
USACE / NAVFAC / AFCEA /NASA UFGS-07 41 13 (April 2006)

Preparing Activity: NAVFAC Replacing without change
UFGS-07412 (May 2004)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 1 April 2006

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SECTION 07 41 13

NON-STRUCTURAL METAL ROOFING 04/06

NOTE: This guide specification covers the requirements for both factory color and mill finish aluminum or steel Non-Structural Metal Roofing.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

NOTE: Non-Structural Metal Roofing is also referred to as architectural metal roofing or hydrokinetic metal roofing. Seam profiles include standing seam and lapped seam. Roof panels shall be applied over a solid substrate (roof deck) with an appropriate underlayment.

This specification may also be used for metal roof panels on auxiliary structures including light storage and open air shed roofs with some modification for application of corrugated or fluted panels over support structure without decking.

Structural standing seam panels, insulated sandwich panels and special systems such as copper, stainless steel, or terne metal are not covered in this guide specification.

This section shall be coordinated with other system components specifications such as framing, decking,

insulation and sheet metal flashing. This section shall also be coordinated 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 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.

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7 (2005) Minimum Design Loads for Buildings and Other Structures

ASTM INTERNATIONAL (ASTM)

ASTM A 463/A 463M (2005) Steel Sheet, Aluminum-Coated, by the Hot-Dip Process

ASTM A 653/A 653M (2004a) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A 755/A 755M (2004a) Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products

ASTM A 792/A 792M (2003) Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

ASTM B 209	(2004) Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 209M	(2004) Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
ASTM D 1308	(2002e1) Effect of Household Chemicals on Clear and Pigmented Organic Finishes
ASTM D 1654	(1992; R 2000) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D 1970	(2001) Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
ASTM D 2244	(2002e1) Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
ASTM D 2247	(2002) Testing Water Resistance of Coatings in 100% Relative Humidity
ASTM D 226	(2005) Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D 2794	(1993; R 2004) Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D 3359	(2002) Measuring Adhesion by Tape Test
ASTM D 4214	(1998) Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D 4587	(2001) Standard Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings
ASTM D 4637	(2004) EPDM Sheet Used in Single-Ply Roof Membrane
ASTM D 522	(1993a; R 2001) Mandrel Bend Test of Attached Organic Coatings
ASTM D 523	(1989; R 1999) Specular Gloss
ASTM D 5894	(1996) Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet)
ASTM D 610	(2001) Evaluating Degree of Rusting on Painted Steel Surfaces
ASTM D 714	(2002) Evaluating Degree of Blistering of Paints

ASTM D 968 (1993; R 2001) Abrasion Resistance of Organic Coatings by Falling Abrasive

ASTM E 1592 (2001) Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference

ASTM G 154 (2000a¹) Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials

METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)

MBMA RSDM (2000) Metal Roofing Systems Design Manual

NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)

NRCA 0405 (2001; R 2003, 5th Ed) Roofing and Waterproofing Manual

UNDERWRITERS LABORATORIES (UL)

UL 580 (1994; Rev thru Feb 1998) Tests for Uplift Resistance of Roof Assemblies

1.2 DESCRIPTION OF METAL ROOF SYSTEM

NOTE: Coordinate with Part 2 materials specification.

In the first sentence, select finish type, metal type, attachment type and delete other options.

In the second sentence, select embossing (as applicable), seam type, and whether stiffening ribs are required. Include the last bracketed option of the second sentence when generic profile is shown on drawings.

Where one system is required for all roof areas, use the first paragraph. Where different systems are required, use the second paragraph successively and replace the open brackets with a description of the substrate(s) or area of the building or project where each system is to be applied.

[Factory color finished,] [Mill finish] [galvanized] [galvalume] [aluminum] metal panel roof system with [concealed clip] [exposed fastener] attachment through to deck substrate. Roof panel profile shall be [embossed] [standing seam] [batten seam] [roll lock seam] [snap lock seam] [box rib] [corrugated] [and with stiffening ribs in the flat of the panel] [as shown on drawings].

[____]: [Factory color finished,] [Mill finish] [galvanized] [galvalume] [aluminum] metal panel roof system with [concealed clip] [exposed fastener] attachment through to deck substrate. Roof panel profile shall

be[embossed][standing seam][batten seam][roll lock seam][snap lock seam][box rib][corrugated][and with stiffening ribs in the flat of the panel][as shown on drawings].

1.2.1 Design Requirements

1.2.2 Wind Uplift Resistance

NOTE: For design-build projects, include the first bracketed sentence and the first bracketed option of the second sentence.

For design-bid-build projects, delete the first bracketed sentence. Include the second bracketed option in the second sentence. Determine the required wind uplift resistance based on ASCE 7 wind loading calculations or applicable building code requirements. Insert calculated loads in the bracketed spaces provided or on roof plan drawings. Incorporate the following safety factors in calculating loads to be resisted:

Structure: 2
Single fasteners: 3
Two or more fasteners: 2.25

For all projects, on drawings indicate the boundary dimensions, or zones, for perimeter, corner, and ridge areas where higher wind loads apply.

