

SECTION 962
STEEL AND OTHER FERROUS METALS AND METAL ITEMS

962-1 Mill Tests and Analysis Reports.

For structural steel items, including rivets, bolts, etc., the Contractor shall supply the Engineer, if requested, with a certified copy of detailed mill inspection and chemical reports made by a reliable engineering firm capable of making such inspection and report in accordance with these specifications and best practice. Unless otherwise so indicated in the plans, mill inspection will be waived, in which case the Contractor shall furnish the State Materials Engineer, at Gainesville, six certified copies of mill tests and analysis reports of such structural shapes as bear the manufacturer's name and melt number and when such identification does not exist the Engineer may require samples for test purposes to be cut from such material and tests made and reported by a reputable laboratory; all expenses being borne by the Contractor. Each copy of the reports shall show the designation of the project on which the materials are intended to be used. The Contractor will not be required to furnish shop inspection reports. As an exception to the above, at the discretion of the Engineer, mill tests and analysis reports for small orders from fabricators and warehouses may be waived.

When requested by the Inspector, the Contractor shall supply satisfactory scales and shall perform, in the presence of the Inspector, all work involved in handling and weighing any material to be incorporated in the finished structure. If the weight of any member or piece of material is more than 2% less than the computed weight, such shall be cause for rejection.

Certified mill analysis reports furnished the Department by manufacturers of foreign structural steel and steel H piling may be subject to verification by the Department. The cost of such verification whether performed by the Department or a commercial laboratory will be borne by the Contractor.

962-2 Miscellaneous Steel (ASTM Designations).

The Steel items listed below shall conform to the ASTM Designations, as shown.

Structural Carbon Steel (except where specified otherwise in the plans)	ASTM A 36 [ASTM A 36M]
Carbon Steel (for welded construction)	ASTM A 36 [ASTM A 36M]
Low-Alloy Steel	(as shown in the plans)
Machine Bolts, Nuts and Tap Bolts	ASTM A 307
High-Strength Bolts, Nuts and Hardened Washers	ASTM A 325 [ASTM A 325M]
Low-Alloy Steel Sheet for Fillers	ASTM A 607, Grade 50 [345], Class 1

In addition to the requirements above, steel items shall conform to the ASTM specifications for the grades of steel designated below as modified.

(1) Grade A36 [250] specification ASTM A 36 [ASTM A 36M].

(a) The second sentence of paragraph 1.2 of ASTM A 36 [ASTM A 36M] is deleted and the following sentence is inserted: "These shall apply only when shown on the plans except that Supplementary Requirement S3 is mandatory for main load carrying components subject to tensile stress."

(b) Paragraph S3 is added to ASTM A 36 [ASTM A 36M] as follows: "The material supplied shall meet the longitudinal Charpy V-notch tests specified in Table A. Sampling and testing procedures shall be in accordance with ASTM A 673 [ASTM A 673M]. The (H) frequency of heat testing shall be used."

TABLE A	
Thickness-inches [millimeters]	Group 1-See Footnote
up to 4 inches [100 mm]	15 ft. lb. @ 70°F [20 J @ 21°C]

Footnote:

Group 1: Minimum service temperature 0°F [-18°C] and above.

(2) Grade A 440.

(a) Add new paragraph 1.2 as follows: "Supplemental requirements are provided where improved notch toughness is important. These supplemental requirements S1 are mandatory for main load carrying member components subject to tensile stress."

(b) Add new paragraph S1 as follows: "The material supplied shall meet the longitudinal Charpy V-notch tests specified in Table A. Sampling and testing procedures shall be in accordance with ASTM A 673 [ASTM A 673M]. The (H) frequency of heat testing shall be used."

TABLE A	
Thickness-inches [millimeters]	Group 1-See Footnote
up to 4 inches [100 mm]	15 ft. lb. @ 70°F [20 J @ 21°C]

Footnote:

Group 1: Minimum service temperature 0°F [-18°C] and above.

(3) Grade A 441.

(a) Add new paragraph 1.2 as follows: "Supplemental requirements are provided where improved notch toughness is important. These supplemental requirements S1 are mandatory for main load carrying member components subject to tensile stress."

(b) Add new paragraph S1 as follows: "The material supplied shall meet the longitudinal Charpy V-notch tests specified in Table A. Sampling and testing procedures shall be in accordance with ASTM A 673 [ASTM A 673M]. The (H) frequency of heat testing shall be used."

TABLE A	
Thickness-inches [millimeters]	Group 1-See Footnote
up to 4 inches [100 mm]	15 ft. lb. @ 70°F [20 J @ 21°C]

Footnote:

Group 1: Minimum service temperature 0°F [-18°C] and above.

