

## DIVISION C600 – STRUCTURES

### SECTION C600 – GENERAL STRUCTURES INFORMATION

**C600.01 General.** This materials division includes structures consisting of various items including: timber and concrete structural components; reinforcement materials, steel structural components; paint; block and brick construction; pipe (reinforced concrete, corrugated, and HDPE); and various other structural components. The sampling and testing requirements for each of these items vary, depending on the use of material and the types of materials incorporated into the item. The following pages describe the sampling and testing procedures followed for each of the items. Some of these items are not tested by Materials & Research personnel, but are instead certified by manufacturer testing. Materials are sampled at the frequencies listed in Table B-1; however, the Department reserves the right to obtain samples at a greater frequency if it is deemed necessary by the Engineer.

### SECTION C601 – TIMBER STRUCTURES

**C601.01 Item Description and Acceptance Guidelines.** Timber structures consist of construction items that are composed of treated, untreated, and structural glue-laminated (glulam) timber. The acceptance of timber materials is based primarily on visual inspection and dimensional check.

**C601.02 Obtaining Samples.** Timber samples are selected randomly and are inspected at a rate of 1 sample per production day.

**C601.03 Tests Performed.** Timber products are visually inspected for defects and correct dimensions to ensure that the materials are acceptable for use in construction. Timber products are also checked for conformance to the applicable material standards listed in Table B-1.

**C601.04 Test Report Evaluations and Distributions.** Visual inspection reports and Form LB 100 (Part E) are distributed as follows:

(1) copy	Lab file
(2) copies	Construction Engineer

### SECTION C602 – CONCRETE STRUCTURES

**C602.01 Item Description and Acceptance Guidelines.** This section covers materials used in the placement of Portland cement concrete for structures. Additional Items included in this section are joint sealant materials, joint fillers, and admixtures. Also included in this section are steel bridge deck forms and supports, pipe for weep holes, sheet metal, form oil, and waterstops.

**C602.02 Obtaining Samples.** Portland cement concrete for structural use is sampled at the same rate as Portland cement concrete for rigid pavements. (See Table C-15)

**C602.03 Handling, Packaging, and Shipping.** The handling, packaging, and shipping requirements for structural Portland cement concrete are the same as those for construction of rigid pavements. Requirements are described in Section C500.04.

**C602.04 Tests Performed.** Portland cement concrete materials used in structures are tested in accordance to the methods listed in Table C-19. All galvanized materials and steel bridge deck forms are visually inspected for defects and checked for proper dimensions.

**C602.05 Test Report Evaluations and Distributions.** Test results are recorded on form LB-90, shown in Part E, and is distributed as follows:

(1) copy	Central Lab Contract File
(1) copy	Test File
(2) copies	Construction Engineer
(1) copy	Supplier

## **SECTION C603 – BAR REINFORCEMENT**

**C603.01 Item Description and Acceptance Guidelines.** Suppliers of deformed steel bars and other reinforcing materials for Department projects are required to provide either certification or the results of mill analysis for each size and heat supplied by the producing mill.

**C603.02 Obtaining Samples.** Samples of bar reinforcement may be taken at the mill, fabrication plant, or project site as deemed necessary by the Engineer. When straight bars are to be used for concrete reinforcement, samples may be taken and tagged at either the mill or the project site. An example of a sample tag used for straight bars (LB-67) is in Part E.

Samples of bent bars for use in structures and other types of construction may be sampled and tagged at the fabrication plant. An example of a sample tag used for bent bars (LB-67) is provided in Part E.

**C603.03 Tests Performed.** While a large quantity of bar reinforcement is accepted based on the manufacturer's certification, quality assurance tests may be performed on samples obtained from the fabrication plants. Tests that may be performed on bar reinforcement for quality assurance are listed in Table B-1.

**C603.04 Test Report Evaluations and Distributions.** For certified bar reinforcement and other related materials, the mill or fabrication plant must submit three copies of the mill analysis report to the Materials & Research Section.

