

ORINATION FORM

Proposed Revisions to the Specifications

(Please provide all information - incomplete forms will be returned)

Date:

Office:

Originator:

Specification Section:

Telephone:

Article/Subarticle:

email:

Associated Section(s) Revisions:

Will the proposed revision require changes to:

Publication	Yes	No	Office Staff Contacted
Standard Plans Index			
Traffic Engineering Manual			
FDOT Design Manual			
Construction Project Administration Manual			
Basis of Estimate/Pay Items			
Structures Design Guidelines			
Approved Product List			
Materials Manual			
Maintenance Specs			

Will this revision necessitate any of the following:

Design Bulletin

Construction Bulletin

Estimates Bulletin

Materials Bulletin

Have all references to internal and external publications in this Section been verified for accuracy?

Synopsis: Summarize the changes:

Justification: Why does the existing language need to be changed?

Do the changes affect either of the following types of specifications (Hover over type to go to site.):

Special Provisions

Developmental Specifications

List Specifications Affected: (ex. SP3270301, Dev330TL, Dev334TL etc.)

Contact the State Specifications Office for assistance in completing this form.

Daniel Strickland 850-414-4130 Daniel.Strickland@dot.state.fl.us Rebecca Arcia 850-414-4155 Rebecca.Arcia@dot.state.fl.us
Darla Hunsicker 850-414-4114 Darla.Hunsicker@dot.state.fl.us Valencia Cunningham 850-414-4101 Valencia.Cunningham@dot.state.fl.us

STRUCTURAL STEEL AND MISCELLANEOUS METAL ITEMS (OTHER THAN ALUMINUM)
(REV 6-27-22)

SECTION 962 is deleted and the following substituted:

962-1 General.

This Section covers the material and fabrication requirements for structural steel and miscellaneous metal components. All steel must be melted and manufactured in the United States and meet Section 6-5.2. All overhead cantilevers, monotubes, trusses and gantries, iron castings, steel gratings, fencing, field splices filler metals, and bridge components (including steel castings, steel forgings, and bearing material) supplied under this Specification shall be from producers currently on the Department's Production Facility Listing. Producers seeking inclusion on the Department's Production Facility Listing must meet the requirements of Section 105. Provide certifications that meet the applicable section and 962-12.

962-~~12~~ Structural Steel.

962-~~12.1~~ Structural Steel Materials: ~~Unless otherwise specified in the Contract Documents, provide structural steel for bolted or welded construction in accordance with Structural Steel for Bridges, ASTM A709 that meets the requirements of Table 962-1.1 and 962-1.2 when impact testing is specified. Grade HPS 70W shall not be substituted for Grade HPS 50W. Weathering steel shall not be substituted for non-weathering steel without Engineer approval.~~

~~Do not apply heat treatment unless approved by the Engineer. If the grade is not shown elsewhere in the Contract Documents, provide the grade as directed by the Engineer. All grades, as specified in the Contract Documents, are to conform to ASTM A709, as shown in Table 962-2.1 below: When galvanizing is specified, provide galvanizing in accordance with 962-11.1.~~

<u>Product</u>	<u>ASTM</u>	<u>Grade/Style</u>	<u>Reportable Properties</u>	<u>Supplementary Requirements</u>	
<u>Plate</u>	<u>A709</u>	<u>36</u>	<u>Composition, Yield Strength, Tensile Strength, Elongation, Killed.</u>	<u>None</u>	
		<u>50</u>		<u>Carbon Equivalency</u>	
		<u>50S</u>		<u>Heat-treating temperatures</u>	
		<u>50CR</u>			<u>Corrosion Resistance Index</u>
		<u>50W</u>	<u>Composition, Yield Strength, Tensile Strength, Elongation, Killed, Fine Grain</u>	<u>Corrosion Resistance Index, Heat Treatment Temperatures</u>	
		<u>HPS 50W</u>			
		<u>HPS 70W</u>			

ASTM A709 Grade	Product Form*	Yield Strength (ksi)	Tensile Strength (ksi)
36	P, S, B	36 min	58-80
50	P, S, B	50 min	65 min
50W	P, S, B	50 min	70 min
50S	S	50-65	65 min
HPS 50W	P, S, B	50 min	70 min
HPS 70W	P, B	70 min	85-110
HPS100W (2-1/2 in or less)	P, B	100 min	110-130
HPS100W (over 2-1/2 in)	P, B	90 min	100-130

* P = plates, S = structural shapes, B = bars

962-12.2 Testing Impact Requirements: Structural steel subject to tensile stress for main load-carrying members shall meet the impact requirements listed in Table 962-2. Mill test reports shall identify average impact test values. Provide certifications that meet this section and 962-12. For structural steel subjected to tensile stress used for main load-carrying members or components (as defined in Section 460), meet the ASTM A709 impact test requirements for non-fracture and fracture critical tension components as specified in the Contract Documents. Meet the requirements for Zone 1 (Minimum Service Temperature 0°F).

If not specified elsewhere in the Contract Documents, For non-fracture and fracture critical tension components, provide structural steel in accordance with ASTM A709 requirements for non-fracture and fracture critical tension components as directed by the Engineer.

