JEA
GREENLAND ENERGY CENTER
FUEL OIL/DEMINERALIZED WATER STORAGE TANK ADDITION
JACKSONVILLE, FLORIDA

FIELD ERECTED WELDED TANKS

196116.77.5450

Bid Issue
June 19, 2017

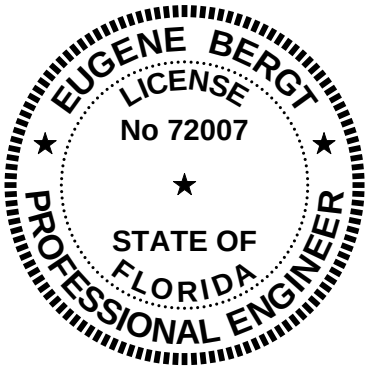
BLACK & VEATCH
JACKSONVILLE, FL

BLACK & VEATCH
12740 Gran Bay Parkway W, Suite 2140
Jacksonville, FL 32258
Certificate of Authorization No.: 8132

Project Identification	
Title:	**Greenland Energy Center – Fuel Oil/Demineralized Water Storage Tank Addition**
Address:	6850 Energy Drive, Jacksonville, FL 32256
Specification:	Field Erected Welded Tanks
Issue Status:	Bid Issue
Certification(s)	

Digitally signed by Bergt, Gene E.
Date: 2017.06.20 07:14:05 -04'00'

I hereby certify that this specification was prepared by me or under my direct supervision and that I am a duly registered professional engineer under the laws of the state of Florida:



Signed: Eugene Bergt
Registration No.: 72007

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01100 - General Requirements and Scope of Work

01100.1 Overall Project Description

Greenland Energy Center (GEC) is located in southeast Jacksonville at the end of Energy Center Drive that intersections Philips Highway at 6850 Energy Drive, Jacksonville, FL 32256 in Duval County. The power plant consists of two nominal 175 MW General Electric (GE) model PG7241 FA (DLN) combustion turbine generators (CTG), designated Units 1 and 2, installed in simple-cycle configuration and currently in Commercial Operation. The site was cleared and developed, including the storm water retention ponds, for ultimate site build out (including future Units 3, 4, 5, 6, and 7).

01100.2 Contractor's Scope of Work

The scope of work specified herein includes improvements to existing fuel oil and NOx injection water systems at JEA's Greenland Energy Center. All work to furnish and erect equipment specified herein shall be provided by the Contractor. The scope of work includes but is not limited to the following.

The Contractor shall provide all materials and services to furnish and erect two (2) 500,000 gallon, API 650 March 2103 Edition including addenda, cone roof, above grade, field erected, welded, carbon steel, fuel oil storage tanks for storage of No. 2 fuel oil. Additionally, the Contractor shall provide all materials and services to furnish and erect the following as shown on the Drawings and as specified herein relating to the installation of the fuel oil storage tanks:

- Access provisions, including:
  - Stairs on the tank exterior
  - Interior ladder with fall prevention device
  - Railing along stairway and on the tank roof to any point that requires access
  - Non-slip coatings for access to all manways, instrumentation, and nozzles on the tank roof
- Instrumentation, including:
  - Float type level gauge accessible at grade for manual inspection of level
- Breather valve with flame arrestor
- Floating suction
- Tank grounding tied into the existing ground grid.
- Pipe supports
- Finish painting

The Contractor shall provide all materials and services to furnish and erect one (1) 800,000 gallon, AWWA D100, cone roof, above grade, field erected, welded, stainless steel, demineralized water storage tank for storage of demineralized water for NOx injection. Additionally, the Contractor shall furnish and erect the following as shown on the Drawings and as specified herein relating to the installation of the demineralized water storage tank:

- Earthwork
- Tank foundation
- Access provisions, including:
  - Stairs on the tank exterior
  - Interior ladder with fall prevention device
  - Railing along stairway and on the tank roof to any point that requires access
  - Non-slip coatings for access to the manway, instrumentation, and nozzles on the tank roof
- Filter intake/vent
- Tank grounding tied into the existing ground grid
- Pipe supports
- Finish painting (where applicable)

The Contractor shall provide all materials and services to furnish and erect a complete and operational system. Omission by Engineer of specific equipment and services in the above list shall not relieve the Contractor of his responsibility to provide all materials and services to furnish and erect a complete and operational system as specified herein.

In the event of technical conflicts, errors, or discrepancies, the detailed technical specifications, including this Section 01100 and all higher numbered sections, take precedence over Section 01400, Technical Supplemental Specifications.

01100.2.1 Erosion Control Measures and Stormwater Pollution Prevention Plan

Overall site erosion control installation is performed by Others. The Contractor shall adhere to the Stormwater Pollution Prevention Plan for Construction Activities (SWPPP) that will be provided by the Owner. Additional site erosion control devices required for adherence to the SWPPP shall be provided by the Contractor. This includes sedimentation protection of the existing inlets. Any damage caused by the Contractor to the site erosion control devices shall be repaired by the Contractor.

01100.2.2 As-Built Drawings

Contractor shall provide as-built drawings of the locations and elevations of equipment, utilities, structures and fixtures. As-built drawings shall be clear and legible and "red-lined" electronically on the most recent drawing revision. The Engineer will provide AutoCAD files for the Contractor to complete the As-built markups. The Contractor shall return the AutoCAD files to the Engineer with the As-built markups. Hard Copy As-built drawings shall be submitted to the Owner within 14 days of completion of a system or area. As-built markups requiring clarification shall be resolved within 7 days of the Owner's request for clarification. As-Built drawings shall be signed and sealed by the Contractor and the Contractor’s Registered Surveyor.

01100.3 Scope of Work Clarifications

01100.3.1 General

Any costs for soil remediation, soil improvements, removal of unknown abnormal underground obstructions or contaminated soil shall be considered additional work, and shall not be included in the initial Contract scope of work or pricing. The Contractor shall assume that on-site material is suitable for general fill.

Normal construction surveys for laying out and controlling the work shall be included in the Contractor's scope of work. Dewatering and shoring of excavation works shall be the responsibility of the Contractor.

JEA Store numbers indicated on the design documents are for reference only to the specified material/assembly, and is not intended to indicate a JEA supplied material/assembly. All materials and assemblies indicated with a JEA Store number shall be provided by the Contractor at the Contractor’s expense.

01100.3.2 Safety, Health, and Accident Prevention

Contractor shall take all precautions to protect the safety of its employees and others on the Work Site. Work safety requirements shall comply with JEA Contractor Safe Work Practices Manual dated February 2007, available on-line at:

https://www.jea.com/About/Procurement/Become_a_Vendor/Contractor_Safety/Contractor_Safety_Manual/

01100.3.3 Lines and Grades

Basic horizontal and vertical control points exist on Site as indicated on the design drawings. These points shall be used as datum for Work under this Contract; however, Contractor shall verify that these control points are correct.

Work shall be done to the lines, grades, and elevations indicated on the design drawings. Contractor shall provide suitable equipment and competent workmen who shall locate and lay out the Work.

Work done without being properly located may be ordered removed and replaced at Contractor's expense.

01100.3.4 Preservation of Monuments, Stakes, and Existing Monitoring Wells

Contractor shall carefully preserve monuments, benchmarks, reference points, stakes, and existing monitoring wells. Contractor will be charged with the expense of replacement of such items destroyed and shall be responsible for mistakes or loss of time that may be caused. Permanent monuments or benchmarks subject to removal or being disturbed shall be protected until they can be properly referenced for relocation. Contractor shall furnish materials and assistance for the proper replacement of such monuments or bench marks.

01100.3.5 Final Grading

At the completion of the Work, holes, ruts, settlements, and depressions resulting from the Work shall be filled and graded to match elevations of adjacent surfaces, and areas disturbed by the Work shall be restored to their original condition to the maximum extent practicable and as reasonably acceptable to Owner.

01100.3.6 Utility Conflicts

Contractor is responsible for providing the materials and labor required to resolve conflicts between the structures being installed by Contractor and the existing underground utilities and structures. The Contractor will be provided with the existing “As-Built” Underground Utility drawings, but it is the responsibilities of the Contractor to field verify all utilities.

01100.3.7 Dewatering

If any dewatering is required to support the construction activities within the Contractor’s Scope of Work, it shall be the responsibility of the Contractor and shall be performed in accordance with applicable permits, laws, and regulations. Dewatering shall be required for all Work which requires excavation below the groundwater table unless otherwise stated. The Contractor shall furnish all supervision, labor, materials, tools, and equipment required to install, operate, monitor, and maintain dewatering systems in accordance with the design drawings and permit requirements

The dewatering systems shall be installed, operated, monitored, and maintained in accordance with the requirements of these specifications, the design drawings, the St. Johns River Water Management District (SJRWMD), the State of Florida, Duval County, and other applicable codes and standards. A detailed dewatering plan including identification of where, when, and how dewatering will be performed, calculation of expected dewatering flow, treatment of discharge flow, and demonstration of insignificant impacts to wetlands and offsite water table shall be provided by the Contractor to the Owner. The Contractor will be required to obtain the applicable dewatering permits.

01100.4 Division of Responsibility

The Division of Responsibility Matrix defining the Contractor's scope of supply and the Owner's scope of supply is included at the end of this section and supplements responsibility definition provided throughout the Contract Documents.

Division of Responsibility Matrix			
Engineering, Procurement, and Construction Items	**Contractor**	**Owner**	**Remarks**
Engineering design	X	X	Contractor shall be responsible for Engineering Design of Fuel Oil Storage Tank and Demineralized Water Storage Tank
Certified AS-BUILT drawings	X		Drawings shall be certified by a Professional Engineer registered in the state of Florida and shall be identified with “AS-BUILT” designation.
Instruction Manuals	X		
Construction specifications		X	
Site acquisition, land purchase, easements, and rights-of-way		X	
Site survey	X(1)	X(2)	(1) As required for construction only. (2) Owner shall provide the overall property survey.
Site Security		X	
Construction power supply	X		Contractor to provide all required temporary facilities and distribution system(s) from the point of Owner supply. Tank welding electric power will not be available from Owner’s on-site electric power facilities.
Construction water supply	X		Includes water required for hydro testing. Contractor may utilize on-site supply of potable water at Contractor’s cost but must utilize back-flow prevention and metering device to be obtained by Contractor.
Construction sewage and waste disposal services	X		

Division of Responsibility Matrix			
Engineering, Procurement, and Construction Items	**Contractor**	**Owner**	**Remarks**
Construction telecommunications	X		
All construction craft and supervision	X		

01100.5 Drawings

The following listed documents are included in Appendix A and shall be part of the Contract Documents.

Mechanical Details		
Drawing No.	**Title**	**Revision**
DM-0001	Fuel Oil Supply & Storage Tank 1 – 500,000 Gallon Fuel Oil Tank	0
DM-0002	Fuel Oil Supply & Storage Tank 2 – 500,000 Gallon Fuel Oil Tank	0
DM-0003	Demineralized Water Supply & Storage – 800,000 Gallon Demin Water Storage Tank	0
DM-0648	Coating System Data Sheets – Coating System 1401	0
DM-0654	Coating System Data Sheets – Coating System 1712	0
DM-0660	Coating System Data Sheets – Coating System 2314	0

01100.6 Schedule of Submittals

Item No.	Reference Doc./Sec.	Submittal Items	Submittal Dates			
			Calendar		Event	Due Date
	77.5450	**General**				
1	77.5450	Engineering, Procurement, Shipping, Construction, Inspection and Testing Schedule and Status Report	30	After	Effective Date of this Contract With Monthly Updates	
2	77.5450	Shipping Notice	2	Before	Delivery	
3	77.5450	Recommended Spare Parts List, with Unit Prices and Names of Suppliers, Necessary to Cover a Full Maintenance Cycle	120	After	Effective Date of this Contract	
4	77.5450	Proof Copy of Instruction Manuals	30	Before	Equipment Installation	
5	77.5450	Final Copies of Instruction Manuals	30	After	Equipment Commissioning	

Item No.	Reference Doc./Sec.	Submittal Items	Submittal Dates			
			Calendar		Event	Due Date
6	77.5450	Certified "AS-BUILT" Drawings	45	After	Substantial Completion	
7	77.5450	Quality Manual, Controlled Copy	30	After	Effective Date of this Contract	
8	77.5450	Subcontractor listing		With	Bid Submittal	
9	77.5450	Inspection and Test Plan	30	After	Effective Date of this Contract	
10	77.5450	Notification of Inspection/Test	14	Before	Test/ Inspection	
	09900	**Field Applied Protective Coatings**				
11	09900	Product data sheets	60	After	Effective Date of this Contract	
12	09900	Surface preparation/coating procedures	60	After	Effective Date of this Contract	
13	09900	Lining/coating inspection/test procedures	60	After	Effective Date of this Contract	
14	09900	Coating system application/repair procedures	60	After	Effective Date of this Contract	
15	09900	Color/coating samples	60	After	Effective Date of this Contract	
16	09900	Painting certification	10	After	Completion of work	
	13201	**Field Erected Welded Oil Tanks**				
17	13201	Tank outline drawings	30	After	Effective Date of this Contract	
18	13201	Nozzle schedule	30	After	Effective Date of this Contract	
19	13201	Foundation loading and anchorage details	30	After	Effective Date of this Contract	
20	13201	Roof, shell, and bottom design and construction details	60	After	Effective Date of this Contract	
21	13201	Access provision drawings and details	60	After	Effective Date of this Contract	
22	13201	Coating procedures	60	After	Effective Date of this Contract	
23	13201	Piping and piping support details	60	After	Effective Date of this Contract	

Item No.	Reference Doc./Sec.	Submittal Items	Submittal Dates			
			Calendar		Event	Due Date
24	13201	Field erection plan drawings and details	60	After	Effective Date of this Contract	
25	13201	Certified mill test reports	10	Before	Start of Fabrication	
26	13201	API 650 tank inspection certification reports			Inspection	
27	13201	Site Safety Manual	20	Before	Site Mobilization	
	13202	**Field Erected Welded Water Tanks**				
28	13202	Tank outline drawings	30	After	Effective Date of this Contract	
29	13202	Nozzle schedule	30	After	Effective Date of this Contract	
30	13202	Foundation loading and anchorage details	30	After	Effective Date of this Contract	
31	13202	Roof, shell, and bottom design and construction details	60	After	Effective Date of this Contract	
32	13202	Access provision drawings and details	60	After	Effective Date of this Contract	
33	13202	Coating procedures	60	After	Effective Date of this Contract	
34	13202	Disinfecting procedures	60	After	Effective Date of this Contract	
35	13202	Piping and piping support details	60	After	Effective Date of this Contract	
36	13202	Field erection plan drawings and details	60	After	Effective Date of this Contract	
37	13202	Certified mill test reports	10	Before	Start of Fabrication	
38	13202	AWWA D100 tank inspection certification reports	7	After	Inspection	
39	13202	Site Safety Manual	20	Before	Site Mobilization	
	Q100	**General Welding Requirements**				
40	Q100	Welding Procedure Specifications (WPS) with applicable Procedure Qualification Records (PQR)	30	Before	Start of Fabrication	

Item No.	Reference Doc./Sec.	Submittal Items	Submittal Dates			
			Calendar		Event	Due Date
41	Q100	Procedures for storing, issuing, and reconditioning of electrodes, wires, and fluxes	30	Before	Start of Fabrication	
42	Q100	Repair procedures associated with a nonconformance report	5	After	Discovery of Repair	
43	Q100	Visual inspectors' qualifications and certificates	30	Before	Start of Fabrication	
	Q303	**Interior Coatings and Linings**				
44	Q303	Manufacturer's product data sheets	60	After	Effective Date of this Contract	
45	Q303	Applicator's blast media data sheets	60	After	Effective Date of this Contract	
46	Q303	Manufacturer's surface preparation and coating application procedures. Include manufacturer's construction standards and recommended practices for surface contamination testing, crack and joint treatment, edge treatment, coating penetration and termination.	60	After	Effective Date of this Contract	
47	Q303	Manufacturer's certification of the coating applicator	60	After	Effective Date of this Contract	
48	Q303	Applicator's inspection and test reports	7	After	Test/ Inspection	

01400 - Technical Supplemental Specifications

This section contains technical supplemental specifications that provide additional requirements applicable to the work covered under the technical sections which follow this Section 01400.

01400.1 Summary of Applicable Supplementals

The technical supplementals applicable to each technical section are indicated below.

	Technical Section Number	Technical Section Name	Applicable Technical Supplementals
1	9900	Field Applied Protective Coatings	D200, Q302, Q303, Q320, Q500
2	13201	Field Erected Welded Oil Tanks	D100, D300, M200, Q001, Q100, Q121, Q210, Q230, Q303, Q320, Q500, S200, S210
3	13202	Field Erected Welded Water Tanks	D100, D300, M200, Q001, Q100, Q121, Q210, Q230, Q303, Q320, Q500, S200, S210

01400.2 Technical Supplemental Specifications

The technical supplemental specifications follow.

D100 Site Meteorological and Seismic Data

(Source: 25Mar08 - Revised by Project: 02Jun11)

Work shall be designed according to the following building code and site conditions:

General Design Data:	
Building Code	State of Florida Building Code 2007
Site Elevation (Mean Sea Level), ft	30
Wind Design Data:	
Basic Wind Speed, V, Nominal 3 second gust wind speed at 33 ft (10 m) above ground for Exposure C category, mph (m/s)	130
Exposure Category	C
Importance Factor (Wind Loads), I	1.15
Seismic Design Data:	
State of Florida Building Code does not consider seismic loads for buildings. For equipment design, the following seismic design criteria shall be considered in accordance with ASCE 7-05 and the Florida State Building Code 2007. Seismic Occupancy Category =	ASD IV

Seismic Site Classification =	D
Siesmic Design Category =	A
S_1 =	0.05 g
S_2 =	0.15g
Importance Factor, I =	1.5

D200 Design Ambients and HVAC Criteria

(Source: 10Sep07 - Revised by Project: 02Jun11)

Area Specific Design. The general design ambient air conditions shall be used unless area specific or equipment specific conditions are indicated in the contract documents:

	Temperature, °F		Relative Humidity	
Area	**Minimum**	**Maximum**	**Minimum**	**Maximum**
General Outdoor Area	7	105	49%	100%

D300 Property Tables

(Source: 25Mar08 - Revised by Project: 02Jun11)

Liquid Fuel Characteristics Table for No. 2 Fuel Oil	
Specific Gravity at 60 °F	0.8 to 0.9
Viscosity, cSt at 100 °F	1.8 to 3.6
Flash Point, °F	120 to 190

Parameter	Demineralized Water
Silica as SiO_2, mg/L	< 0.01
Total Dissolved Solids, mg/L	< 0.025
Specific Conductance, µS/cm	< 0.1

M200 Piping

(Source: 19Dec09 - Revised by Project: 02Jun11)

All piping and pipe supports shall be in accordance with ASME B31.1 - Power Piping. Materials and wall thickness of piping and fittings will be selected based on design conditions established for the piping system. The following minimum requirements shall apply:

Table 1 - General Pipe and Tubing Selection Criteria					
			Minimum Wall Thickness		
Material	**Typical Standard**	**Typical Temperature Range**	**Diameter Less Than or Equal to 2 Inches**	**Diameter Greater Than 2 Inches**	**Notes**
Carbon steel	A53, A106, A134, A672, AWWA	-20º F to 800º F	Sch XS	Std wt	For lined pipe, other criteria may be used as approved by Owner. AWWA is used for large diameter water service only.
Stainless steel	A312	-20º F to 1,200º F	Sch 10S*	Sch 10S	Min carbon 0.04 percent TP 304 over 1000º F TP 316 over 1000º F
SS tubing	A213 TP304 or TP316	-20º F to 1,200º F	Refer to Table 4	--	U not allowed, min carbon 0.04 per-cent for supercritical services or for flowing services with temperatures >1000º F, Rockwell hardness less than B90 (B80 or less preferred)
FRP	Varies	40º F to 210º F	Varies	Varies	OwnerFor use as fuel oil containment piping only
*For Victaulic PressFit® systems, pipe shall be certified Vic-Press 304 with 0.065 inch (1.6 mm) wall thickness.					

The following pipe sizes shall be used for carbon steel. Other sizes shall not be used:

Table 2 - Carbon/Low Alloy Pipe			
NPS	**Service**	**Schedules**	**Connections**
1 inch	All	XS, XXS	SW or flanged
2 inch	All	XS, 160, XXS	SW or flanged

Table 2 - Carbon/Low Alloy Pipe			
NPS	**Service**	**Schedules**	**Connections**
2-1/2 inch and up	All	Std wt min	BW or flanged

The following pipe sizes shall be used for stainless steel pipe. Other sizes shall not be used:

Table 3 - Stainless Steel Pipe			
NPS	**Service**	**Schedules**	**Connections**
1 inch	All	5S*, 10S, 40S, 80S	SW or flanged
2 inch	All	5S*, 10S, 40S, 80S	SW or flanged
2-1/2 inch and up	All	10S and up	BW or flanged
*0.065 inch (1.6 mm) wall for Victaulic PressFit systems only.			

The following tubing specifications shall be used for instrumentation systems.

Tubing material shall be stainless steel tubing and shall be joined with automatic butt-welding fittings, grip fittings, or socket-welded fittings as described below:

Table 4 - Tubing Requirements	
Tubing Design Parameter	**Project Design Basis**
Tubing fittings (wall less than or equal to 0.083 inch)	316 SS butt-weld or grip type fittings*
Tubing fittings (wall greater than 0.083 inch)	316 SS butt-weld or socket-weld fittings*
Tubing direction changes	Tubing fitting or bending (bending will affect pressure and temperature rating)
Tubing supports	Per B31.1 and as required to allow thermal expansion or to protect tube from damage
Tubing design pressure and temperature	In accordance with mechanical design criteria for process pipe and B31.1
Tubing Sizing	
Pressure measurement tubing	1/2 inch OD with nominal wall thickness of 0.049, 0.065, or 0.083 inch, depending on process design pressures and temperatures and B31.1. Actual minimum wall thickness (accounting for tolerances allowed by the material specification) must meet or exceed the requirements of B31.1.
Flow and level measurement by differential pressure	Use pressure tubing criteria

Table 4 - Tubing Requirements	
Tubing Design Parameter	**Project Design Basis**
Using separate instrument manifolds (not direct mounted)	1/4 inch OD with minimal wall thickness of 0.049 inch as flex lines (less than 36 inch length)
*Minimum carbon content of 0.04 percent required for any supercritical services or for flowing services when temperatures are greater than 1000º F. Note: Direct manifold mounting to the instrument is preferred.	

Seam Welded Pipe

Seam welded pipe may be used in the following applications as determined by the Engineer, or where seamless pipe is not available:

Table 5 - Seam Welded Pipe	
System/Application	**Limitations**
Stainless steel	No limitations when design complies with B31.1

Fittings, Flanges, and Valves

Fittings, flanges, and valves shall be in accordance with the requirements which follow:

Table 6 - Fittings and Flanges	
System/Application	**Limitations**
Fittings 2-1/2 inches and larger	Butt-weld type, in accordance with ASME B16.9
Fittings 2 inches and smaller	Forged steel socket-welded type, in accordance with ANSI B16.11
Flanges, nonmetallic with metallic backing ring	Flat faced slip-on or socket-welded for thermal or solvent welding
Flanges, cast iron or steel, to mate with nonmetallic flanges	Flat faced slip-on type or threaded, in accordance with B16.5
Flanges, 150 class	Raised face weld neck or slip-on type, in accordance with B16.5
Flanges, 300 class and higher	Raised face weld neck type only, in accordance with B16.5
Grooved pipe joints	Rolled or cut grooved joints in accordance with AWWA C-606 (rolled grooves preferred)
Crimp type joints	Victaulic PressFit system only

All welded fittings shall be of the same material as the pipe. Forged steel socket-welded and threaded fittings shall have the minimum class rating described below:

Table 7 - Forged Steel Fittings Minimum Class Ratings		
Pipe Wall Thickness	**Threaded Fittings**	**Socket-Welded Fittings**
Schedule 80 and less	3,000	3,000
Over Schedule 80 to Schedule 160	3,000	6,000

Table 9 - Valves	
System/Application	**Limitations**
2-1/2 inch and larger	Carbon steel, alloy, stainless steel, or other, corresponding to pipe material; ASME Pressure Class 150 minimum; butt-welded, flanged, or grooved ends; cast or forged steel bodies, with pressure/temperature ratings in accordance with ANSI B16.34
2 inch and smaller	Carbon steel, ASME Pressure Class 600 minimum, socket-welded ends, forged steel bodies, with pressure/temperature ratings in accordance with ASME B16.34. Control valves and other special applications may deviate from these requirements.

Joints shall be provided as required to facilitate assembly or disassembly of equipment. Pipe unions shall not be used.

Pipe ends for socket-welded connections shall be reamed to full inside diameter to remove all burrs and obstructions. Fittings shall be used for all changes in direction.

Preparation of pipe butt welding ends shall be in accordance with ASME B16.25.

Gaskets

Gaskets shall be as follows:

Table 10 - Gaskets		
Joint	**Gasket**	**Limitations**
Class 150 SW flanges and RF SO flanges	1/16 inchcompressed fiber type, nonasbestos	Class 150 systems or lower within temperature limits of gasket material
FF, nonmetallic, and cast iron flanges	1/8 inch red rubber type (EPDM for hot service)	With backing rings as needed. Up to 150 °F only; above 150 °F to 215 °F, use EPDM.

