JOINT BASE LEWIS-McCHORD DESIGN STANDARDS

DIVISION 07 - THERMAL AND MOISTURE PROTECTION SECTION 07 41 13

METAL ROOF PANELS

# 07/18

PART 1 GENERAL

**Notes to Designers: No concealed/boxed gutters. Design should plan for exposed gutters.**

* 1. REFERENCES

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 (2015) 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 S100 (2012) North American Specification for the Design of Cold-Formed Steel Structural Members

AISI SG03-3 (2002; Suppl 2001-2004; R 2008)

Cold-Formed Steel Design Manual Set AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7 (2017) Minimum Design Loads 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 (2015; Errata 1 2015; Errata 2 2016)

Structural Welding Code - Steel

AWS D1.2/D1.2M (2014) Structural Welding Code - Aluminum ASTM INTERNATIONAL (ASTM)

ASTM A1008/A1008M (2016) 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 A123/A123M (2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A36/A36M (2014) Standard Specification for Carbon Structural Steel

ASTM A424/A424M (2009a; R 2016) Standard Specification for Steel Sheet for Porcelain Enameling

ASTM A463/A463M (2010; R 2015) Standard Specification for Steel Sheet, Aluminum-Coated, by the

Hot-Dip Process

ASTM A653/A653M (2017) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or

Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A755/A755M (2016; E 2016) 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 A792/A792M (2010) Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

ASTM A924/A924M (2017a) Standard Specification for General Requirements for Steel Sheet,

Metallic-Coated by the Hot-Dip Process

ASTM B117 (2016) 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 C286 (1999; R 2017) Standard Terminology Relating to Porcelain Enamel and Ceramic-Metal Systems

ASTM C552 (2017) Standard Specification for Cellular Glass Thermal Insulation

ASTM C553 (2013) Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications

ASTM C792 (2004; R 2008) Effects of Heat Aging on Weight Loss, Cracking, and Chalking of Elastomeric Sealants

ASTM C920 (2018) Standard Specification for Elastomeric Joint Sealants

ASTM D1056 (2014) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber

ASTM D1308 (2013) Effect of Household Chemicals on Clear and Pigmented Organic Finishes

ASTM D1654 (2008; R 2016; E 2017) Standard Test

Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments

ASTM D1667 (2017) Standard Specification for Flexible Cellular Materials - Poly (Vinyl Chloride) Foam (Closed-Cell)

ASTM D1970/D1970M (2017) Standard Specification for

Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection

ASTM D2244 (2016) Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

ASTM D2247 (2015) Testing Water Resistance of Coatings in 100% Relative Humidity

ASTM D226/D226M (2017) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing

ASTM D2794 (1993; R 2010) Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)

ASTM D3359 (2017) Standard Test Methods for Rating

Adhesion by Tape Test

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 D4587 (2011) Standard Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings

ASTM D4637/D4637M (2015) EPDM Sheet Used in Single-Ply Roof Membrane

ASTM D4869/D4869M (2016a) Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing

ASTM D522/D522M (2014) Mandrel Bend Test of Attached Organic Coatings

ASTM D523 (2014) Standard Test Method for Specular Gloss

ASTM D5894 (2016) Standard Practice for Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet)

ASTM D610 (2008; R 2012) Evaluating Degree of Rusting on Painted Steel Surfaces

ASTM D714 (2002; R 2017) Standard Test Method for Evaluating Degree of Blistering of Paints

ASTM D822 (2013) Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings

ASTM D968 (2017) Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive

ASTM E1592 (2005; R 2012) 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 E84 (2018) Standard Test Method for Surface Burning Characteristics of Building Materials

ASTM G152 (2013) Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

ASTM G153 (2013) Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

FM GLOBAL (FM)

FM 4471 (2010) Class I Panel Roofs METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)

MBMA RSDM (2012) Metal Roofing Systems Design Manual NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)

NRCA 0420 (2010) Architectural Metal Flashing, Condensation Control and Reroofing

NRCA RoofMan (2017) The NRCA Roofing Manual PORCELAIN ENAMEL INSTITUTE (PEI)

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

PEI CG-3 (2005) Color Guide for Architectural Porcelain Enamel

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

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

UNDERWRITERS LABORATORIES (UL)

UL 580 (2006; Reprint Oct 2013) Tests for Uplift Resistance of Roof Assemblies

UL Bld Mat Dir (updated continuously online) Building Materials Directory

* 1. DESCRIPTION OF METAL ROOF SYSTEM
		1. Performance Requirements

Steel panels and accessory components must conform to the following standards:

ASTM A1008/A1008M ASTM A123/A123M ASTM A36/A36M

* + - 1. Hydrostatic Head Resistance

No water penetration when tested according to ASTM E2140. Submit leakage test report upon completion of installation.

Design criteria for hydrostatic standing seam panels shall have the following minimal performance:

ASTM E 1680:  Static pressure air infiltration (roof panels):

Pressure            Leakage Rate

1.57 PSF            0.0012 cfm/sq.ft.

6.24 PSF            0.0001 cfm/sq.ft.

20.0 PSF            0.0011 cfm/sq.ft.

ASTM E 1646: Static pressure water infiltration (roof panels):

Pressure                      Result

5 Gal/Hr Per S.F. and Static   No Leakage

Pressure Of 20.0 Psf for 15 minutes

Wind and wind driven rain resistance:  No water penetration or panel movement when exposed to 110 mph wind velocities when tested in accordance with TAS 100.