Product	ASTM	Grade	Zone	Minimum Average Energy (ft*lb)	
				Non-Fracture Critical	Fracture Critical
Structural Steel	A709	36	1	15 at 70°F	25 at 70°F
		50		15 at 70°F (≤ 2.0"t) 20 at 70°F (> 2.0"t)	25 at 70°F (≤ 2.0"t) 30 at 70°F (> 2.0"t)
		50W			
		50S		15 at 70°F	25 at 70°F
		50CR		20 at 10°F (≤ 2.0"t) 25 at 50°F (> 2.0"t)	30 at 10°F (≤ 2.0"t) 35 at 50°F (> 2.0"t)
		HPS 50W		25 at -10°F	35 at -10°F
HPS 70W					
Structural Steel Tubing	A500	B, C, D	1	15 at 70°F	25 at 70°F
	A501	A, B			
	A847	Round, Square, Rectangle, Special			

Note: If yield ≥15ksi above specified grade, test temperature must drop 15°F for each 10ksi above grade.

962-23 Steel Castings.

Provide carbon steel and corrosion resistant castings in accordance with this section and Table 962-3.

962-23.1 Carbon Steel Castings: Perform heat treatments by annealing, normalizing, normalizing & tempering, or quenching & tempering after castings have been allowed to cool from the pouring temperature to below the transformation temperature range as regulated by the use of pyrometers. Class 1 castings shall be used if post-weld heat treatment is specified in the contract documents. ~~Provide carbon steel castings that conform to the requirements of ASTM A27. Unless otherwise specified in the Contract Documents, all castings are to be Grade 65-35 or Grade 70-36.~~

962-23.2 Corrosion Resistant Steel Castings: ~~Provide corrosion resistant Iron-Chromium or Iron-Chromium-Nickel castings that conform to the requirements of ASTM A743. Unless otherwise specified in the Contract Documents, all castings are to be Grade CA 15M. Perform heat treatments by air cooling and tempering; or annealing as defined in ASTM A743 Table 1.~~

<u>Table 962-3</u> <u>Requirements for Steel Castings</u>					
<u>Product</u>	<u>Standard</u>	<u>Grade</u>	<u>Class</u>	<u>Reportable Properties</u>	<u>Supplementary Requirements</u>
<u>Carbon Steel</u>	<u>ASTM A27</u>	<u>65-35,</u> <u>70-36</u>	<u>1, 2</u>	<u>Composition,</u> <u>Tensile,</u> <u>Class</u>	<u>None</u>
<u>Corrosion Resistant Steel</u>	<u>ASTM A743</u>	<u>CA 15M</u>	<u>All</u>	<u>Composition,</u> <u>Heat Treatment</u>	<u>S11, S12</u>
	<u>AASHTO M163</u>				

962-34 Steel Forgings.

Provide carbon steel and alloy steel forgings from which pins, rollers, trunnions, shafts, gears, or other forged parts are fabricated in accordance with this section and Table 962-4. ~~that conform to ASTM A668. Unless otherwise specified in the Contract Documents, all forgings are to be Class C, D, F, or G.~~

The manufacturer may elect to choose from any of the class specific heat treatments identified in the Table 962-4, provided that the controlling cross-sectional thickness meets mechanical property test requirements. Retreatment by re-austenitizing a lot is allowed up to three times when the mechanical properties have not been met. Re-testing of the mechanical properties is required on any lot subject to retreatment.

<u>Table 962-4</u> <u>Requirements for Steel Forgings</u>				
<u>Product</u>	<u>Standard</u>	<u>Class</u>	<u>Reportable Properties</u>	<u>Supplementary Requirements</u>
<u>Steel Forgings</u>	<u>ASTM A668</u>	<u>C, D, F, G</u>	<u>Composition, Tensile, Yield, Elongation, Hardness</u>	<u>S7</u>
	<u>AASHTO M102</u>			

962-45 Iron Castings.

Provide iron castings that conform to the requirements of this section and Table 962-5. Use producers listed on the Department's Production Facility Listing for galvanizing.

962-45.1 Gray Iron Castings: Provide gray iron castings that conform to the requirements of this section and Table 962-4. AASHTO HL-93 load testing may be substituted for tensile testing when specified in the contract documents. When Alternative G castings are specified, provide a composition that precludes the possibility of embrittlement during the normal thermal cycle of hot-dip galvanizing. AASHTO M105. For frames, grates, rings, and covers for inlets, manholes, and other structures placed in areas of vehicular traffic, conform to the requirements of AASHTO M306. Unless otherwise specified in the Contract Documents, provide gratings, manhole covers and frames to Class 35B and machinery parts to Class 30.

962-45.2 Ductile Iron Castings: Provide ductile iron castings that conform to the requirements of ASTM A536. Unless otherwise specified in the Contract Documents, provide castings to Grade 414-276-18. In addition to the specified test coupons, test specimens from parts integral with the castings, such as risers, are to be tested for castings with a mass more than 1,000 pounds to determine that the required quality is obtained in the castings in the finished condition. Perform full ferritizing anneal to remove carbides or stabilized pearlite. AASHTO HL-93 load testing may be substituted for tensile testing when specified in the contract documents.

962-54.3 Malleable Iron Castings: Provide malleable iron castings that conform to the requirements of ASTM A47. Unless otherwise specified in the Contract Documents, provide castings to Grade 24118. Perform heat treatments in the same production furnace and in the same cycles as the castings they represent. Produce a microstructure consisting of temper carbon nodules distributed through a ferritic matrix and free of excessive pearlite, massive carbides, and primary graphite. When critical sections of the production castings differ appreciably from that of the central portion, the time cycle for tempering may be altered from that of the production lot in order to obtain similar microstructures, or hardness, or both.