Table 10 - Gaskets		
Joint	**Gasket**	**Limitations**
RF flanges (except as above)	Spiral wound type, nonasbestos	--

Q001 General Quality System Requirements

(Source: 21Jan10 - Revised by Project: 02Jun11)

The purpose of this supplemental document to the technical requirements is to establish a set of requirements pertaining to the quality of supplied equipment and commodities.

Q001.1 Quality System

It is the responsibility of Contractor to define and implement a detailed and documented quality management system which ensures that all equipment and commodities supplied are in conformance with required drawings and/or specifications and which meets all the guidelines (requirements) set forth in this document. The system shall be capable of providing assurance that design, purchasing, materials, manufacturing, examination and testing of equipment, shipping, storage, and related services comply with the requirements of the purchase order.

Contractor's quality system shall include, at a minimum, procedures or methods to ensure that the following are controlled:

Design documents, drawings, specifications, quality assurance procedures, quality records, inspection procedures, inspection and test status, and purchase documents maintained current, accurate, and under control.

Purchased materials, equipment, and services conform to the requirements of this purchase order.

Receipt inspection, in-process inspection, examination, testing, and checkouts conducted.

Shipping, storage, and preservation of equipment and commodities supplied meet purchase order requirements.

Adequate inspection of subcontracted work.

Control of special processes such as welding, heat treating, hot forming, and nondestructive testing.

Proper methods employed for the qualification of personnel who are performing special processes: welding, nondestructive examinations, coatings, etc.

Inspection, measuring, and test equipment.

Procedures that document and control the verification, storage, use, and maintenance of customer-supplied product provided for incorporation into manufactured equipment or commodities.

Any applicable commercial standards (such as ANSI, AGMA, API, ASME, etc.) should also be incorporated into this system. This system shall be made available to the Purchaser for review upon request.

Q001.2 Quality System Manual

The quality system shall be documented in a quality system manual. One controlled copy of the manual shall be submitted to the Purchaser. The quality system manual shall be kept current by submittal of revisions as applicable throughout the life of the purchase order.

Q001.3 Subcontractors

Contractor shall notify the Purchaser in writing prior to the award of this purchase order of the intention to use subcontractors. If, at the time of award of this purchase order, the prime contractor does not know the name of the subcontractor, the prime contractor shall provide the name, type, and location of the subcontractor and the qualification documentation of Contractor's subcontractor prior to award of subcontractor's purchase order.

Contractor shall ensure that subcontractors have the capabilities to fulfill purchase order requirements. Contractors shall submit objective evidence of subcontractor's capabilities, processes, or in-process work involving the fabricating and manufacturing of equipment and commodities for the Purchaser.

Subcontractor qualification and monitoring are the responsibility of Contractor, in accordance with this Supplemental Specification, to ensure adherence to the same high quality standards of Contractor. When deemed necessary, the Purchaser has the authority to perform quality audits and inspections, and monitor and/or review subcontractor processes and facilities.

Q001.4 Inspections by Purchaser

Purchaser may elect to perform inspections, quality audits, or witness testing at any time during the manufacturing process. Purchaser may designate an authorized agent for inspections, witness testing, or quality audits. Authorized agent can be an employee of the Purchaser or an outside agency. When an outside agency is designated as an authorized agent for the Purchaser, such designation will be in writing with a copy provided to Contractor. Hereinafter, when a Purchaser's representative is used, it may also mean the Purchaser or the authorized agent.

The following requirements shall apply for Purchaser's inspection at Contractor's mill, factory, yard, or warehouse.

Q001.4.1 Inspection and Test Plan

In accordance with the Schedule of Submittals, a detailed inspection and test plan (i.e., a Quality Assurance/Quality Control Plan) for the work shall be submitted to the Purchaser as specified in the purchase order. The inspection and test plan is a detailed step-by-step list of operations and requirements which shall identify the inspection and testing points for major components of the work and shall be maintained current throughout the duration of the purchase order. The plan shall include Contractor's strategy for inspecting subcontractor's work, including inspection by Contractor at his subcontractor's facilities. The Purchaser will designate any test witness points or other inspection points required.

Q001.4.2 Access

The Purchaser will have the right to inspect Contractor's and subcontractor's work and related documents in the course of manufacture providing no delays in manufacture are caused thereby. Contractor is required to provide, at his own expense, reasonable facilities including tools and instruments for demonstrating acceptability of the work.

Q001.4.3 Test Witnessing
If called for in the purchase order and when designated as a hold point, witnessing of mill or factory tests must be performed in the presence of the Purchaser's representative unless waived in writing by the Purchaser's representative. Contractor shall bear all expenses of such tests except the compensation and expense of the Purchaser's representative.

Contractor shall inform and notify the Purchaser at least 30 working days in advance of the appropriate times of inspections and tests, when such inspection and test points have been designated as required hold points for witnessing. The work shall not progress past a required inspection and test point until the Purchaser has inspected the work or witnessed the designated test, or waived in writing the right to perform an inspection or to witness a test. If Contractor has notified the Purchaser defining test date times and Contractor is not ready to conduct the test at the stated time, Contractor is liable for expenses incurred by the Purchaser.

Q001.4.4 Corrective Action
Upon detection of a noncompliance with the requirements of the purchase order or Contractor's quality system, Contractor shall document the noncompliance issue and provide the Purchaser's representative a copy of the report. If Contractor does not document the noncompliance, the Purchaser's representative shall issue a corrective action report to Contractor. Contractor will be required to correct, in a timely manner, all deficiencies identified.

Q001.4.5 Rejection
If any items or articles are found to not meet the requirements of the specifications, the lot, or any faulty portion thereof, may be rejected. Before offering specified material or equipment for shipment, Contractor is required to inspect the material and equipment and eliminate any items that are defective or do not meet the requirements of the purchase order. The fact that materials or equipment have been previously inspected, tested, and accepted does not relieve Contractor of responsibility in the case of later discovery of flaws or defects.

Q001.5 Receipt Inspection
Materials or equipment purchased under this purchase order may be inspected at the specified receiving points and will either be accepted or rejected. Inspection will include the necessary testing for determining compliance with the specifications. All expenses for initial acceptance tests will be borne by the Purchaser. The expenses for subsequent tests will be charged against Contractor if due to initial test failures.

Q100 General Welding Requirements
(Source: 06Jan10 - Revised by Project: 02Jun2011)

Unless otherwise specified, the applicable governing edition and addenda to be used for all references to codes or standards specified herein shall be interpreted to be the jurisdictionally approved edition and addenda. If a code or standard is not jurisdictionally mandated, then the current edition and addenda in effect at the time of (contract or specification) approval shall govern.

Q100.1 General
Section Q100 shall be used in conjunction with the other Welding Technical Supplemental Specification sections.

Any conflict identified between the requirements of this Welding Technical Supplemental Specification and the provisions of any applicable industry standard, code, regulation, or any specification, standard, or purchasing document contractually required for a given application shall be referred to Owner for resolution prior to the start of welding.

Where requirements of a referenced code or standard differ from the Welding Technical Supplemental Specification sections, the more stringent or restrictive requirements shall apply.

Any request for deviation from specified requirements shall be submitted in writing and shall include the proposed deviation, rationale for the deviation, any technical data supporting the deviation, and historical experience supporting the deviation.

Q100.2 Welding Processes

Unless otherwise specified, only shielded metal arc welding (SMAW), gas metal arc welding (GMAW), flux cored arc welding (FCAW), submerged arc welding (SAW), plasma arc welding (PAW), stud welding, and gas tungsten arc welding (GTAW) processes shall be permitted within the restrictions or limitations specified in the applicable Welding Technical Supplemental Specification section. Other welding processes may be used, provided the governing code or standard permits it and written approval has been granted by Engineer.

Any limitation or restriction specified for GMAW short-circuit arc transfer or a variation of GMAW short-circuit arc transfer marketed by welding equipment manufacturers shall be applied the same, whether a constant voltage (CV) power supply or other power supply developed by a welding equipment manufacturer is used.

Q100.3 Welding Procedure Qualification

Welding procedures shall be prepared and qualified in accordance with the referenced code. Unless otherwise specified, each manufacturer or contractor is responsible for conducting the tests required by the referenced code to qualify the Welding Procedure Specification (WPS).

Welding procedure qualification with GMAW short-circuit arc transfer using a CV power supply shall not qualify a welding procedure for GMAW using a controlled variation of short-circuit arc transfer by a power supply other than CV or vice versa.

WPSs and applicable Procedure Qualification Records (PQRs) shall be submitted for review by Engineer prior to start of fabrication. Submittal of welding procedures and applicable PQRs shall apply to all suppliers and subsuppliers. Contractors shall review the documents in accordance with the applicable code and specification requirements and shall accept all of their subsuppliers' welding procedures and applicable PQRs prior to submitting accepted documents to Engineer.

Because of the number of different alloys within various alloy P-number or S-number groups, WPSs for welding P-number or S-number 8, 10H, and 41 through 49 alloy materials should identify the base materials by the Unified Numbering System (UNS) or alloy type to aid in the proper application of the WPS, e.g., P45 (UNS N08367, AL6XN). As an alternative to identifying the UNS number on the WPS, the UNS number of the base material or alloy type from the WPS may be cross-referenced to the WPS by other means.

Standard Welding Procedure Specifications (SWPSs) produced by the American Welding Society (AWS) may be used when permitted by the jurisdictional code. Any supplemental requirements mandated by the jurisdictional code shall be met.

Q100.4 Welder/Welding Operator Performance Qualification

Welders and welding operators shall be qualified in accordance with the referenced code. The welder and welding operator qualification records shall be available at the shop facility or construction site and shall be made available for review when requested.

Field personnel not qualified and certified as welders or welding operators are prohibited from performing any welding activities such as tack welds, temporary welds, permanent welds, manufacturing aids, tools,

fixtures, or other welded items. The only field personnel not qualified or certified as welders or welding operators who are permitted to perform welding are personnel completing welding training or performing welding performance qualification testing required by the applicable referenced code or specification.

Shop personnel not qualified and certified as welders or welding operators are prohibited from performing any welding activity on materials designated for permanent or temporary installation by the contract, such as tack welds or temporary welds.

Welders and welding operators qualified for GMAW short-circuit arc transfer using a CV power supply shall not qualify a welder or welding operator for GMAW using a controlled variation of short-circuit arc transfer by a power supply other than CV or vice versa.

Each manufacturer or contractor is responsible for the qualification of welders or welding operators. Welder or welding operator performance qualification testing shall be performed under the full supervision and control of the manufacturer or contractor.

Q100.5 Filler Materials

Welding filler metal shall comply with the requirements of the referenced code and any modified requirements specified herein. The filler metal shall be as specified in the applicable WPS.

Unless otherwise specified, the welding filler metal for welding similar base metal types shall have a chemical composition as similar as possible to the base materials to be welded. The finished weld as deposited, or after postweld heat treatment (PWHT) when required, shall be at least equal to the base metal's minimum specified properties or characteristics as they pertain to strength, ductility, notch toughness, corrosion-erosion resistance, or other physical or thermal properties.

Unless otherwise approved in writing, the GTAW or PAW process shall require the addition of filler metal.

Unless otherwise specified or permitted by an approved deviation request, the use of the -G electrode/wire classification is prohibited. When permitted, welding procedures specifying "G" classification consumables shall be restricted to the same manufacturer and brand-name consumable used to weld the procedure qualification test coupon. The manufacturer and brand name shall be listed on the WPS and PQR. The manufacturer's standard, including the mechanical properties and chemical analysis, along with the request for using non-AWS classification or “G” classification consumables shall be submitted to Owner prior to fabrication.

SAW multipass weld deposits shall use an essentially neutral flux for welding carbon steels. Alloy, semiactive, or active fluxes shall not be used except as specified otherwise. Fluxes that compensate for losses of alloying elements are permitted. Active flux may be used for single pass welding of carbon steels, provided the weld deposit thickness is approximately 1/4 inch maximum each side for a double-V-groove joint design or approximately 1/4 inch one side for a single-V-groove joint design. The joint thickness shall not exceed 1/2 inch nominal.

When using the SAW process, the flux listed in the WPS is restricted to the specific brand-name flux used in the welding procedure qualification test. Any change in the flux brand name or designation shall require a new welding procedure qualification. For SAW welding of stainless or nickel-base alloy materials, only those fluxes specified by the flux manufacturer as suitable for the particular type of high alloy electrode to be used are permitted.

The SAW process shall not use recrushed slag.

SMAW low-hydrogen type electrodes, including stainless steel and nickel and nickel alloy electrodes, shall be purchased in hermetically sealed or vacuum packed containers only.

Q100.5.1 Filler Material for Welding Miscellaneous Materials
Unless otherwise specified, filler material selection shall be in accordance with the following requirements.

Q100.5.1.1 Filler Materials for Steel and Low Alloy Steel. For the SMAW process, all filler metal shall be of the low-hydrogen type when welding on either carbon steel or low alloy steel materials. Nonlow-hydrogen type electrodes (E6010 or E7010-A1 only) may be used only for root pass welding on carbon steel piping, unless otherwise specified by other Welding Technical Supplemental Specification sections. SMAW low-hydrogen type ferrous electrodes for all fill passes shall have a minimum tensile strength of 70,000 psi (495 MPa) as defined by the applicable SFA or AWS specification. When welding is required for existing unknown carbon steel materials, the carbon content shall not exceed 0.30 percent or 0.40 percent carbon equivalent (CE) as determined by CE=C%+ (Mn%/6+Si%/6).

For the FCAW process when welding carbon steel materials, only AWS filler metal Classifications E7XT-1, -5, -9, -12 with shielding gas shall be used (current AWS classifications also utilize either an "M" or "C" after the final digit).

Low alloy FCAW electrodes of nominal composition 2-1/4 Cr - 1 Mo and higher for use on pressure-retaining components shall be purchased with a diffusible hydrogen designation of H4 maximum (SFA-5.29).

Q100.5.1.2 Filler Materials for Dissimilar Material Welds. Filler metals for welding pressure retaining component materials of carbon steel or low alloy steel to austenitic stainless steel shall be in accordance with the following:

Service ≤500° F (260° C)		**Service >500° F (260° C)**	
ASME Specification	**AWS Classification**	**ASME Specification**	**AWS Classification**
SFA 5.9 or SFA 5.14	ER309 or ER309L ERNiCr-3	SFA 5.14	ERNiCr-3
SFA 5.4 or SFA 5.11	E309 or E309L ENiCrFe-3	SFA 5.11	ENiCrFe-3
SFA 5.22	E309TX-X or E309LTX-X	N/A	N/A

Where carbon steel or low alloy steel piping is to be welded to austenitic stainless steel components, and the carbon or low alloy steel piping is of such a thickness as to require PWHT, the end of the carbon or low alloy steel pipe shall be buttered with Type 309L, ERNiCr-3, or ENiCrFe-3 filler metal for system service ≤500° F and shall be buttered with Type ERNiCr-3 or ENiCrFe-3 filler metal for system service >500° F ; the buttered end shall be postweld heat treated. The buttering thickness shall be 3/16 inch minimum after final surface preparation. The weld joint shall then be made between the austenitic stainless steel and the buttering on the carbon or low alloy steel as applicable. This joining method is applicable only to groove welds unless written approval has been granted by Engineer.

Q100.5.1.4 Filler Material for Welding 300 Series Stainless Steels. Filler metal for welding austenitic stainless steel, ASME P-number 8 or S-number 8 base materials shall be in accordance with the following*:

Base Material Type/Grade 304 shall use Type 308 or 308L filler metal.

Base Material Type/Grade 304L shall use Type 308L filler metal.

Base Material Type/Grade 316, shall use Type 316 or 316L filler metal.

Base Material Type/Grade 316L shall use Type 316L filler metal.

*This selection requirement may not apply to cryogenic applications.

When FCAW austenitic stainless steel weld deposits require PWHT or are used at service temperatures >1,000° F (535° C), the electrodes shall have a formulation that does not intentionally add bismuth, and bismuth in the deposited weld metal shall not exceed 0.002 weight percent.

Q100.5.2 Filler Material Control
Storage, handling, and drying of SMAW electrodes and SAW flux shall, as a minimum, be in accordance with the manufacturers' recommendations. In addition, SMAW low-hydrogen type carbon and low alloy steel electrodes shall be stored in ovens at 250° F minimum after the hermetically sealed or vacuum packed container is opened. Bare rod in straight lengths shall be individually flag tagged, stamped, or otherwise identified with the AWS classification or product classification. Each spool of solid or cored rod shall be tagged, labeled, or otherwise identified with the AWS classification or product classification. SMAW low-hydrogen type covered electrodes shall only be reconditioned one time. Any SMAW electrodes that have been wet or have damaged coatings shall not be used. Any welding filler metals or fluxes not readily identifiable shall not be used.

A written procedure for storing, handling, issuing, and reconditioning electrodes, wires, and fluxes shall be submitted for review by Owner.

Q100.6 Fabrication Controls

Q100.6.1 Welding Preheat and Interpass Temperature
The preheat and interpass temperature requirements are mandatory values and shall be in accordance with the referenced code and as specified herein. The WPS for the material being welded shall specify the minimum preheat and maximum interpass temperature requirements. The thickness used to determine preheat requirements shall be the thickness of the thickest part at the point of welding.

The minimum preheat temperature shall be obtained prior to any welding. This shall include tack welding or temporary tack welding.

Preheating shall provide uniform heating over the complete weld or thermal removal process area.

Preheat and interpass temperatures shall be monitored and checked by temperature indicating crayons, thermocouples (TCs), surface contact pyrometers or thermometers, or other suitable methods.

Preheat of pressure retaining components for carbon steel P-number 1 or S-number 1 materials shall be 175° F when the material specified carbon content is in excess of 0.30 percent and the nominal thickness at the joint is in excess of 1 inch. In addition, 200° F minimum preheat is required for nominal thickness over 1.25 inches, regardless of carbon content. A minimum preheat temperature of 50° F is required for all other carbon steel P-number 1 or S-number 1 materials.

The maximum interpass temperature for welding carbon steel and low alloy steel materials shall be 600° F. The maximum interpass temperature for welding carbon steel when impact testing is required shall be 500° F.

The maximum preheat and interpass temperature for stainless steel materials shall be 350° F. The minimum preheat temperature shall be sufficient to ensure that moisture is removed from the material to be welded.

Q100.6.2 Not Used

Q100.6.3 Fabrication Controls for Austenitic Stainless Alloys
The following requirements shall apply when fabricating austenitic stainless alloy components.

Grinding shall be by aluminum oxide, zirconium oxide, or silicon carbide grinding wheels that shall not have been used on carbon or low alloy steels. Hand or power wire brushing shall be by stainless steel brushes that shall not have been used on carbon or low alloy steels. All tools used in fabrication shall be protected to minimize contact with steels or free iron. Grinding wheels and brushes shall be identified and controlled for their use on these materials only to ensure that contamination of these materials does not occur.

To minimize the risk of iron contamination by the inadvertent use of iron contaminated brushes or abrasives, welders and fitters should be instructed not to perform unnecessary wire brushing and abrasive finishing operations.

Antispatter compounds, marking fluids, marking pens, tape, temperature indicating crayons, and other tools shall have a total halogen content of less than 200 parts per million.

Heat input control for welding shall be specified in the applicable WPS and shall not exceed 55 KJ/in. Austenitic stainless steel instrument tubing shall be welded using only the GTAW process.

Socket welds or butt welds in all austenitic stainless steel instrument tubing lines shall require an inert gas backing (purge) using argon during welding to avoid oxidation.

When service conditions require that austenitic stainless steel material maintain its corrosion resistance, the austenitic stainless steel material shall not be postweld heat treated except by solution annealing. If solution annealing is performed, a procedure detailing the solution annealing process shall be submitted for review by Owner prior to performing solution annealing.

For materials that have been contaminated with steels or free iron, Owner may request a ferroxyl test or wet/dry test to identify iron contamination. Iron contamination identified by the ferroxyl or wet/dry test or by other identification means (e.g., visible rusting) shall be removed by mechanical or chemical cleaning. Mechanical cleaning methods, when used, shall be capable of removing the contamination without smearing or redepositing contaminants on the material surface. Chemical cleaning methods, when used, shall be performed in accordance with ASTM A380, Paragraph 6.4 and Annex A2. If requested, a ferroxyl or wet/dry test procedure and cleaning procedure shall be submitted to Owner for review.

Q100.6.4 Miscellaneous Fabrication Control Requirements
Welding shall not be performed when surfaces of the parts to be welded are wet. The parts to be welded shall be protected from deleterious contamination and from rain, snow, and excessive wind during welding.

Prior to welding, the weld preparation and adjacent base material surfaces shall be cleaned and kept free from paint, oil, grease, dirt, scale, rust, and other foreign materials.

The weld end preparation on carbon and low alloy steel materials that will be stored for extended periods of time may consist of coating with deoxaluminate or an equivalent protective material. This coating may be welded through if applied within the manufacturer's maximum weldable limit of 1.25 mils. Complete

removal of the coating is neither required nor prohibited, unless signs of rust or other foreign materials such as oil, grease, dirt, or excessive coating are apparent, in which case these areas shall be cleaned.

Acceptable cleaning solvents include new or redistilled acetone (acetone reclaimed by other methods shall not be used), alcohol (ethyl, methanol, or isopropanol), methyl ethyl ketone, or toluene (toluol). Halogenated cleaning solvents shall not be used for cleaning or degreasing.

All groove butt joints shall be complete joint penetration unless specified otherwise by design documents or the applicable code. Partial penetration weld joints not specified by design shall require written approval by Engineer.

Tack welds that are to remain in the completed weld shall have their stopping and starting ends prepared by grinding or other suitable means for satisfactory incorporation into the completed weld. Tack welds that are to become part of the completed weld shall be visually examined; defective tack welds, including cracked tack welds, shall be removed.

When runoff plates are used, they shall be of the same nominal alloy composition as either of the base metals being joined. If runoff plates are used, they shall be properly removed after completion of welding. The method of removal shall not damage the remaining weld or base metal. Runoff plates shall not be knocked off.

Complete penetration joints welded from both sides shall have the root of the first layer or pass chipped, gouged, ground, or machined to sound metal prior to welding from the second side. This requirement is not intended to apply to automated line processes, where the welding from the second side is controlled to provide adequate penetration and ensure full fusion without back gouging.

Welded joints shall be made by completing each weld layer before succeeding weld layers are deposited. Partial fill passes are permitted to correct localized underfill conditions and for the purpose of maintaining alignment. Block welding is prohibited.

As-welded surfaces are permitted; however, the surfaces of welds shall be uniform in width and size throughout their full length. The cover pass shall be free from coarse ripples, grooves, overlaps, abrupt ridges, and valleys. The surface condition of the finished welds shall be suitable for the proper interpretation of nondestructive examination. If the surface of the weld requires grinding to meet the above criteria, care shall be taken to avoid reducing the weld or base material below the minimum required thickness.

All pressure retaining fillet weld joints other than socket welded joints that require a fillet weld size greater than 1/4 inch shall require a minimum of two weld layers, except for those fillet weld joints welded with a mechanized or automatic welding process.

Socket welds shall meet the following requirements within the welding process restrictions and limitations specified in the applicable Welding Technical Supplemental Specification section:

A minimum of two weld layers is required for pipe or tube over 0.200 inch nominal wall thickness.

For pipe or tube 1/2 inch or less in nominal pipe size, the GTAW process shall be used.

Welding slag and spatter shall be removed from all welds.

A gas or gas mixture used for shielding shall be welding grade or shall meet Specification SFA-5.32 and have a dew point of -40° F or lower.

Shop fabricators and suppliers shall check for residual magnetism at each end of the machined field pipe weld bevels. Weld bevels containing residual magnetism greater than 5 gauss shall be demagnetized.

Arc strikes outside of the area of permanent welds should be avoided on any base metal. Cracks or blemishes caused by arc strikes shall be ground to a smooth contour and checked to ensure soundness.

Peening is prohibited. The use of power tools for slag removal is not considered peening.

The application of heat to correct weld distortion and dimensional deviation without prior written approval from Owner is prohibited.

Complete joint penetration welds welded from one side without backing, weld repairs welded from one side without backing, or weld repairs in which the base metal remaining after excavation is less than 0.1875 inch from being through wall, which are fabricated from materials with an ASME P-number of 5B or higher or unassigned metals with similar chemical compositions, shall have the root side of the weld purged with an argon backing gas prior to welding. Unless otherwise specified, backing gas (purge) shall only be argon. The argon backing gas shall be classified as welding grade argon or shall meet Specification SFA-5.32, AWS Classification SG-A. The backing gas (purge) shall be maintained until a minimum of two layers of weld metal have been deposited.

Temporary attachments to pressure boundary components outside the weld bevel groove area should be avoided and only used when absolutely necessary. When required, clamps, welded clips, tack welds, or other appropriate means shall be used to properly align the joint for welding. Welded attachments used for fit-up shall be compatible with the base material and shall be welded with a qualified welding procedure. Attachments shall not be knocked off base material. The attachments shall be removed by suitable methods, such as grinding, machining, or sawing, followed by grinding flush with the base material. When thermal cutting is used to remove attachments, approximately 3/16 inch of material shall be left for final removal by grinding. The ground area shall then be visually examined for defects. The area from which attachments have been removed shall be examined as required by the governing code or specification. Any defects found shall be repaired.

Welding across the flanges of Owner's structural steel members (welds that are transverse to the beam or column center line) shall not be an acceptable practice, and Contractor shall design all welded interfaces to Owner's steel structure to specifically avoid this condition. Contractor's design of such interfaces shall achieve full required design strength and stability by means other than welds applied across flanges.

All defects in welds or base materials shall be removed and repaired in accordance with the referenced code.