(4) Grade A 242 [242M] specification ASTM A 242 [ASTM A 242M].

(a) Add new paragraph 1.2 as follows: "Supplemental requirements are provided where improved notch toughness is important. These supplemental requirements S1 are mandatory for main load carrying member components subject to tensile stress."

(b) Add new paragraph S1 as follows: "The material supplied shall meet the longitudinal Charpy V-notch tests specified in Table A. Sampling and testing procedures shall be in accordance with ASTM A 673 [ASTM A 673M]. The (H) frequency of heat testing shall be used."

TABLE A	
Thickness-inches [millimeters]	Group 1-See Footnote
up to 4 inches [100 mm]	15 ft. lb. @ 70°F [20 J @ 21°C]

Footnote:

Group 1: Minimum service temperature 0°F [-18°C] and above.

(5) Grade A 588 [588M] specification ASTM A 588 [ASTM A 588M].

(a) Add new paragraph 1.2 as follows: "Supplemental requirements are provided where improved notch toughness is important. The supplemental requirements S1 are mandatory for main load carrying member components subject to tensile stress."

(b) Add new paragraph S1 as follows: "The material supplied shall meet the longitudinal Charpy V-notch tests specified in Table A. Sampling and testing procedures shall be in accordance with ASTM A 673 [ASTM A 673M]. The (H) frequency of heat testing shall be used."

TABLE A*	
Thickness-inches [millimeters]	Group 1-See Footnote
up to 4 inches [100 mm] mechanically fastened	15 ft. lb. @ 70°F [20 J @ 21°C]
up to 2 inches [50 mm] welded	15 ft. lb. @ 70°F [20 J @ 21°C]
over 2 to 4 inches [50 to 100 mm] welded	20 ft. lb. @ 70°F [27 J @ 21°C]
Footnote: Group 1: Minimum service temperature 0°F [-18°C] and above.	
*If the yield point of the material exceeds 65 ksi [450 MPa], the temperature for the CVN value for acceptability shall be reduced by 15°F [8°C] for each increment of 10 above 65 ksi [70 above 450 MPa]	

(6) Grade A 572 [572M] specification ASTM A 572 [ASTM A 572M].

(a) Delete existing paragraph 1.2. Add new paragraph 1.2 as follows:

"Supplemental requirements S2.1 are provided where improved notch toughness is important. These supplemental requirements are mandatory for main load carrying member components subject to tensile stress."

(b) Add new paragraph S2.1 as follows: "The materials supplied shall meet the longitudinal Charpy V-notch tests specified in Table A. Sampling and testing procedures shall be in accordance with ASTM A 673 [ASTM A 673M]. The (H) frequency of heat testing shall be used."

TABLE A*	
Thickness-inches [millimeters]	Group 1-See Footnote
up to 4 inches [100 mm] mechanically fastened	15 ft. lb. @ 70°F [20 J @ 21°C]
up to 2 inches [50 mm] welded	15 ft. lb. @ 70°F [20 J @ 21°C]
Footnote: Group 1: Minimum service temperature 0°F [-18°C] and above.	
*If the yield point of the material exceeds 65 ksi [450 MPa], the temperature for the CVN value for acceptability shall be reduced by 15°F [8°C] for each increment of 10 above 65 ksi [70 above 450 MPa]	

(7) Grade A 514 [514M] specification ASTM A 514 [ASTM A 514M].

(a) Add new paragraph 1.3 as follows: "Supplemental requirement S3 is mandatory for main load for carrying member components subject to tensile stress."

(b) Add new paragraph S3 as follows: "The material supplied shall meet the longitudinal Charpy V-notch tests specified in Table A. Sampling and testing procedures shall be in accordance with ASTM A 673 [ASTM A 673M]. The (P) frequency testing shall be used."

TABLE A	
Thickness - inches [millimeters]	Group 1-See Footnote
up to 4 inches [100 mm] mechanically fastened	25 ft. lb. @ 30°F [35 J @ -1°C]
up to 2 1/2 inches [65 mm] welded	25 ft. lb. @ 30°F [35 J @ -1°C]
over 2 1/2 to 4 inches [65 to 100 mm] welded	35 ft. lb. @ 30°F [45 J @ -1°C]

Footnote:

Group 1: Minimum service temperature 0°F [-18°C] and above.

962-3 Steel Castings.

Steel castings shall conform to the requirements of ASTM A 27 [ASTM A 27M]. Unless otherwise shown in the plans all castings shall be Grade 65 to 35 [450 to 240].

