

# VERMONT CONSTRUCTION SPECIFICATION

## 46 – METAL FABRICATION AND PAINTING

### 1. Scope

The work consists of furnishing, fabricating, and erecting metalwork, including the metal parts and fasteners of the composite structures. The work shall also consist of cleaning metal surfaces and applying paints and protective coatings.

### 2. Material

#### A. Structural steel

Structural grade steel shall conform to the requirements of the applicable ASTM listed below:

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<u>Product</u>	<u>ASTM Specification</u>
Structural Steel	A36
High Strength Low-Alloy Structural Steel	A242, or A588
Carbon Steel Plates of Structural Quality to be Bent, Formed, Shaped Cold	A283, Grade C
Carbon Steel Sheets of Structural Quality	A570, Grade 40, or A611, Grade D
Carbon Steel Strip of Structural Quality	A570, Grade 36

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#### B. Commercial or merchant quality steel

Commercial or merchant quality steel shall conform to the requirements of the applicable ASTM listed below:

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<u>Product</u>	<u>ASTM Specification</u>
Carbon Steel Bars	A575, Grade M1015 to M1031
Carbon Steel Sheets	A569
Carbon Steel Strips	A569
Zinc-coated Carbon Steel Sheets	A653, or A924

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## VERMONT CONSTRUCTION SPECIFICATION

### C. Aluminum alloy

Aluminum alloy products shall conform to the requirements of the applicable ASTM standard listed below. Unless otherwise specified, alloy 6061-T6 shall be used.

<u>Product</u>	<u>ASTM Specification</u>
Standard Structural Shape	B308
Extruded Structural Pipe and Tube	B429
Extruded Bars, Rods, Shapes and Tubes	B221
Drawn Seamless Tubes	B210
Rolled or Cold Finished Bars, Rods and Wire	B211
Sheet and Plate	B209

### D. Bolts

Steel bolts shall conform to the requirements of ASTM Standard A307. If high-strength bolts are specified, they shall conform to the requirements of ASTM A325.

When galvanized or zinc-coated bolts are specified, the zinc coating shall conform to the requirements of ASTM Standard A153 except that bolts 0.5 inch or less in diameter may be coated with electro-deposited zinc or cadmium coating conforming to the requirements of ASTM Standard B633, Service Condition SC 3, or ASTM A65, Type TS, unless otherwise specified.

### E. Rivets

Steel rivets shall conform to the requirements of ASTM Specification A502, Grade 1. Aluminum alloy rivets shall be Alloy 606-T6 conforming to the requirements of ASTM Standard B316.

### F. Welding electrodes

Steel welding electrodes shall conform to the requirements of American Welding Society Specification AWS A5.1, "Specification for Mild Steel Covered Arc-Welding Electrodes," except that they shall be uniformly and heavily coated (not washed) and shall be of such a nature that the coating does not chip or peel while being used with the maximum amperage specified by the manufacturer.

Aluminum welding electrodes shall conform to the requirements of American Welding Society Specification AWS A5.10, "Specification for Aluminum and Aluminum-Alloy Welding Rods and Bare Electrodes."

## VERMONT CONSTRUCTION SPECIFICATION

### G. Galvanizing

Zinc coatings shall conform to the requirements of ASTM A123 for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products or as otherwise specified in the items of work and construction details of the Construction Specification.

ASTM A123 covers both fabricated and nonfabricated products; e.g., assembled steel products, structural steel fabrications, large tubes already bent or welded before galvanizing, and wire work fabricated from noncoated steel wire. It also covers steel forgings and iron castings incorporated into pieces fabricated before galvanizing or which are too large to be centrifuged (or otherwise handled to remove excess galvanizing bath metal).

Items to be centrifuged or otherwise handled to remove excess zinc shall meet the requirements of ASTM A153, except bolts, screws, and other fasteners 0.5 inch or less in diameter may be coated with electro-deposited zinc or cadmium coating conforming to the requirements of ASTM B766, coating thickness Class 5, Type III, or ASTM B633, Service Condition SC-3, unless otherwise specified.

### H. Paint

For the purpose of this specification, paints and coatings shall be designated by types as defined below. Materials for systems requiring two or more coats shall be supplied by the same manufacturer.

**Type 1 - Alkyd primer.** Alkyd based, rust inhibitive primer shall be lead and chromate free. Primer shall have a minimum of 54 percent solids, by volume. Color availability shall be red, gray, and white. Primer shall be able to be applied satisfactory at 2 to 3 mils dry-film thickness in one coat.

**Type 2 - Alkyd enamel (gloss).** Alkyd based enamel shall be lead free. It shall have a minimum of 49 percent solids, by volume. Alkyd enamel shall be able to be applied satisfactory at 2 to 3 mils dry-film thickness in one coat. Finish shall be gloss.

**Type 3 - Alkyd enamel (semigloss).** Alkyd based enamel shall be lead free. It shall have a minimum of 55 percent solids, by volume. Alkyd enamel shall be able to be applied satisfactory at 2 to 3 mils dry-film thickness in one coat. Finish shall be semigloss.

**Type 4 - Epoxy polyamide primer.** Epoxy polyamide primer shall be lead and chromate free. It shall have a minimum of 56 percent solids, by volume. Epoxy primer shall be able to be applied satisfactory at 4 to 6 mils dry-film thickness in one coat. Color availability shall be red, gray, and white. Epoxy primer shall conform to AWWA Standard C 210 and AWWA Standard D 102.