A written procedure for root side purging shall be described in detail and shall be submitted concurrently with the welding procedures for review by Engineer.

Welding machine ground leads and clamps shall be located to avoid passing welding current through equipment, snubbers, bearings, or any other items where transfer of electrical current may result in damage to equipment.

A complete repair procedure for repairs that are documented as the basis of a nonconformance report shall be submitted to Engineer for review and approval in writing prior to performing the repair. If repair by welding is required, the applicable WPSs and supporting PQRs shall be submitted with the repair procedure. All nonconformance report dispositions shall comply with applicable code requirements.

Q100.7 Nondestructive Examination (NDE)

All NDE shall be performed in accordance with the methods specified in the referenced code and any supplemental NDE specified within the other Welding Technical Supplemental Specification sections.

Except for final visual examination, which is required for all welds, the responsible Contractor's Certified Welding Inspector (CWI) shall perform in-process visual inspections at suitable intervals during the fabrication and erection process to ensure the applicable requirements of the referenced code, design specification, and WPS are met. Such inspections, on a sampling basis, shall be performed prior to assembly, during assembly, and during welding.

NDE shall be performed in accordance with written procedures that are prepared in accordance with the referenced code and as specified herein. NDE procedures other than for visual examination shall be approved by a qualified and certified NDE Level III. The NDE Level III approval shall be shown on the NDE procedure. NDE procedures shall be submitted for review by Engineer prior to their use.

NDE personnel performing NDE other than visual shall be qualified and certified for the applicable NDE method. Personnel shall meet written practice ASNT SNT-TC-1A, unless permitted otherwise by the referencing code or prior written approval from Engineer is obtained. NDE personnel qualification records shall be made available for review when requested.

All welds shall receive 100 percent visual examination. Visual inspection of welds shall be performed prior to any painting, coating, or galvanizing. Visual weld examination acceptance criteria and other NDE acceptance criteria shall be in accordance with applicable referenced codes and design documents. Records of these examinations shall be documented.

The NDE results shall be provided in a NDE Report that is evaluated, interpreted, and accepted by a Level II or Level III NDE personnel.

Contractor shall obtain and pay for the services of an independent testing laboratory to provide the required field nondestructive examination. Any defective weld shall be removed, repaired, and retested at the Contractor's expense.

Owner may order NDE by an independent laboratory in addition to any examinations specified herein. The NDE type, extent, and method shall be the same as that required for the original weld. If the weld is defective, the laboratory costs shall be paid by the Contractor. If the weld is not defective, the laboratory costs will be paid by Owner. Repair of defective welds and reexamination shall be at the Contractor's expense. Weld acceptance standards shall be in accordance with applicable codes and design specifications. If an individual interpretation is in question, the final authority shall be the responsibility of Owner.

Q100.8 Records

Records of inspections, NDE, impact testing, hardness testing, PWHT charts or records, base material test reports, filler material test reports, radiographic film with applicable reader sheets, deviation requests including resolution documentation, nonconformance reports, and other records, as required, shall be retained by the Contractor for 5 years after completion of the work. Records shall be submitted to Engineer and/or Owner, if requested.

Quality records, including applicable Data Report Forms generated by a manufacturer or assembler in accordance with an approved Quality Control System, shall be provided in accordance with the approved Contract. Quality records shall be legible, appropriately completed, and sufficiently detailed to permit traceability to the item or activity involved.

Q121 Welding of Carbon, Low Alloy, and Stainless Structural Steel
(Source: 04Feb10 - Revised by Project: 26Jul2011)

Q121.1 General
This Technical Supplemental Specification provides requirements for welding carbon, low alloy, and stainless structural steel, ductwork, stacks, and other welded steel structures as required by design, in accordance with AWS D1.1, Structural Welding Code - Steel or AWS D1.6, Structural Welding Code - Stainless Steel. Supplemental requirements for welding a seismic load-resisting system (SLRS) shall be in accordance with AWS D1.8, Structural Welding Code – Seismic Supplement, when seismic detailing or enhanced ductility is required by design. This Technical Supplemental Specification shall be used in conjunction with Section Q100 of the Welding Technical Supplemental Specifications.

Q121.2 Welding Processes
Permitted welding processes shall be as specified in Section Q100 and shall include the restrictions and limitations applicable to those processes as specified herein.

Q121.2.1 Welding Process Restrictions and Limitations
The Gas Metal Arc Welding (GMAW) process utilizing the short-circuiting transfer mode shall not be used in any application, except for the following:

AWS D1.1 – No exceptions.

AWS D1.6 – When welding base metals that have a maximum thickness of 3/16 inch.

AWS D1.8 – No exceptions.

The Flux Cored Arc Welding (FCAW) process shall only be used with shielding gas, except for the following:

AWS D1.1 – When welding base metals that have a maximum thickness of 1/2 inch and that use E71T-8 electrodes.

AWS D1.6 – No exceptions.

AWS D1.8 – When welding base metals that have a maximum thickness of 1/2 inch and that use E71T-8 electrodes. Furthermore, the electrodes shall meet the impact testing requirements of AWS D1.8, Annex B.

The weld progression for manual or semiautomatic vertical position welds shall be uphill, except for the following:

AWS D1.1 – Undercut may be repaired vertically downward, provided the preheat is in accordance with AWS D1.1, Table 3.2, but not lower than 70° F.

AWS D1.1 – When tubular products are welded, the progression of vertical welding may be upward or downward, but only in the direction in which the welder is qualified and as permitted by the Welding Procedure Specification (WPS).

AWS D1.6 – Using the prequalified Gas Tungsten Arc Welding (GTAW), GMAW-S, and FCAW-G processes, progression may be vertically downward for base metal with a 3/16 inch maximum thickness.

AWS D1.6 – Undercut may be repaired vertically downward on the joint faces only, without any base metal thickness limitations when using the prequalified GTAW and FCAW-G processes. When using the prequalified GMAW-S process, undercut may be repaired vertically downward on the joint faces only for base metal with a 3/16 inch maximum thickness.

AWS D1.8 – AWS D1.1 requirements above shall apply.

Q121.3 Welding Procedure Qualification

Welding procedures shall be prepared and qualified or shall be prepared as prequalified in accordance with the applicable AWS code. All prequalified WPSs shall be in the form of a written document. For a WPS to be prequalified, conformance with all of the applicable requirements of AWS D1.1, Section 3 or AWS D1.6, Section 3 shall be required.

For AWS D1.1 welds, when the base metal is required to be Charpy V-Notch (CVN) impact tested by the design specification or contract documents, the WPS qualification shall include the CVN test requirements of AWS D1.1. The minimum CVN test temperature for the welding procedure qualification shall be at or below the minimum test temperature specified by the design specification or contract documents.

For AWS D1.8 welds (Demand Critical and Non-Demand Critical), CVN testing is mandatory. All WPS qualifications shall be performed in accordance with the CVN test requirements of both AWS D1.1 and AWS D1.8. The minimum CVN test temperature for the welding procedure qualification shall be at or below the minimum test temperature specified by the design specification or contract documents.

When the base metal is required to be CVN impact tested by the design specification or contract documents, the filler metal required by the WPS for welding the CVN base metal shall be classified with CVN impact testing at a test temperature at or below the test temperature specified by the design specification or contract documents.

Q121.4 Welder/Welding Operator Performance Qualification

Welders and welding operators shall be qualified in accordance with the applicable AWS code. As an alternative, welders and welding operators may be qualified in accordance with ASME Section IX within the welding personnel performance essential variable limitations permitted by the applicable AWS code.

For AWS D1.8 welding, the shielding gas for FCAW shall constitute an essential variable and any change shall require requalification.

For AWS D1.8 welding, the qualification for welding personnel using the Supplemental Welder Qualification for Restricted Access Welding shall remain valid for 12 months or the duration of the project, unless there is a specific reason to question the welder's ability.

Q121.5 Fabrication Control

Fabrication, assembly, and erection shall be in accordance with the applicable AWS code and the design documents.

When welds joining ASTM A588 weathering steels will experience exposure to atmospheric conditions and are left exposed, bare, unpainted, uninsulated, or otherwise visually observable in their final service condition, the filler metal required for welding shall comply with the requirements specified in AWS D1.1, Section 3.7.3 and Table 3.3.

When tensile forces are to be transmitted through full penetration groove welds on AISC material Groups 4 and 5 rolled shapes, or shapes built up by welding plates more than 2 inches thick together to

form the cross section, the requirements of AISC J1.7 in the AISC 9th Edition or AISC J1.5 and J2.6 in the AISC 13th Edition, as applicable, shall apply.

Q121.5.1 Backing and Retainers
When required, backing shall be in accordance with the applicable AWS code.

Nonmetallic retainers or nonfusing metal retainers shall not be used unless specified in the WPS. When used, they shall be removed.

Q121.5.2 Preheat and Postweld Heat Treatment
For AWS D1.1 prequalified carbon and low alloy steels, preheat shall be performed in accordance with AWS D1.1, Table 3.2, applicable to the materials listed and the design documents. The minimum preheat temperature shall be specified in the WPS.

For AWS D1.6 prequalified austenitic stainless steels, the minimum preheat temperature shall be 50° F. The minimum preheat temperature shall be specified in the WPS.

For AWS D1.1 or AWS D1.6 materials that are not prequalified, the minimum preheat temperature shall be in accordance with the preheat temperature established from the welding procedure qualification. The minimum preheat temperature shall be specified in the WPS.

For AWS D1.8 welding, the maximum interpass temperature shall not exceed 500° F.

When required by design, postweld heat treatment shall be performed in accordance with the applicable AWS code and the design documents.

Q121.5.3 Weld End Preparation
Preparation of butt welding ends of piping components for shop welds shall be in accordance with the fabricator's standard end preparation details and WPS. Preparation of pipe butt welding ends for field welds shall be in accordance with ASME B16.25.

Q121.6 Nondestructive Examination (NDE)
In addition to the 100 percent Visual Examination (VE) required of all welds, other required NDE of welds shall be performed in accordance with the applicable AWS code and the design documents defined herein.

Supplemental VE of welds after galvanizing shall be performed as defined in Article Q121.6.1.1.1.

Unless otherwise specified, any weld defects identified by NDE shall have additional examinations conducted as required by Section 6.15 of AWS D1.1 (including AWS D1.8 welds) or Section 6.8 of AWS D1.6, as applicable. All defects found shall be removed, repaired, and re-examined by the same NDE method that identified the original defect.

Q121.6.1 NDE Requirements of Welds
Structures include buildings and non-buildings, as defined in ASCE 7. Non-building structures similar to buildings will require the same NDE methods as the appropriate building structure type.

Q121.6.1.1 Not Used.

Q121.6.1.1.1 Supplemental Visual Examination Requirements of Welds after Galvanizing. The following welds and immediate adjacent areas (within 1 inch of the weld) shall be 100 percent visually examined by the responsible supplier or responsible contractor that performs the galvanizing not less than 48 hours after completion of galvanizing:

Butt joint splices, columns, and beams.

Beam clip angles.

Plate girder and built-up flexural member joint welds.

All areas requiring VE shall be examined for the presence of cracks. The acceptance criteria for the subject welds shall be “free from cracks.”

If any cracks are visually identified after galvanizing, Engineer shall be notified prior to repair. Engineer may request additional NDE by MT examination of any similar joint types. Any cracks discovered by MT, but not previously identified by VE, shall require 100 percent MT examination of all similar joint types at the expense of Contractor. Any cracking detected by VE or MT shall be repaired at the expense of Engineer.

Visual inspection of the subject welds after galvanizing may be performed by personnel other than the responsible Contractor’s Certified Welding Inspector (CWI). Personnel other than a CWI must have experience suitable to Engineer for performing post-galvanizing weld visual inspection. Visual inspectors' qualifications and certificates or evidence of training or experience shall be submitted to Engineer for review.

Q210 Welding of Power Piping

(Source: 21Aug07 - Revised by Project: 02Jun2011)

This Supplemental Specification provides requirements for welding of power piping.

Q210.1 Welding Procedures

Welding Procedure Specifications (WPS) and Procedure Qualification Records (PQR) shall be in accordance with ASME B31.1, Power Piping Code and, where applicable, ASME Section I, Power Boilers and latest Addenda.

Welders qualified and certified in accordance with the United Association (UA) Welder Qualification Program may be permitted to perform welding at the project construction site without further testing, provided the following requirements are met:

The UA Welder Qualification Program has been approved by state authorities and clients.

The UA Welder Qualification Program shall not be accepted for ASME boiler proper and boiler external piping. This program is applicable only for nonboiler external piping.

Project construction site personnel shall be provided with the applicable UA Welder Performance Qualification Test Record and the UA Welder's Record of Continuity as specified by ASME B31.1, Paragraph 127.5.3 (B).

If the provided documentation is acceptable, project construction site personnel shall prepare and sign a welder performance qualification record accepting responsibility for the ability of the welder in accordance with ASME B31.1, Paragraph 127.6.

At a minimum, the welder shall perform a workmanship sample of the processes qualified or the first production weld of each welder will be 100 percent radiographed for performance qualification verification as permitted by ASME Section IX, QW-304.1. If the

production weld does not meet the radiographic standards, the welder has failed the test. In this event, the production weld shall be repaired by a qualified welder.

Q210.2 Welding Processes

All welds, procedures, processes, related operations, and records shall be in accordance with ASME B31.1, Power Piping Code or ASME Section I, Power Boilers, as applicable.

Piping systems, when specified in the Pipeline List, shall have the root pass(es) deposited using only the Gas Tungsten Arc Welding or Shielded Metal Arc Welding processes.

Q210.3 Fabrication Controls

Q210.3.1 Welding Technique

Backing rings shall be used only where specifically permitted by these specifications. When used, backing rings shall only be the split band type with pins. Backing rings that become a permanent part of the weld shall be made from material of weldable quality, compatible with the base material, and the sulfur content shall not exceed 0.05 percent.

Q210.3.2 Heat Treatment

Postweld heat treatment shall be performed in accordance with ASME B31.1.

Stainless steel flow nozzles inside carbon steel or chrome alloy steel pipe shall not be stress relieved. An acceptable alternative is to butter each pipe member by applying weld metal (buttering) to a minimum thickness of 3/16 inch (5 mm) (after machining), heat treat each pipe member, then weld the two pipe members together with flow nozzle installed. (Refer to ASME Section IX, Article QW-283.)

Q210.3.3 SafeEnd Pipe Connections

Equipment fabricated from foreign material specifications, i.e., non-ASME/ASTM materials, shall have a SafeEnd attached by Contractor on each equipment connection to the Purchaser's piping. The SafeEnd shall comprise a pipe stub of the same ASME/ASTM material specification as the adjoining Purchaser's piping, including mechanical and chemical properties, dimensional size, and end preparation. Material certifications shall be supplied for all SafeEnd pipe stubs. The SafeEnd stub length shall be as follows:

12 inches (300 mm) for material 6 inches (150 mm) inside diameter or less.

16 inches (400 mm) for material 6 inches (150 mm) through 14 inches (350 mm) inside diameter.

24 inches (600 mm) for material over 14 inches (350 mm) inside diameter.

If the use of SafeEnds is not feasible, and if acceptable to the Purchaser, then Contractor shall furnish weld coupons for Purchaser's welding procedure qualifications in lieu of SafeEnds in accordance with the following requirements:

Material certifications shall be supplied with all material used for weld coupons.

Weld coupon material shall be of the same chemical composition and mechanical properties, type, and/or grade as the valve or nozzle that it represents.

Material quantity shall be sufficient to complete the required test for procedure qualification prescribed by the governing ASME code and/or standard. As a minimum, the weld coupon material product form shall be of adequate size and thickness to permit

removal of the required test specimens and to qualify the joint thickness required for the production weld.

The weld coupon sample material shall be delivered in adequate time to support weld procedure qualification and production schedules as defined by the Purchaser.

Q210.3.4 End Preparations

Preparation of pipe butt welding ends for shop welds shall be in accordance with the fabricator's standard end preparation and welding procedure used. Preparation of pipe butt welding ends for field welds shall be in accordance with ASME B16.25 and the attached table. Pipe ends for socket-weld connections shall be reamed to full inside diameter to remove all burrs and obstructions. The difference between major and minor diameters for a distance of 3 inches (76 mm) from the ends of the pipe shall not exceed 1/8 inch (3 mm) or 1 percent of the nominal diameter, whichever is less. To ensure satisfactory fit-up for circumferential butt welds in piping systems fabricated of rolled and welded plate, the following procedures shall be followed:

Concentricity. If weld metal is used to obtain concentricity, the weld deposit shall be free from porosity or other defects, and the inside surface shall be ground smooth and blended smoothly into the pipe wall.

Nondestructive Examination. Additional nondestructive examinations specified herein shall be evaluated in accordance with ASME B31.1, Power Piping Code, Article 136.4.

Radiographic Inspection. Upon completion of the weld buildup and finishing procedures, the area shall be radiographed (in accordance with ASME B31.1, Article 136.4.5, Acceptance Criteria) prior to shop welding to other sections or prior to shipment. The radiographs shall be submitted to the Purchaser to permit complete analysis of the joint after field radiography.

Q210.3.5 Stamping of Alloy Pipe

Information may be stamped directly on alloy piping with "low stress" die stamps such as interrupted dot or round nose types.

Carbon steel stamps shall not be used on stainless steel or nickel base alloy materials.

Stamping shall not damage material or reduce the wall thickness to less than design requirements.

Q210.4 Weld Inspection, Examination, and Testing

In addition to the welds requiring radiographic examination under the code, the circumferential butt joints in the cold reheat system shall be 100 percent radiographically examined.

In addition, branch welds over 6 inch (150 mm) pipe size in the reheat system piping shall be 100 percent magnetic particle or liquid penetrant examined.

Table Q210-1 - B&V Weld Code Definitions						
Weld Code	**General System Parameters**	**Root Pass Weld Process**	**Backing Rings Permitted**	**Wall Type**	**Wall Thickness**	**ASME B16.25 Detail**
W-1	Any systems that are designated as high energy or any systems that require a high cleanliness level at the completion of welding (without cleaning) or any alloy or stainless steel materials	GTAW (Note 1)	No	Nominal (schedule)	Over 7/8 inch (22 mm)	Figure 3, Detail C
					5/8 inch (16 mm) to 7/8 inch (22 mm)	Figure 2, Detail A
					Under 5/8 inch (16 mm)	
					Valves	Figure 2, Detail B
					Pipe and fittings	Figure 2, Detail A
				Special (minimum wall)		Figure 2, Detail C or Figure 3, Detail C
W-2	Carbon steel piping in any moderate or low energy system that requires high cleanliness, for which the high cleanliness can be achieved during cleaning of system	GTAW or SMAW (Note 2)	No	Nominal	Over 7/8 inch (22 mm)	Figure 3, Detail C
					5/8 inch (16 mm) to 7/8 inch (22 mm)	Figure 2, Detail C
					Under 5/8 inch (16 mm)	
					Valves	Figure 2, Detail B
					Pipe and fittings	Figure 2, Detail A
W-3	Low energy carbon steel systems classified as low cleanliness, for which backing rings are not permitted	Contractor's option (refer to Welding Specifica-tions)	No	Nominal	Over 7/8 inch (22 mm)	Figure 3, Detail C
					5/8 inch (16 mm) to 7/8 inch (22 mm)	Figure 2, Detail C
					Under 5/8 inch (16 mm)	
					Valves	Figure 2, Detail B
					Pipe and fittings	Figure 2, Detail A

Table Q210-1 - B&V Weld Code Definitions						
Weld Code	**General System Parameters**	**Root Pass Weld Process**	**Backing Rings Permitted**	**Wall Type**	**Wall Thickness**	**ASME B16.25 Detail**
W-4	Moderate or low energy carbon steel systems with low cleanliness, for which backing rings are acceptable	Contractor's option (refer to Welding Specifications)	Contractor's option	Nominal	Over 7/8 inch (22 mm)	Figure 3, Detail C
					5/8 inch (16 mm) to 7/8 inch (22 mm)	Figure 2, Detail C
					Under 5/8 inch (16 mm)	
					Valves	Figure 2, Detail B
					Pipe and fittings	Figure 2, Detail A
W-5	Large diameter (26 inch [650 mm] and larger) carbon steel, low energy, low cleanliness	Contractor's option (refer to Welding Specifications)	No	All types	All thicknesses	B&V Drawing 81113-DM-0104

Notes:
1. GTAW is gas tungsten arc welding.
2. SMAW is shielded metal arc welding.

Q230 Welding of API and AWWA Storage Tanks
(Source: 21Aug07 - Revised by Project: 02Jun2011)

Q230.1 General
This Technical Supplemental Specification provides requirements for welding steel tanks for water storage and steel tanks for oil storage in accordance with Standards AWWA D100 and API 650 as applicable, and shall be used in conjunction with Section Q100 of the Welding Technical Supplemental Specifications.

Q230.2 Welding Processes
Permitted welding processes shall be as specified in Section Q100 and shall include the restrictions and limitations applicable to those processes as specified herein.

Q230.2.1 Welding Process Restrictions and Limitations
The Gas Metal Arc Welding (GMAW) process utilizing the short-circuiting transfer mode shall not be used in any application, except the GMAW short-circuiting transfer mode may be used for root pass installation only when the root pass is subsequently removed by backgouging and back welded.

The weld progression for manual or semiautomatic vertical position welds shall be uphill, except when the GMAW short-circuiting transfer mode or Shielded Metal Arc Welding (SMAW) (E6010 or E7010-A1) electrodes are used for root pass installation, then the progression may be uphill or downhill.

The Flux Cored Arc Welding (FCAW) process shall only be used with shielding gas, except that FCAW without shielding gas is permitted within the limitations specified below:

The base metal thickness shall not exceed 0.500 inch and the filler metal classification E71T-8 shall be used.

The FCAW process shall not be used for root pass applications in single welded joints without backing or without backgouging and back welding.

The SMAW process shall not be used for root pass applications in single welded joints without backing or without backgouging and back welding.

SMAW nonlow-hydrogen electrodes (E6010 or E7010-A1) may be used for root pass installation only for carbon steel materials, provided the nonlow-hydrogen weld deposit is removed by backgouging and back welded. When SMAW is used on carbon steel materials, SMAW low-hydrogen type ferrous electrodes shall be used for all fill passes and shall have a minimum tensile strength of 70,000 psi.

Q230.3 Welding Procedure Qualification

Welding procedures shall be prepared and qualified in accordance with ASME Section IX and AWWA D100 or API 650, as applicable.

Q230.4 Welder/Welding Operator Performance Qualification

Welders and welding operators shall be qualified in accordance with ASME Section IX and AWWA D100 or API 650, as applicable.

Q230.5 Fabrication Control

Fabrication, assembly, and erection shall be in accordance with Standards AWWA D100 and API 650, and the design documents, as applicable.

Tanks requiring an internal protective coating shall have all interior welds ground smooth and blended with the parent metal surface. Welds shall be free of defects. Weld spatter shall be removed, and all surface imperfections shall be repaired as necessary. Interior plate edges and corners shall be ground to a minimum 1/8 inch radius.

Intermittent welds shall not be used on interior or exterior surfaces.

All welded seams exposed in exterior locations shall be provided with continuous welds along all contact edges.

The inside roof plate joints and roof-to-shell joints shall be seal welded.

All shell plate joints shall be of the double-welded butt joint type with complete fusion and penetration. Preparation of pipe butt welding ends for shop welds shall be in accordance with the fabricator's standard end preparation and welding procedure used. Preparation of pipe butt welding ends for field welds shall be in accordance with the contract drawings.

Longitudinal and circumferential joints shall not cross each other, but shall be offset from each other a minimum distance of 5t, where t is the nominal thickness of the thicker course at the point of offset.

Q230.5.1 Backing and Retainers

When required by design, backing shall be in accordance with the Welding Procedure Specification (WPS).

Nonmetallic retainers or nonfusing metal retainers shall not be used unless specified in the WPS. When used, they shall be removed.

Q230.5.2 Preheat
Preheat shall be performed in accordance with Standards AWWA D100 and API 650, the WPS applicable to the materials being welded, and the design documents.

Q230.5.3 Weld End Preparation
Preparation of butt welding ends of piping components for shop welds shall be in accordance with the fabricator's standard end preparation details and WPS. Preparation of pipe butt welding ends for field welds shall be in accordance with ASME B16.25.

Q230.6 Nondestructive Examination (NDE)
NDE of welds shall be performed in accordance with Standard AWWA D100 or API 650, as applicable, and as specified by the design documents.

Q230.7 Certification
The manufacturer shall be responsible for providing the following:

For AWWA D100 tank fabrication, the tank shall be identified by a nameplate, and a written report or certification of compliance shall be provided to the Engineer. Tank marking and certification shall be in accordance with Section 11 or Section 14 of AWWA D100, as applicable.

For API 650 tank fabrication, the tank shall be identified by a nameplate, and a manufacturer's certification letter of compliance shall be provided to the Engineer. Tank marking and certification shall be in accordance with API 650, Section 10.

Q302 Purchaser Specified Exterior Shop Coating
(Source: 11Dec07 - Revised by Project: 02Jun11)

Shop coating systems for ferrous metal surfaces of equipment shall be as specified on the Coating System Data Sheets listed under Technical Attachments in the Technical Specification. Where specific products are not listed, the coating materials shall meet the criteria indicated. Where specific products are listed, coating materials by other manufacturers may be acceptable. In either case, information assuring conformance with the specified criteria shall be submitted with the Proposal.

Paint materials shall conform with and shall be applied in accordance with the regulations of the air quality management agency having jurisdiction. Paint materials that cannot be guaranteed by the manufacturer to so conform, whether or not specified by product designation, shall not be used. Alternate materials that do conform shall be proposed. Information on the alternate materials shall be submitted to the Purchaser for acceptance prior to application. Materials shall contain no greater than 0.06 percent lead or chromium in the dried film.