When Alternative G castings are specified, provide a composition that precludes the possibility of embrittlement during the normal thermal cycle of hot-dip galvanizing, or provide heat treatment that immunizes the casting against embrittlement during the normal thermal cycle of hot-dip galvanizing.

<u>Table 962-5</u> <u>Requirements for Iron Castings</u>				
<u>Product</u>	<u>Standard</u>	<u>Grade/Class</u>	<u>Reportable Properties</u>	<u>Supplementary Requirements</u>
<u>Gray Iron Traffic Service</u>	<u>AASHTO M105 & AASHTO M306</u>	<u>35B</u>	<u>Tensile*</u>	<u>None</u>
<u>Gray Iron Machinery</u>	<u>AASHTO M105</u>	<u>30</u>	<u>Tensile</u>	<u>None</u>
<u>Ductile Iron</u>	<u>ASTM A536</u>	<u>60-40-18</u>	<u>Tensile*, Yield, Elongation, Heat Treatment</u>	<u>Additional Tensile test for castings > 1000 lbs.</u>
<u>Malleable Iron</u>	<u>ASTM A47</u>	<u>30518 [24118]</u>	<u>Tensile, Yield, Elongation, Heat Treatment</u>	<u>None</u>
<u>*AASHTO HL-93 may be substituted for tensile testing of vaned gratings, when specified in the contract.</u>				

962-65 Bolts, Nuts and Washers Not Designated as High-Strength.

Provide bolts, nuts, and washers not designated as high strength meeting the requirements listed in this Section and Table 962-6. When galvanizing is specified in the contract documents, provide galvanizing in accordance with 962-11.3.1. Provide bolts that conform to the requirements of ASTM A307 or ASTM A449. Provide nuts that conform to the requirements of ASTM A563 and washers that conform to ASTM F436, unless specified as ordinary rough or machine bolts as approved by the Engineer. Washers provided to ASTM F844 and nuts to ASTM A194 may be used with the Engineer's approval.

Use double nuts, when ordinary rough or machine bolts are specified in the Contract Documents. Bolted assemblies shall be made of similar coating composition. When weathering material is used, provide the entire assembly in weathering steel. Bolts meeting the requirements of ASTM A193, washers meeting the requirements of ASTM F844 and nuts meeting the requirements of ASTM A194 or AASHTO M292 may be used with the Engineer's approval.

<u>Table 962-6</u> <u>Bolts, Nuts, and Washers Not Designated as High-Strength</u>				
<u>Product</u>	<u>Standard</u>	<u>Grade</u>	<u>Style</u>	<u>Reportable Properties</u>
<u>Bolts</u>	<u>ASTM A307</u>	<u>A, B</u>	<u>Heavy Hex, Threaded Rod</u>	<u>Size, Composition, Hardness, Tensile</u>
	<u>ASTM A449</u>	<u>1, 3</u>	<u>Hex, Threaded Stud</u>	<u>Size, Composition, Tensile, Proof Load, Hardness</u>

<u>Table 962-6</u> <u>Bolts, Nuts, and Washers Not Designated as High-Strength</u>				
	<u>ASTM F593</u>	<u>Group 2</u> <u>316 or 316L</u>	<u>Condition A</u> <u>CW1 or SH1</u>	<u>Alloy, Group, Condition</u>
	<u>ASTM A193*</u>	<u>B7, B16</u>	<u>Any</u>	<u>Size, Composition,</u> <u>Hardness, Heat</u> <u>Treatment, Macroetch</u> <u>results</u>
<u>Nuts</u>	<u>ASTM A563</u>	<u>A</u>	<u>Hex</u>	<u>Size, Composition, Proof</u> <u>Load, Hardness</u>
		<u>C, C3, DH,</u> <u>DH3</u>	<u>Heavy Hex</u>	
	<u>ASTM F594</u>	<u>Group 2</u> <u>316 or 316L</u>	<u>CW</u>	<u>Alloy, Group, Condition</u>
	<u>ASTM A194*</u>	<u>2, 2H</u>	<u>Hex, Heavy</u> <u>Hex</u>	<u>Composition, Hardness,</u> <u>Proof Load</u>
	<u>AASHTO</u> <u>M292*</u>	<u>2, 2H</u>	<u>Hex, Heavy</u> <u>Hex</u>	<u>Size, Composition,</u> <u>Hardness, Heat</u> <u>Treatment, Macroetch</u> <u>results</u>
<u>Washers</u>	<u>ASTM F436</u>	<u>1, 3</u>	<u>Circular,</u> <u>Beveled,</u> <u>Clipped,</u> <u>Extra Thick</u>	<u>Size, Hardness</u>
	<u>N/A</u>	<u>316 or 316L</u>	<u>Any</u>	<u>Alloy, Size</u>
	<u>ASTM F844*</u>	<u>Plain</u>	<u>Round,</u> <u>Miscellaneous</u>	<u>Size</u>
	<u>ASTM A36</u>	<u>All</u>	<u>N/A</u>	<u>Killed, Thickness</u>
<u>Shims</u>	<u>ASTM A1011</u>	<u>Any</u>	<u>Any</u>	<u>None</u>
	<u>ASTM A109</u>	<u>Any</u>	<u>Any</u>	<u>None</u>
	<u>ASTM B36</u>	<u>Brass</u>	<u>Any</u>	<u>None</u>

962-76 High-Strength Bolts, Nuts, Washers and Direct-Tension-Indicator (DTI) Devices.