The results of quality assurance tests performed on bar reinforcement are reported on form LB-90. (See Part E for an example)

## SECTION C605 – STEEL STRUCTURES

**C605.01 Item Description and Acceptance Guidelines.** The term steel structures refers to the various parts, members, and related items necessary for the completed structure including the structural steel, rivets, bolts, nuts, washers, shear connectors, castings, machine parts, grating, bearing pads, and paint. Section 605 in the Standard Specifications contains details concerning steel structures.

Structural steel may be carbon steel or high-strength, low-alloy steel of various compositions. The steel may be a stain resistant type that does not require paint or a more commonly used non-stain resistant type that requires shop and field painting. The type of steel required for a given structure is specified in the Special Provisions and on the Plans for each project.

Paint used for a steel structure is sometimes a bid item, but also can be included in the item used for the steel structure. Many different types of paint are used on Department projects, and the requirements vary for each. Traffic Marking paints are the only types of paint that are tested in the laboratory.

**C605.02 Obtaining Samples.** Steel samples are selected at random for inspection of visual and dimensional defects.

Paint samples are typically taken at a rate of 1 sample per source per contract. Paint is primarily accepted on the manufacturers' certification of physical properties; however, samples are obtained for reference and to be tested for viscosity, density, pigment, and percentage of solids.

**C605.03 Tests Performed.** All materials used in the fabrication of structures shall conform to Section 605 of the Standard Specifications, as well as all applicable Special Provisions and Plan Notes. Table B-1 lists the applicable test procedures.

For Department projects involving major steel structures, an inspector may be assigned to the rolling mill producing the steel. The inspector observes production and witnesses sampling and testing, both chemical and physical, of the steel. If an inspector is not assigned to the mill producing the steel, the mill is required to furnish certified chemical and physical test data for the major steel items to the fabricator. Miscellaneous items such as rivets, bolts, nuts, washers, and similar items may be accepted from stock supply with appropriate certification.

An inspection of the curing, forming, welding, grinding, and metal preparation activities is conducted at the fabrication shop. Department personnel may perform the inspection; however, in the majority of cases a materials consultant under contract to Materials & Research will conduct the inspection. The Department inspector or materials consultant will attach an inspection tag or stencil to the steel at the fabrication shop. The tag or stencil notifies project personnel that the steel was inspected prior to delivery to the project site.

Certification requirements for paint used for steel structures are listed in Section 820 of the Standard Specifications. When paint is approved, the containers are stenciled with the inspection agency's insignia and numbered identification tags are attached to each container.

**C605.04 Test Report Evaluations and Distributions.** Unless directed otherwise by the Engineer, mill inspection reports and shop inspection reports are distributed as follows:

(1) copy	Project File in Materials & Research Section
(2) copies	Construction Engineer
(1) copy	Inspection Agency File

## **SECTION C611 – BLOCK AND BRICK MASONRY**

**C611.01 Item Description and Acceptance Guidelines.** Concrete block and brick (clay or concrete) are generally used on minor items of construction such as catch basins and manholes. In order to ensure adequate service life and performance of these structures, the materials must conform to Section 611 of the Standard Specifications and the contract Special Provisions.

Unless required by the contract Special Provisions, inspection and testing of block and brick will be conducted on a source basis rather than a project basis. Inspection and testing of block and brick will be performed on a project basis when special materials are required for a project. Material requirements are also shown for each item in Table B-1.

**C611.02 Obtaining Samples.** A Materials & Research Section Technician will visit the source and obtain representative samples for testing. Materials & Research Section personnel will also periodically visit various project sites to obtain samples of delivered materials. The rate of sampling varies with the type of material and conditions. Table C-23 lists the required sampling methods. Samples are labeled according to the system described in Table C-24. An example of a sample tag (LB-67) is shown in Part E.

**C611.03 Tests Performed.** Block and brick masonry samples are tested according to the applicable procedures shown in Table C-25. An example of an inspection report (LB-100) is shown in Part E.

## **SECTION C612 – REINFORCED CONCRETE PIPE**

**C612.01 Item Description and Acceptance Guidelines.** If cast-in-place reinforced concrete pipe is to be used on a project, approval is based on sampling and testing the material components of the pipe (cement, fine and coarse aggregate, and wire reinforcement).