Surfaces shall be cleaned, prepared, and coated in accordance with the coating manufacturer's instructions and Steel Structures Painting Council cleaning and application specifications. Surfaces to be painted shall be filled, as necessary, to provide a smooth, uniform base for painting.

Contractor shall furnish sufficient touchup paint for repairing 10 percent of the area on all factory painted external surfaces of each item of electrical equipment. The touchup paint shall be of the same type and color as the factory applied paint and shall be carefully packed to avoid damage during shipment. Complete painting instructions shall be furnished.

Coatings shall not be applied when the surface temperature is within 5° F (3° C) of the dew point. No paint shall be applied to surfaces within 3 inches (75 mm) of field welded connections.

Q302.1 Not Used

Q302.2 Mechanical Equipment

Mechanical equipment, including pumps, compressors, valves, valve operators, dampers, damper drives, mills, grinding apparatus, external piping surfaces, conveying machinery, and other similar equipment, shall be cleaned, prepared, and primed as specified on the Coating System Data Sheets.

The above requirement applies to equipment operating up to 200° F (93° C) and to equipment operating above 200° F (93° C) which will be insulated.

Q302.3 Structural Steel and Miscellaneous Metals

Structural steel and miscellaneous metals not specified to be galvanized, including all items fabricated of structural and miscellaneous steel such as ducts, tanks, hangers, supports, and similar fabricated steel assemblies, shall be cleaned, prepared, and primed as specified on the Coating System Data Sheets.

Q302.4 Hot Metal Surfaces

Hot metal surfaces include metal surfaces of electrical or mechanical equipment or structural steel and miscellaneous metals as defined above that have an operating or service temperature above 200° F (93° C).

Hot metal surfaces that will not be insulated and lagged shall be cleaned, prepared, and primed as specified on the Coating System Data Sheets.

Q302.5 Codes and Standards

Work performed under this specification shall be done in accordance with the following codes and standards. The version that is latest adopted, published, and effective at the date of bid shall apply unless specifically stated otherwise. In the following list, SSPC refers to Steel Structures Painting Council and NACE refers to National Association of Corrosion Engineers:

Application	Code/Standard
Solvent cleaning	SSPC-SP1
Hand tool cleaning	SSPC-SP2
Power tool cleaning	SSPC-SP3
White metal blast cleaning	SSPC-SP5
Commercial blast cleaning	SSPC-SP6
Near white blast cleaning	SSPC-SP10
Power tool cleaning to bare metal	SSPC-SP11
Shop, field, and maintenance painting	SSPC-PA1
Tank design, fabrication, and surface finish	NACE RP-01-78

Q303 Interior Coatings and Linings

(Source: 11Dec07 - Revised by Project: 02Jun11)

The interior surfaces of piping, tanks, and other vessels shall be cleaned and coated as specified on the Coating System Data Sheets listed under Technical Attachments in the Technical Specification. Ferrous surfaces which are not to be painted shall be coated with rust-preventive compound.

Exposed iron and carbon steel surfaces shall be protected by the specified coatings. Surfaces to be coated shall include all pipe flanges and tank nozzles through and onto the face of flanges, tank structural members, and miscellaneous tank appurtenances.

Surfaces to be coated shall be prepared in accordance with the latest edition of the surface preparation specifications indicated on the Coating System Data Sheets. Blasting media shall be limited to aluminum oxide (pink or white grade), cut steel wire (SAE J441), or steel grit. The blasting media used shall contain no more than 1.2 percent complexed silica and 0 percent free silica. Product data sheets on the blasting media proposed by the Contractor shall be submitted to the Owner for review and acceptance prior to its use. Product data sheets shall include an ultimate analysis of the product indicating elemental silica content. The use of Black Beauty, Starblast, slags, sand, or other materials not meeting the above criteria is prohibited.

The Contractor shall be responsible for immediate and complete removal of ALL blasting media from the component(s) before shipment to the jobsite, or before placement into service if blasting occurs in the field. This includes all field cleanup costs incurred by the Owner if blasting material is not completely removed by the Contractor.

Surfaces shall be coated immediately after surface preparation and cleaning, and application shall be in strict conformance with the coating manufacturer's recommendations.

Coatings shall be applied by skilled and experienced applicators. Coating films that show defects such as sags, checks, blisters, teardrops, fat edges, et cetera will not be accepted. Any coated surface that contains any of the previously mentioned defects shall be repaired or, if necessary, entirely removed from the member or unit involved and the surface recoated.

Cleaning, blasting, and application of the coatings shall be done by an applicator who is experienced in the application of each specified coating.

Interior coatings shall be checked for pinholes and holidays using a nondestructive holiday detector, in accordance with NACE RP0188, at a voltage as specified by the manufacturer, and using a suitable saline solution. Pinholes shall be repaired by grinding to the underlying substrate and reapplying the coating as recommended by the manufacturer. These areas shall be retested until the entire lining is free from defects.

Coating dry film thicknesses shall be measured using a magnetic or electronic thickness detector per SSPC-PA2. Additional coating shall be applied to all areas which show a deficiency in dry film thickness. Final test results shall be submitted to the Owner for verification.

Q320 Galvanizing

(Source: 27Jan04 - Revised by Project: 02Jun11)

Structural steel members and steel assemblies shall be "pickled" after all cutting, punching, reaming, drilling, tapping, and other fabrication processes which would damage galvanizing have been completed. The pickling shall be done in accordance with the latest accepted practice and shall continue until all scale, rust, grease, and other impurities have been completely removed. The steel shall then be hot-dip galvanized.

When either member to be bolted is galvanized and where required by the detailed specifications, erection and structural bolts shall be galvanized.

ZRC Brush Applied Cold Galvanizing Compound shall be used for touchup of galvanized surfaces in lieu of Cold Galvanizing Spray.

Q320.1 Codes and Standards

Work performed under this specification shall be done in accordance with the following codes and standards. The version that is latest adopted, published, and effective at the date of bid shall apply unless specifically stated otherwise:

Work	In Accordance With
Hot-dip galvanizing	ASTM A123 or ASTM A153
Bolt galvanizing	ASTM B695 Class 50

Q500 Shop Drawings and Instruction Manuals

This section, in conjunction with the Schedule of Submittals, stipulates the requirements for engineering data that Contractor shall submit for design information and review. Document submittal procedures shall be in accordance with the requirements of this Contract.

Q500.1 Submittal Requirements

Technical data shall be submitted in electronic format. Hard copy prints of the electronic files shall also be submitted, as specified below.

Electronic technical data submittals shall be made using IBackup, a Web-based file transfer service. If Contractor does not already have IBackup transmittal capability, information is available at http://www.ibackup.com/. (The Uniform Resource Locator [URL] to be used for electronic file submittals will be made available upon Contract award.)

Electronic technical data submittals shall be made using IBackup, a Web-based file transfer service. Instructions for uploading submittals to iBackup will be provided upon award.

Upon upload of the submittals, an email notification should be sent to the following individuals:
Gene Bergt – BergtGE@bv.com
Jamila Akrayi – akrajr@jea.com

The following subject line shall be included on all email notifications:

196116.77.5450 YYMMDD JEA GEC Fuel Oil/Demineralized Water Storage Tank Addition Project – Transmittal No. XX – DISCIPLINE

YYMMDD = Date of Transmittal in the listed format
Transmittal No. XX = Unique Sequential Transmittal Number
DISCIPLINE = Electrical, Mechanical, Civil/Structural or Architecture

The following number of prints shall be submitted unless otherwise indicated in the Schedule of Submittals:

Submittal Description	Copies Required	
	Engineer	Owner
Design Data	1 Electronic Copy	1 Electronic Copy and 1 Full Size Print

Submittal Description	Copies Required	
	Engineer	Owner
Test and Inspection Data	1 Electronic Copy	1 Electronic Copy and 1 Full Size Print
Drawings	1 Electronic Copy	1 Electronic Copy, 1 ANSI C Size Print

Q500.2 Compliance Reports
Reports shall be submitted that record the tests and/or calculations required in the specification technical sections. Reports shall be submitted for each piece of equipment or each plant system. Specified drawings shall be submitted with the compliance reports.

Q500.3 Motor and Electric Actuator Information
If required by the Specifications, Motor and Electric Actuator Information shall be submitted in accordance with Supplemental Q502.

Q500.4 Drawings
Drawings shall be in sufficient detail to indicate the kind, size, arrangement, component weight, breakdown for shipment, and operation of component materials and devices; the external connections, anchorages, and supports required; the dimensions needed for installation and correlation with other materials and equipment; and the information specifically requested in the Schedule of Submittals.

Contractor shall fully complete and certify drawings for compliance with the Contract requirements. Drawings shall have title block entries that clearly indicate the drawing is certified.

Each submitted drawing shall be project unique and shall be clearly marked with the name of the project, unit designation, Owner’s Contract title, Owner’s Contract file number, project equipment or structure nomenclature, component identification numbers, and Owner's name. Equipment, instrumentation, and other components requiring Owner-assigned identification tag numbers shall be clearly identified on the drawings. If standard drawings are submitted, the applicable equipment and devices furnished for the project shall be clearly marked.

Transmittal letters shall identify which Schedule of Submittals item (by item number) is satisfied by each drawing or group of drawings. The transmittal letter shall include the manufacturer’s drawing number, revision number, and title for each drawing attached. Each drawing title shall be unique and shall be descriptive of the specific drawing content. Transmittal letters for resubmitted drawings shall include the Engineer’s drawing numbers.

Catalog pages are not acceptable, except as drawings for standard nonengineered products and when the catalog pages provide all dimensional data, all external termination data, and mounting data. The catalog page shall be submitted with a typed cover page clearly indicating the name of the project, unit designation, specification title, specification number, component identification numbers, model number, Contractor’s drawing number, and Owner's name.

Drawings shall be submitted with all numerical values in English units.

Q500.4.1 Drawing Submittal
A standard drawing submittal template form and transmittal letter are included at the end of this section. Contractor shall use this form for all submittals. (An electronic copy of this form will be made available upon Contract award.)

Drawings shall be submitted electronically in Tagged Image File Format (TIFF) - Group 4 or Adobe Portable Document Format (PDF). AutoCAD or MicroStation format files are not acceptable.

If hard copies are required for submittal, the separately submitted hard copy drawing prints shall be black line on white background. Blue line on white background or color prints are not acceptable. All drawings shall be suitable for electronic imaging and shall have the maximum contrast. Print size shall not exceed 34 inches by 44 inches. Drawings shall be folded to 8-1/2 inches by 11 inches. Drawings shall be collated in sets.

Q500.4.2 Drawing Processing
Contractor's engineering schedule shall allow a minimum of three (3) weeks for mailing, processing, and review of drawings and data by Owner Engineer.

Unless this Contract indicates that a drawing or engineering data submittal by Contractor is to be for Engineer's information only, Engineer, upon receipt of submittals, shall review and return same to Contractor, marked "No Exceptions Noted," "Exceptions Noted," "Received for Distribution," "Returned for Corrections," "Release for Record," "Void," or "Superseded." The timing of Contractor's submittals and Engineer's review shall be in accordance with the Completion Dates for same as set forth in the Contract. The submittal of any drawing or other submittal document by Contractor to Engineer under this Contract will be certification by Contractor that the information set forth therein is accurate in all material respects.

Q500.4.2.1 No Exceptions Noted (NE) or Received for Distribution (RD). Upon receipt of a submittal marked "No Exceptions Noted" or "Received for Distribution," Contractor may proceed with its Work to the extent of and in accordance with the submittal. Contractor shall not resubmit unless the drawing or document is revised, in which case it shall be resubmitted as a new document revision in accordance with Q500.4.2.7.

Q500.4.2.2 Exceptions Noted (EN). Upon receipt of a submittal marked "Exceptions Noted" and if Contractor concurs with Engineer's comments, Contractor shall incorporate same and may proceed with its Work to the extent of and in accordance with the annotated submittal. Contractor shall submit to Engineer within fourteen calendar days a revision to the original submittal in which Engineer's comments have been incorporated. If Contractor determines that it cannot incorporate Engineer's comments without prejudice to Contractor's warranty or other obligations under this Contract, Contractor shall so advise Engineer in writing within seven calendar days of its receipt of Engineer's comments, stating the reasons therefore. Contractor may proceed with its Work to the extent of and in accordance with the annotated submittal only upon Engineer and Contractor resolving Engineer's comments.

Q500.4.2.3 Returned for Corrections (RC). Upon receipt of a submittal marked "Returned for Corrections," Contractor shall immediately take all necessary action to revise its submittal in accordance with Engineer's comments, the Specification, and the Drawings, and shall resubmit to Engineer for review the corrected original submittal, voiding previous information and adding new documents if required. In no event shall Contractor proceed with the affected Work until its revised submittals have been returned to Contractor marked "No Exceptions Noted" or "Exceptions Noted" by Engineer.

Q500.4.2.4 Release for Record (RR). Receipt of a submittal marked "Release for Record" indicates that there are no specific objections to the document. Work may proceed. Certain project information required by the Engineer's document management system may have been added electronically to the drawing and provided to Contractor for the record. Contractor shall not resubmit the drawing or document unless revisions to the design are required. If revisions are required, Contractor shall incorporate Engineer's information and resubmit as a new revision. Engineer's project-specific information shall be added if future revisions and submittals are made.

Q500.4.2.5 Void (VO) or Superseded (SS). Receipt of a submittal marked “Void” or “Superseded” does not require any action by Contractor. “Void” indicates that the submittal is no longer applicable to the project and is not being replaced by other drawings or data. “Superseded” indicates that different drawings or data have replaced the previously submitted drawings and data; this status does not pertain to revisions of the same drawings and data.

Q500.4.2.6 Hold (HO). A submittal may be given a status of "Hold" by the Engineer, or the Contractor may have "Holds" on the submitted drawing.

For a Hold status designated by the Engineer, the Contractor shall not proceed with the work that is designated on "Hold" except as specifically directed by the Engineer. Additional information required for the Contractor to release the "Hold" will be transmitted from the Engineer later.

The Contractor shall provide information to the Engineer about the cause for any "Holds" designated on the drawing and immediately take all action necessary to resolve the "Holds". The Contractor shall resubmit the drawing for review once the "Holds" are removed from the drawing and should make all efforts to not submit drawings to the Engineer until drawing review comments have been received back from the Engineer.

Q500.4.2.7 Resubmittals. If during or subsequent to the completion of the submittal process, Contractor makes further changes to the equipment and materials shown on submittals that have been reviewed by Engineer, the changes shall be clearly marked on the submittal by Contractor and the submittal process shall be repeated. If changes are made by Contractor after delivery to the Jobsite, as-built drawings indicating the changes shall be prepared by Contractor and submitted to Engineer for review. Any resubmittal of information shall clearly identify the revisions by footnote or by a form of back-circle, with revision block update, as appropriate.

Q500.4.2.8 Engineer’s Review. Engineer's review of drawings and other submittals will cover only general conformity of the data to the Specifications and Drawings, external connections, interfaces with equipment and materials furnished under separate specifications, and dimensions that affect plant arrangements. Engineer's review does not include a thorough review of all dimensions, quantities, and details of the equipment, material, device, or item indicated or the accuracy of the information submitted. Review and comment by Engineer of Contractor's Drawings or other submittals shall not relieve Contractor of its sole responsibility to meet the Completion Dates requirement of this Contract and to supply Goods that conform to the requirements of this Contract.

Q500.4.2.9 File Returns to Contractor. The IBackup web service will be used by Engineer to return TIFF files to Contractor.

A copy of the manifest will be returned to Contractor indicating drawings statused as NE (No Exceptions Noted).

Each packet of drawings returned to Contractor will include a manifest generated by Engineer. The manifest will include a list of drawings transmitted, manufacturer's drawing numbers, Engineer's assigned drawing numbers, Engineer's drawing titles, and the status of the drawings.

Files returned to Contractor will be in TIFF Group 4 format unless another format is agreed upon by Engineer and Contractor.

Q500.5 Wiring Diagrams

If required by the Specifications, Wiring Diagrams shall be submitted in accordance with Supplemental Q502.

Q500.6 Instruction Manuals

If required by the Specifications, Instruction Manuals shall be submitted in accordance with Supplemental Q501.

SAMPLE LETTER OF TRANSMITTAL

To: Black & Veatch Corporation
12740 Gran Bay Parkway West, Suite 2140
Jacksonville, FL 32258

Attention: Mr. Gene Bergt

From: (Contractor Name)
(Street Address)
(City, State, Zip)
(Contact Name)
(Contact Phone No.)
(Email Address)

Project Name: JEA GEC Fuel Oil/Demineralized Water Storage Tank Addition
Black & Veatch Project Number: 196116.77.5450
Date: (fill-in)
Contractor Transmittal No. (fill-in)
(other Contractor-specific information)

Submittal Item No	Mfr Dwg #	Rev	# of Sheets	Title	Elec File Name	Resubmittal (Y/N) ?

Q501 Instruction Manuals

(Source: 27Apr10 - Revised by Project: 02Jun11)

This section, in conjunction with Section Q500 stipulates the requirements for Instruction Manuals that Contractor shall submit for design information and review. Document submittal procedures shall be in accordance with the requirements of this Contract, Section Q500, and the following.

Q501.1 Submittal Requirements

Hard copies shall be submitted for the documents listed below. The following number of copies shall be submitted unless otherwise indicated in the Schedule of Submittals:

Submittal Description	Copies Required
Proof Copies	1 Electronic Copy (Table of Contents only)
Final Copies	3 Electronic Copies on CD, 3 Hard Copies

Q501.2 Instruction Manuals

Contractor shall furnish proof and final instruction manuals for the unloading, storage, installation, operation, and maintenance of the equipment. The manuals shall be delivered as specified in the Schedule of Submittals.

Manuals shall include the following information specific to the furnished equipment. The documents or drawings submitted within the Instruction Manual shall be consistent with the documents or drawings previously submitted for Owner's review. Documents or drawings which were previously submitted for review and are included within the Instruction Manual shall be identical, with the same revision number. If these documents or drawings were revised due to design revisions subsequent to issuance of the Instruction Manuals, the document or drawing shall be resubmitted in accordance with Article Q500.4.2.7 in Supplemental Q500 so the Owner can provide updated drawings to the holders of the Instruction Manuals.

Table of contents and index tabs. (If multiple volumes are required, a table of contents listing materials included in each volume shall be supplied for each volume.)

Specifications and test data specified in the technical specifications.

Description of the equipment, including illustrations showing elevations, cross section, and all details of the equipment with all parts named, numbered, and identified with Owner's tag numbers. When multiple model numbers are shown on the drawings, the equipment supplied for the project shall be clearly identified.

Complete and detailed operating instructions, including safety precautions, philosophy of operation and, where applicable, process optimization techniques.

Detailed minor and major maintenance instructions, including description, use of special tools furnished, and preventive maintenance schedule.

Instructions for receiving, inspection, storage, and handling of equipment prior to installation.

Installation instructions.

Inspection procedures.

Troubleshooting guide.

All fluid systems schematics and piping diagrams.

Control logic diagrams, as applicable.

Electrical wiring diagrams, as applicable.

Calibration Data Sheet for each adjustable instrument included in the scope of supply.

Control Panel Arrangements, as applicable.

Contractor and sub-supplier operating and maintenance manuals.

Illustrated parts breakdown.

Assembly drawings.

Parts lists.

List of acceptable lubricants.

Nameplate information and shop order numbers for each item of equipment and associated component parts thereof.

List of recommended spare parts.

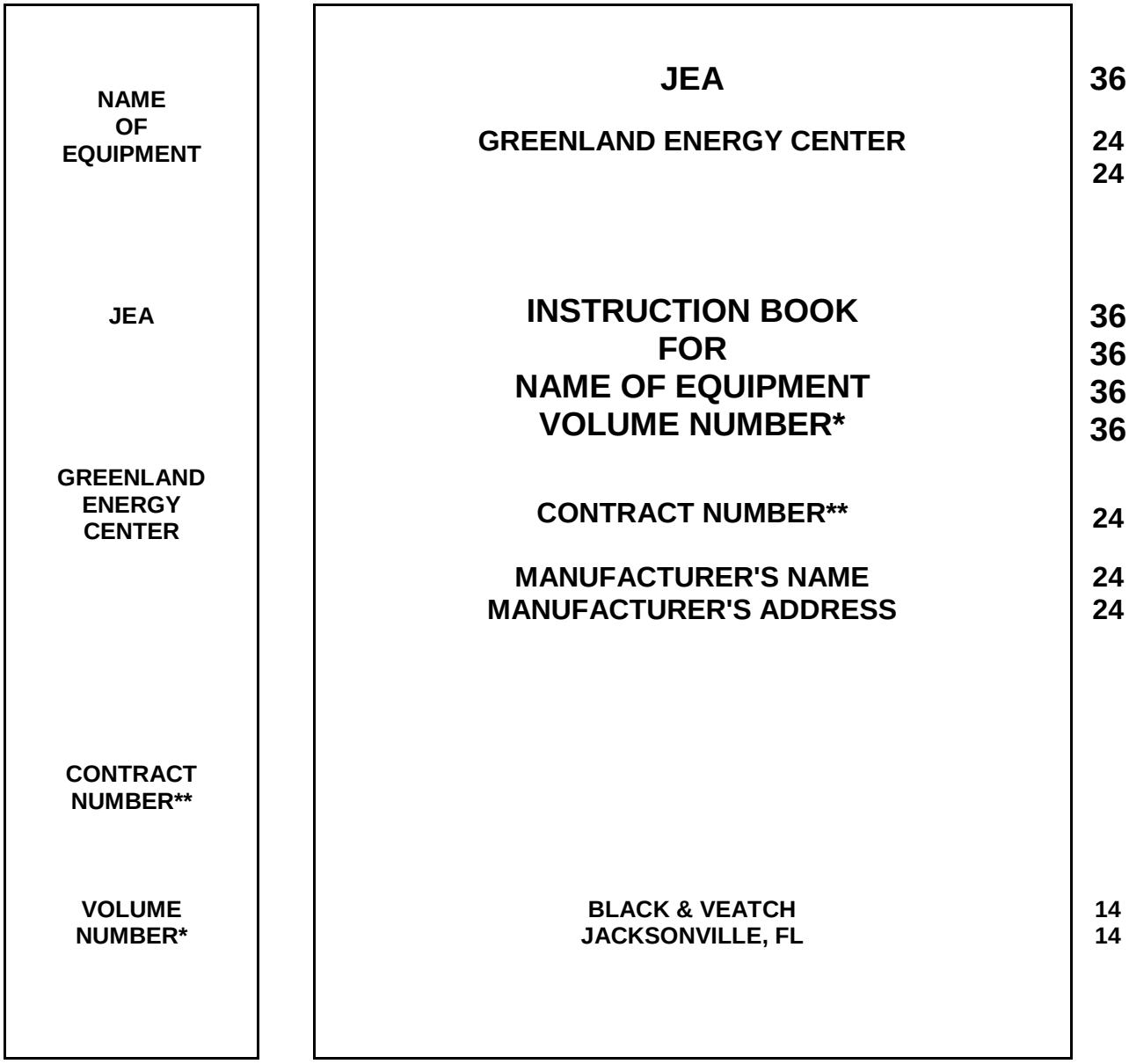
List of maintenance tools furnished with the equipment.

The above listed requirements are the minimum requirements; however, requirements that are clearly not applicable to the equipment may be deleted with Owner's approval. Additional information that is necessary for proper operation and care of the equipment shall also be included..

Q501.2.1 Binding
Each copy of the manuals shall be assembled and bound in three-ring or post binders designed for rough usage. Light-duty binders will not be acceptable.

Front covers and backbones of the manuals shall be permanently marked with lettering per the Typical Instruction Book Cover attached at the end of this section.

TYPICAL INSTRUCTION BOOK COVER



(Backbone) (Cover)

NOTES:
1. All lettering shall be a block style font such as Arial.
2. All backbone lettering shall be 14 point.
3. Cover lettering shall be point sizes indicated in column to right of cover illustration.
4. *Volume number required only if instructions are contained in more than one volume.
5. **OwnerOwner assigned Contract number.

S200 Miscellaneous Equipment Access Provisions

(Source: 22Oct10 - Revised by Project: 02Jun11)

This Supplemental Specification covers design and fabrication requirements for the access provisions to individual pieces of equipment.

Access provisions shall consist of stairs, platforms, walkways, handrails, guardrails, and ladders necessary to provide complete and convenient access for operation, inspection, testing, and maintenance of individual pieces of equipment and associated components. Arrangement drawings for access provisions shall be provided as part of the Technical Data.

S200.1 Design Criteria

Access provisions shall conform to all applicable codes and standards and the following minimum requirements.

As a minimum, all egress paths and equipment access provisions shall be designed to comply with OSHA, and NFPA 101 Regulations, including all addenda and interpretations. Application of these regulations shall be based on their literal translation.

S200.1.1 Support Steel

Platform and walkways supporting steel shall be designed for a minimum live load of 60 pounds per square foot. Stairway supporting steel shall be designed for a minimum live load of 100 pounds per square foot. Fixed stairways shall also be designed for a minimum moving concentrated load of 1,000 pounds as specified in OSHA 29CFR-1910.24(c). Vertical live load deflection of steel framing members shall not exceed 1/360 of the span length. The length of landing platforms, measured in direction of travel, shall be, as a minimum, equal to the stair width, but shall not exceed 4 feet where the stairway has a straight run. Platforms shall have lateral bracing as required for rigidity and stability.

