

USACE / NAVFAC / AFCESA / NASA	UFGS-07 42 13 (April 2006)
Preparing Activity: NAVFAC	Superseding UFGS-07413 (May 2004)

References are in agreement with UMRL dated 9 October 2006

04/06

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USACE / NAVFAC / AFCEA / NASA UFGS-07 42 13 (April 2006)

Preparing Activity: NAVFAC Superseding
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UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 9 October 2006

SECTION 07 42 13

METAL WALL PANELS 04/06

NOTE: This guide specification covers the requirements for both factory color and mill finish metal wall panels, including factory insulated wall panels.

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: This section does not include light gage siding for temporary construction, housing, or preengineered metal buildings, or decorative wall panels.

This section shall be coordinated with other system components specifications such as framing, insulation and sheet metal flashing. This section shall also be coordinated with applicable Unified Facilities Criteria as it relates to the specific project.

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.

ALUMINUM ASSOCIATION (AA)

AA ADM1 (2005) Aluminum Design Manual

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG-973 (2002) Cold-Formed Steel Design Manual

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 D 1654 (1992; R 2000) Evaluation of Painted or Coated Specimens Subjected to Corrosive

Environments

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 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 522	(1993a; R 2001) Mandrel Bend Test of Attached Organic Coatings
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 84	(2005) Surface Burning Characteristics of Building Materials
ASTM G 154	(2000ae1) Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials

1.2 DESCRIPTION OF WALL PANEL 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 a combination of options as necessary to describe the generic profile required. Include the last bracketed option of the second sentence when generic profile is shown on

drawings. Show panel profile and dimensions on the drawings when a particular aesthetic appearance is desired.

[Factory color finished,] [Mill finish] [galvanized] [galvalume] [aluminum] metal wall panel system with [concealed fastening] [exposed fastener] attachment. Panel profile shall be [embossed] [recessed seam lock] [flush face] [smooth face] [recessed bead] [raised bead] [striated] [square ribbed] [beaded rib] [roll lock seam] [snap lock seam] [box rib] [corrugated] [standing seam] [batten seam] [and with stiffening ribs in the flat of the panel] [as shown on drawings].

1.3 GENERAL DESIGN REQUIREMENTS

NOTE: Drawings will show the design wind loads and supports to receive the metal siding.

Criteria, loading combinations, and definitions shall be in accordance with **ASCE 7**. Maximum calculated fiber stress shall not exceed the allowable value in the AISI or AA manuals; a one third overstress for wind is allowed. Midspan deflection under maximum design loads shall be limited to L/180. Contract drawings show the design wind loads and the extent and general assembly details of the metal siding. Members and connections not shown on the drawings shall be designed by the Contractor. Siding panels and accessories shall be the products of the same manufacturer. Steel siding design shall be in accordance with **AISI SG-973**. Aluminum siding design shall be in accordance with **AA ADM1**.

1.4 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

Siding[; G][; G, [_____]]

Drawings consisting of catalog cuts, panel configuration, system
assembly, attachment details, flashing details, design and
erection drawings, shop coating and finishing specifications, and
other data as necessary to clearly describe design, materials,
sizes, layouts, construction details, fasteners, and erection.
Drawings shall be accompanied by engineering design calculations
for the siding panels. Drawings shall be approved by the metal
wall panel 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.

Wall panels[; G][; G, [_____]]

Closures

flashing

Accessories

Fasteners

Gaskets and Insulating Compounds

SD-04 Samples

WALL PANEL;

One piece of each type and finish (exterior and interior) to be
used, 9 inches 230 mm long, full width.

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

Provide standard [and custom] color charts for wall panel and

accessory color selection.

Accessories;

One sample of each type of flashing, trim, 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. If so requested, random samples of bolts, nuts, and washers as delivered to the jobsite shall be taken in the presence of the Contracting Officer and provided to the Contracting Officer for testing to establish compliance with specified requirements.

Insulation;

One piece of each type to be used, and descriptive data covering installation.

Gaskets and Insulating Compounds;

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

Sealant;

One sample, approximately 1 pound 0.45 kg, and descriptive data.

Wall Liners;

One piece, 9 inches long 230 mm, full width.