The installed roof system assembly shall show that it can resist the calculated roof pressure in section 1.11.B in accordance with the test results of TAS 125.

Water penetration in low slope applications:  No water penetration or panel movement when subject to 6-inch head of water for 6 hours when tested in accordance with the ASTM E 2140 and when subject to 6-inch head of water for 7 days when tested in accordance with the TAS 114 Appendix G

* + - 1. Wind Uplift Resistance

Provide metal roof panel system that conform to the requirements of

ASTM E1592 and UL 580. Uplift force due to wind action governs the design for panels. Submit wind uplift test report prior to commencing installation.

Roof system and attachments must resist the wind loads as determined by ASCE 7, in pounds per square foot. Metal roof panels and component materials must also comply with the requirements in FM 4471 as part of a panel roofing system as listed in Factory Mutual Guide (FMG) "Approval Guide" for class 1 or noncombustible construction, as applicable. Identify all materials with FMG markings.

Design Loads: Submit copy of manufacturer's minimum design load calculations according to ASCE 7-05, Method 2 for Components and Cladding, sealed by a registered professional engineer employed by the system manufacturer as a full-time staff engineer. In no case shall the design loads be taken to be less than those detailed in Design and Performance Criteria article of this specification.

* 1. SUBMITTALS

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NOTE: If 01 33 29 is incorporated in the specifications, select that option below. If not, select the option for 01 57 19. Include items noted at SD-01 and SD-11 as applicable, based on project scope.

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Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the [Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING]‌[Environmental Records Binder, in conformance to Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS]. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Roof Panels (Recycled Content); S

Insulation (Recycled Content); S

Fiber Underlayment (Recycled Content); S

SD-02 Shop Drawings

Roofing Panels; G

Flashing and Accessories; G Gutter/Downspout Assembly; G

SD-03 Product Data

Submit manufacturer's catalog data for the following items:

Roof Panels; G

 Factory-Applied Color Finish; G

 Accessories;

Fasteners; G

Pressure Sensitive Tape;

Underlayments; G

Gaskets and Sealing/Insulating Compounds;

Coil Stock;

Enamel Repair Paint; G

Galvanizing Repair Paint; G

SD-04 Samples

Roof Panels; G

Factory-applied Color Finish, Samples, 23 cm 9 inch lengths, full width; G

Accessories; G

Fasteners; G

Gaskets and Sealant/Insulating Compounds; G

SD-05 Design Data

Wind Uplift Resistance; G

 SD-06 Test Reports; G

Leakage Test Report; G

Wind Uplift Test Report; G

Fire Rating Test Report; G

Factory Finish and Color Performance Requirements; G

 SD-07 Certificates

Roof Panels; G

Coil Stock Compatibility; G

 Self-Adhering Modified Bitumen Underlayment; G

 Qualification of Manufacturer; G Qualification of Applicator; G

SD-08 Manufacturer's Instructions

 Insulation; G

Installation Manual; G SD-09 Manufacturer's Field Reports

 Manufacturer's Field Inspection Reports;

SD-11 Closeout Submittals

Roof Panels (Recycled Content); S

Insulation (Recycled Content); S

Fiber Underlayment (Recycled Content); S

Warranties;

 Information Card; G

 Date of Installation Wall-Mounted Placard;

1.4 QUALITY ASSURANCE

* + 1. Qualification of Manufacturer

Submit documentation verifying metal roof panel manufacturer has been in the business of manufacturing metal roof panels for a period of not less than 5 years.

Manufacturer must also provide engineering services by an authorized engineer, currently licensed in the geographic area of the project, with a minimum of five (5) years’ experience as an engineer knowledgeable in roof wind design analysis, protocols and procedures for MBMA RSDM, ASCE 7, UL 580, and FM 4471. Engineer must provide certified engineering calculations for the project conforming to the stated references.

1.4.1.2 Single Source

Roofing panels, clips, closures, and other accessories must be standard products of the same manufacturer, and the most recent design of the manufacturer to operate as a complete system for the intended use.

* + 1. Qualification of Applicator

Metal roof system applicator must be approved, authorized, or licensed in writing by the roof panel manufacturer and have a minimum of three years’ experience as an approved, authorized, or licensed applicator with that manufacturer, approved at a level capable of providing the specified warranty. Supply the names, locations and client contact information of 5 projects of similar size and scope constructed by applicator using the manufacturer's roofing products submitted for this project within the previous three years.

* + 1. Field Verification

Prior to the preparation of drawings and fabrication, verify location of roof framing, roof openings and penetrations, and any other special conditions. Indicate all special conditions and measurements on final shop drawings.

* + 1. Qualifications for Welding Work

Welding procedures must conform to AWS D1.1/D1.1Mfor steel or AWS D1.2/D1.2M for aluminum.

Operators are permitted to make only those types of weldments for which each is specifically qualified.