Use Provide high-strength bolts, nuts, washers and DTI devices meeting the following requirements: in accordance with this Section and Table 962-7. High-strength bolts shall have identifying marks meeting ASTM F3125 Table 2 and ASTM A563. High-strength bolted assemblies shall be made of similar coating composition. When galvanizing is specified in the contract documents, provide galvanizing in accordance with 962-11.3.2. Bolts meeting the requirements of ASTM F3125 Grade A490, washers meeting the requirements of ASTM F844,

and nuts meeting the requirements of ASTM A194 or AASHTO M292 may be used with the Engineer's approval.

~~_____ Bolts: Grade A325 or Grade A490, Heavy Hex. Only use Grade A490 high strength bolts with the approval of the Engineer.~~

~~_____ Nuts: ASTM A563, Heavy Hex. Select nuts in accordance with ASTM F3125 (Table 1). If grade C, D or C3 nuts are selected, provide with a minimum Rockwell hardness of 89 HRB or a minimum Brinell hardness of 180 HB. Use nuts meeting the requirements of ASTM A194 only when approved by the Engineer.~~

~~_____ Washers: ASTM F436 and ASTM F3125 (Table 1). Use washers meeting the requirements of ASTM F844 only when approved by the Engineer.~~

~~_____ Identifying Marks: in accordance with ASTM F3125 (Table 1) and ASTM A563.~~

~~_____ DTI devices: meeting the requirements of ASTM F959. Furnish plain DTI devices for use with plain bolts if the finish coat of paint is applied after installation and testing of the DTI device and will cover the remaining gap. Otherwise, coat the DTI device in accordance with the manufacturer's recommendations.~~

~~_____ When the Contract Documents call for uncoated weathering steel in any component of the connected part, provide Type 3 bolts and washers, and nuts with weathering characteristics. If one side of the assembly is coated and the other exposed weathering steel, coat the fastener assembly on the coated side similarly (Such as the case for weathering steel tub girders coated on the inside only).~~

~~_____ Ensure that fastener assemblies are properly lubricated in accordance with ASTM A563 Supplementary Requirements S1 and S2.~~

<u>Table 962-7</u>					
<u>Requirements for High-Strength Steel Fastener Assemblies</u>					
<u>Products</u>	<u>Standard</u>	<u>Grade</u>	<u>Type/ Style</u>	<u>Reportable Properties</u>	<u>Supplementar y Requirements</u>
<u>Bolts</u>	<u>ASTM F3125</u>	<u>A325</u>	<u>Heavy Hex</u>	<u>Size, Composition, Tensile, Proof Load, Hardness,</u>	<u>None</u>
		<u>A490*</u>		<u>Size, Composition, Tensile, Proof Load, Hardness, Magnetic Particle, Carburization/ Decarburization</u>	
	<u>ASTM A193</u>	<u>B7, B16</u>	<u>Any</u>	<u>Size, Composition, Hardness, Heat Treatment, Macroetch results</u>	
<u>Nuts</u>	<u>ASTM A563</u>	<u>DH, DH3</u>	<u>Heavy Hex</u>	<u>Size, Composition, Proof Load, Hardness</u>	<u>S1, S2 min. 89 HRB or 180 HB</u>

<u>Table 962-7</u> <u>Requirements for High-Strength Steel Fastener Assemblies</u>					
	<u>ASTM A194*</u>	<u>2H</u>	<u>Heavy Hex</u>	<u>Size, Composition, Hardness</u>	<u>Max HRC32</u>
	<u>AASHTO M292*</u>	<u>2H</u>	<u>Heavy Hex</u>	<u>Size, Composition, Hardness, Heat Treatment, Macroetch results</u>	<u>Max HRC32</u>
<u>Washers</u>	<u>F436</u>	<u>Circular, Beveled, Clipped, Extra Thick</u>	<u>1, 3</u>	<u>Size, Hardness</u>	<u>None</u>
	<u>F844*</u>	<u>Round, Miscellaneous</u>	<u>Plain</u>	<u>Size</u>	<u>None</u>
	<u>ASTM A709</u>	<u>36, 50</u>	<u>Any</u>	<u>Yield, Tensile, Elongation, Killed</u>	<u>None</u>
<u>DTI Devices</u>	<u>F959</u>	<u>A325</u>	<u>1</u>	<u>Size, Composition, Compression Load, Hardness</u>	<u>None</u>
			<u>3</u>	<u>Size, Composition, Compression Load, Hardness, Corrosion Resistance Index</u>	
<u>*Requires Engineer Approval.</u>					

962-~~8~~7 Anchor Rods and Bridge Bearing Materials.

962-8.1 Bearing and Masonry Plate: Meet the requirements of Table 962-8. Masonry plates and bearings shall be welded in accordance with AASHTO/AWS D1.5 Bridge Welding Code. When galvanizing is specified meet the requirements of 962-11.1. Use producers listed on the Department's Production Facility Listing for galvanizing.

