Preparing Activity: USACE Superseding
UFGS-07 41 63 (May 2009)

UNIFIED FACILITIES GUIDE SPECIFICATION

References are in agreement with UMRL dated July 2023
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SECTION 07 41 63

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USACE / NAVFAC / AFCEC / NASA **UFGS-07 41 63 (November 2016)**

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SECTION 07 41 63

FABRICATED ROOF PANEL ASSEMBLIES
11/16

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NOTE: This guide specification covers the requirements for both factory color and mill finish aluminum or steel fabricated roof panel assemblies.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

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NOTE: This section includes structural standing seam panels, insulated sandwich panels and special fabricated roof panel systems.

Coordinate this section with other system components specifications such as framing, decking, insulation and sheet metal flashing. Also coordinate with the criteria of Unified Facilities Criteria (UFC) 3-110-06, "Design: Roofing" as it relates to the specific project and Service Exceptions indicated therein. For Army projects also refer to TI 809-29, "Structural Considerations for Metal Roofing".

****

PART 1 GENERAL

1.1 REFERENCES

****

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ALUMINUM ASSOCIATION (AA)

AA ADM	(2020) Aluminum Design Manual

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 341	(2016) Seismic Provisions for Structural Steel Buildings

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI D100	(2017) Cold-Formed Steel Design Manual

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7-16	(2017; Errata 2018; Supp 1 2018) Minimum Design Loads and Associated Criteria for Buildings and Other Structures

AMERICAN WELDING SOCIETY (AWS)

AWS A5.1/A5.1M	(2012) Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding
AWS D1.1/D1.1M	(2020; Errata 1 2021) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon

	Structural Steel
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A424/A424M	(2009a; R 2016) Standard Specification for Steel Sheet for Porcelain Enameling
ASTM A463/A463M	(2022) Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process
ASTM A606/A606M	(2023) Standard Specification for Steel Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance
ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A755/A755M	(2018) Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products
ASTM A780/A780M	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A792/A792M	(2022) Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
ASTM A924/A924M	(2022a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM A1008/A1008M	(2021a) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
ASTM B117	(2019) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B209M	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
ASTM B659	(1990; R 2021) Standard Guide for Measuring Thickness of Metallic and Inorganic Coatings

ASTM C273/C273M	(2020) Standard Test Method for Shear Properties of Sandwich Core Materials
ASTM C286	(2022) Standard Terminology Relating to Porcelain Enamel and Ceramic-Metal Systems
ASTM C553	(2013; R 2019) Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
ASTM C612	(2014; R 2019) Standard Specification for Mineral Fiber Block and Board Thermal Insulation
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM C1396/C1396M	(2017) Standard Specification for Gypsum Board
ASTM D522/D522M	(2017) Mandrel Bend Test of Attached Organic Coatings
ASTM D523	(2014; R 2018) Standard Test Method for Specular Gloss
ASTM D714	(2002; R 2017) Standard Test Method for Evaluating Degree of Blistering of Paints
ASTM D822	(2013; R 2018) Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings
ASTM D968	(2022) Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1056	(2020) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D1308	(2002; R 2013) Effect of Household Chemicals on Clear and Pigmented Organic Finishes
ASTM D1621	(2016) Standard Test Method for Compressive Properties of Rigid Cellular Plastics
ASTM D1622	(2020) Apparent Density of Rigid Cellular Plastics
ASTM D1667	(2022) Standard Specification for Flexible Cellular Materials - Poly (Vinyl Chloride) Foam (Closed-Cell)
ASTM D2244	(2021) Standard Practice for Calculation of Color Tolerances and Color Differences

	from Instrumentally Measured Color Coordinates
ASTM D2247	(2015; R 2020) Standard Practice for Testing Water Resistance of Coatings in 100?Percent Relative Humidity
ASTM D2794	(1993; R 2019) Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D3363	(2005; E 2011; R 2011; E 2012) Film Hardness by Pencil Test
ASTM D4214	(2007; R 2015) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D6226	(2021) Standard Test Method for Open Cell Content of Rigid Cellular Plastics
ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E119	(2022) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E136	(2022) Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C
ASTM E1592	(2017) Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
ASTM E2140	(2001; R 2017) Standard Test Method for Water Penetration of Metal Roof Panel Systems by Static Water Pressure Head
ASTM G152	(2013; R 2021) Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G153	(2013; R 2021) Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

FM GLOBAL (FM)

FM 4471	(2010) Class I Panel Roofs
FM 4474	(2014) Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies Using Static Positive and/or Negative

Differential Pressures

METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)

MBMA RSDM (2012) Metal Roofing Systems Design Manual

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM AMP 500 (2006) Metal Finishes Manual

NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)

NRCA 0429 (2022) The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control and Reroofing

NRCA RoofMan (2020) The NRCA Roofing Manual

PORCELAIN ENAMEL INSTITUTE (PEI)

PEI 1001 (1996) Specification for Architectural Porcelain Enamel (ALS-100)

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1793 (2012) Architectural Sheet Metal Manual, 7th Edition

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC PS 9.01 (1982; E 2004) Cold-Applied Asphalt Mastic Painting System with Extra-Thick Film

UNDERWRITERS LABORATORIES (UL)

UL 580 (2006; Reprint Mar 2019) UL Standard for Safety Tests for Uplift Resistance of Roof Assemblies

1.2 DEFINITIONS

Fabricated Roof Panel Assembly: Metal roof and liner panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories shop-fabricated or field-assembled for a complete weathertight roofing system.

1.3 SUBMITTALS

****

NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's

Quality Control System. Only add a “G” to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.
****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Qualification of Manufacturer; G[, [____]]

Qualification of Installer; G[, [____]]

Qualifications for Welding; G[, [____]]

Work Plan; G[, [____]]

On-Site Inspection and Acceptance Procedure; G[, [____]]

SD-02 Shop Drawings

Roofing Panels; G[, [____]]

Flashing and Accessories; G[, [____]]

Gutter/Downspout Assembly; G[, [____]]

SD-03 Product Data

Sustainable Acquisition; G[, [____]].

Coil Stock; G[, [____]]

Factory Color Finish; G[, [____]]

Sub-girts and Formed Shapes; G[, [____]]

Closure Materials; G[, [____]]

Insulation; G[, [____]]

Pressure-Sensitive Tape; G[, [____]]

Sealants and Caulking; G[, [____]]

Rated Wall Assembly; G[, [____]]

[Galvanizing Repair Paint; G[, [____]]

][Enamel Repair Paint; G[, [____]]

][Aluminized Steel Repair Paint; G[, [____]]

] Accessories; G[, [____]]

SD-04 Samples

Coil Stock; G[, [____]]

Roofing Panels; G[, [____]]

Fasteners; G[, [____]]

Metal Closure Strips; G[, [____]]

Insulation; G[, [____]]

Manufacturer's Color Charts and Chips; G[, [____]]

SD-05 Design Data

Wind Design Analysis

[Seismic Design Analysis

] SD-06 Test Reports

Leakage Tests; G[, [____]]

[Fire Rating Test Report; G[, [____]]

] Coatings and Base Metals of Metal Roofing; G[, [____]]

Factory Finish and Color Performance Requirements; G[, [____]]

