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USACE / NAVFAC / AFCEC / NASA | UFGS-07 61 15.00 20 (August 2016)
Change 2 - 11/18

Preparing Activity: NAVFAC | Superseding
UFGS-07 61 15.00 20 (May 2011)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
****

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SECTION 07 61 15.00 20

ALUMINUM STANDING SEAM ROOFING

08/16, CHG 2: 11/18

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-- End of Section Table of Contents --

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SECTION 07 61 15.00 20

ALUMINUM STANDING SEAM ROOFING
08/16, CHG 2: 11/18

****
NOTE: This guide specification covers the requirements for aluminum standing seam roofing.

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

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

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

****
NOTE: Design exterior envelope to meet the requirements of UFC 1-200-02, "High Performance and Sustainable Building Requirements" which invokes the requirements within UFC 3-101-01, "Architecture". UFC 1-200-02 and UFC 3-101-01 make references throughout to various ASHRAE documents governing energy efficiency and requirements for the components of building envelope design including moisture control and thermal performance.
****

****
NOTE: On the drawings, show:

1. Design loads.

2. Roof slope (minimum 1e in 24 1/2 inch per foot).

3. Line(s) of fixity.

4. Supporting structural framework.

5. Track spacing and attachment details, when applicable.

6. Attachment clip spacing (list capacity of each type in spec).

7. Flashing support and fastening spacing.

8. Roof venting. (Pay particular attention to preventing infiltration of wind-driven rain).

9. Sealant and closure locations.

10. Locations for dissimilar metal protection.

11. Details of accessories such as ladders, walkways, antenna mounts, guy wire fastening, ventilation equipment and lighting.

12. Details of flashing at all roof penetrations.

13. Location and attachment of permanent fall protection devices.

****

****

NOTE: When designing standing seam roofs, consider:

1. Consult with manufacturers early in design stage to obtain current design manuals and structural information regarding roof attachments. Early contact will reduce need for corrections and changes during review process and construction phase.

2. Calculate wind uplift forces in accordance with UFC 1-200-01, "General Building Requirements".

3. Minimum guidelines are 1 in 24 1/2 inch per foot for roof slopes. Provide greater slope if possible. In renovation of existing buildings, adequate slope must often be obtained by imaginative solutions. Sleepers and stub walls have been successfully used, but attachment and structural stability of these must be assured. In some existing structures it will be difficult to design strong connections to structural system, or modifications to existing structural shimming system will be necessary to resist wind forces adequately.

4. It will be necessary to diagram a number of attachment clips for varying roof conditions. Each type should be individually designated on the drawings with spacing shown. Spacing will be a function of allowable panel span and holding

capability assumed for the clip(s). Minimum holding force for each type should be specified as subparagraphs under paragraph ATTACHMENT CLIPS. Assure that fasteners used to attach clips to structure develop full capacity of clip. Check existing structures to assure that the forces can be resisted by existing structural system. Make provisions for thermal expansion of roof structure.

5. Flashing presents a particular design problem in preventing wind and water infiltration. High winds create stresses in flashing which must be resisted by careful detailing of attachment.

While standing seam roofing presents continuous, sealed surface to the elements, flashing transitions are often the cause of serious problems. Overhangs, especially, are susceptible to high wind forces and attachment should be at much closer spacing than usual. Copious use of sealants and closure pieces molded to conform to roof panels is imperative.

6. Building may require equipment such as antennae, ladders, or lighting installed on roof. Access to roof-mounted mechanical equipment is often required. Provide walking surfaces and attachment accessories which do not compromise integrity of roof system. These accessories should provide support without penetrating roofing panels. Usually this is done with clamps attached to standing seam, or other specially designed clips. Provide curbs for mechanical equipment.

7. Specify insulation in appropriate Division 07 section.

****

PART 1 GENERAL

1.1 REFERENCES

****

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

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

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

references in the publish print process.
****

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

ALUMINUM ASSOCIATION (AA)

AA ADM	(2020) Aluminum Design Manual
AA ASM-35	(2000) Specifications for Aluminum Sheet Metal Work in Building Construction, Construction Manual Series Section 5

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG03-3	(2002; Suppl 2001-2004; R 2008) Cold-Formed Steel Design Manual Set

AMERICAN WOOD COUNCIL (AWC)

AWC NDS	(2015) National Design Specification (NDS) for Wood Construction

ASTM INTERNATIONAL (ASTM)

ASTM B117	(2019) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B209M	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
ASTM D226/D226M	(2017) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D522/D522M	(2017) Mandrel Bend Test of Attached Organic Coatings
ASTM D523	(2014; R 2018) Standard Test Method for Specular Gloss
ASTM D714	(2002; R 2017) Standard Test Method for Evaluating Degree of Blistering of Paints
ASTM D968	(2022) Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1654	(2008; R 2016; E 2017) Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D2247	(2015; R 2020) Standard Practice for

	Testing Water Resistance of Coatings in 100?Percent Relative Humidity
ASTM D2565	(2016) Standard Practice for Xenon Arc Exposure of Plastics Intended for Outdoor Applications
ASTM D4214	(2007; R 2015) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films
ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E330/E330M	(2014; R 2021) Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E1592	(2017) Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
ASTM G152	(2013; R 2021) Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G153	(2013; R 2021) Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)

NRCA CONDET	(2014) Construction Details Manual

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

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

U.S. DEPARTMENT OF ENERGY (DOE)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

1.2 DEFINITIONS

1.2.1 Field-Formed Seam

Seams of panels so configured that when adjacent sheets are installed the seam is sealed utilizing mechanical or hand seamers. Crimped (45 degree bend), roll formed (180 degree bend), double roll formed (2 - 180 degree bend), and roll and lock systems are types of field-formed seam systems.

1.2.2 Snap Together Seam

Panels so configured that the male and female portions of the seam interlock through the application of foot pressure or tamping with a mallet. Snap-on cap configurations are a type of snap together system.

1.2.3 Pre-Formed

Formed to the final, less field-formed seam, profile and configuration in the factory.

1.2.4 Field-Formed

Formed to the final, less field-formed seam, profile and configuration at the site of work prior to installation.

1.2.5 Roofing System

The roofing system is defined as the assembly of roofing components, including roofing panels, flashing, fasteners, and accessories which, when assembled properly result in a watertight installation.

1.2.6 SSMRS

Standing Seam Metal Roof System (SSMRS) is abbreviation of the entire roof system specified herein with all components and parts coming from a single manufacturer's system.

1.3 SYSTEM DESCRIPTION

1.3.1 Design Requirements

a. Provide continuous length panels with no joints or seams, except where indicated. Individual panels must be removable for replacement of damaged material.

b. There must be no exposed or penetrating fasteners except where shown on the approved shop drawings. Fasteners into wood must be stainless steel sheet metal screws with full length threads. Fasteners into steel must be stainless steel or cadmium plated stainless steel screws inserted into predrilled holes. Length and diameter of screws must be sufficient to meet the design loads with a suitable factor of safety for the material to which the roofing components are attached. Calculate fastener capacity in accordance with AISI SG03-3, AA ADM or AWC NDS as applicable.

c. Roof panel standing seam must include a capillary break and be mechanically locked closed by the manufacturer's locking tool. The seam must include a continuous sealant when required by the manufacturer to withstand the rainfall and wind specified in paragraph MANUFACTURER'S REQUIREMENTS.

d. Roof panel anchor clips must be concealed and designed to allow for thermal movement of the panels, except where specific fixed points are indicated.

e. The system must resist the positive and negative loads specified herein in accordance with "Sheet Building Sheathing Design Guide" of

the AA ADM. Determine capacity in accordance with principles of ASTM E330/E330M modified as follows:

(1) Test panels must be production material of the type proposed for use. Use either full length or partial length panels with attachment representative of the main part of the roof.

(2) Test specimens must be five panels wide, span one or more supports, and must have no end or edge attachment or seals that will restrict crosswise movement of the panels under load. Do not bridge longitudinal seams with tape or film that can restrict separation.

(3) Test panels to failure. Report load at failure.

f. Panels must support walking loads without excessive distortion or telegraphing of the structural supports. Panels must support a 115 kilogram 250 pound load concentrated on a 2500 square millimeter (mm) 4 square inch area at the center of the panel without buckling or permanent distortion.

1.3.2 Performance Requirements

1.3.2.1 Wind Loads

****

NOTE: Determine the appropriate pressures, positive and negative, that apply to the various portions of the roof using current engineering technology that takes into account the height, shape, and location of the structure. See UFC 3-301-01, "Structural Engineering," for structural design and wind load information.

****

Resistance to wind uplift generated by winds of [200] [_____] km/h [124] [_____] mph. The roof system and attachments must resist the following wind loads (kPapsf) with a factor of safety appropriate for the material holding the anchor:

	Positive	Negative
At eaves	[_____]	[_____]
At rakes	[_____]	[_____]
At ridge	[_____]	[_____]
At building corners	[_____]	[_____]
At central areas	[_____]	[_____]

1.3.2.2 Resistance to Water Infiltration

Roofing system must show no infiltration at seams, edges, flashings, counterflashings and penetrations when subjected to a rainfall of [125] [_____] mm [5] [_____] inches per hour with [200] [_____] km/h [124]

[_____] mph wind.

1.3.2.3 Thermal Movement

****
NOTE: Select the temperature range appropriate for the finish and color specified.
****

The system must be capable of withstanding thermal movement based on a temperature range of 5 degrees C 10 degrees F below design low air temperature and [60 degrees C140 degrees F for mill finish and light colors.][82 degrees C180 degrees F for dark colors.]