Provide anchor rods, washers, masonry plates, bearings and other miscellaneous metal components that conform to the following requirements:

Provide anchor rods that conform to the requirements of ASTM F1554 unless the Engineer approves the use of anchor rods meeting the requirements of ASTM A307, with nuts that meet the requirements of ASTM A563, Hex Nuts, Heavy and with a finish consistent with the rod. Nuts meeting the requirements of ASTM A194 may be used only with the Engineer's approval.

Use washers meeting the requirements of ASTM F436, with a finish consistent with the rod. Washers meeting the requirements of ASTM A844 may be used only with the Engineer's approval.

<u>Table 962-8</u> <u>Requirements for Bearings and Masonry Plate</u>					
<u>Product</u>	<u>ASTM</u>	<u>Grade</u>	<u>Style</u>	<u>Reportable Properties</u>	<u>Supplementary Requirements</u>
<u>Plate</u>	<u>A709</u>	<u>50W</u>	<u>All</u>	<u>Yield, Tensile, Elongation, Killed, Fine Grain</u>	<u>Corrosion Resistance Index</u>
<u>Laminates</u>	<u>A240</u>	<u>316</u>	<u>Gage 16</u>	<u>Yield, Tensile, Elongation, Hardness</u>	<u>None</u>
	<u>A1011</u>	<u>36</u>	<u>HSLAS, Class 1</u>	<u>Designation, Style</u>	<u>None</u>
	<u>A36</u>	<u>All</u>	<u>All</u>	<u>Yield, Tensile, Elongation, Killed</u>	<u>None</u>

962-8.2 Anchor Rods and Bearing Hardware: Provide anchor rods and other bearing hardware in accordance with this section and Table 962-9. All fastening components shall be made of similar composition. When galvanizing is specified in the contract documents, provide galvanizing in accordance with Section 962-11.3.1. Anchor rods meeting the requirements of ASTM A307, washers meeting the requirements of ASTM F844, and nuts meeting the requirements of ASTM A194 may be used with the Engineer's approval.

<u>Table 962-9</u> <u>Requirements for Anchor Rods and Bearing Hardware</u>					
<u>Product</u>	<u>ASTM</u>	<u>Grade</u>	<u>Style</u>	<u>Reportable Properties</u>	<u>Supplementary Requirements</u>
<u>Bolts</u>	<u>F1554</u>	<u>36</u>	<u>Threaded Rod</u>	<u>Lot, Size, Tensile</u>	<u>None</u>
		<u>55</u>		<u>Lot, Size, Tensile, Carbon Equivalency</u>	<u>S1</u>
		<u>105</u>		<u>Lot, Size, Tensile, Carbon Equivalency</u>	<u>S3</u>
	<u>A307*</u>	<u>A, B</u>	<u>Threaded Rod</u>	<u>Size, Composition, Hardness, Tensile</u>	<u>S1</u>
<u>Nuts</u>	<u>A563</u>	<u>DH</u>	<u>Heavy Hex</u>	<u>Size, Composition, Proof Load, Hardness</u>	<u>None</u>
	<u>A194*</u>	<u>2H</u>	<u>Heavy Hex</u>	<u>Size, Composition, Hardness</u>	<u>None</u>
<u>Washers</u>	<u>F436</u>	<u>1, 3</u>	<u>Circular, Beveled, Clipped, Extra Thick</u>	<u>Size, Hardness</u>	<u>None</u>
	<u>F844*</u>	<u>Plain</u>	<u>Round, Miscellaneous</u>	<u>Size</u>	<u>None</u>

<u>Table 962-9</u> <u>Requirements for Anchor Rods and Bearing Hardware</u>					
<u>Plate</u>	<u>A36</u>	<u>All</u>	<u>All</u>	<u>Yield, Tensile, Elongation, Killed</u>	<u>None</u>
<u>Shim</u>	<u>A653</u>	<u>All</u>	<u>Min. G30</u>	<u>Grade</u>	<u>None</u>
	<u>A1008</u> <u>A36</u>	<u>All</u>	<u>A153, F2329</u>	<u>None</u>	<u>None</u>
*Requires Engineers Approval.					

962-8 Overhead Signs

Provide overhead sign materials in accordance with this section Table 962-2, and Table 962-10. When galvanizing is specified, meet the requirements of 962-11.1. Produce welds using E7018 electrode, in accordance with AWS D1.1 Structural welding Code.

<u>Table 962-10</u> <u>Requirements for Overhead Signs</u>					
<u>Product</u>	<u>Standard</u>	<u>Grade</u>	<u>Type/Style</u>	<u>Reportable Properties</u>	<u>Supplementary Requirements</u>
<u>Upright Pipe</u>	<u>API 5L</u>	<u>X42R,</u> <u>X42N,</u> <u>X42M,</u> <u>X46N,</u> <u>X46M,</u> <u>X52N,</u> <u>X52M,</u> <u>X56N,</u> <u>X56M,</u> <u>X60N,</u> <u>X60M,</u> <u>X65M,</u> <u>X70M</u>	<u>PSL2</u>	<u>Killed, Fine Grain, Tensile, CVN Test</u>	<u>N/A</u>
	<u>A500</u>	<u>B, C</u>	<u>Round Structural</u>	<u>Composition, Yield, Tensile, Elongation</u>	<u>UT Seam Weld, CVN Test per 962-2</u>
<u>Chords</u>	<u>A500</u>	<u>B, C</u>	<u>Round Structural</u>	<u>Composition, Yield, Tensile, Elongation</u>	<u>N/A</u>
<u>Plate, Angles & Handhole Frame</u>	<u>A709</u>	<u>50</u>	<u>Plates & Shapes</u>	<u>Composition, Yield, Tensile, Elongation</u>	<u>N/A</u>
	<u>A36</u>	<u>36</u>			<u>Yield > 50ksi</u>
<u>Poles</u>	<u>A1011</u>	<u>50, 55, 60, 65</u>	<u>Any</u>	<u>Designation, Grade</u>	<u>N/A</u>
	<u>A572</u>	<u>50, 55, 60, 65</u>	<u>1, 2, 3, 5</u>	<u>Composition, Tensile, Type, Killed</u>	<u>N/A</u>