[Wind Uplift Test Report; G[, [____]]

][Seismic Test Report; G[, [____]]

] SD-07 Certificates

Coil Stock

Fasteners

[Galvanizing Repair Paint

][Enamel Repair Paint

] Safety Data Sheets

Coating Physical Properties:

SD-08 Manufacturer's Instructions

Installation of Roof Panel Assemblies

SD-11 Closeout Submittals

Warranty

Information Form and Placard; G[, [____]]

Manufacturer's Field Inspection Reports

Application Instructions

Date of Installation Wall-Mounted Placard; G

20-year "No-Dollar-Limit" Warranty for Labor and Materials; G

1.4 QUALITY CONTROL

1.4.1 Preroofing Conference

After submittals are received and approved but before roofing and insulation work, including associated work, is performed, the Contracting Officer will hold a preroofing conference to review the following:

a. The drawings and specifications:

(1) Fabrication and installation drawings for the following items are to indicate completely dimensioned structural frame and erection layouts, openings in the roof, special framing details and construction details at corners, ridges, eaves, building intersections, curbs and flashing, location and type of mastic and metal filler strips, location and erection of flashing and gutter/downspout assembly.

(2) Installation of roof panel assemblies

(3) Roofing panels, submit sample 30.5 cm 12 inches long by actual panel width

(4) Flashing and accessories, submit sample 25.4 cm 10 inches long of each type

(5) Gutter/downspout assembly

Submit certification from the coil stock manufacturer or supplier that the

machinery used will form the provided coil stock without warping, waviness, or rippling that is not a part of the panel profile, and without damage, abrasion or marring of the finish coating, and certification of conformance with the standards specified herein. Submit a sample 30.5 cm 12 inches long by the actual panel width.

Submit the manufacturer's color charts and chips, approximately 10.2 by 10.2 cm 4 by 4 inches, showing the full range of colors, textures and patterns available for roof panels with the factory color finish.

Submit factory finish and color performance requirements verified by an independent testing agency.

Submit a wind design analysis from the manufacturer including wind speed, exposure category, coefficient, importance factor. Designate a type of facility, negative pressures for each zone, methods and requirements of attachment. Include a roof plan delineating dimensions and attachment patterns for each zone. Include a signed and sealed wind design analysis with a Licensed project engineer,in the geographic area where the construction will take place.

[(6) Wind Uplift Test Report

][(7) Seismic Design Analysis

][(8) Seismic Test Report

] (9) Fire Rating Test Report

b. Qualifications including:

(1) Qualification of Manufacturer

(2) Qualification of Installer

(3) Qualifications for Welding

c. Submit an on-site inspection and acceptance procedure of the roofing substrate and pertinent structural details relating to the roofing system, including:

(1) Safety Data Sheets

(2) Sub-girts and Formed Shapes

(3) Closure Materials

(4) Insulation

(5) Pressure-Sensitive Tape

(6) Sealants and Caulking

(7) Rated Wall Assembly

[(8) Galvanizing Repair Paint

][(9) Enamel Repair Paint

][(10) Aluminized Steel Repair Paint

] (11) Accessories

d. Submit a work plan for coordination of the various trades involved in providing the roofing system and other components secured to the roofing.

Include detailed application instructions and standard manufacturer drawings altered as required by these specifications. Explicitly identify in writing the differences between the manufacturer's instructions and the specified requirements.

e. Safety requirements

f. Submit manufacturer's data indicating the percentage of recycle material in roofing panels to verify sustainable acquisition compliance.

1.4.2 Manufacturer's Technical Representative

Ensure the representative has authorization from the manufacturer to approve field changes and is thoroughly familiar with the products and installations in the geographical area where construction will take place.

1.4.3 Qualification of Manufacturer

Guarantee the metal roof panel system manufacturer possesses the following:

a. A minimum of five years of experience in manufacturing metal roof system and accessory products.

b. Engineering services of an authorized engineer; currently licensed in the geographical area where construction will take place, having a minimum of four years of experience as an engineer knowledgeable in roof wind design analysis, protocols and procedures for the MBMA RSDM; ASCE 7-16, UL 580 and FM 4474 FM wind design guide for metal roof systems.

c. Certified engineering calculations using the products submitted for wind uplift requirements in accordance with FM 4474 and ASCE 7-16.

1.4.4 Qualification of Installation Contractor

Confirm that the installation contractor is approved and certified by the roofing panel manufacturer before installing the metal roofing system.

1.4.5 Qualifications for Welding

Provide certification of welding procedures conforming to AWS A5.1/A5.1M and AWS D1.1/D1.1M

1.4.6 Single-Source

Obtain each type of metal roof and liner panels, clips, closures and other accessories from the standard products of the single-source manufacturer to ensure these items operate as a complete system for the intended use.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver components, sheets, metal roof panels, and other manufactured items, handling them in a manner to prevent damage or deformation; package metal roof panels for protection during transportation and handling.

Unload, store, and erect metal roof panels in a manner to prevent bending, warping, twisting, and surface damage.

Stack metal roof panels on platforms or pallets, covered with a suitable weather-tight and ventilated covering; store metal roof panels to ensure dryness. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.

Protect the strippable protective covering on metal roof panels from exposure to sunlight and high humidity, except to extent necessary for the period of metal roof panel installation.

Protect foam-plastic insulation as follows:

a. Do not expose the foam-plastic insulation to sunlight, except to extent necessary for period of installation and concealment.

b. Protect the foam-plastic insulation against ignition at all times. Do not deliver foam-plastic insulation materials to the project site before installation time.

Complete installation and concealment of plastic materials as rapidly as possible.

1.6 PROJECT/SITE CONDITIONS

Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit metal roof panel work to be performed according to the manufacturer's written instructions and warranty requirements.

Field Measurements: Verify th actual dimensions of construction contiguous with metal roof panels by field measurements before fabrication.

1.7 WARRANTY

Furnish the metal roof panel manufacturer's [5][10][_____][20][30]-year [no dollar limit]roof system materials and installation workmanship warranty, including flashing, [insulation,]components, trim, and accessories necessary for a watertight roof system construction. Issue the warranty directly to the Government, such that the warranty takes effect at the time of the Government's acceptance of the roof work. Provide a warranty with the following conditions:

a. If within the warranty period, the metal roof system, as installed for its intended use in the normal climatic and environmental conditions of the facility, becomes nonwater-tight, shows evidence of moisture intrusion within the assembly, displaces, corrodes, perforates, separates at the seams, or shows evidence of excessive weathering due to defective materials or installation workmanship, the repair or replacement of the defective and damaged materials of the metal roof system and correction of defective workmanship is the responsibility of the metal roof panel manufacturer. All costs associated with the

repair or replacement work are the responsibility of the metal roof panel manufacturer. Conform galvanized repairs to ASTM A780/A780M.

b. If the manufacturer or the applicator approved by the manufacturer fail to perform the repairs within [24][48][72] hours of notification, emergency temporary repairs performed by others does not void the warranty.