SD-05 Design Data

Wind load calculations[; G][; G, [_____]]

Calculations shall be prepared, signed, and sealed by a registered structural engineer.

SD-06 Test Reports

Salt Spray Test;

SD-07 Certificates

Wall Panels[; G][; G, [_____]]

Accessories;

Insulation;

Certificates from the wall panel manufacturer attesting that the panels and accessories conform to the specified requirements and are suitable for the installation environment.

SD-08 Manufacturer's Instructions

INSTALLATION[; G][; G, [_____]]

Submit manufacturer's printed installation manual and instructions.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver, store, and handle panel materials, bulk 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 dry and 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 wall 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. Storage accommodations for metal wall panels shall provide good air circulation and protection from surface 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 installation.

1.6 WARRANTIES

The Contractor shall provide a weathertight material and workmanship warranty for the metal wall panel system installation for a period of [5][10][20] years and to include a manufacturer's [5][10][_____] year warranty against cracking, peeling, or delamination of the color finish and corrosion of the base metal, and 10 year warranty against the corrosion of fasteners caused by ordinary wear and tear by the elements. The warranties shall start upon final acceptance of the work or the date the Government takes possession, whichever is earlier.

PART 2 PRODUCTS

2.1 WALL PANEL

NOTE: This paragraph will be edited to reflect the project requirements with regard to panel finish, edge configuration, and fastening system. Except for special situations, steel and aluminum will be retained as options for wall panel materials. Where

appearance is not critical, the overlapping configurations and exposed penetrating fastener options may remain as contractor options.

Panels shall be [steel] [aluminum] and shall have a [mill] [factory-applied color] finish. Panel profile shall be [recessed seam lock] [flush face] [smooth face] [recessed bead] [raised bead] [striated] [square ribbed] [beaded rib] [roll lock seam] [snap lock seam] [box rib] [corrugated] [standing seam] [batten seam] [and with stiffening ribs in the flat of the panel] [as shown on drawings]. Wall panels shall have [edge configurations for overlapping adjacent sheets] [or] [interlocking ribs for securing adjacent sheets]. Width of sheets [with overlapping configurations shall provide not less than 600 mm 24 inches of coverage in place] [, and those] [with interlocking ribs shall provide not less than 300 mm 12 inches of coverage in place]. Wall panels shall be fastened to framework using [exposed] [or] [concealed] fasteners. Length of panels shall be sufficient to cover the entire height of any unbroken wall surface when length of run is 9150 mm 30 feet or less. When length of run exceeds 9150 mm 30 feet, each sheet in the run shall extend over two or more spans. Sheets longer than 9150 mm 30 feet may be furnished if approved 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.

2.1.1 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 or AZ 55 metallic coating is allowed for factory-color-finished. Az 55 metallic coating is required 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. Wall 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 load 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.

2.1.2 Aluminum Panels

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

Alloy 3003 or 3004 conforming to **ASTM B 209**, 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 load requirements.

2.1.3 Factory Insulated Panels

NOTE: Where factory insulated panels are required, include this paragraph in conjunction with the previous paragraphs properly edited as required for the design.

Select flame spread rating of 25 and smoke developed rating of 50 for Class A interior finish as defined in NFPA 101, and select 75/100 for Class B interior finish. Determine the required insulated wall panel thickness or the required R-value of the assembled panel, and specify. Do not specify or indicate R-value and thickness as conflicts may occur.

R-value shall be determined at 25 degrees C (75 degrees F) in accordance with ASTM C 236.

Insulated wall panels shall be factory-fabricated units with insulating core between metal face sheets, securely fastened together and uniformly separated with rigid spacers; facing of [steel] [aluminum] of composition and gauge specified for wall panels; and constructed to eliminate condensation on interior of the panel. [Panels shall be [] mm () inches) thick.] Panels shall have a [factory-applied color] [mill] finish. Insulation shall [provide an R-value of []]; be compatible with adjoining materials; nonrunning and nonsettling; capable of retaining its R-value for the life of the metal facing sheets; and unaffected by extremes of temperature and humidity. The assembly shall have a flame spread rating not higher than [25] [75], and smoke developed rating not higher than [50] [100] when tested in accordance with **ASTM E 84**. The insulation shall remain odorless, free from mold, and not become a source of food and shelter for insects. Panels shall be not less than 200 mm 8 inches wide and shall be in one piece for unbroken wall heights.