1.3.2.4 Deflection

Panel deflection must not exceed L/140.

1.3.2.5 Structural Performance

The structural performance test methods and requirements must be in accordance with ASTM E1592.

1.4 SUBMITTALS

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

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

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

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

item for Army projects.
****

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

SD-02 Shop Drawings

Roofing Panels; G[, [_____]]

Submit drawings as necessary to supplement the instructions and diagrams. Include design and erection drawings containing an isometric view of the roof showing the design uplift pressures and dimensions of edge, ridge and corner zones. Show typical and special conditions including flashings, accessory installation, materials and thicknesses, all dimensions, anchoring methods, sealant locations, sealant tape locations, fastener layout, sizes, spacing, provisions for thermal movement, terminations, penetrations, and attachments. Details of installation must be in accordance with the manufacturer's Standard Instructions and details or the SMACNA 1793. The manufacturer's technical engineering department must approve the drawings before they are submitted.

SD-03 Product Data

Roofing Panels; G[, [_____]]

Energy Star Label for Aluminum Roofing Product; S

Recycled Content of Aluminum Roofing Products; S

[Heat Island Reduction; S

] Attachment Clips

Closures

Accessories

Underlayment

Sample Warranty Certificate; G[, [_____]]

Submit for all materials to be provided. Submit data sufficient to indicate conformance to specified requirements.

SD-04 Samples

Roofing Panels

Submit a 300 mm 12 inch long section of typical panel [in color specified] [in color selected].

When colors are not indicated, submit samples of not less than

six different manufacturer's standard colors for selection.

Accessories

Submit each type of accessory item used in the project including, but not limited to: each type of anchor clip, closures, fasteners and leg clamps.

SD-05 Design Data

Load Calculations; G[, [_____]]

SD-06 Test Reports

Structural Performance; G[, [_____]]

Panel Finish; G[, [_____]]

Submit reports of the tests required by this section.

Manufacturer's Field Inspection; G[, [_____]]

Submit manufacturer's technical representative's inspection reports as required in paragraph MANUFACTURER'S FIELD INSPECTION.

SD-07 Certificates

Technical Representative

Qualification of Installer

Submit documentation proving the installer is factory-trained, has the specified experience and is authorized by the manufacturer to install the products specified.

Coil Stock Compatibility; G[, [_____]]

Provide certification of coil compatibility with roll forming machinery to be used for forming panels without warping, waviness, and rippling not part of panel profile; to be done without damage, abrasion or marking of finish coating.

SD-08 Manufacturer's Instructions

Sealant

Submit manufacturer's sealant requirements for roofing.

Installation Manual; G[, [_____]]

Submit manufacturer's printed installation manual/instructions and standard details.

SD-11 Closeout Submittals

Information Card

For each roofing installation, submit a typewritten card or photoengraved aluminum card containing the information listed on

Form 1 located at the end of this section.

Warranty

1.5 LOAD CALCULATIONS

****
NOTE: Ensure that appropriate design loads are specified in paragraph WIND LOADS.
****

****
NOTE: Use 200 km/h 124 mph at Adak, Alaska.
****

Submit load calculations for the following by a structural engineer registered as a Professional Engineer in any jurisdiction verifying that the system supplied meets the design loads indicated. Coordinate calculations with manufacturer's test results.

a. Wind load uplift design pressure at roof locations specified in paragraph WIND LOADS.

b. Clip spacing and allowable load per clip calculations.

c. The fastening of clips to structure or intermediate support spacing.

d. Intermediate support spacing and fastening to structure when required.

e. Allowable panel span at anchorage spacing indicated.

f. Safety factor used in determining loading.

1.6 QUALITY ASSURANCE

1.6.1 Preroofing Conference

****
NOTE: Consult with the Contracting Officer responsible for construction of the project to determine who should conduct the conference. For NAVFAC SE administered projects, delete the option of Contractor conducting the conference and delete the last sentence.
****

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

a. The drawings and specifications

b. Procedure for on site inspection and acceptance of the roofing substrate and pertinent structural details relating to the roofing system

c. 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

d. Safety requirements.

The preroofing conference must be attended by the Contractor and personnel directly responsible for the roofing [and insulation] installation, [mechanical] [and] [electrical work], and the roofing manufacturer's technical representative. Conflicts among those attending the preroofing conference must be resolved and confirmed in writing before roofing work, including associated work, is begun.[Prepare written minutes of the preroofing conference and submit to the Contracting Officer.]

1.6.2 Manufacturer's Technical Representative

The representative must have authorization from manufacturer to approve field changes and be thoroughly familiar with the products and with installations in the geographical area where construction will take place. The manufacturer's representative must be an employee of the manufacturer with at least 5 years experience in installing the roof system. The representative must be available to perform field inspections and attend meetings as required herein, and as requested by the Contracting Officer.

