
USACE / NAVFAC / AFCEA UFGS-13121 (October 2003)

Preparing Activity: USACE Superseding
UFGS-13121A (January 2002)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 25 June 2004

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SECTION 13121

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10/03

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SECTION 13121

METAL BUILDING SYSTEMS (MINOR REQUIREMENTS) 10/03

NOTE: This guide specification covers the requirements for small, simple, readily available commercial products designed in accordance with MBMA MBSM "(2002) Metal Building Systems Manual" with loads and load combinations in accordance with ASCE7. Examples are: pump houses, small storage buildings, guard house, small maintenance shops, etc.; more complex projects (those that use masonry, contain cranes, have other special design requirements, or contain high dollar value contents) should use UFGS-13120 PREENGINEERED METAL BUILDINGS.

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.

PART 1 GENERAL

1.1 REFERENCES

NOTE: Issue (date) of references included in project specifications need not be more current than provided by the latest guide specification. Use of SpecsIntact automated reference checking is recommended for projects based on older guide specifications.

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 (2000) Aluminum Design Manual

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 316 (1989) ASD Manual of Steel Construction

AISC 350 (1999) Load and Resistance Factor Design (LRFD) Specification for Structural Steel Buildings

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7 (2002) Minimum Design Loads for Buildings and Other Structures

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2002) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A 252 (1998; R 2002) Welded and Seamless Steel Pipe Piles

ASTM A 36/A 36M (2003a) Carbon Structural Steel

ASTM A 463/A 463M (2002a) Steel Sheet, Aluminum-Coated, by the Hot-Dip Process

ASTM A 500 (2003) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

ASTM A 501 (2001) Hot-Formed Welded and Seamless Carbon Steel Structural Tubing

ASTM A 529/A 529M (2003) High-Strength Carbon-Manganese Steel of Structural Quality

ASTM A 53/A 53M (2002) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A 570/A 570M (1998) Steel, Sheet and Strip, Carbon, Hot-Rolled

ASTM A 572/A 572M (2003a) High-Strength Low-Alloy Columbium-Vanadium Structural Steel

ASTM A 588/A 588M (2003) High-Strength Low-Alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point to 4 in. (100 mm) Thick

ASTM A 606	(2001) Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance
ASTM A 607	(1998) Steel, Sheet and Strip, High-Strength, Low-Alloy, Columbium or Vanadium, or Both, Hot-Rolled and Cold-Rolled
ASTM A 618	(2001) Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing
ASTM A 653/A 653M	(2003) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 792/A 792M	(2002) Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
ASTM B 209	(2002a) Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 209M	(2002a) Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
ASTM B 221	(2002) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B 221M	(2002) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)
ASTM B 241/B 241M	(2002) Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube
ASTM B 308/B 308M	(2002) Aluminum-Alloy 6061-T6 Standard Structural Profiles
ASTM B 429	(2002) Aluminum-Alloy Extruded Structural Pipe and Tube
ASTM C 1289	(2002) Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
ASTM C 518	(2002e1) Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
ASTM C 553	(2002) Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
ASTM C 578	(2003a) Rigid, Cellular Polystyrene Thermal Insulation
ASTM C 612	(2000a) Mineral Fiber Block and Board Thermal Insulation

ASTM C 991	(2000) Flexible Glass Fiber Insulation for Metal Buildings
ASTM D 2244	(2002e1) Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
ASTM D 4214	(1998) Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D 4397	(2002) Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
ASTM E 84	(2003) Surface Burning Characteristics of Building Materials
ASTM E 96	(2000e1) Water Vapor Transmission of Materials

METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)

MBMA MBSM	(2002) Metal Building Systems Manual
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SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA Arch. Manual	(2003, 6th Ed) Architectural Sheet Metal Manual
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STEEL DOOR INSTITUTE (SDI)

SDI 100	(1998) Standard Steel Doors and Frames
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U.S. ARMY CORPS OF ENGINEERS (USACE)

TI 809-04	(1998) Seismic Design for Buildings
TI 809-07	(1998) Design of Cold-Formed Load Bearing Steel Systems and Masonry Veneer/Steel Stud Walls

UNDERWRITERS LABORATORIES (UL)

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

NOTE: Submittals must be limited to those necessary for adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item should be required.

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 projects.

Submittal items not designated with a "G" are considered as being for information only for Army projects and for Contractor Quality Control approval for Navy 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 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Metal Building Systems

Detail drawings consisting of catalog cuts, design and erection drawings.

SD-03 Product Data

Manufacturer's Instructions

Manufacturer's literature for individual building component systems.

Qualifications

Qualifications of the manufacturer, and qualifications and experience of the building erector. A brief list of locations where buildings of similar design have been used shall be included with the detail drawings and shall also include information regarding date of completion, name and address of owner, and how the structure is used.

SD-07 Certificates

Metal Building Systems

a. A Certificate from the metal building manufacturer stating that the metal building was designed in accordance with MBMA MBSM.

b. Mill certification for structural bolts, framing steel, roofing and siding, and steel wall liner panels.

c. