance and Health and Safety Plan

including CP approval (signature, date, and certification number);
G

Competent Person qualifications; G

Training Certification of workers and supervisors; G

Hazardous Metal and PCB Waste Management Plan; G

Certification of Medical Examinations; G

SD-06 Test Reports

Sampling results; G

Occupational and Environmental Assessment Data Report; G

SD-07 Certificates

Testing laboratory qualifications; G

Clearance Certification; G

1.5 QUALITY ASSURANCE

1.5.1 Qualifications

1.5.1.1 Competent Person (CP)

Submit name, address, and telephone number of the CP selected to perform responsibilities specified in paragraph entitled "Competent Person (CP) Responsibilities." Provide documented construction project-related experience with implementation of OSHA's Hazardous Metal and PCB in Construction standards (29 CFR 1926.62, 29 CFR 1926.55, 29 CFR 1926.1126 and 29 CFR 1926.1127) which shows ability to assess occupational and environmental exposure to Hazardous Metal and PCB, experience with the use of respirators, personal protective equipment and other exposure reduction methods to protect employee health. Submit proper documentation that the CP is trained and licensed or certified in accordance with Federal, State and local laws.

1.5.1.2 Training Certification

Submit a certificate for each worker and supervisor, signed and dated by the training provider, stating that the employee has received the required training specified in 29 CFR 1926.62, 29 CFR 1926.1126 and 29 CFR 1926.1127 and is certified to perform or supervise hazardous metal removal or demolition activities.

1.5.1.3 Testing Laboratory

Submit the name, address, and telephone number of the testing laboratory selected to perform the air and wipe analysis, testing, and reporting of airborne concentrations of hazardous metals and PCBs. Use a laboratory participating in the EPA National Lead Laboratory Accreditation Program (NLLAP) by being accredited by either the American Association for Laboratory Accreditation (A2LA) or the American Industrial Hygiene Association (AIHA) and that is successfully participating in the Environmental Lead Proficiency Analytical Testing

(ELPAT) program to perform sample analysis. Laboratories selected to perform blood analysis shall be OSHA approved.

1.5.2 Requirements

1.5.2.1 Competent Person (CP) Responsibilities

- a. Verify training meets all Federal, State, and local requirements.
- b. Review and approve Hazardous Metal and PCB Compliance and Health and Safety Plan for conformance to the applicable referenced standards.
- c. Continuously inspect hazardous metal and PCB work for conformance with the approved plan.
- d. Perform (or oversee performance of) air sampling. Recommend upgrades or downgrades (whichever is appropriate based on exposure) on the use of PPE (respirators included) and engineering controls.
- e. Ensure work is performed in strict accordance with specifications.
- f. Control work to prevent hazardous exposure to human beings and to the environment.
- g. Supervise final cleaning of the control area, take clearance wipe samples; review clearance sample results and make recommendations for further cleaning.
- h. Certify the conditions of the work as called for elsewhere in this specification.

1.5.2.2 Hazardous Metal and PCB Compliance and Health and Safety Plan

Submit a detailed job-specific plan of the work procedures to be used in the disturbance of paint, coatings or materials containing hazardous metals or PCBs. The plan shall include a sketch showing the location, size, and details of control areas, critical barriers, physical boundaries, location and details of decontamination facilities, viewing ports, and mechanical ventilation system. Include a description of equipment and materials, work practices, controls and job responsibilities for each activity from which hazardous metals or PCBs are emitted. Include in the plan, eating, drinking, smoking, hygiene facilities and sanitary procedures, interface of trades, sequencing of hazardous metals and PCB related work, collected waste water and dust containing hazardous metals and PCB and debris, air sampling, respirators, personal protective equipment, and a detailed description of the method of containment of the operation to ensure that hazardous metals and PCB are not released outside of the control area. Include site preparation, cleanup and clearance procedures. Include occupational and environmental sampling, training and strategy, sampling and analysis, strategy and methodology, frequency of sampling, duration of sampling, and qualifications of sampling personnel in the air sampling portion of the plan. Include a description of arrangements made among contractors on multicontractor worksites to inform affected employees and to clarify responsibilities to control exposures.

Work may involve the disturbance of concrete, masonry and tile that will result in the release of respirable silica. The plan shall address work procedures and controls to address silica exposure.

1.5.2.3 Occupational and Environmental Assessment Data Report

If initial monitoring is necessary, submit occupational and environmental [sampling results](#) to the Contracting Officer within three working days of collection, signed by the testing laboratory employee performing the analysis, the employee that performed the sampling, and the CP.

In order to reduce the full implementation of [29 CFR 1926.62](#), [29 CFR 1926.1126](#) or [29 CFR 1926.1127](#), the Contractor shall provide documentation. Submit a report that supports the determination to reduce full implementation of the requirements of [29 CFR 1926.62](#), [29 CFR 1926.1126](#) or [29 CFR 1926.1127](#) and supporting the Hazardous Metal and PCB Compliance and Health and Safety Plan.

- a. The initial monitoring shall represent each job classification, or if working conditions are similar to previous jobs by the same employer, provide previously collected exposure data that can be used to estimate worker exposures per [29 CFR 1926.62](#), [29 CFR 1926.1126](#) or [29 CFR 1926.1127](#). The data shall represent the worker's regular daily exposure to lead, cadmium or chromium (VI) for stated work.
- b. Submit worker exposure data gathered during the task based trigger operations of [29 CFR 1926.62](#), [29 CFR 1926.1126](#) or [29 CFR 1926.1127](#) with a complete process description. This includes manual demolition, manual scraping, manual sanding, heat gun, power tool cleaning, rivet busting, cleanup of dry expendable abrasives, abrasive blast enclosure removal, abrasive blasting, welding, cutting and torch burning where lead, cadmium or chromium (VI) containing coatings are present.
- c. The initial assessment shall determine the requirement for further monitoring and the need to fully implement the control and protective requirements including the Hazardous Metal and PCB Compliance and Health and Safety Plan per [29 CFR 1926.62](#), [29 CFR 1926.1126](#) or [29 CFR 1926.1127](#).

1.5.2.4 Medical Examinations

Initial medical surveillance as required by [29 CFR 1926.62](#), [29 CFR 1926.1126](#) or [29 CFR 1926.1127](#) shall be made available to employees exposed to lead, cadmium or chromium (VI) above the action level. Full medical surveillance shall be made available to employees on an annual basis who are or may be exposed to lead, cadmium or chromium (VI) in excess of the action level for more than 30 days a year or as required by [29 CFR 1926.62](#), [29 CFR 1926.1126](#) or [29 CFR 1926.1127](#). Adequate records shall show that employees meet the medical surveillance requirements of [29 CFR 1926.33](#), [29 CFR 1926.62](#), [29 CFR 1926.1126](#) or [29 CFR 1926.1127](#) and [29 CFR 1926.103](#). Provide medical surveillance to all personnel exposed to lead as indicated in [29 CFR 1926.62](#), [29 CFR 1926.1126](#) or [29 CFR 1926.1127](#). Maintain complete and accurate medical records of employees for the duration of employment plus 30 years.

1.5.2.5 Training

Train each employee performing work that disturbs hazardous metals and PCBs, who performs hazardous metal and PCB disposal, and air sampling operations prior to the time of initial job assignment and annually thereafter, in accordance with [29 CFR 1926.21](#), [29 CFR 1926.62](#), [29 CFR 1926.1126](#) or [29 CFR 1926.1127](#) and State and local regulations.

1.5.2.6 Respiratory Protection Program

- a. Provide each employee required to wear a respirator a respirator fit test at the time of initial fitting and at least annually thereafter as required by 29 CFR 1926.62, 29 CFR 1926.1126 or 29 CFR 1926.1127.
- b. Establish and implement a respiratory protection program as required by AIHA Z88.6, 29 CFR 1926.103, 29 CFR 1926.62, and 29 CFR 1926.55, 29 CFR 1926.1126, 29 CFR 1926.1127 and KSC Respiratory Protection Program.

1.5.2.7 Hazard Communication Program

Establish and implement a Hazard Communication Program as required by 29 CFR 1926.59.

1.5.2.8 Hazardous Metal and PCB Waste Management

The Hazardous Metal and PCB Waste Management Plan shall supplement the waste management plans submitted in accordance with Section 01 57 20.00 10, ENVIRONMENTAL PROTECTION PLAN and comply with Federal, State, and local hazardous waste regulations and address:

- a. Identification and classification of wastes associated with the work.
- b. Estimated quantities of wastes to be generated and disposed of.
- c. Names and qualifications of each contractor that will be transporting, storing, treating, and disposing of the wastes. Include the facility location and operator and a 24-hour point of contact.
- d. Names and qualifications (experience and training) of personnel who will be working on-site with hazardous wastes.
- e. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.
- f. Spill prevention, containment, and cleanup contingency measures including a health and safety plan to be implemented in accordance with 29 CFR 1926.65.
- g. Work plan and schedule for waste containment, removal and disposal. Proper containment of the waste includes using acceptable waste containers (e.g., 55-gallon drums) as well as proper marking/labeling of the containers. Wastes shall be cleaned up and containerized daily.
- h. Include processes that may alter or treat waste rendering a hazardous waste non hazardous.

1.5.2.9 Environmental, Safety and Health Compliance

In addition to the detailed requirements of this specification, comply with laws, ordinances, rules, and regulations of Federal, State, and local authorities regarding hazardous metal and PCBs. Comply with the requirements of the current issue of 29 CFR 1926.62, 29 CFR 1926.1126 or 29 CFR 1926.1127. Submit matters regarding interpretation of standards to the Contracting Officer for resolution before starting work. Where specification requirements and the referenced documents vary, the most stringent requirement shall apply. The following KSC requirements regarding

removing, handling, storing, transporting, and disposing of hazardous metal and PCB-contaminated materials apply:

- a. [KNPR 1840.19](#) KSC Industrial Hygiene Program
- b. [KNPR 8500.1](#) (2010; Rev B) KSC Environmental Requirements

1.5.3 Pre-Construction Conference

Along with the CP, meet with the Contracting Officer to discuss in detail the Hazardous Metal and PCB Waste Management Plan and the Hazardous Metal and PCB Compliance and Health and Safety Plan, including procedures and precautions for the work.

1.6 EQUIPMENT

1.6.1 Respirators

Furnish appropriate respirators approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services, for use in atmospheres containing hazardous metal or PCB dust, fume and mist.

Respirators shall comply with the requirements of [29 CFR 1926.62](#), [29 CFR 1926.103](#), [29 CFR 1926.1126](#) and [29 CFR 1926.1127](#).

1.6.2 Special Protective Clothing

Furnish personnel who will be exposed to hazardous metal and PCB dust with proper disposable protective whole body clothing, head covering, gloves, eye, and foot coverings as required by [29 CFR 1926.62](#), [29 CFR 1926.1126](#) and [29 CFR 1926.1127](#). Furnish proper disposable plastic or rubber gloves to protect hands. Reduce the level of protection only after obtaining approval from the CP.

1.6.3 Rental Equipment Notification

If rental equipment is to be used during hazardous metal and PCB handling and disposal, notify the rental agency in writing concerning the intended use of the equipment.

1.6.4 Vacuum Filters

[UL 586](#) labeled HEPA filters.

1.6.5 Equipment for Government Personnel

Furnish the Contracting Officer with two complete sets of personal protective equipment (PPE) daily, as required herein, for entry into and inspection of the hazardous metal and PCB removal work within the controlled area. Personal protective equipment shall include disposable whole body covering, including appropriate foot, head, eye, and hand protection. PPE shall remain the property of the Contractor. The Government will provide respiratory protection for the Contracting Officer.

1.7 PROJECT/SITE CONDITIONS

1.7.1 Protection of Existing Work to Remain

Perform work without damage or contamination of adjacent areas. Where

existing work is damaged or contaminated, restore work to its original condition or better as determined by the Contracting Officer.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Protection

3.1.1.1 Notification

a. Notify the Contracting Officer 20 days prior to the start of hazardous metal and PCB work.

b. The CP shall notify the facility managers of hazardous operations requiring establishment of control areas. Facility managers will forward notifications to facility tenant management points of contact and the MESC IH Office.

The Notification shall include:

- (a) Estimated start date and times.
- (b) Facility number and name.
- (c) Work location.
- (d) Project Identification Number.
- (e) Contact Name and Phone Number (Construction Management Point of Contact).
- (f) Brief description of work or operation to be conducted.

3.1.1.2 Control Area

a. Physical Boundary - Provide physical boundaries around the control area by roping off the area designated in the work plan or providing curtains, portable partitions or other enclosures to ensure that hazardous metal and PCBs will not escape outside of the control area.

b. Warning Signs - Provide warning signs at approaches to control areas. Locate signs at such a distance that personnel may read the sign and take precautions before entering the area. Signs shall comply with the requirements of 29 CFR 1926.62, 29 CFR 1926.1126 and 29 CFR 1926.1127.

In addition, signage shall identify the type of work in progress, project identification number and provide the name and phone number of a point of contact for project information and for notification in the event of an emergency.

3.1.1.3 Furnishings

The Government will remove furniture and equipment from the building before hazardous metal and PCB work begins.

3.1.1.4 Heating, Ventilating and Air Conditioning (HVAC) Systems

Shut down, lock out, and isolate HVAC systems that supply, exhaust, or pass through the control areas. Seal intake and exhaust vents in the control area with 6 mil plastic sheet and tape. Seal seams in HVAC components that

pass through the control area.

3.1.1.5 Decontamination Shower Facility

Provide clean and contaminated change rooms and shower facilities in accordance with this specification and 29 CFR 1926.62.

3.1.1.6 Eye Wash Station

Where eyes may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes shall be provided within the work area.

3.1.1.7 Mechanical Ventilation System

- a. To the extent feasible, use local exhaust ventilation or other collection systems, approved by the CP. Local exhaust ventilation systems shall be evaluated and maintained in accordance with 29 CFR 1926.62.
- b. Vent local exhaust outside the building and away from building ventilation intakes or ensure system is connected to HEPA filters.
- c. Use locally exhausted, power actuated tools or manual hand tools.

3.1.1.8 Personnel Protection

Personnel shall wear and use protective clothing and equipment as specified herein. Eating, smoking, or drinking or application of cosmetics is not permitted in the control area. No one will be permitted in the control area unless they have been appropriately trained and provided with protective equipment.

3.2 ERECTION

3.2.1 Control Area Requirements

Establish a control area by completely establishing barriers and physical boundaries around the area or structure where paint and coating removal operations will be performed.

3.3 APPLICATION

3.3.1 Hazardous Metal and PCB Work

Perform hazardous metal and PCB work in accordance with approved Hazardous Metal and PCB Compliance and Health and Safety Plan. Use procedures and equipment required to limit occupational exposure and environmental contamination with hazardous metals and PCBs when the work is performed in accordance with 29 CFR 1926.62, 29 CFR 1926.1126 and 29 CFR 1925.1127 and as specified herein. Dispose of paint, coatings or materials coating, hazardous metals and PCBs and associated waste in compliance with Federal, State, and local requirements.

3.3.2 Paint with Hazardous Metals and PCBs or Material Containing Hazardous Metals and PCBs Removal

Manual or power sanding or grinding of hazardous metals and PCBs surfaces or materials is not permitted unless tools are equipped with HEPA

attachments or wet methods. The dry sanding or grinding of surfaces that contain hazardous metals and PCBs is prohibited. Provide methodology for removing hazardous metals and PCBs in the Hazardous Metal and PCB Compliance and Health and Safety Plan. Select hazardous metals and PCBs removal processes to minimize contamination of work areas outside the control area with contaminated dust or other contaminated debris or waste and to ensure that unprotected personnel are not exposed to hazardous concentrations. Describe this removal process in the Hazardous Metal and PCB Compliance and Health and Safety Plan.

Remove paints and coatings 6 inches to either side of areas where torch cutting or abrasive grindings will occur.

3.3.2.1 Paint with Hazardous Metal and PCBs or Material Containing Hazardous Metals and PCBs - Indoor Removal

Perform manual, mechanical removal and thermal cutting in the control areas using enclosures, barriers or containments. Collect residue for disposal in accordance with Federal, State, and local requirements.

3.3.3 Personnel Exiting Procedures

Whenever personnel exit the controlled area, they shall perform the following procedures and shall not leave the work place wearing clothing or equipment worn in the control area:

- a. Vacuum clothing before entering the contaminated change room.
- b. Remove protective clothing in the contaminated change room, and place them in an approved impermeable disposal bag.
- c. Wash hands and face at the site, don appropriate disposable or uncontaminated reusable clothing, move to an appropriate shower facility, shower.
- d. Change to clean clothes prior to leaving the clean clothes storage area.

3.4 FIELD QUALITY CONTROL

3.4.1 Tests

3.4.1.1 Air and Wipe Sampling

Conduct sampling for hazardous metals and PCBs in accordance with [29 CFR 1926.62](#), [29 CFR 1926.55](#), [29 CFR 1926.1126](#) and [29 CFR 1926.1127](#) and as specified herein. Air and wipe sampling shall be directed or performed by the CP.

- a. The CP shall be on the job site directing the air and wipe sampling and inspecting the paint, coatings or materials containing hazardous metals and PCBs removal work to ensure that the requirements of the contract have been satisfied during the entire operation.
- b. Collect personal air samples every three months on employees who are anticipated to have the greatest risk of exposure as determined by the CP. In addition, collect air samples on at least twenty-five percent of the work crew or a minimum of two employees, whichever is greater, during each work shift.

- c. Submit results of air samples, signed by the CP, within 72 hours after the air samples are taken.
- d. Conduct area air sampling every three months, on each shift in which paint and coating removal operations are performed, in areas immediately adjacent to the control area. Sufficient area monitoring shall be conducted to ensure unprotected personnel are not exposed at or above action levels. If an action level of air is reached or exceeded, stop work, correct the conditions(s) causing the increased levels. Notify the Contracting Officer immediately. Determine if condition(s) require further change in work methods. Removal work shall resume only after the CP and the Contracting Officer give approval.
- e. Surface Wipe Samples - Collect surface wipe samples on floors at a location no greater than 10 feet outside the control area at a frequency of once every three months while removal work is conducted. Surface wipe results shall meet criteria in paragraph "Clearance Certification."

3.4.1.2 Testing of Material Containing Hazardous Metal and PCB Residue

Test residue in accordance with 40 CFR 261 and 40 CFR 761 for hazardous waste and PCBs.

3.5 CLEANING AND DISPOSAL

3.5.1 Cleanup

Maintain surfaces of the control area free of accumulations of dust and debris. Restrict the spread of dust and debris; keep waste from being distributed over the work area. Do not dry sweep or use pressurized air to clean up the area. At the end of each shift and when the paint and coating removal operation has been completed, clean the controlled area of visible contamination by vacuuming with a HEPA filtered vacuum cleaner, wet mopping the area and wet wiping the area as indicated by the Hazardous Metal and PCB Compliance and Health and Safety Plan. Reclean areas showing dust or debris. After visible dust and debris are removed, wet wipe and HEPA vacuum surfaces in the controlled area. If adjacent areas become contaminated during the work, clean, visually inspect, and then wipe sample contaminated areas. The CP shall then certify in writing that the area has been cleaned of hazardous metal and PCB contamination before clearance testing.

3.5.1.1 Clearance Certification

The CP shall certify in writing that air samples collected outside the control area during paint removal operations are less than action levels for lead, cadmium and chromium (VI); the respiratory protection used for the employees was adequate; the work procedures were performed in accordance with 29 CFR 1926.62, 29 CFR 1926.1126 and 29 CFR 1926.1127; and that there were no visible accumulations of material and dust containing hazardous metals and PCBs left in the work site. Do not remove the control area or roped off boundary and warning signs prior to the Contracting Officer's acknowledgement of receipt of the CP certification.

Certify surface wipe samples are not significantly greater than the initial surface loading determined prior to work.

Clear the control area in industrial facilities of visible dust and debris.

3.5.2 Disposal

Waste streams shall be disposed of in accordance with [KNPR 8500.1](#) KSC Environmental Requirements.

- a. Material, whether hazardous or non-hazardous shall be disposed in accordance with laws and provisions and Federal, State or local regulations. Ensure waste is properly characterized. The Technical Response Package provided by the Contracting Officer and result of each waste characterization (TCLP for RCRA materials) will dictate disposal requirements.
- b. Contractor is responsible for segregation of waste. Collect hazardous metal and PCB contaminated waste, scrap, debris, bags, containers, equipment, and contaminated clothing that may produce airborne concentrations of hazardous metal and PCB particles. Label the containers in accordance with [29 CFR 1926.62](#), [29 CFR 1926.1126](#), [29 CFR 1926.1127](#) and [40 CFR 261](#).
- c. Store waste materials in U.S. Department of Transportation ([49 CFR 178](#)) approved 55 gallon drums. Properly label each drum to identify the type of waste ([49 CFR 172](#)) and the date the drum was filled. For hazardous waste, the collection drum requires marking/labeling in accordance with [40 CFR 262](#) during the accumulation/collection timeframe. The Contracting Officer or an authorized representative will assign an area for interim storage of waste-containing drums. Do not store hazardous waste drums in interim storage longer than 90 calendar days from the date affixed to each drum.
- e. Handle and store, hazardous metal and PCB contaminated waste in accordance with [40 CFR 260](#), [40 CFR 261](#), [40 CFR 262](#), [40 CFR 263](#), [40 CFR 264](#), [40 CFR 265](#), [40 CFR 761](#) and [KNPR 8500.1](#), Rev. B, KSC Requirements.