[2.1.4 Liner Panels

NOTE: Include this paragraph where interior liner panels are required. Insert the applicable specification section number for the insulation specification.

Formed of same material as wall panels with 25 mm (1 mil) minimum finish coat on the exposed face and a prime coat on the liner side. [Provide types of insulation, as appropriate, as specified in Section [].]

]2.2 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.

Wall panels are available in several standard colors. Custom color options shall only be specified with Government approval. Where accent colors are required, specify accordingly. Except where interior surfaces receive a factory color coat, the exposed reverse side of the panels normally are provided with an off-white backer coating.

The choice of coating for the interior face of panels depends on environmental and aesthetic considerations. Where a corrosive atmosphere is anticipated within the structure, the finish should be PVF2 in a thickness appropriate to the environment. For utilitarian facilities with little likelihood of a detrimental atmosphere, a standard backer coat is appropriate. Backer coat is the manufacturer's standard coating (usually polyester based) applied to the back side of the metal panel. This coating is normally a wash coating and is not controlled for consistent color or gloss. Where interior surfaces are concealed behind insulation, liner panels, etc., provide only a primer coat. These finishes should not be confused with a wash coat which is used primarily to facilitate the coil forming process and which is not closely controlled for color, gloss or film thickness. The designer's rationale for using any special interior finish should be reflected in the design analysis.

Energy considerations must be included in the choice of standard colors for the wall panels. White or light-colored siding surfaces are much better at reflecting sunlight than darker surfaces, transferring less heat to internal building spaces. Coordinate the use of light-colored siding material with the user.

Panels shall have a factory applied [70 percent polyvinylidene fluoride (PVDF2)] [polyvinylidene fluoride (PVDF)] [_____] finish on the exposed side. The exterior finish shall consist of a baked-on finish coat with an appropriate prime coat. 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.] The exterior coating shall be a nominal [1] [2] mil thickness consisting of a topcoat of not less than 0.02 mm (0.75 mil) [_____] dry film thickness and the paint manufacturer's

recommended primer of not less than [0.005 mm (0.2 mil)][_____] thickness. [Provide manufacturer's standard factory-applied clear coat system over color finish coat on the exterior side.] The interior color finish shall consist of [the same coating and dry film thickness as the exterior] [a nominal 1 mil thick [PVDF2] [PVDF] [_____] finish otherwise the same as the exterior] [a backer coat with a dry film thickness of 0.5 mil] [a 0.2 mil thick prime coat]. 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 Salt Spray 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.

2.2.2 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.

2.2.3 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.

Coating sample shall withstand weathering test of 5000 hours, in accordance with ASTM D 4587 and ASTM G 154, Type D using 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. 200 mm 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.]

2.2.4 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.

2.2.5 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 loss of adhesion.

2.2.6 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.

2.3 ACCESSORIES

Flashing, trim, metal closure strips, caps, and similar metal accessories shall be the manufacturer's standard products. Exposed metal accessories shall be finished to match the panels furnished. Molded closure strips shall be bituminous-saturated fiber, closed-cell or solid-cell synthetic rubber or neoprene, or polyvinyl chlorided premolded to match configuration of the panels and shall not absorb or retain water.

2.4 FASTENERS

NOTE: Fasteners that are not color coated may be limited to 300-series corrosion resisting steel when justified by atmospheric exposure conditions.

Fasteners for steel panels shall be zinc-coated steel, aluminum, corrosion resisting steel, or nylon capped steel, type and size specified below or as otherwise approved for the applicable requirements. Fasteners for aluminum panels shall be aluminum or corrosion resisting steel. Fasteners for attaching wall panels to supports shall provide both tensile and shear strength of not less than 340 kg 750 pounds per fastener. Fasteners for accessories shall be the manufacturer's standard. Exposed wall fasteners shall be color finished or provided with plastic color caps to match the panels. Nonpenetrating fastener system for wall panels using concealed clips shall be manufacturer's standard for the system provided.

2.4.1 Screws

Screws shall be as recommended by the manufacturer.

2.4.2 End-Welded Studs

Automatic end-welded studs shall be shouldered type with a shank diameter of not less than 3/16 inch and cap or nut for holding panels against the shoulder.