S200.1.2 Platforms and Walkways

Platforms and walkways shall be a minimum of 36 inches wide. Platforms and walkways shall be provided with guardrails.

S200.1.3 Stairs

Stairs shall be a minimum of 30 inches wide. Treads and risers shall be in accordance with OSHA and Section 40.2.5.2 of NFPA 101. Minimum concentrated load on stair treads (on area of 4 square inches) is 300 pounds. The tread depth shall be exclusive of nosings or projection. Vertical distance between floor and landing shall not exceed 12 feet. Vertical headroom clearance shall be 7 feet minimum at projections above the stairs. Stair stringers shall be not less than 10 inches in depth, and 15.3 pounds per foot channels. Slip resistant nosing shall be supplied with stair treads. Stairs shall be provided with handrails and guardrails in accordance with S200.1.4 Guardrails and Handrails.

S200.1.4 Guardrails and Handrails

Guardrails and handrails shall be designed to comply with OSHA, NFPA 101 Regulations, and all other applicable codes and standards. Design shall be to the most restrictive requirements of the referenced codes. All open stairs shall have a combination guardrail/handrail system as described in the codes. The upper surface of the top rail of guardrails shall be 42 inches above the surface of platforms, walkways, and stair treads in line with face of riser at the forward edge of the tread. Handrails on stairs shall be supported by brackets from the guardrail posts with the upper surface of the handrail 34 inches above the surface of stair treads in line with face of riser at the forward edge of the tread.

Railings shall be designed to meet the design loading requirements of OSHA, NFPA 101 Regulations, and other applicable codes and standards. Steel posts shall be vertical and uniformly spaced with 7 feet maximum spacing, or less as required for the post, railings, and connections to conform to the design

loading requirements of the applicable codes and standards. Handrails shall be 1-1/2 inch nominal diameter steel pipe.

Railings shall be smooth, with all projecting joints and sharp corners ground smooth. Welded joints shall be of the flush type. Members shall be neatly coped and continuously welded at all junctions of posts and rails. Flattening of the rail or post ends at junctions of posts and rails will not be permitted. Fittings or other connectors shall not be used at junctions of posts and rails. For galvanized railings, joints shall have internal openings so there are no closed or blind sections of pipe. When the bottom of the handrail post is closed, a drain hole shall be provided on the vertical side of the post near the bottom.

All welding shall be done neatly and substantially, with all fillets dressed to uniform radius, all excess metal removed, and all welds ground smooth and flush.

All angles, offsets, and other changes in alignment of railings shall be made with accurately mitered joints, welded railing fittings, or smooth radius shop bends.

S200.1.5 Kickplates
Kickplates shall be provided for platforms, on equipment roofs as required, and as necessary for personnel protection and safety. Kickplates shall project a minimum of 4 inches. Minimum thickness of kickplates shall be 3/16 inch. Kickplates on roofs shall be notched for drainage. Openings in grating panels shall be provided with kickplates.

S200.1.6 Ladders
Ladders may be used in lieu of stairways in locations where stairways would not be practical and where applicable codes and standards allow. Egress provisions must meet codes and standards criteria for ladder use. Ladders shall be designed to meet the design loading requirements and other specified requirements of OSHA, ANSI, and NFPA 101 Regulations, and all other applicable codes and standards.

Ladders shall not be less than 18 inches wide with 3/4 inch diameter solid steel rungs spaced 12 inches center-to-center. The distance of the first rung at the bottom of the ladder may range up to 14 inches from the surface below. The top rung shall be level with the landing or platform. Ladder side rails shall be steel bars not smaller than 3 inches by 1/2 inch. Ladder side rails shall be punched for the rungs. Rungs shall be extended to within 1/8 inch of the outside rail surface, and the remaining 1/8 inch shall be plug welded. Rungs shall be continuously fillet welded inside each rail surface. Ladder supports shall be steel brackets not less than 4 inches by 1/2 inch, spaced not more than 18 feet vertically center-to-center. The center of the rung shall be no less than 7 inches (horizontal measure) from the nearest permanent objects. Cages shall be provided on ladders where the length of climb is more than 20 feet. Where the length of climb is less than 20 feet but the top of ladder is more than 20 feet above adjoining surfaces (fall potential to the ground, roofs or floors), cages shall also be provided. Ladder side rails shall extend a minimum of 3 feet 6 inches above the top of floors and be flared to a minimum clear width of 24 inches for walk-through access, and extend a minimum of 4 feet 0 inches for side access ladders.

Self-closing gates shall be provided at all ladder entrances. (Chains shall not be used.)

S200.2 Materials
Materials used shall be equal to or exceed the following minimal requirements:

Steel framing, kickplates, angles	ASTM A36
Ladders	ASTM A36
Connection bolts for steel framing	ASTM A325, Type 1, with washers and nuts

Rectangular bar grating 1-1/4 inch minimum depth (serrated for exterior use)	ANSI/NAAMM MGB531, W-19-4
Stair tread grating	Same as rectangular grating except bearing bars not less than 3/16 inch by 1 inch for lengths up to and including 3 feet and less. Bearing bar spacing not to exceed 1-3/16 inch
Stair tread fasteners (furnish with stair treads)	Galvanized 3/8 inch minimum diameter bolts conforming to ASTM A307, Grade A with lock washers and nuts
Nosing	Slip resistant checkered plate or acceptable equal
Guardrails and handrails - posts and rails (minimum size and strength)	ASTM A53, Type E or S, Grade B, 1-1/2 inch nominal diameter pipe, Rails Schedule 40, Posts Schedule 80, or acceptable equal
Optional rail fittings for angles, offsets, and other changes in alignment	R&B Wagner railing fittings with Wedgelock welding connectors at each end. (Slip-on fittings using set screws and open seam fittings are not acceptable.)

S200.3 Coatings
Coatings shall be in accordance with Section 09900.

S200.4 Welding
Welding shall be in accordance with the applicable requirements of Supplemental Specifications Q100 and Q121 in this Section 01400.

S200.5 Technical Attachments
The following attachments accompany these specifications in either paper or electronic format. The information contained in these documents constitutes requirements under this Supplemental Specification:

Document Number/Description	Title	Revision
81112-DS-0064	Typical Guardrail and Stair Rail Conforming to IBC 2003, 2006 & 2009 for Areas Not Accessible to the Public	9
81112-DS-0071	Typical Ladder Details	8

S210 Equipment Access Provisions - Erection

S210.1 Steel
Steel materials shall be erected in accordance with OSHA, AISC, the drawings, and these specifications.

S210.2 Grating

Each section of rectangular bar grating shall be securely fastened in place with not less than two fasteners at each support. Fasteners shall be saddle clips with stud type anchors, Hilti powder actuated studs and disks (hot-dip galvanized Type X-FCM-F disks and Type EM8-15-14FP10 carbon steel threaded studs), G-clips manufactured by Grating Fasteners, Inc. or acceptable equal. Fasteners shall be furnished by the grating erector.

Stair treads shall be bolted to the stair stringers with galvanized unfinished bolts, nuts, and lock washers furnished with the stair treads.

S210.3 Guardrails and Handrails

Railing shall be welded or bolted to the supporting structure. Welded rail splices shall be ground smooth. Field erected sections of railings shall have the longitudinal rails parallel and horizontal, except for railings attached to sloping surfaces such as stair stringers which shall parallel the sloping surface. Posts shall be vertical.

S210.4 Coatings - Touchup

Damaged surfaces of coatings shall be touchup coated by the erection contractor. Touchup coatings for inorganic zinc primer shall be in accordance with Coating System Data Sheet A1P or acceptable equal. Touchup coatings for hot-dip galvanized surfaces shall be in accordance with Coating System Data Sheet A19 or acceptable equal. Touchup coatings shall be applied in accordance with the manufacturer's written instructions.

S210.5 Welding

Welding shall be in accordance with the applicable requirements of Supplemental Specifications Q100 and Q121 in this Section 01400.

09900 - Field Applied Protective Coatings

09900.1 General

Cleaning, surface preparation, and coating application shall be as specified herein and shall meet or exceed the coating manufacturer's recommendations. When the manufacturer's minimum recommendations exceed the specified requirements, the Contractor shall comply with the manufacturer's minimum recommendations.

This section covers the requirements for shop and field application of protective coatings and painting for components that are not galvanized. The painting systems specified are expected to provide an optimum life expectancy of 10 years from the time of original painting. The environment shall be considered a Severe Environment – Heavy Industrial and Chemical Plant area with high levels of fumes and fallout as defined by the Steel Structures Painting Council (SSPC). Coatings shall be suitable for an industrial environment. The optimum life of a coating system will be considered the time until first maintenance painting/touchup should occur, when 3 to 5 percent breakdown of the topcoats occurs, before active rusting begins. Surfaces which will be inaccessible after assembly shall be protected for the life of the equipment.

Painting work shall include the protection of surfaces not to be painted and surface preparation, furnishing and applying paint materials, and other work incidental to painting which is required to properly execute the painting work.

All external metallic surfaces of equipment provided under these specifications which are subject to corrosion shall be cleaned and prepared in accordance with the Coating System Data Sheets listed under Technical Attachments in the Technical Specification, and shall be protected by the specified coatings. Surfaces which will be inaccessible after assembly shall be protected for the life of the equipment.

Painting shall be in accordance with Owner’s color scheme.

09900.1.1 Scope

This section covers field applied protective coatings, including surface preparation, protection of surfaces, inspection, and other appurtenant work for equipment and surfaces designated to be coated with heavy-duty industrial coatings. Touch-up painting, where required, shall restore or complete any damaged, inadequate, or masked surfaces to the full coating specified on the applicable Coating System Data Sheet.

Except for those surfaces excluded hereinafter, all exposed surfaces of facilities constructed or otherwise incorporated into the scope of work shall be painted. All exposed surfaces of equipment components and structures that are not finish painted shall be field painted by Contractor.

Exposed surfaces shall mean all interior and exterior surfaces which are not encased or covered by the equipment and which are visible and accessible for painting.

Areas which would be difficult or impossible to paint after all construction is complete shall be painted at a stage during construction when painting is possible.

Abraded or damaged areas of shop primed surfaces shall be cleaned and touchup painted before applying finish paint system. Abraded or damaged areas of shop finish painted surfaces shall be repaired by spot priming and repainting.

Accessories for equipment shall be painted with the same paint system specified for the equipment.

Exposed surfaces of electrical conduit, conduit boxes, and fittings shall be painted only where they are adjacent to painted parts of the equipment. These surfaces shall be painted the same color as the adjacent surfaces.

09900.1.1.1 Surfaces to be Painted. Exposed surfaces of all equipment, piping, valves, and hangers, unless excluded hereinafter, shall be finish painted.

09900.1.1.2 Surfaces Not to be Painted. Except as otherwise specified or directed by Owner**,** the surfaces of the following shall not be painted:

Aluminum surfaces
Brass
Bronze
Bus duct enclosures
Cable trays and supports
Chromium plated metals
Concrete floors, sidewalks, curbs, and paving
Electrical conductors, insulated, or uninsulated
Electrical conduits, wire ways, and junction boxes (except as otherwise specified)
Embedments (galvanized)
Floor plates
Gauges
Galvanized grating and hand railing
Galvanized structural steel
Glazing
Hardware
Light fixtures, except supports
Polished or machined surfaces
Porcelain enameled surfaces
Porcelain bushings
Rotating shafts and couplings
Rubber belts, skirting, gaskets, and idler disks
Stainless steel surfaces

Bearing surfaces and nameplates shall not be painted, but shall be coated with an easily removable rust preventative. Sliding surfaces and threads shall not be painted, but shall be properly lubricated. Surfaces to be field welded shall be left unpainted for a distance of 3 inches from the weld and painted after the welding is complete.

09900.1.1.3 Surfaces to be Touchup Painted. After erection, touchup coatings shall be furnished and applied to abraded or damaged areas on shop-coated equipment surfaces. Surfaces shall be properly prepared before application of coatings. The touchup coatings shall be of the same manufacturer or Owner approved equivalent, type and color as the shop coatings, with surface preparation, undercoating, and paint application procedures in accordance with the original paint manufacturer's recommendations. Repair painting shall be applied as required to produce a finish equal to the shop paint finish.

Where touchup coatings are provided by the equipment supplier, those coatings shall be used for touchup and surface preparation, undercoating and coating application procedures furnished by the supplier shall be followed.

Use of aerosol spray paint is not acceptable. Refer to JEA Contractor Safe Work Practices Manual for acceptable practices.

09900.1.2 Not Used

09900.1.3 Coating Applications and Material Requirements

Paint systems shall be in accordance with the following listing. Paint system designations refer to the Coating System Data Sheets listed under Technical Attachments in the Technical Specification:

Application	Coating System Number
Outdoor exposed steel (not galvanized), shop and field erected uninsulated carbon steel tanks and vessels, piping supports, Contractor furnished equipment	1712
Valves and fittings, electric motors, electrical equipment, instruments and control panels	Manufacturer's standard coatings (if standard finish is primer, Contractor shall finish coat equipment)
Fuel Oil Tank Interior – Vapor space	1401
Fuel Oil Tank Interior – Bottom/floor and 3 ft up side	2314

09900.1.4 Codes and Standards

Work performed under these specifications shall be done in accordance with the following codes and standards. Unless otherwise specified, the applicable governing edition and addenda to be used for all references to codes or standards specified herein shall be interpreted to be the jurisdictionally approved edition and addenda. If a code or standard is not jurisdictionally mandated, then the current edition and addenda in effect at the date of this document shall apply. These references shall govern the work except where they conflict with the Engineer's specifications. In case of conflict, the latter shall govern to the extent of such difference:

Work	In Accordance With
Fabrication details, surface finish require-ments, and proper design considerations for tanks and vessels to be lined for immersion service	NACE RP0178
Mineral and Slag Abrasives	SSPC-AB 1
Newly Manufactured or Remanufactured Steel Abrasives	SSPC-AB 3
Solvent cleaning	SSPC-SP 1
Hand tool cleaning	SSPC-SP 2
Power tool cleaning	SSPC-SP 3
White metal blast cleaning	SSPC-SP 5 / NACE No. 1
Near white blast cleaning	SSPC-SP 10 / NACE No. 2
Commercial blast cleaning	SSPC-SP 6 / NACE No. 3
Brush-off blast cleaning	SSPC-SP 7 / NACE No. 4

Work	In Accordance With
Power tool cleaning to bare metal	SSPC-SP 11
Surface Preparation and Cleaning of Steel and Other Hard Materials by High- and Ultra-High Pressure Water Jetting Prior to Recoating	SSPC-SP 12
Surface Preparation of Concrete	SSPC-SP 13
Shop, field, and maintenance painting of steel	SSPC-PA 1
A guide to safety in paint application	SSPC-PA Guide 3
Standard procedure for evaluating painting contractors	SSPC-QP 1
Visual standard for abrasive blast cleaned steel	SSPC-VIS 1
Visual standard for power and hand tool cleaned surfaces	SSPC-VIS 3

09900.1.5 Not Used

09900.1.6 Not Used

09900.1.7 Test Requirements

The following testing shall be conducted in accordance with the specified source. This testing is to be considered part of the defined Scope of Work, and all associated costs are the responsibility of the Contractor:

Tests	In Accordance With	Conducted By
Indicating moisture in concrete by the plastic sheet method	ASTM D4263	Contractor
Indicating oil or water in compressed air	ASTM D4285	Contractor
Measurement of wet film thickness by notch gauges	ASTM D4414	Contractor
Field measurement of surface profile of blast cleaned steel	ASTM D4417	Contractor
Pull-off strength of coatings using portable adhesion testers	ASTM D4541	Contractor

Tests	In Accordance With	Conducted By
Discontinuity (Holiday) testing of nonconductive protective coatings on metallic substrates	ASTM D5162	Contractor
Measurement of dry paint thickness with magnetic gauges	SSPC-PA 2	Contractor

09900.1.8 Technical Attachments
Technical attachments relevant to the work under this section are listed in Section 01100.

09900.1.9 Supplemental Specifications
Technical supplemental specifications that are applicable to the work covered under this technical specification section are identified and included in Section 01400.

09900.1.10 Submittals
A coating system submittal shall be provided in accordance with Supplemental Specification Q500 in Section 01400 and shall include:

Product data sheets.

Material safety data sheets (MSDS).

Surface preparation requirements and application instructions for each coating system furnished under this section.

Ventilation, dehumidification or heating requirements.

Repair procedures for damaged areas and detected holidays.

Quality assurance / quality control plan.

Name of coating inspector and level of certification held.

A separate coating system submittal shall be developed and submitted for each variation or change in a coating system or surface to be coated.

Protective coating and lining work shall be undertaken by applicators, including supervisors and workers, qualified by commercial experience installing the types of materials specified. To satisfy this experience requirement, the applicator shall be certified to SSPC-QP 1 or equivalent and shall submit to the Owner a work history demonstrating a record of performance of such applications.

When the proposed products will be in contact with potable water, the Contractor shall submit certifications that the proposed systems are in compliance with ANSI/NSF 61.

Contractor shall submit color cards for all coatings proposed for use, together with specifications to the Owner for review and color selection.

Approval of the Contractor submittals must be provided by the Owner prior to the commencement of work.

09900.1.11 Quality Assurance

09900.1.11.1 Certification. The Contractor shall review and approve in writing the coating manufacturer's recommendations for the intended service. Any variations from these specifications or the coating manufacturers published recommendations shall be submitted in writing and approved by the Owner.

09900.1.11.2 Manufacturer's Services. The services provided by the coating manufacturer shall include review of the project before surface preparation; certification, in writing, of the applicator and the coating materials to be used.

09900.2 Products

09900.2.1 Materials

Paint materials shall be as indicated on the Coating System Data Sheets listed under Technical Attachments in the Technical Specification.

All coating products shall be received and stored in accordance with the coating manufacturer's recommendations. Paint materials shall be stored in sealed, original labeled containers bearing manufacturer's name, type of paint, brand name, color designation, and instructions for mixing and/or reducing. The manufacturers' recommended application instructions for each type of paint shall be included with each shipment of paint.

Except for catalyzed coatings, all paint shall be factory mixed in correct proportions and consistency suitable for direct application in warm weather without addition of thinners. Pigments shall be fully ground, maintaining a soft paste consistency, capable of being readily and uniformly dispersed to a complete homogeneous mixture.

Materials from the same manufacturer shall be applied for all coats in each coating system.

Except as otherwise acceptable to Owner, coatings shall be formulated and compounded by manufacturers named in the Coating System Data Sheets listed under Technical Attachments in the Technical Specification.

All coatings shall conform to the air quality regulations applicable at the location of use. Coating materials that cannot be guaranteed by the manufacturer to conform, whether or not specified by product designation, shall not be used.

09900.2.2 Approved Manufacturers

Except as otherwise acceptable to the Owner, coatings shall be manufactured, formulated, and compounded by coating manufacturers named in the Coating System Data Sheets. Abrasive blast media shall be supplied by abrasive blast materials manufacturers named in the Blast Media Data Sheets.

09900.2.3 Finish Paint Colors

Finish paint colors will be generally selected from the manufacturer's standard line of colors to match Owner's standard specification for paint colors as listed below. Sample boards showing the proposed color scheme for each area shall be prepared and submitted to Owner for color selection. The sample boards shall include samples of each finish material labeled with the manufacturer and color name of each sample. A minimum of three final sample boards shall be submitted after final Owner selection.

All color references shall be made to the Federal Standard Colors as specified in Federal Standard 595a, as published by the U.S. Government Printing Office. Where a particular gloss is not shown in Federal

Standard 595a the color shall be so selected to represent that gloss of the specified color as if it were shown in the Federal Standard.

Federal Standard Color Number	Basic Color	Normal Use or Application
14491	Green	No. 2 Fuel Oil Storage Tank Piping Valves
26081	Gray	Kick Plates Wire Partitions All Exterior Structural Steel Stairs, Platforms and Railings Pipe Hangers

09900.3 Execution

09900.3.1 Surface Preparation

Coating work shall include the protection of surfaces not to be coated and surface preparation, furnishing and applying materials, and other work incidental to coating that is required to properly execute the work. All exposed surfaces of the equipment shall be coated as directed on the Coating System Data Sheets. The remainder of the plant equipment will be coated under separate specifications.

All surfaces to be coated shall be clean and dry and shall meet the recommendations of the coating manufacturer for surface preparation. Oil and grease shall be completely removed by using techniques described in SSPC-SP 1 before mechanical cleaning is started.

Surfaces shall be free of cracks, pits, projections, or other imperfections that would interfere with the formation of a smooth, unbroken coating film.

Freshly coated surfaces shall be protected from dust and other contaminants. The gloss on previously coated surfaces shall be dulled if necessary for proper adhesion of topcoats.

When applying touchup coating or repairing previously coated surfaces, the surfaces to be coated shall be cleaned as recommended by the coating manufacturer and the edges of the repaired area shall be feathered by sanding or wire brushing to produce a smooth transition that will not be noticeable after the coating is applied. All coatings made brittle or otherwise damaged by heat of welding shall be completely removed.

The quality of compressed air shall be verified in accordance with ASTM D4285 prior to performing abrasive blasting. The test will be carried out at the beginning of each shift and witnessed by the coating inspector.

09900.3.1.1 Not Used.

09900.3.1.2 Ferrous Metal Surfaces. Ferrous metal surfaces shall be prepared for coating by using one or more of the following cleaning procedures as specified: solvents (SSPC-SP1); hand tools (SSPC-SP2); power tools (SSPC-SP3 or -SP11); abrasive blasting (SSPC-SP5, -SP6, -SP7, or -SP10); or water jetting (-SP12). Oil and grease shall be completely removed in accordance with SSPC-SP1 before beginning any other cleaning method. Surfaces of welds shall be scraped and ground as necessary to remove all slag and weld spatter.

All cut or sheared edges shall be ground smooth to a 1/8 inch minimum radius for all material 1/4 inch thickness and larger. For material thickness less than 1/4 inch all cut or sheared edges shall be ground smooth to a radius equal to 1/2 the material thickness. Grinding of rolled edges on standard shapes with a minimum radius of the 1/16 inch will not be required.

Unless specified in the Coating System Data Sheets, all ferrous metal surfaces shall have all welds ground smooth and free of all defects in accordance with NACE Standard RP0178, Appendix C, Designation D.

All blasting residue, waste, and accumulation shall be removed before coating application.

Cleaned surfaces shall be coated or lined with the specified coating, primer, or touchup coat within 6 hours of cleaning, or before rust bloom occurs. No blast cleaned surfaces shall stand overnight before coating.

The surface preparation specified herein are minimums, and if the requirements printed in the coating manufacturer's data sheets exceed the limits specified, the value printed on the data sheets shall become the minimum requirement

09900.3.1.3 Not Used.

09900.3.2 Mixing and Thinning

Coating shall be thoroughly mixed each time any is withdrawn from the container. Coating containers shall be kept tightly closed except while coating is being withdrawn.

Coating shall be factory mixed to proper consistency and viscosity for hot weather application without thinning. Thinning will be permitted only as necessary to obtain recommended coverage at lower application temperatures. In no case shall the wet film thickness of applied coating be reduced, by addition of coating thinner or otherwise, below the thickness recommended by the coating manufacturer. Thinning shall be done in compliance with all applicable air quality regulations.

Uniform suspension of coating pigments shall be maintained during application.

Jobsite tinting will not be permitted.

09900.3.3 Application

Coating shall be applied in a neat manner that will produce an even film of uniform and proper thickness, with finished surfaces free of runs, sags, ridges, laps, and brush marks. In no case shall coating be applied at a rate of coverage greater than the maximum rate recommended by the coating manufacturer.

A skid resistant additive shall be incorporated into the top layer of coating systems which are applied to permanent walking surfaces.

Each layer of the coating system shall be of a visibly different color or shade from the preceding coat. Coatings shall be factory tinted.

A minimum of 20 foot-candles (215 lux) of illumination shall be provided for surfaces to be coated.

Ventilation in the work area shall be adequate to remove all particulates and solvent vapors. Where natural ventilation is inadequate, a mechanical ventilation system shall be employed. The ventilation system shall provide a clean air supply during all phases of coating operations.

Coating failures will not be accepted and shall be entirely removed down to the substrate and the surface recoated. Failures include but are not limited to checking, cracking, teardrops, fat edges, fisheyes, or delamination.

Coating materials shall be applied in accordance with the manufacturer's recommendations by competent and experienced applicators.

09900.3.4 Protection of Surfaces

Throughout the work, proper dropcloths, masking tapes, and other protective measures shall be provided to protect surfaces from accidental spraying, splattering, or spilling of coatings. Damage resulting from coating operations shall be corrected and repaired. Coatings deposited on surfaces not being coated shall immediately be removed.

The Contractor shall remove and reinstall, or provide adequate in-place protection for, valve and equipment identification tags, gauges, installed hardware, accessories, lighting and electrical components, factory finished materials, plumbing fixtures and fittings, and other materials that may become splattered or damaged by coating materials.

09900.3.5 Environmental Conditions

Coatings shall not be applied, except under environmentally controlled conditions, during wet, damp, or foggy weather, or when windblown dust, dirt, debris, or insects will collect on freshly applied coating.

Do not install coating or lining material if substrate temperature is within 5^{o} F of the dewpoint temperature or if the relative humidity is greater than 95%.

Coatings shall not be applied at temperatures lower than the minimum temperature recommended by the coating manufacturer, or to metal surfaces where conditions are likely to cause condensation, regardless of the air temperature. When necessary for proper application, a temporary enclosure shall be erected and the environment properly conditioned until the coating has fully cured.