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METAL FASTENINGS

PART 1 GENERAL

1.1 REFERENCES

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

ASME INTERNATIONAL (ASME)

ASME BPVC SEC IX (2007; Addenda 2008) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ASNT SNT-TC-1A (2011) Recommended Practice, Personnel Qualification and Certification in Nondestructive Testing

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4 (2012) Standard Symbols for Welding, Brazing and Nondestructive Examination

AWS A5.1/A5.1M (2004; Errata 2004) Carbon Steel Electrodes for Shielded Metal Arc Welding

AWS A5.17 (1980) Carbon Steel Electrodes and Fluxes for Submerged Arc Welding

AWS D1.1/D1.1M (2010; Errata 2010) Structural Welding Code - Steel

AWS D1.2/D1.2M (2003; Errata 2004) Structural Welding Code - Aluminum

AWS D1.6/D1.6M (2007) Structural Welding Code - Stainless Steel

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

NASA-SPEC-5004 Welding of Aerospace Ground Support Equipment and Related Nonconventional Facilities

1.2 WELD CRITERIA

Except as noted, all carbon steel welding shall be in accordance with AWS D1.1/D1.1M and NASA-SPEC-5004. All aluminum welding shall be in accordance with AWS D1.2/D1.2M and NASA-SPEC-5004. All stainless steel welding shall be in accordance with AWS D1.6/D1.6M and NASA-SPEC-5004 with

one exception. The pre-qualified welding procedure specifications presented in [AWS D1.6/D1.6M](#) do not need to be qualified by testing, as stipulated by [NASA-SPEC-5004](#).

Classification: See [NASA-SPEC-5004](#) for classification to establish levels of inspection for structural weldments. All welds require a Class B inspection, except where weld is designated as a Class A weld.

1.3 SUBMITTALS

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

[SD-01 Preconstruction Submittals](#)

[Training data](#) shall be submitted for welding inspectors in accordance with the paragraph entitled, "Certification of Welding Inspectors," of this section; [G](#).

[SD-02 Shop Drawings](#)

[Detail Drawings](#) shall be submitted in accordance with the section entitled, "General" of this section; [G](#).

[SD-03 Product Data](#)

Detailed weights shall be provided for all equipment, components, materials and products which will be installed on the ML during construction/fabrication as a permanent part of the facility.

[SD-06 Test Reports](#)

Test reports shall be submitted for the following items in accordance with [AWS D1.1/D1.1M](#) for carbon steel, [AWS D1.2/D1.2M](#) for aluminum, and [AWS D1.6/D1.6M](#) for stainless steel. Inspection reports of shop welds shall be submitted within 1 week of test date in accordance with the paragraph entitled "Quality Provisions", of this section.

[Welder Qualifications](#); [G](#)
[Inspector Qualification Tests](#); [G](#)
[Inspection reports of shop welds](#); [G](#)

[SD-07 Certificates](#)

[Welding Procedures](#) and [Welder Qualifications](#) shall be submitted in accordance with the paragraph entitled, "Qualifications of Welding Procedures and Welders," of this section; [G](#).

[Certificates](#) shall be submitted for qualifications of welding procedures and welders in accordance with the paragraph entitled, "Certification of Welding Inspectors," of this section; [G](#).

[Certificates for Electrodes](#); [G](#)

[SD-09 Manufacturer's Field Reports](#)

Inspection Reports of field welds shall be submitted within 1 week of test date in accordance with the paragraph entitled, "Quality Provisions," of this section; G.

1.4 QUALIFICATIONS OF WELDING PROCEDURES AND WELDERS

Prior to any production welding, the Contractor shall demonstrate the satisfactory quality of representative welds by means of tests specified hereinafter under paragraph entitled, "Quality Provisions." Certificates of such qualification shall be current for welder qualifications and welding procedures and are subject to the Contracting Officer's approval. Certificates shall have the Government inspector's stamp affixed.

1.5 PROCEDURE AND PERFORMANCE QUALIFICATIONS

Contractor shall qualify welding procedures and welder performances.

Qualifications and certification shall be accomplished in accordance with the applicable portions of AWS D1.1/D1.1M for carbon steel, AWS D1.2/D1.2M for aluminum, and AWS D1.6/D1.6M for stainless steel. Additionally, carbon steel welders and welding operators shall be qualified in accordance with ASME BPVC SEC IX. Copies of certification shall be submitted to the Contracting Officer.

Retesting is not required for renewal of performance qualification if the welder has performed production welding meeting the requirements of this specification within the previous six months.

1.6 CERTIFICATION OF WELDING INSPECTORS

Welding inspectors shall be certified to meet the requirements of ASNT SNT-TC-1A. Contractor may have an in-house level III certified inspector as a designated representative to certify other inspectors at levels I and II. As an option, he may use the services of a private laboratory, approved by the Contracting Officer, to provide a certified level III inspector to conduct qualification training and examination of the Contractor's personnel at level II. In such instances, the responsibility of certification shall be retained by the Contractor. Inspector Qualification Tests shall meet referenced standards within this and referenced sections.

If a private laboratory is used to provide qualification training and examination of the Contractor's inspectors, the Contractor shall have at least level II nondestructive testing (NDT) inspectors of the applicable testing method on his staff for performance of the required inspections. These inspectors shall be certified to perform inspections of the type required by the specifications.

Contractor may certify a level II inspector in magnetic particle or liquid penetrant and waive the required trainee or level I documented work experience time if the Contractor specifically ascertains that the employee is qualified to properly perform the required inspection and so states in his certification to the Contracting Officer. Once an inspector has been certified, no further training will be required for the life of the contract.

Contractor also has the option of using the services of a private laboratory, approved by the Contracting Officer, to provide the required NDT inspections.

[Training data](#) shall be submitted for welding inspectors. Data shall include description of training, training aids to be used, samples of training materials to be used, and schedules of training.

[Certificates](#) shall be submitted for qualifications of welding procedures and welders including the type of welding and positions each operator is qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualification tests.

1.7 HANDLING AND STORAGE

All materials used in welding processes shall be stored so that no degradation will result during storage. Handling and storage methods shall be stated in the welding procedure.

PART 2 PRODUCTS

2.1 GENERAL

Base metal shall be as specified in [AWS D1.1/D1.1M](#) for carbon steel, [AWS D1.2/D1.2M](#) for aluminum, and [AWS D1.6/D1.6M](#) for stainless steel.

Welding rods, welding wire, and electrodes used in welding shall be capable of producing satisfactory welds when used by a certified welding operator with adequate welding apparatus and shall have a composition suitable for producing welds conforming to the requirements of [NASA-SPEC-5004](#).

Fluxes for carbon steel shall be of such composition that the carbon content of the resulting weld metal will be within the limits for the applicable base metal. Fluxes for submerged-arc welding shall be compatible with the filler metal and the base metal and shall be of such a composition that the qualities of the resultant weldment shall be equivalent to or better than those obtained by the electric-arc-coated electrode process.

Anti-spatter compounds, when used, shall be of a consistency and uniformity that degradation of the weldment will not result. Anti-spatter compounds shall also be easy to apply and remove.

[Detail Drawings](#) shall include the following:

Class A welds shall be transposed by the Contractor to detail drawings by designating "A" in the tail of the weld symbol. Detail drawings shall include notes specifying radiographic inspection for Class A welds. These notes shall be detailed enough to ascertain that a satisfactory radiographic inspection can be accomplished considering technique, fabrication sequence, and joint configuration for each Class A weld.

2.2 ELECTRODES FOR MANUAL SHIELDED METAL-ARC WELDING

Electrodes for manual shielded metal-arc welding of carbon steel shall meet the requirements of [AWS D1.1/D1.1M](#). Electrodes shall be, covered mild-steel electrodes, E70 series conforming to [AWS A5.1/A5.1M](#).

2.3 ELECTRODES AND FLUX FOR SUBMERGED-ARC WELDING

The bare electrodes and flux used in combination for submerged-arc welding

of carbon steel shall meet the requirements of AWS D1.1/D1.1M and shall be bare mild-steel electrodes and fluxes F70 series for submerged-arc welding conforming to AWS A5.17.

Shielded metal-arc electrodes having low-hydrogen coverings shall be purchased in hermetically sealed containers or dried for at least 2 hours between 450 and 500 degrees F before they are used. After opening, hermetically sealed electrodes shall be stored at all times in an oven, supplied by the Contractor, capable of maintaining a temperature of at least 250 degrees F.

The flux used for submerged-arc welding shall be dry and free of contamination from dirt, mill scale, or other foreign material. Flux used in welding shall not be reused.

2.4 FILLER METAL FOR ALUMINUM WELDING

Filler metal shall conform to the requirements of AWS D1.2/D1.2M.

2.5 FILLER METAL FOR STAINLESS STEEL WELDING

Filler metal shall conform to the requirements of AWS D1.6/D1.6M.

PART 3 EXECUTION

3.1 JOINT PREPARATION

Interpretation of the weld symbols shall be made in accordance with AWS A2.4. Mismatch and misalignment of fit-up shall not exceed the allowable as shown in AWS D1.1/D1.1M for steel, AWS D1.2/D1.2M for aluminum, and AWS D1.6/D1.6M for stainless steel. Root opening of the joint shall be checked before tacking or depositing the first layer to ensure that it is correct. Oxide and protective coatings shall be removed. Surfaces to be welded shall be free of grease and other foreign matter. Any method of removal may be used which does not contaminate the surfaces. Edges to be fusion welded shall be essentially free of defects and finished to a surface roughness in accordance with AWS D1.1/D1.1M for carbon steel, AWS D1.2/D1.2M for aluminum, and AWS D1.6/D1.6M for stainless.

Thermal or mechanical cutting may be used to cut carbon steel. Mechanical cutting may be used to cut stainless steel piping and tubing. Anti-spatter compound, when used, shall be applied to all surfaces adjacent to the joints where it is necessary to control spatter from welding.

3.2 PROTECTION OF EQUIPMENT AND ADJACENT SURFACES

Contractor shall protect equipment and adjacent surfaces during welding operations. Remove insulation within 12" of weld joints prior to welding operations. Removal is required on near side as well as far side surfaces due to the thermal conductivity of steel. Upon completion of welding operations, provide new insulation in accordance with project requirements. Damages resulting from failure to provide protection shall be repaired to the satisfaction of the Contracting Officer, at no additional cost to the Government.

3.3 PROCEDURES

3.3.1 Preheating and Interpass Heating

Temperatures shall be measured by a surface pyrometer or other suitable temperature-indicating means, accurate within plus or minus 25 degrees F. Heating and maintaining the proper temperature shall be accomplished, as applicable, by a furnace, by induction, by a gentle sootfree gas flame, by heat lamps, or by other suitable means capable of providing a reasonably uniform temperature throughout the part. When a gas flame is used for preheating, the area to be welded shall be brushed clean of any soot before tacking or welding.

3.3.2 Tacking

Tack welds shall be used as required. Wherever possible, the tack welds shall be spaced symmetrically along or around the joint. Tack welds shall be of sufficient size and length to permit ease of subsequent welding, yet ensure holding of the parts in place without cracking of the tack weld. Chipping or grinding shall be done to fair both ends of the tack welds in with base metal. Tack welds which have cracked shall be removed.

3.3.3 Weld Beads

Weld beads shall be terminated so as to avoid critical areas of the weld. Assemblies shall be welded in the flat position whenever practical. The back step and skip methods of welding shall be used to lessen warpage when necessary. Tabs on which the arc can be struck or extinguished may be used wherever practical to minimize porosity at the beginning and end of the weld bead. When manual welding multipass welds in circumferential joints in tubular sections or depositing continuous-circular-butt or fillet-type welds, the first layer, should be deposited by welds in opposite quadrants. All machine welding or circumferential or circular type joints shall be accomplished utilizing a continuous single pass or multiple stringer technique. All groove welded joints which are to be welded from both sides and which require 100 percent penetration shall be back gouged, as necessary, to ensure complete penetration of the joint.

3.3.4 Techniques

A maximum of two passes shall be deposited on the first side prior to the back gouging of the back side. The imbalance of passes between sides on double sided weld joints shall not exceed two. Back gouging to sound metal may be done by chisel, grinder, or air carbon-arc process. Gouged areas shall be smoothed to fair in with adjacent metal. Starts and stops of each weld bead shall be chipped or ground as necessary to remove cracks and visible porosity in the weld metal before depositing the subsequent weld bead. Ground areas shall fair in smoothly with the adjacent material. Weld beads shall not terminate in inside corners or in other critical areas such as changes in welding direction or sudden changes in section thickness. Return welds shall be continuously full size around the corner for a length equal to twice the weld size. End returns shall be indicated on design and detail drawings. Corner welds may be a fillet weld, a butt weld, or a combination thereof depending of forming or drawing requirements. Unless otherwise specified, there shall be complete penetration to the inside of the joint permitted for contouring and blending when an inside fillet weld is not specified. The outside of the joint shall blend smoothly with the adjacent metal and unless otherwise specified, sufficient metal shall be added to provide a suitable fillet or

reinforcement.

3.3.5 Postweld Heat Treatment

Stress relief or heat treatment of welded assemblies is optional unless specifically called for on the drawing.

3.4 IN-PROCESS REPAIR OF WELDMENTS

Weld repair shall be performed in accordance with [NASA-SPEC-5004](#). A weld repair is defined as any time defects in weld metal have been corrected.

3.5 QUALITY PROVISIONS

3.5.1 Inspection Requirements

Contractor shall perform all inspection requirements as specified. The Contractor shall use his independent inspection facilities and services acceptable to the Government. The provision in [NASA-SPEC-5004](#) that permits use of the Contractor's own inspectors is not applicable for this project. Inspection and test records shall be kept complete and provided to the Contracting Officer or his designated representative. Contracting Officer, or his designated representative, reserves the right to perform (at Government expense and without any increase in contract price) any or all of the inspections set forth in this specification to ensure that the end item conforms to the prescribed requirements. Test records, [inspection reports of shop welds](#), and [inspection reports of field welds](#) shall be kept complete and provided to the Contracting Officer or his designated representative within 1 week of the test being performed.

3.5.2 Inspection

Welds shall conform to [AWS D1.1/D1.1M](#) for carbon steel, [AWS D1.2/D1.2M](#) for aluminum, and [AWS D1.6/D1.6M](#) for stainless steel.

Weld inspection shall be performed in accordance with [NASA-SPEC-5004A](#).

Certain Class B welds, whose quality cannot be satisfactorily determined by the testing procedures set forth in "Inspection Requirements" and "Examination of Weldments," as determined by the Contracting Officer, shall be subject to radiographic inspection at Government expense but without increase in contract price.

3.5.3 Examination of Weldments

Joint design tolerance shall be inspected prior to welding to verify compliance with [AWS D1.1/D1.1M](#) for steel, [AWS D1.2/D1.2M](#) for aluminum, and [AWS D1.6/D1.6M](#) for stainless steel. Weld joint fit shall be inspected for accurate alignment to ensure complete and sound penetration of the root pass. Inspector shall also inspect each root pass to ensure complete penetration and soundness.

Visual inspection of all welds shall be accomplished using AWS fillet and butt weld gages.

Magnetic particle inspection of Class B carbon steel weldments shall be performed in accordance with the requirements of [AWS D1.1/D1.1M](#).

Radiographic inspection shall be conducted, when applicable, in accordance

with AWS D1.1/D1.1M or AWS D1.6/D1.6M.

3.5.4 Acceptance Criteria

Defects shall not be in excess of those specified in AWS D1.1/D1.1M and NASA-SPEC-5004 for steel, AWS D1.2/D1.2M for aluminum, and AWS D1.6/D1.6M for stainless steel. In case of doubt, the Contracting Officer may require coupons to be cut from base or weld material for destructive tests. When the material of weld does not meet the applicable specifications for strength and soundness, the Contractor shall be liable for the cost of the investigation of the defective area. When coupons are removed from any part of the structure, the members shall be repaired in a neat and workmanlike manner, with joints of proper type to develop the full strength of the members and joints cut, and with peening as necessary or as directed to relieve residual stress.

3.5.5 Inspection Record

An inspection record for each full penetration weld made in the field shall be prepared. Inspection records shall be made available to the Contracting Officer within 1 week of the test being performed.

3.6 POSTWELD CLEANING

All welded assemblies shall be cleaned free of oxides, flux, scale, weld splatter or other foreign matter prior to final inspection.

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SECTION 05 12 00

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 INSTITUTE OF STEEL CONSTRUCTION (AISC)

- AISC 201 (2006) AISC Certification Program for Structural Steel Fabricators
- AISC 325 (2005) Steel Construction Manual
- AISC 326 (2009) Detailing for Steel Construction
- AISC 360 (2005) Specification for Structural Steel Buildings

AMERICAN WELDING SOCIETY (AWS)

- AWS A2.4 (2012) Standard Symbols for Welding, Brazing and Nondestructive Examination
- AWS D1.1/D1.1M (2010; Errata 2010) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

- ASME B46.1 (2009) Surface Texture, Surface Roughness, Waviness and Lay

ASTM INTERNATIONAL (ASTM)

- ASTM A123/A123M (2009) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- ASTM A143/A143M (2007) Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
- ASTM A153/A153M (2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- ASTM A193/A193M (2012) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications

ASTM A276	(2010) Standard Specification for Stainless Steel Bars and Shapes
ASTM A307	(2010) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A325	(2010) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A36/A36M	(2008) Standard Specification for Carbon Structural Steel
ASTM A500/A500M	(2010a) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A529/A529M	(2005; R 2009) Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A563	(2007a) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A572/A572M	(2012) Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A6/A6M	(2012) Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM A992/A992M	(2011) Standard Specification for Structural Steel Shapes
ASTM F1554	(2007ae1) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
ASTM F436	(2011) Hardened Steel Washers
ASTM F844	(2007a) Washers, Steel, Plain (Flat), Unhardened for General Use

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

29 CFR 1926.756 Steel Erection; Beams and Columns

1.2 SYSTEM DESCRIPTION

Provide the structural steel system, including shop primer or 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 360 and AISC 325 except as modified in this contract.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Erection Plan, including description of temporary supports; G

Fabrication drawings including description of connections; G

SD-03 Product Data

Shop primer

Welding electrodes and rods

SD-06 Test Reports

Bolts, nuts, and washers

Supply the certified manufacturer's mill reports which clearly show the applicable ASTM mechanical and chemical requirements together with the actual test results for the supplied fasteners.

SD-07 Certificates

Steel

Bolts, nuts, and washers

Galvanizing

Pins and rollers

AISC Quality Certification

Welding procedures and qualifications

1.4 AISC QUALITY CERTIFICATION

Work shall be fabricated in an AISC certified Category Std fabrication plant.

1.5 QUALITY ASSURANCE

1.5.1 Drawing Requirements

Submit fabrication drawings for approval prior to fabrication. Prepare in accordance with AISC 326 and AISC 325. Fabrication drawings shall not be reproductions of contract drawings. Sign and seal fabrication drawings by

a professional engineer registered in the State of Florida. 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. Double connections that require an erection seat to comply with OSHA 29 CFR 1926.756(c)(1) shall be shown on the shop drawings, reviewed and approved by the structural engineer of record. Use AWS A2.4 standard welding symbols. Shoring and temporary bracing shall be designed and sealed by a Florida registered professional engineer and submitted for record purposes, with calculations, as part of the drawings. Member substitutions of details shown on the contract drawings shall be clearly highlighted on the fabrication drawings. Explain the reasons for any deviations from the contract drawings.

1.5.2 Certifications

1.5.2.1 Erection Plan

Indicate the sequence of erection, temporary shoring and bracing. The Plan shall be developed by a Florida registered professional engineer. The Contractor shall submit and receive written approval of the erection plan from the COTR prior to commencement of field erection.

1.5.2.2 Welding Procedures and Qualifications

See Specification section 05 05 23.00 98, METAL FASTENINGS.

Conform to all requirements specified in AWS D1.1/D1.1M.

PART 2 PRODUCTS

2.1 STEEL

2.1.1 Structural Steel

ASTM A36/A36M. ASTM A529/A529M, Grade 50

2.1.2 High-Strength Structural Steel

2.1.2.1 Low-Alloy Steel

ASTM A572/A572M, Grade 50. ASTM A992/A992M Grade 50.

2.1.3 Structural Shapes for Use in Building Framing

Wide flange shapes, ASTM A992/A992M.

2.1.4 Structural Steel Tubing

ASTM A500/A500M, Grade B.

2.1.5 Steel Pipe

ASTM A53/A53M, Type E or S, Grade B.

2.2 BOLTS, NUTS, AND WASHERS

Provide the following unless indicated otherwise.

2.2.1 Structural Steel, Steel Pipe

2.2.1.1 Bolts

ASTM A325, Type 1. The bolt heads and the nuts of the supplied fasteners must be marked with the manufacturer's identification mark, the strength grade and type specified by ASTM specifications.

2.2.1.2 Nuts

ASTM A563, Grade and Style for applicable ASTM bolt standard recommended.

2.2.1.3 Washers

ASTM F436 washers for ASTM A325 bolts.

2.2.2 High-Strength Structural Steel and Structural Steel Tubing

2.2.2.1 Bolts

ASTM A325, Type 1.