[1.7.1 Manufacturer's Finish Warranty

****
NOTE: Include the following paragraph when factory color finish panels are specified.

For NAVFAC projects, delete this paragraph and use the appropriate warranty forms included in the paragraph titled "FORM ONE".
****

Provide a manufacturer's 20-year "No-Dollar-Limit" Warranty for Labor and Materials for the roofing system. Issue the warranty directly to the Government at the date of Government acceptance, warranting that the factory color finish, under normal atmospheric conditions at the site, will not crack, peel, or delaminate; chalk in excess of a numerical rating of 8 when measured in accordance with ASTM D4214; or fade or change colors in excess of 5 NBS units as measured in accordance with ASTM D2244.

]1.7.2 Metal Roof System Installer Warranty

****
NOTE: For Army projects use the first bracketed paragraph and delete the remainder of the installer warranty requirements.

For all other projects, delete the first bracketed paragraph, and use the second paragraph.
****

Provide the "Contractors [Five][Ten][Twenty] [5][10][20])-Year No Penalty Sum Warranty for Non-Structural Metal Roof System" attached at the end of this section. [Provide a separate bond in an amount equal to the installed total material and installation roofing system cost in favor of the Government covering the installer's warranty responsibilities effective throughout the [five][ten][twenty] [5][10][20])-year warranty period.]

Provide roof system installer warranty for a period of not less than [two][five] years that the roof system, as installed, is free from defects in installation workmanship, including the roof panel installation, flashing, [insulation,] accessories, attachments, and sheet metal installation integral to a complete watertight roof system assembly. Issue warranty directly to the Government. Issue a statement that correction of defective workmanship and replacement of damaged or affected materials is the responsibility of the metal roof system installer. Also state that all costs associated with the repair or replacement work are the responsibility of the installer.

1.7.3 Continuance of Warranty

Approve and accomplish repair or replacement work that becomes necessary within the warranty period to restore the integrity of the roof system assembly and maintain the validity of the metal roof system manufacturer's warranty for the remainder of the manufacturer warranty period.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

2.1.1 Conformance and Compatibility

Provide an entire roofing and flashing system in accordance with specified and indicated requirements, including wind resistance [and seismic per AISC 341]requirements. Perform any work not specifically addressed, or any deviation from specified requirements in general accordance with recommendations of the MBMA RSDM, NRCA RoofMan, the metal panel manufacturer's published recommendations and details, and compatible with surrounding components and construction. Submit any deviation from specified or indicated requirements to the Contracting Officer for approval before installation.

2.1.2 Performance Requirements

a. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E2140.

b. Wind-Uplift Resistance: Provide roof panel assemblies that comply with the requirements of the roof systems and attachments in accordance with ASTM E1592 and UL 580. Ensure that uplifting force caused by wind action governs the design for panels. Ensure that roof systems and attachments are to resist the wind loads as determined by ASCE 7-16.

c. FMG Listing: Provide FRP roof panels and component materials that comply with the requirements in FM 4471 as part of a panel roofing system. Identify materials with FMG markings.

d. Structural Performance: Provide roof panel assemblies capable of withstanding the effects of gravity loads and stresses within limits and under conditions indicated, based on testing according to ASTM E1592.

****
NOTE: Include bracketed reference for seismic conditions.
****

[e. Seismic Performance: Provide fabricated roof panel assemblies conforming to AISC 341 and the test data confirming compliance.

]2.1.3 Fire-Resistance

2.1.3.1 Surface-Burning Characteristics

Provide metal roof panels having insulation core material with the following surface-burning characteristics as determined by testing identical products according to ASTM E84 by a qualified testing agency.

Identify products with the appropriate markings of an applicable testing agency.

Flame-Spread Index: [25][_____] or less.

Smoke-Developed Index: [450][_____] or less.

2.1.3.2 Fire-Resistance Ratings

Where indicated, provide metal roof panels identical to those of assemblies tested for fire resistance by a qualified testing agency in accordance with ASTM E119. Identify products with the appropriate markings of the applicable testing agency.

Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency. Combustion Characteristics: ASTM E136.

2.2 FABRICATION

2.2.1 Fabrication

Fabricate and finish metal roof panels and accessories at the factory to the greatest extent possible, using the manufacturer's standard procedures and processes to fulfill the indicated performance requirements. Comply with indicated profiles, and dimensional and structural requirements conforming to AISI D100.

Provide a panel profile, including major ribs and intermediate stiffening ribs, if any, for the full length of panel.

Fabricate metal roof panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weather-tight and minimize noise from movements within the panel assembly.

Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA 1793 that apply to the design, dimensions, metal, and other characteristics of the item indicated.

Form exposed sheet metal accessories without excessive oil canning, buckling, and tool marks, and true to the line and levels indicated, with exposed edges folded back to form hems.

End Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant, compliant with SMACNA 1793.

Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on the faces of accessories exposed to view.

Fabricate cleats and attachment devices of the size and metal thickness recommended by SMACNA 1793 or by the metal roof panel manufacturer for application, but not less than the thickness of the metal being secured.

2.2.2 Sheet Metal Flashing and Trim

2.2.2.1 Fabrication, General

Custom-fabricate sheet metal flashing and trim to comply with the recommendations in SMACNA 1793 that apply to the design, dimensions, metal, and other characteristics of the items indicated. Shop-fabricate items where practicable. Obtain field measurements for an accurate fit before shop fabrication.

2.2.2.2 Roof Drainage Sheet Metal Fabrications

Fabricate gutters to the cross section indicated, with riveted and soldered joints, complete with end pieces, outlet tubes, and other special accessories as required. Fabricate in 243.8 cm 96-inch long sections at a minimum. Fabricate expansion joints and accessories from the same metal as the gutters, unless otherwise indicated.

Fabricate [circular] [rectangular] downspouts complete with mitered elbows. Furnish with metal hangers, fabricated from the same material as the downspouts and anchors.

2.2.3 Finishes

Comply with NAAMM AMP 500 for recommendations for applying and designating finishes.

Appearance of Finished Work: Ensure that there are no noticeable variations in finish on the same piece. Variations in the appearance of adjoining components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

2.3 COMPONENTS

2.3.1 Miscellaneous Metal Framing

2.3.1.1 General

Provide cold-formed metallic-coated steel sheet conforming to AISI D100 and ASTM A653/A653M and specified in Section 05 40 00 COLD-FORMED METAL FRAMING unless otherwise indicated.

2.3.1.2 Fasteners for Miscellaneous Metal Framing

Provide fasteners of a type, material, corrosion resistance, size, and sufficient length to penetrate the supporting member a minimum of 2.54 cm 1 inch and possessing the other properties required to fasten miscellaneous metal framing members to substrates in accordance with the roof-panel manufacturer's and ASCE 7-16 requirements.

2.3.2 Fasteners

2.3.2.1 General

Provide fasteners of a type, material, corrosion resistance, size, and sufficient length to penetrate the supporting member a minimum of 2.54 cm 1 inch and possessing the other properties required to fasten miscellaneous metal framing members to substrates in accordance with the roof-panel manufacturer's and ASCE 7-16 requirements.

2.3.2.2 Exposed Fasteners

Provide corrosion-resistant coated steel, aluminum, stainless steel, or nylon-capped, steel-compatible exposed fasteners, with the sheet panel or flashing. Provide exposed fasteners of a type and size recommended by the manufacturer to meet the performance requirements and design loads specified. Provide the manufacturer's standard fasteners for accessories. Provide an integral metal washer that matches the color of material the washer is attached to with a compressible sealing EPDM gasket approximately .238 cm 3/32 inch thick.