Coatings shall not be applied at temperatures higher than the maximum temperature recommended by the coating manufacturer. Where coatings are applied during periods of elevated ambient temperatures, the Contractor shall ensure that proper application is performed including adherence to all re-coat window requirements. Precautions shall be taken to reduce the temperature of the surface application, especially for metal, at elevated temperatures above 100°F including shading the application area from direct sunlight, applying coating in the evening or at night, and ventilating the area to reduce the humidity and temperature.

Concrete that is expelling air, or increasing in temperature, shall not be coated.

09900.3.6 Field Quality Control

The following inspection and testing shall be performed: visual inspection, surface profile, wet and dry film thickness, spark testing, and adhesion testing. The Owner shall be responsible for review of all Contractor testing documentation and shall also establish hold points indicating periodic on-site review of the Contractor’s test procedures.

The Contractor shall provide daily documented atmospheric condition reports to the Owner including temperature and humidity every four hours during application and temperature monitoring during cure of the coating system.

Personnel performing or supervising the inspection of surface preparation, coating application and quality control testing shall be qualified as a Certified Coating Inspector in accordance with the requirements of NACE International or previously approved equivalent program.

09900.3.6.1 Surface Profile Testing. The surface profile for ferrous metal surfaces shall be measured for compliance with the specified minimum profile in accordance with ASTM D4417. The surface profile for concrete shall comply with SSPC-SP 13, Table 1, for severe service.

09900.3.6.2 Visual Inspection. The surface of the protective coatings shall be visually inspected.

09900.3.6.3 Film Thickness. Coating film thickness shall be verified by measuring the film thickness of each coat as it is applied and the dry film thickness of the entire system. Dry film thickness shall be measured in accordance with SSPC-PA 2. Wet film thickness shall be measured with a gauge that will measure the wet film thickness within an accuracy of ±0.5 mil in accordance with ASTM D4414.

09900.3.6.4 Spark Testing. Coatings shall be spark tested using an acceptable electrical spark tester set at the recommended voltage. The Owner shall observe the spark testing and shall verify the testing equipment is working properly before the spark testing of the coating is started. The electrode movement shall be continuous and shall proceed in a systematic manner that will cover 110 percent of the coated surface.

Spark testing for coatings on metal shall be done in accordance with ASTM D5162.

All detected holidays and pinholes shall be marked and repaired as recommended by the coating manufacturer.

09900.3.6.5 Adhesion Testing. An adhesion test shall be conducted on a properly prepared and coated steel or concrete surface that is acceptable to the Contractor and the Owner. The test area shall be at least 2 square feet or larger to allow a minimum of three tests to be conducted. The test area shall be coated with the specified system and cured as recommended by the coating manufacturer. Pull-off strength adhesion tests of the coating shall be conducted in accordance with ASTM D4541 using an Elcometer tensile adhesion tester. At least three adhesion tests shall be conducted and the results averaged. Adhesion strength shall equal or exceed the minimum adhesion strength recommended by the coating manufacturer and shall exceed the tensile strength of the substrate.

If the coating fails the adhesion test, the cause of the failure shall be determined and corrected before reconducting the test.

13201 - Field Erected Welded Oil Tanks

13201.1 General

13201.1.1 Scope of Supply

The Contractor shall furnish the following scope of services as part of the work under this Contract:

All materials, equipment, and accessories as defined herein.

Erection of the field erected welded fuel oil tank.

Tests as defined herein.

13201.1.2 Items Furnished by Others and Interfaces

Items furnished by others and not in this scope of supply include the following:

Tank foundation as specified on the Field Erected Welded Oil Tanks Specification Sheet(s).

Tank anchorage, if required by Contactor design.

13201.1.3 Performance and Design Requirements

Performance and design requirements are covered in the attached Field Erected Welded Oil Tanks Specification Sheet(s).

13201.1.4 Codes and Standards

Work performed under these specifications shall be done in accordance with the following codes and standards. Unless otherwise specified, the applicable governing edition and addenda to be used for all references to codes or standards specified herein shall be interpreted to be the jurisdictionally approved edition and addenda. If a code or standard is not jurisdictionally mandated, then the current edition and addenda in effect at the date of this document shall apply. These references shall govern the work except where they conflict with the Owner's specifications. In case of conflict, the latter shall govern to the extent of such difference:

Work	In Accordance With
Design	API 650 March 2103 Edition including addenda
Venting	API RP 2000
Wind load design	ASCE 7
Pipe flanges	ASME/ANSI B16.5
Forged steel pipe fittings	ANSI B16.11
Grounded pad screw hole spacing and location	NEMA
Tank erection, testing, and coating	API 650 March 2103 Edition including addenda
Cleanliness inspection before painting	SSPC Visual Standard, SSPC VIS 1

Work	In Accordance With
Pipe/Flange butt weld end preparation details	ANSI B16.25

13201.1.5 Materials

The following materials shall be used:

Component	Material
Shell plate	ASTM A283 Gr C or D or acceptable equal
Pipe flange covers and manhole necks (if not seamless)	ASTM A181 or ASTM A105, Gr I or II
Nozzles or seamless manhole necks	ASTM A106 Grade B
Structural shapes and plates	ASTM A36
Forged steel flanges	ASTM A105
Grounding pads	ASTM A167, Type 304
Overflow piping	ASTM A53, Std Wt
Appurtenance flange bolting and nuts	ASTM A307 Gr A bolts with hex heads or studs; ASTM A563 Gr A hex nuts; all galvanized
Gaskets	Buna N (Nitrile)
Two-component polysulfide rubber sealant	Fed Spec TT-S-00227E, Type II, Class A
Cement	ASTM C150, Type I
Sand	ASTM C33

13201.1.6 Approved Manufacturers of Components

For the following components, the manufacturers listed below provide examples of the quality of workmanship required by these specifications. If the Contractor wants to propose a nonlisted manufacturer that is considered to provide an equivalent level of quality, this manufacturer must be identified and supporting testimony provided. Acceptance of the manufacturer as a substitute is at the discretion of the Engineer:

Component	Manufacturer
Roof manhole	Varec; Model 220
Pressure/Vacuum Vents	Varec; Model 5810
Forged steel pipe fittings	Bonney Forge or WFI
Emergency self-closing valve	OCECO Model V-114
Ground reading tank level gauge	Morrison Bros. Co. Model 1018GM with Fig. 1018 Electronic AST Gauge and Overfill Alarm

Component	Manufacturer
Two-component polysulfide rubber sealant	Pecora Chemical Corp; GC2+ Synthacalk PolySpec; Thiokol 2235M
Interior ladder components	McMaster "Versatile-Mount Steel Ladders System" mounted onto a nominal 6 inch stainless steel pipe; McMaster "Fall-Prevention Ladder Climbing System," complete with one full body harness

13201.1.7 Test Requirements
The following testing shall be conducted in accordance with the specified source. This testing is to be considered part of the defined Scope of Work, and all associated costs are the responsibility of the Contractor:

Tests	In Accordance With	Conducted By
All weld tests	API 650	Contractor
Leak tests	Articles 13201.3.4.2 and 13201.3.5.2 herein	Contractor

13201.1.8 Technical Attachments
Technical attachments relevant to the work under this section are listed in Section 01100.

13201.1.9 Supplemental Specifications
Technical supplemental specifications that are applicable to the work covered under this technical specification section are identified and included in Section 01400.

13201.2 Products
Each tank shall be a vertical, cylindrical, crowned bottom, aboveground, atmospheric oil storage tank. Each tank shall be designed for field erection by welding. Each tank shall be designed for installation on a Type 2 foundation as defined in Article 13201.3.2 and as indicated on the Field Erected Welded Oil Tanks Specification Sheet(s).

13201.2.1 Design Criteria
The thicknesses of the tank roof, shell, and bottom plates shall be as required by code, plus corrosion allowance(s) if specified on the Field Erected Welded Oil Tanks Specification Sheet(s).

Seismic design shall be in accordance with Section 01400.

Design pressure for all tanks shall be atmospheric pressure.

The maximum overall height of the fuel oil storage tank shall be less than 35 feet excluding access and safety provisions and instrumentation.

13201.2.2 Material Test Reports
Certified mill test reports that cover all steel plates and structural shapes to be used in the work shall be furnished as evidence that such materials are new and in compliance with the referenced standards.

13201.2.3 Fabrication Requirements
Tank sections shall be shop fabricated to the maximum extent practical to minimize field welding.

A tank roof of the type indicated on the Field Erected Welded Oil Tanks Specification Sheet(s) shall be provided. The tank roof shall have a slope of 1 to 12. A crowned tank bottom with a slope of 1 to 120 shall be provided. Shell plate joints of the double-welded butt joint type shall be provided with complete penetration. Lap welded joints shall be provided in roof and bottom plates. All field joints on the drawings submitted shall be properly identified. Joint locations and design shall be subject to acceptance by the Engineer.

Welding shall be performed in accordance with API 650 and Section 01400.

13201.2.4 Tank Appurtenances

Specified tank appurtenances shall be furnished. The following exterior appurtenances shall be designed for the wind loads specified:

Roof Manholes. Provide roof manholes on each tank as indicated on the drawing(s), each with an inside diameter of 24 inches. Each manhole shall have a hinged, rainproof cover with locking device.

Shell Manholes. Provide shell manholes on each tank as indicated on the drawing(s). Shell manholes shall be 24 inch diameter hinged closures.

Manhole Gaskets. Furnish two sets of permanent gaskets for all manhole covers. Furnish the permanent gaskets in wooden boxes identified by tank name.

Piping Connections. Provide piping connections as indicated on the drawings and as specified. Provide raised face, ANSI Pressure Class 150, weld neck type flanges. Prepare butt welding ends in accordance with Section 01400. Unless otherwise indicated on the drawings, tank connections 2 inches and smaller shall be ANSI Pressure Class 3000 integrally reinforced forged branch outlet fittings. Provide each tank outlet that is larger than 4 inches in diameter with an antivortexing device.

Vents. Provide the tank with normal and emergency vents. Size normal vents based on the specified maximum flow rates. Provide additional vents for emergency venting. Submit calculations indicating the basis for sizing the emergency vents. Provide tank vents screened with 1/4 inch mesh, 14 gauge, stainless steel screen wire.

Pressure-Vacuum Vents. Where indicated on the Field Erected Welded Oil Tanks Specification Sheet(s), pressure-vacuum vents that are capable of venting air equal to the maximum flow rates specified on the Field Erected Welded Oil Tanks Specification Sheet(s) shall be provided for the tank roof.

Level Indicator. Provide a ground reading level gauge. The instrument shall be constructed of materials suitable for the intended service.

Locate the level transmitter so that tank liquid level can be accurately indicated to a height equal to the straight side height of the tank. Furnish all connection lugs or openings in the tank required for instrument installation.

Sump. Provide a water drawoff sump, complete with 2 inch drawoff piping and a shutoff valve with locking device as indicated on the drawings.

Valves. If specified, provide each connection in the shell, bottom, or sump with an emergency self-closing internal valve. Design the valve to be closed manually from outside the tank, or to close automatically upon melting of a fusible link.

Foam Chamber Connection(s). Provide the tank with the specified shell hole with bolted cover plate, designed for future attachment of a fire protection foam chamber assembly.

Grounding Pads. Provide four stainless steel grounding pads equally spaced around the exterior of the tank, welded to the tank shell 6 inches above the bottom. Provide pads 2 inches by 3-1/2 inches by 1/2 inch thick, drilled and tapped to full thickness for two 3/8-16 hex head cap screws. Match screw hole spacing and location to that of NEMA standard two-hole terminals. Provide flat and smooth contact surfaces, which should be protected during handling to maintain contact surface quality.

Floating Suctions. Where indicated on the Field Erected Welded Oil Tanks Specification Sheet(s), tanks shall be furnished with floating suctions. The floating suctions shall be as indicated on the drawings. The design of the floating suctions shall be subject to acceptance by the Engineer.

13201.2.5 Shop Coating

Exterior surfaces of tank roof and shell plates shall be shop primed as indicated on the Field Erected Welded Oil Tanks Specification Sheet(s).

13201.2.6 Access Provisions

Access provisions shall be in accordance with Section 01400 and the following requirements:

Interior Ladder. Where specified or indicated on the drawings, provide an interior ladder. Interior ladder shall be provided with fall prevention equipment.

Exterior Stairs. Provide exterior stairs with a top landing platform. The stairs shall extend from the bottom to the top of the tank and shall be spiral type.

Each stair landing platform shall incorporate the best access and most economical use of space in platform design. Platform arrangement shall be acceptable to the Engineer.

Non-Slip Surfacing. A 3 foot wide walkway shall be provided on each tank roof. The walkway shall consist of non-slip surfacing and shall extend from the upper ladder termination or stair landing platform to the manholes and other roof mounted appurtenances and along the perimeter of the tank. The tank perimeter shall be completely enclosed with handrails and kickplates except at the ladder or landing platform access opening.

13201.3 Execution

13201.3.1 Handling

Shop fabricated tank sections and structural components shall be handled during shipping, storage, and erection in a manner that will prevent warping, bending, distortion, or physical damage of any kind.

13201.3.2 Tank Foundation

The tank foundation shall be a Type 2, concrete mat foundation. For Type 2 (concrete mat) foundations, a minimum 1/2 inch thick cane-fiber joint filler meeting the requirements of ASTM D1751 shall be furnished and installed by the Contractor between the tank bottom and concrete slab. The tank shell shall

be supported with portland cement grout or, alternatively, 1/2 inch thick cane-fiber joint filler in accordance with AWWA D100.

When portland cement grout is used as the bearing surface for the tank shell, it shall be installed after erection of the first shell course. Sand and water used for grouting the tank bottom shall meet the following minimum requirements:

Sand--Fine aggregate, clean, well graded, natural sand.

Water--Clean and free from mud, oil, organic matter, and other deleterious substances.

Grout shall be mixed and placed in accordance with the manufacturer's recommendations. Grouting for water tanks shall be mixed in the proportions specified in AWWA D100. Grouting for oil tanks shall be mixed using a cement to sand ratio of 5 to 8. Only enough water shall be added to produce a grout that can be tamped in place. All grout shall be thoroughly mixed for not less than 5 minutes in a mechanical mixer of an acceptable type. After mixing, the grout shall be used immediately, before stiffening sets in.

After complete curing of the grout, the peripheral joint between the tank bottom plate and the foundation shall be completely sealed as indicated on the seal detail included as an attachment to these specifications. A two-component polysulfide rubber sealant shall be applied in accordance with the sealant manufacturer's recommendations, including removal of oil from all surfaces in contact with the sealant.

13201.3.3 Tank Erection

Welding shall be in accordance with Section 01400. Tank appurtenances shall be installed in accordance with referenced codes and standards and manufacturer's instructions.

13201.3.4 Not Used

13201.3.5 Surface Preparation, Testing, Painting, Coating, and Identification of Oil Tanks

13201.3.5.1 Surface Preparation. All clips and lugs used for erection shall be cut off. Any remaining clip and lug attachment weld material, and any welds used for fit-up, shall be ground smooth and flush with the parent metal. All welds shall be ground to remove any roughness or irregularity. All weld spatter shall be removed.

On the interior of the tank, all butt welds with remaining weld bead crown height not exceeding 1/16 inch shall be ground smooth. All sharp metal edges existing at fillet welds shall be ground to a minimum 1/8 inch radius.

All surfaces shall be cleaned of lubricants.

13201.3.5.2 Testing. All testing and repair work shall be accepted by the Engineer after any weld grinding, but before blasting or painting is started.

The welded joints in the shell of the tank shall be radiographically inspected as required by the referenced codes and standards. Radiograph reader sheets shall be submitted in accordance with Article 13201.4. Defective welds shall be repaired in accordance with API 650.

Tank roof and bottom joints shall be tested by vacuum box method using soapsuds, linseed oil, or other suitable material acceptable to the Engineer. Any leaking joints shall be repaired in accordance with API 650.

After completion of welding but before beginning surface preparation for painting or coating, and before any external piping has been connected, the tank shall be filled with water and all submerged joints shall be inspected. Any leaking joints shall be repaired after the water level has been dropped to at least 2 feet below the point being repaired. The test shall be repeated until all joints are completely leaktight (zero leakage and seepage).

13201.3.5.3 Painting. After erection, surface preparation, and testing, exterior exposed iron and steel surfaces of the tank and accessories (except stainless steel, nonferrous metal, or galvanized surfaces) shall be cleaned and painted in accordance with Section 01400, the Coating System(s) specified in Article 13202.1.8, and Section 09900 - Field Applied Protective Coatings.

The interior surface of the tank shall be painted with inorganic zinc on the tank roof and down the side wall to a level 6 inches below the tank high level alarm location, and with coal tar epoxy on the tank bottom and 3 feet up the side wall. Cleaning and painting shall be in accordance with Section 01400 and Section 09900 - Field Applied Protective Coatings.

13201.3.5.4 Interior Coating. After the interior paint has fully cured, interior immersion tank surfaces shall be cleaned from 1 foot below the expected oil level down to and including the tank bottom, and coated with No. 2 fuel oil.

13201.3.5.5 Identification. The tank shall bear an official API nameplate.

Field Erected Welded Oil Tanks Specification Sheet

Tank Name	Fuel Oil Storage Tank No. 1 & 2
Tank Identification Number(s)	CFOA-TNK-001 & CFOA-TNK-002
Quantity to be Furnished	Two (2)
Liquid Stored	No. 2 fuel oil
Design Specific Gravity (SG) (SG of water = 1.0)	0.880
Design Lowest One Day Mean Temperature, °F	7
Base Bid	
Net Capacity, gal	500,000
Maximum Shell Outside Diameter, ft	54
Approximate Straight Side Shell Height, ft	32
Number of Foam Nozzle Connections	1
Tank Roof Type	Internal column supported conical or self-supporting conical
Corrosion Allowances, inch	
Roof plates	1/16
Shell plates	1/16
Bottom plates	1/16
Tank Foundation Type	Type 2 (concrete mat)
Maximum Flow Rates, gpm	
In	1,940
Out	1,120
Minimum Shell Manhole Diameter, inch	24
Minimum Design Metal Temperature, °F	7
Exterior Coating System (shop primer)	Coating System Data Sheet 1712
Field Applied Coating System	
Exterior	Coating System Data Sheet 1712; Color Code 14491
Interior, vapor space	Coating System Data Sheet 1401
Interior, bottom/floor and 3 ft up side	Coating System Data Sheet 2314
Floating Suction Required	Yes
Pressure/Vacuum Vents Required	Yes
Foam Nozzle Shell Hole Size, inch	6
Oil for Internal Coating	Furnished by Contractor

13202 - Field Erected Welded Water Tank

13202.1 General

13202.1.1 Scope of Supply

The Contractor shall furnish the following scope of services as part of the work under this Contract:

All materials, equipment, and accessories as defined herein.

Drawings and design documentation certified by a professional engineer registered in the appropriate jurisdiction.

Erection of the welded water tanks.

Tests as defined herein.

Instruction manuals.

13202.1.2 Items Furnished by Others and Interfaces

Items furnished by others and not in this scope of supply include the following:

Tank foundations

Tank anchorage, if required by Contractor design.

13202.1.3 Performance and Design Requirements

Performance and design requirements are covered in the attached Field Erected Welded Water Tanks Specification Sheet(s).

13202.1.4 Codes and Standards

Work performed under these specifications shall be done in accordance with the following codes and standards. Unless otherwise specified, the applicable governing edition and addenda to be used for all references to codes or standards specified herein shall be interpreted to be the jurisdictionally approved edition and addenda. If a code or standard is not jurisdictionally mandated, then the current edition and addenda in effect at the date of this document shall apply. These references shall govern the work except where they conflict with the Owner's specifications. In case of conflict, the latter shall govern to the extent of such difference:

Work	In Accordance With
Design	AWWA D100
Grounded pad screw hole spacing and location	NEMA
Tank erection, testing, and coating	AWWA D100
Pipe flanges	ASME/ANSI B16.5
Forged steel pipe fittings	ANSI B16.11
Pipe/flange butt weld end preparation details	ANSI B16.25
Proportions for mixing of grout filler	AWWA D100

Work	In Accordance With
Use of cane-fiber joint filler for tank support	AWWA D100

13202.1.5 Materials

The following materials shall be used:

Component	Material
Shell plate, pipe flange covers, and manhole necks (if not seamless)	ASTM A240 Type 304
Nozzles or seamless manhole necks	ASTM A312 Type 304
Structural shapes and plates	ASTM A240 Type 304
Forged steel flanges	ASTM A182, Type 304
Grounding pads	ASTM A167, Type 304
Overflow piping	ASTM A312 Type 304, Sch.10S
Appurtenance flange bolting and nuts	ASTM A193/A193M Grade B7 bolts with hex heads or studs; ASTM A194/A194M Grade 2H hex nuts
Gaskets	Buna N (Nitrile)
Cement	ASTM C150, Type I
Sand	ASTM C33
Cane-fiber joint filler	ASTM D1751
Tank roof walkways	Serrated grating in accordance with Supplemental Specification S200 in Section 01400
Two-component polysulfide rubber sealant	Fed Spec TT-S-00227E, Type II, Class A
Cement	ASTM C150, Type 1
Sand	ASTM C33

13202.1.6 Approved Manufacturers of Components

For the following components, the manufacturers listed below provide examples of the quality of workmanship required by these specifications. If the Contractor wants to propose a nonlisted manufacturer that is considered to provide an equivalent level of quality, this manufacturer must be identified and supporting testimony provided. Acceptance of the manufacturer as a substitute is at the discretion of the Engineer:

Component	Manufacturer
Filter	Dollinger; Model AI-104
Pressure and Vacuum Relief Valve	Varec; Model 2020B

Component	Manufacturer
Forged steel pipe fittings	Bonney Forge or WFI; Class 3000
Ground reading tank level gauge	Morrison Bros. Co. Model 1018GM
Two-component polysulfide rubber sealant	Pecora Chemical Corp.; GC2+ Synthacalk PolySpec; Thiokol 2235M
Interior ladder components	McMaster "Versatile-Mount Steel Ladders System" mounted onto a nominal 6 inch stainless steel pipe; McMaster "Fall-Prevention Ladder Climbing System," complete with one full body harness

13202.1.7 Test Requirements
The following testing shall be conducted in accordance with the specified source. This testing is to be considered part of the defined Scope of Work, and all associated costs are the responsibility of the Contractor:

Tests	In Accordance With	Conducted By
All weld tests	AWWA D100	Contractor
Leak tests	Article 13202.3.4.2 herein	Contractor

13202.1.8 Technical Attachments
Technical attachments relevant to the work under this section are listed in Section 01100.

13202.1.9 Supplemental Specifications
Technical supplemental specifications that are applicable to the work covered under this technical specification section are identified and included in Section 01400.

13202.2 Products
Each tank shall be a vertical, cylindrical, crowned bottom, aboveground, atmospheric water storage tank. Each tank shall be designed for field erection by welding. Each tank shall be designed for installation on a Type 2 foundation as defined in Article 13202.3.2 and indicated on the Field Erected Welded Water Tanks Specification Sheet(s).

13202.2.1 Design Criteria
The thicknesses of the tank roof, shell, and bottom plates shall be as required by the specified design code(s) plus corrosion allowance(s) if specified on the Field Erected Welded Water Tanks Specification Sheet(s).

Seismic design shall be in accordance with Section 01400.

Design pressure for all tanks shall be atmospheric pressure.

The maximum overall height of the fuel oil storage tank shall be less than 35 feet excluding access and safety provisions and instrumentation.

13202.2.2 Material Test Reports
Certified mill test reports shall be furnished covering all steel plates and structural shapes to be used in the work as evidence that such materials are new and in compliance with the referenced standards.

13202.2.3 Fabrication Requirements

Tank sections shall be shop fabricated to the maximum extent practical to minimize field welding.

A self-supporting roof shall be provided. A crowned tank bottom shall be provided sloped 1 to 120. Shell plate joints shall be double-welded butt joint type welds with complete penetration. Roof joints shall be complete penetration welds or lap welds welded continuously on both edges. Bottom plates shall be complete penetration welds or lap welded on top side. All field joints shall be properly identified on the erection drawings. Joints shall be acceptable to the Engineer.

Welding shall be performed in accordance with the specified design codes and Section 01400.

13202.2.4 Tank Appurtenances

Specified tank appurtenances shall be furnished. Exterior appurtenances shall be designed for the wind, snow, and seismic loads specified.

13202.2.4.1 Roof Manholes. A single roof manhole shall be provided on each tank as indicated on the drawing(s), each with an inside diameter of 24 inches. The manhole shall have a hinged, rainproof cover with locking device.

13202.2.4.2 Shell Manholes. A single manhole shall be provided on each tank as indicated on the drawing(s). Shell manholes shall be 24 inch diameter hinged closures.

13202.2.4.3 Manhole Gaskets. Two sets of permanent gaskets shall be furnished for all manhole covers. The permanent gaskets shall be furnished in wooden boxes identified by tank name.

13202.2.4.4 Piping Connections. Piping connections shall be provided as indicated on the drawings and as specified. Flanges shall be raised face, ANSI Pressure Class 150, weld neck type flanges. Butt welding ends shall be prepared in accordance with Section 01400. Unless otherwise indicated on the drawings, tank connections 2 inches and smaller shall be ANSI Pressure Class 3000 integrally reinforced forged branch outlet fittings. Each tank outlet that is larger than 4 inches in diameter shall be provided with an antivortexing device.