## VERMONT CONSTRUCTION SPECIFICATION

**Type 5 - Epoxy polyamide (intermediate or finish).** Epoxy polyamide shall be lead free. It shall have a minimum of 56 percent solids, by volume. Epoxy polyamide shall be able to be applied satisfactory at 4 to 6 mils dry-film thickness in one coat. Finish shall be semigloss. Epoxy finish shall conform to AWWA C 210 and AWWA D 102.

**Type 6 - Acrylic polyurethane (gloss).** Acrylic polyurethane shall be lead free. It shall have a minimum of 74 percent solids, by volume. Polyurethane shall be able to be applied satisfactory at 3 to 5 mils dry-film thickness in one coat. Finish shall be gloss.

**Type 7 - Acrylic polyurethane (semigloss).** Acrylic polyurethane shall be lead free. It shall have a minimum of 58 percent solids, by volume. Polyurethane shall be able to be applied satisfactory at 3 to 5 mils dry-film thickness in one coat. Finish shall be semigloss.

**Type 8 - Vinyl acid wash treatment.** Pretreatment primer for galvanized and nonferrous metal. Pretreatment primer shall have a minimum of 8 percent solids, by volume. The applied dry-film thickness of pretreatment primer shall not exceed 0.5 mil. Steel primed with pretreatment primer shall be topcoated within 6 to 8 hours in humid conditions.

**Type 9 - Single package moisture cured urethane primer.** Urethane primer shall have a minimum of 50 percent solids, by volume. Primer shall be able to be applied satisfactory at 2 to 3 mils dry-film thickness in one coat. Color shall be metallic aluminum.

**Type 10 - Coal tar epoxy.** Coal tar epoxy shall have a minimum of 75 percent solids, by volume, and conform to the requirements of NRCS Material Specification 583 Coal Tar Epoxy Paint (Steel Structures Paint Council PS No. 16, Type I). Coal tar epoxy shall be able to be applied satisfactory at 8 to 15 mils dry-film thickness in one coat.

### 3. Fabrication

Fabrication of structural steel shall conform to the requirements of Specification for the Design, Fabrication and Erection of Structural Steel for Buildings (Riveted, Bolted and Arc-Welded Construction), American Institute of Steel Construction.

Fabrication of structural aluminum shall conform to the requirements in the Aluminum Design Manual available from The Aluminum Association.

# VERMONT CONSTRUCTION SPECIFICATION

## 4. Erection

The frame of metal structures shall be installed true and plumb. Temporary bracing shall be placed wherever necessary to resist all loads to which the structure may be subjected, including those applied by the installation and operation of equipment. Such bracing shall be left in place as long as may be necessary for safety.

As erection progresses the work shall be securely bolted up, or welded, to resist all dead load, wind, and erection stresses. The contractor shall furnish such installation assisting bolts, nuts, and washers as may be required.

No riveting or welding shall be performed until the structure is stiffened and properly aligned.

Rivets driven in the field shall be heated and driven with the same care as those driven in the shop.

All field welding shall be performed in conformance to the requirements for shop fabrication except those that expressly apply to shop conditions only.

## 5. Protective coatings

Items specified to be galvanized shall be completely fabricated for field assembly before the application of the zinc coatings. Galvanized items shall not be cut, welded, or drilled after the zinc coating is applied.

Items specified to be painted shall be painted in conformance to the requirements of Construction Specification 82 for the specified paint systems.

## 6. Painting Metalwork

### A. Surface preparation

All surfaces to be coated shall be prepared by removing all grease, oil, dirt, rust, mill scale, residue or other foreign material using steam cleaning, solvent cleaning, sand or grit blasting, hand sanding or scraping, wiping or by other means.

### B. Paint systems

The paint system shall consist of one primer coat (Type 1, 4 or 9) and one or two coats of paint (Type 2, 3, 5, 6, 7, 8, or 10) as specified or as desired by the landowner. The primer and paint must be compatible to the metal and to each other. Ideally, the paint thickness should be 6 to 8 mil.

## VERMONT CONSTRUCTION SPECIFICATION

### C. Application of paint

Surfaces shall be painted immediately after preparation or within the same day as prepared with a minimum of one coat of the primer type specified. Remaining surfaces not required to be painted shall be protected against contamination and damage during the cleaning and painting operation.

Paints shall be thoroughly mixed immediately before application.

After erection or installation of the metalwork, all damage to shop-applied coating shall be repaired and all bolts, nuts, welds, and field rivet heads shall be cleaned and painted with one coat of the specified priming paint.

Initial priming coats shall be applied by brush except on surfaces accessible only to spray equipment. All other coats may be applied by brush or spray. Each coat shall be applied in such a manner to produce a paint film of uniform thickness with a rate of coverage within the guidelines and limits recommended by the paint manufacturer.

The drying time between coats shall be as prescribed by the paint manufacturer, but not less than that required for the paint film to thoroughly dry. The elapsed time between coats in paint shall not exceed 24 hours. If for any reason the critical recoat time is exceeded, the coated surface shall be treated with the manufacturer's recommended tackifier solvent or brush blasted to roughen the surface.

The finished surface of each coat shall be free from runs, drops, ridges, laps, or excessive brushmarks and shall present no variation in color, texture, and finish. The surface of each dried coat shall be cleaned as necessary before application of the next coat.

### D. Atmospheric conditions

Paint application shall not be performed when the temperature of the air is less than 50 degrees Fahrenheit. Painting shall be performed only when the humidity and temperature of the surrounding air and the temperature of the metal surfaces are such that evaporation rather than condensation results during the time required for application and drying. The surface shall be dry and a minimum of 5 degrees Fahrenheit above the dew point. Surfaces protected from adverse atmospheric conditions by special cover, heating, or ventilation shall remain so protected until the paint is thoroughly dry.