Where non-rated systems may be permissible, include the bracketed option at the end of the paragraph.

[The required uplift resistance of the roof assembly shall be calculated in accordance with [ASCE 7] [____ Building Code requirements]. Metal roof panel assembly shall resist [the calculated loads incorporating appropriate safety factors and including increased loads in perimeter and corner areas.][the following wind loads as determined by [ASCE 7] [____ Building Code] with a factor of safety appropriate for the material holding the anchor:

	Negative	Positive
a. At eaves	[____kg/m ² (psf)]	[____kg/m ² (psf)]
b. At rakes	[____kg/m ² (psf)]	[____kg/m ² (psf)]
c. At ridge	[____kg/m ² (psf)]	[____kg/m ² (psf)]
d. At building corners	[____kg/m ² (psf)]	[____kg/m ² (psf)]
e. At central areas	[____kg/m ² (psf)]	[____kg/m ² (psf)]

The roof assembly shall be tested in accordance with [ASTM E 1592][UL 580] to resist the [calculated][specified][indicated] loads. Non-tested

assemblies shall not be installed[, except as approved by the Contracting Officer. Provide wind load calculations and submit engineering calculations and substantiating data to validate wind resistance of any non-tested assembly].]

1.2.2.1 Performance Requirements

The installed roof assembly shall be watertight, conform to the roof slope, and resist the uplift pressures [calculated][specified][indicated]. The Contractor shall furnish a commercially available roofing system which satisfies all specified requirements.

1.3 SUBMITTALS

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation 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.

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" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.][for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Metal Roofing[; G][; G, [_____]]

Drawings consisting of catalog cuts, panel configuration, system assembly, attachment details, flashing details, erection drawings, and other data as necessary to clearly describe layouts, construction details, fasteners, and erection. Drawings shall be approved by the metal roofing manufacturer prior to submission.

SD-03 Product Data

NOTE: Edit the product data submission requirements as necessary for the system specified. Include bracketed requirements as applicable to the system being specified.

Roof panels[; G][; G, [____]]

[FACTORY COLOR FINISH[; G][; G, [____]]]

Accessories

Fasteners

UNDERLAYMENTS

Gaskets and Insulating Compounds

SD-04 Samples

Roof Panels

One piece of each type and finish to be used, 9 inches long, full width.

Factory-applied Color Finish Charts[; G][; G, [____]]

Provide standard [and custom] color charts for roof panel and accessory color selection.

Accessories

One sample of each type of flashing, trim, fascia, closure, cap and similar items. Size shall be sufficient to show construction and configuration.

Fasteners

Two samples of each type to be used with statement regarding intended use.

Gaskets and Insulating Compounds

Two samples of each type to be used and descriptive data.

Sealant

SD-05 Design Data

NOTE: Coordinate with requirements of "Wind Uplift" paragraph. Include bracketed requirement where non-rated systems may be permissible.

Wind Uplift Resistance[; G][; G, [____]]

Engineering calculations [comparing wind uplift calculations with tested wind resistance][validating the wind resistance of non-tested roof system]. Calculations shall be prepared, signed, and sealed by a registered structural engineer.

SD-06 Test Reports

roof assembly[; G][; G, [____]]

Factory Color Finish Performance Requirements

SD-07 Certificates

Roof Panels[; G][; G, [____]]

Certificates from the roof panel manufacturer attesting that the panels and accessories conform to the specified requirements and are suitable for the installation environment at the indicated design slope.

Coil stock compatibility[; G][; G, [____]]

NOTE: When on-site roll forming is utilized, require coil manufacturer/supplier to certify that the coil to be used is compatible with the roll forming machinery that will be used.

Provide certification of coil compatibility with roll forming machinery to be used in the field.

[Self-Adhering Modified Bitumen Underlayment

Certify underlayment compatibility with service conditions of the roof installation.]

Qualification of Manufacturer[; G][; G, [____]]

Certify that the manufacturer of the roof membrane meets requirements specified under paragraph entitled "Qualification of Manufacturer."

Qualification of Applicator[; G][; G, [____]]

Certify that the applicator meets requirements specified under paragraph entitled "Qualification of Applicator."

SD-08 Manufacturer's Instructions

INSULATION

INSTALLATION

Roof panel installation manual[; G][; G, [____]]

Submit manufacturer's printed installation manual and instructions.

[SD-09 Manufacturer's Field Reports

NOTE: Include this paragraph when manufacturer inspection is specified.

Copy of manufacturer's field inspection reports, submitted within 48 hours of each site visit.]