**C612.02 Production and Operations.** Precast reinforced concrete pipe may be tested by two different methods. The Department is currently using a Quality Assurance/Quality Control (QA/QC) process to accept pipe. Under the guidelines of the QA/QC program, the manufacturer must submit the design of their program. The manufacturer then supplies the pipe to State projects according to their QA/QC program. The visual inspection and stamping of the pipe is the manufacturer's responsibility. Under the guidelines for the pipe QA/QC program, Department technicians or a representative still witnesses the strength tests.

In addition to the QA process, pipe may be tested according to the procedure described below. Each manufacturer of concrete pipe that regularly supplies products for Department projects will be considered an approved source provided that the requirements described in this Section are satisfied.

- (a) The manufacturer may request approval of stock in its storage yard. Personnel from the Materials & Research Section will inspect a sufficient quantity of various pipe sizes necessary.
- (b) The manufacturer will then be permitted to furnish the inspected pipe to all projects for which they have been submitted as the source of supply. At the end of each month, the manufacturer must inform the Materials & Research Section of the footage of each size of pipe shipped to each project. The Materials & Research Section will then prepare the necessary documents to advise the project personnel of the quantities of pipe inspected and shipped to each project.
- (c) If any questions arise concerning material used in production of the pipe, its load bearing capacity, or other properties, the questions should be directed to the Materials & Research Section. The date of manufacture (found on each section of pipe with the class) is necessary to obtain information concerning particular sections of pipe from records in the Central Laboratory.
- (d) If specially designed pipe is required or other unusual circumstances develop, the pipe will be inspected on a project basis. All reports in this scenario will be referenced to the specific project.

**C612.03 Obtaining Samples.**

- (a) *Precast Pipe.* Samples of pipe and materials are obtained using the sampling rates and procedures listed in Table C-22.
- (b) *Cast-In-Place Pipe.* For testing purposes, 6" x 12" (150 mm x 300 mm) concrete cylinders are made in the field. Four cylinders are made for each compression test that is to be performed. Cylinders are first field cured for 24 to 48 hours, and remain under moist conditions after this time until testing is conducted. Testing is performed according to AASHTO T23.

Sampling of materials that are used in the construction of cast-in-place concrete pipe is performed at the rates listed in Table C-21.

**Table C-21: Sampling Rates of Cast-In-Place Concrete Pipe**

<b>Material</b>	<b>Sample Size</b>	<b>Frequency</b>	<b>Sample Tag</b>
Cement	10 lb (4.5 kg)	Minimum 1 / month	LB-67
Fine Aggregate	10 lb (4.5 kg)	Minimum 1 / month	LB-67
Coarse Aggregate	30 lb (13.5 kg)	Minimum 1 / month	LB-67
Wire Reinforcement	12" x 36" (300mm x 900mm)	Each size	LB-67
Absorption Sample	6" x 6" (150mm x 150mm)	4 / year	LB-67

**C612.04 Handling, Packaging, and Shipping.** Because each manufacturer will ship from inspected stock, no reports on tests of materials used in the pipe manufacture, or reports on load bearing tests will be sent to the project receiving the pipe. The receipt of a shipment of pipe to a project (from the source for that project) with inspection marks should indicate to the project inspector that the pipe is satisfactory for use. However, if the pipe contains visible defects or apparent damage when it is delivered to the project, the inspector should reject the pipe and have it removed from the project.

**C612.05 Tests Performed.**

(a) *Precast Pipe.* Prior to inspection of precast pipe, samples of materials used on Department projects are obtained for testing for conformance to AASHTO M170 for circular pipe and AASHTO M207 for elliptical pipe. The following procedure is followed for testing of pipe in stock.

- (1) Materials & Research Section Technicians are advised of the size and footages submitted by the manufacturer for inspection.
- (2) Samples of pipe, representative of the lot submitted for inspection, are selected for load bearing tests according to the schedule listed in Table C-22.