* + 1. Pre-roofing Conference

After approval of submittals and before performing roofing system installation work, hold a pre-roofing conference to review the following:

* + - 1. Drawings, specifications, and submittals related to the roof work. Submit, as a minimum; sample profiles of roofing panels, with factory-applied color finish samples, flashing and accessories, gutter/downspout assembly samples, typical fasteners and pressure sensitive tape, sample gaskets and sealant/insulating compounds. Also include data and 1/2 pint sample of enamel repair paint and technical data on coil stock and coil stock compatibility, and manufacturer's installation manual.
			2. Roof system components installation;
			3. Procedure for the roof manufacturer's technical representative's onsite inspection and acceptance of the roofing substrate, the name of the manufacturer's technical representatives, the frequency of the onsite visits, distribution of copies of the inspection reports from the manufacturer's technical representative;
			4. Contractor's plan for coordination of the work of the various trades involved in providing the roofing system and other components secured to the roofing; and
			5. Quality control plan for the roof system installation;
			6. Safety requirements.

Coordinate pre-roofing conference scheduling with the Contracting Officer. Attendance is mandatory for the Contractor, the Contracting Officer's designated personnel, personnel directly responsible for the installation of metal roof system, flashing and sheet metal work, mechanical and electrical work, other trades interfacing with the roof work, and representative of the metal roofing manufacturer. Before beginning roofing work, provide a copy of meeting notes and action items to all attending parties. Note action items requiring resolution prior to start of roof work.

* 1. DELIVERY, HANDLING, AND STORAGE

Deliver, store, and handle panel materials, bulk roofing products, accessories, and other manufactured items in a manner to prevent damage and deformation, as recommended by the manufacturer, and as specified.

* + 1. Delivery

Package and deliver materials to the site in undamaged condition. Provide adequate packaging to protect materials during shipment. Do not uncrate materials until ready for use, except for inspection. Immediately upon arrival of materials at jobsite, inspect materials for damage, deformation, dampness, and staining. Remove affected materials from the site and immediately replace. Remove moisture from wet materials not otherwise affected, restack and protect from further moisture exposure.

* + 1. Handling

Handle materials in a manner to avoid damage. Select and operate material handling equipment so as not to damage materials or applied roofing.

* + 1. Storage

Stack materials stored on site on platforms or pallets, and cover with tarpaulins or other weathertight covering which prevents trapping of water or condensation under the covering. Store roof panels so that water which may have accumulated during transit or storage will drain off. Do not store panels in contact with materials that might cause staining. Secure coverings and stored items to protect from wind displacement.

* 1. PROJECT CONDITIONS

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

* 1. FABRICATION

Fabricate and finish metal roof panels and accessories on a factory stationary industrial type rolling mill to the greatest extent possible, per manufacturer's standard procedures and processes, and as necessary to fulfill indicated performance requirements. Comply with indicated profiles, dimensional and structural requirements.

Provide panel profile, as indicated on drawings including major ribs and intermediate stiffening ribs for full length of panel. Fabricate panel side laps with factory installed captive gaskets or separator strips providing a weather tight seal and preventing metal-to metal contact, and minimizing noise from movements within the panel assembly.

* + 1. Finishes

Finish quality and application processes must conform to the related standards specified within this section. Noticeable variations within the same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved samples and are assembled or installed to minimize any contrasting variations.

* + 1. Accessories

Fabricate flashing and trim to comply with recommendations in SMACNA 1793 as applicable to the design, dimensions, metal, and other characteristics of the item indicated.

* + - 1. Form exposed sheet metal accessories which are free from excessive oil canning, buckling, and tool marks, and are true to line and levels indicated, with exposed edges folded back to form hems.
			2. End Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
			3. Sealed Joints: Form non-expansion, but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA 1793.
			4. Conceal fasteners and expansion provisions where possible.
			5. Fabricate cleats and attachments devices of size and metal thickness recommended by SMACNA or by metal roof panel manufacturer for application, but not less than the thickness of the metal being secured.
	1. WARRANTIES

Provide metal roof system material and workmanship warranties meeting specified requirements. Provide revision or amendment to manufacturer's standard warranty as required to comply with the specified requirements.

* + 1. Metal Roof Panel Manufacturer Warranty

Furnish the metal roof panel manufacturer's 20 year no dollar limit roof system materials and installation workmanship warranty, including flashing, components, trim, and accessories necessary for a watertight roof system construction. Make warranty directly to the Government, commencing at time of Government's acceptance of the roof work. The warranty must state that:

* + - 1. 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 non-watertight, 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.
			2. If the manufacturer or his approved applicator fail to perform the repairs within 72 hours of notification, emergency temporary repairs performed by others does not void the warranty.

1.8.2 Manufacturer's Finish Warranty

The Government shall receive one (1) warranty from manufacturer of roof panels covering all of the following criteria.  Multiple warranties are not acceptable.

1.  Manufacturer's 30-year watertight warranty, including coverage for all trim, flashings, and penetrations associated with the standing seam roof area.

2.  20-year coverage on finish including checking, crazing, peeling, chalking, fading and/or adhesion.

3.  Warranty shall commence on date of substantial completion or final payment, whichever is agreed by contract.

4.  One manufacturer shall provide a single warranty for standing seam roof areas, low slope roof areas, and transitions between the two material types.