<u>Table 962-10</u> <u>Requirements for Overhead Signs</u>					
	<u>A595</u>	<u>A, B</u>	<u>Any</u>	<u>Composition,</u> <u>Tensile,</u> <u>Type, Killed</u>	<u>N/A</u>

962-108 Miscellaneous Metal Items.

962-10.1 General: Unless otherwise specified in the eContract dDocuments, provide miscellaneous metal components in accordance with this section and Table 962-11, Table 962-12, Table 962-13, or Table 962-14. Structural tubing subject to tensile stresses, as defined in Section 460, shall meet Table 962-2.2 for tension components, Zone 1. Welding shall be done in accordance with the most current AWS D1.1 structural welding code. When galvanizing is specified in the contract documents, provide galvanizing in accordance with the contract documents.

Requirements for concrete reinforcement are contained in Section 931.

Requirements for steel guardrail are contained in Section 967.

the following specific materials:

<u>Table 962-11</u> <u>Requirements for Miscellaneous Metals</u>				
<u>Product</u>	<u>Standard</u>	<u>Grade</u>	<u>Type/ Style</u>	<u>Reportable Properties</u>
<u>Steel Sheet Piling</u>	<u>A328</u>	<u>All</u>	<u>Cold Rolled, Heat Treated</u>	<u>Composition, Tensile, Killed</u>
	<u>A572</u>	<u>42, 50, 55, 60, 65</u>	<u>1, 2, 3, 5</u>	<u>Composition, Tensile, Size, Killed</u>
	<u>A690</u>	<u>All</u>	<u>All</u>	<u>Composition, Tensile, Killed</u>
<u>Steel Pipe Piling</u>	<u>A252</u>	<u>3</u>	<u>All</u>	<u>Composition, Tensile, Size</u>
	<u>API 5L</u>	<u>X46, X52, X56, X60, X65, X70</u>	<u>PSL1</u> <u>PSL2</u>	<u>Tensile</u> <u>Killed, Fine Grain, Tensile</u>
<u>Structural Tubing</u>	<u>A500</u>	<u>Round</u>	<u>B, C</u>	<u>Composition, Tensile, Flattening Test, Impact (Zone 1), Size</u>
		<u>Shaped</u>		<u>Composition, Tensile, Impact (Zone 1), Size</u>
	<u>A501</u>	<u>Square, Round, Rectangular, Special</u>	<u>A, B</u>	<u>Composition, Tensile, Impact (Zone 1), Size</u>
	<u>A847</u>	<u>Round</u>	<u>Welded, Seamless</u>	<u>Composition, Tensile, Flattening, Impact (Zone 1), Size</u>
<u>Square, Rectangle, Special</u>		<u>Welded, Seamless</u>	<u>Composition, Tensile, Impact (Zone 1), Size</u>	

<u>Table 962-11</u> <u>Requirements for Miscellaneous Metals</u>				
<u>Pipe Railing</u>	<u>A53</u>	<u>A, B</u>	<u>E, S</u>	<u>Composition, Mechanical Testing (Tensile, Bend, Flattening), Size</u>

~~962-8.1 Pipe Railings: Provide steel pipe conforming to the requirements of ASTM A53 for Standard Weight Pipe.~~

~~962-8.2 Steel Sheet Piling: Provide steel sheet piles conforming to the requirements of ASTM A328, ASTM A572 or ASTM A690.~~

~~962-8.3 Steel Sign Supports and Accessories: Provide steel members for sign supports that meet the material requirements specified in the Contract Documents.~~

~~962-8.4 Structural Tubing:~~

~~962-8.4.1 Materials: Provide steel structural tubing as one of the following: Cold formed, welded or seamless conforming to the requirements of ASTM A500, Grade B or C, coated in accordance with the Contract Documents;~~

~~Hot formed, welded or seamless tubing conforming to the requirements of ASTM A501, coated in accordance with the Contract Documents;~~

~~ASTM A847 when weathering characteristics are required; or~~

~~As indicated elsewhere in the Contract Documents.~~

~~962-8.4.2 Testing: Structural steel tubing subjected to tensile stresses used in main load carrying members or components (as defined in Section 460) shall meet the impact test requirements of ASTM A709 for non fracture and fracture critical tension components for Zone 1. Minimum Average energy shall be 15 ft-lbf at 70°F (non fracture critical); or 25 ft-lbf at 70°F (fracture critical).~~

~~962-8.5 Steel for Concrete Reinforcement: Requirements for concrete reinforcement are contained in Section 931.~~

~~962-8.6 Steel Guardrail: Requirements for steel guardrail are contained in Section 967.~~