13202.2.4.5 Overflow. An external overflow assembly shall be provided. The assembly shall consist of a rectangular overflow box mounted on the exterior of the shell, with a discharge pipe that extends from the bottom of the box down the exterior of the tank to near ground level. The overflow box shall span the overflow level. The shell shall form the inside wall of the box, up only to overflow level, where it shall act as a weir across which water passes from the tank to the overflow box. The overflow box shall be of all-welded construction, sized as required to handle the maximum inflow rate specified. The discharge end of the overflow pipe shall be provided with an elbow and flap valve. Overflow piping shall be rigidly supported and braced from the tank wall at intervals not exceeding 6 feet. The piping shall be adequately supported and braced for weight, expansion or contraction, wind, and hydraulic forces. U-bolts for support members shall not be used. If required, spreading pads shall be provided on the shell where pipe supports are attached.

13202.2.4.6 Filter and Breather Valve. If specified, a corrosion-resistant filter and a breather valve shall be provided for each tank. The valve shall be sized for the maximum flow rates specified on the field Erected Welded Water Tanks Specification Sheet(s).

13202.2.4.7 Grounding Pads. Four stainless steel grounding pads shall be provided, equally spaced around the exterior of the tank and welded to the tank shell 6 inches above the bottom. Pads shall be provided that are 2 inches by 3-1/2 inches by 1/2 inch (13 mm) thick, drilled and tapped to full thickness for two 3/8-16 hex head cap screws. Screw hole spacing and location shall be matched to that of NEMA

standard two-hole terminals. Flat and smooth contact surfaces shall be provided and protected during handling to maintain contact surface quality.

13202.2.4.8 Level Indicator. Provide a ground reading level gauge. The instrument shall be constructed of materials suitable for the intended service.

Locate the level transmitter so that tank liquid level can be accurately indicated to a height equal to the straight side height of the tank. Furnish all connection lugs or openings in the tank required for instrument installation.

13202.2.5 Not Used

13202.2.6 Access Provisions
Access provisions shall be in accordance with Section 01400 and the requirements herein.

13202.2.6.1 Not Used.

13202.2.6.2 Interior Ladder. Where specified or indicated on the drawings, an interior ladder shall be provided with a fall prevention ladder climbing system.

13202.2.6.3 Exterior Stairs. Where specified or indicated on the drawings, exterior stairs shall be provided with a top landing platform. The stairs shall extend from the bottom to the top of the tank and shall be spiral type.

Each stair landing platform shall incorporate the best access and most economical use of space in platform design. Platform arrangement shall be acceptable to the Engineer.

13202.2.6.4 Non-Slip Surfacing. A 3 foot wide walkway shall be provided on each tank roof. The walkway shall consist of non-slip surfacing and shall extend from the upper ladder termination or stair landing platform to the manholes and other roof mounted appurtenances and along the perimeter of the tank. The tank perimeter shall be completely enclosed with handrails and kickplates except at the ladder or landing platform access opening.

13202.3 Execution

13202.3.1 Handling
Shop fabricated tank sections and structural components shall be handled during shipping, storage, and erection in a manner that will prevent warping, bending, distortion, or physical damage of any kind.

13202.3.2 Tank Foundation
The tank support concrete foundation(s) shall be furnished by the Contractor. The tank foundation shall be a Type 2, concrete mat foundation. For Type 2 (concrete mat) foundations, a minimum 1/2 inch thick cane-fiber joint filler meeting the requirements of ASTM D1751 shall be furnished and installed by the Contractor between the tank bottom and concrete slab. The tank shell shall be supported with portland cement grout or, alternatively, 1/2 inch thick cane-fiber joint filler in accordance with AWWA D100.

When portland cement grout is used as the bearing surface for the tank shell, it shall be installed after erection of the first shell course. Sand and water used for grouting the tank bottom shall meet the following minimum requirements:

Sand--Fine aggregate, clean, well graded, natural sand.

Water--Clean and free from mud, oil, organic matter, and other deleterious substances.

Grout shall be mixed and placed in accordance with the manufacturer's recommendations and in the proportions specified in AWWA D100. Only enough water shall be added to produce a grout that can be tamped in place. All grout shall be thoroughly mixed for not less than 5 minutes in a mechanical mixer of an acceptable type. After mixing, the grout shall be used immediately, before stiffening sets in.

After complete curing of the grout, the peripheral joint between the tank bottom plate and the foundation shall be completely sealed as indicated on the seal detail included as an attachment to these specifications. A two-component polysulfide rubber sealant shall be applied in accordance with the sealant manufacturer's recommendations, including removal of oil from all surfaces in contact with the sealant.

13202.3.3 Tank Erection

Welding shall be in accordance with Section 01400. Tank appurtenances shall be installed in accordance with referenced codes and standards and manufacturer's instructions.

13202.3.4 Surface Preparation, Testing, Painting, Cleaning, and Disinfecting of Water Tanks

13202.3.4.1 Surface Preparation. All clips and lugs used for erection shall be cut off. Any remaining clip and lug attachment weld material, and any welds used for fit-up, shall be ground smooth and flush with the parent metal. All welds shall be ground to remove any roughness or irregularity. All weld spatter shall be removed.

On the interior of the tank, all butt welds with remaining weld bead crown height not exceeding 1/16 inch shall be ground smooth. All sharp metal edges existing at fillet welds shall be ground to a minimum 1/8 inch radius.

All surfaces shall be cleaned of lubricants.

13202.3.4.2 Testing. All testing and repair work shall be accepted by the Owner after any weld grinding, but before blasting or painting is started.

Welded joints shall be radiographically inspected in the shell of the tank as required by the applicable referenced codes and standards.

Joints shall be tested by vacuum box method where required by the applicable referenced codes and standards.

Repair of defective welds and leaking joints shall be in accordance with the applicable referenced codes and standards.

After completion of welding and before any external piping has been connected, the tank shall be filled with water and all submerged joints shall be inspected. Any leaking joints shall be repaired after the water level has been dropped to at least 2 feet below the point being repaired. The test shall be repeated until all joints are completely leaktight (zero leakage and seepage).

13202.3.4.3 Not Used.

13202.3.4.4 Cleaning. After erection and testing have been completed, the interior of the tank shall be thoroughly cleaned and all debris shall be removed.

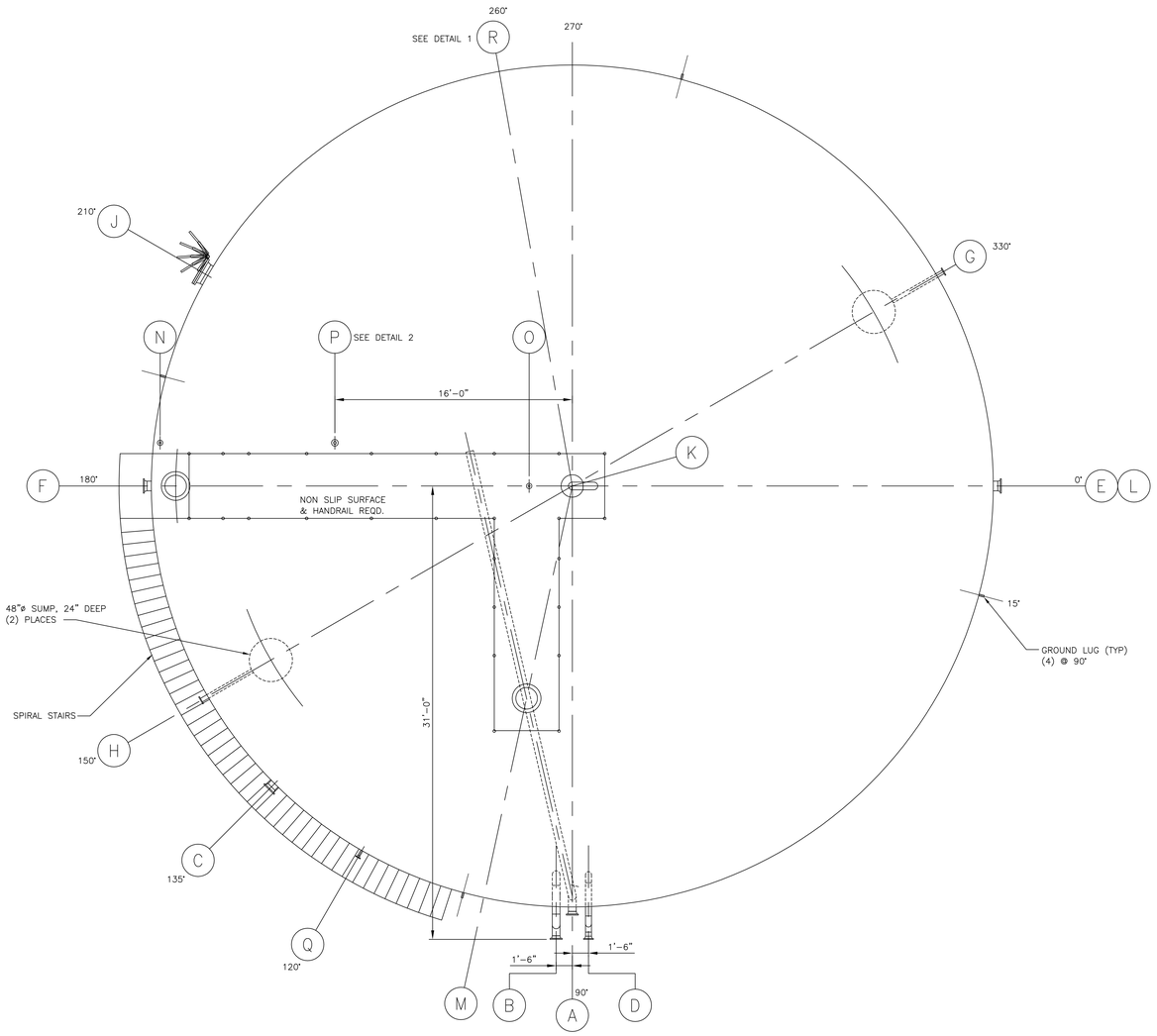
Prior to starting any cleaning work, the Contractor shall submit to the Owner and Engineer the detailed procedures proposed, including the coordination and sequence of operations. All procedures shall be acceptable to the Owner and Engineer.

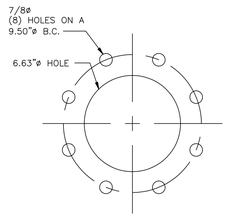
The Contractor shall provide all cleaning materials and all equipment and labor necessary for the cleaning operation. All wastewater used in cleaning the tank shall be disposed of in a manner acceptable to the Owner and the appropriate pollution control agency.

Field Erected Welded Water Tanks Specification Sheet

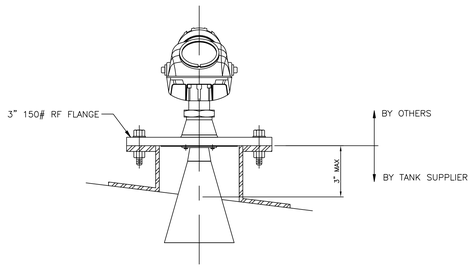
Tank Name	Demineralized Water Storage Tank No. 1
Tank Identification Number(s)	CWSH-TNK-001
Quantity to be Furnished	One (1)
Liquid Stored	Demineralized Water
Net Capacity (each), gal	800,000
Density, lb/ft^3	62.4
Maximum Shell Outside Diameter, ft	68
Approximate Straight Side Shell Height, ft	32
Tank Roof Type	Conical
Corrosion Allowances, in.	
Roof plates	None
Shell plates	None
Bottom plates	None
Tank Foundation Type	Type 2 (concrete mat)
Internal Ladder Required?	Yes
Full Perimeter Roof Handrail System Required?	Yes
Pressure/Vacuum Vents Required?	Yes
Maximum Flow Rates	
In, gpm	1,400
Out, gpm	1,320
Minimum Shell Manhole Diameter, in.	24
Minimum Design Metal Temperature, °F	7
Shop Primer for Plates	None
Field Applied Coating System	
Exterior	None
Interior	None
Disinfect Tank Interior after Erection?	No

NOZZLE/MANWAY SCHEDULE						
		FLANGE				
MARK	SIZE	CLASS	FCG	SERVICE	ELEVATION	PROJ
A	10"	150 #	R.F.	SUCTION	2'-8 1/4"	9"
B	8"	150 #	R.F.	FILL	2'-8 1/4"	SEE DWG
C	10"	150 #	R.F.	OVERFLOW	29'-0"	9"
D	6"	150 #	R.F.	RECIRCULATION RETURN	2'-7 1/4"	SEE DWG
E	10"	150 #	R.F.	SPARE CONNECTION	2'-8 1/4"	9"
F	10"	150 #	R.F.	SPARE CONNECTION	2'-8 1/4"	9"
G	4"	150 #	R.F.	WATER DRAIN	9"	9"
H	4"	150 #	R.F.	WATER DRAIN	9"	9"
J	24"	150 #	R.F.	MANWAY W/DAVIT	2'-6 3/8"	9"
K	8"	150 #	R.F.	VENT - GOOSE NECK W/ FLAME ARRESTER & BIRD SCREEN	TOP OF TANK	-
L	24"	150 #	R.F.	ROOF MANWAY	TOP OF TANK	6"
M	24"	150 #	R.F.	ROOF MANWAY	TOP OF TANK	6"
N	2"	150 #	R.F.	INSTRUMENT-LEVEL INDICATOR	TOP OF TANK	3"
O	2"	150 #	R.F.	SOUNDING CONNECTION (LOCKABLE HINGED COVER)	TOP OF TANK	3"
P	3"	150 #	R.F.	INSTRUMENT-RADAR LEVEL TRANSMITTER	TOP OF TANK	3"
Q	2"	150 #	R.F.	INSTRUMENT-TEMPERATURE TRANSMITTER	2'-8 1/4"	9"
R	6"	150 #	N/A	FIRE PROTECTION FOAM CONNECTION	29'-0"	N/A

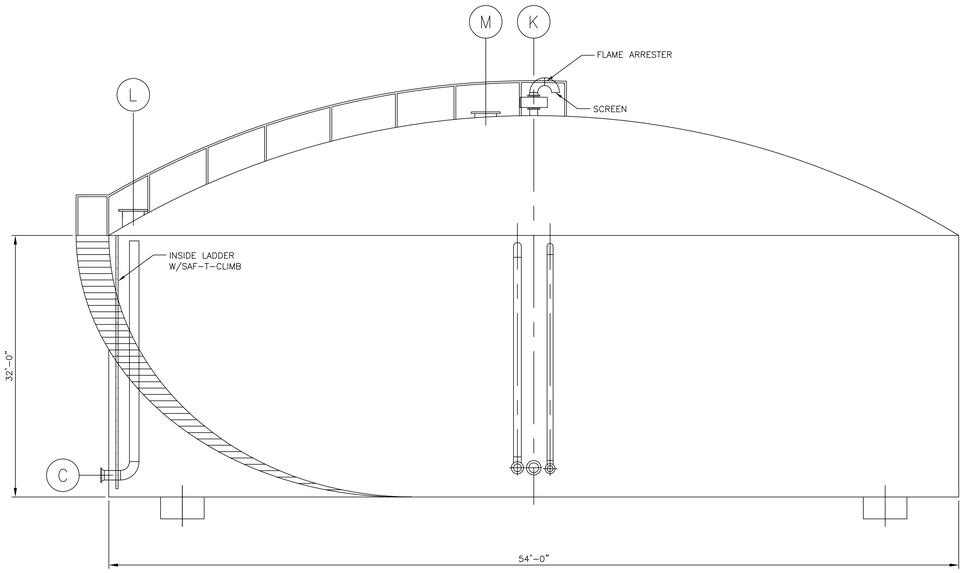


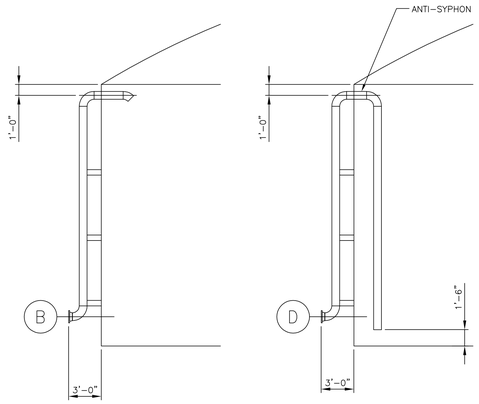


DETAIL 1
CONNECTION R
FIRE PROTECTION FOAM CONNECTION



DETAIL 2
CONNECTION P
RADAR LEVEL TRANSMITTER FLANGE MOUNT





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6' 4' 2' 0 5' 10'
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BLACK & VEATCH 12740 Gran Bay Parkway West Suite 2145 Jacksonville, Florida 32258 CERTIFICATE OF AUTHORIZATION NO. 8132

ENGINEER: EEB	DRAWN: SAJ
CHECKED:	DATE:

JEA
GREENLAND ENERGY CENTER
FUEL OIL SUPPLY & STORAGE
500,000 GALLON TANK 1

PROJECT NUMBER:	DRAWING NUMBER:	REV
196116-DM-0001		0
CODE:	REFERENCE DWG NUMBER:	
AREA:		

SYM52704 ACAD 1=1
02/17/16 13:15:02
18.2s (LMS Tech) 34" x 44"

NOZZLE/MANWAY SCHEDULE						
		FLANGE				
MARK	SIZE	CLASS	FCG	SERVICE	ELEVATION	PROJ
A	10"	150 #	R.F.	SUCTION	2'-8 1/4"	9"
B	8"	150 #	R.F.	FILL	2'-8 1/4"	SEE DWG
C	10"	150 #	R.F.	OVERFLOW	29'-0"	9"
D	6"	150 #	R.F.	RECIRCULATION RETURN	2'-7 1/4"	SEE DWG
E	10"	150 #	R.F.	SPARE CONNECTION	2'-8 1/4"	9"
F	10"	150 #	R.F.	SPARE CONNECTION	2'-8 1/4"	9"
G	4"	150 #	R.F.	WATER DRAIN	9"	9"
H	4"	150 #	R.F.	WATER DRAIN	9"	9"
J	24"	150 #	R.F.	MANWAY W/DAVIT	2'-6 3/8"	9"
K	8"	150 #	R.F.	VENT – GOOSE NECK W/ FLAME ARRESTER & BIRD SCREEN	TOP OF TANK	–
L	24"	150 #	R.F.	ROOF MANWAY	TOP OF TANK	6"
M	24"	150 #	R.F.	ROOF MANWAY	TOP OF TANK	6"
N	2"	150 #	R.F.	INSTRUMENT–LEVEL INDICATOR	TOP OF TANK	3"
O	2"	150 #	R.F.	SOUNDING CONNECTION (LOCKABLE HINGED COVER)	TOP OF TANK	3"
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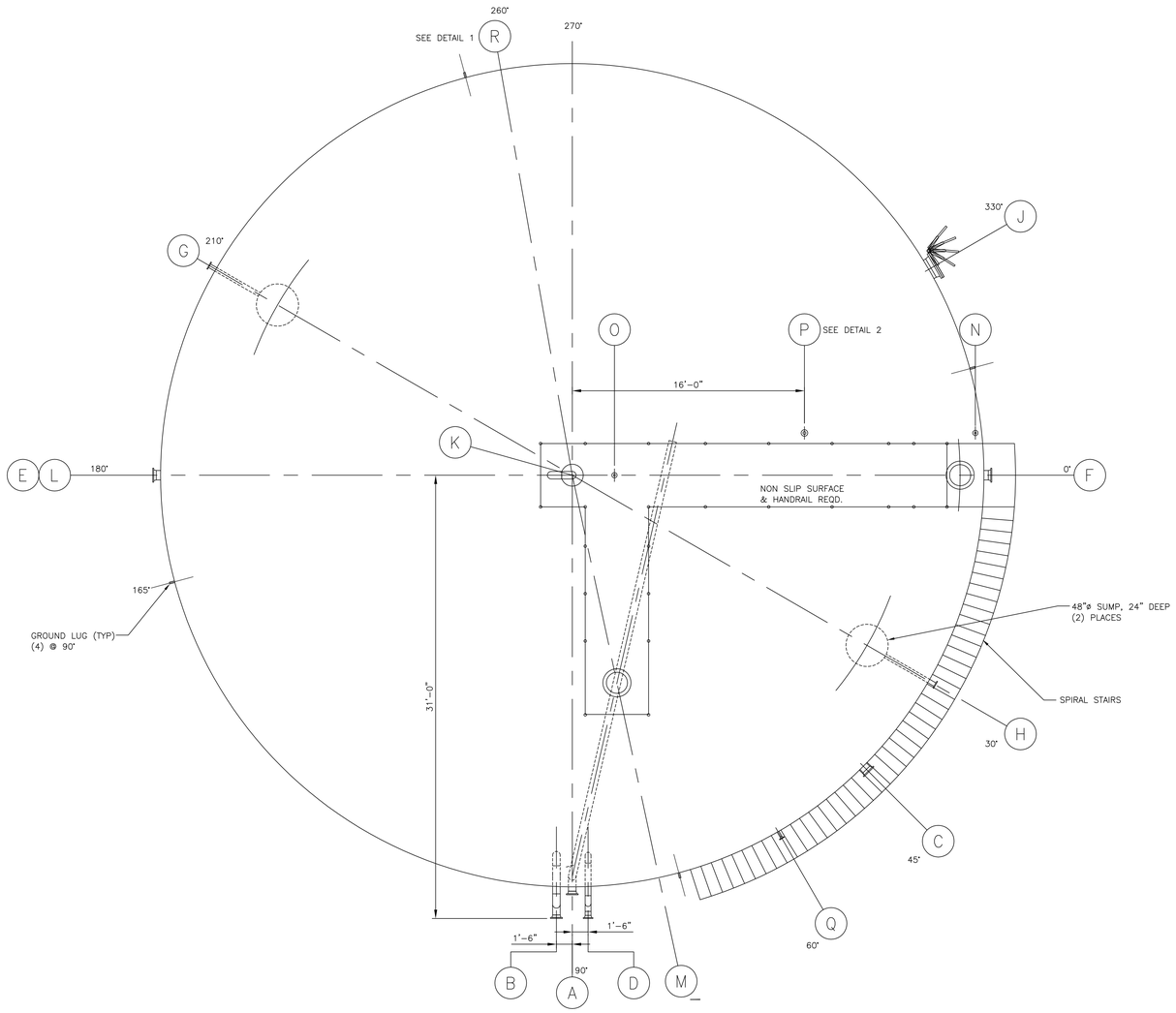
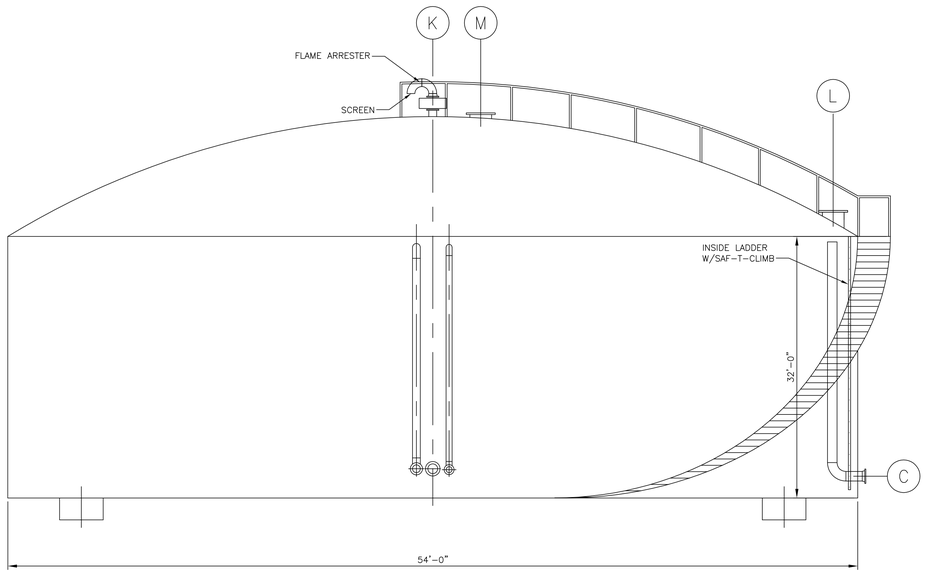
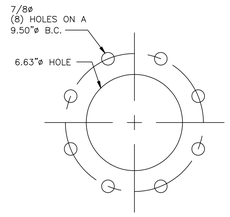
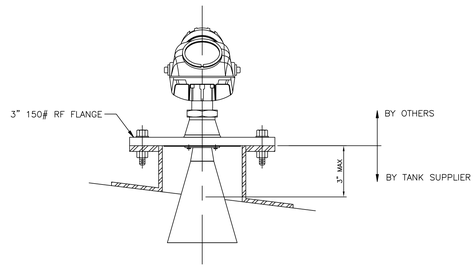
R	6"	150 #	N/A	FIRE PROTECTION FOAM CONNECTION	29'-0"	N/A



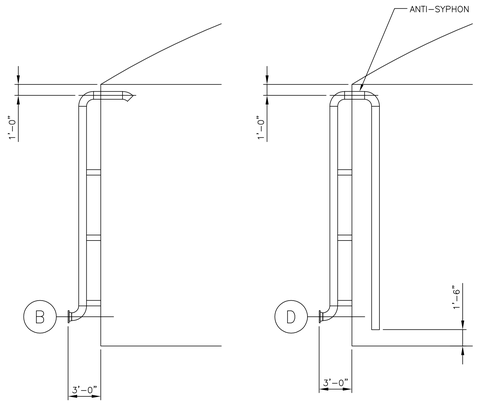




DETAIL 1
CONNECTION R
FIRE PROTECTION FOAM CONNECTION



DETAIL 2
CONNECTION P
RADAR LEVEL TRANSMITTER FLANGE MOUNT



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ENGINEER: EEB	DRAWN: SAJ
CHECKED:	DATE:

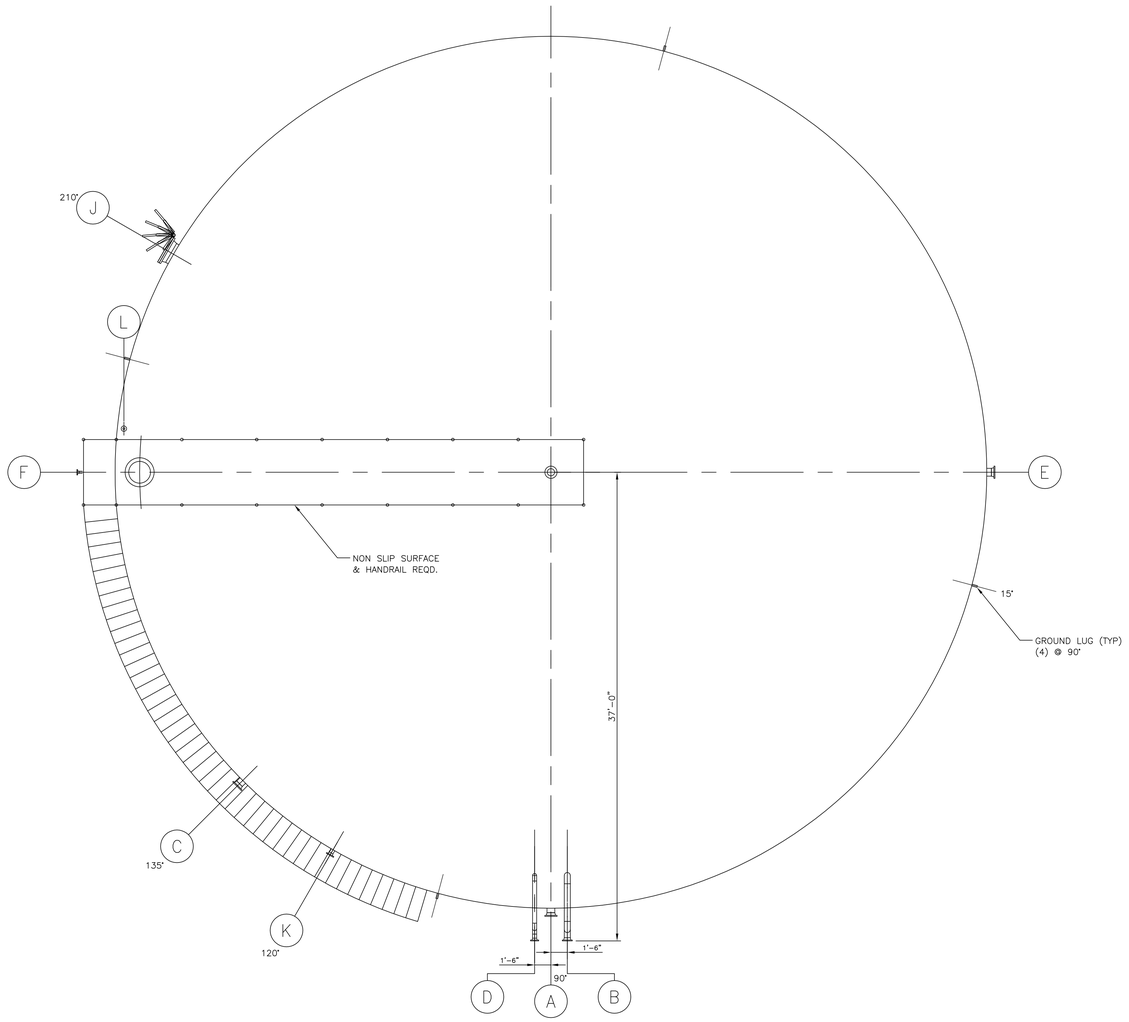
JEA
GREENLAND ENERGY CENTER
FUEL OIL SUPPLY & STORAGE
500,000 GALLON TANK 2

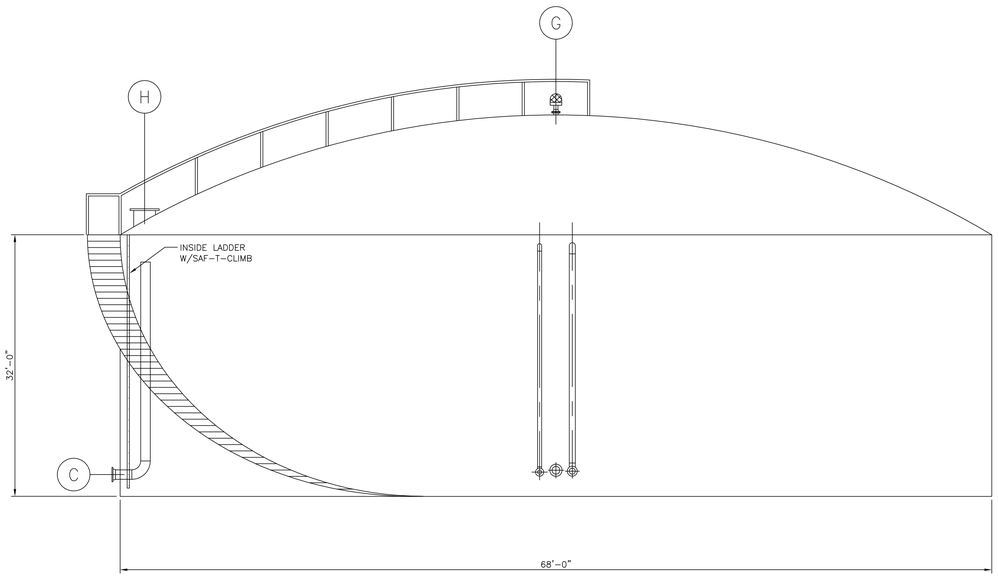
PROJECT NUMBER:	DRAWING NUMBER:	REV
196116-DM-0002		0
CODE:	REFERENCE DWG NUMBER:	
AREA:		

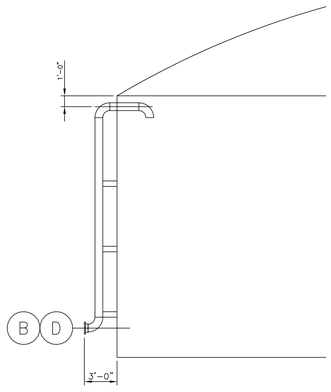
18.2s (LMS Tech) 34" x 44"
SYM52704 ACAD 1=1
02/17/16 13:15:02

NOZZLE/MANWAY SCHEDULE

MARK	SIZE	FLANGE CLASS	FLANGE FCG	SERVICE	ELEVATION	PROJ
A	8"	150 #	R.F.	SUCTION	2'-8 1/4"	9"
B	6"	150 #	R.F.	FILL	2'-7 1/4"	SEE DWG
C	8"	150 #	R.F.	OVERFLOW	29'-0"	9"
D	4"	150 #	R.F.	RECIRCULATION RETURN	2'-6 3/16"	SEE DWG
E	8"	150 #	R.F.	SPARE CONNECTION	2'-8 1/4"	9"
F	4"	150 #	R.F.	DRAIN	9"	9"
G	8"	150 #	R.F.	INTAKE FILTER/VENT	TOP OF TANK	–
H	24"	150 #	R.F.	ROOF MANWAY	TOP OF TANK	6"
J	24"	150 #	R.F.	MANWAY W/DAVIT	2'-6 3/8"	9"
K	3"	150 #	R.F.	INSTRUMENT-PRESSURE/LEVEL TRANSMITTER	1'-6"	3"
L	2"	150 #	R.F.	INSTRUMENT-LEVEL INDICATOR	TOP OF TANK	3"







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12740 Gran Bay Parkway West Suite 2140 Jacksonville, Florida 32258

ENGINEER: EEB | DRAWN: SAJ | CHECKED: | DATE:

JEA
GREENLAND ENERGY CENTER
DEMINERALIZED WATER SUPPLY & STORAGE
800,000 GALLON TANK

PROJECT NUMBER: 196116-DM-0003 | DRAWING NUMBER: | REV 0
CODE: | REFERENCE DWG NUMBER:
AREA:

SYM52704 02/17/16 ACAD 1=1 13:15:02 18.2s (LMS Tech) 34" x 44"

Project	Energy-Std-2-03880-01420
Description	Inorganic zinc with organic zinc touchup
Surfaces	Carbon steel

	First Coat	Touchup	Second Coat
VOC Limits	4.17 lb/gal (500 g/L)	4.17 lb/gal (500 g/L)	

Approved Products	Coating manufacturers and products other than those listed herein are subject to Engineer's review/approval.		
Manufacturer	**First Coat**	**Touchup**	**Second Coat**
Carboline	Carbozinc 11	Carbozinc 859	
ICI/Devoe	Cathacoat 304L	Cathacoat 315HA	
International	Interzinc 22	Interzinc 52	
Jotun Resist	78	Barrier	
PPG Amercoat	Dimetcote 9VOC	68HS	
Sherwin-Williams	Zinc Clad II	Zinc Clad V	
Tnemec	Series 90E-92	Series 90-97	

Surface Preparation	SSPC-SP6/NACE No. 3 Commercial Blast Cleaning Profile depth 1 to 2 mils (25 µm to 50 µm)
Remarks	Profile to be verified by Contractor using ASTM D4417 Method C. Welds to be prepared in accordance with NACE RP0178, Appendix C, Replica "E."

Dry Film Thickness (DFT)					
	Generic Coating Type	**Minimum DFT**	**Maximum DFT**	**Shop (S) or Field (F) Applied**	**Remarks**
First Coat	IZ	3 mils (75 µm)	4 mils (100 µm)	S	Class B slip coefficient.
Touchup	EPZ	3 mils (75 µm)	4 mils (100 µm)	S, F	SSPC-SP3 Power Tool Cleaning.
Second Coat					
Completed System		3 mils (75 µm)	4 mils (100 µm)		Dry film thickness to be verified in accordance with SSPC-PA2.

Project	Energy-Std-2-03880-01420
Description	Organic zinc primer with high-build polyurethane finish
Surfaces	Carbon steel

	First Coat	Touchup	Second Coat
VOC Limits	4.17 lb/gal (500 g/L)	4.17 lb/gal (500 g/L)	2.83 lb/gal (340 g/L)

Approved Products	Coating manufacturers and products other than those listed herein are subject to Engineer's review/approval.		
Manufacturer	**First Coat**	**Touchup**	**Second Coat**
Carboline	Carbozinc 859	Carbozinc 859	Carbothane 133 LH
ICI/Devoe	Cathacoat 315HA	Cathacoat 315HA	Devthane 359
International	Interzinc 315	Interzinc 52	Interthane 990UHS
Jotun	Barrier Barrier Hardto		p XP
PPG Amercoat	68HS 68HS 450		H
Sherwin-Williams	Zinc Clad 200 Plus	Zinc Clad V	Hi-Solids Polyurethane
Tnemec	Series 90-97	Series 90-97	Series 73

Surface Preparation	SSPC-SP6/NACE No. 3 Commercial Blast Cleaning Profile depth 1 to 2 mils (25 µm to 50 µm)
Remarks	Profile to be verified by Contractor using ASTM D4417 Method C. Welds to be prepared in accordance with NACE RP0178, Appendix C, Replica "E."

Dry Film Thickness (DFT)

	Generic Coating Type	Minimum DFT	Maximum DFT	Shop (S) or Field (F) Applied	Remarks
First Coat	EPZ	3 mils (75 µm)	4 mils (100 µm)	S	Class B slip coefficient.
Touchup	EPZ	3 mils (75 µm)	4 mils (100 µm)	S, F	SSPC-SP3 Power Tool Cleaning.
Second Coat	URA	3 mils (75 µm)	5 mils (125 µm)	S, F	
Completed System		6 mils (150 µm)	9 mils (225 µm)		Dry film thickness to be verified in accordance with SSPC-PA2.

Project	Energy-Std-2-03880-01420
Description	Epoxy coal tar primer with epoxy coal tar finish
Surfaces	Carbon steel

	First Coat	Touchup	Second Coat
VOC Limits	2.83 lb/gal (340 g/L)		2.83 lb/gal (340 g/L)

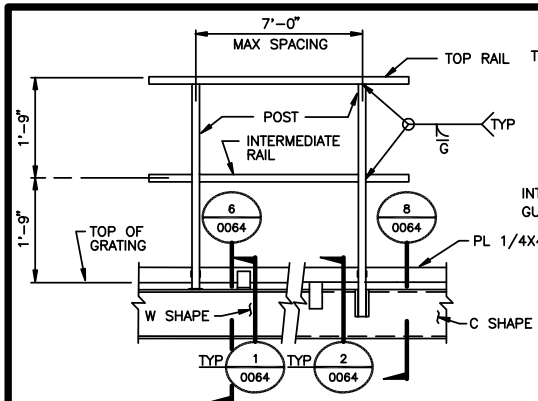
Approved Products	Coating manufacturers and products other than those listed herein are subject to Engineer's review/approval.		
Manufacturer	**First Coat**	**Touchup**	**Second Coat**
PPG Amercoat	78HB		78HB
Carboline Bitumastic	300 M		Bitumastic 300 M
Hempel	Hempadur 15130		Hempadur 15130
Jotun	Jotaguard Special 90		Jotaguard Special 90
Sherwin-Williams	Tar Guard		Tar Guard
Tnemec	Series 46H		Series 46H

Surface Preparation	SSPC-SP5/NACE No. 1 White Metal Blast Cleaning Profile depth 2 to 4 mils (50 µm to 100 µm)
Remarks	Profile to be verified by Contractor using ASTM D4417 Method C. Welds to be prepared in accordance with NACE RP0178, Appendix C, Replica "C."

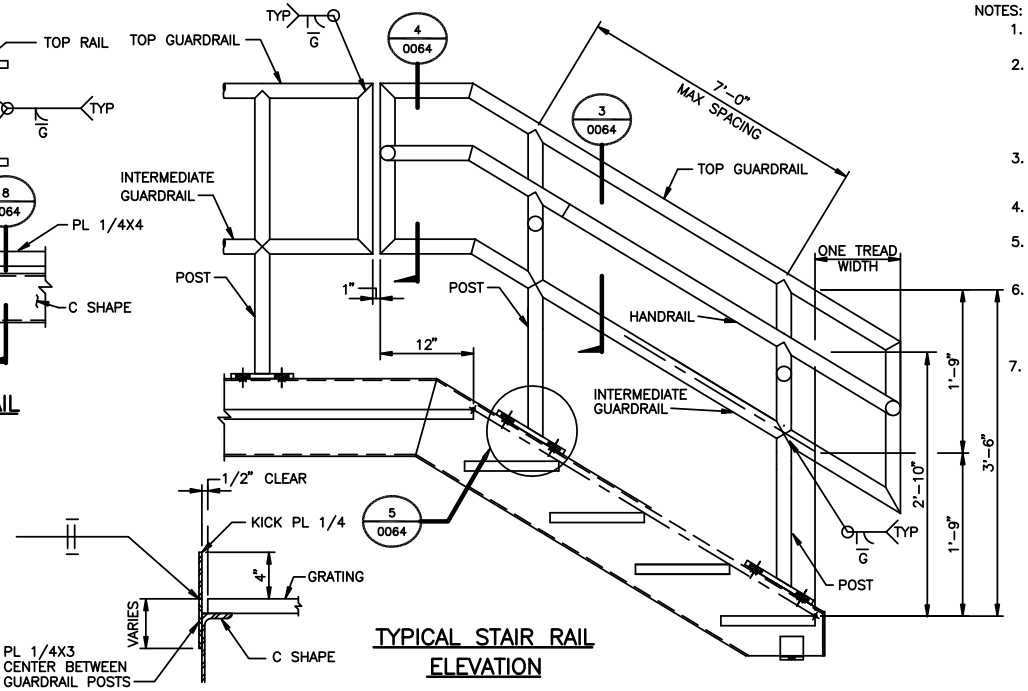
Dry Film Thickness (DFT)

	Generic Coating Type	Minimum DFT	Maximum DFT	Shop (S) or Field (F) Applied	Remarks
First Coat	EPT	8 mils (200 µm)	12 mils (300 µm)	S, F	
Touchup	N/A		N/A		
Second Coat	EPT	8 mils (200 µm)	12 mils (300 µm)	S, F	
Completed System		16 mils (400 µm)	24 mils (600 µm)		Dry film thickness to be verified in accordance with SSPC-PA2. Holiday testing required in accordance with NACE RP0188 and coating manufacturer's instructions.

BUI06695 ACAD 18.2s (LMS Tech)
A1ASL010 A1 1=1
09/08/14 11:47:38



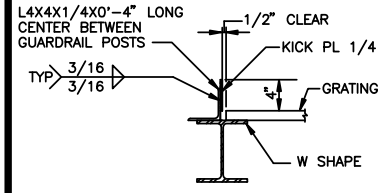
TYPICAL GUARDRAIL ELEVATION



TYPICAL STAIR RAIL ELEVATION

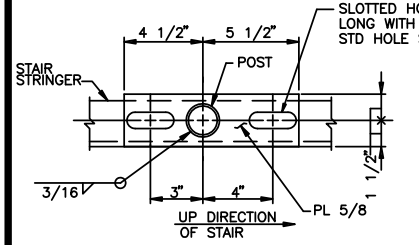
NOTES:

1. POSTS SHALL BE SPACED UNIFORM BETWEEN CORNER POSTS WITH MAXIMUM POST SPACING OF 7'-0".
2. SHOP & FIELD WELD CONNECTIONS SHOWN ARE TO BE CONSIDERED TYPICAL DETAILS. CONNECTIONS REQUIRED BUT NOT DETAILED ARE TO BE CONSIDERED IN LIGHT OF TYPICAL DETAILS. ALL CONNECTIONS SUBJECT TO ENGINEERS ACCEPTANCE PRIOR TO FABRICATION.
3. CHECK APPROPRIATE CODE FOR HANDRAIL AND GUARDRAIL CONCENTRATED AND OR UNIFORM LOAD REQUIREMENTS.
4. SAFETY GATES SHALL BE PROVIDED IN THE RAIL AT THE TOP OF ALL LADDERS.
5. STAIR RAILS AND HANDRAILS SHALL BE EXTENDED AS SHOWN UNLESS CONTINUOUS AROUND NEWEL POSTS BETWEEN STAIR FLIGHTS.
6. RAILING DIMENSIONS CONFORM TO BUILDINGS AND STRUCTURES CLASSIFIED AS FACTORY, INDUSTRIAL, AND STORAGE OCCUPANCIES, FOR AREAS NOT ACCESSIBLE TO THE GENERAL PUBLIC, AND HAVE AN OCCUPANT LOAD NO GREATER THAN 50.
7. CHECK APPLICABLE NATIONAL, STATE, AND LOCAL CODES FOR DEVIATIONS FROM DETAILS SHOWN.



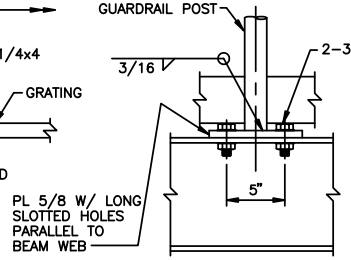
NOTE:
ATTACHMENT OF ANGLE TO W SHAPE SHALL BE SAME AS GUARDRAIL POST TO W SHAPE

SECTION 1



DETAIL 5

SECTION 6



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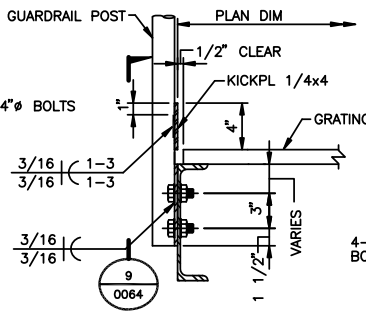
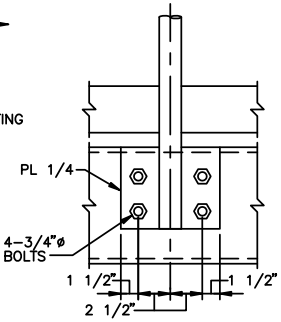


SECTION 8



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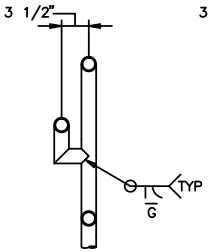
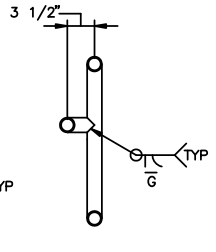


DETAIL 3



DETAIL 4

8	04/30/10	GENERAL REVISIONS	SJB	BES	KWB		BES	9	10/21/10	REVISED DRAWING TITLE	KWB	BES	KWB		BES
10	09/08/14	REVISED DRAWING TITLE	KWB	BAG	KWB		BAG	NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP

BLACK & VEATCH CORPORATION

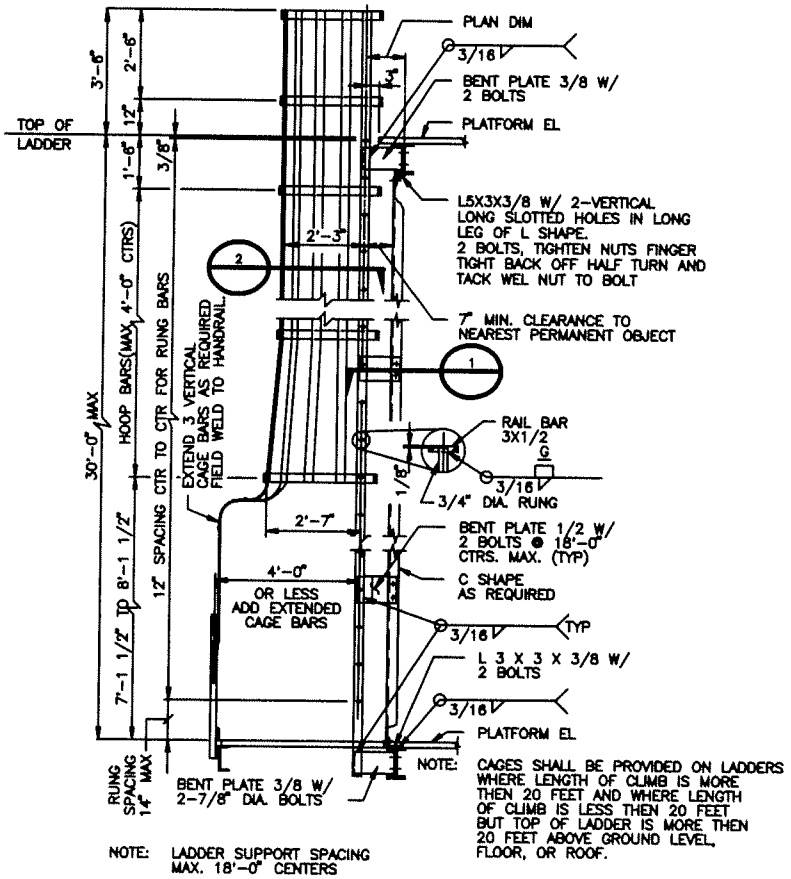
PROJECT 81112-DS-0064 | DRAWING NUMBER | REV 10

ENGINEER | DRAWN | CHECKED | DATE

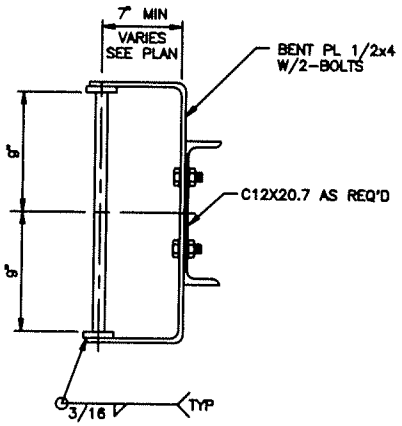
TYPICAL GUARDRAIL AND STAIR RAIL CONFORMING TO IBC 2003, 2006, 2009 & 2012 FOR AREAS NOT ACCESSIBLE TO THE PUBLIC

CODE | AREA

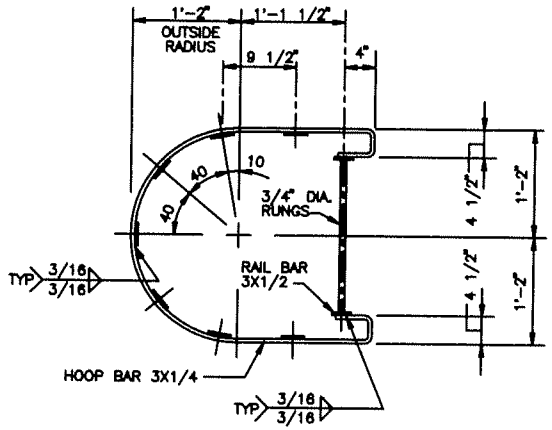
ZI014903 ACAD 16.1s (LMS Tech)
A1ASL010 A1 1=1
07/21/08 16:12:04



TYPICAL LADDER & CAGE



SECTION 1



SECTION 2

8	07/25/2008	GENERAL REVISIONS	REZ	REZ	KWB		BES	6	12/10/2004	GENERAL REVISIONS	REZ	AB	KWB		BES
7	02/22/2007	GENERAL REVISIONS	KWB	BES	KWB		BES	NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP

BLACK & VEATCH CORPORATION

ENGINEER	VHS	DRAWN	AGG
CHECKED	DRN	DATE	08/09/85

TYPICAL LADDER DETAILS

PROJECT DRAWING NUMBER: 81112-DS-0071

REV: 8

CODE

AREA