2.2.2.2 Nuts

ASTM A563, Grade and Style as specified in the applicable ASTM bolt standard.

2.2.2.3 Washers

ASTM F436, plain carbon steel.

2.2.3 Foundation Anchorage

2.2.3.1 Anchor Bolts

ASTM F1554 Gr 55, Class 1A. Stainless steel ASTM A193/A193M.

2.2.3.2 Anchor Nuts

ASTM A563, Grade A, hex style. Stainless steel ASTM A193/A193M.

2.2.3.3 Anchor Washers

ASTM F844. Stainless steel Type 316 conforming to ASTM A276.

2.2.3.4 Anchor Plate Washers

ASTM A36/A36M Stainless steel Type 316 conforming to ASTM A276.

2.3 STRUCTURAL STEEL ACCESSORIES

2.3.1 Welding Electrodes and Rods

AWS D1.1/D1.1M.

2.3.2 Pins and Rollers

ASTM A193/A193M, Grade B7, unless specified otherwise.

2.4 SHOP PRIMER

See Specification section 09 97 13.00 40.

2.5 GALVANIZING

ASTM A123/A123M or ASTM A153/A153M, as applicable, unless specified otherwise galvanize after fabrication where practicable.

2.6 FABRICATION

2.6.1 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. Affix embossed tags to hot-dipped galvanized members.

2.6.2 Shop Primer

2.6.2.1 Cleaning and Primer

See Specification section 09 97 13.00 40.

2.6.3 Surface Finishes

ASME B46.1 maximum surface roughness of 125 for pin, pinholes, and sliding bearings, unless indicated otherwise.

2.7 DRAINAGE HOLES

Adequate drainage holes shall be drilled to eliminate water traps. Hole diameter shall be 1/2 inch and location shall be indicated on the detail drawings. Hole size and location shall not affect the structural integrity.

PART 3 EXECUTION

3.1 FABRICATION

Fabrication shall be in accordance with the applicable provisions of AISC 325. Fabrication and assembly shall be done in the shop to the greatest extent possible. The fabricating plant shall be certified under the AISC 201 for Category STD.

Compression joints depending on contact bearing shall have a surface roughness not in excess of 500 micro inch as determined by ASME B46.1, and ends shall be square within the tolerances for milled ends specified in ASTM A6/A6M.

Structural steelwork, except surfaces of steel to be encased in concrete, surfaces to be field welded, surfaces to be fireproofed, and contact surfaces of friction-type high-strength bolted connections shall be prepared for painting in accordance with endorsement "P" of AISC 201 and primed with the specified paint.

Shop splices of members between field splices will be permitted only where indicated on the Contract Drawings. Splices not indicated require the

approval of the Contracting Officer.

3.2 INSTALLATION

3.3 ERECTION

- a. Erection of structural steel, shall be in accordance with the applicable provisions of **AISC 325** . Erection plan shall be reviewed, stamped and sealed by a licensed structural engineer.
- b. Do not splice truss top and bottom chords except as approved by the Contracting Officer. Chord splices shall occur at panel joints at approximately the third point of the span. The center of gravity lines of truss members shall intersect at panel points unless otherwise approved by the Contracting Officer. When the center of gravity lines do not intersect at a panel point, provisions shall be made for the stresses due to eccentricity. Cumber of trusses shall be **1/8 inch** in 10 feet unless otherwise indicated.

Provide for drainage in structural steel. After final positioning of steel members, provide full bearing under base plates and bearing plates using nonshrink grout. Place nonshrink grout in accordance with the manufacturer's instructions.

3.3.1 STORAGE

Material shall be stored out of contact with the ground in such manner and location as will minimize deterioration.

3.4 CONNECTIONS

Except as modified in this section, connections not detailed shall be designed in accordance with **AISC 360**. Build connections into existing work. Do not tighten anchor bolts set in concrete with impact torque wrenches. Punch, subpunch and ream, or drill bolt holes perpendicular to the surface of the member. Holes shall not be cut or enlarged by burning. Bolts, nuts, and washers shall be clean of dirt and rust, and lubricated immediately prior to installation.

3.4.1 Common Grade Bolts

ASTM A307 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, unless otherwise noted. 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 A325 bolts shall be fully tensioned to 70 percent of their minimum tensile strength, unless otherwise noted. Bolts shall be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, bolts shall then be fully tensioned, progressing from the most rigid part of a connection to the free edges.

3.5 GAS CUTTING

Use of gas-cutting torch in the field for correcting fabrication errors will not be permitted on any major member in the structural framing. Use

of a gas cutting torch will be permitted on minor members not under stress only after approval has been obtained from the Contracting Officer.

3.6 WELDING

See Specification section 05 05 23.00 98.

3.7 GALVANIZING REPAIR

See Specification section 09 97 13.00 40.

3.8 FIELD QUALITY CONTROL

Perform field tests, and provide labor, equipment, and incidentals required for testing, except that electric power for field tests will be furnished as set forth in Division 1. 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

See Specification section 05 05 23.00 98, METAL FASTENINGS.

3.8.2 High-Strength Bolts

3.8.2.1 Testing Bolt, Nut, and Washer Assemblies

Test a minimum of 3 bolt, nut, and washer assemblies from each mill certificate batch in a tension measuring device at the job site prior to the beginning of bolting start-up. Demonstrate that the bolts and nuts, when used together, can develop tension not less than the provisions specified in AISC 360, depending on bolt size and grade. The bolt tension shall be developed by tightening the nut. A representative of the manufacturer or supplier shall be present to ensure that the fasteners are properly used, and to demonstrate that the fastener assemblies supplied satisfy the specified requirements.

3.8.2.2 Inspection

Inspection procedures shall be in accordance with AISC 360. Confirm and report to the Contracting Officer that the materials meet the project specification and that they are properly stored. Confirm that the faying surfaces have been properly prepared before the connections are assembled. Observe the specified job site testing and calibration, and confirm that the procedure to be used provides the required tension. Monitor the work to ensure the testing procedures are routinely followed on joints that are specified to be fully tensioned.

The Contractor shall inspect bolted connections in accordance with AISC 360.

3.8.2.3 Testing

The Contractor shall have an independent testing agency perform nondestructive tests on 10 percent of the installed bolts to verify compliance with pre-load bolt tension requirements.

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 Contractor shall allow access for the Government to

perform the tests. 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 at the Contractor's expense. Retest new bolts after installation at the Contractor's expense.

3.8.3 Testing for Embrittlement

Follow [ASTM A143/A143M](#) guidelines for steel products hot-dip galvanized after fabrication to detect embrittlement.

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SECTION 05 30 00

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SECTION 05 30 00

STEEL DECKS

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG03-3 (2002; Suppl 2001-2004; R 2008)
Cold-Formed Steel Design Manual Set

ASTM INTERNATIONAL (ASTM)

ASTM A653/A653M (2011) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A780/A780M (2009) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

STEEL DECK INSTITUTE (SDI)

SDI 31 (2007) Design Manual for Composite Decks, Form Decks, and Roof Decks

SDI DDM03 (2004; Errata 2006; Add 2006) Diaphragm Design Manual; 3rd Edition

SDI DDP (1987; R 2000) Deck Damage and Penetrations

SDI MOC2 (2006) Manual of Construction with Steel Deck

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 20 (2002; E 2004) Zinc-Rich Primers (Type I, Inorganic, and Type II, Organic)

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. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fabrication and Installation Drawings; G

Metal Floor Deck Units; G

SD-03 Product Data

Accessories

Galvanizing Repair Paint

Mechanical Fasteners

Metal Floor Deck Units

Touch-Up Paint

SD-04 Samples

Metal Floor Deck Units

Flexible Closure Strips

Accessories

SD-05 Design Data

Metal Floor Deck Units

Submit manufacturer's design calculations, or applicable published literature for the structural properties of the proposed deck units.

1.3 QUALITY ASSURANCE

1.3.1 Metal Deck Units

Furnish metal deck units and accessory products from a manufacturer regularly engaged in manufacture of steel decking. Provide a 2 sq feet sample of decking material and each accessory to be used. Provide manufacturer's certificates attesting that the decking material meets the specified requirements.

1.3.2 Qualifications for Welding Work

See specification section 05 05 23.00 98, METAL FASTENERS

1.3.3 Fabrication and Installation Drawings

Submit fabrication drawings showing type and location of units, location and sequence of connections, bearing on supports, methods of anchoring, attachment of accessories, adjusting plate details, size and location of holes to be cut and reinforcement to be provided, the manufacturer's erection instructions and other pertinent details.

Submit templates, erection and installation drawings indicating thickness, type, grade, class of metal, and dimensions. Show construction details, reinforcement, anchorage, and installation with relation to the building construction.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver deck units to the site in a dry and undamaged condition. Store and handle steel deck in a manner to protect it from corrosion, deformation, and other types of damage. Do not use decking for storage or as working platform until units have been fastened into position. Exercise care not to damage material or overload decking during construction. The maximum uniform distributed storage load must not exceed the design live load. Stack decking on platforms or pallets and cover with weathertight ventilated covering. Elevate one end during storage to provide drainage. Maintain deck finish at all times to prevent formation of rust. Repair deck finish using Manufacturer's recommended touch-up paint. Replace damaged material.

1.5 DESIGN REQUIREMENTS FOR ROOF DECKS

1.5.1 Properties of Sections

Properties of metal roof deck sections must comply with engineering design width as limited by the provisions of [AISI SG03-3](#).

1.5.2 Allowable Loads

Indicate total uniform dead and live load for detailing purposes.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Steel Sheet

Flat rolled carbon steel sheets of structural quality, thickness not less than indicated before coating, meeting the requirements of [AISI SG03-3](#), except as modified herein.

2.1.2 Steel Coating

See specification section [09 97 13.00 98](#), STEEL COATINGS.

2.1.3 Mixes

2.1.3.1 [Galvanizing Repair Paint](#) for Floor Decks

Provide a high-zinc-dust content paint for touch-up repair and regalvanizing welds in galvanized steel conforming to [ASTM A780/A780M](#).

2.2 [ACCESSORIES](#)

Provide accessories of same material as deck, unless specified otherwise. Provide manufacturer's standard type accessories, as specified.

2.2.1 Adjusting Plates

Provide adjusting plates, or segments of deck units, of same thickness and configuration as deck units in locations too narrow to accommodate full size units. Provide factory cut plates of predetermined size where possible.

2.2.2 End Closures

Fabricated of sheet metal by the deck manufacturer. Provide end closures minimum 0.028 inch thick to close open ends at exposed edges of floors, and openings through deck.

2.2.3 Sheet Metal Collar

Where deck is cut for passage of pipes, ducts, columns, etc., and deck is to remain exposed, provide a neatly cut sheet metal collar to cover edges of deck. Do not cut deck until after installation of supplemental supports.

2.2.4 Cover Plates

Sheet metal to close panel edge and end conditions, and where panels change direction or butt.

Fabricate cover plates for abutting floor deck units from the specified structural-quality steel sheets not less than nominal thickness of deck units before galvanizing. Provide 6 inch wide cover plates and form to match the contour of the floor deck units.

2.2.5 Access Hole Covers

Sheet metal, minimum 0.0474 inch thick.

2.2.6 Hanger

Metal deck is not to be used for hanging utilities.

2.2.7 Mechanical Fasteners

Provide mechanical fasteners, for anchoring the deck to structural supports and adjoining units that are designed to meet the loads indicated. Provide positive locking-type fasteners, as approved by the Contracting Officer.

2.2.8 Miscellaneous Accessories

Furnish the manufacturer's standard accessories to complete the deck installation. Furnish metal accessories of the same material as the deck and with the minimum design thickness as follows: saddles, 0.0474 inch welding washers, 0.0598 inch cant strip, 0.0295 inch other metal accessories, 0.0358 inch unless otherwise indicated. Accessories must include but not be limited to saddles, welding washers, fasteners, cant strips, butt cover plates, underlapping sleeves, and ridge and valley plates.

2.3 FABRICATION

Furnish one sample of each type of Metal Floor Deck Units used to illustrate the actual cross section dimensions and configuration.

Furnish one sample of each type Flexible Closure Strips, 12 inch long.

2.3.1 Metal Floor Deck Units

2.3.1.1 Cellular Metal Floor Deck Units

Fabricate units from the specified structural-quality steel sheets. Provide nominal thickness of the steel sheets, before galvanizing, a minimum

3/16 inch for the upper element of the floor deck unit, and a minimum 16-gage for the lower element of the floor deck unit. Attach 3/16 inch top plate seams to metal deck using a complete penetration weld.

Provide sufficient welds, forming the steel sheets into the cellular floor deck unit, to develop the full horizontal shear at the plane where the steel sheets are joined.

Cellular metal floor deck units must be fluted section cells combined on a flat plate having interlocking type sidelaps. Provide depth, width of unit, number of cells per unit, and width of cells as follows:

DEPTH MINIMUM (inch)	WIDTH OF UNIT NOMINAL (inch)	NUMBER OF CELLS PER UNIT	WIDTH OF CELLS NOMINAL (inch)
1-1/2	36	6	3-5/8

Cellular metal floor deck units must be fluted section cells combined with a matching fluted bottom section having interlocking type sidelaps. Provide depth, width of unit, number of cells per unit, and width of cells as follows:

Conform to SDI 31 for deck units. Conform to ASTM A653/A653M, SQ, Grade 230, Grade 33; for formed cellular decking and accessories. Use panels of maximum possible lengths to minimize end laps. Fabricate deck units in lengths to span 3 or more supports with flush, telescoped, or nested 2 inch laps at ends, and interlocking, or nested side laps, unless otherwise indicated. Deck with cross-sectional configuration differing from the units indicated may be used, provided that the properties of the proposed units, determined in accordance with AISI SG03-3, are equal to or greater than the properties of the units indicated and that the material will fit the space provided without requiring revisions to adjacent materials or systems.

2.3.2 Length of Floor Deck Units

Provide floor deck units of sufficient length to span three or more spacings where possible.

2.3.3 Touch-Up Paint

Provide touch-up paint for zinc-coated units of an approved galvanizing repair paint with a high-zinc dust content. Touch-up welds with paint conforming to SSPC Paint 20 in accordance with ASTM A780/A780M. Maintain finish of deck units and accessories by using touch-up paint whenever necessary to prevent the formation of rust.

For floor decking installation, wire brush, clean, and touchup paint the scarred areas on the top and bottom surfaces of the metal floor decking and on the surface of supporting steel members. Include welds, weld scars, bruises, and rust spots for scarred areas. Touched up the galvanized surfaces with galvanizing repair paint. Touch up the painted surfaces with paint for the repair of painted surfaces.

PART 3 EXECUTION

3.1 EXAMINATION

Prior to installation of decking units and accessories, examine worksite to verify that as-built structure will permit installation of decking system without modification.

3.2 INSTALLATION

Install steel deck units in accordance with [SDI 31](#), [SDI DDMO3](#) and approved shop drawings. Place units on structural supports, properly adjusted, leveled, and aligned at right angles to supports before permanently securing in place. Damaged deck and accessories including material which is permanently stained or contaminated, deformed, or with burned holes shall not be installed. Extend deck units over three or more supports unless absolutely impractical. Report inaccuracies in alignment or leveling to the Contracting Officer and make necessary corrections before permanently anchoring deck units. Locate deck ends over supports only. Do not use unanchored deck units as a work or storage platform. Permanently anchor units placed by the end of each working day. Do not support suspended ceilings, light fixtures, ducts, utilities, or other loads by steel deck unless indicated. Distribute loads by appropriate means to prevent damage.

3.2.1 Attachment

Immediately after placement and alignment, and after correcting inaccuracies, permanently fasten steel deck units to structural supports and to adjacent deck units and to adjacent deck units with screws, as indicated on the design drawings and in accordance with manufacturer's recommended procedure and [SDI 31](#). Clamp or weight deck units to provide firm contact between deck units and structural supports while performing fastening. Attachment of adjacent deck units by button-punching is prohibited.

3.2.1.1 Fastening

Anchor deck to structural supports and adjoining units with mechanical fasteners, per approved fabrication and installation drawings.

3.2.2 Openings

Cut or drill all holes and openings required and be coordinated with the drawings, specifications, and other trades. Frame and reinforce openings through the deck in conformance with [SDI DDP](#). Reinforce holes and openings [6 to 12 inch](#) across by [0.0474 inch](#) thick steel sheet at least [12 inch](#) wider and longer than the opening and be fastened to the steel deck at each corner of the sheet and at a maximum of [6 inch](#) on center. Reinforce holes and openings larger than [12 inch](#) by steel channels or angles installed perpendicular to the steel joists and supported by the adjacent steel joists. Install steel channels or angles perpendicular to the deck ribs and fasten to the channels or angles perpendicular to the steel floor beams. Deck manufacturer shall approve holes or openings larger than [6 inch](#) in diameter prior to drilling or cutting.

3.2.3 Deck Damage

[SDI MOC2](#), for repair of deck damage.

3.2.4 Accessory Installation

3.2.4.1 Adjusting Plates

Install as shown on shop drawings.

3.2.4.2 End Closures

Provide end closure to close open ends of cells at floor edges and openings in deck.

3.2.4.3 Access Hole Covers

Provide access whole covers to seal holes cut in decking to facilitate welding of the deck to structural supports.

3.2.4.4 Hangers

Do not attach hangers to metal deck.

3.3 CLOSURE STRIPS FOR DECKS

Provide closure strips at open, uncovered ends and edges of the decking. Install closure strips in position in a manner to provide a weathertight installation.

3.4 FIELD QUALITY CONTROL

Inspect the decking top surface for distortion after installation. Verify distortion by placing a straight edge across three adjacent top flanges. The maximum allowable gap between the straight edge and the top flanges is $1/16$ inch; when gap is more than $1/16$ inch, provide corrective measures or replacement. Reinspect decking after performing corrective measures or replacement.

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SECTION 05 50 13

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SECTION 05 50 13

MISCELLANEOUS METAL FABRICATIONS

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 303 (2010) Code of Standard Practice for Steel Buildings and Bridges

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.3 (2006) Operations - Safety Requirements for Powder Actuated Fastening Systems

ASME INTERNATIONAL (ASME)

ASME B18.2.1 (2010) Square and Hex Bolts and Screws (Inch Series)

ASME B18.2.2 (2010) Standard for Square and Hex Nuts

ASME B18.21.1 (2009) Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series)

ASME B18.6.2 (1998; R 2010) Slotted Head Cap Screws, Square Head Set Screws, and Slotted Headless Set Screws: Inch Series

ASME B18.6.3 (2010) Machine Screws, Tapping Screws, and Machine Drive Screws (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M (2009) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A153/A153M (2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A283/A283M (2003; R 2007) Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates

ASTM A307 (2010) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile

Strength

ASTM A325	(2010) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A36/A36M	(2008) Standard Specification for Carbon Structural Steel
ASTM A47/A47M	(1999; R 2009) Standard Specification for Ferritic Malleable Iron Castings
ASTM A500/A500M	(2010a) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A529/A529M	(2005; R 2009) Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A563	(2007a) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A653/A653M	(2011) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A786/A786M	(2005; R 2009) Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates
ASTM A924/A924M	(2010a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B108/B108M	(2011) Standard Specification for Aluminum-Alloy Permanent Mold Castings
ASTM B209	(2010) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B221	(2012) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B26/B26M	(2011) Standard Specification for Aluminum-Alloy Sand Castings
ASTM C1513	(2012) Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections

ASTM D2047

(2011) Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine

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. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Cover plates and frames, installation drawings; G

Submit fabrication drawings showing layout(s), connections to structural system, and anchoring details as specified in AISC 303.

Submit templates, erection and installation drawings indicating thickness, type, grade, class of metal, and dimensions. Show construction details, reinforcement, anchorage, and installation with relation to the building construction.

SD-03 Product Data

Cover plates and frames

1.3 QUALIFICATION OF WELDERS

See Specification section 05 05 23.00 98.

1.4 DELIVERY, STORAGE, AND PROTECTION

Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove and replace damaged items with new items.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Structural Carbon Steel

ASTM A36/A36M. ASTM A529/A529M, Grade 50.

2.1.2 Structural Tubing

ASTM A500/A500M.

2.1.3 Steel Pipe

ASTM A53/A53M, Type E or S, Grade B.

2.1.4 Fittings for Steel Pipe

Standard malleable iron fittings ASTM A47/A47M.

2.1.5 Floor Plates, Patterned

Floor plate [ASTM A786/A786M](#). Steel plate shall not be less than 14 gage.

2.1.6 Anchor Bolts

[ASTM A325](#). Where exposed, shall be of the same material, color, and finish as the metal to which applied.

2.1.6.1 Expansion Anchors, Sleeve Anchors and Adhesive Anchors

Provide as indicated on contract drawings.

2.1.6.2 Lag Screws and Bolts

[ASME B18.2.1](#), type and grade best suited for the purpose.

2.1.6.3 Toggle Bolts

[ASME B18.2.1](#).

2.1.6.4 Bolts, Nuts, Studs and Rivets

[ASME B18.2.2](#) or [ASTM A307](#). Nuts that do not conform to [ASTM A563](#) shall be flex-top expanding locknuts.

2.1.6.5 Powder Actuated Fasteners

Follow safety provisions of [ASSE/SAFE A10.3](#).