SD-11 Closeout Submittals

Warranties

Information card

1.4 QUALITY ASSURANCE

1.4.1 Qualification of Manufacturer

NOTE: Specify 5 years manufacturer experience unless directed otherwise by the Government.

Metal roof panel manufacturer shall have been in the business of manufacturing metal roof panels for a period of not less than 5 [____] years.

[1.4.1.1 Manufacturer's Technical Representative

NOTE: Include this paragraph where manufacturer inspection is required.

The manufacturer's technical representative shall be thoroughly familiar with the products to be installed, installation requirements and practices, and with any special considerations in the geographical area where construction will take place. The representative shall be available to perform field inspections and attend meetings as specified.

]1.4.2 Qualification of Applicator

NOTE: Specify 3 years as an approved contractor unless directed otherwise by the Government

Metal roof system applicator shall be approved, authorized, or licensed in writing by the roof panel manufacturer and shall have a minimum of [three][____] years experience as an approved, authorized, or licensed applicator with that manufacturer and be approved at a level capable of

providing the specified warranty. The applicator shall supply the names, locations and client contact information of 5 projects of similar size and scope that the applicator has constructed using the manufacturer's roofing products submitted for this project within the previous three years.

1.4.3 Preroofing Conference

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

- a. Drawings and specifications and submittals related to the roof work;
- b. Roof system components installation;
- c. 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;
- d. 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
- e. Quality control plan for the roof system installation;
- f. Safety requirements.

Preroofing conference scheduling shall be coordinated with the Contracting Officer. The conference shall be attended by 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.

1.5 DELIVERY, STORAGE, AND HANDLING

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.

1.5.1 Delivery

Deliver materials to the site in undamaged condition. Provide adequate packaging to protect materials during shipment. Crated materials shall not be uncrated 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. Remove moisture from wet materials not otherwise affected, restack and protect from further moisture exposure.

1.5.2 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.

1.5.3 Handling

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

1.6 WARRANTIES

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

1.6.1 Metal Roof Panel Manufacturer Warranty

**Note: Select the appropriate warranty duration.
Five and ten year warranties may be specified for
facilities of small area and of minor importance.
For occupied, sensitive, or large facilities,
including warehousing, specify 20-year warranty
unless directed otherwise by the Government.**

Furnish the metal roof panel manufacturer's [5] [10] [_____] [20]-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. The warranty shall run directly to the Government and commence at time of Government's acceptance of the roof work. The warranty shall state that:

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 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 shall be the responsibility of the metal roof panel manufacturer. All costs associated with the repair or replacement work shall be the responsibility of the metal roof panel manufacturer.

b. When the manufacturer or his approved applicator fail to perform the repairs within 72 hours of notification, emergency temporary repairs performed by others shall not void the warranty.

[1.6.2 Manufacturer's Finish Warranty

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

Provide a manufacturer's 20 year exterior material finish warranty 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 D 4214](#); or fade or change colors in excess of 5 NBS units as measured in accordance with [ASTM D 2244](#).

]1.6.3 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. Use the second paragraph.

[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.]]

[The roof system installer shall warrant for a period of not less than two years that the roof system, as installed, is free from defects in installation workmanship, to include the roof panel installation, flashing, [insulation,] accessories, attachments, and sheet metal installation integral to a complete watertight roof system assembly. The warranty shall run directly to the Government. Correction of defective workmanship and replacement of damaged or affected materials shall be the responsibility of the metal roof system installer. All costs associated with the repair or replacement work shall be the responsibility of the installer.]

1.6.4 Continuance of Warranty

Repair or replacement work that becomes necessary within the warranty period shall 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.

1.7 CONFORMANCE AND COMPATIBILITY

The entire metal roofing and flashing system shall be in accordance with specified and indicated requirements, including wind resistance requirements. Work not specifically addressed and any deviation from specified requirements shall be in general accordance with recommendations of the [MBMA RSDM](#), [NRCA 0405](#), the metal panel manufacturer's published recommendations and details, and compatible with surrounding components and construction. Any deviation from specified or indicated requirements shall be submitted to the Contracting Officer for approval prior to installation.

PART 2 PRODUCTS

2.1 ROOF PANELS

Roof panels shall be [steel] [aluminum] with a [mill] [factory-applied

color] finish. Panel attachment shall be with [concealed clips] [exposed fasteners]. Panel profile shall be [standing seam] [batten seam] [roll lock seam] [snap lock seam] [box rib] [corrugated] [as shown on drawings]. Roof panels shall provide nominal [300 mm (12 inches)] [400 mm (16 inches)] [450 mm (18 inches)] [mm(inches)] of coverage in place. Minimum height of [ribs] [seams] [corrugations] at overlap of adjacent roof sheets shall be [mm (inches)] [the panel manufacturer's standard for the indicated roof slope]. Individual panels shall be of continuous length sufficient to cover the entire length of any unbroken roof slope with no joints or seams, except where indicated or approved otherwise by the Contracting Officer. Panels shall be formed without warping, waviness, or ripples that are not a part of the panel profile and shall be free of damage to the finish coating system. Provisions shall be made for thermal expansion and contraction consistent with the type of system to be used. All sheets shall be either square-cut or miter-cut.