2.3.2.3 Screws

Provide corrosion-resistant coated steel, aluminum or stainless steel screws of the type and size recommended by the manufacturer to meet the performance requirements.

2.3.2.4 Rivets

Provide closed-end rivets, made of corrosion-resistant coated steel, aluminum, or stainless steel where watertight connections are required.

2.3.2.5 Attachment Clips

Provide clips fabricated from steel hot-dipped galvanized in accordance with ASTM A653/A653M Z275 G 90 or Series 300 stainless steel. Ensure that the size, shape, thickness and capacity are as required to meet the insulation thickness and design load criteria specified.

2.4 MATERIALS

[2.4.1 Aluminum Sheet

Roll-form aluminum roof and liner panels to the specified profile, with fy equals [2.12][2.81][3.52][5.63] kscm to a [30] [40] [50] [80] ksi, [0.81][1.02][1.27] mm [.032][.040][.050] inch thickness and depth as indicated. Ensure that the material is plumb and true, and within the tolerances listed:

a. Aluminum Sheet conforming to ASTM B209, ASTM B209M, and AA ADM.

b. Ensure individual panels have continuous length to that covers the entire length of any unbroken roof slope with no joints or seams, formed without warping, waviness, or ripples that are not part of the panel profile, and free of damage to the finish coating system.

c. Provide panels with thermal expansion and contraction coefficients consistent with the type of system specified.

[(1) Provide profile and coverage of minimum height and width based on the manufacturer s standard for the indicated roof slope.

][(2) Provide a profile of 3.8 cm 1 1/2 inch high rib at 30.5 cm 12 inches o.c. with small stiffening ribs, 96.5 cm 38 inch overall width with 91.5 cm 36 inch coverage and exposed fasteners.

][(3) Provide a profile of 3.8 cm 1 1/2 inch high rib at 18.3 cm 7.2 inches o.c., 98.75 cm 38-7/8 inch overall width with 91.5 cm 36

inch coverage and exposed fasteners.

][(4) Provide a profile of 2.54 cm 1 inch high rib at 10.2 cm 4 inches o.c., 126 cm 49-5/8 inch overall width with [122][112] cm [48] [44] inch coverage and exposed fasteners.

][(5) Provide a profile of 2.54 cm 1 inch high rib at 20.3 cm 8 inches o.c., 106 cm 41-5/8 inch overall width with 102 cm 40 inch coverage and exposed fasteners.

][(6) Provide a profile of 4.45 cm 1 3/4 inch high V-beam rib at 12.7 cm 5 inches o.c., 114 cm 44 7/8 inch overall width with 107 cm 42 inch coverage and exposed fasteners.

][(7) Provide a profile of 2.22 cm 7/8 inch high corrugated rib at 5.08 cm 2 inches o.c., 98.74 cm 38 7/8 inch overall width with 91.44 cm 36 inch coverage and exposed fasteners.

][(8) Provide a profile of 7.6 cm 3 inch high standing seam, 61 cm 24 inch coverage, factory-caulked and with mechanical crimping or snap-together seams with concealed clips and fasteners.

][(9) Provide a profile of [2.54][4.45][5.08][6.35] cm [1][1 3/4][2][2 1/2] inch high standing seam, [30.5][40.6][46] cm [12] [16] [18] inch coverage, with mechanical crimping or snap-together seams with concealed clips and fasteners.

][(10) Provide a [smooth, flat] [embossed] surface texture.

]][2.4.2 Steel Sheet

Provide roll-form steel roof and liner panels to the specified profile, with fy equal to [30] [40] [50] [80] ksi, [26] [24] [22] [20] [18] gauge and depth as indicated, conforming to ASTM A1008/A1008M, ASTM A36/A36M. Ensure the material is plumb and true, and within the tolerances listed:

[a. Galvanized/Galvannealed steel sheet conforming to ASTM A123/A123M, ASTM A653/A653M, ASTM A792/A792M, and AISI D100.

] b. Metallic coated steel sheet in accordance with ASTM A924/A924M.

[c. Aluminum-Zinc Alloy-coated sheet steel in accordance with ASTM A463/A463M, ASTM A755/A755M, ASTM A792/A792M and AISI D100.

][d. Steel sheet with porcelain coating in accordance with ASTM A424/A424M, ASTM C286, and PEI 1001, or ASTM A606/A606M for improved atmospheric corrosion resistance.

] e. Provide individual panels with a continuous length that covers the entire length of any unbroken roof slope with no joints or seams and formed without warping, waviness, or ripples that are not part of the panel profile and free of damage to the finish coating system.

f. Provide panels with thermal expansion and contraction consistent with the type of system specified.

[(1) Profile and coverage: a minimum height and width from manufacturer's standard for the indicated roof slope.

][(2) Profile: a 3.8 cm 1 1/2 inch high rib at 30.5 cm 12 inches o.c. with small stiffening ribs, 96.5 cm 38 inch overall width with 91.5 cm 36 inch coverage and exposed fasteners.

][(3) Profile: a 3.8 cm 1 1/2 inch high rib at 18.3 cm 7.2 inches o.c., 98.75 cm 38-7/8 inch overall width with 91.5 cm 36 inchcoverage and exposed fasteners.

][(4) Profile: a 2.54 cm 1 inch high rib at 10.2 cm 4 inches o.c., 126 cm 49-5/8 inch overall width with [122][112] cm [48] [44] inch coverage and exposed fasteners.

][(5) Profile: a 2.54 cm 1 inch high rib at 20.3 cm 8 inches o.c., 106 cm 41-5/8 inch overall width with 102 cm 40 inch coverage and exposed fasteners.

][(6) Profile: a 2.22 cm 7/8 inch high corrugated rib at 5.08 cm 2 inches o.c., 98.74 cm 38-7/8 inch overall width with 91.44 cm 36 inch coverage and exposed fasteners.

][(7) Profile: a 7.6 cm 3 inch high standing seam, 61 cm 24 inch coverage, factory-caulked and with mechanical crimping or snap-together seams with concealed clips and fasteners.

][(8) Profile: a [2.54][4.45][5.08][6.35] cm [1][1 3/4][2][2 1/2] inch high standing seam, [30.5][40.6][46] cm [12] [16] [18] inch coverage, with mechanical crimping or snap-together seams with concealed clips and fasteners.

][(9) Provide [smooth, flat] [embossed] surface texture.

]][2.4.3 Foam-Insulation Core Roof Panel

Provide factory-formed [aluminum] [steel] roof panel assembly fabricated from two sheets of metal with modified polyisocyanurate or polyurethane foam insulation core [foamed-in-place] [board] during fabrication with joints between panels designed to form weather-tight seals. Include accessories required for weather-tight installation.

a. Closed-Cell Content: 90 percent when tested according to ASTM D6226.

b. Density: 32 to 42 kg/cu. m 2.0 to 2.6 lb/cu. ft. when tested according to ASTM D1622.

c. Compressive Strength: Minimum 140 kPa 20 psi when tested according to ASTM D1621.

d. Shear Strength: 179 kPa 26 psi when tested according to ASTM C273/C273M.