1.6.3 Qualification of Installer

The roofing system installer must be factory-trained, approved by the aluminum roofing system manufacturer to install the system, and must have a minimum of three years experience as an approved applicator with that manufacturer. The applicator must have applied five installations of similar size and scope to this project within the previous 3 years.

1.6.4 Single Source

Provide roofing panels, clips, closures and other accessories from a single manufacturer.

1.6.5 Manufacturer

The SSMRS must be the product of an aluminum roofing industry recognized SSMRS manufacturer who has been in the practice of manufacturing SSMRS for a period of not less than 5 years and who has been involved in at least 5 projects similar in size and complexity to this project.

1.6.6 Laboratory Tests For Panel Finish

Previously manufactured panels of the same type and finish as proposed for the project must have been tested by an approved testing laboratory to ensure conformance to specifications. The term "appearance of base metal" refers to the aluminum base metal. Panels must meet the following test requirements.

1.6.6.1 Salt Spray Test

****
NOTE: Use 2000-hour test for products to be installed in marine environments.
****

Panels must withstand a salt spray test for a minimum of [1000][2000]

hours in accordance with ASTM B117, including the scribe requirement in the test. Immediately upon removal of the panel from the test, coating must receive a rating of 10, no blistering, as determined by ASTM D714; and a rating of 7, 2 mm 1/16 inch failure at scribe, as determined by ASTM D1654, Rating Schedule No. 1.

1.6.6.2 Formability Test

For formability test, when subjected to a 180 degree bend over a 3 mm 1/8 inch diameter mandrel in accordance with ASTM D522/D522M, exterior coating film must show only microchecking of the exterior film and there must be no loss of adhesion.

1.6.6.3 Accelerated Weathering Test

Panels must withstand an accelerated weathering test for a minimum of 2000 hours in accordance with ASTM G152, ASTM G153 or ASTM D2565 without cracking, peeling, blistering, loss of adhesion of the protective coating, or corrosion of the base metal. Protective coating that can be readily removed from the base metal with a penknife blade or similar instrument will be considered to indicate loss of adhesion.

1.6.6.4 Chalking Resistance

After the 2000-hour weatherometer test, exterior coating may not chalk greater than No. 8 rating when measured in accordance with ASTM D4214 test procedures.

1.6.6.5 Abrasion Resistance Test for Color Coating

When subjected to the falling sand test in accordance with ASTM D968, coating system must withstand a minimum of 100 liters of sand per 0.025 mm (mil) of coating thickness before appearance of base metal.

1.6.6.6 Humidity Test

When subjected to a humidity cabinet test in accordance with ASTM D2247 for 1000 hours, a scored panel must show no signs of blistering, cracking, creepage, or corrosion.

1.6.6.7 Fire Hazard

****

NOTE: Delete this paragraph if mill finish has been selected. If roofing is exposed in exit areas, use a flame spread of 25; if exposed in non-exit areas, use flame spread of 75; otherwise delete the paragraph.

****

The finish on factory-fabricated panels must have a flame spread rating of not more than [25][75] when tested in accordance with ASTM E84.

1.6.6.8 Gloss

The gloss of the finish must be 30 plus or minus 5 at an angle of 60 degrees, when measured in accordance with ASTM D523.

1.6.6.9 Glare Resistance

****

NOTE: The requirements for glare resistance should be included only when specifically required by the facility for critical glare areas such as control towers or other structures where glare can be an operational hazard.

****

Surfaces of panels that will be exposed to the exterior must have a specular reflectance of not more than 10 when measured in accordance with ASTM D523 at an angle of 85 degrees. Requirements specified under FORMABILITY TEST will be waived if necessary to conform to this requirement.

1.7 DELIVERY, STORAGE, AND HANDLING

Deliver, store, and handle preformed panels, bulk roofing products and other manufactured items in a manner to prevent damage or deformation.

1.7.1 Delivery

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, dampness, and staining. Replace damaged or permanently stained materials that cannot be restored to like-new condition with new material. If materials are wet, remove moisture, restack and protect panels until used.

1.7.2 Handling

Handle material carefully to avoid damage to surfaces, edges and ends.

1.7.3 Storage

Stack materials stored on the site on platforms or pallets and cover with tarpaulins or other suitable weathertight coverings which prevent water trapping or condensation. Store panels so that water which might have accumulated during transit or storage will drain off. Do not store the panels in contact with materials that might cause staining, such as mud, lime, cement, fresh concrete or chemicals. Protect stored panels from wind damage.

1.8 WARRANTY

Furnish manufacturer's no dollar limit materials and workmanship warranty for the roofing system. The warranty period must be not less than 20 years from the date of Government acceptance of the work. Issue the warranty directly to the Government. The warranty must provide that if within the warranty period the aluminum roofing system becomes non-watertight or shows evidence of corrosion, perforation, peeling paint, rupture or excess weathering due to deterioration of the roofing system resulting from defective materials or workmanship the repair or replacement of the defective materials and correction of the defective workmanship must be the responsibility of the roofing system manufacturer. Repairs that become necessary because of defective materials and workmanship while roofing is under warranty must be performed within 7 days after notification, unless additional time is

approved by the Contracting Officer. Failure to perform repairs within the specified period of time will constitute grounds for having the repairs performed by others and the cost billed to the manufacturer. In addition, provide a 2 year contractor installation warranty.

PART 2 PRODUCTS

2.1 ROOFING PANELS

****

NOTE: Certain roofing products are required to conform to public law (PL) 109-58 - Energy Policy Act of 2005 (EPAct05) by meeting or exceeding Energy Star or FEMP efficiency requirements at "energy-efficient products" at http://energy.gov/eere/femp/energy-and-water-efficient-products.

Use materials with recycled content where appropriate for use. Verify suitability, availability within the region, cost effectiveness and adequate competition before specifying product recycled content requirements. A resource that can be used to identify products with recycled content is the "Comprehensive Procurement Guidelines (CPG)" page within the EPA's website at http://www.epa.gov. **Other products with recycled content are also acceptable when meeting all requirements of this specification.**

Research shows the product is available from US national manufacturers above the minimum recycled content stated. Some manufacturers and regions have higher percentages.

****

2.1.1 Material

3004 aluminum, ASTM B209M ASTM B209. Aluminum roofing materials must contain a minimum of 30 percent total recycled content. Provide data identifying percentage of recycled content of aluminum roofing products.

****

NOTE: Facilities with dominant cooling loads and/or in mild or warm climate zones are required to meet "cool roofing" requirements of FEMP. Cool roof design must follow the requirements in UFC 3-110-03 Roofing, Appendix B and ASHRAE 90.1 Chapter 5, for the design of insulation and energy performance of the building. The roofing system will need to include a top surface layer that meets the Energy Star criteria for Cool Roof Products see http://www.energystar.gov/products/certified-products/detail/roof-products.

NOTE: If a cool roof is not selected in ASHRAE zones 1 thru 3, design must meet one of the exception requirements listed in ASHRAE 90.1 Chapter 5 or provide thermal insulation above the deck with an R value of 33 or greater. Coordinate these requirements with insulation design and

specifications.

Retain the next to last bracketed sentence for project with cool roof requirement. Retain the last bracketed sentence for project with sustainable third party certification credit requirement for reduced heat island effect.
****

Provide aluminum roofing product that is Energy Star labeled. Provide data identifying Energy Star label for aluminum roofing product.[Provide solar reflectance product with an initial solar reflectance greater than or equal to 0.25 and a solar reflectance greater than or equal to 0.15 three years after installation under normal conditions.][Provide emittance and reflectance percentages, solar reflectance index values, [and] slopes [_____], to meet sustainable third party certification requirements for Heat Island Reduction.]

2.1.1.1 Thickness

1.0 mm0.040 inch minimum.

2.1.1.2 Finish

****
NOTE: Choose the finish appropriate for the project. In general, hangars, warehouses, and other utilitarian structures may use mill finish to reduce cost. Mill finish Alclad is more economical than fluorocarbon painted finish. Some colors in the painted finish are substantially more costly than others, due to the scarcity of certain pigments.
****

****
NOTE: Use coated alclad in locations with an Environmental Severity Classification (ESC) of C3 through C5. Unpainted aluminum, mill finish, may be used in locations with an ESC of C1 or C2 unless there are factors which may lead to a locally corrosive microenvironment (e.g., local source of industrial pollution). See UFC 1-200-01 for determination of ESC for project locations.
****

[Alclad mill finish, unpainted] [Alclad fluorocarbon baked enamel exterior and neutral washcoat interior].

2.1.1.3 Texture

[Stucco embossed.][Smooth.][Smooth with raised intermediate ribs for added stiffness].

2.1.1.4 Color

****
NOTE: Check with the facility regarding color selection. Use only manufacturer's standard colors. Delete this paragraph if mill finish has been

selected.
****

[Blue][Red][[_____], No. [_____]] exterior as selected from the manufacturer's standard colors.

2.1.1.5 Configuration

****
NOTE: The height of vertical legs should not be less than 50 mm 2 inches on roofs having a slope less than 2 in 12. The occurrence of ice dams or other water flow obstructions should be considered when determining the vertical leg height.
****

Provide panels of continuous lengths from ridge to eaves or from top to eaves on shed roof designs. Panels must be [300] [_____] mm [12] [_____] inches wide with a minimum [50] [_____] mm [2.0] [_____] inch high vertical legs and two [9.4 mm0.37 inch] [_____] stiffening ribs at 100 mm 4 inches on center between the legs to minimize oil-canning and telegraphing of structural members. Leading vertical leg must have a continuous groove in the rib top for anti-siphon protection when hook-rib top of next panel is locked over leading vertical leg to form the standing seam. Panels from coil stock must be formed without warping, waviness or ripples not a part of the panel profile, and must be free of damage to the finish coating system.