2.4.3 Explosive Actuated Fasteners

Fasteners for use with explosive actuated tools shall have a shank of not less than 0.145 inch with a shank length of not less than 1/2 inch for fastening panels to steel and not less than 1 inch for fastening panels to concrete.

2.4.4 Blind Rivets

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

2.4.5 Bolts

Bolts shall be not less than 6 mm 1/4 inch diameter, shouldered or plain shank as required, with proper nuts.

2.5 SEALANT

Sealant shall be an elastomeric type containing no oil or asphalt, as recommended by the wall panel manufacturer. Silicone based sealants are prohibited, unless approved otherwise by the 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 panel seams shall be provided in accordance with the manufacturer's recommendations.]

2.6 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.

2.7 INSULATION

NOTE: 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 wall panel system application specified, as approved by the metal panel manufacturer, and as specified in Section [____].

PART 3 EXECUTION

3.1 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 from each other by means of gaskets or insulating compounds. Improper or mislocated drill holes shall be plugged with an oversize screw fastener and gasketed washer; however, panels with an excess of such holes or with such holes in critical locations shall not be used. 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.

3.1.1 Wall Panels and Accessories

NOTE: If horizontal panel installation is specified, modify other specification parameters as appropriate.

When factory insulated panels are used, the terminology in this paragraph will be modified as necessary to cover their installation.

Wall panels shall be applied with the longitudinal configurations in the [vertical] [horizontal] position. Provide panels in [longest obtainable lengths, with end laps occurring only at girts and structural members] [full wall heights from base to eave with no horizontal joints except at junctions of door frames, window frames, louver panels, and similar locations]. Minimum end laps for panels shall be [50 mm (2 inches)] [100 mm (4 inches)] [150 mm (6 inches)] and shall occur only over girt and structural members. Side laps shall be standard overlap or interlocking ribs based on manufacturer's standard. Seal side and end laps with joint-sealing material. Flash wall panels at base and at top, around windows, door frames, framed louvers, and other similar openings. Place closures, flashing, and sealing materials to achieve complete water tightness. Flashing is not required where approved [interlocking, concealed-type side joints with concealed fasteners for wall panels] ["self-flashing" panels] are used. Accessories shall be fastened into

framing members, except as otherwise approved. Closure strips shall be provided as indicated and where necessary to provide weathertight construction.

3.1.1.1 Lap Type Panels with Exposed Fasteners

End laps shall be made over framing members with fasteners into framing members approximately [50 mm (2 inches)] from the end of the overlapping sheet. Side laps shall be laid away from the prevailing winds. Spacing of fasteners shall present an orderly appearance and shall not exceed: 200 mm (8 inches) on center at end laps of wall panels, 200 mm (8 inches) on center at connection of panels to intermediate supports, and 450 mm (18 inches) on center at side laps of panels except when otherwise recommended by the panel manufacturer and approved by the Contracting Officer. Side and end laps of wall panels and joints at accessories shall be sealed. Fasteners shall be installed in straight lines within a tolerance of 50 mm (1/2 inch) in the length of a bay. Fasteners shall be driven normal to the surface and to a uniform depth to seat the gasketed washers properly.

[3.1.1.2 Concealed Fastener Wall Panels

NOTE: Include this paragraph when concealed fastening is specified.

Panels shall be fastened to framing members with concealed fastening clips or other concealed devices standard with the manufacturer. Spacing of fastening clips and fasteners shall be in accordance with the manufacturer's written instructions. Spacing of fasteners and anchor clips along the panel interlocking ribs shall not exceed 300 mm (12 inches) on center except when otherwise recommended by the panel manufacturer and approved by the Contracting Officer. Fasteners shall not puncture metal sheets except as approved for flashing, closures, and trim; exposed fasteners shall be installed in straight lines. Interlocking ribs shall be sealed with factory-applied sealant. Joints at accessories shall be sealed.

]3.2 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 and filings. 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.]

3.3 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.

3.4 FIELD QUALITY CONTROL

3.4.1 Construction Monitoring

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.

Framing and substrates are in acceptable condition, in compliance with specification, prior to application of wall panels.

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.

-- End of Section --