962-4 Steel Forgings.

Steel forgings from which pins, rollers, trunnions, shafts, gears, or other forged parts are to be fabricated shall conform to ASTM A 668 [ASTM A 668M]. Unless otherwise specified, Class C shall be used.

962-5 Cold-Rolled Steel.

Cold-rolled steel for shafting shall conform to the requirements of ASTM A 108, for the grade specified or shown on approved shop plans.

962-6 Annealing.

Steel parts requiring their full strength, and which have been partially heated, shall be subsequently annealed. Slight bends in pieces of secondary importance may be made without heating the metal. Crimped web stiffeners need not be annealed.

The annealing shall be done by heating uniformly to the proper temperature, followed by slow and uniform cooling in the furnace. The temperature of the pieces shall be under full control at all stages.

A record of the annealing charges shall be furnished the Engineer showing the pieces included in each charge and the treatment they received.

962-7 Galvanizing Structural Steel and Accessories.

962-7.1 Fasteners: Bolts, nuts, washers and other fastener items shall be galvanized in accordance with the requirements of ASTM A 153 [ASTM A 153M]. When zinc coating is required by the plans or specifications for high strength bolts, nuts and washers, the supplier has the option of furnishing either hot-dip galvanized (Class C of ASTM A 153 [ASTM A 153M]) or mechanically deposited zinc coated (Class 50 of ASTM B 695) products unless the specific process is called for in the plans or specifications. The bolt, nut and washer used in the fastener assembly shall be coated by the same process, i.e., hot-dip or mechanically deposited. After erection, the bolts, nuts, and washers shall be cleaned of all oil and deleterious material and then painted according to the written recommendations of the manufacturer of the structural steel zinc primer paint.

962-7.2 Shapes, Plates, Bars and Strips: Zinc coatings applied by dipping in a molten bath of zinc onto structural steel articles or products fabricated from structural steel shapes, plates, bars, and strips $\frac{1}{8}$ inch [3 mm] thick and heavier, shall conform to the requirements of ASTM A 123 [ASTM A 123M], ASTM A 143 and ASTM A 384, except as follows:

(a) When dipping in a molten bath of zinc produces detrimental effects such as distortion, warpage and embrittlement to the steel which has been designated in the plans to be used, the Contractor shall select an alternate grade of steel suitable for fabrication and galvanizing without detrimental effect.

(b) When the Contractor selects an alternate grade of steel to that designated in the plans he shall submit his selection together with appropriate redesign computations to the Engineer for approval.

(c) Redesign computations to accommodate the substitution of an alternate grade steel shall demonstrate that the finished product is equal to or better, in all respects, than the original design.

Mechanical galvanizing shall be permitted when the materials specified in the plans or specifications are of the type which can be mechanically galvanized with no detrimental effects on the material. When mechanical galvanizing is utilized, the process shall be in accordance with ASTM B 695 unless otherwise required by the plans and specifications. Chromate treatment shall not be used unless specifically required in the Contract Documents.

962-8 Gray-Iron Castings (Including Frames and Grates).

Iron castings shall conform to ASTM A 48 [ASTM A 48M] and, for machinery parts, shall be of the No. 30 Classes. For manholes which are to be constructed within the area of vehicular traffic the frames and gratings shall be machine-ground, so that irregularity of contact will be reduced to a minimum and the grates will be rattleproof.

962-9 Steel Materials for Specific Items.

962-9.1 Pipe Railings: Steel or gas pipe used as railing shall conform to the requirements of ASTM A 53, for Standard Weight Pipe.

962-9.2 Steel Sheet Piling: Steel sheet piles shall conform to the requirements of ASTM A 328 [ASTM A 328M], including the requirement for copper content.

962-9.3 Steel Sign Supports and Accessories:

962-9.3.1 Steel Materials: The steel members for the sign supports shall meet the particular specifications called for in the plans.

962-9.3.2 Galvanizing of Steel Members: The steel members for sign supports shall be galvanized in accordance with the requirements of 962-7.

962-9.3.3 Bolts, Nuts and Washers: Steel bolts, nuts and lockwashers shall meet the requirements of ASTM A 307 unless otherwise specified. Bolts, nuts and lockwashers shall be galvanized in accordance with ASTM A 153 [ASTM A 153M].

962-10 Steel for Concrete Reinforcement, Fencing and Guardrail.

The requirements for the steel for these items are contained in the following Sections.

Reinforcing Steel for Concrete Pavement and for Structural Concrete.....	Section 931
Guardrail Materials.....	Section 967