[2.1.1.6 Prefinished Coating System

****
NOTE: Delete this paragraph if mill finish has been selected.
****

Fluorocarbon baked enamel, factory-applied, minimum total dry film nominal thickness of [0.0175] [0.050] [_____] mm [0.7] [2.0] [_____] mils, and conforming to test requirements specified herein. Provide prefinished coating system on [both faces.] [the exterior face.] Interior face must receive same coating system, or, at the manufacturer's option, receive a coat of acrylic wash coat applied to a minimum total dry film nominal thickness of 0.005 mm 0.20 mil.

]2.2 ATTACHMENT CLIPS

****
NOTE: Add the appropriate choice(s) for the attachment clip(s) used in the design. Insert design value for minimum load capacity.
****

Series 300 non-magnetic stainless steel.

a. Type 1: [_____] clip, minimum capacity [_____] kgs lbs.

b. Type 2: [_____] clip, minimum capacity [_____] kgs lbs.

c. Type 3: [_____] clip, minimum capacity [_____] kgs lbs.

2.3 ACCESSORIES

Sheet metal flashings, trim, moldings, closure strips, caps, preformed crickets, equipment curbs, [gutters,] [down spouts,] and other similar sheet aluminum accessories provided in conjunction with preformed aluminum panels must be of the same material and finish as panels, except that such items which will be concealed after installation may be provided without the finish if they are aluminum or stainless steel. Provide ridge and rib closures, as specified. Aluminum must be of thickness not less than that of panels. Molded closure strips must be closed-cell synthetic rubber, neoprene, or polyvinyl chloride premolded to match configurations of preformed aluminum panels. Thermal spacer blocks and other thermal barriers at concealed fasteners must be as recommended by the roofing panel manufacturer.

2.3.1 Closures

2.3.1.1 Ridge Closure

Aluminum-clad foam or aluminum closure with foam secondary closure matching panel configuration for installation on surface of roof panel between panel ribs at ridge and headwall roof panel flashing conditions and terminations. Foam material must not absorb water.

2.3.1.2 Rib Closure

Aluminum, closed-cell or solid-cell synthetic rubber, neoprene or polyvinyl chloride pre-molded to match configuration of rib opening. Material for closures must not absorb water.

2.3.2 Fasteners

****

NOTE: In the high winds, metal will vibrate and fatigue at fasteners on "normal" spacings. For this reason, cleated (blind fastened) flashings are not acceptable, and attachment at 50 to 200 mm 6 to 8 inches on center is customary. Flashing should not extend a significant distance more than 25 mm 1 inch beyond a support or fastener.

****

Series 300 stainless steel with composite metal and neoprene composition washers. Fasteners for attachment to structural supports and fasteners for attachment of panels must be as approved and in accordance with manufacturer's recommendation. Unless specified otherwise herein, fasteners must be either self-tapping screws, bolts and nuts, or self-locking bolts. Design fastening system to withstand design loads indicated. Fasteners must not be over-torqued and must develop full capacity of attachment clips.

2.3.2.1 Screws

Provide not less than 0.242 mm No. 14 diameter for self-tapping type and not less than 0.216 mm No. 12 diameter for self-drilling and self-tapping.

2.3.2.2 Bolts

Provide not less than 6 mm 1/4 inch diameter, shouldered or plain shank as

required, with proper nuts.

2.3.2.3 Automatic End-Welded Studs

Provide shouldered type with a shank diameter of not less than 5 mm 3/16 inch and cap or nut for holding covering against the shoulder.

2.3.2.4 Explosive Driven Fasteners

Provide fasteners to be driven with explosive actuated tools and with a shank diameter of not less than 13 mm 1/2 inch for fastening to steel and not less than 25 mm 1 inch for fastening to concrete.

2.3.2.5 Rivets

Blind rivets must be aluminum with 5 mm 3/16 inch nominal diameter shank or stainless steel with 3 mm 1/8 inch nominal diameter shank. Rivets must be threaded stem type if used for other than fastening trim. Rivets with hollow stems must have closed ends.

2.3.3 Sealant

Elastomeric type containing no oil or asphalt. Exposed sealant must cure to a rubberlike consistency. Concealed sealant must be the non-hardening type. Seam sealant must be factory-applied, non-skinning, non-drying, and must conform to the roofing manufacturer's recommendations. Do not use silicone-based sealants in contact with finished metal panels and components unless approved otherwise by the Contracting Officer.