962-108.27 Field Splice Filler Materials: Provide field splice filler materials in accordance with the Contract Documents. If unspecified and less than 3/16 inches thick filler splice materials in accordance with this section and Table 962-12. Filler plates may also meet the appropriate grades specified in 962-2. When galvanized plate is specified, use producers listed on the Department's Production Facility Listing for galvanizing.
~~provide ASTM A606 or ASTM A1011.~~

<u>Table 962-12</u> <u>Requirements for Field Splice Filler Materials</u>				
<u>Product</u>	<u>Standard</u>	<u>Grade</u>	<u>Type/Style</u>	<u>Reportable Properties</u>
<u>Filler Sheet</u>	<u>A1011</u>	<u>50</u>	<u>HSLAS, Class 1</u>	<u>Designation, Grade</u>

962-10.3 Fencing Material: Provide fencing materials in accordance with this section and Table 962-13. When galvanizing is specified, provide galvanizing in accordance with the contract documents. Use producers listed on the Department's Production Facility Listing for Coated Steel Fencing.

<u>Table 962-13</u> <u>Material Requirements for Fencing</u>				
<u>Product</u>	<u>Standard</u>	<u>Grade / Type</u>	<u>Style</u>	<u>Reportable Properties</u>
<u>Fabric</u>	<u>A116</u>	<u>60</u>	<u>No. 9</u>	<u>Breaking Strength,</u> <u>Coating Weight</u>
		<u>175</u>	<u>No. 12-1/2</u>	
	<u>A584</u>	<u>175</u>	<u>No. 12-1/2</u>	
	<u>M181</u>	<u>1, 2, 4</u>	<u>No. 9</u>	
	<u>A392</u>	<u>All</u>	<u>No. 9</u>	
	<u>A491</u>	<u>All</u>	<u>No. 9</u>	
<u>F668</u>	<u>All</u>	<u>No. 9</u>		
<u>Posts</u>	<u>A702</u>	<u>50</u>	<u>Carbon, Rail</u>	<u>Tensile or Hardness</u>
<u>Pipe, Tube</u>	<u>A53</u>	<u>A, B</u>	<u>E, F, S</u>	<u>Grade, Finish</u>
	<u>F1083</u>	<u>Schedule 40</u>	<u>High Strength</u>	<u>Schedule</u>
	<u>F1043</u>	<u>1C</u>	<u>All</u>	<u>Group, Coating,</u> <u>Type</u>
		<u>1A</u>	<u>High strength</u>	
<u>Beam</u>	<u>A36</u>	<u>36</u>	<u>All Shapes</u>	<u>Grade, Killed</u>
	<u>A572</u>	<u>42</u>		
	<u>A992</u>	<u>50</u>		
<u>Sheets</u>	<u>A1011</u>	<u>36, 45, 50</u>	<u>HSLAS, HSLAS-F,</u> <u>SS</u>	<u>Designation, Style</u>

~~962-8.8 Steel Pipe Piling: Provide seamless, or longitudinal or helical welded pipe conforming to the requirements of API 5L Grade L320, X46 or higher, or ASTM A252 Grade 3. Provide longitudinal or helical welded pipe with only complete joint penetration (CJP) welds conforming to the requirements of API 5L or AWS D1.1.~~

~~962-108.49 Steel Grates: Provide steel grating in accordance with this section and Table 962-14. When vaned gratings are specified, AASHTO HL-93 load testing may be substituted for tensile testing when specified in the contract documents. When Alternate G is specified, provide galvanizing in accordance with 962-11.1. Grade 50 steel per ASTM A242/A242 M, A572/A572 M or A588/A588 M for grates. Galvanize grates in accordance with 962-9 when "Alt. G" grates are specified in the Plans.~~

~~Use producers listed on the Department's Production Facility Listing for galvanizing.~~

<u>Table 962-14</u> <u>Requirements for Steel Grating</u>				
<u>Product</u>	<u>Standard</u>	<u>Grade</u>	<u>Type/ Style</u>	<u>Reportable Properties</u>
<u>Steel Grating</u>	<u>A242</u>	<u>50</u>	<u>1</u>	<u>Composition, Tensile*, Killed</u>
	<u>A572</u>		<u>1, 2, 3, 5</u>	<u>Composition, Tensile*, Size, Killed</u>
	<u>A588</u>		<u>A, B, K</u>	<u>Composition, Tensile*, Fine Grain</u>
	<u>A1011</u>	<u>Any</u>	<u>SS, HSLAS, HSLAS-F</u>	<u>Designation, Style</u>
<u>* AASHTO HL-93 may be substituted for tensile testing for vaned gratings when specified.</u>				

962-~~11~~9 Galvanizing.

962-~~11~~9.1 Plates, Structural Shapes, Bars, and Strip: When galvanizing is specified in the Contract Documents for ferrous metal products, ~~other than fasteners and hardware items,~~ provide galvanizing in accordance with the requirements of ASTM A123, ~~Specifications for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products~~ Zinc composition shall meet “Intermediate Grade” in accordance with ASTM B6. Use galvanizers listed on the Department’s Production Facility Listing for hot-dip galvanizing.