]2.4.4 Insulated Panel Construction

Shop-fabricate or field-assemble insulated panel construction with specified exterior and interior [aluminum] [steel] sheet in accordance with manufacturer's printed instructions.

Provide pre-finished interior lath- or board-finished interior surfaces for panel assemblies in accordance with ASTM C1396/C1396M.

Provide [glass-fiber] [slag-wool-fiber] [rock-wool-fiber] insulation conforming to ASTM C553 and ASTM C612 of thickness and density as required for the geographical area where construction will take place. Glass-fiber and mineral-wool-fiber are materials listed in the EPA's Comprehensive Procurement Guidelines (CPG) https://www.epa.gov/smm/comprehensive-procurement-guidelines-construction-products Submit a sample of insulation approximately 20 by 28 cm 8 inches by 11 inches.

Provide adhesively attached insulation fasteners plate-welded to projecting spindle anchors, capable of holding insulation of thickness indicated, secured in position with self-locking washers and complying with the following requirements:

a. Plate: Perforated galvanized carbon-steel sheet, 0.762 mm 0.030 inch thick by 50 m 2 inches square.

b. Spindle: Copper-coated, low-carbon steel; fully annealed; 2.67 mm 0.105 inch in diameter; length to suit depth of insulation indicated.

c. Insulation-Retaining Washers: Self-locking washers formed from 0.41-mm 0.016 inch thick galvanized steel sheet, with a beveled edge for increased stiffness, sized as required to hold insulation in place, but not less than 38 mm 1 1/2 inches square or in diameter.

d. Adhesive: Provide an anchor adhesive to bond insulation anchors to the substrates indicated without damaging insulation, fasteners, and substrates.

2.4.5 Finish

Ensure all panels receive a factory-applied [polyvinylidene fluoride] [Kynar 500/Hylar 5000] [_____] finish consisting of a baked-on top-coat and a manufacturer's recommended prime coat with to the following:

a. Metal Preparation: Prepare all metal surfaces for painting on a continuous process coil coating line by alkali cleaning, hot-water rinsing, application of chemical conversion coating, cold-water rinsing, sealing with acid rinse, and thorough drying.

b. Prime Coating: Apply a base-coat of epoxy paint, specifically formulated to interact with the top-coat, to the prepared surfaces by roll-coating the paint to a dry film thickness of 0.20 mils plus 0.05 mils. Ensure that the prime coat is oven-cured before the application of finish coat is applied.

c. Exterior Finish Coating: Apply the finish coating over the primer by roll-coating the finish coating to a dry film thickness of 0.80 plus 5 mils (3.80 plus 0.50 mils for Vinyl Plastisol) for a total dry-film thickness of 1.00 mils plus 0.10 mils (4.00 mils plus 0.10 mils for Vinyl Plastisol). Ensure that the finish coat is oven-cured.

d. Interior Finish Coating: Apply a wash-coat on the reverse side over the primer by roll-coating to a dry-film thickness of 0.30 mils plus 0.05 mils for a total-dry film thickness of 0.50 mils plus 0.10 mils. Ensure that the wash-coat is oven-cured.

e. Color: Ensure that the exterior finish is as chosen from the manufacturer's standard color chart.

f. Coating Physical Properties: Provide coating conforming to the industry and manufacturer's standard performance criteria as listed by the following certified test reports:

(1) Chalking: ASTM D4214

(2) Coating Thickness: ASTM B659

(3) Color Change and Conformity: ASTM D2244

(4) Weatherometer: ASTM G152, ASTM G153 and ASTM D822

(5) Humidity: ASTM D2247 and ASTM D714

(6) Salt Spray: ASTM B117

(7) Chemical Pollution: ASTM D1308

(8) Gloss at 60: ASTM D523

(9) Pencil Hardness: ASTM D3363

(10) Reverse Impact: ASTM D2794

(11) Flexibility: ASTM D522/D522M

(12) Abrasion: ASTM D968

(13) Flame Spread: ASTM E84

2.5 ACCESSORIES

2.5.1 General

Provide only accessories which are compatible with the metal roof panels. Sheet metal flashing, trim, metal closure strips, caps and similar metal accessories can not be less than the minimum thickness specified for the roof panels. Submit a 10 inches long sample of each type. Ensure the exposed metal accessories and finishes match the panels furnished, except as otherwise indicated. Provide molded-foam rib, ridge and other closure strips which are non-absorbent closed-cell or solid-cell synthetic rubber or pre-molded neoprene to match the configuration of the panels.

2.5.2 Rubber Closure Strips

Provide closed-cell, expanded cellular rubber conforming to ASTM D1056 and ASTM D1667; extruded or molded to the configuration of the specified roof panel and in lengths supplied by the roof-panel manufacturer.

2.5.3 Metal Closure Strips

Provide factory fabricated [aluminum] [steel] closure strips of the same [gauge] [thickness], color, finish and profile as the specified roof panel.

2.5.4 Joint Sealants

2.5.4.1 Sealants

Provide an approved gun-type sealant for use in hand- or air-pressure caulking guns at temperatures above 4 degrees C 40 degrees F (or frostfree application at temperatures above minus 12 degrees C 10 degrees F with minimum solid content of 85 percent of the total volume. Provide sealant that has a tough, durable, dry surface skin that permits it to remain soft and pliable underneath, providing a weather-tight joint. No migratory staining is permitted on painted or unpainted metal, stone, glass, vinyl, or wood.

Prime all joints to receive sealants with a compatible one-component or two-component primer as recommended by the roof-panel manufacturer.

a. Shop-Applied Caulking: Use an approved gun-grade, non-sagging one-component polysulfide or silicone conforming to ASTM C920, Type II, with a curing time to ensure the sealant's plasticity at the time of field erection.

b. Field Applied Caulking: Use an approved gun-grade, non-sagging one-component polysulfide or two-component polyurethane with an initial maximum Shore A durometer hardness of 25, conforming to ASTM C920, Type II. Match the color to the panel colors.

c. Tape Sealant: Use a pressure-sensitive, 100 percent solid with a release paper backing, permanently elastic, non-sagging, non-toxic and non-staining as approved by the roof-panel manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

The Contracting Officer may request verification and certification testing of coatings and base metals of metal roofing prior to installation. The following areas may be verified:

a. Examine substrates, areas, and conditions, with the installer present, for compliance with the requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the work.

b. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by the metal roof-panel manufacturer, and as required for the geographical area where construction has taken place.

c. Examine solid roof sheathing to verify that the sheathing joints are supported by framing or blocking and that the installation is within flatness tolerances required by themetal roof-panel manufacturer.

d. Examine roughing-in for components and systems penetrating the metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before metal roof panel installation.

e. Submit to the Contracting Officer a written report, endorsed by the

installer, listing conditions detrimental to performance of the work.

f. Proceed with the installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

Clean substrates of substances harmful to insulation, remove projections capable of interfering with insulation attachment.

Install sub-purlins, eave angles, furring, and other miscellaneous roof-panel support members and anchorage according to themetal roof-panel manufacturer's written instructions.