2.1.1.1 Steel Panels

NOTE: Delete this paragraph when steel panels are not used in the project.

When a factory color finish is specified, remove last two sentences from this paragraph.

AZ 50 coating is allowed for factory-color-finished and not for mill finish.

Consider aluminum-coated steel materials for Army projects only.

Zinc-coated steel conforming to **ASTM A 653/A 653M**, Structural Grade 40 and minimum G90 galvanized smooth metallic coating; aluminum-zinc alloy coated steel conforming to **ASTM A 792/A 792M**, AZ [55] [50] coating[; or aluminum-coated steel conforming to **ASTM A 463/A 463M**, Type 2, coating designation T2 65]. Prepainted steel sheet shall also comply with **ASTM A 755/A 755M**. Roof panel material shall be minimum [0.60 mm (24 gage)] [0.76 mm (22 gage)] thick prior to coating application, and as required to meet wind uplift requirements. Panels shall be within 95 percent of the nominal thickness. Prior to shipment, mill finish panels shall be treated with a passivating chemical and oiled to inhibit the formation of oxide corrosion products. Panels that have become wet during shipment and have started to oxidize shall be rejected.

2.1.1.2 Aluminum Panels

NOTE: Delete this paragraph when aluminum panels are not used in the project.

Alloy 3003 or 3004 conforming to **ASTM B 209 ASTM B 209M**, temper as required for the forming operation; minimum [0.80 mm (0.032 inch)] [1.0 mm (0.040 inch)] thick, and as required to meet wind uplift requirements.

2.1.1.3 Texture

[Smooth] [Stucco embossed] [Smooth with raised intermediate stiffening

ribs] [as shown on drawings].

2.2 ROOF PANEL FACTORY COLOR FINISH

NOTE: Factory color finish shall be specified except when the buildings are to be used for temporary purposes or where mill finish aluminum or galvalume panels provide an acceptable appearance. If factory color finish is not required, document the rationale for the decision in the design analysis and delete this paragraphs and related subparagraphs.

The US metal building industry offers a variety of color finishes to protect the metal panels against chemical corrosion and ultraviolet radiation; to provide long life with minimum maintenance plus acceptable weathering and color retention; and to assure chalk, fade, and mar resistance. Some of the most widely used coatings include, but are not limited to, the following:

- a. Polyvinylidene fluoride (PVDF2); a nominal 0.025 mm (1 mil) thick coating modified with a proprietary resin for toughness; it may be used in most environments.
- b. Silicone-modified polyester (SMP); a thermoset coating system composed of polyester resin modified by copolymerization with a functional silicone resin intermediate designed for added protection against chemical corrosion and ultraviolet radiation.
- c. Plastisol (PVC); a two-coat system consisting of a polyvinyl-chloride resin dispersed in a plasticizer top-coat over a corrosion-resistant primer; it is a high-performance, thick coating designed for highly aggressive and corrosive environments with excellent resistance to common acids, alkalis, and inorganic compounds.

Most coatings may be ordered extra-thick for buildings in direct contact with salt or chemical laden air or where a premium finish would be justified. The thicker coating provides additional primer and increases the coating's corrosion and abrasion resistance, but it requires a special run by the coil coater and additional delivery time. Appropriate specification requirements must be added if thick film coatings are to be used. Clear coats may also be added to the finish color coated coil to enhance the coatings performance.

The baseline values included in this specification are for a standard 0.025 mm (1 mil) PVDF2 (i.e., Kynar 500, Hylar 5000) coating system. If a different coating type or thickness is required, research the coating type and modify indicated values accordingly. Coordinate with the coating

type specified elsewhere in this section.

Corrosion of galvanized steel panels, together with the fact that cut edges, scratches and penetrations of the panels expose the steel substrate, warrants consideration for the use of aluminum panels in salt spray and other corrosive environments; however, the greater expansion of aluminum must be considered in the design. Where steel panels are used in coastal environments, enhanced PVDF2 or other premium coatings shall be specified. Increased PVDF2 coating thicknesses and or addition of a factory-applied clear coat over the color finish will enhance coating system performance.

Roof panels are available in several standard colors. Custom color options shall only be specified with Government approval. Where accent colors are required, specify accordingly.

Energy considerations may be a consideration in the color choice for the roof panels. White or light-colored roofing surfaces are much better at reflecting sunlight than darker surfaces. Coordinate color specification and selection with the user.