**Table C-22: Load Bearing Test Schedule**

Pipe Diameter	Sampling Rate	Test To
29" (74 cm) and Under	1 test / 200 pieces of pipe	Ultimate Load
30" (76 cm) – 48" (122 cm)	1 test / 200 pieces of pipe	First Crack
49" (125 cm) and Over	1 test / 200 pieces of pipe or test cylinder	First Crack

- (3) The results of load bearing tests are reported on form LB-92 (Part E).
- (4) If the results of the load-bearing tests are satisfactory, the Materials & Research Technician then performs a visual inspection of the pipe in stock and pieces are marked with the standard stencil (DDOT). If the results of the load-bearing test do not meet specification requirements, another piece of pipe manufactured the same day as the first piece tested will be selected at random and tested. Should the retest not be satisfactory, all pipes manufactured on that date will not be considered for use on Department projects. No additional testing is required if the pipe is determined to be unsatisfactory. If, however, the retest is satisfactory, the pipe represented will be considered for the visual inspection.

(b) *Cast-In-Place Pipe.* Table B-1 lists the required testing procedures for pipe materials. The material is required to meet minimum compressive strength as required by AASHTO.

**C612.06 Test Report Evaluations and Distributions.**

- (a) *Precast Pipe.* The following test reports are maintained in Central Laboratory files:

Pipe manufacture materials tests  
Manufacturer load bearing tests

Reports regarding specialty pipe will be maintained in the contract file of the Materials & Research Section.

The distribution of form LB-92 is as follows:

Original	Materials Section
(1) copy	Producer of pipe
(1) copy	Pipe test file
(1) copy	Pipe plant reference file
(1) copy	Materials Supervisor

- (b) *Cast-In-Place Pipe.* Test reports from materials sampled for cast-in-place concrete pipe are distributed as follows:

(1) copy	Pipe Manufacturer
(1) copy	Pipe Test File
(1) copy	Pipe plant reference file
(1) copy	Materials Supervisor

The original copy is maintained by the unit that generated the report.

**SECTION C614 – CORRUGATED PIPE**

**C614.01 Item Description and Acceptance Guidelines.** Corrugated metal pipe used on Department projects must be tested prior to use. Acceptance of the pipe is by manufacturer’s certification and visual inspection.

Corrugated polyethylene pipe is used on some construction projects in various dimensions. This type of pipe is primarily certified for use on Department projects. The item for this type of pipe consists of the joints and the pipe itself.

**C614.02 Production and Operations.** Manufacturers of corrugated metal pipe shall submit 3 copies of a certification stating that the pipe and bands conform to Section 614 of the Standard Specifications. The applicable tests and material specifications required are shown in Table B-1. If bituminous coating and/or paving is specified, the certification will also note that the bituminous material used for the coating and/or paving meets the requirements of 614.03 of the Standard Specifications.

**C614.03 Tests Performed.**

- (a) *Corrugated Metal Pipe.* In addition to supplying the required certifications, the manufacturer or contractor must notify the Materials & Research Section of the date and time of delivery to the project so that a visual inspection can be conducted. A report of this inspection is made on form LB-100.

In instances where small quantities are involved, the pipe may be used on manufacturer's certification only with an attached cover letter.

- (b) *Corrugated Polyethylene Pipe.* For pipes larger than 12" (300 mm) in diameter, the manufacturer must certify that pipe materials conform to AASHTO M294 material standards. For pipes smaller than 12" (300 mm) in diameter, pipe materials must conform to the material requirements of AASHTO M252. Manufacturer tests must demonstrate that the pipe conforms to stiffness requirements when tested according to ASTM D2412. Gaskets used in fittings must conform to ASTM F477 and the joint system must conform to ASTM D3212. The contractor using this pipe must provide a manufacturer's certificate stating that the pipe meets these requirements.