3.3 INSTALLATION

3.3.1 Workmanship

Ensure lines, arises, and angles are sharp and true. Free exposed surfaces from visible wave, warp, buckle, and tool marks. Fold back exposed edges neatly to form a 1.27 cm 1/2 inch hem on the concealed side. Ensure that sheet metal that is exposed to the weather is watertight, with provisions for expansion and contraction.

Ensure surfaces that are to receive sheet metal are plumb and true, clean, even, smooth, dry, and free of defects and projections that might affect the application. Install items not shown in detail or not covered by specifications conform to the applicable requirements of SMACNA 1793. Provide sheet metal flashing in the angles formed where roof decks abut walls, curbs, ventilators, pipes, or other vertical surfaces, and wherever indicated and necessary to make the work watertight.

3.3.2 Roof Panels

Provide metal roof panels of full length from eave to ridge or eave to wall as indicated, unless otherwise indicated or restricted by shipping limitations. Anchor metal roof panels and other components of the work in place, with provisions for thermal and structural movement in accordance with NRCA 0429.

[a. Steel Roof Panels: Use stainless-steel fasteners for exterior surfaces and galvanized steel fasteners for interior surfaces.

][b. Aluminum Roof Panels: Use aluminum or stainless-steel fasteners for exterior surfaces and aluminum or galvanized steel fasteners for interior surfaces.

][c. Anchor Clips: Anchor metal roof panels and other components of the work securely in place. Use the manufacturer's approved fasteners according to the manufacturer's written instructions.

] d. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating conforming to SSPC PS 9.01, by applying rubberized-asphalt underlayment to each contact surface, or with another means to separate the metals and contact surface as recommended by metal roof-panel manufacturer.

e. Joint Sealers: Install gaskets, joint fillers, and sealants where

required for weatherproof performance of metal roof panel assemblies. Provide the types of gaskets, fillers, and sealants indicated; or if not indicated, provide types recommended by the metal roof panel-manufacturer.

Erect the roofing system in accordance with the approved erection drawings, the printed instructions and the safety precautions of the manufacturer.

Do not overload, abuse, or subject sheets to undue impact. Do not apply bent, chipped, or defective sheets.

Erect sheets true and plumb and in exact alignment with the horizontal and vertical edges of the building, securely anchored, and with the indicated rake, eave, and curb overhang.

Allow for thermal movement of the roofing and movement of the building structure, and provide permanent freedom from noise caused by wind pressure.

Field cutting metal roof panels by torch is not permitted.

Lay roofing sheets with corrugations in the direction of the roof slope. End laps of exterior roofing cannot be less than 20.3 cm 8 inches; the side laps of standard exterior corrugated sheets cannot be less than 2-1/2 corrugations.

Do not permit storage, walking, wheeling, and trucking directly on applied roofing materials. Provide temporary walkways, runways, and platforms of smooth clean boards or planks as necessary to avoid damage to the installed roofing materials and to distribute weight to conform to the indicated live-load limits of roof construction.

3.3.3 Fasteners

Anchor metal roof panels and other components of the work in place using the manufacturer's approved fasteners according to the manufacturer's written instructions.

3.3.4 Flashing, Trim and Closure

3.3.4.1 General Requirements

Comply with performance requirements, the manufacturer's written installation instructions, and SMACNA 1793. Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather-resistant.

Install sheet metalwork to form weathertight construction without waves, warps, buckles, fastening stresses or distortion, and allow for expansion and contraction. Ensure sheet metal mechanics perform cutting, fitting, drilling, and other operations in connection with sheet metal work required to accommodate the work of other trades.

3.3.4.2 Metal Flashing

Install metal flashing at building corners, rakes and eaves, junctions between metal siding and roofing, valleys and changes of slope or

direction in metal roofing, and building expansion joints and gutters.

Provide exposed metal flashing that is the same material, color, and finish as the specified metal roofing.

Fasten flashing at not more than 20.8 cm 8 inches on-center for roofs, except where flashing are held in place by the same screws that secure covering sheets.

Furnish flashing in at least 2.44 m 8 foot lengths. Provide exposed flashing that has 2.54 cm 1 inch locked and blind-soldered end joints, and expansion joints at intervals of not more than 4.88 m 16 feet.

Bed exposed flashing and flashing subject to rain penetration in the specified joint sealant.

To prevent electrolytic deterioration, isolate flashing that is in contact with dissimilar metals by means of the specified asphalt-mastic material.

Form drips to the profile indicated, with the edge folded back 1.27 cm 1/2 inch to form a reinforced drip edge.

3.3.4.3 Closures

Install metal closure strips at the open ends of corrugated or ribbed pattern roofs, and at the intersection of wall and roof unless open ends are concealed with formed eave flashing, at the rake of the metal roof unless the open end has a formed flashing member, and in other required areas.

Install mastic closure strips at the intersection of the wall with metal roofing, a the top and bottom of metal siding, at the heads of wall openings, and in other required locations.

3.3.5 Information Form and Placard

For each roof, furnish a typewritten information card for facility records and a card laminated in plastic and framed for interior display at the roof access point, or a photoengraved 1 mm 0.032 inch thick aluminum card for exterior display. Format the card as directed in paragraph FORM ONE.

Provide an information card 215 mm by 275 mm 8 1/2 inches by 11 inches minimum, identifying the facility name and number, location, contract number, approximate roof area, detailed roof system description, including deck type, roof panel manufacturer and product name, type underlayment, date of completion, installing contractor identification and contact information; manufacturer warranty expiration, warranty reference number, and contact information. Install the card at [interior roof top access point][_____] and provide a paper copy to the Contracting Officer.

3.4 FIELD QUALITY CONTROL

3.4.1 Acceptance Provisions

3.4.1.1 Erection Tolerances

Erect metal roofing straight and true with plumb vertical lines correctly lapped and secured in accordance with the manufacturer's written instructions. Do not vary horizontal lines more than 0.32 cm in 12.2 m

1/8 inch in 40 feet.

3.4.1.2 Leakage Tests

Finished application of metal roofing is subject to inspection and test for leakage by the Contracting Officer, and architect/engineer. Conduct inspections and tests without cost to the Government.

Perform inspections and tests promptly after erection to permit correction of defects and the removal and replacement of defective materials.

3.4.1.3 Repairs to Finish

Repair scratches, abrasions, and minor surface defects in the finish with the specified repair materials. Ensure repaired finished surfaces are uniform and free from variations of color and surface texture.

Immediately remove and replace repaired metal surfaces that are not acceptable to the project requirements with new material.

3.4.1.4 Paint-Finish Metal Roofing

Test paint-finish metal roofing for color stability by the Contracting Officer during the manufacturer's specified guarantee period.

Remove and replace panels that have visual evidence of color changes, fading, or surface degradation, with new panels at no expense to the Government.

Replaced panels are subject to the specified tests for an additional year from the date of their installation.

[3.4.2 Manufacturer's Inspection

****
NOTE: Include this paragraph when manufacturer's inspection of work is required. Select desired frequency of manufacturer inspection and coordinate with text of optional 2nd and 3rd bracketed sentences.
****

Ensure the manufacturer's technical representative visits the site a minimum of [[three][_____] times][once per week] during the installation to review material installation practices and to verify the adequacy of work in place.[Make inspections during the first 20 squares of roof panel installation, at mid-point of the installation, and at substantial completion, at a minimum. Additional inspections are required for each 100 squares of total roof area, with the exception that follow-up inspections of previously noted deficiencies or application errors are performed as requested by the Contracting Officer.] After each inspection, submit a report, signed by the manufacturer's technical representative, to the Contracting Officer within 3 working days. Note in the report the overall quality of work, deficiencies, and any other concerns, and recommended corrective action.