1.8.3 Metal Roof System Installer Warranty

 Provide the "Contractors Five 5 Year No Penal 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 5 year warranty period.

1.8.4 Continuance of Warranty

Repair or replacement work that becomes necessary within the warranty period must be approved, as required, and accomplished in a manner so as to restore the integrity of the roof system assembly and validity of the metal roof system manufacturer warranty for the remainder of the manufacturer warranty period.

* 1. CONFORMANCE AND COMPATIBILITY

The entire metal roofing and flashing system must be in accordance with specified and indicated requirements, including wind resistance and seismic per AISC 341 requirements. Work not specifically addressed and any deviation from specified requirements must be 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 prior to installation.

* 1. SCHEDULE

Some metric measurements in this section are based on mathematical conversion of English unit measurements, and not on metric measurement commonly agreed to by the manufacturers or other parties. The English and metric units for the measurements shown are as follows:

|  |  |  |
| --- | --- | --- |
| PRODUCTS | ENGLISH UNITS | METRIC UNITS |
| a. Sheet Aluminum | 0.040 inch | 1.0 mm |
| b. Panels | 12 inches | 300 mm |
| - vertical legs | 2 inches | 50 mm |
| - stiffening ribs | 4 inches | 100 mm |
| c. Screws | No. 14 | 0.242 mm |
| No. 12 | 0.216 mm |
| d. Bolts | 1/4 inch | 6 mm |
| e. Studs | 3/16 inch | 5 mm |
| f. Fasteners | 1/2 inch | 13 mm |
| One inch | 25 mm |
| g. Rivets | 1/16 inch | 5 mm |
| 1/8 inch | 3 mm |

PART 2 PRODUCTS

* 1. ROOF PANELS

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2.1.1 Steel Sheet Panels

Roll-form steel sheet roof panels to the specified profile, with fy as indicated ksi and minimum 22 gauge and depth as indicated.

Material must be plumb and true, and within the tolerances listed:

a. Galvanized steel sheet conforming to ASTM A653/A653M and AISI SG03-3.

b. Aluminum-Zinc alloy coated steel sheet conforming to ASTM A792/A792M and AISI SG03-3.

1. Individual panels to have continuous length sufficient to cover the entire length of any unbroken roof slope with no joints or seams and formed without warping, waviness, or ripples that are not a part of the panel profile and free from damage to the finish coating system.
2. Provide panels with thermal expansion and contraction consistent with the type of system specified, and the following profile:

 (1) profile to be a 4.45cm 1-3/4 inch high standing seam, 30.48 cm 12 inch coverage with mechanical crimping or snap-together seams with concealed clips and fasteners.

 (2) profile to be smooth, flat surface.

 (3) profile to be custom, as shown on drawings.

Provide products with recycled content and provide documentation in accordance with Section [01 33 29 SUSTAINABILITY REPORTING][01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS] paragraph RECYCLED CONTENT. For more information see https://sftool.gov/greenprocurement/green-products/1/construction-materials/231/roofing-materials/0?addon=False and https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program.

2.2 FACTORY FINISH AND COLOR PERFORMANCE REQUIREMENTS

All panels are to receive a factory applied finish consisting of a baked topcoat with a manufacturer's recommended prime coat conforming to the following:

1. Metal Preparation: All metal is to have the surfaces carefully prepared 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 an acid rinse, and thorough drying.
2. Prime Coating: A base coat of epoxy paint, specifically formulated to interact with the top-coat, is to be applied to the prepared surfaces by roll coating to a dry film thickness of 0.20 plus 0.05 mils. The prime coat must be oven cured prior to application of the finish coat.
3. Exterior Finish Coating: Apply the exterior finish coating over the primer by roll coating to a dry film thickness of 0.80 plus 0.05 mils (3.80 plus 0.05 mils for Vinyl Plastisol) for a total dry film thickness of 1.00 plus 0.10 mils (4.00 plus 0.10 mils for Vinyl Plastisol). This exterior finish coat must be oven-cured.
4. Interior finish coating: Apply a wash coat on the reverse side over primer by roll coating to a dry film thickness of 0.30 plus 0.05 mils for a total dry fill thickness of 0.50 plus 0.10 mils. The wash coat must be oven cured.
5. Color: The exterior finish chosen from the manufacturer's standard color chart.
6. Physical Properties: Coating must conform to the industry and manufacturer's standard performance criteria as listed by the following certified test reports:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| General: | ASTM | D5894 | and | ASTM | D4587 |
|  |  |  |  |  |  |
| Abrasion: | ASTM D968 |
| Adhesion: | ASTM D3359 |
| Chalking: | ASTM D4214 |
| Chemical Pollution: | ASTM D1308 |
| Color Change and Conformity: | ASTM D2244 |
| Creepage: | ASTM D1654 |
| Cyclic Corrosion Test: | ASTM D5894 |
| Flame Spread: | ASTM E84 |
| Flexibility: | ASTM D522/D522M |
| Formability: | ASTM D522/D522M |
| Gloss at 60 and 85 degrees: | ASTM D523 |
| Humidity: | ASTM D2247 and ASTM D714 |
| Oxidation: | ASTM D610 |
| Pencil Hardness: | ASTM D3363 |
| Reverse Impact: | ASTM D2794 |
| Salt Spray: | ASTM B117 |
| Weatherometer: | ASTM G152, ASTM G153 and ASTM D822 |

2.2.1 Specular Gloss

Finished roof surfaces to have a specular gloss value of 30 plus or minus

at an angle of 60 degrees for general areas, use 10 or less at an angle of 85 degrees if it is along airfield areas, when measured in accordance with ASTM D523.