**C614.04 Test Report Evaluations and Distributions.**

- (a) *Corrugated Metal Pipe.* Form LB-100 is distributed as follows:

(1) copy	Contract file in the Central Lab
(2) copies	Construction Engineer
(1) copy	Supplier

- (b) *Corrugated Polyethylene Pipe.* Manufacturer's Certification is distributed as follows:

(1) copy	Contract file in the Central Lab
(2) copies	Construction Engineer
(1) copy	Supplier



<b>Table C-23: Division 600 - Sampling Methods</b>	
<b>Method ID</b>	<b>Method Name</b>
DOH 5	Sampling Stone, Slag, Gravel, Sand, and Sand Block for Use as Highway Materials
DOH 8	Sampling of Portland Cement, 10 Lb Sample
ASTM C172-90	Practice for Sampling Freshly Mixed Concrete
ASTM C149M	Sampling and Testing Masonry Units (Solid Types)
AASHTO T32	Sampling and Testing Brick

<b>Table C-24: Division 600 - Sample Identification Numbering</b>
Pipe Sample Ids include the type of pipe inspected, the number of the inspection in order from the first date of pipe inspection, and the year the inspection occurred. The ID is P-No.-Year.
Brick and Cement Block Ids include the number of the inspection in order from the first date of the pipe inspection and the year the inspection occurred. The ID is K-No. -Year for Brick and N-No.-Year for Cement Block
Coarse aggregate samples start with Test # 1 on January 1 and are numbered consecutively until December 31. Example: D-1-02 D = Delaware , 1 = test number, 02 = Year 2002
Fine aggregate samples are numbered consecutively from the start of the fiscal year, July 1, until June 30 the following year
Concrete Cylinders are numbered consecutively from the beginning of testing at this laboratory, the Sample Identification is E#####, where the # sign represents the number of the test

<b>Table C-25: Division 600 - Test Methods</b>	
<b>Test ID</b>	<b>Test Name</b>
DOH 15	Testing of Reinforcing Steel
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C497	Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile
ASTM D5329	Standard Test Method for Joint Sealants, Hot-Poured, for Concrete and Asphalt Pavements
ASTM E28	Standard Test Methods for Softening Point of Resins Derived from Naval Stores by Ring-and-Ball Apparatus
ASTM G12	Standard Test Method for Nondestructive Measurement of Film Thickness of Pipeline Coatings on Steel
AASHTO T11	Materials Finer Than 75- $\mu$ m (No. 200) Sieve in Mineral Aggregates by Washing
AASHTO T19	Bulk Density ("Unit Weight") and Voids in Aggregate
AASHTO T21	Organic Impurities in Fine Aggregates for Concrete
AASHTO T22	Compressive Strength of Cylindrical Concrete Specimens
AASHTO T23	Making and Curing Concrete Test Specimens in the Field
AASHTO T24	Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
AASHTO T26	Quality of Water to be Used in Concrete
AASHTO T27	Sieve Analysis of Fine and Coarse Aggregates
AASHTO T65	Mass (Weight) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
AASHTO T85	Specific Gravity and Absorbtion of Coarse Aggregate
AASHTO T88	Particle Size Analysis of Soils
AASHTO T89	Determining the Liquid Limit of Soils
AASHTO T90	Determining the Plastic Limit and Plasticity Index of Soils
AASHTO T96	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
AASHTO T97	Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
AASHTO T99	Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
AASHTO T105	Chemical Analysis of Hydraulic Cement
AASHTO T106	Compressive Strength of Hydraulic Cement Mortar (Using 50-mm or 2-in. Cube Specimens)
AASHTO T107	Autoclave Expansion of Portland Cement
AASHTO T119	Slump of Hydraulic Cement Concrete
AASHTO T129	Normal Consistency of Hydraulic Cement
AASHTO T131	Time of Setting of Hydraulic Cement by Vicat Needle
AASHTO T133	Density of Hydraulic Cement