2.1.6.6 Screws

[ASME B18.2.1](#), [ASME B18.6.2](#), [ASME B18.6.3](#) and [ASTM C1513](#).

2.1.6.7 Washers

Provide plain washers to conform to [ASME B18.21.1](#). Provide beveled washers for American Standard beams and channels, square or rectangular, tapered in thickness, and smooth. Provide lock washers to conform to [ASME B18.21.1](#).

2.1.7 Aluminum Alloy Products

Conform to [ASTM B209](#) for sheet plate, [ASTM B221](#) for extrusions and [ASTM B26/B26M](#) or [ASTM B108/B108M](#) for castings, as applicable. Provide aluminum extrusions at least 1/8 inch thick and aluminum plate or sheet at least 0.050 inch thick.

2.2 FABRICATION FINISHES

2.2.1 Galvanizing

Hot-dip galvanize items specified to be zinc-coated, after fabrication where practicable. Galvanizing: [ASTM A123/A123M](#), [ASTM A153/A153M](#), [ASTM A653/A653M](#) or [ASTM A924/A924M](#), G90, as applicable.

2.2.2 Galvanize

Anchor bolts, grating fasteners, washers, and parts or devices necessary for proper installation, unless indicated otherwise.

2.2.3 Repair of Zinc-Coated Surfaces

See Specification section 09 97 13.00 40.

2.2.4 Steel Coatings

See Specification section 09 97 13.00 40.

2.2.5 Nonferrous Metal Surfaces

Protect by plating, anodic, or organic coatings.

2.2.6 Aluminum Surfaces

2.2.6.1 Surface Condition

Before finishes are applied, remove roll marks, scratches, rolled-in scratches, kinks, stains, pits, orange peel, die marks, structural streaks, and other defects which will affect uniform appearance of finished surfaces.

2.2.6.2 Aluminum Finishes

See specification section 09 97 13.00 40, STEEL COATINGS.

2.3 COVER PLATES AND FRAMES

Fabricate cover plates of 1/4 inch thick rolled steel weighing not more than 100 pounds per plate with a selected raised pattern nonslip top surface, carbon steel conforming to ASTM A283/A283M having a minimum static coefficient of friction of 0.50 when tested in accordance with ASTM D2047. On wearing surfaces provide aluminum oxide or silicon carbide. Plate shall be galvanized. Frames shall be structural steel shapes and plates, securely fastened to the structure as indicated. Miter and weld all corners. Butt joint straight runs. Allow for expansion on straight runs over 15 feet. Provide flush drop handles for removal formed from 1/4 inch round stock where indicated. Remove sharp edges and burrs from cover plates and exposed edges of frames. Weld all connections and grind top surface smooth. Weld bar stops every six inches. Provide 1/8 inch clearance at edges and between cover plates.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Install items at locations indicated, according to manufacturer's instructions. Verify all measurements and take all field measurements necessary before fabrication. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and harmonize with the material to which fastenings are applied. Include materials and parts necessary to complete each item, even though such work is not definitely shown or specified. Poor matching of holes for fasteners shall be cause for rejection. Conceal fastenings where practicable. Thickness of metal and details of assembly and supports shall provide strength and stiffness. Form joints exposed to the weather shall be formed to exclude water. Items listed below require additional procedures.

3.2 WORKMANSHIP

Provide miscellaneous metalwork that is well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Provide continuous welding along the entire area of contact except where tack welding is permitted. Do not tack weld exposed connections of work in place and ground smooth. Provide a smooth finish on exposed surfaces of work in place and unless otherwise approved, flush exposed riveting. Mill joints where tight fits are required. Corner joints shall be coped or mitered, well formed, and in true alignment. Accurately set work to established lines and elevations and securely fastened in place. Install in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

3.3 ANCHORAGE, FASTENINGS, AND CONNECTIONS

Provide anchorage where necessary for fastening miscellaneous metal items securely in place. Include for anchorage not otherwise specified or indicated slotted inserts, expansion shields, and powder-driven fasteners, when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; through bolts, lag bolts, and screws for wood. Do not use wood plugs in any material. Provide non-ferrous attachments for non-ferrous metal. Make exposed fastenings of compatible materials, generally matching in color and finish, to which fastenings are applied. Conceal fastenings where practicable.

3.4 BUILT-IN WORK

Form for anchorage metal work built-in with concrete or masonry, or provide with suitable anchoring devices as indicated or as required. Furnish metal work in ample time for securing in place as the work progresses.

3.5 WELDING

See Specification Section 05 05 23.00 98.

3.6 FINISHES

3.6.1 Dissimilar Materials

Where dissimilar metals are in contact, protect surfaces with teflon isolator material to prevent galvanic or corrosive action.

3.7 COVER PLATES AND FRAMES

Install the tops of cover plates and frames flush with floor.

-- End of Section --

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DIVISION 05 - METALS

SECTION 05 52 00

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SECTION 05 52 00

METAL RAILINGS

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2010; Errata 2010) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME B18.2.1 (2010) Square and Hex Bolts and Screws (Inch Series)

ASME B18.21.1 (2009) Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM A153/A153M (2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A283/A283M (2003; R 2007) Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates

ASTM A36/A36M (2008) Standard Specification for Carbon Structural Steel

ASTM A500/A500M (2010a) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

ASTM A53/A53M (2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM B429/B429M (2010e1) Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM AMP 521 (2001) Pipe Railing Manual

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

29 CFR 1910.23

Guarding Floor and Wall Openings and Holes

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Fabrication Drawings; G

Iron and Steel Hardware; G

Steel Shapes, Plates, Bars and Strips

SD-03 Product Data

Structural Steel Plates, Shapes, and Bars; G

Structural Steel Tubing; G

Steel Railings; G

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Portable Railings; G

Anchorage and Fastening Systems; G

SD-08 Manufacturer's Instructions

Installation Instructions; G

1.3 QUALITY ASSURANCE

1.3.1 Welding Procedures

Section 05 05 23.00 98 WELDING, STRUCTURAL applies to work specified in this section.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide complete, detailed fabrication and installation drawings for all iron and steel hardware, and for all steel shapes, plates, bars and strips used in accordance with the design specifications referenced in this section.

Pre-assemble items in the shop to the greatest extent possible. Disassemble units only to the extent necessary for shipping and handling. Clearly mark units for reassembly and coordinated installation.

For the fabrication of work exposed to view, use only materials that are smooth and free of surface blemishes, including pitting, seam marks, roller

marks, rolled trade names, and roughness. Remove blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and application of surface finishes, including zinc coatings.

2.2 GENERAL FABRICATION

Provide fabrication drawings including railings detail plans and elevations at not less than 1 inch to 1 foot. Provide details of sections and connections at not less than 3 inches to 1 foot. Also detail setting drawings, diagrams, templates for installation of anchorages, including anchor bolts, and miscellaneous metal items having integral anchors.

Use materials of size and thicknesses indicated or, if not indicated, of required size and thickness to produce adequate strength and durability in finished product for intended use. Work materials to dimensions indicated on approved detail drawings, using proven details of fabrication and support. Use type of materials indicated or specified for the various components of work.

Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ensure all exposed edges are eased to a radius of approximately 1/32 inch. Bend metal corners to the smallest radius possible without causing grain separation or otherwise impairing the work.

Weld corners and seams continuously and in accordance with the recommendations of AWS D1.1/D1.1M. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.

Form exposed connections with hairline joints that are flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of the type indicated or, if not indicated, use Phillips flathead (countersunk) screws or bolts.

Provide anchorage of the type indicated and coordinated with the supporting structure. Fabricate anchoring devices and space as indicated and as required to provide adequate support for the intended use of the work.

Use hot-rolled steel bars for work fabricated from bar stock unless work is indicated or specified to be fabricated from cold-finished or cold-rolled stock.

2.3 STRUCTURAL STEEL PLATES, SHAPES AND BARS

Provide structural-size shapes and plates, except plates to be bent or cold-formed, conforming to ASTM A36/A36M, unless otherwise noted.

Provide steel plates, to be bent or cold-formed, conforming to ASTM A283/A283M, Grade C.

Provide steel bars and bar-size shapes conforming to ASTM A36/A36M, unless otherwise noted.

2.4 STRUCTURAL STEEL TUBING

Provide structural steel tubing, hot-formed, welded or seamless, conforming to ASTM A500/A500M, Grade B, unless otherwise noted.

2.5 STEEL PIPE

Provide pipe conforming to [ASTM A53/A53M](#), type as selected, Grade B; primed finish, unless galvanizing is required; standard weight (Schedule 40).

2.6 FASTENERS

Provide galvanized zinc-coated fasteners in accordance with [ASTM A153/A153M](#) suitable for exterior applications. Select fasteners for the type, grade, and class required for the installation of railing items.

Provide square-head lag bolts conforming to [ASME B18.2.1](#).

Provide plain round, general-assembly-grade, carbon steel washers conforming to [ASME B18.21.1](#).

Provide helical spring, carbon steel lockwashers conforming to [ASME B18.2.1](#).

2.7 PROTECTIVE COATING

Prepare steelwork as indicated in accordance with Section [09 97 13.00 98](#) STEEL COATINGS.

2.8 STEEL RAILINGS

Design guardrails to resist a concentrated load of [200 lbs](#) in any direction at any point of the top of the rail or [20 lbs per foot](#) applied horizontally to top of the rail, whichever is more severe. [NAAMM AMP 521](#), provide the same size rail and post.

2.8.1 Steel Guardrails

Provide steel rails, including steel pipe conforming to [ASTM A53/A53M](#) or structural tubing conforming to [ASTM A500/A500M](#), Grade A or B of equivalent strength. Provide steel railings of [1 1/2 inches](#) nominal size, as shown on the drawings.

- a. Fabrication: Joint posts, rail, and corners by the following method:

- (1) Mitered and welded joints made by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Butt railing splices and reinforce them by a tight fitting interior sleeve not less than [6 inches](#) long.

- b. Provide gates as indicated.

Provide toeboard between railing posts where indicated, consisting of [1/8-inch](#) steel flat bar not less than [4 inches](#) high. Secure toeboard as indicated.

2.9 ALUMINUM RAILINGS

Provide railings consisting of [1 1/2 inch](#) nominal schedule 80 per [ASTM B429/B429M](#). Ensure all fasteners are type 316 stainless steel. Design guardrails to resist a concentrated load of 200 lbs. in any direction at any point of the top of the rail or 20 lbs. per foot applied horizontally to top of the rail, whichever is more severe.

- a. Fabrication: Provide jointing by the following method:
 - (1) Mitred and welded joints made by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Do not splice rails.
- b. Removable railing sections: Provide removable railing sections as indicated. Provide toeboard between railing post where indicated.

2.10 PORTABLE RAILINGS

Provide portable free-standing guardrail system for railings complying with [29 CFR 1910.23](#). Railings shall be capable of withstanding a concentrated load of 200 lbs. applied to the top rail at any point and in any direction. Railings shall be capable of withstanding a uniform load of 50 pounds per linear foot (4) applied to the top rail horizontally with a simultaneous load of 100 lbs. per lf applied vertically downward.

2.11 GATES

Gate to be fabricated of galvanized steel. Provide self-closing hinge and latch. Basis of design:

Hollaender, Item Number 51216 or 51105

PART 3 EXECUTION

3.1 INSTALLATION INSTRUCTIONS

Submit manufacturer's [installation instructions](#) for the following products to be used in the fabrication of rail work:

[Anchorage and fastening systems](#)

Provide complete, detailed fabrication and installation drawings for all [iron and steel hardware](#), and for all [steel shapes, plates, bars and strips](#) used in accordance with the design specifications referenced in this section.

3.2 PREPARATION

Adjust railings prior to securing in place to ensure proper matching at butting joints and correct alignment throughout their length. Space posts not more than [5 feet](#) on center, unless otherwise indicated on the drawings. Plumb posts in each direction. Secure posts and rail ends as shown on the drawings.

Anchor posts to steel with steel oval flanges, angle type or floor type as required by conditions, welded to posts and welded to the steel supporting members.

Anchor rail ends to steel with steel oval or round flanges welded to tail ends and welded to the structural steel members.

Install toeboards where indicated. Make splices, where required, at expansion joints. Install removable sections as indicated.

3.3 STEEL GUARDRAIL

Install steel rail by welding post to stringers or structural steel frame work with partial penetration welds. Weld toeboard to post.

3.4 ALUMINUM GUARDRAIL

Install aluminum rail to base structure as shown on the drawings. Where aluminum or alloy fittings or extrusions are to be in contact with dissimilar metals provide isolation as noted on the drawings.

3.5 FIELD WELDING

Ensure procedures of manual shielded metal arc welding, appearance and quality of welds made, and methods used in correcting welding work comply with AWS D1.1/D1.1M.

3.6 PAINTING

Finish steel rails in accordance with Section 09 97 13.00 98, STEEL COATINGS.

Finish aluminum rails in accordance with Section 09 90 00.00 98, GENERAL COATINGS.

Finish portable rails with epoxy powder coat, color = safety yellow.

Immediately after installation, clean field welds, bolted connections, abraded areas and touch up finish in accordance with Sections 09 90 00.00 98 GENERAL COATINGS and 09 97 13.00 98 STEEL COATINGS as required.

-- End of Section --

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SECTION 09 90 00.00 98

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SECTION 09 90 00.00 98

PAINTING AND COATING

PART 1 GENERAL

This specification section includes painting requirements for architectural surfaces such as aluminum guardrails. For additional coating requirements refer to Section 09 97 13.00 98 STEEL COATINGS

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 920 (2011) Standard Specification for Elastomeric Joint Sealants

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 1 (1982; E 2004) Solvent Cleaning

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD-595 (Rev C) Colors Used in Government Procurement

1.2 SUBMITTALS

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

SD-01 Preconstruction Submittals

Material Safety Data Sheets shall be submitted to the Contracting Officer.; G

Manufacturer's Standard Color Charts shall be submitted for architectural painting materials in accordance with the paragraph entitled, "General," of this section.; G

A Safety Plan; G shall be submitted to the Contracting Officer.

SD-03 Product Data

Manufacturer's catalog data shall be submitted for the following items including designated name, formula or specification number, manufacturer's instructions and name of manufacturer. Data shall include detailed analysis of each coating material required, with constituents measured as percentages of the total weight of coating; and details of application, thinning, and average

coverage per gallon.

Abrasive Blasting Material; G
Sealant Compound; G
Inhibitive Polyamide Epoxy; G
Aliphatic Polyurethane; G

Material, Equipment, and Fixture Lists
Mix Designs; G

SD-08 Manufacturer's Instructions

Manufacturer's Instructions; G shall be submitted for architectural coatings in accordance with paragraph entitled, "General," of this section.

1.3 DELIVERY, HANDLING AND STORAGE

Materials shall be delivered in their original, unbroken containers bearing the manufacturer's name and product identification.

All paint materials, thinners, and cleaners shall be stored in tightly closed containers in a covered, well-ventilated area where they will not be exposed to excessive heat, sparks, flame, or direct sunlight. Water-based materials shall be protected against freezing.

Material Safety Data Sheets shall be submitted by the contracting officer.

1.4 GENERAL

A Safety Plan shall be submitted for protective coating systems in accordance with OSHA regulations. See paragraph 3.1.1 for requirements.

Material, Equipment, and Fixture Lists shall be submitted for manufacturer's style or catalog numbers, specification and drawing reference numbers and warranty information for the Protective Coatings Systems fabrication site.

Manufacturer's Standard Color Charts shall be submitted showing manufacturer's standard finish colors. Three color chips of each color shall also be submitted.

Mix Designs shall be submitted for each type of protective coating including a complete list of ingredients and admixtures. Applicable test report shall verify that the mix has been successfully tested and meets design requirements.

1.5 CONTRACTOR PERSONNEL QUALIFICATION

Personnel assigned to the work shall be certified by the Contractor to have had adequate previous experience in the successful application of paints and coatings similar to those specified.

1.6 WARRANTY

Contractor shall guarantee all work against defects in labor and material for a period of one year.

PART 2 PRODUCTS

2.1 GENERAL

The following are suggested paint manufacturers and their products that have been tested and approved by the government. Substitute paints are not acceptable. All thinners and cleaners shall be products of the coating manufacturer. Primer and finish coats of the paint system shall be products of the same manufacturer.

Manufacturer's Instructions shall be submitted for architectural coatings showing printed instructions covering thinning, mixing, handling, and applying.

2.2 ABRASIVE BLASTING MATERIAL

Abrasive Blasting Material for aluminum surfaces shall be walnut shells, plastic media or approved equivalent.

2.3 SEALANT COMPOUND

Sealant Compound shall be a self-curing, single component, polysulfide-rubber type conforming to ASTM C 920 Type S, Grade NS, Class 25, use NT, A and O. Sealant shall be gray in color and capable of being applied into the joint with a caulking gun.

2.4 EPOXY

An Inhibitive Polyamide Epoxy shall be selected from the following listing.

All coatings thinners, and cleaners shall be the product of the same manufacturer.

Section I. Materials with Greater than 420 Grams/Liter (3.5 Pounds/Gallon) VOC (SB is Solvent-Based and WB is Water-Based):

<u>Epoxy</u>	<u>Manufacturer</u>
Devran 201 (SB)	International Paint LLC/Devoe Coatings 6001 Antoine Drive Houston, TX 77091 (713) 682-1711 (800) 654-2616 www.international-pc.com
PittGuard 95-245 (SB)	PPG Industries, Inc. One PPG Place Pittsburgh, PA 15272 (800) 722-4509 <u>www.ppg.com</u>

Section II. Materials with Less than 340 Grams/Liter (2.8 Pounds/Gallon) VOC (SB is Solvent-Based and WB is Water-Based):

<u>Epoxy</u>	<u>Manufacturer</u>
Amerlock 400 (SB)	PPG Industries, Inc.

<u>Epoxy</u>	<u>Manufacturer</u>
Amerlock 2/400 (SB)* (800) 722-4509	One PPG Place Pittsburgh, PA 15272 www.ppgamercoatus.ppgpmc.com
Carboguard 893 (SB) Carbomastic 15 (SB) St. Louis, MO 63146	Carboline Company 2150 Schuetz Road (314) 644-1000 www.carboline.com
Devran201H (SB)	International Paint LLC/Devoe Coatings 6001 Antoine Drive Houston, TX 77091 (713) 682-1711 (800) 654-2616 www.international-pc.com
Macropoxy 646-100	Sherwin-Williams 101 Prospect Avenuet Cleveland, OH 44115 (800) 336-1110 www.sherwin-williams.com
Interseal 670HS (SB)	International Paint LLC 6001 Antoine Drive Houston, TX 77091 (713) 682-1711 (800) 654-2616 www.international-pc.com

2.5 POLYURETHANE

An **Aliphatic Polyurethane** finish coat shall be selected from the following listing and all coatings, thinners, and cleaners shall be the product of the same manufacturer. Each successive coating shall be of a contrasting color to provide a visual assurance of complete coverage.

Section I. Materials with Greater than 420 Grams/Liter (3.5 Pounds/Gallon) VOC (SB is Solvent-Based and WB is Water-Based):

<u>Topcoat (Type)</u>	<u>Manufacturer</u>
Devthane 359 (SB) Devthane 369 (SB) Devthanw 379 UVA (SB)	International Paint LLC/Devoe Coatings 6001 Antoine Drive Houston, TX 77091 (713) 682-1711 (800) 654-2616 www.international-pc.com
PittThane 95-812 (SB)	PPG Industries, Inc. One PPG Place Pittsburgh, PA 15272 (800) 722-4509 www.ppg.com

Section II. Materials with Less than 340 Grams/Liter (2.8 Pounds/Gallon)
VOC (SB is Solvent-Based and WB is Water-Based):

<u>Topcoat (Type)</u>	<u>Manufacturer</u>
Amercoat 450HS (SB) PSX1001 (SB) Americoat 450H (SB) Amercoat 335 (SB)	PPG Industries, Inc. One PPG Place Pittsburgh, PA 15272 (800) 722-4509 www.ppg.com
Carbothane 134HS (SB) Carboacrylic 3359 (WB) Carboxane 2000 (SB)	Carboline Company 2150 Schuetz Road St. Louis, MO 63146 (314) 664-1000 www.carboline.com
Devthane 379 (SB)	International Paint LLC/Devoe Coatings 6001 Antoine Drive Houston, TX 77091 (713) 682-1711 (800) 654-2616 www.international-pc.com
Hydrogloss WB (WB) Hi-Solids Poly-CA (SB)	Sherwin-Williams 101 Prospect Avenue Cleveland, OH 44115 (800) 336-1110
Interfine 979 (SB) Interfine 878 (SB)	International Paint LLC 6001 Antoine Drive Houston, TX 77091 (713) 682-1711 www.international-pc.com

2.6 APPROVED SYSTEMS

All coatings, thinners, and cleaners shall be the product of the same manufacturer. Each successive coating shall be of a contrasting color to provide a visual assurance of complete coverage.