Provide factory-applied, thermally cured coating system on roof panel surfaces. Provide exterior coat of primer and [70 percent polyvinylidene fluoride resin] [_____] color finish coat on the exposed side. Prime coat shall be not less than 0.005 mm (0.2 mil) [_____] . Color finish coat shall be not less than 0.02 mm (0.8 mil) [_____] . Total color coating system thickness shall be not less than [0.025 mm (1 mil)] [_____] and with any additional primer and finish coat thickness required to meet the color finish performance requirements specified. [Provide manufacturer's standard factory-applied clear coat system over color finish coat.] Underside coating shall consist of roof panel manufacturer recommended protective backer coat suitable for the application conditions, not less than 0.008 mm (0.3 mil) thick unless approved otherwise by the Contracting Officer. Finish coat color shall [be _____] [be as selected by Contracting Officer from manufacturer standard [and custom] color charts] [match the color indicated [on the drawings] [in Section 09 06 90 COLOR SCHEDULE]]. The exterior color finish shall meet the performance requirements specified.

2.2.1 Factory Color Finish Performance Requirements

2.2.1.1 Cyclic Salt Fog/UV Test

NOTE: The results of the salt spray test will vary depending on the thickness of the coating.

Normally specify less than 3 mm (1/8 inch) creepage from scribe for steel panels and 1.5 mm (1/16 inch) creepage from scribe for aluminum panels.

For projects located in high temperature and regular high humidity service conditions or other severely

corrosive environment, or where premium finish would be justified, the following test requirement selections should be made for steel panels and appropriate coating type and thickness specified:

Rating of 10, no blisters in field
Rating of 7, 1.5 mm (1/16 inch) edge creep

A sample of the sheets shall withstand a cyclic corrosion test for a minimum of 2014 hours in accordance with [ASTM D 5894](#), including the scribe requirement in the test. Immediately upon removal of the panel from the test, the coating shall receive a rating of not less than [8][10], [few blisters][no blistering], as determined by [ASTM D 714](#); no rusting, as determined by [ASTM D 610](#); and a rating of [6][7], less than [1.5 mm (1/16 inch)][3 mm (1/8 inch)] creepage from scribe as determined by [ASTM D 1654](#).

2.2.1.2 Formability Test

When subjected to testing in accordance with [ASTM D 522](#) Method B, 3 mm (1/8 inch) diameter mandrel, the coating film shall show no evidence of fracturing to the naked eye.

2.2.1.3 Accelerated Weathering, Chalking Resistance and Color Change

NOTE: Low gloss finishes have relatively poor weathering qualities. Delete the last sentence if a low gloss finish is not required by paragraph "Specular Gloss".

Coating sample shall withstand weathering test of 5000 hours , in accordance with [ASTM D 4587](#) and [ASTM G 154](#), Type D, without cracking, peeling, blistering, loss of adhesion of the protective coating, or corrosion of the base metal. Protective coating with an adhesion rating of less than 4B when tested in accordance with [ASTM D 3359](#), Test Method B, shall be considered as an area indicating loss of adhesion. Following the accelerated weathering test, the coating shall have a chalk rating not less than No. 8 in accordance with [ASTM D 4214](#) test procedures, and the color change shall not exceed 5 CIE or Hunter Lab color difference (delta E) units in accordance with [ASTM D 2244](#). [For sheets required to have a low gloss finish, the chalk rating shall be not less than No. 6 and the color difference shall be not greater than 7 units.]

2.2.1.4 Humidity Test

When subjected to a humidity cabinet test in accordance with [ASTM D 2247](#) for 1000 hours, a scored panel shall show no signs of blistering, cracking, creepage or corrosion.

2.2.1.5 Impact Resistance

Factory-painted sheet shall withstand direct and reverse impact in accordance with [ASTM D 2794](#) 13 mm (0.50 inch) diameter hemispherical head indenter, equal to 1.5 times the metal thickness in mils, expressed in inch-pounds, with no cracking.

2.2.1.6 Abrasion Resistance Test

NOTE: The 70 percent polyvinylidene fluoride (PVDF2) finish has a minimum abrasion resistance of about 65 liters per 0.025 mm (65 liters/mil) of coating thickness. A 0.030 mm (1.2 mil) PVDF2 coating will resist 80 liters of sand and a 0.035 mm (1.4 mil) PVDF2 coating will resist approximately 100 liters of sand. Note that the results of this test are variable and offer poor repeatability. Where greater than 65 liters of sand abrasion resistance is specified, coordinate with coating type specified.

When subjected to the falling sand test in accordance with [ASTM D 968](#), Method A, the coating system shall withstand a minimum of [50] [80] [100] liters of sand before the appearance of the base metal. The term "appearance of base metal" refers to the metallic coating on steel or the aluminum base metal.

2.2.1.7 Specular Gloss

NOTE: Specify the first bracketed option for most roof conditions.