* 1. MISCELLANEOUS METAL FRAMING
		1. General

Provide cold formed metallic-coated steel sheet conforming to

ASTM A653/A653M, AISI S100, and as specified in 05 40 00 COLD-FORMED METAL

FRAMING unless otherwise indicated.

* + 1. Fasteners and Miscellaneous Metal Framing

Provide compatible type, corrosion resistant, of sufficient size and length to penetrate the supporting element a minimum of one inch with other required properties to fasten miscellaneous metal framing members to substrates in accordance with the roof panel manufacturer's and ASCE 7 requirements.

Exposed

* + - 1. Rivets

Provide closed-end type rivets, corrosion resistant stainless steel where watertight connections are required.

* + - 1. Attachment Clips

Provide stainless steel, series 300 clips. Size, shape, thickness and capacity must meet the thickness and design load criteria specified.

2.3.3 Electrodes for Manual, Shielded Metal Arc Welding

Electrodes for manual, shielded metal arc welding must meet the requirements of AWS D1.1/D1.1M, and be covered, mild-steel electrodes conforming to AWS A5.1/A5.1M.

* 1. ACCESSORIES

Accessories must be compatible with the metal roof panels. Sheet metal flashing, trim, metal closure strips, caps, and similar metal accessories must be not less than the minimum thicknesses specified for roof panels. Provide exposed metal accessories to match the panels furnished, except as otherwise indicated. Molded foam rib, ridge and other closure strips must be closed-cell or solid-cell synthetic rubber or neoprene premolded to match configuration of the panels and not absorb or retain water.

* + 1. Pre-manufactured Accessories

Pre-manufactured accessories must be manufacturer's standard for intended purpose, comply with applicable specification section, compatible with the metal roof system and approved for use by the metal roof panel manufacturer. Construct curbs to match roof slope.

* + 1. Metal Closure Strips

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

* + 1. Rubber Closure Strips

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

2.4.4 Subgirts for Retrofits

Provide bar subgirts 38 by 3 millimeter 1-1/2 by 1/8 inch galvanized steel with slotted holes for welding to end of impaling clip spikes.

2.5 JOINT SEALANTS

* + 1. Sealants

Sealants are to be an approved gun type for use in hand or air pressure caulking guns at temperatures above 4 degrees C 40 degrees F (or frost-free application at temperatures above minus 12 degrees C 10 degrees F) with a minimum solid content of 85 percent of the total volume. Sealant must dry with a tough, durable surface skin which permits it to remain soft and pliable underneath, providing a weather tight joint. No migratory staining, in conformance with to ASTM C792, 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.

* + - 1. Shop Applied Sealants

Sealant for shop-applied caulking must be an approved gun grade, non-sag

one-component polysulfide or silicone conforming to ASTM C792 and ASTM C920, Type II, with a curing time which ensures the sealants plasticity at the time of field erection. Color to match panel color.

* + - 1. Field Applied Sealants

Sealants for field-applied caulking must be an approved gun grade, non-sag on-component polysulfide or two component polyurethane with an initial maximum Shore A durometer hardness of 25, conforming to ASTM C920, Type

II. Color to match panel color.

* + - 1. Tape Sealants

Provide pressure sensitive, 100 percent solid tape sealant with a release paper backing; permanently elastic, non-sagging, non-toxic and non-staining as approved by the roof panel manufacturer.

* + 1. Sheet Metal Flashing and Trim
			1. Fabrication, General

Custom fabricate sheet metal flashing and trim to comply with recommendations within the SMACNA 1793 that apply to design, dimensions, metal type, and other characteristics of design indicated. Shop fabricate items to the greatest extent possible. Obtain and verify field measurements for accurate fit prior to shop fabrication. Fabricate flashing and trim without excessive oil canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

* + - 1. Roof Drainage Sheet Metal Fabrications

Gutters: Fabricate to cross section indicated, with riveted and soldered joints, complete with end pieces, outlet tubes, and other special accessories as required. Fabricate in minimum 244 cm 96 inch long sections. Fabricate expansion joints and accessories from the same metal as gutters, unless otherwise indicated. **No concealed/boxed gutters. Design should plan for exposed gutters.**

Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangars of same material as downspouts and anchors.

* 1. INSULATION

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

NOTE: If 01 33 29 is incorporated in the specifications, select that option below. If not, select the option for 01 57 19.

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Insulation, facer material and attachment must be compatible with metal roof system specified, as approved by the roof panel manufacturer, and conform to ASTM C552 (cellular glass) or ASTM C553 (fiber blankets). Provide products with recycled content and provide documentation in accordance with Section [01 33 29 SUSTAINABILITY REPORTING][01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS] paragraph RECYCLED CONTENT. For more information see <https://sftool.gov/greenprocurement/green-products/1/construction-materials/22/building-insulation/0?addon=False> and https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program.