<u>Primer (Type)</u>	<u>Base Coat (Type)</u>	<u>Topcoat (Type)</u>	<u>Manufacturer</u>
N/A	Devran 201(SB) Louisville, KY 40207	Devthane 359(SB)	ICI Devoe Coatings 4000 Dupont Circle (800) 654-2616 www.devoecoatings.com
N/A	Devran 201(SB) \	Devthane 369(SB)	www.devoecoatings.com
N/A	Devran 201(SB)	Devthane 379UVA(SB)	
N/A	PittGuard 95-245(SB)	PittThane 95-812(SB)	PPG Industries, Inc. One PPG Place Pittsburgh, PA 15272 (800) 722-4509 www.ppg.com
N/A	Amerlock 400(SB) One PPG Place Pittsburgh, PA 15272	Amercoat 450(SB)	PPG Industries, Inc. (800) 722-4509 www.ppgamercoatus.ppgpmc.com
N/A	Amerlock 2/400 (SB)	Amercoat 450H(SB)	
N/A	Amerlock 2/400 (SB)	Amercoat 335(SB)	
N/A	Carboguard 893(SB)	Carbothane 134HS(SB)	Carboline Co. 2150 Schuetz Road St. Louis, MO 63146 (314) 644-1000 www.carboline.com
N/A	Carbomastic 15(SB)	Carboacrylic 3359(WB)	
N/A	Carboguard 893(SB)	Carboacrylic 3359(WB)	
N/A	Devran 201H(SB)	Devthane 379(SB)	ICI Devoe Coatings 4000 Dupont Circle Louisville, KY 40207 (800) 654-2616 www.devoecoatings.com
Sherwin-Williams			
N/A	Macropoxy 646-100(SB)	Hydrogloss WB(WB)	101 Prospect Ave. Cleveland, OH 44115 (800) 336-1110
N/A	Macropoxy	Hi-Solids Poly-CA(SB)	www.sherwin-williams.com
N/A	Interseal	Interfine 979(SB)	International Paint 6001 Antoine Drive Houston, TX 77091 (713) 682-1711 www.international-pc.com
N/A	Interseal	Interfine 878(SB)	

PART 3 EXECUTION

3.1 GENERAL

Manufacturer's recommendations for surface preparation, thinning, mixing, handling, and applying his product shall be considered a part of this specification. In case of conflict between the manufacturer's recommendations and the requirements of this specification, the latter shall take precedence.

3.2 PROTECTION

Contractor shall remove and reinstall, or provide acceptable protection for, all hardware, accessories, lighting and electrical components, factory-finished materials, plumbing fixtures and fittings, and any other materials that may become splattered or damaged by the painting work. "WET PAINT" signs shall be posted to indicate newly painted surfaces.

Every precaution shall be taken to prevent damage to adjacent surfaces. Roping, barricading or covering to preclude damage to personal and real property during surface preparation and painting shall be the Contractor's responsibility. When spray painting, the Contractor must give 24 hours advance warning, coordinated with the Contracting Officer or his representative, and post signs to ensure appropriate warning.

3.3 SURFACE PREPARATION

3.3.1 General Surface Preparation

All surfaces shall be clean, dry, and free from contaminants and foreign matter. All chipped, peeling, or blistered paint shall be removed and the surface spot-primed. Hard, glossy surfaces shall be dulled and roughened to ensure proper adhesion.

All aluminum surfaces shall be brush blasted and coated per paragraph 3.7.1 of this specification.

3.3.1.1 Coating Instructions

Manufacturer's recommendation for thinning, mixing, handling and applying his product shall be considered a part of this specification. In the event of conflict between the requirements of this specification and the manufacturer's recommendations, this specification shall take precedence.

Compressed air used for spraying coatings shall be free of moisture and oil.

Each coat of material applied shall be free from runs, sags, blisters, and bubbles; variations in color, gloss, and texture; holidays (missed areas); excessive film build; foreign contaminants; dry overspray. Masking shall be complete and each coat applied shall form a film of uniform thickness.

All coatings shall be thoroughly worked into all joints, crevices and open spaces.

All coatings shall be applied by airless or conventional spray.

3.3.1.2 Weather Conditions

No coatings shall be applied when contamination from rainfall is imminent

or when the temperature or humidity is outside limits recommended by the coating manufacturer. To prevent moisture condensation during application, surface temperature must be at least 3 degrees Celsius (5 degrees Fahrenheit) above the dewpoint. Wind speed shall not exceed 25 kilometers per hour (15 miles per hour) in the immediate coating area when using spray application methods.

3.3.2 Masonry Surfaces

All surfaces shall be free from form-release compounds, laitance, and other contaminants.

Large cracks, voids and other major surface imperfections shall be repaired before painting. All repairs to cracks and openings in cement block or masonry surfaces shall require preparation of a "V" type opening with the top of the "V" one-half the depth of the crack or opening. All non-tenacious material shall be removed, then the "V" shall be filled using Portland cement grout.

3.3.3 Sealing

All cracks, crevices, and joints such as those along the perimeter of doors and mounted fixtures shall be sealed with a paintable polysulfide type caulking.

Sealant shall be a self-curing, single component, polysulfide-rubber type conforming to **ASTM C 920** Type S, Grade NS, Class 25, use NT, A and O. Sealant shall be gray in color and capable of being applied into the joint with a caulking gun.

3.4 MIXING AND APPLICATION

3.4.1 General

All painting shall be accomplished in accordance with the painting schedule.

No paints or coatings shall be applied when the temperature or humidity is outside the limits recommended by the manufacturer, per 3.3.1.2.

Paints and coatings shall be applied by brush, roller, or airless spray.

Each coat of material applied shall be free from runs, sags, bubbles, and foreign contaminants; variations in color, gloss and texture; dry overspray, brush, and roller marks; holidays (missed areas); or other evidence of poor application.

All paints and coatings shall be thoroughly worked into corners and crevices.

Paints and coatings shall be neatly "cut-in" around doors, windows, ceilings, etc.

All newly painted surfaces shall be adequately protected from damage.

3.4.2 Procedures

Coatings shall be applied as follows:

- a. Material shall be thoroughly stirred to produce a uniform mixture.

- b. Material shall be thinned for workability and improved spray characteristics, but only according to the manufacturer's instructions.
- c. Each coat shall be applied uniformly at the minimum wet-film thickness specified by the manufacturer.
- d. Special attention shall be given when coating sharp edges, corners, and crevices to ensure complete coverage.
- e. Finish coats shall show good hiding characteristics and uniform appearance.

3.5 SPOT-PAINTING

Spot-painting to correct damaged surfaces will be allowed only when touchup area blends into the surrounding finish. Otherwise, the entire area shall be recoated. Touchup shall be accomplished using the same method of application as was used to apply the original material.

3.6 ACCEPTANCE PROVISIONS

3.6.1 Inspection

Work as described herein shall be inspected for compliance with this specification by an independent NACE (National Association of Corrosion Engineers) Certified Coating Inspector Level 3 provided by the Contractor. See Section 09 97 13.0098, paragraph 3.5

3.6.2 Cleanup

Contractor shall be responsible for removal of all paint or coating splatter and spills from floors, adjacent walls, hardware, and all other finished surfaces.

Contractor shall leave the work area clean and free from all rubbish and accumulated material left from his work.

3.7 PAINT SCHEDULE

3.7.1 Exterior Paint Schedule

Colors shall be in accordance with FED-STD-595.

<u>SURFACE DESCRIPTION</u>	<u>SURFACE PREPARATION</u>	<u>COATING</u>	<u>FINISH COLOR</u>	<u>DRY-FILM THICKNESS</u>
Aluminum removable Guardrails	SP-10**	Epoxy Urethane	Orange 12473*	Per Mfg's instructions Per Mfg's instructions

* FED-STD-595 Color Identification Number

** Abrasive blasting of aluminum guardrails followed by solvent wipe (SSPC SP 1) is the preferred method for preparing the aluminum surfaces, provided that adequate procedures are implemented to prevent distortion or

damage to the aluminum components.

-- End of Section --

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STEEL COATINGS

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 A 123 (2002) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM C 920 (2011) Standard Specification for Elastomeric Joint Sealants

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD 595 (Rev C; 2008) Colors Used in Government Procurement

U.S. Department of Defense (DOD)

MIL-A-22262 (1959) Abrasive Blast Ship Hull Blast Cleaning

MIL-PRF-24667 (1987) Coating System Non-Skid Roll or Spray

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

KSC-STD-SF-0004 (Rev B) Safety Standard for Ground Piping Systems Color Coding and Identification

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC AB-1 (2000) Mineral and Slag Abrasives

SSPC SP 1 (1982; E 2004) Solvent Cleaning

SSPC SP 7 (2007) Brush-Off Blast Cleaning

SSPC SP 10 (2000) Joint Surface Preparation, Standard Near-White Metal Blast Cleaning (NACE No. 2)

SSPC SP 11 (1987; E 2004) Power Tool Cleaning to Bare Metal

SSPC SP 3 (2004; E 2004) Power Tool Cleaning

1.2 SUBMITTALS

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

SD-01 Preconstruction Submittals

Material Safety Data Sheets; G shall be submitted in accordance with the paragraph entitled, "delivery, handling and storage", of this section.

Material, Equipment, and Fixture Lists; G shall be submitted in accordance with the paragraph entitled, "General," of this section.

Manufacturer's Color Samples; G shall be submitted for painting materials in accordance with the paragraph entitled, "General", of this section.

A **Safety Plan; G** shall be submitted in accordance with paragraph entitled, "General," of this section.

Mix Designs; G shall be submitted in accordance with paragraph entitled, "General", of this section.

Coating Inspector Plan; G shall be submitted in accordance with paragraph entitled, "Inspection" of this section.

Waste Management Plan; G shall be submitted in accordance with Section 01 57 20.00 10 ENVIRONMENTAL PROTECTION.

SD-02 Shop Drawings

Coating Repair Plan; G shall be submitted for each piece of GFE in accordance with the paragraph entitled, "Touch-up" of this section.

SD-03 Product Data

Manufacturer's catalog data; shall be submitted for the following items, including designated name, formula or specification numbers, manufacturer's instructions and name of manufacturer. Data shall include detailed analysis of each coating material required, with constituents measured as percentages of the total weight of coating; and details of application, thinning, and average coverage per liter gallon:

Abrasive Blasting Material; G
Sealant Compound; G
Inorganic Zinc; G
Aliphatic Polyurethane; G
Non-skid Coating; G

SD-06 Test Reports

Inspection reports; G shall be submitted for protective coating systems in accordance with paragraph entitled, "Inspection," of this section.

Daily Inspection Reports; G shall be submitted for protective

coating systems in accordance with paragraph entitled, "Inspection," of this section.

SD-08 Manufacturer's Instructions

Manufacturer's instructions shall be submitted for [Protective Coatings](#); [G](#) including details of thinning, mixing, handling, and application.

1.3 SCOPE

This section covers materials, surface preparation and the application of protective coatings on all new structure and equipment installed under this contract as well as any existing coating damaged by construction activities. This specification does not apply to existing equipment, systems and structure, except as indicated.

1.4 DELIVERY, HANDLING AND STORAGE

Materials shall be delivered in their original, unbroken containers bearing the manufacturer's name, product identification, and batch number. Coatings, thinners, and cleaners shall be stored in tightly closed containers in a covered, well-ventilated area where they will be protected from exposure to extreme cold or heat, sparks, flame, direct sunlight, or rainfall. Manufacturer's instructions for storage limitations shall be followed.

[Material Safety Data Sheets](#) shall be submitted by the Contractor.

1.5 PROTECTION OF EQUIPMENT AND ADJACENT SURFACES

All equipment and adjacent surfaces that may be damaged as a result of any phase of this work shall be protected.

1.6 GENERAL

A [Safety Plan](#) shall be submitted for protective coating systems in accordance with OSHA regulations. See paragraph 3.1.1 for requirements.

[Material, Equipment, and Fixture Lists](#) shall be submitted for manufacturer's style or catalog numbers, specification and drawing reference numbers and warranty information for the Protective Coatings Systems fabrication site.

[Manufacturer's Color Samples](#) shall be submitted showing the manufacturer's match of the FED standard finish colors specified.

[Mix Designs](#) shall be submitted for each type of protective coating including a complete list of ingredients and admixtures. Applicable test report shall verify that the mix has been successfully tested and meets design requirements.

PART 2 PRODUCTS

2.1 ABRASIVE BLASTING MATERIAL

Blasting aggregates for use on carbon steel shall be approved materials in accordance with [MIL-A-22262](#) or [SSPC AB-1](#), Type I or II, Class A, or steel grit. Only materials approved in the QPL attached to [MIL-A-22262](#) shall be

used. The abrasive grade selected must produce the required surfaces profile and possess physical properties that are compatible with the requirements of this standard. The steel grit shall be neutral (6.0 to 8.0 pH), rust and oil free, dry, commercial-grade blasting grit with a hardness to 40 to 50 Rockwell C. The size shall be selected to produce the required anchor profile. All abrasive blasting material shall be silica free.

Steel grit shall not be used as the blasting aggregate for stainless steel. Abrasive blasting material for stainless steel surfaces shall be walnut shells, plastic media, or approved equivalent.

2.2 SEALANT COMPOUND

Sealant shall be a self-curing, single component, polysulfide-rubber type conforming to **ASTM C 920** Type S, Grade NS, Class 25, use NT, A and O. Sealant shall be gray in color and capable of being applied into the joint with a calking gun.

2.3 PROTECTIVE COATINGS

2.3.1 Coating Systems

All carbon steel surfaces shall be abrasive blasted per **SSPC SP 10** and coated with inorganic zinc unless otherwise noted specifically on the drawings or paragraph 3.7 Coating Schedule of this specification.

All stainless steel surfaces shall be degreased and brush blasted per **SSPC SP 7** and coated with coating system No. 6 unless specifically noted in the drawings or paragraph 3.7 COATING SCHEDULE of this specification.

Special care must be taken to avoid damaging surfaces when blasting, especially thin-walled items.

The following are suggested paint manufacturers and their products which have been tested and approved by the government. Substitute paints are not acceptable. All thinners and cleaners shall be products of the coating manufacturer. Primer and finish coats of the paint system shall be products of the same manufacturer.

All products have been approved for use by NASA. However, not all products are appropriate for all weather/environmental conditions. It is the responsibility of the Contractor to select the products for use on the project.

The following coating systems definitions are to be specified for use on the surfaces listed in the Coating Schedules, of this section, and as directed.

COATING SYSTEM NO. 1

Coating System No. 1 shall consist of **inorganic zinc** only. Inorganic zinc shall be selected from the following listing. Coatings, thinners, and cleaners shall be the product of one manufacturer.

Section I. Materials with Greater than 400 Grams/Liter (3.3 Pounds/Gallon) VOC (SB is Solvent-Based and WB is Water-Based):

<u>Coating Designation</u>	<u>Type</u>	<u>Manufacturer</u>
Dimetcote 9	SB	PPG Industries, Inc. One PPG Place Pittsburgh, PA 15272 (800) 722-4509 www.ppgamercoatus.ppgpmc.com
Carbo-Zinc 11	SB	Carboline Company 2150 Schuetz Road St. Louis, MO 63146 (314) 644-1000 www.carboline.com
Cathacoat 304L	SB	ICI Devoe Coatings 4000 Dupont Circle Louisville, KY 40207 (800) 654-2616 www.devoecoatings.com
Cathacoat 304K	SB	
Metalhide 1001	SB	PPG Industries, Inc. One PPG Place Pittsburgh, PA 15272 (800) 722-4509 www.ppg.com
Zinc-Clad II	SB	Sherwin-Williams Company 101 Prospect Avenue N.W. Cleveland, OH 44115 (800) 336-1110 www.sherwin-williams.com

Section II. Materials with Less than 400 Grams/Liter (3.3 Pounds/Gallon)
VOC (SB is Solvent-Based and WB is Water-Based):

<u>Coating Designation</u>	<u>Type</u>	<u>Manufacturer</u>
Dimetcote D-9H	SB	PPG Industries, Inc. One PPG Place Pittsburgh, PA 15272 (800) 722-4509 www.ppgamercoatus.ppgpmc.com
Dimetcote D-9HS	SB	
Carbo-Zinc 11HS	SB	Carboline Company 2150 Schuetz Road St. Louis, MO 63146 (314) 644-1000 www.carboline.com
Carbo-Zinc 11 VOC	SB	
Carbo-Zinc 11 WB	WB	
Cathacoat 305	WB	ICI Devoe Coatings 4000 Dupont Circle Louisville, KY 40207 (800) 654-2616 www.devoecoatings.com
Cathacoat 304V	SB	
InterZinc 22HS	SB	International Paint 6001 Antoine Drive Houston, TX 77091

<u>Coating Designation</u>	<u>Type</u>	<u>Manufacturer</u> (713) 682-1711 www.international-pc.com
Zinc-Clad XI Zinc-Clad II Plus	WB SB	Sherwin-Williams Company 101 Prospect Avenue N.W. Cleveland, OH 44115 (800) 336-1110 www.sherwin-williams.com
Kolor-Zinc 2.8 VOC	SB	Keeler & Long/PPG 856 Echo Lake Road Watertown, CT 06795 (800) 238-8596 www.ppg.com/coatings/pmc/brands/keelerlong

COATING SYSTEM NO. 2

Coating System No. 2 applies to hot dipped galvanized items. Rigid steel conduit shall be coated with coating System No.2.

Galvanized surfaces to be top coated shall be prepared by solvent cleaning per **SSPC SP 1** and brush blasted per **SSPC SP 7** using Star Blast X-11 with compressed air pressure 40 to 60 psi.

<u>Topcoat (Type)</u>	<u>Manufacturer</u>
741 (SB) (IOT)	PPG Industries, Inc. One PPG Place Pittsburgh, PA 15272 (800) 722-4509 ppgamercoatus.ppgpmc.com
Carbozinc Finish (SB) (IOT) Carbozinc Finish (SB) (IOT)	Carboline Co. 2150 Schuetz Road (314) 644-1000 www.carboline.com
Devram 702 (SB) (IOT)	ICI Devco Coatings 4000 Dupont Circle Louisville, KY 40207 (800) 654-2616 www.devoecoatings.com
Intertherm 181 (SB) (IOT)	International Paint 6001 Antoine Dr. Houston, TX 77091 (713) 682-1711 www.international-pc.com
L03 (SB) (IOT)	Sherwin-William 101 Prospect Ave. Cleveland, OH 44115 (800) 336-1110 www.sherwin-williams.com

COATING SYSTEM NO. 3

Coating System No. 3 shall consist of an inhibitive polyamide epoxy tie coat, and Aliphatic Polyurethane finish coat. Coatings shall be selected from the following listing and all coatings, thinners, and cleaners shall be the product of the same manufacturer. Each successive coating shall be of a contrasting color to provide a visual assurance of complete coverage.

Section I. Materials with Greater than 400 Grams/Liter (3.3 Pounds/Gallon) VOC (SB is Solvent-Based and WB is Water-Based):

<u>Tiecoat (Type)</u>	<u>Topcoat (Type)</u>	<u>Manufacturer</u>
Devran 201 (SB)	Devthane 359 (SB)	ICI Devoe Coatings Co.
Devran 230 (SB)	Devthane 369 (SB)	4000 Dupont Circle
Devran 201 (SB)	Devthane 369 (SB)	Louisville, KY 40207
		(800) 654-2616
		www.devoecoatings.com

Section II. Materials with Less than 400 Grams/Liter (3.3 Pounds/Gallon) VOC (SB is Solvent-Based and WB is Water-Based):

<u>Tiecoat (Type)</u>	<u>Topcoat (Type)</u>	<u>Manufacturer</u>
Amerlock 400 (SB)	Amercoat 450S (SB)	Ameron P.C.F.G.
N/A	PSX700 (SB)	210 North Berry St.
Amercoat 383(SB)	PSX101 (SB)	Brea, CA 92821
		(800) 926-3766
		www.ameron.intl.com
Carboguard 893 (SB)	Carbothane 134HS (SB)	Carboline Company
Carbomastic 15 (SB)	Carboacrylic 3359 (WB)	350 HanleyIndustrialCt.
Cargoguard 893 (SB)	Carboxane 2000(SB)	St. Louis, MO 63114
		(800) 677-0753
		www.carboline.com
Devran 201H (SB)	Devthane 379 (SB)	ICI Devoe Coatings Co.
		4000 Dupont Circle
		Louisville, KY 40207
		(800) 654-2616
		www.devoecoatings.com
N/A	Polysiloxane xle	Sherwin Williams
		101 Prospect Ave
		Cleveland, OH 44115
		(800) 336-1110
		www.sherwin-william.com
Interseal 670HS(SB)	Interfine 979(SB)	International Paint
Interseal 670HS(SB)	Interfine 878(SB)	6001 Antoine Dr.
		Houston, TX 77091
		(713) 682-1711
		www.international-pc.com

COATING SYSTEM NO. 4

Coating System No. 4 shall consist of a non-skid coating system applied to steel floor surfaces subject to personnel traffic and equipment carts.

Approved Non-skid Coatings shall meet MIL-PRF-24667, Type 1, as available from American Safety Technologies, Inc., 565 Eagle Rock Avenue, Roseland, NJ 07068, telephone (800) 631-7841, www.astantislip.com, or approved equal (Primer MS-7C, Topecoat MS 400G, Color Topping MS-200).

<u>Primer</u>	<u>Non-skid</u>	<u>Manufacturer</u>
MS-7C7	AS-2300 SCILTC	American Safety Technologies, Inc.