For roofs of structures along airfields where glare would be objectionable and may be an operational hazard, the specular gloss value should be limited to 10 or less at an angle of 85 degrees. Limited paint systems can meet this reflectance value. Panel embossing also reduces the gloss, or reflectance value, and may be specified in combination with the paint system specification to meet the necessary requirement

Finished roof surfaces for shall have a specular gloss value of [30 plus or minus 5 at an angle of 60 degrees] [10 or less at an angle of 85 degrees] when measured in accordance with [ASTM D 523](#).

2.2.1.8 Pollution Resistance

Coating shall show no visual effects when covered spot tested in a 10 percent hydrochloric acid solution for 24 hours in accordance with [ASTM D 1308](#).

2.3 ACCESSORIES

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

2.3.1 Pre-manufactured Accessories

NOTE: Include the following general paragraph.

Add subparagraphs for specific accessory materials requirements as required for the specific project and components to be installed.

Accessory components might include ridge vents, curbs, hatches, roof jacks, prefabricated flashing boots, walkways, snow guards, etc.

Pre-manufactured accessories shall 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. Curbs shall be constructed to match roof slope.

2.4 FASTENERS

Fasteners for roof panels shall be corrosion resistant coated steel, aluminum, stainless steel, or nylon capped steel, compatible with the sheet panel or flashing material and of type and size recommended by the manufacturer to meet the performance requirements. Fasteners for accessories shall be the manufacturer's standard. Exposed fasteners shall have integral metal washer head and compressible sealing EPDM washer. Sealing washer shall be approximately 2.4 mm (3/32 inch) thick. Exposed portion of fasteners shall match color of attached material.

2.4.1 Screws

Not smaller than 6 mm (No. 14) diameter self-tapping type and not less than 4 mm (No. 12) diameter self-drilling type.

2.4.2 Rivets

Closed-end type where watertight connections are required.

2.5 UNDERLAYMENTS

NOTE: Underlayments included in this UFGS are for slopes of 3:12 or greater. For slopes less than 3:12 other underlayment materials should be used. Refer to MBMA RSDM and NRCA RWM for guidance.

Select proper underlayment or combination of underlayment materials. Delete other options.

Consider self-adhering modified bitumen underlayment for ice dam protection and ridge, hip, valley, and sidewall areas. Additionally, severe weather locations, complex roofs, or high value contents shall consider the higher protection capacity of a self-adhering modified bitumen underlayment, where it will not create a condensation concern.

When low perm underlayment is used throughout the

roof area, ensure its vapor retarding effects are considered such that its use does not create condensation issues. Consideration for predominant vapor drive action in hot and cold climates in combination with building use and location, insulation location, under deck or attic space venting, and vapor retarder needs and positioning should be considered in underlayment selection. Underlayment in conjunction with an underlying and properly positioned vapor retarder/barrier may be required in some circumstances.

For shed roofs, underlayment may be omitted.

[2.5.1 Felt Underlayment

Felt underlayment shall be No. 30 felt in compliance with [ASTM D 226](#), Type II.

] [2.5.2 Self-Adhering Modified Bitumen Underlayment

Self-adhering modified bitumen membrane underlayment material in compliance with [ASTM D 1970](#), and suitable for use as underlayment for metal roofing. Membrane resistant to cyclical elevated temperatures for extended period of time shall be used in high heat service conditions. Membrane shall have 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.

] [2.5.3 EPDM Membrane

Ethylene Propylene Diene Terpolymer (EPDM), [ASTM D 4637](#), Type I, non-reinforced, minimum 1.1 mm (0.045 inch) thick.

] [2.5.4 Slip Sheet

Slip Sheet shall be 0.24 kg per square meter (5 pounds per 100 sf) rosin sized unsaturated building paper.

] 2.6 SEALANT

Sealant shall be an elastomeric type containing no oil or asphalt, as recommended by the roof panel manufacturer. Silicone based sealants are prohibited, unless approved otherwise by the roof panel manufacturer and the Contracting Officer. Exposed sealant shall be [colored to match adjacent components] [clear] and shall cure to a rubberlike consistency. Concealed sealant shall be non-hardening type. [Sealant placed in the roof panel standing seam ribs shall be provided in accordance with the manufacturer's recommendations.]

2.7 GASKETS AND INSULATING COMPOUNDS

Gaskets and insulating compounds shall be nonabsorptive and suitable for insulating contact points of incompatible materials. Insulating compounds shall be nonrunning after drying.

[2.8 INSULATION

NOTE: Include this paragraph only when the non-structural roof system assembly incorporates insulation above the roof deck or directly in contact with the roof panels. Coordinate with the appropriate insulation specification section.

Vapor retarder design shall also be coordinated with the insulation requirements and specified in the insulation section.

Insulation, facer material, and attachment shall be compatible with metal roof system application specified, as approved by the roof panel manufacturer, and as specified in Section [_____].