<b>Table C-25 (cont.): Division 600 - Test Methods</b>	
<b>Test ID</b>	<b>Test Name</b>
AASHTO T137	Air Content of Hydraulic Cement Mortar
AASHTO T152	Air Content of Freshly Mixed Concrete by the Pressure Method
AASHTO T153	Fineness of Hydraulic Cement by Air Permeability Apparatus
AASHTO T154	Time of Setting of Hydraulic Cement by Gillmore Needles
AASHTO T162	Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency
AASHTO T186	Early Stiffening of Hydraulic Cement (Paste Method)
AASHTO T196	Air Content of Freshly Mixed Concrete by the Volumetric Method
AASHTO T198	Splitting Tensile Strength of Cylindrical Concrete Specimens
AASHTO T244	Mechanical Testing of Steel Products
AASHTO T277	Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration
AASHTO T280	Concrete Pipe, Manhole Sections, or Tile
AASHTO T299	Rapid Identification of Alkali-Silica Reaction Products in Concrete
AASHTO T303	Accelerated Detection of Potentially Deleterious Expansion of Mortar Bars Due to Alkali-Silica Reaction
AASHTO T309	Temperature of Freshly Mixed Portland Cement Concrete

<b>Table C-26: Division 600 - Certification Test Procedures / Material Standards</b>	
<b>Test ID</b>	<b>Test Name</b>
ASTM A36	Standard Specification for Carbon Structural Steel
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A53	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A105	Standard Specification for Carbon Steel Forgings for Piping Applications
ASTM A106	Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A108	Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality
ASTM A109	Standard Specification for Steel, Strip, Carbon (0.25 Maximum Percent), Cold-Rolled
ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A126	Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A193	Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A194	Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both
ASTM A216	Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service
ASTM A234	Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
ASTM A240	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
ASTM A242	Standard Specification for High-Strength Low-Alloy Structural Steel
ASTM A252	Standard Specification for Welded and Seamless Steel Pipe Piles
ASTM A276	Standard Specification for Stainless Steel Bars and Shapes
ASTM A304	Standard Specification for Carbon and Alloy Steel Bars Subject to End-Quench Hardenability Requirements
ASTM A307	Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
ASTM A325	Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A563	Standard Specification for Carbon and Alloy Steel Nuts

<b>Table C-26 (cont.): Division 600 - Certification Test Procedures / Material Standards</b>	
<b>Test ID</b>	<b>Test Name</b>
ASTM A588	Standard Specification for High-Strength Low-Allow Structural Steel with 50 ksi (345 Mpa) Minimum Yield Point to 4-in. (100mm) Thick
ASTM A615	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A666	Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
ASTM A690	Standard Specification for High-Strength Low-Alloy Steel H-Piles and Sheet Piling for Use in Marine Environments
ASTM A709	Standard Specification for Carbon and High-Strength Low-Alloy Structural Steel Shapes, Plates, and Bars and Quenched-and-Tempered Alloy Structural Steel Plates for Bridges
ASTM B21	Standard Specification for Naval Brass Rod, Bar, and Shapes
ASTM B69	Standard Specification for Rolled Zinc
ASTM B117	Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B221	Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B584	Standard Specification for Copper Alloy Sand Castings for General Applications
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C90	Standard Specification for Loadbearing Concrete Masonry Units
ASTM C109	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. (50-mm) Cube Specimens)
ASTM C145	Standard Specification for Solid Load-Bearing Concrete Masonry Units
ASTM C150	Standard Specification for Portland Cement
ASTM C206	Standard Specification for Finishing Hydrated Lime
ASTM C331	Standard Specification for Lightweight Aggregates for Concrete Masonry Units
ASTM C443	Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C989	Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
ASTM C1107	Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

<b>Table C-26 (cont.): Division 600 - Certification Test Procedures / Material Standards</b>	
<b>Test ID</b>	<b>Test Name</b>
ASTM D93	Standard Test Methods for Flash-Point by Pensky-Martens Closed Cup Tester
ASTM D256	Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics
ASTM D257	Standard Test Methods for DC Resistance or Conductance of Insulating Materials
ASTM D395	Standard Test Methods for Rubber Property-Compression Set
ASTM D412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension
ASTM D445	Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (the Calculation of Dynamic Viscosity)
ASTM D471	Standard Test Method for Rubber Property-Effect of Liquids
ASTM D523	Standard Test Method for Specular Gloss
ASTM D572	Standard Test Method for Rubber-Deterioration by Heat and Oxygen
ASTM D573	Standard Test Method for Rubber-Deterioration in an Air Oven
ASTM D624	Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
ASTM D638	Standard Test Method for Tensile Properties of Plastics
ASTM D785	Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials
ASTM D790	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D792	Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
ASTM D1044	Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion
ASTM D1056	Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber
ASTM D1149	Standard Test Method for Rubber Deterioration-Surface Ozone Cracking in a Chamber
ASTM D1171	Standard Test Method for Rubber Deterioration-Surface Ozone Cracking Outdoors or Chamber (Triangular Specimens)
ASTM D1190	Standard Specification for Concrete Joint Sealer, Hot-Applied Elastic Type
ASTM D1248	Standard Specification for Polyethylene Plastics Extrusion Materials For Wire and Cable
ASTM D1360	Standard Test Method for Fire Retardancy of Paints (Cabinet Method)