- Type 1 - High Durability, rollable deck coating
- Composition G - General use abrasive deck system
- Non-Skid coating shall conform to MIL-PRF-24667

PART 3 EXECUTION

3.1 SURFACE PREPARATION

3.1.1 General

The on-site abrasive blasting and painting work shall require complete containment, collection and disposal of waste material in accordance with OSHA and local government and KSC environmental and safety regulations for handling hazardous materials and personnel protection.

The Contractor shall submit a plan and procedure for approval by the Contracting Officer for the protection of personnel and the environment during abrasive blasting and painting. The submittal shall describe materials, equipment and instrumentation used for compliance to contain, collect and dispose of waste materials in accordance with OSHA and the local authority.

Faying surfaces that will become inaccessible after installation shall be abrasive blasted and coated with inorganic zinc only, prior to installation.

Surfaces that are part of slip-critical joints shall be abrasive blasted and coated with inorganic zinc only prior to installation.

Surfaces to be welded shall be masked off and left uncoated. After installation by completion of field welding, all uncoated surfaces shall be cleaned and painted in accordance with paragraph 3.3.

Surfaces shall be inspected and degreased as required prior to subsequent surface preparation and the application of protective coatings. Degreasing shall be by solvent cleaning, detergent washing, or steam cleaning. SSPC SP 1 shall apply for solvent cleaning.

Immediately after the surface to be coated has been prepared, it will be inspected by the NACE Inspector to determine compliance with the specification for surface preparation. Any areas not meeting the surface preparation requirements shall be re-cleaned until approved. No coatings shall be applied until the surface preparation has been approved.

Prepared surfaces shall be coated within 6 hours after completion of surface preparation and before rusting or recontamination occurs. Surfaces not coated within 6 hours or which show rusting or contamination, regardless of the length of time after preparation, shall be reprepared.

Fastener holes shall be treated as uncoated surfaces and shall be coated in accordance with this specification.

Surface preparation and coating operations shall be sequenced so that freshly applied coatings will not be contaminated by dust or foreign matter.

3.1.2 Colors

Inorganic zinc coatings shall be pigmented so that there is a definite contrast between the coating and the dull gray appearance of the blasted steel surface during the coating application. Color coding for fluid system piping shall be in accordance with [KSC-STD-SF-0004](#). Finish coat colors specified in paragraph 3.6 shall be in accordance with [FED-STD 595](#) color numbers using pigments free of lead, chromium and cadmium.

3.1.3 Abrasive Blasting (AB)

Abrasive blasting shall conform to [SSPC SP 10](#).

Compressed air used for abrasive blasting shall be free of moisture and oil.

Surfaces not to be blasted are:

Prefinished surfaces except when specified to be blast-cleaned in the coating schedule

Piston rods and bearing surfaces

A minimum nozzle pressure of [90 pounds per square inch](#) shall be maintained.

Weld slag, weld spatter, and foreign matter shall be removed from surfaces to be coated prior to abrasive blasting using mechanical methods as specified.

Blast cleaning shall achieve a [1.5-to 3.0-mil](#) anchor profile as indicated by a surface profile comparator, replica tape, or similar device.

Rust and corrosion shall be removed from pits and depressions.

Abrasive blast aggregate shall not be reused.

All traces of abrasive residue and dust shall be removed from the surface, leaving it clean and dry.

3.1.4 Mechanical Cleaning (MC)

Where mechanical cleaning is specified required, needle scalers or abrasive disks or wheels shall be used in accordance with [SSPC SP 3](#) and [SSPC SP 11](#), leaving the surface anchor profile of the surface cleaned with the power tool equal to 1.5 mil to 3.0 mil. All rust shall be completely removed from pits and depressions.

3.2 INSPECTION OF SURFACE PREPARATION

Immediately after the surface has been prepared, it will be inspected by the NACE inspector to determine compliance with the specification for surface preparation. Any areas not meeting the surface preparation requirements shall be re-cleaned until approved. No coatings shall be applied until the surface preparation has been approved.

3.3 COATING APPLICATION

Application and handling characteristics of all coatings will vary. To obtain optimum performance, adequate instructions from the manufacturer are essential and must be closely followed, in conjunction with the requirements of this specification.

Manufacturer's recommendations for thinning, mixing, handling, and applying his product shall be considered a part of this specification. In the event of conflict between the requirements of this specification and the manufacturer's recommendations, this specification shall take precedence.

Compressed air used for spraying coatings shall be free of moisture and oil.

Each coat of material applied shall be free from runs, sags, blisters, bubbles, variations in color, gloss and texture, holidays (missed areas), excessive film build, foreign contaminants, dry overspray, etc.

All coatings shall be thoroughly worked into all joints, crevices, and open spaces. Special attention shall be paid to welds, cutouts, sharp edges, rivets, crevices and bolts to ensure proper coverage and thickness.

All newly coated surfaces shall be adequately protected from damage. Special attention shall be paid to potential damage resulting from nearby operations such as grinding, welding, cutting, etc. Metal fittings that result from such activity shall not remain on coated surfaces. Any damage to coatings resulting from such operations shall be cleaned and touched-up per paragraph 3.3 of this section.

Apply all coatings by airless spray, conventional spray, or by brush. Airless spray shall be used for large surface areas. Conventional spray and brushes may be used for small areas of intricate configuration and touchup. During application of inorganic zinc coating, maintain uniform suspension.

3.3.1 Weather Conditions

The ambient weather conditions at the actual location of the work shall be determined before and during the surface preparation and coating application operations to ensure they are correct for the work being conducted.

No coatings shall be applied when contamination from rainfall is imminent or when the temperature or humidity is outside limits recommended by the coating manufacturer. To prevent moisture condensation during application, surface temperature must be at least 3 degrees Celsius (5 degrees Fahrenheit) above the dewpoint. Wind speed shall not exceed 25 kilometers per hour (15 miles per hour) in the immediate coating area when using spray application methods.

Proper instrumentation shall be used to measure air temperature, relative humidity, dewpoint, surface temperature, and wind speed and direction.

All ambient weather conditions shall be recorded in the daily inspection reports.

Solvent-based inorganic zinc coatings, polysiloxane topcoats, and IOTs shall not be applied in conditions with <40 percent RH.

Water-based inorganic zinc coatings shall not be applied in conditions with <40 percent or >80 percent RH.

3.3.2 Mixing and Application Procedures

Material shall be stirred thoroughly using a instrument that will not induce air into coating.

Strain the mixed material through a 30 to 60 mesh screen.

Provide continuous slow agitation during application to maintain uniform suspension. Avoid continuous rapid agitation.

Thin for workability and improved spray characteristics only. Use only the manufacturers' recommended thinner and amount.

Adjust spray equipment to produce an even wet coat with minimum overspray.

Apply in even parallel passes, overlapping 50 percent to provide complete and uniform coverage. Pay special attention to welds, cut-outs, sharp edges, rivets, crevices, and bolts to ensure proper coverage.

Pressure pot, when used, shall be kept at the same level or above the spray gun for proper material delivery.

3.3.3 Dry-Film Thickness (DFT)

Coatings shall be applied to the following dry-film thicknesses:

Coating System No. 1:

Inorganic zinc	4.0 to 6.0 mils
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Coating System No. 2:

Hot Dipped Galvanized	ASTM A 123
Inorganic Topcoat	4.0 to 5.0 mils

Coating System No. 3:

Inhibitive Polyimide Epoxy	Per Mfg's recommendation
Aliphatic Polyurethane	Per Mfg's recommendation

Coating System No. 4:

Heavy Duty Metal Primer	Per Mfg's recommendation
2-part epoxy with premixed aggregate	Per Mfg's recommendation

When dry through (dry to handle), the film thickness shall be checked with a calibrated nondestructive dry-film thickness gage. If less than specified thickness, additional material shall be applied as required. Proper DFT for the inorganic zinc coating shall be obtained in a single application which may consist of multiple passes, while coating is still wet.

3.4 TOUCH-UP AND REPAIR

Touch-up shall be required of all damaged coatings that occur during shipment and field handling. During the construction work, touch-up shall be an on-going process to repair coatings that are damaged and expose steel surfaces to the elements. Field welds shall be cleaned, painted and inspected promptly to avoid rust formation.

Repair surfaces shall be prepared for coatings by water washing and by mechanical methods to SSPC SP 11 to a roughness profile of 1.5 mils to remove corrosion and weld slag to bare metal. All chipped, peeling, or blistered paint shall be removed prior to touch-up. Repair coatings shall be "feathered in" to adjacent existing coating edges. Touched-up areas shall blend in with the surrounding area.

The following general touch-up requirements shall apply:

<u>COATING SYSTEM</u>	<u>TOUCH UP COATING</u>
<u>Coating System No. 1:</u> Inorganic zinc	Inorganic zinc
<u>Coating System No. 2:</u> Hot Dipped Galvanized Inorganic Topcoat	Inorganic zinc Inorganic topcoat
<u>Coating System No. 3:</u> Inhibitive Polyimide Epoxy Aliphatic Polyurethane	Inhibitive Epoxy Aliphatic Polyurethane

Touch-up of damaged coatings shall be to the quality of the original finish coat. Contractor is responsible to protect the finish of all factory finishes and G.F.E. Should damage to these coating(s) be identified, the Contractor shall provide reasonable protection to prevent further damage. The Contractor shall submit a [Coating Repair Plan](#) for each damaged item. The plan shall include a proposed coating system, the location(s) of coating damage and proposed method of repair.

Coating System No. 4:
Final appearance and distribution of aggregate texture shall be uniform across the entire surface.

3.5 SEALANT COMPOUND APPLICATION

Caulking shall be accomplished after application and cure of inorganic zinc coating and prior to application of topcoats.

Exterior joints shall be calked to seal all crevices against intrusion of water, including, but not limited to, the following:

- a. Perimeter of faying and bearing surfaces of structural members
- b. Joints in members between intermittent welds
- c. Perimeter of bearing surfaces between floor plates and supporting members (inside, outside, top, and bottom)
- d. Stair treads, where joined to channel stringers
- e. Openings of 1/2 inch or smaller (Foam filler backup shall be used as required.)
- f. Hot-dipped galvanized vent holes

3.6 INSPECTION

On-site and off-site work as described herein shall be inspected for compliance with this specification by an independent third party NACE (National Association of Corrosion Engineers) Certified Coating Inspector Level 3 provided by the Contractor.

The NACE Certified Coating Inspector shall be present at the pre-work conference and shall submit a [Coating Inspector Plan](#) (CIP) specifically applicable to this project. The program shall include both off-site and on-site work.

The Coating Inspector Plan shall include, as a minimum, the following:

1. Basic inspection plan for determining compliance with the coating requirements in this section.
2. Inspection Forms which shall identify the key inspection intervals, activities and steps witnessed, inspected, tested and certified for this project.
3. The inspection plan for identifying areas and surfaces damaged during handling, erection and construction activities. Non-conformance reports are required to be signed and submitted to the Contracting Officer within 1 workday from the time that it is written. Once nonconformations have been corrected, complete a conformance verification report for the specific item or area.
4. Inspection and certifying repairs to damaged areas and surfaces.
5. Submittal schedule for issuing inspection reports. Signed, daily [Inspection reports](#) shall be submitted on a weekly basis as a minimum.
6. Non-conformance plan detailing expected coating failures and repairs, as well as sample reports.

Structural assemblies painted offsite and delivered onsite shall require the following:

1. Submittal of the certified [daily inspection reports](#) for each item.
2. Spot check a minimum of 10% of surface areas on each item delivered for compliance with the specifications. The government reserves the right to select the areas.
3. 10% of the surface areas shall be divided into 3 separate locations for spot checks.
4. Deficiencies greater than 10% shall require that the assembly be returned to the offsite facility for rework to comply with the specifications.

3.7 COATING SCHEDULE

<u>SURFACE DESCRIPTION</u>	<u>SURFACE PREPARATION SSPC</u>	<u>COATING SYSTEM</u>	<u>FINISH COLOR</u>	<u>DRY-FILM THICKNESS</u>
Structural Steel	SP-10	1	Gray	IZ 4.0 to 6.0 mils
Fixed Guardrails	SP-10	1	Gray	IZ 4.0 to 6.0 mils
Galvanized Conduit & Pipe	SP-1, SP-7	2	Gray	IOT 4.0 to 5.0 mils
All Uncoated Stainless Steel Surfaces	SP-7	3	Gray 16187*	Per Mfg's recommendations
Walking Surfaces	SP-10	4	Gray	Per Mfg's recommendations

*FED STD-595 Color Identification Number
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INTERIOR 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 in the text by basic designation only.

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

36 CFR 1191

Americans with Disabilities Act (ADA)
Accessibility Guidelines for Buildings and
Facilities; Architectural Barriers Act
(ABA) Accessibility Guidelines

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Detail Drawings; G

SD-03 Product Data

Installation; G
Warranty; G

SD-04 Samples

Interior Signage; G

1.3 QUALITY ASSURANCE

1.3.1 Samples

Submit interior signage samples of each of the following sign types showing typical quality, workmanship and color: Directional sign. The samples may be installed in the work, provided each sample is identified and location recorded.

1.3.2 Detail Drawings

Submit detail drawings showing elevations of each type of sign, dimensions, details and methods of mounting or anchoring, mounting height, shape and thickness of materials, and details of construction. Include a schedule showing the location, each sign type, and message.

1.4 DELIVERY, STORAGE, AND HANDLING

Materials shall be packaged to prevent damage and deterioration during shipment, handling, storage and installation. Product shall be delivered to the jobsite in manufacturer's original packaging and stored in a clean, dry area in accordance with manufacturer's instructions.

1.5 WARRANTY

Warrant the interior signage for a period of 2 years against defective workmanship and material. Warranties shall be signed by the authorized representative of the manufacturer. Submit warranty accompanied by the document authenticating the signer as an authorized representative of the guarantor. Guarantee that the signage products and the installation are free from any defects in material and workmanship from the date of delivery.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Signs shall be the standard product of a manufacturer regularly engaged in the manufacture of such products that essentially duplicate signs that have been in satisfactory use at least 2 years prior to bid opening. Obtain signage from a single manufacturer with edges and corners of finished letterforms and graphics true and clean.

2.2 SIGNAGE

2.2.1 Load Rating Signs

Painted aluminum .063" gauge, with 1 inch radius corners. Lettering in 3M Scotchlite Hi Intensity vinyl sheeting, or approved equal, white reflective.

2.2.2 Type of Mounting For Signs

Mounting shall be by mechanical fasteners.

2.3 FABRICATION AND MANUFACTURE

2.3.1 Factory Workmanship

Holes for bolts and screws shall be drilled or punched. Drilling and punching shall produce clean, true lines and surfaces. Exposed surfaces of work shall have a smooth finish and exposed riveting shall be flush. Fastenings shall be concealed where practicable.

2.3.2 Dissimilar Materials

Where dissimilar metals are in contact, the surfaces will be protected to prevent galvanic or corrosive action.

2.4 COLOR, FINISH, AND CONTRAST

Color shall be as indicated. Finish of all signs shall be eggshell, matte, or other non-glare finish as required in handicapped-accessible buildings.

2.5 TYPEFACE

Helvetica Regular.

PART 3 EXECUTION

3.1 INSTALLATION

Signs shall be installed plumb and true and in accordance with approved manufacturer's instructions at locations shown on the detail drawings . Mounting height and mounting location shall conform to 36 CFR 1191. Required blocking shall be installed.

3.1.1 Anchorage

Anchorage shall be in accordance with approved manufacturer's instructions. Anchorage not otherwise specified or shown shall include machine carriage bolts for steel. Exposed anchor and fastener materials shall be compatible with metal to which applied and shall have matching color and finish.

3.1.2 Protection and Cleaning

Protect the work against damage during construction.

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ELECTRIC TRACTION ELEVATORS

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2010; Errata 2010) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME A17.1/CSA B44 (2010) Safety Code for Elevators and Escalators

ASME A17.1 (2010) Safety Code for Elevators and Escalators

ASME A17.2 (2010) Guide for Inspection of Elevators, Escalators, and Moving Walks Includes Inspection Procedures for Electric Traction and Winding Drum Elevators, Hydraulic Elevators, and Escalators and Moving Walks

INTERNATIONAL CODE COUNCIL (ICC)

ICC UBC (1997; Erratas Vol 1, 2 & 3 01/2001; Vol 1 & 2 03/2001; Vol 2 10/2001) Uniform Building Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2011; Errata 2 2012) National Electrical Code

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

36 CFR 1191 Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

1.2 SYSTEM DESCRIPTIONS

1.2.1 General Requirements

The Contractor shall modify the existing elevators 13, 14, 15 and 16 controllers and control logic and field devices to allow for new

vehicle-side elevator lobbies being installed under this contract. Elevator controllers shall allow for the vertical adjustment of the new and existing (11 total) vehicle-side elevator lobbies. Program logic shall allow for the automatic adjustment of travel distances and lobby locations after lobbies have been moved. At no time shall the vehicle-side cab doors be allowed to open unless the associated lobby is in place and has been secured. In addition, the Contractor shall provide all necessary appliances to add new fixed tower elevator landings as identified in the contract drawings.

Existing elevator drives, motors, hoist ways, pit equipment, cabs, lobbies, landings, call buttons, and any other devices used in the operation of the existing elevators shall be re-used, unless by doing so, personnel safety or violation governing codes are at risk.

Section 26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL applies to work specified in this section.

Connection Diagrams shall be submitted for electrical passenger elevator systems indicating the relations and connections of devices and apparatus by showing the general physical layout of all controls, the interconnection of one system with another (or portion thereof) and internal tubing, wiring, and other devices.

Schematics shall be submitted for elevator systems including annotated ladder logic diagrams for programmable logic controllers.

1.3 SUBMITTALS

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

SD-02 Shop Drawings

Elevator and accessories; G

Supporting systems; G

Machinery and controls; G

Wiring diagrams; G

Sequence of operations; G

SD-03 Product Data

Elevator and accessories; G

Elevator supporting systems; G

Data sheets; G

SD-05 Design Data

Reaction loads; G

SD-07 Certificates

Welders' qualifications; G

SD-10 Operation and Maintenance Data

Elevator, Data Package 4; G

1.4 QUALITY ASSURANCE

1.4.1 Qualification

Provide pre-engineered elevator system by a manufacturer regularly engaged in the manufacture of elevator systems. The manufacturer shall either install elevator system or shall provide letter of endorsement certifying that the elevator-system installer is acceptable to the manufacturer. An installer is required to be regularly engaged in the installation and maintenance of elevator system.

1.4.2 Shop Drawing Requirements

Provide assembly and arrangement of elevators, accessories, and supporting systems. Show location of **machinery and controls** in machine room. Provide details for materials and equipment, including but not limited to operating and signal fixtures, doors, door and car frames, car enclosure, controllers, motors, guide rails and brackets, layout of hoistway in plan and elevation, and other layout information and clearance dimensions. Submit complete **wiring diagrams** and **sequence of operations**, which show electrical connections and functions of elevator systems, for the machine room, hall and in the hoistway. Provide one set of wiring diagrams in plastic or glass cover, framed and mounted in the elevator machine room. Deliver other sets to the Contracting Officer. Coded diagrams are not acceptable unless adequately identified.

1.4.3 Product Data Requirements

Include information on motor, hall station, and buffer on elevators and accessories. For elevator **supporting systems**, include information on car control and emergency power systems, and for **data sheets**, provide document identification number or bulletin number, published or copyrighted prior to the date of contract bid opening.

1.4.4 Design Data: Reaction Load Data Requirements

Provide calculations to the Contracting Officer for **reaction loads** imposed on building by elevator system. Demonstrate calculations complying with **ASME A17.1/CSA B44**. Provide calculations certified by a licensed structural engineer registered in any state. Do not fabricate materials nor perform construction until approved by the Contracting Officer.

1.4.5 Certificates: Welders' Requirements

Comply with **AWS D1.1/D1.1M**, Section 5. Include certified copies of **welders' qualifications**. List welders' names with corresponding code marks to identify each welder's welding work.

PART 2 PRODUCTS

2.1 ELEVATOR DESCRIPTION

Provide elevator system that complies with **ASME A17.1/CSA B44** in its

entirety, ASME A17.2 in its entirety, and additional requirements specified herein.

2.1.1.1 Passenger Elevators

- a. Type: Gearless
- b. Rated load: 8,000 lb.
- c. Rated Speed: 700 fpm
- d. Travel Length: 419 ft. 9 in.
- e. Number of Stops: 32
- f. Number of Hoistway Openings: 32 Front; 11 Rear
- g. Car Inside Dimensions: Existing Cars
- h. Car Door Opening: 5 ft. 0 in. wide and 8 ft. 1/4 in. high
- i. Car Door Types: Single-speed Center opening Horizontal sliding.

2.1.1.1.1 Cab Enclosures and Door Finishes

Existing cab enclosures and finishes to remain.

a. Hoistway Doors and Frame Finishes

Provide finishes on exterior of hoistway as follows:

- (1). Frame; stainless steel.
- (2). Exterior face of door; prefinished steel.

2.2 SPECIAL OPERATION AND CONTROL

Provide all special operations and control systems in accordance with ASME A17.1/CSA B44. Provide special operation key switches with 6 pin cylinder locks with removable cores. Provide a key control lock for each operation system.

2.2.1 Firefighters' Service

Existing to remain.

2.2.2 Smoke Detectors

Existing to remain.

2.2.3 Top-of-Car Operating Device

Existing to remain.

2.2.4 Hoistway Access Switches

Existing to remain.