]PART 3 EXECUTION

3.1 EXAMINATION

Examine surfaces to receive metal roof panel and flashing installation. Ensure surfaces are suitable, dry and free of defects and projections which might affect the installation.

3.2 INSTALLATION

Installation shall meet specified requirements and be in accordance with the manufacturer's installation instructions and approved shop drawings. Correct defects or errors in materials and installation. Do not install damaged materials. Dissimilar materials which are not compatible when contacting each other shall be insulated by means of gaskets or insulating compounds. Exposed surfaces and edges shall be kept clean and free from sealant, metal cuttings, hazardous burrs, and other foreign material. Stained, discolored, or damaged materials shall be removed from the site.

3.2.1 Underlayment

NOTE: Coordinate underlayment application with materials specification in Part 2.

Show the extent and location of the appropriate underlayments on the drawings. The underlayment must ensure that any water penetrating below the roof panels will drain outside of the building envelope.

Include the bracketed option related to ice dam protection where ice damming is a concern.

Include the bracketed option in the last sentence when felt underlayment is used.

Install underlayment parallel to roof slope and in a watershedding fashion. [Install self-adhering underlayment [EPDM underlayment] in accordance with manufacturer's instructions.] [Self-adhering underlayment may be installed

parallel to roof slope with the approval of the Contracting Officer.]
[Provide a minimum 1 meter (36 inch) wide sheet of self-adhering modified bitumen membrane underlayment at all penetrations, eaves, rakes, hips, ridges, valleys, slope transitions, and side wall and head wall transitions.] [Ice dam protection shall extend minimum 36 inches inside of building wall line and as otherwise necessary to provide effective protection from water intrusion due to ice damming.] Turn underlayment up minimum 4 inches at vertical transitions, except as otherwise indicated. Underlayment shall be concealed by finished flashing and cladding construction. Ensure underlayment is attached [with 25 mm (1 inch) cap nails] in a manner to hold in place until metal roof panels are installed. The underlayment shall ensure that any water that penetrates below the metal roofing panels will drain outside of the building envelope.

3.2.1.1 Slip Sheet

NOTE: Include first bracketed option when underlayment is used. Include second bracketed option when underlayment is omitted over deck substrate (e.g., shed roof over plywood decking).

[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.]

3.2.2 Roofing

Apply roofing panels with longitudinal configurations in the direction of the roof slope. Provide roofing panels in unbroken lengths from peak to low point with no transverse joints except at junction of ventilators, curbs, skylights, chimneys, and similar openings, unless otherwise indicated or approved by the Contracting Officer. Where panel end laps are required, form and install to shed water and seal in a watertight manner as recommended by the panel manufacturer's installation instructions. Attach roof panels in the manner, type and frequency required by the roof panel manufacturer and to resist required wind uplift pressures. Close panel ribs or side laps as required by the manufacturer to meet specified requirements. Lay side laps away from prevailing wind. Side and end lap distances, joint sealing, and fastening and spacing of fasteners shall be in accordance with manufacturer's instructions. Flash seal roof at ridge, eaves, rakes, and at projections through roof. All sheet metal laps, including but not limited to panel [side laps] end laps, flashing laps and junctures at accessories and penetrations flashings, shall be sealed watertight within the lap area. Closure strips, flashing, and sealing material shall be provided as indicated and where otherwise necessary to provide complete weathertight construction.

3.2.2.1 Field Forming of Roof Panels

Roll forming equipment shall be maintained in proper working order and operated by a factory trained technician. Field formed panels shall meet all specified requirements. Where UL 580 classified materials are required, rollformer equipment certification shall be provided. In cold weather conditions, warming of the steel coils to be field formed shall be performed as necessary just prior to the rolling operations.

3.2.3 Flashings

NOTE: Coordinate flashing requirements with Section 07 60 00 and details. Ensure Section 07 60 00 is properly edited for application to the metal roofing system and for inclusion of flashing conditions of the project.

Provide all flashings, related closures, and accessories necessary for a complete, watertight installation. Minimize exposed fastening of flashings. On sloped planes, form flashing lap joints to shed water and provide sealant within the lap area. Laps joints shall have minimum 100 mm (4 inch) overlap except where greater overlap is indicated, or otherwise required by the roof panel manufacturer. For butt joints of flashings, provide joint splice and cover plates supplemented by waterproof sealants and sealant tapes to form a watertight joint condition. Ensure firm underlying support for joints greater than 200 mm (8 inches) wide and where otherwise indicated or required by the roof panel manufacturer. Installation shall allow for expansion and contraction of flashing without impacting watertight integrity.