2.6.1 Fire Rated Assembly System

Provide semi-rigid glass-fiber insulation board conforming to ASTM C553, Form A, Class 1, Class A fire-hazard classification with a minimum density of 24.8 kilogram per cubic meter and 38 millimeter 1.55 pounds per cubic foot (pcf) and 1-1/2 inches thick. Thermal conductivity (K) must not exceed

0.42 watt per meter per degree K 0.24.

2.6.2 Fire Rated Roof Panel Assembly

Provide materials for fire-rated roof panel construction as follows:

Impaling clips, accessories, and fasteners must be UL listed 40 U18.24 UL Bld Mat Dir galvanized steel sheet or impaling bolts welded to each wall unit joint and spaced not more than 1200 millimeter 48 inches on center.

Provide bar subgirts 38 by 3 millimeter 1-1/2 by 1/8 inch galvanized steel with slotted holes for welding to end of impaling clip spikes.

Provide galvanized steel structural angles and flashing angles, gage or thickness as indicated, or material as specified. Flashing angles must be not less than 1.3 millimeter thick No. 18 U.S. standard gage.

Provide hot-dip galvanized steel metal facing conforming to ASTM A653/A653M, Grade A. Coating must conform to, ASTM A653/A653M and ASTM A924/A924M.

Metal facing must be as indicated and fabricated of enamel-coated hot-dip galvanized steel conforming to ASTM A653/A653M, Grade A. Coating must conform to ASTM A653/A653M and ASTM A924/A924M. Provide Class A fire hazard classification finish. Flame spread, fuel contributed, or smoke developed cannot exceed a value of 25.

 Submit fire rating test report to contracting officer for review and approval. Secure written approval prior to commencement of installation.

* 1. UNDERLAYMENTS

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

NOTE: If 01 33 29 is incorporated in the specifications, select that option below. If not, select the option for 01 57 19.

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2.7.1 Felt Underlayment

Provide No. 30 asphalt-saturated organic, non-perforated felt underlayment in compliance with ASTM D226/D226M, Type II, or ASTM D4869/D4869M. Provide products with recycled content and provide documentation in accordance with Section [01 33 29 SUSTAINABILITY REPORTING][01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS] paragraph RECYCLED CONTENT. For more information see https://sftool.gov/greenprocurement/green-products/1/construction-materials/231/roofing-materials/0?addon=False and https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program.

2.7.2 Self-Adhering Modified Bitumen Underlayment

Provide self-adhering modified bitumen membrane underlayment material in compliance with ASTM D1970/D1970M, suitable for use as underlayment for metal roofing. Use membrane resistant to cyclical elevated temperatures for extended period of time in high heat service conditions. Provide membrane with integral non-tacking top surface of polyethylene film or other surface material to serve as separator between bituminous material and metal products to be applied above.

2.7.3 EPDM Membrane

Ethylene Propylene Diene Terpolymer (EPDM), ASTM D4637/D4637M, Type I, non-reinforced, minimum 1.1 mm 0.045 inch thick.

2.7.4 Slip Sheet

Provide 0.24 kg per square meter 5 pounds per 100 sf rosin sized unsaturated building paper for slip sheet.

2.8 GASKETS AND SEALING/INSULATING COMPOUNDS

Gaskets and sealing/insulating compounds must be nonabsorptive and suitable for insulating contact points of incompatible materials.

Sealing/insulating compounds must be non-running after drying.

2.9 FINISH REPAIR MATERIAL

Repair paint for color finish enameled roofing must be compatible paint of the same formula and color as the specified finish furnished by the manufacturer.

Only use repair and touch-up paint supplied by the roof panel manufacturer and is compatible with the specified system.

PART 3 EXECUTION

* 1. EXAMINATION

Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the work. Ensure surfaces are suitable, dry and free of defects and projections which might affect the installation.

Examine primary and secondary roof framing to verify that rafters, purlins, angels, channels, and other structural support members for panels and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer, UL, ASTM, and ASCE 7 and applicable seismic requirements.

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

Examine rough-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of panels prior to installation.

Submit a written report to the Contracting Officer, endorsed by the installer, listing conditions detrimental to the performance of the work. Proceed with installation only after defects have been corrected.

* 1. INSTALLATION

Installation must meet specified requirements and be in accordance with the manufacturer's installation instructions and approved shop drawings. Do not install damaged materials. Dissimilar materials which are not compatible when contacting each other must be insulated by means of gaskets or sealing/insulating compounds. Keep all exposed surfaces and edges clean and free from sealant, metal cuttings, hazardous burrs, and other foreign material. Remove stained, discolored, or damaged materials from the site.

* + 1. Preparation

Clean all substrate substances which may be harmful to insulation, and roof panels including removing projections capable of interfering with insulation and roof panel attachment.

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

* + 1. Underlayment

Install underlayment according to roof panel manufacturer's written recommendations and recommendation in NRCA "The NRCA Roofing and Waterproofing Manual".