Submit three [_____] signed copies of the manufacturer's field inspection reports to the Contracting Officer within one week of substantial completion.

]3.4.3 Repair of Finish Protection

Provide repair paint for color-finish enameled roofing that is compatible with the paint of the same formula and color as the specified finish furnished by the roofing manufacturer.

3.5 ADJUSTING AND CLEANING

Clean all exposed sheet metal work at completion of installation. Remove metal shavings, filings, nails, bolts, and wires from roofs. Remove grease and oil films, excess sealants, handling marks, contamination from steel wool, fittings, and drilling debris and scrub the work clean. Ensure exposed metal surfaces are free of dents, creases, waves, scratch marks, solder or weld marks, and damage to the finish coating.

Collect and place scrap/waste materials in containers. Dispose of demolished materials immediately. Do not allow demolished materials to accumulate on-site; transport demolished materials from government property and legally dispose of them.

3.6 SCHEDULES

3.6.1 Form One

FORM 1 - PREFORMED [STEEL][ALUMINUM] PANEL ROOFING SYSTEM AND COMPONENTS

1. Contract Number:

2. Building Number & Location:

3. NAVFAC Specification Number:

4. Deck/Substrate Type:

5. Slopes of Deck/Roof Structure:

6. Insulation Type & Thickness:

7. Insulation Manufacturer:

8. Vapor Retarder: ( )Yes ( )No

9. Vapor Retarder Type:

10. Preformed Steel Standing Seam Roofing Description:

a. Manufacturer (Name, Address, & Phone No.):
b. Product Name: c. Width: d. Gage:
e. Base Metal: f. Method of Attachment:

11. Repair of Color Coating:

a. Coating Manufacturer (Name, Address & Phone No.):
b. Product Name:
c. Surface Preparation:
d. Recoating Formula:
e. Application Method:

12. Statement of Compliance or Exception:_____
_____
_____

13. Date Roof Completed:

14. Warranty Period: From_____ To_____

15. Roofing Contractor (Name & Address):

16. Prime Contractor (Name & Address):

Contractor's Signature _____ Date:

Inspector's Signature _____ Date:

3.6.2 Date of Installation Wall-Mounted Placard

For each metal roof panel installation, furnish an exterior "Date of Installation Placard", 0.032 inch thick [aluminum][_____], 21.6 cm 8-1/2 inches high by 28 cm 11 inches wide, with mounting accessories, photoengraved to include the following information:

Facility Name and Number
Approximate Roof Area Newly Installed and Date of Completion
Manufacturer, Type of Roof Panel and Name
Underlayment and Insulation System, R value
Installing Contractor and Contact Information
Warranty Expiration Date
Warranty Reference Number and Contact Information

Install placard as directed by the Contracting Officer.

3.6.3 Warranty

****
NOTE: Include the attached four page warranty document for Army projects only. Coordinate with the warranty text in Part 1 of this specification.
****

CONTRACTOR'S [FIVE (5)][TEN (10)][TWENTY (20)] YEAR NO PENAL SUM WARRANTY
FOR
NON-STRUCTURAL METAL ROOF SYSTEM

FACILITY DESCRIPTION_____

BUILDING NUMBER:_____

CORPS OF ENGINEERS CONTRACT NUMBER:_____

CONTRACTOR

CONTRACTOR:_____

ADDRESS:_____

POINT OF CONTACT:_____

TELEPHONE NUMBER:_____

OWNER

OWNER:_____

ADDRESS:_____

POINT OF CONTACT:_____

TELEPHONE NUMBER:_____

CONSTRUCTION AGENT

CONSTRUCTION AGENT:_____

ADDRESS:_____

POINT OF CONTACT:_____

TELEPHONE NUMBER:_____

CONTRACTOR'S [FIVE (5)][TEN (10)][TWENTY (20)] YEAR NO PENAL SUM WARRANTY
FOR
NON-STRUCTURAL METAL ROOF SYSTEM
(continued)

THE NON-STRUCTURAL METAL ROOF SYSTEM INSTALLED ON THE ABOVE NAMED BUILDING IS WARRANTED BY _____ FOR A PERIOD OF FIVE (5) YEARS AGAINST WORKMANSHIP AND MATERIAL DEFICIENCIES, WIND DAMAGE, STRUCTURAL FAILURE, AND LEAKAGE. FOR THE NON-STRUCTURAL METAL ROOFING SYSTEM COVERED UNDER THIS WARRANTY INCLUDE, BUT DO NOT LIMIT TO, THE FOLLOWING: THE ENTIRE ROOFING SYSTEM, MANUFACTURER SUPPLIED FRAMING AND STRUCTURAL MEMBERS, METAL ROOF PANELS, FASTENERS, CONNECTORS, ROOF SECUREMENT COMPONENTS, AND ASSEMBLIES TESTED AND APPROVED IN ACCORDANCE WITH UL 580. IN ADDITION, THE SYSTEM PANEL FINISHES, SLIP SHEET, INSULATION, VAPOR RETARDER, ALL ACCESSORIES, COMPONENTS, AND TRIM AND ALL CONNECTIONS ARE INCLUDED. THIS INCLUDES ROOF PENETRATION ITEMS SUCH AS VENTS, CURBS, SKYLIGHTS; INTERIOR OR EXTERIOR GUTTERS AND DOWNSPOUTS; EAVES, RIDGE, HIP, VALLEY, RAKE, GABLE, WALL, OR OTHER ROOF SYSTEM FLASHING INSTALLED AND ANY OTHER COMPONENTS SPECIFIED WITHIN THIS CONTRACT TO PROVIDE A WEATHERTIGHT ROOF SYSTEM; AND ITEMS SPECIFIED IN OTHER SECTIONS OF THE SPECIFICATIONS THAT ARE PART OF THE NON-STRUCTURAL METAL ROOFING SYSTEM.

REPAIR ALL MATERIAL DEFICIENCIES, WIND DAMAGE, STRUCTURAL FAILURE, AND LEAKAGE ASSOCIATED WITH THE NON-STRUCTURAL METAL ROOF SYSTEM COVERED UNDER THIS WARRANTY AS APPROVED BY THE CONTRACTING OFFICER. IN THIS WARRANTY COVER THE ENTIRE COST OF REPAIR OR REPLACEMENT, INCLUDING ALL MATERIAL, LABOR, AND RELATED MARKUPS. THE ABOVE REFERENCED WARRANTY COMMENCED ON THE DATE OF FINAL ACCEPTANCE ON _____ AND WILL REMAIN IN EFFECT FOR STATED DURATION FROM THIS DATE.