3.2.4 Exposed Fastener Installation

Where exposed fastening is required, provide fastener spacings in accordance with manufacturer's recommendations, in straight lines and to present a uniform appearance. Drive fasteners normal to surface and to uniform depth to seat washers with gaskets without tearing or cracking gasketing material. Exercise extreme care when drilling pilot hole for fastenings to keep drills perpendicular and centered. After drilling, remove metal filings and burrs from holes prior to installing fasteners and washers. Torque used when applying fasteners shall not exceed that recommended by manufacturer. Remove metal shavings and filings from roofs upon completion to prevent rusting and discoloration of panels.

3.3 PROTECTION OF APPLIED ROOFING

Do not permit storing, 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 applied roofing materials, and to distribute weight to conform to indicated live load limits of roof construction.

3.4 CLEAN UP AND FINISH TOUCH-UP

NOTE: Include optional last sentence for steel panels in salt spray environment (i.e., within 150 m or 500 feet of waterfront) and other corrosive environments.

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 shall 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.]

3.5 CORRECTION OF DEFICIENCIES

Where any form of deficiency is found, additional measures shall be taken as deemed necessary by the Contracting Officer to determine the extent of the deficiency and corrective actions shall be as directed by the Contracting Officer.

3.6 FIELD QUALITY CONTROL

3.6.1 Construction Monitoring

During progress of the roof work, Contractor shall make visual inspections as necessary to ensure compliance with specified requirements. Additionally, verify the following:

Materials comply with the specified requirements.

All materials are properly stored, handled and protected from damage. Damaged materials are removed from the site.

Substrates are in acceptable condition, in compliance with specification, prior to application of underlayment, roof panel, and flashing materials.

Nailers and blocking are provided where and as needed.

Underlayment is installed as required and of type required.

Slip sheet, if required, is installed as roof panels are installed.

Panels are installed without buckles, ripples, or waves and in uniform alignment and modulus.

Side laps are formed, sealed, fastened or seam locked as required.

The proper number, type, and spacing of attachment clips and fasteners are installed.

Installer adheres to specified and detailed application parameters.

Associated flashings and sheet metal are installed in a timely manner in accord with the specified requirements.

[3.6.2 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.

Manufacturer's technical representative shall visit the site a minimum of three [] times [once per week] during the installation for purposes of reviewing materials installation practices and adequacy of work in place.[Inspections shall occur during the first 20 squares of roof panel

installation, at mid-point of the installation, and at substantial completion, at a minimum. Additional inspections shall not exceed one for each 100 squares of total roof area with the exception that follow-up inspections of previously noted deficiencies or application errors shall be performed as requested by the Contracting Officer.] After each inspection, a report, signed by the manufacturer's technical representative shall be submitted to the Contracting Officer within 3 working days. The report shall note overall quality of work, deficiencies and any other concerns, and recommended corrective action.

]3.7 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. Card shall be 215 mm by 275 mm (8 1/2 by 11 inches) minimum. Information card shall 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. The card shall be a minimum size of 215 mm by 275 mm (8 1/2 by 11 inches). Install card at roof top or access location as directed by the Contracting Officer and provide a paper copy to the Contracting Officer.

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) 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 FLASHINGS 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 _____ 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) YEAR NO PENAL SUM WARRANTY
FOR
NON-STRUCTURAL METAL ROOFING SYSTEM
(continued)

THE CONTRACTOR SHALL SUPPLEMENT THIS WARRANTY WITH WRITTEN WARRANTIES FROM THE MANUFACTURER AND/OR INSTALLER OF THE NON-STRUCTURAL METAL ROOFING SYSTEM, WHICH SHALL BE SUBMITTED ALONG WITH THE CONTRACTOR'S WARRANTY. HOWEVER, THE CONTRACTOR WILL BE 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 SHALL 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
(continued)

**REPORTS OF LEAKS AND ROOF SYSTEM DEFICIENCIES SHALL BE RESPONDED TO WITHIN 48 HOURS OF RECEIPT OF NOTICE, BY TELEPHONE OR IN WRITING, FROM EITHER THE OWNER OR CONTRACTING OFFICER. EMERGENCY REPAIRS TO PREVENT FURTHER ROOF LEAKS SHALL BE INITIATED IMMEDIATELY; A WRITTEN PLAN SHALL BE SUBMITTED FOR APPROVAL TO REPAIR OR REPLACE THIS ROOF SYSTEM WITHIN SEVEN (7) CALENDAR DAYS. ACTUAL WORK FOR PERMANENT REPAIRS OR REPLACEMENT SHALL BE STARTED 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 SHALL 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 SHALL BE THE DULY SELECTED ARBITRATOR. THE COSTS OF THE ARBITRATION, INCLUDING THE ARBITRATOR'S FEE AND EXPENSES, COURT REPORTER, COURTROOM OR SITE SELECTED, ETC., SHALL BE BORNE EQUALLY BETWEEN THE PARTIES. EITHER PARTY DESIRING A COPY OF THE TRANSCRIPT SHALL 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.

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

-- End of Section --