 3.2.2.1 Single Layer Felt Underlayment for a Standard Slope Roof Deck

Install single layer of felt underlayment on roof deck perpendicular to roof slope in parallel courses. Lap sides a minimum of 5.1 cm 2 inches over underlying course. Lap ends a minimum of 10.2 cm 4 inches. Stagger end laps between succeeding courses a minimum of 183 cm 72 inches. Fasten with felt underlayment roofing nails.

 Install felt underlayment on roof deck not covered by self-adhering sheet underlayment. Lap sides of felt over self-adhering sheet underlayment not less than 7.62 cm 3 inches in a direction to shed water. Lap ends of felt not less than 15.3 cm 6 inches over self-adhering sheet underlayment.

 3.2.2.2 Self-Adhering Sheet Underlayment

Install self-adhering sheet underlayment; wrinkle free on roof deck.

Comply with low-temperature installation restrictions of manufacturer where applicable. Install at locations indicated on project drawings, lapped in a direction to shed water. Lap sides not less than 8.9 cm 3-1/2 inches.

Lap ends not less than 15.3 cm 6 inches staggered 61 cm 24 inches between courses. Roll laps with roller. Cover underlayment within seven days.

 3.2.2.3 Slip Sheet

Apply specified slip sheet at time of roof panel installation when felt or other underlayment is used that may be in direct contact with and adhere to or adversely impact the underside of roof panels, and as otherwise recommended by the roof panel manufacturer. Install slip sheet over deck substrates prior to roof panel installation.

3.3 INSULATION INSTALLATION

Install insulation concurrently with metal roof panel installation, in thickness indicated, to cover entire roof, according to manufacturer's written instructions.

* 1. PROTECTION OF APPLIED MATERIALS

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

* 1. FASTENER INSTALLATION

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

3.5.1 Welding

Procedures for manual, shielded metal-arc welding, the appearance and quality of welds made, and the methods used in correcting welding work must be in accordance with AWS D1.1/D1.1M.

* 1. FLASHING, TRIM, AND CLOSURE INSTALLATION
		1. General Requirements

Comply with performance requirements, manufacturer's written installation instructions, and SMACNA 1793. Provide concealed fasteners where possible. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently water tight and weather resistant. Work is to be accomplished to form weather tight construction without waves, warps, buckles, fastening stresses or distortion, and to allow for expansion and contraction. Cutting, fitting, drilling, and other operations in connection with sheet metal required to accomplish the work must conform to the manufacturers written instructions.

* + 1. Metal Flashing

Install exposed metal flashing at building corners, rakes, eaves, junctions between metal siding and roofing, valleys and changes off slope or direction in metal roofing, building expansion joints and gutters.

Exposed metal flashing must be the same material, color, and finish as the specified metal roofing panels. Furnish flashing in minimum 2.44 m 8 foot lengths. Exposed flashing must have 1 inch locked and blind soldered end joints, with expansion joints at intervals of no greater than 4.88 m 16 feet.

Fasten flashing at not more than 8 inches on center for roofs, except where flashing is held in place by the same screws used to secure panels.

Exposed flashing and flashing subject to rain penetration must be bedded in specified joint sealant. Flashing which is contact with dissimilar metals must be isolated by means of the specified asphalt mastic material to prevent electrolytic deterioration.

Form drips to the profile indicated, with the edge folded back 1.27 cm ½ inch to form a reinforced drip edge.

* 1. ROOF PANEL INSTALLATION

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 or other components of the Work securely in place, with provisions for thermal and structural movement in accordance with NRCA 0420.

 Steel Roof Panels: Use stainless steel fasteners for exterior surfaces and galvanized fasteners for unexposed surfaces.

 Aluminum Roof Panels: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior and aluminum or galvanized steel fasteners for unexposed surfaces.

 Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using approved fasteners according to manufacturer's written instructions. Provide all blocking and nailers as required.

Metal Protection: Where dissimilar metals contact each other or possibly corrosive substrates, protect against galvanic action by coating contact surfaces with a bituminous coating or applying rubberized asphalt underlayment to each contact surface or permanent separation as recommended by the metal roof panel manufacturer.

Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and required for weatherproof performance of metal roof panel system. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal roof panel manufacturer.

* + 1. Handling and Erection

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

Do not subject panels to overloading, abuse, or undue impact. Do not apply bent, chipped, or defective panels. Damaged panels must be replaced and removed from the site at the contractor’s expense. Erect panels true, plumb, and in exact alignment with the horizontal and vertical edges of the building, securely anchored, and with indicated rake, eave, and curb overhang. Allow for thermal movement of the roofing, movement of the building structure, and provide permanent freedom from noise due to wind pressure.

Do not permit storage, walking, wheeling or 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 the roof construction.

Roof panels must be laid with corrugations in the direction of the roof slope. End laps of exterior roofing must not be less than 20.3 cm 8 inches; side laps of standard exterior corrugated panels must not be less than

2-1/2 corrugations.

Field cutting of metal roof panels by torch is not permitted. Field cut only as recommended by manufacturer's written instructions.

* + 1. Closure Strips

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

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

* + 1. Workmanship

Make lines, arises, and angles sharp and true. Free exposed surfaces from any 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. Make sheet metal exposed to the weather watertight with provisions for expansion and contraction.

Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry, and free of defects and projections which might affect the application. For installation of 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 as necessary to make the work watertight.