2.3.4 Sealant Tape

Polyvinyl chloride closed cell foam tape or composed of 99 percent solids in a base of butyl polyisobutylene rubber with the following properties and characteristics:

a. Webbing and Elongation: 100 percent minimum at 25 degrees C 77 degrees F

b. Adhesion: Excellent to surfaces used

c. U-V light exposure: No effect

d. Ozone: No effect

e. Weathering: 1000 hours in QUV Test Apparatus - Excellent, no cracking, bleeding, or significant changes.

f. Moisture Transmission: 0.05 to 0.15 grams per 62500 square mm 100 square inches in 24 hours.

g. Service Temperature Tests: Bending over 13 mm 1/2 inchmandrel at minus 50 degrees C minus 60 degrees F with no cracking. Expose sealed typical metal lap joint to plus 176 degrees C plus 350 degrees F for 24 hours with no significant loss of original properties.

h. Reaction to Metals: Non-corrosive to aluminum

2.4 UNDERLAYMENT FOR WOOD SUBSTRATES

****

NOTE: Include the following paragraph where standing seam aluminum roof is applied directly to a wood deck.

****

Provide underlayment ASTM D226/D226M, Type I perforated, covered by water-resistant rosin sized building paper.

2.5 LINER PANELS

Fabricate liner panels of the same material as roof panels, and formed or patterned to prevent waviness and distortion. Liner panels must have a factory applied, 0.025 mm one mil thick minimum painted coating on the inside face, and a prime coat on the liner side.

PART 3 EXECUTION

3.1 EXAMINATION

Do not use building construction materials that show visible evidence of biological growth.

Examine surfaces to receive standing seam aluminum roofing and flashing. Provide plumb and true surfaces, clean, even, smooth and as dry as possible. Ensure that surfaces are free from defects and projections which might affect the installation. Report unsuitable conditions to Contracting Officer.

3.2 PROTECTION OF DISSIMILAR METALS

****

NOTE: Galvanized steel will deteriorate in humid conditions, coastal areas and should be considered a dissimilar metal unless it is known that the contact surface will remain dry and free from condensation. Wood which has been pressure treated will also react with aluminum. Provide protection if aluminum could contact treated wood.

****

Where an aluminum component is in contact with, fastened to, or contacted by drainage from dissimilar metals other than stainless steel, give such dissimilar metals one of the following treatments:

a. A heavy brush coat of primer followed by two coats of aluminum metal and masonry paint.

b. A heavy coat of alkali-resistant bituminous paint.

c. Separate contact surfaces with non-absorptive tape or gasket.

3.2.1 Contact with Masonry

Where aluminum is in contact with masonry, concrete, or plaster, apply a heavy coat of alkali-resistant bituminous paint.

3.2.2 Contact with Wood

Where aluminum is in contact with wood or other absorptive material subject to wetting, or with wood treated with a preservative not compatible with aluminum, seal joints with sealing compound and apply one heavy brush coat of aluminum pigmented bituminous paint.

3.3 INSTALLATION

Install in accordance with approved manufacturer's erection instructions shop drawings, and diagrams, except as specified otherwise herein. Provide panels in full and firm contact with clips. Obtain approval prior to installation on prefinished panels cut in the field, and factory applied coverings or coatings that were repaired after being abraded or damaged during handling or installation. Make repairs with material of same color as weather coating. Completely seal openings through panels. Correct defects or errors in materials in an approved manner. Replace materials which cannot be corrected in an approved manner with new materials. Provide molded closure strips where indicated and where necessary for weathertight construction. [Use shims as required to ensure clip line is true.] Use a spacing gage at each row of panels to ensure that panel width is not stretched or shortened. [Provide one layer of asphalt-saturated felt placed perpendicular to roof slope covered by one layer of rosin-sized building paper placed parallel to roof slope with side laps down slope and attached with roofing nails. Overlap side end laps 75 mm 3 inches, offset seams in building paper with seams in felt.]

3.3.1 Roof Panels

Apply roofing panels with standing seams parallel to slope of roof. Provide roofing panels in full lengths from ridge to eaves (top to eaves on shed roofs), with no transverse joints except at the junction of ventilators, curbs, skylights, chimneys, and similar openings. Form interlocking rib type panel seams in the field with an automatic mechanical seamer approved by the manufacturer. Attach panels to structure with concealed clips which are incorporated into the panel seams. Clip attachment must allow roof to move freely and independently of the structure, except at fixed points as indicated.

3.3.2 Flashings

****

NOTE: In the high winds metal will vibrate and fatigue at fasteners on "normal" spacings. For this reason, cleated (blind fastened) flashings are not acceptable, and attachment at 100 to 150 mm 4 to 6 inches on center is customary. Flashing should not extend a significant distance more than 25 mm one inch beyond a support or fastener.