SIGNED, DATED, AND NOTARIZED (BY COMPANY PRESIDENT)

_____

(Company President) (Date)

CONTRACTOR'S [FIVE (5)][TEN (10)][TWENTY (20)] YEAR NO PENAL SUM WARRANTY
FOR
NON-STRUCTURAL METAL ROOFING SYSTEM
(continued)

ENSURE THE CONTRACTOR SUPPLEMENTS THIS WARRANTY WITH WRITTEN WARRANTIES FROM THE MANUFACTURER AND/OR INSTALLER OF THE NON-STRUCTURAL METAL ROOFING SYSTEM.SUBMIT ALONG WITH THE CONTRACTOR'S WARRANTY. HOWEVER, THE CONTRACTOR IS ULTIMATELY RESPONSIBLE FOR THIS WARRANTY AS OUTLINED IN THE SPECIFICATIONS AND AS INDICATED IN THIS WARRANTY EXAMPLE.

EXCLUSIONS FROM COVERAGE

1. NATURAL DISASTERS, ACTS OF GOD (LIGHTNING, FIRE, EXPLOSIONS, SUSTAINED WIND FORCES IN EXCESS OF THE DESIGN CRITERIA, EARTHQUAKES, AND HAIL).

2. ACTS OF NEGLIGENCE OR ABUSE OR MISUSE BY GOVERNMENT OR OTHER PERSONNEL, INCLUDING ACCIDENTS, VANDALISM, CIVIL DISOBEDIENCE, WAR, OR DAMAGE CAUSED BY FALLING OBJECTS.

3. DAMAGE BY STRUCTURAL FAILURE, SETTLEMENT, MOVEMENT, DISTORTION, WARPAGE, OR DISPLACEMENT OF THE BUILDING STRUCTURE OR ALTERATIONS MADE TO THE BUILDING.

4. CORROSION CAUSED BY EXPOSURE TO CORROSIVE CHEMICALS, ASH OR FUMES GENERATED OR RELEASED INSIDE OR OUTSIDE THE BUILDING FROM CHEMICAL PLANTS, FOUNDRIES, PLATING WORKS, KILNS, FERTILIZER FACTORIES, PAPER PLANTS, AND THE LIKE.

5. FAILURE OF ANY PART OF THE NON-STRUCTURAL METAL ROOF DUE TO ACTIONS BY THE OWNER TO INHIBIT FREE DRAINAGE OF WATER FROM THE ROOF AND GUTTERS AND DOWNSPOUTS OR ALLOW PONDING WATER TO COLLECT ON THE ROOF SURFACE. IN CONTRACTOR'S DESIGN ENSURE FREE DRAINAGE FROM THE ROOF AND DO NOT ALLOW PONDING WATER.

6. THIS WARRANTY APPLIES TO THE NON-STRUCTURAL METAL ROOFING SYSTEM. IT DOES NOT INCLUDE ANY CONSEQUENTIAL DAMAGE TO THE BUILDING INTERIOR OR CONTENTS WHICH IS COVERED BY THE WARRANTY OF CONSTRUCTION CLAUSE INCLUDED IN THIS CONTRACT.

7. THIS WARRANTY CANNOT BE TRANSFERRED TO ANOTHER OWNER WITHOUT WRITTEN CONSENT OF THE CONTRACTOR; AND THIS WARRANTY AND THE CONTRACT PROVISIONS WILL TAKE PRECEDENCE OVER ANY CONFLICTS WITH STATE STATUTES.

CONTRACTOR'S [FIVE (5)][TEN (10)][TWENTY (20)] YEAR NO PENAL SUM WARRANTY
FOR
NON-STRUCTURAL METAL ROOF SYSTEM
(continued)

**RESPOND TO REPORTS OF LEAKS AND ROOF SYSTEM DEFICIENCIES WITHIN 48 HOURS OF RECEIPT OF NOTICE, BY TELEPHONE OR IN WRITING, FROM EITHER THE OWNER OR CONTRACTING OFFICER. INITIATE EMERGENCY REPAIRS TO PREVENT FURTHER ROOF LEAKS IMMEDIATELY; SUBMIT A WRITTEN PLAN FOR APPROVAL TO REPAIR OR REPLACE THIS ROOF SYSTEM WITHIN SEVEN (7) CALENDAR DAYS. COMMENCE ACTUAL WORK FOR PERMANENT REPAIRS OR REPLACEMENT WITHIN 30 DAYS AFTER RECEIPT OF NOTICE, AND COMPLETED WITHIN A REASONABLE TIME FRAME. IF THE CONTRACTOR FAILS TO ADEQUATELY RESPOND TO THE WARRANTY PROVISIONS, AS STATED IN THE CONTRACT AND AS CONTAINED HEREIN, THE CONTRACTING OFFICER MAY HAVE THE NON-STRUCTURAL METAL ROOF SYSTEM REPAIRED OR REPLACED BY OTHERS AND CHARGE THE COST TO THE CONTRACTOR.

UNDER THE CONTRACT DISPUTES ACT, THE CONTRACTOR MAY CHALLENGE THE OWNER'S DEMAND FOR REPAIRS AND/OR REPLACEMENT DIRECTED BY THE OWNER OR CONTRACTING OFFICER EITHER BY REQUESTING A CONTRACTING OFFICER'S DECISION UNDER THE CONTRACT DISPUTES ACT, OR BY REQUESTING THAT AN ARBITRATOR RESOLVE THE ISSUE. MAKE THE REQUEST FOR AN ARBITRATOR WITHIN 48 HOURS OF BEING NOTIFIED OF THE DISPUTED DEFECTS. UPON BEING INVOKED, WITHIN TEN (10) DAYS, ENSURE THE PARTIES JOINTLY REQUEST A LIST OF FIVE (5) ARBITRATORS FROM THE FEDERAL MEDIATION AND CONCILIATION SERVICE. THE PARTIES TEN (10) DAYS AFTER RECEIPT OF THE LIST TO SEEK AGREEMENT ON AN ARBITRATOR TO CONFER. IF THE PARTIES CANNOT AGREE ON AN ARBITRATOR, THE CONTRACTING OFFICER AND THE PRESIDENT OF THE CONTRACTOR'S COMPANY WILL STRIKE ONE (1) NAME FROM THE LIST ALTERNATIVELY UNTIL ONE (1) NAME REMAINS. THE REMAINING PERSON IS THE DULY SELECTED ARBITRATOR. THE COSTS OF THE ARBITRATION, INCLUDING THE ARBITRATOR'S FEE AND EXPENSES, COURT REPORTER, COURTROOM OR SITE SELECTED, ETC., WILL BE BORNE EQUALLY BETWEEN THE PARTIES. EITHER PARTY DESIRING A COPY OF THE TRANSCRIPT PAYS FOR THE TRANSCRIPT. A HEARING WILL BE HELD AS SOON AS THE PARTIES CAN MUTUALLY AGREE. REQUEST A WRITTEN ARBITRATOR'S DECISION NO LATER THAN 30 DAYS FOLLOWING THE HEARING. THE DECISION OF THE ARBITRATOR WILL NOT BE BINDING; HOWEVER, IT WILL BE ADMISSIBLE IN ANY SUBSEQUENT APPEAL UNDER THE CONTRACT DISPUTES ACT.

POST A FRAMED COPY OF THIS WARRANTY IN THE MECHANICAL ROOM OR OTHER APPROVED LOCATION DURING THE ENTIRE WARRANTY PERIOD.

-- End of Section --