<u>Table 962-15</u> <u>Requirements for Galvanizing Bath Composition</u>			
<u>Product</u>	<u>Zinc (Zn)</u>	<u>Lead (Pb)</u>	<u>Tin (Sn)</u>
<u>Galvanizing Bath</u>	<u>≥ 99.00%</u>	<u>≤ 0.50%</u>	<u>≤ 0.10%</u>

962-11.2 Castings: When Alternative G castings are specified in the contract documents, provide galvanizing in accordance with the requirements of ASTM A123. Zinc composition shall meet 962-11.1.

962-~~11~~9.32 Fasteners and Hardware:

962-11.3.1 Fasteners and Hardware Designated Not High-Strength: When zinc coating is required in the cContract dDocuments, ~~fasteners and hardware items shall be galvanized~~ provide galvanizing of stell or malleable iron in accordance with the requirements of ASTM A153, ~~Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware, except for high strength fasteners as noted below:~~

- ~~1. Do not galvanize Grade A490 bolts.~~
- ~~2. Mechanically galvanize Grade A3125 Type 1 bolts in accordance with ASTM B695, Class 55.~~
- ~~3. For all anchor rods and hardware treat the coated rods, nuts and washers with chromate after coating in a water solution containing 0.2% sodium dichromate 3 ounces/10 gallons. Coat the bolt, nut and washer used in the fastener assembly by the same zinc process, and submit a test report on the zinc coating thickness.~~

~~4. For anchor rods fabricated from material having a yield strength greater than 80,000 psi, apply an electroplated zinc coating SC 3, Type II in accordance with ASTM B633.~~

~~**962-9.3 Qualifications of Galvanizer:** Use galvanizers listed on the Department's Production Facility Listing. Producers seeking inclusion shall meet the requirements of Section 105.~~

962-11.3.2 Fasteners and Hardware Designated as High-Strength: When zinc coating is required in the Contract Documents, provide galvanizing in accordance with Table 962-16. Coating of ASTM F3125, A490 bolts is prohibited. Bake all hot dipped or electroplated bolt, rod, or bar with a tensile strength greater than or equal to 150 ksi to remove any residual hydrogen.

<u>Table 962-16</u>				
<u>Coating Requirements for Fastener and Hardware</u>				
<u>Designated as High-Strength</u>				
<u>Product</u>	<u>ASTM</u>	<u>Grade</u>	<u>Type/Style</u>	<u>Coating Finish</u>
<u>Bolts</u>	<u>F3125</u>	<u>A325</u>	<u>1</u>	<u>ASTM B695, Class 55</u> <u>ASTM F2329</u>
		<u>A490</u>	<u>All</u>	<u>Do Not Galvanize</u>
<u>Anchor Rods</u>	<u>F3125</u>	<u>A325</u>	<u>1</u>	<u>ASTM B633 SC 3, Type II</u>
		<u>A490</u>	<u>All</u>	<u>Do Not Galvanize</u>
	<u>F1554</u>	<u>105</u>	<u>All</u>	<u>ASTM B633 SC 3, Type II</u>
<u>Anchor Rods</u>	<u>F1554</u>	<u>36, 55</u>	<u>All</u>	<u>ASTM B695 Class 55</u> <u>ASTM F2329</u>
<u>Nuts</u>	<u>A563</u>	<u>A, C, D, C3, DH,</u> <u>DH3</u>	<u>Hex, Heavy</u> <u>Hex</u>	
	<u>A194</u>	<u>1, 2</u>	<u>All</u>	
<u>Washers</u>	<u>F436</u>	<u>Circular, Beveled,</u> <u>Clipped, Extra</u> <u>Thick</u>	<u>1</u>	
	<u>F844</u>	<u>Round,</u> <u>Miscellaneous</u>	<u>A</u>	
<u>DTI Devices</u>	<u>F959</u>	<u>A325</u>	<u>1</u>	

962-120 Certifications and Verification.

962-120.1 General: Provide certifications for steel directly from the Mill. Mill certifications shall show compliance to the specification and include the reportable properties and supplementary requirements from the applicable sections listed above.

When secondary processing, or testing has occurred, in addition to the mill certificate, provide a certified mill analysis signed by a quality control representative that show compliance with and the test results of the applicable sections listed above.

When material meeting "Buy America" is specified, the mill certification or certified mill analysis shall identify that the included material meets the Source of Supply-Steel requirements in Section 6. Supply a certified mill analysis to the Engineer for all metal materials to be used in fabrication, including but not limited to plates, bars, shapes, and fasteners in accordance with their respective ASTM or AASHTO specification. Show or attach the full and complete

~~designation of the project for which the materials are intended for use and specifically cross-identify each furnished piece to the order material.~~

~~—————Material meeting equivalent AASHTO and ASTM specifications may be supplied under either specification. Provide materials in accordance with the latest edition of the specifications shown below, as approved by the Engineer.~~

~~—————**962-10.2 Conformance:** The certified mill analysis will indicate that the material is in conformance with the applicable material specification and will include actual values from required tests. Check the certified mill analysis against the appropriate specification to ensure that materials conform to Contract Documents.~~

~~—————**962-10.3 Certified Mill Analysis Source:** The certified mill analysis must originate from the producer of the material and not from a supplier. Material from stock may only be accepted if it can be positively identified and the appropriate documentation is submitted.~~

~~—————**962-10.4 Verification Samples:** Provide verification samples in accordance with Section 6.~~

~~962-11 Heat Treatments.~~

~~—————Provide procedures and perform heat treatments in accordance with Section 460.~~