<b>Table C-26 (cont.): Division 600 - Certification Test Procedures / Material Standards</b>	
<b>Test ID</b>	<b>Test Name</b>
ASTM D1457	Standard Specification for Polytetrafluoroethylene (PTFE) Molding and Extrusion Materials
ASTM D1475	Standard Test Method for Density of Liquid Coatings, Inks, and Related Products
ASTM D1630	Standard Test Method for Rubber Property-Abrasion Resistance (Footwear Abrader)
ASTM D1640	Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature
ASTM D1644	Standard Test Methods for Nonvolatile Content of Varnishes
ASTM D1654	Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D2084	Standard Test Method for Rubber Property-Vulcanization Using Oscillating Disk Cure Meter
ASTM D2131	Standard Specification for Natural Muscovite Mica Splittings
ASTM D2240	Standard Test Method for Rubber Property-Durometer Hardness
ASTM D2247	Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity
ASTM D2628	Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements
ASTM D2794	Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D3033	Specification for Type PSP Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3034	Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3359	Standard Test Methods for Measuring Adhesion by Tape Test
ASTM D3363	Standard Test Method for Film Hardness by Pencil Test
ASTM D3405	Standard Specification for Joint Sealants, Hot-Applied, for Concrete and Asphalt Pavements
ASTM D3786	Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method
ASTM D4491	Standard Test Methods for Water Permeability of Geotextiles by Permittivity
ASTM D4533	Standard Test Method for Trapezoid Tearing Strength of Geotextiles
ASTM D4833	Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D4632	Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

<b>Table C-26 (cont.): Division 600 - Certification Test Procedures / Material Standards</b>	
<b>Test ID</b>	<b>Test Name</b>
ASTM D5532	Standard Specification for Micaceous Iron Oxide Pigments for Paint
ASTM F593	Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
ASTM F594	Standard Specification for Stainless Steel Nuts
ASTM G12	Standard Test Method for Nondestructive Measurement of Film Thickness of Pipeline Coatings on Steel
ASTM G23	Standard Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) with and without Water for Exposure of Nonmetallic Materials
AASHTO M6	Fine Aggregate for Portland Cement Concrete
AASHTO M31	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
AASHTO M32	Steel Wire, Plain, for Concrete Reinforcement
AASHTO M36	Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains
AASHTO M45	Aggregate for Masonry Mortar
AASHTO M55	Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
AASHTO M80	Coarse Aggregate for Portland Cement Concrete
AASHTO M85	Portland Cement
AASHTO M102	Steel Forgings, Carbon and Alloy, for General Industrial Use
AASHTO M105	Gray Iron Castings
AASHTO M107	Bronze Castings for Bridges and Turntables
AASHTO M108	Wrought Copper-Alloy Bearing and Expansion Plates and Sheets for Bridge and Other Structural Use
AASHTO M111	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
AASHTO M114	Building Brick (Solid Masonry Units Made from Clay or Shale)
AASHTO M133	Preservatives and Pressure Treatment Processes for Timber
AASHTO M152	Flow Table for Use in Tests of Hydraulic Cement
AASHTO M154	Air-Entraining Admixtures for Concrete
AASHTO M160	General Requirements for Steel, Plates, Shapes, Sheet Piling, and Bars for Structural Use
AASHTO M163	Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application
AASHTO M164	High-Strength Bolts for Structural Steel Joints
AASHTO M168	Wood Products
AASHTO M169	Steel Bars, Carbon, Cold-Finished, Standard Quality
AASHTO M170	Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
AASHTO M181	Chain-Link Fence
AASHTO M183	Standard Specification for Structural Steel
AASHTO M190	Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches



<b>Table C-26 (cont.): Division 600 - Certification Test Procedures / Material Standards</b>	
<b>Test ID</b>	<b>Test Name</b>
AASHTO M192	Steel Castings for Highway Bridges
AASHTO M194	Chemical Admixtures for Concrete
AASHTO M195	Lightweight Aggregates for Structural Concrete
AASHTO M196	Corrugated Aluminum Pipe for Sewers and Drains
AASHTO M201	Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes
AASHTO M202	Steel Sheet Piling
AASHTO M203	Steel Strand, Uncoated Seven-Wire for Concrete Reinforcement
AASHTO M207	Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe
AASHTO M218	Steel Sheet, Zinc-Coated (Galvanized), for Corrugated Steel Pipe
AASHTO M219	Corrugated Aluminum Alloy Structural Plate for Field-Bolted Pipe, Pipe-Arches, and Arches
AASHTO M221	Steel Welded Wire Fabric, Deformed for Concrete Reinforcement
AASHTO M222	High-Strength Low-Alloy Structural Steel with 50,000 psi Minimum Yield Point to 4-in. Thick
AASHTO M223	High-Strength Low-Alloy Columbium-Vanadium Steels of Structural Quality
AASHTO M232	Zin Coating (Hot-Dip) on Iron and Steel Hardware
AASHTO M240	Blended Hydraulic Cement
AASHTO M243	Field Applied Coating of Corrugated Metal Structural Plate for Pipe, Pipe-Arches, and Arches
AASHTO M244	High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding
AASHTO M251	Plain and Laminated Elastomeric Bridge Bearings
AASHTO M252	Corrugated Polyethylene Drainage Pipe
AASHTO M253	Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
AASHTO M254	Corrosion Resistant Coated Dowel Bars
AASHTO M255	Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties
AASHTO M270	Carbon and High-Strength Low-Alloy Structural Steel Shapes, Plates, and Bars and Quenched and Tempered Alloy Structural Steel Plates for Bridges
AASHTO M274	Steel Sheet, Aluminum-Coated (Type 2), for Corrugated Steel Pipe
AASHTO M284	Epoxy-Coated Reinforcing Bars: Materials and Coating Requirements
AASHTO M285	Castings, Iron-Chromium-Nickel, Corrosion Resistant, for Sever Service

<b>Table C-26 (cont.): Division 600 - Certification Test Procedures / Material Standards</b>	
<b>Test ID</b>	<b>Test Name</b>
AASHTO M294	Corrugated Polyethylene Pipe, 300 to 1200 mm Diameter
AASHTO M295	Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
AASHTO M298	Coatings of Zinc Mechanically Deposited on Iron and Steel
AASHTO M300	Inorganic Zinc-Rich Primer
AASHTO M301	Joint Sealants, Hot-Poured for Concrete and Asphalt Pavements
AASHTO M302	Ground Iron Blast-Furnace Slag for Use in Concrete and Mortars
AASHTO M307	Microsilica for Use in Concrete and Mortar
AASHTO T68	Tension Testing of Metallic Materials
AASHTO T243	Sampling Procedure for Impact Testing of Structural Steel
AASHTO T244	Mechanical Testing of Steel Products
ANSI B16.9	Forged steel fittings
ANSI B16.11	Forged steel fittings
NASA M88441	LOX - Liquid Oxygen Compatibility
SAE 1010	Society of Automotive Engineers Steel Standard no. 1010
SAE 1015	Society of Automotive Engineers Steel Standard no. 1015
SSPC Paint 9	White (or Colored) Vinyl Paint
SSPC Paint 16	Coal Tar Epoxy-Polyamide Black (or Dark Red) Paint
SSPC Paint 20	Zinc-Rich Primers (Type I, Inorganic, and Type II, Organic)
SSPC Paint 27	Basic Zinc Chromate-Vinyl Butyral Wash Primer
SSPC SP-10	Near-White Blast Cleaning