* 1. ACCEPTANCE PROVISIONS
		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. Horizontal lines must not vary more than .32 cm in 12.2 m 1/8 inch in 40 feet.

* + 1. Leakage Tests

Finished application of metal roofing is to be subject to inspection and test for leakage by the Contracting Officer or his designated representative, and Architect/Engineer. Inspection and tests will be conducted without cost to the Government.

Inspection and testing is to be made promptly after erection to permit correction of defects and removal/replacement of defective materials.

* + 1. Repairs to Finish

Scratches, abrasions, and minor surface defects of finish may be repaired with the specified repair materials and as recommended by the metal roof panel manufacturer. Finished repaired surfaces must be uniform and free from variations of color and surface texture. Repaired metal surfaces that are not acceptable to the project requirements are to be immediately removed and replaced with new material.

* + 1. Paint Finished Metal Roofing

Paint finished metal roofing will be tested for color stability by the Contracting Officer during the manufacturer's specified guarantee period. Panels that indicate color changes, fading, or surface degradation, determined by visual examination, must be removed and replaced with new panels at no expense to the Government. New panels will be subject to the specified tests for an additional year from the date of their installation.

* 1. CLEAN UP AND DISPOSAL

Clean 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. Exposed metal surfaces must be free of dents, creases, waves, scratch marks, solder or weld marks, and damage to the finish coating. Touch up scratches in panel finish with manufacturer supplied touch-up paint system to match panel finish. Treat exposed cut edges with manufacturer supplied clear coat.

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

* 1. FIELD QUALITY CONTROL
	2. INFORMATION CARD

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

Make card 215 mm by 275 mm 8 1/2 by 11 inches minimum. Information card must identify 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(s), date of completion; installing contractor identification and contact information; manufacturer warranty expiration, warranty reference number, and contact information. Install card at interior roof top access point or location as directed by the Contracting Officer and provide a paper copy to the Contracting Officer.

* + 1. Form One

FORM 1 - PREFORMED STEEL or 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:
				1. Manufacturer (Name, Address, & Phone No.):
				2. Product Name: c. Width: d. Gage:

e. Base Metal: f. Method of Attachment:

* + - 1. Repair of Color Coating:
				1. Coating Manufacturer (Name, Address & Phone No.):
				2. Product Name:
				3. Surface Preparation:
				4. Recoating Formula:
				5. Application Method:
			2. Statement of Compliance or Exception:
			3. Date Roof Completed:
			4. Warranty Period: From
			5. Roofing Contractor (Name & Address):
			6. Prime Contractor (Name & Address):

To

Contractor's Signature Date:

Inspector's Signature [3.12 DATE OF INSTALLATION WALL-MOUNTED PLACARD

Date: Text

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.

3.13 USACE WARRANTY

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) 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. THE NON-STRUCTURAL METAL ROOFING SYSTEM COVERED UNDER THIS WARRANTY SHALL INCLUDE, BUT SHALL NOT BE LIMITED 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.

ALL MATERIAL DEFICIENCIES, WIND DAMAGE, STRUCTURAL FAILURE, AND LEAKAGE ASSOCIATED WITH THE NON-STRUCTURAL METAL ROOF SYSTEM COVERED UNDER THIS WARRANTY SHALL BE REPAIRED AS APPROVED BY THE CONTRACTING OFFICER. THIS WARRANTY SHALL 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 WILL REMAIN IN EFFECT FOR STATED DURATION FROM THIS DATE.

SIGNED, DATED, AND NOTARIZED (BY COMPANY PRESIDENT)

AND

(Company President) (Date)

CONTRACTOR'S FIVE 5 YEAR NO PENAL SUM WARRANTY FOR

NON-STRUCTURAL METAL ROOFING SYSTEM

(continued)

THE CONTRACTOR MUST SUPPLEMENT 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. CONTRACTOR'S DESIGN MUST INSURE FREE DRAINAGE FROM THE ROOF AND 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 YEAR NO PENAL SUM WARRANTY FOR

NON-STRUCTURAL METAL ROOF SYSTEM

\*\*REPORTS OF LEAKS AND ROOF SYSTEM DEFICIENCIES MUST BE RESPONDED TO 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.

IN THE EVENT THE CONTRACTOR DISPUTES THE EXISTENCE OF A WARRANTABLE DEFECT, 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. THE REQUEST FOR AN ARBITRATOR MUST BE MADE WITHIN 48 HOURS OF BEING NOTIFIED OF THE DISPUTED DEFECTS. UPON BEING INVOKED, THE PARTIES SHALL, WITHIN TEN (10) DAYS, JOINTLY REQUEST A LIST OF FIVE (5) ARBITRATORS FROM THE FEDERAL MEDIATION AND CONCILIATION SERVICE. THE PARTIES MUST CONFER WITHIN TEN (10) DAYS AFTER RECEIPT OF THE LIST TO SEEK AGREEMENT ON AN ARBITRATOR. 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 MUST PAY FOR THE TRANSCRIPT. A HEARING WILL BE HELD AS SOON AS THE PARTIES CAN MUTUALLY AGREE. A WRITTEN ARBITRATOR'S DECISION WILL BE REQUESTED NOT 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 --