2.2.5 Independent Service

Existing to remain.

2.2.6 Elevator Operation

ASME A17.1/CSA B44.

2.2.6.1 Duplex Selective Collective Automatic Operations

Provide Duplex Selective Collective Automatic Operation. Provide a single push button for terminal landings and dual push buttons, up and down, at intermediate landings. If a car is taken out of service or fails to respond to a landing call within a predetermined adjustable time limit of approximately 40 to 180 seconds, transfer calls to the other car functioning as a single car Selective Collective elevator until the out-of-service car is returned to the system. Provide a push button riser adjacent to each elevator.

2.2.7 Emergency Commandeering Service

Provide "ON-OFF" key switch and indicator light at all landings to cause one elevator to respond directly to the landing activated. Turning switch to "ON" position cancels previously registered "CAR" calls and requires car to bypass hall calls while in route to activated landing.

On arrival, car will remain at landing with hoistway and car doors open for predetermined time to permit car to be placed on emergency service. If the person decides not to use car during predetermined time period, car doors will close and car will automatically return to normal service. Indicator lights shall automatically illuminate during emergency service. Key shall be removable only in "OFF" position.

2.3 ELEVATOR MACHINE

Existing elevator machine to remain.

2.4 CONTROL EQUIPMENT

2.4.1 Elevator Control Equipment

The Contractor shall provide all electrical components and devices, support hardware, fasteners, interconnecting wiring and/or piping required to make all new adjustable elevator platform lobbies functional. All wiring to panel connections from field instruments, devices, and other panels shall be terminated at master numbered terminal strips. The bottom six inches of all free standing panels shall be free of all devices, including terminal strips.

2.4.2 Programmable Logic Control (PLC)

The existing PLCs shall be reprogrammed as required to include new platform I/O points. These existing PLCs shall continue to function as currently programmed with exception of the additional platform landing stops made available.

2.5 OPERATING PANELS, SIGNAL FIXTURES, AND COMMUNICATIONS CABINETS

2.5.1 Capacity and Data Plates

Existing to remain.

2.5.2 Car and Hall Buttons

Provide recessed tamper-proof push buttons of minimum $3/4$ inch size satin-finish stainless steel with illuminated jewel center.

2.5.2.1 Hall Station Door Operating Buttons

Identical in size and design to hall call buttons, but not illuminated.

2.5.3 Passenger Car-Operating Panel

ASME A17.1/CSA B44, Section 211 and 306. Existing passenger car-operating panels shall be updated to include: New landing buttons, labeling and necessary control programming to provide access to new and modified access points. Provide exposed, flush mounted buttons for the controls that must be passenger accessible. Provide service cabinet or keyed switches for these controls that should not be passenger accessible. Use engraving and backfilling or photo etching for button and switch designators. Do use attached signs.

2.5.3.1 Passenger Controls

Existing to be modified.

- a. Illuminated operating call buttons identified to correspond to landings served by elevator car. For two openings at a floor, provide two buttons marked "FRONT" and "REAR" above button location.
- b. "DOOR OPEN" and "DOOR CLOSE" buttons, existing to remain.
- c. Keyed "STOP" switch, existing to remain.
- d. "ALARM" button, existing to remain.
- e. "FIRE DEPARTMENT" key switch, existing to remain.
- f. Emergency two-way communication, existing to remain.

2.5.3.2 Service Controls

Existing to remain.

2.5.3.3 Certificate Window

Existing to remain.

2.5.4 Semi-Selective Door Operation

Existing to remain.

2.5.5 Switches and Devices

Existing to remain.

2.5.6 In-Car Position and Direction Indicator and Signal

Existing to remain.

2.5.6.1 In-Car Position Indicator and Signal

Existing to remain.

2.5.6.2 In-Car Direction Indicator and Signal

Existing to remain.

2.5.7 Landing Position and Direction Indicator and Signal

Provide a single fixture containing the landing position and direction indicators.

2.5.7.1 Landing Position Indicator and Signal

Provide an electrical or electronic digital position indicator similar to the car position indicator. Arrange position indicator in wall horizontally above the door frame or vertically at the side of the door frame. Indicators to show floor position of car in hoistway. Indicate position by illumination of numeral or letter corresponding to landing at which car is passing or stopping.

2.5.7.2 Landing Direction Indicator and Signal

Provide landing direction indicator with visual and audible signal devices. Provide single direction indicator at terminal floors; "UP" and "DOWN" direction indicator at intermediate floors. Provide equilateral triangles not less than 2 1/2 inches in size, green for upward direction and red for downward direction. Provide electronic audible device that sounds once for upward direction and twice for downward direction. Provide audible signals exceeding ambient noise level by at least 20 decibels with frequency not higher than 1500 Hz.

2.6 HOISTWAY AND CAR EQUIPMENT

ASME A17.1/CSA B44, Parts I and II.

2.6.1 Car and Counterweight Guide Rails and Fastenings

Existing to remain.

2.6.2 Car and Counterweight Buffers

Existing to remain.

2.6.3 Pit Equipment

Existing to remain.

2.6.3.1 Pit "STOP" Switch

Existing to remain.

2.6.3.2 Ladder

Existing to remain.

2.6.3.3 Lighting of Pits

Existing to remain.

2.6.4 Terminal Stopping Devices

Existing to remain.

2.6.5 Wiring and Traveling Cables

Existing to remain.

2.6.6 Emergency Signaling Devices

Existing to remain.

2.7 HOISTWAY DOOR ACCESSORIES

ASME A17.1/CSA B44. Provide high-speed electric operator, safety interlocks for hoistway doors, and electric safety contact to prevent car operation unless doors are closed. Provide electrical circuitry that restores car to service at specified time lapse with time out circuit as option for intensive service elevators.

2.7.1 Infra-red Curtain Unit

Existing to remain.

2.8 PASSENGER ELEVATOR GUIDES, PLATFORM, AND ENCLOSURE

2.8.1 Roller Guides

Existing to remain.

2.8.2 Car Frame and Platform

Existing to remain.

2.8.3 Car Enclosure, Car Door, and Car Illumination

Existing to remain.

2.8.3.1 Car Shell Return Panels, Entrance Columns, Cove Base, and Transom

Existing to remain.

2.8.3.2 Car Top

Existing to remain.

2.8.3.3 Car Door

Existing to remain.

2.8.3.4 Car Entrance Sill

Existing to remain.

2.9 PASSENGER ELEVATOR HOISTWAY DOORS AND ENTRANCES

ASME A17.1/CSA B44. Provide hoistway entrance assemblies with a minimum 1-1/2 hour fire rating.

2.9.1 Hoistway Entrance Frames

14 gauge stainless steel.

2.9.2 Hoistway Entrance Sills

For new hoistway entrances, provide one-piece cast solid white bronze or nickel silver entrance sills. After sill is set level and flush with finished floor height, solidly grout under full length of sill. Use same materials for hoistway and car entrance sills.

2.9.3 Hoistway Entrance Doors

ASME A17.1/CSA B44, hollow metal non-vision construction with flush surfaces on car and landing sides. Provide a minimum of 2 door guide assemblies per door panel, one guide at leading edge and one at trailing edge with guides in the sill groove the entire length of travel. Provide sheet metal hoistway door track dust covers at each landing. Dust covers must cover door locks and door roller tracks and extend the full width of the door track and associated hardware. Existing hoistway entrance doors contain asbestos. Any alteration to these doors must include processes and procedures involved with asbestos containment and removal.

2.9.4 Entrance Fascias and Dust Covers

ASME A17.1/CSA B44.

2.10 MEDICAL SERVICES ACCESS

36 CFR 1191, Sections 4.10 for Elevator, 4.30 for Signage, and 4.31 for Telephones.

2.10.1 Emergency Medical Services

ICC UBC, Chapter 30 for elevators and signage.

PART 3 EXECUTION

3.1 INSTALLATION

Install in accordance with manufacturer's instructions, **ASME A17.1/CSA B44**, **36 CFR 1191**, and **NFPA 70**.

3.1.1 Structural Members

Do not cut or alter. Restore any damaged or defaced work to original condition.

3.1.2 Safety Guards

Selector cables or tapes exposed to possibility of accidental contact in machine room shall be completely enclosed with 16 gage sheet metal or expanded metal guards, both horizontally and vertically. Exposed gears, sprockets, tape or rope sheaves, floor controllers, or signal machines, and their driving ropes, chains or tapes, and selector drums shall be guarded from accidental contact in accordance with ASME A17.1/CSA B44.

3.1.3 Miscellaneous Requirements

Include recesses, cutouts, slots, holes, patching, grouting, and refinishing to accommodate elevator installation. Use core drilling to drill all new holes in concrete. Finish work to be straight, level, and plumb. During installation, protect machinery and equipment from dirt, water, or mechanical damage. At completion, clean all work, and spot paint.

3.2 FIELD QUALITY CONTROL

After completing elevators system installation, notify Contracting Officer that elevator system is ready for final inspection and acceptance test.

3.2.1 Testing Materials and Instruments

Furnish testing materials and instruments required for final inspection. Include calibrated test weights, tachometer, 600-volt megohm meter, volt meter and ammeter, three Celsius calibrated thermometers, door pressure gage, spirit level, stop watch, dynamometer, and 100 foot tape measure.

3.2.2 Field Tests

Perform acceptance tests as outlined in section ASME A17.1 and ASME A17.2 under alterations.

3.2.2.1 Leveling Tests

Test existing elevator car leveling devices for landing accuracy of plus or minus 1/4 inch at each introduced or relocated floor with no load in car, symmetrical load in car, and with rated load in car in both directions of travel. Determine accuracy of floor landing both before and immediately after endurance tests.

3.2.2.2 Insulation Resistance Tests

Perform tests to ensure elevator platform wiring systems installed as part of alterations, are free from short circuits and grounds. Minimum acceptable insulation resistance for electrical conductors is one megohm between each conductor and ground and between each conductor and other conductors. Prior to megohm meter test, make provisions to prevent damage to electronic devices.

3.3 MAINTENANCE SERVICE TRAINING

Provide qualified representative of elevator manufacturer to instruct Government personnel in care, adjustment, and maintenance of elevator equipment installed as part of these alterations, for a period of not less than 5 working days immediately following acceptance of elevator system.

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 - 1.5.1 Shop Drawings (SD-02)
 - 1.5.2 Product Data (SD-03)
- 1.6 QUALITY ASSURANCE
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BASIC ELECTRICAL 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 in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D709 (2001; R 2007) Laminated Thermosetting Materials

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100 (2000; Archived) The Authoritative Dictionary of IEEE Standards Terms

IEEE C2 (2012; Errata 2012; INT 1 2012; INT 2 2012) National Electrical Safety Code

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250 (2008) Enclosures for Electrical Equipment (1000 Volts Maximum)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2011; Errata 2 2012) National Electrical Code

1.2 RELATED REQUIREMENTS

This section applies to certain sections of Division 14, CONVEYING EQUIPMENT. This section applies to all sections of Division 26 and 28, ELECTRICAL and ELECTRONIC SAFETY AND SECURITY, of this project specification unless specified otherwise in the individual sections.

1.3 DEFINITIONS

- a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE 100.
- b. The technical sections referred to herein are those specification sections that describe products, installation procedures, and equipment operations and that refer to this section for detailed description of submittal types.
- c. The technical paragraphs referred to herein are those paragraphs in PART 2 - PRODUCTS and PART 3 - EXECUTION of the technical sections that describe products, systems, installation procedures, equipment, and

test methods.

1.4 ELECTRICAL CHARACTERISTICS

Electrical characteristics for this project shall be 480V volts secondary, three phase, four wire. Final connections to the power distribution system at the existing substation shall be made by the Contractor as directed by the Contracting Officer.

1.5 ADDITIONAL SUBMITTALS INFORMATION

Submittals required in other sections that refer to this section must conform to the following additional requirements as applicable.

1.5.1 Shop Drawings (SD-02)

Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.

1.5.2 Product Data (SD-03)

Submittal shall include performance and characteristic curves.

1.6 QUALITY ASSURANCE

1.6.1 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.6.2 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in the technical section.

1.6.2.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable

if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.6.2.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

1.7 WARRANTY

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.8 POSTED OPERATING INSTRUCTIONS

Provide for each system and principal item of equipment as specified in the technical sections for use by operation and maintenance personnel. The operating instructions shall include the following:

- a. Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
- b. Start up, proper adjustment, operating, lubrication, and shutdown procedures.
- c. Safety precautions.
- d. The procedure in the event of equipment failure.
- e. Other items of instruction as recommended by the manufacturer of each system or item of equipment.

Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions where directed. For operating instructions exposed to the weather, provide weather-resistant materials or weatherproof enclosures. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

1.9 MANUFACTURER'S NAMEPLATE

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

1.10 FIELD FABRICATED NAMEPLATES

ASTM D709. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified in the technical sections or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, 0.125 inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be one by 2.5 inches. Lettering shall be a minimum of 0.25 inch high normal

block style.

1.11 ELECTRICAL REQUIREMENTS

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

1.12 INSTRUCTION TO GOVERNMENT PERSONNEL

Where specified in the technical sections, furnish the services of competent instructors to give full instruction to designated Government personnel in the adjustment, operation, and maintenance of the specified systems and equipment, including pertinent safety requirements as required. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section.

PART 2 PRODUCTS

2.1 FACTORY APPLIED FINISH

Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA 250 corrosion-resistance test and the additional requirements specified in the technical sections.

PART 3 EXECUTION

3.1 FIELD APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be as specified in the section specifying the associated electrical equipment.

3.2 FIELD FABRICATED NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

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SECTION 26 05 00.00 40

COMMON WORK RESULTS FOR ELECTRICAL

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 D709 (2001; R 2007) Laminated Thermosetting Materials

ELECTRONIC INDUSTRIES ALLIANCE (EIA)

EIA 480 (1981) Toggle Switches

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE Stds Dictionary (2009) IEEE Standards Dictionary: Glossary of Terms & Definitions

INTERNATIONAL CODE COUNCIL (ICC)

ICC/ANSI A117.1 (2009) Accessible and Usable Buildings and Facilities

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI Z535.1 (2006; R 2011) American National Standard for Safety--Color Code

ANSI/NEMA OS 1 (2008; Amd 2010) Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports

NEMA FB 1 (2012) Standard for Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable

NEMA KS 1 (2001; R 2006) Enclosed and Miscellaneous Distribution Equipment Switches (600 V Maximum)

NEMA WD 6 (2002; R 2008) Wiring Devices Dimensions Specifications

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2011; Errata 2 2012) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 1	(2005; Reprint Jul 2007) Standard for Flexible Metal Conduit
UL 489	(2009; Reprint Jun 2011) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
UL 6	(2007; reprint Nov 2010) Electrical Rigid Metal Conduit-Steel
UL 797	(2007) Electrical Metallic Tubing -- Steel
UL 870	(2008) Standard for Wireways, Auxiliary Gutters, and Associated Fittings

1.2 DEFINITIONS

- a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in [IEEE Stds Dictionary](#).
- b. The technical sections referred to herein are those specification sections that describe products, installation procedures, and equipment operations and that refer to this section for detailed description of submittal types.

1.3 SUBMITTALS

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

[SD-01 Preconstruction Submittals](#)

Submit [Material, Equipment, and Fixture Lists](#) for the following:

[Conduits, Raceway and Fittings](#)

[Wire and Cable](#)

[Splices and Connectors](#)

[Switches](#)

[Receptacles](#)

[Outlets, Outlet Boxes, and Pull Boxes](#)

[Circuit Breakers; G](#)

[Lamps and Lighting Fixtures; G](#)

[SD-03 Product Data](#)

Submit manufacturer's catalog data for the following items:

Conduits, Raceway and Fittings

Wire and Cable

Splices and Connectors

Switches

Receptacles

Outlets, Outlet Boxes, and Pull Boxes

Circuit Breakers; G

Lamps and Lighting Fixtures; G

Spare Parts

Certification

SD-06 Test Reports

Continuity Test

Phase-Rotation Tests

Insulation Resistance Test

SD-08 Manufacturer's Instructions

Submit [Manufacturer's Instructions](#).

1.4 PREVENTION OF CORROSION

Protect metallic materials against corrosion. Provide equipment enclosures with the standard finish by the manufacturer when used for most indoor installations. For harsh indoor environments (any area subjected to chemical and/or abrasive action), and all outdoor installations, refer to Section [09 90 00.00 98 PAINTING AND COATING](#). Do not use aluminum when in contact with earth or concrete and, where connected to dissimilar metal, protect by approved fittings and treatment. Ferrous metals such as, but not limited to, anchors, bolts, braces, boxes, bodies, clamps, fittings, guards, nuts, pins, rods, shims, thimbles, washers, and miscellaneous [spare parts](#) not of corrosion-resistant steel shall be hot-dip galvanized except where other equivalent protective treatment is specifically approved in writing.

1.5 GENERAL REQUIREMENTS

Submit [material, equipment, and fixture lists](#) for the following items showing manufacturer's style or catalog numbers, specification and drawing reference numbers, warranty information, and fabrication site.

Submit [manufacturer's instructions](#) including special provisions required to install equipment components and system packages. Special notices shall detail impedances, hazards and safety precautions.

Submit [certification](#) required to install equipment components and system packages.

1.6 POSTED OPERATING INSTRUCTIONS

Provide for each system and principal item of equipment as specified in the technical sections for use by operation and maintenance personnel. The operating instructions shall include the following:

- a. Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
- b. Start up, proper adjustment, operating, lubrication, and shutdown procedures.
- c. Safety precautions.
- d. The procedure in the event of equipment failure.
- e. Other items of instruction as recommended by the manufacturer of each system or item of equipment.

Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions where directed. For operating instructions exposed to the weather, provide weather-resistant materials or weatherproof enclosures. Operating instructions shall not fade when exposed to sunlight and be secured to prevent easy removal or peeling.

1.7 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.

1.8 FIELD FABRICATED NAMEPLATES

ASTM D709. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified in the technical sections or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, 0.125 inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be one by 2.5 inches. Lettering shall be a minimum of 0.25 inch high normal block style.

PART 2 PRODUCTS

2.1 MATERIALS

Materials and equipment to be provided shall be the standard cataloged products of manufacturers regularly engaged in the manufacture of the products.

2.1.1 Rigid Steel Conduit

Rigid steel conduit shall comply with **UL 6** and be galvanized by the hot-dip process.

Fittings for rigid steel conduit shall be threaded.

Gaskets shall be solid. Conduit fittings with blank covers shall have gaskets, except in clean, dry areas or at the lowest point of a conduit run where drainage is required.

Covers shall have captive screws and be accessible after the work has been completed.

2.1.2 Electrical Metallic Tubing (EMT)

EMT shall be in accordance with [UL 797](#) and be zinc coated steel. Couplings and connectors shall be zinc-coated, raintight, gland compression with insulation throat. Crimp, spring, or setscrew type fittings are not acceptable.

2.1.3 Flexible Metallic Conduit

Flexible metallic conduit shall comply with [UL 1](#) and be galvanized steel.

Fittings for flexible metallic conduit shall be specifically designed for such conduit.

Provide liquidtight flexible metallic conduit with a protective jacket of PVC extruded over a flexible interlocked galvanized steel core to protect wiring against moisture, oil, chemicals, and corrosive fumes.

Specifically design fittings for liquidtight flexible metallic conduit for such conduit.

2.1.4 Wireways and Auxiliary Gutters

Wireway and auxiliary gutters shall be a minimum 4- by 4 inch trade size conforming to [UL 870](#).

2.2 WIRE AND CABLE

Conductors installed in conduit shall be copper 600-volt type THHN or XHHW as indicated. All conductors [AWG No. 8](#) and larger, shall be stranded. All conductors smaller than [AWG No. 8](#) shall be solid.

Flexible cable shall be Type SO and contain a grounding conductor with green insulation.

Conductors installed in plenums shall be marked plenum rated.

2.3 SPLICES AND CONNECTORS

Make all splices in [AWG No. 8](#) and smaller with approved insulated electrical type.

Make all splices in [AWG No. 6](#) and larger with indentor crimp-type connectors and compression tools. Joints shall be wrapped with an insulating tape that has an insulation and temperature rating equivalent to that of the conductor.

2.4 SWITCHES

2.4.1 Safety Switches

Safety switches shall comply with **NEMA KS 1**, and be the heavy-duty type with enclosure, voltage, current rating, number of poles, and fusing as indicated. Switch construction shall be such that, when the switch handle in the "ON" position, the cover or door cannot be opened. Cover release device shall be coinproof and be so constructed that an external tool shall be used to open the cover. Make provisions to lock the handle in the "OFF" position, but the switch shall not be capable of being locked in the "ON" position.

Provide switches of the quick-make, quick-break type. Approve terminal lugs for use with copper conductors.

Safety color coding for identification of safety switches shall conform to **ANSI Z535.1**.

2.4.2 Toggle Switches

Toggle switches shall comply with **EIA 480**, control incandescent, mercury, and fluorescent lighting fixtures and be of the heavy duty, general purpose, noninterchangeable flush-type.

Toggle switches shall be commercial grade toggle type, single double-pole, three-way two-position devices (as indicated) rated 20 amperes at 277 volts, 60 hertz alternating current (ac) only.

All toggle switches shall be products of the same manufacturer.