****

Provide flashing and related closures and accessories in connection with preformed metal panels [as indicated] and as necessary to provide a weathertight installation. Install flashing to ensure positive water drainage away from roof penetrations. Flash and seal roof at ridge, eaves and rakes, at projections through roof, and elsewhere as necessary. Accomplish placement of closure strips, flashing, and sealing material in an approved manner that will ensure complete weathertightness. Details of installation which are not indicated must be in accordance with the

NRCA CONDET, SMACNA 1793, AA ASM-35, panel manufacturer's printed instructions and details of the approved shop drawings. Installation must allow for expansion and contraction of flashing.

3.3.3 Flashing Fasteners

****

NOTE: In the high winds, metal will vibrate and fatigue at fasteners on "normal" spacings. For this reason, cleated (blind fastened) flashings are not acceptable, and attachment at 100 to 150 mm 4 to 6 inches on center is customary. Flashing should not extend any significant distance more than 25 mm one inch beyond a support or fastener.

****

Fastener spacings must be in accordance with the panel manufacturer's recommendations and as necessary to withstand the indicated design loads. Install fasteners in roof valleys as recommended by the manufacturer of the panels. Install fasteners in straight lines within a tolerance of 13 mm 1/2 inch in the length of a bay. Drive exposed penetrating type fasteners normal to the surface and to a uniform depth to seat gasketed washers properly and drive so as not to damage factory applied coating. Exercise extreme care in drilling pilot holes for fastenings to keep drills perpendicular and centered. Do not drill through sealant tapes. After drilling, remove metal filings and burrs from holes prior to installing fasteners and washers. Torque used in applying fasteners must not exceed that recommended by the manufacturer. Remove panels deformed or otherwise damaged by over-torqued fastenings, and provide new panels.

3.3.4 Closure/Closure Strips

Set closure/closure strips in joint sealant material.

3.4 CLEANING

Clean exposed sheet metal work at completion of installation. Remove metal shavings, filings, nails, bolts, and wires from roofs on completion to prevent discoloration and harm to the panels and flashing. 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, and solder or weld marks.

3.5 MANUFACTURER'S FIELD INSPECTION

Manufacturer's technical representative must visit the site as necessary during the installation process to assure panels, flashings, and other components are being installed in a satisfactory manner. Manufacturer's technical representative must perform a field inspection during the first [20] [_____] squares of roof panel installation and at substantial completion prior to issuance of warranty, as a minimum, and as otherwise requested by the Contracting Officer. Additional inspections must 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 must be performed as requested by the Contracting Officer. Each inspection visit must include a review of the entire installation to date. After each inspection, submit a report, signed by the manufacturer's technical representative, to the Contracting Officer

noting the overall quality of work, deficiencies and any other concerns, and recommended corrective actions in detail. Notify Contracting Officer a minimum of 2 working days prior to site visit by manufacturer's technical representative.

3.6 COMPLETED WORK

Completed work must be plumb and true without oil canning, dents, ripples, abrasion, rust, staining, or other damage detrimental to the performance or aesthetics of the completed roof assembly.

3.7 INFORMATION CARD

****
NOTE: Include only the applicable EFD.
****

For each roof, provide a typewritten card, laminated in plastic and framed for interior display or a photoengraved 0.8 mm thick 0.032 inch thick aluminum card for exterior display. Card to be 220 by 280 mm 8 1/2 by 11 inches minimum and contain the information listed on Form 1 at end of this section. Install card near point of access to roof, or where indicated. Send a photostatic paper copy to [NAVFAC Washington, Building 2, Washington Navy Yard, Washington, DC 20374-2121][LANTNAVFACENGCOM, Code 1613, 1510 Gilbert Street, Norfolk, VA 23511-2699] [NORTHNAVFACENGCOM, Code 103A, 10 Industrial Highway, Mail Stop #82, Lester, PA 19113-2090] [PACNAVFACENGCOM, Code 102, Pearl Harbor, HI 96860-7300] [SOUTHNAVFACENGCOM, Code 0535, P.O. Box 190010, North Charleston, SC 29419-9010] [SOUTHWESTNAVFACENGCOM, Code 133SB, 1220 Pacific Highway, San Diego, CA 92132-5190][_____].

3.8 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

3.9 FORM ONE

FORM 1 - PREFORMED STEEL STANDING SEAM ROOFING SYSTEM COMPONENTS

1. Contract Number:

2. Building Number & Location:

3. NAVFAC Specification Number:

4. Deck/Substrate Type:

5. Slopes of Deck/Roof Structure:

6. Insulation Type & Thickness:

7. Insulation Manufacturer:

8. Vapor Retarder: ( )Yes ( )No

9. Vapor Retarder Type:

10. Preformed Steel Standing Seam Roofing Description:

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

11. Repair of Color Coating:

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

12. Statement of Compliance or Exception:_____
_____
_____

13. Date Roof Completed:

14. Warranty Period: From_____ To_____

15. Roofing Contractor (Name & Address):

16. Prime Contractor (Name & Address):

Contractor's Signature _____ Date:

Inspector's Signature _____ Date:

-- End of Section --