1 Purpose and Scope

This Specification defines the technical requirements for iron and steel components to be hot-dip galvanized after manufacture or fabrication in accordance with ASTM A123 and ASTM A153 for all Viasat products as indicated on plans and/or specifications.

2 Part 1 – General

2.1 Work Included

2.1.1 Hot-dip galvanizing of iron and steel components and their respective hardware and accessories

2.2 Related Work

2.2.1 Steel materials, fabrications and assemblies are specified to be furnished and installed in accordance with the Reference Standards herein.

2.3 Reference Standards

ASTM:

- A123/A123M Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- A143 Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
- A153/A153M Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- A384 Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
- A385 Practice for Providing High-Quality Zinc Coatings (Hot-Dip)
- A780 Repair of Damaged Hot-Dip Galvanized Coatings
- B6 Specification for Zinc
- D6386 Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting
- E376 Practice for Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Test Methods

2.4 Quality Assurance

2.4.1 **Coating applicator**: Company specializing in hot-dip galvanizing after fabrication and following the procedures set forth in the applicable ASTM Standard(s).

2.4.2 **Pre-construction Conference for Metal Fabrications**: At Viasat's request, the fabricator shall schedule a meeting to be attended by fabricator, galvanizer, and Viasat representative. Topics to be addressed include project schedule, scope of metal fabrications, coordination between fabricator and galvanizer, finish of surfaces, application of coatings, inspection, testing, submittals and approvals.

2.4.3 **Materials:** For steel to be hot-dip galvanized, provide steel chemically suitable for metal coatings complying with the following requirements: carbon below 0.25, phosphorous below 0.04, manganese below 1.3, and silicon below 0.04. Notify the galvanizer if steel does not meet these requirements so that suitability for galvanizing may be determined and whether special processing techniques are required.

2.5 **Submittals**

The Galvanizer shall submit an original and two copies of the duly notarized Certificate of Compliance indicating that the hot-dip galvanized coating meets or exceeds the specified requirements of ASTM A123 / A123M or, A153/A153M, as applicable.

2.6 **Delivery, Storage & Handling**

2.6.1 Store and protect products in accordance with generally accepted industry practices.

2.6.2 Load and store galvanized articles in accordance with generally accepted industry practices.

2.6.3 Galvanized articles shall not be stored or shipped directly on wood pallets without an isolation barrier between the wood and the galvanized surfaces to protect against staining and discoloration.

3 Part 2 – Products

3.1 **Acceptable Coating Applicators**

Acceptable coating applicators shall be duly insured and/or bonded and approved by the both the Fabricator and Viasat.

3.2 **Steel Materials**

- Material for galvanizing to be geometrically suitable for galvanizing as described in ASTM A384 and A385. Steel materials suitable for galvanizing include structural shapes, pipe, sheet, fabrications and assemblies.
- Material to be chemically suitable for galvanizing.

Steel containing carbon below 0.25, phosphorus below 0.04 and manganese below 1.3, either individually or in combination, and providing the silicon content is 0.04 or less, will normally develop a typical coating when conventional galvanizing techniques are applied.

Recommended steel materials for hot-dip galvanizing include but are not limited to:

3.2.1 Structural shapes and plates: ASTM A36, A242 type 2, A283, A441, A500, A501, A529, A572, A588 and A992.

3.2.2 Steel for fasteners:

General Category	Bolt Material	Nut Material
Carbon Steel	A 307 Gr AorB	A 563 Gr A
High-strength	A 325 Type I	A563 GrDH
Tower Bolts	A 394	A 563 Gr A
Quenched & Tempered *(Carbon Steel Bolts)*	A499	A563 O-C
Quenched & Tempered *(Alloy Steel Bolts)*	A354GrBC	A563 GrDH

NOTE: Avoid use of steel with an ultimate tensile strength greater than 150 ksi. These steels have been shown to have a potential for hydrogen embrittlement resulting from the pickling process prior to galvanizing.

3.3 Fabrication Requirements

3.3.1 Fabrication practices for products to be in accordance with the applicable portions of ASTM A143, A384, and A385, except as specified herein. Avoid fabrication techniques that could cause steel distortion or embrittlement.

3.3.2 The fabricator shall consult with Viasat and galvanizer regarding potential concerns, including handling issues, during the galvanizing process that may require design modification before fabrication proceeds.

3.3.3 Completely remove all welding slag, splatter, anti-splatter compounds and burrs prior to delivery for galvanizing.

3.3.4 Provide holes and/or lifting lugs to allow for handling and zinc drainage during galvanizing. The fabricator shall obtain Viasat approval prior to adding any undocumented drain holes or lifting lugs.

3.3.5 Avoid unsuitable marking paints. Consult with the galvanizer about removal of grease, oil, paint and other deleterious material prior to fabrication.

3.3.6 Remove by blast-cleaning or other methods, surface contaminants and coatings that are not removable by the normal chemical cleaning process in the galvanizing operation.

3.3.7 Whenever possible, slip joints should be used to minimize field welding of material

4 Part 3 – Execution

4.1 Surface Preparation

Pre-clean steel work in accordance with accepted methods to produce an acceptable surface for quality hot-dip galvanizing.

4.2 Coating Application

4.2.1 Galvanize steel members, fabrications and assemblies after fabrication by the hot-dip process in accordance with ASTM A123/ 123M.

4.2.2 Galvanize bolts, nuts, washers and iron and steel hardware components in accordance with ASTM A153/ 153M.

4.2.3 Safeguard products against steel embrittlement in conformance with ASTM A143.

4.2.4 Handle all articles to be galvanized in such a manner as to avoid any mechanical damage and to minimize distortion.

4.2.5 If material is to be duplex coated, water quenching following galvanizing is expressly prohibited.

4.3 Coating Requirements

4.3.1 Conform to paragraph 6.1 of ASTM A123 / 123M or Table 1 of ASTM A153 / 153M.

4.3.2 Surface Finish: Continuous, adherent, as smooth and evenly distributed as possible and free from any defect detrimental to the stated end use of the coated article.

4.3.3 Adhesion: Withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.

4.4 Inspection and Testing

4.4.1 Inspection and testing for adherence, zinc coating thickness and roughness detrimental to the end user of hot-dip galvanized coatings shall be done at the galvanizers plant prior to shipping.

NOTE: Color is beyond the control of the galvanizer

4.4.2 Include visual examination and tests in accordance with ASTM A123/ 123M or A153/153M, as applicable, to determine the thickness of the zinc coating on the metal surface.

4.4.3 Furnish notarized Certificate of Compliance with ASTM standards and specifications herein listed. The Certificate must be signed by the galvanizer, notarized and contain a detailed description of the material processed. The Certificate shall include information as to the ASTM standard used for the coating.

4.5 Repair of Damaged Coating

4.5.1 The maximum area to be repaired by the galvanizer following galvanizing is defined in accordance with ASTM A123 / 123M, Section 6.2.

- The maximum area to be repaired in the field shall be determined in advance by mutual agreement between parties.

4.5.2 Repair areas damaged by welding, flame cutting or during handling, transport or erection by one of the approved methods in accordance with ASTM A780 whenever damage exceeds 3/16" in width. Minimum thickness requirements for the repair are those described in ASTM A123/123M, Section 6.2. The use of aerosol spray cans is NOT permitted. Thickness of repair coating is to be determined in accordance with ASTM 376.

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