2.5 RECEPTACLES

Receptacles shall be commercial grade, 20A, 125 VAC, 2-pole, 3-wire duplex conforming to **NEMA WD 6**, NEMA 5-20R.

Special purpose receptacles shall be as indicated.

2.6 OUTLETS, OUTLET BOXES, AND PULL BOXES

Outlet boxes for use with conduit systems shall be in accordance with **NEMA FB 1** and **ANSI/NEMA OS 1** and be not less than 1-1/2 inches deep. Furnish all pull and junction boxes with screw-fastened covers.

2.7 CIRCUIT BREAKERS

Circuit-breaker interrupting rating shall be not less than those indicated and in no event less than 10,000 amperes root-mean-square (rms) symmetrical at 208 volts, respectively. Multipole circuit breakers shall be the common-trip type with a single handle. Molded case circuit breakers shall be bolt-on type conforming to **UL 489**.

2.8 LAMPS AND LIGHTING FIXTURES

Manufacturers and catalog numbers shown are indicative of the general type desired and are not intended to restrict the selection to fixtures of any particular manufacturer. Fixtures with the same salient features and equivalent light distribution and brightness characteristics, of equal finish and quality, are acceptable. Provide lamps of the proper type and

wattage for each fixture.

Ballasts shall be high power factor and be energy efficient. Ballasts shall have a Class P terminal protective device for multi-volt operation as indicated and be rapid-start fluorescent. Ballasts shall be "A" sound rated. Fluorescent lamps shall be standard reduced wattage type.

High intensity discharge (HID) lighting fixtures shall have prewired integral ballasts and cast aluminum housings complete with tempered glass lenses suitable for installation in damp or wet locations. Provide fixtures and lamps.

PART 3 EXECUTION

3.1 CONDUITS, RACEWAYS AND FITTINGS

Conduit runs between outlet and outlet, between fitting and fitting, or between outlet and fitting shall not contain more than the equivalent of three 90-degree bends, including those bends located immediately at the outlet or fitting.

Do not install crushed or deformed conduit. Avoid trapped conduit runs where possible. Take care to prevent the lodgment of foreign material in the conduit, boxes, fittings, and equipment during the course of construction. Clear any clogged conduit of obstructions or be replaced.

Conduit and raceway runs concealed in or behind walls, above ceilings, or exposed on walls and ceilings 5 feet or more above finished floors and not subject to mechanical damage may be electrical metallic tubing (EMT).

3.1.1 Rigid Steel Conduit

Make field-made bends and offsets with approved hickey or conduit bending machine. Conduit elbows larger than 2-1/2 inches shall be long radius.

Provide all conduit stubbed-up through concrete floors for connections to free-standing equipment with the exception of motor-control centers, cubicles, and other such items of equipment, with a flush coupling when the floor slab is of sufficient thickness. Otherwise, provide a floor box set flush with the finished floor. Conduits installed for future use shall be terminated with a coupling and plug set flush with the floor.

3.1.2 Electrical Metallic Tubing (EMT)

EMT shall be grounded in accordance with NFPA 70, using pressure grounding connectors especially designed for EMT.

3.1.3 Flexible Metallic Conduit

Use flexible metallic conduit to connect recessed fixtures from outlet boxes in ceilings, transformers, and other approved assemblies.

Bonding wires shall be used in flexible conduit as specified in NFPA 70, for all circuits. Flexible conduit shall not be considered a ground conductor.

Electrical connections to vibration-isolated equipment shall be made with flexible metallic conduit.

Liquidtight flexible metallic conduit shall be used in wet and oily locations and to complete the connection to motor-driven equipment.

3.1.4 Wireway and Auxiliary Gutter

Straight sections and fittings shall be bolted together to provide a rigid, mechanical connection and electrical continuity. Dead ends of wireways and auxiliary gutters shall be closed. Plug all unused conduit openings.

Auxiliary gutters used to supplement wiring spaces for equipment not contained in a single enclosure shall contain no switches, overcurrent devices, appliances, or apparatus and be not more than 30 feet long.

3.2 WIRING

Feeder and branch circuit conductors shall be color coded as follows:

<u>CONDUCTOR</u>	<u>120/208VAC COLOR</u>	<u>277/480VAC COLOR</u>
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Natural Gray
Equipment Grounds	Green	Green

Conductors up to and including AWG No. 2 shall be manufactured with colored insulating materials. Conductors larger than AWG No. 2 shall have ends identified with color plastic tape in outlet, pull, or junction boxes.

Splice in accordance with the NFPA 70. Provide conductor identification within each enclosure where a tap, splice, or termination is made and at the equipment terminal of each conductor. Terminal and conductor identification shall match as indicated.

Where several feeders pass through a common pullbox, the feeders shall be tagged to clearly indicate the electrical characteristics, circuit number, and panel designation.

3.3 SAFETY SWITCHES

Securely fasten switches to the supporting structure or wall, utilizing a minimum of four 1/4 inch bolts. Do not use sheet metal screws and small machine screws for mounting. Do not mount switches in an inaccessible location or where the passageway to the switch may become obstructed. Mounting height shall be 5 feet above floor level, when possible.

3.4 WIRING DEVICES

3.4.1 Wall Switches and Receptacles

Install wall switches and receptacles so that when device plates are applied, the plates will be aligned vertically to within 1/16 inch.

Ground terminal of each flush-mounted receptacle shall be bonded to the

outlet box with an approved green bonding jumper when used with dry wall type construction.

3.4.2 Device Plates

Device plates for switches that are not within sight of the loads controlled shall be suitably engraved with a description of the loads.

Device plates and receptacle cover plates for receptacles other than 125-volt, single-phase, duplex, convenience outlets shall be suitably marked, showing the circuit number, voltage, frequency, phasing, and amperage available at the receptacle. Required marking shall consist of a self-adhesive label having 1/4 inch embossed letters.

Device plates for convenience outlets shall be similarly marked indicating the supply panel and circuit number.

3.5 BOXES AND FITTINGS

Furnish and install pullboxes where necessary in the conduit system to facilitate conductor installation. Conduit runs longer than 100 feet or with more than three right-angle bends shall have a pullbox installed at a convenient intermediate location.

Securely mount boxes and enclosures to the building structure with supporting facilities independent of the conduit entering or leaving the boxes.

Mounting height of wall-mounted outlet and switch boxes, measured between the bottom of the box and the finished floor, shall be in accordance with ICC/ANSI A117.1 and as follows:

<u>LOCATION</u>	<u>MOUNTING HEIGHT</u>
Receptacles in offices	18 inches
Receptacles in corridors	18 inches
Receptacles in shops and laboratories	48 inches
Receptacles on platforms	48 inches
Switches for light control	48 inches

3.6 LAMPS AND LIGHTING FIXTURES

Install new lamps of the proper type and wattage in each fixture. Securely fasten fixtures and supports to structural members and install parallel and perpendicular to major axes of structures.

3.7 IDENTIFICATION PLATES AND WARNINGS

Furnish and install identification plates for lighting and power panelboards, motor control centers, all line voltage heating and ventilating control panels, fire detector and sprinkler alarms, door bells, pilot lights, disconnect switches, manual starting switches, and magnetic starters. Process control devices and pilot lights shall have identification plates.

Furnish identification plates for all line voltage enclosed circuit breakers, identifying the equipment served, voltage, phase(s) and power source. Circuits 480 volts and above shall have conspicuously located warning signs in accordance with OSHA requirements.

3.8 PAINTING

Exposed conduit, supports, fittings, cabinets, pull boxes, and racks shall be thoroughly cleaned and painted as specified in Section 09 90 00.00 98 PAINTING AND COATING.

3.9 FIELD TESTING

Submit Test Reports in accordance with referenced standards in this section.

After completion of the installation and splicing, and prior to energizing the conductors, perform wire and cable continuity and insulation tests as herein specified before the conductors are energized.

Contractor shall provide all necessary test equipment, labor, and personnel to perform the tests, as herein specified.

Isolate completely all wire and cable from all extraneous electrical connections at cable terminations and joints. Substation and switchboard feeder breakers, disconnects in combination motor starters, circuit breakers in panel boards, and other disconnecting devices shall be used to isolate the circuits under test.

Perform [insulation-resistance test](#) on each field-installed conductor with respect to ground and adjacent conductors. Applied potential shall be 500 volts dc for 300 volt rated cable and 1000 volts dc for 600 volt rated cable. Take readings after 1 minute and until the reading is constant for 15 seconds. Minimum insulation-resistance values shall not be less than 25 Megohms for 300 volt rated cable and 100 Megohms for 600 volt rated cable. For circuits with conductor sizes 8AWG and smaller insulation resistance testing is not required.

Perform [continuity test](#) to insure correct cable connection (i.e correct phase conductor, grounded conductor, and grounding conductor wiring) end-to-end. Any damages to existing or new electrical equipment resulting from contractor mis-wiring will be repaired and re-verified at contractor's expense. All repairs shall be approved by the CO prior to acceptance of the repair.

Conduct [phase-rotation tests](#) on all three-phase circuits using a phase-rotation indicating instrument. Perform phase rotation of electrical connections to connected equipment clockwise, facing the source.

Final acceptance will depend upon the successful performance of wire and cable under test. Do not energize any conductor until the final test reports are reviewed and approved by the CO.

-- End of Section --

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DIVISION 26 - ELECTRICAL

SECTION 26 09 23.00 40

LIGHTING CONTROL DEVICES

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-- End of Section Table of Contents --

SECTION 26 09 23.00 40

LIGHTING CONTROL DEVICES

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.

GREEN SEAL (GS)

GC-12 (1997) Occupancy Sensors

1.2 GENERAL REQUIREMENTS

Section 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS applies to work specified in this section.

1.3 SUBMITTALS

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

SD-03 Product Data

Occupancy Sensors; G

PART 2 PRODUCTS

2.1 OCCUPANCY SENSORS

Provide UL listed occupancy sensor complying with GC-12. Design occupancy sensors and power packs to operate on the voltage indicated. Provide sensors and power packs with circuitry that only allows load switching at or near zero current crossing of supply voltage, with mounting as indicated. Provide sensor with an LED occupant detection indicator, adjustable sensitivity, and adjustable delayed-off time range of 5 minutes to 15 minutes. Provide wall mounted sensors, and white ceiling mounted sensors. Provide ceiling mounted sensors with 360 degree coverage unless otherwise indicated.

c. Ultrasonic/Infrared Combination Sensor

2.2 EQUIPMENT IDENTIFICATION

2.2.1 Manufacturer's Nameplate

Provide each item of equipment with a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in an inconspicuous place; the nameplate of the distributing agent is not acceptable.

2.2.2 Labels

Provide labeled control devices, clearly marked for operation of specific lighting functions according to type.

Make markings related to control device type clear and locate to be readily visible to service personnel, but unseen from normal viewing angles when devices are in place.

PART 3 EXECUTION

3.1 FIELD TESTING

Demonstrate that photoconductive control devices operate satisfactorily in the presence of the Contracting Officer.

-- End of Section --

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DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

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-- End of Section Table of Contents --

SECTION 28 05 26.00 40

GROUNDING AND BONDING

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WELDING SOCIETY (AWS)

AWS A5.8/A5.8M (2011) Specification for Filler Metals for Brazing and Braze Welding

ASTM INTERNATIONAL (ASTM)

ASTM B3 (2001; R 2007) Standard Specification for Soft or Annealed Copper Wire

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2011; Errata 2 2012) National Electrical Code

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-889 (1976; Rev B; Notice 2 1988; Notice 3 1993) Dissimilar Metals

UNDERWRITERS LABORATORIES (UL)

UL 467 (2007) Grounding and Bonding Equipment

1.2 GENERAL REQUIREMENTS

Section **26 00 00.00 20** BASIC ELECTRICAL MATERIALS AND METHODS applies to work specified in this section.

Section **05 05 23.00 98** METAL FASTENINGS applies to work specified in this section.

1.3 SUBMITTALS

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

SD-01 Preconstruction Submittals

Submit material, equipment, and fixture lists for Grounding Systems including manufacturer's style or catalog numbers, specification and drawing reference numbers, warranty information,

and fabrication site information.

SD-02 Shop Drawings

Submit [Record Drawings](#) in accordance with paragraph entitled, "Drawings," of this section.

SD-03 Product Data

Submit equipment and performance data for the following items including life, test, system functional flows, safety features, and mechanical automated details.

Submit Manufacturer's catalog data for the following items:

[Ground Wires](#)

[Connectors and Fasteners](#)

[Bonding](#)

SD-06 Test Reports

Submit Test Reports for the following tests on grounding systems in accordance with the paragraph entitled, "Field Tests," of this section. Within the report include certified record of ground-resistance tests on each driven ground rod, ground rod assembly, and other grounding electrodes. Include within the record the number of rods driven and their depth at each location to meet the required resistance-to-ground measurements specified. Include a statement describing the condition of the soil at the time of measurement.

[Bond Resistance Test](#)

[Ground Isolation Test](#)

[Continuity Isolation Test](#)

SD-08 Manufacturer's Instructions

Submit Manufacturer's instructions for the Grounding Systems including special provisions required to install equipment components and system packages. Within special notices, detail impedances, hazards and safety precautions.

1.4 DRAWINGS

[Record Drawings](#) must indicate the location of ground rods, mats, grids, building ground bus, supplementary grounding electrodes, steel building columns, and other metal structures connected to the grounding system.

Identify the location of each ground rod and ground-rod assembly and other grounding electrodes by letter in alphabetical order and keyed to the record of ground-resistance tests.

PART 2 PRODUCTS

2.1 GROUND WIRES

Ground wires must be in accordance with Section 26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL.

Ground and bond wires for substations, main panels and distribution points must be annealed bare copper conforming to ASTM B3, stranded, with 98 percent conductivity. Wire size must be in accordance with the grounding requirements of NFPA 70.

Ground wires for equipment receptacles for noncurrent carrying hardware, installed in conduit must be soft drawn copper, in accordance with ASTM B3, stranded, with green insulation. Note wire size.

2.2 CONNECTORS AND FASTENERS

Grounding and bonding fasteners and connectors must conform to the requirements of UL 467, and Section 26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL.

Grounding and bonding fasteners must be copper or bronze.

Bonding straps and jumpers must be copper and have a cross-sectional area of not less than No. 6 AWG. Bonding straps and jumpers for shock-mounted devices with pivot, hinged or swivel joints must be made of woven-wire braid wire.

PART 3 EXECUTION

3.1 BONDING AND GROUNDING

Bonding and grounding requirements must be in accordance with NFPA 70.

3.2 BUILDING GROUNDS

Steel framework of the VAB is considered to be grounded to an existing counterpoise grounding grid. Existing system includes electrically connected grounding conductor from steel columns and extending around the perimeter of the building.

3.3 EQUIPMENT GROUNDING

In addition to the green colored equipment grounding conductor required in each raceway and sized in accordance with Table 250.122 of the NEC, each panelboard/ switchboard enclosure, transformer housing, motor housing, disconnect, starter, and other electrical equipment, addressed under this contract, must be bonded to the grounding system with a stranded copper conductor, routed external to the feeder raceway.

Metallic raceway systems must have electrical continuity with equipment individually and be directly connected to the building ground, independent of the raceway system.

Individually and directly connect enclosures for panelboards to the building ground. Grounding conductor must not be less than No. 2 AWG and be connected from the building ground to a copper ground-bus terminal strip located in each panelboard.

Polarized receptacles, lighting fixtures, and equipment enclosures must be grounded with an identified (green color) insulated conductor, not smaller than No. 12 AWG, connected to the branch circuit ground-bus terminal strip. Ground-bus terminal strip in each panelboard enclosure must be isolated and independent of the system neutral terminal strip.

Indoor substations, transformers, switchboard frames, switchgear assemblies, motors, motor control centers, air compressors, air handlers, refrigerated air dryers, generators, frames and tracks of cranes, and platforms must be individually and directly connected to the building ground. Current-carrying capacity of the grounding conductor must be the same as the current-carrying capacity of the power conductors for circuits utilizing power lines size No. 2 AWG and smaller. For circuits with power wiring larger than No. 2 AWG, the grounding conductor must be in accordance with NFPA 70, except that the grounding conductor must not be smaller than No. 2 AWG.

Noncurrent carrying metallic parts of electrical equipment, including metallic cable sheaths, conduit, raceways, and electrical structural members, must be bonded together and connected to the ground grid or ground connection rods.

Install secure ground systems for power and instrumentation. Independently connect each system to the building counterpoise as shown.

Secure ground systems must consist of unspliced ground wires in individual welded or epoxied conduit runs from the secure area to the building counterpoise. Welding and epoxying must conform to Section 26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL.

3.4 GROUNDING CONNECTIONS

Ground connections must be bonded connections in accordance with paragraph entitled, "Bonding," of this section.

Weld ground connections that are buried or in inaccessible locations.

Bolt connections in accessible locations. Connections to steel building columns in accessible locations must be cast-copper-alloy clamp lugs bolted or exothermically fusion-welded to the structure.

Clean, grease, and remove foreign matter from ground connection surfaces. Do not penetrate clad material in the cleaning process. Make connection between like metals where possible. Where dissimilar metals are welded, brazed, or clamped, follow the weld kit manufacturer's instructions. Connections between dissimilar metals must not produce galvanic action in accordance with MIL-STD-889.

3.5 BONDING

3.5.1 Type of Bonds

Accomplish bonding of metal surfaces by brazing, welding, clamping or structural joining methods.

3.5.1.1 Brazing

Brazing solder must conform to AWS A5.8/A5.8M.

3.5.1.2 Welding

Welding must be by the exothermic process. Within the welding procedure, include the proper mold and powder charge and conform to the manufacturer's recommendations.

Welding processes must be of the exothermic fusion type that will make a connection without corroding or loosening. Process must join all strands and not cause the parts to be damaged or weakened. Completed connection or joint must be equal or larger in size than the conductors joined and have the same current-carrying capacity as the largest conductor. Paint buried ground connections with a bitumastic paint.

3.5.1.3 Clamping

In external locations, use clamping only where a disconnect type of connection is required. Connection device may utilize spring-loaded jaws or threaded fasteners. Construct device such that positive contact pressure is maintained at all times. Use machine bolts with spring-type lockwashers.

3.5.1.4 Structural Joining Methods

Consider joints made with high-strength structural bolts, and clean unpainted faying surfaces sufficiently bonded. Install a jumper across the joint in the form of a No. 4 AWG bare copper wire exothermically welded at each end to the surfaces involved spanning the connection wire jumpers used across joints employing miscellaneous machine bolts.

3.5.2 Cleaning of Bonding Surfaces

Thoroughly clean surfaces that comprise the bond before joining. Apply an appropriate abrasive with gentle and uniform pressure to ensure a smooth and uniform surface. Do not remove excessive metal from the surface. Clean clad metals in such a manner that the cladding material is not penetrated by the cleaning process. Then clean bare metal with an appropriate solvent to remove any grease, oil, dirt, corrosion preventives, and other contaminants. Bond to the cleaned area must be made within one hour after cleaning. Seal joint and refinish the exposed surfaces within two hours of exposure to prevent oxidation. When additional time is required, apply a corrosion preventive compound until the area can be refinished.

3.5.3 Bonding Straps and Jumpers

Install jumpers such that the vibration by the shock-mounted device will not change its electrical characteristics.

Braze or Weld bonds for outdoor locations unless a disconnect type of connection is required. When a disconnect is required, use clamping with bolts. Insert a tooth-type lockwasher between the strap and metallic member for each bolt.

Bond straps directly to the basic structure and do not penetrate any adjacent parts. Install straps in an area that is accessible for maintenance.

Use single straps for the bonds and install such that they will not

restrict movement of structural members. Do not connect two or more straps in series.

Install straps such that they will not weaken structural members to which they are attached.

3.5.4 Equipment and Enclosure Bonding

Each metallic enclosure and all electrical equipment must be bonded to ground. At least one copper connection must be made from the system ground point to one or more enclosures in the area such that all enclosures and equipment provide a low-impedance path to ground when properly bonded together.

3.5.5 Bonding of Conduit and Raceway Systems

Bond all metal conduit, fittings, junction boxes, outlet boxes, armored and metal sheathed cable, and other raceways. Take care to ensure adequate electrical contact at the joints and terminations.

3.5.5.1 Rigid Metal Conduit and Terminations

Threaded connections must be wrench-tight and there must be no exposed threads. Ream all ends of the conduit to remove burrs and rough edges. Conduits entering boxes and enclosures must be bonded to the box with locknuts and grounding-type bushings. Locknuts that gouge into the metal box when tightened are not acceptable.

Conduit systems that are interrupted by PVC dielectric links must be bonded separately on either side of the link. Dielectric link must not be jumpered.

3.5.5.2 Flexible Metal Conduit

Flexible conduit must have an integral grounding conductor.

3.5.6 Protection of Finished Bonds

Protect finished bonds by painting to match the original finish after the bond is made.

3.6 FIELD TESTS

Perform the following tests in the presence of the Contracting Officer.

3.6.1 Bond Resistance Test

Resistance of any bond connection must not exceed 0.5 milliohm. Rework bonds that exceed this resistance at no additional cost to the Government.

3.6.2 Ground Isolation Test

Test ground systems for isolation from other ground systems.

3.6.3 Continuity Isolation Test

Perform continuity test on all power receptacles to ensure that the ground terminals are properly grounded to the facility ground system.

-- End of Section --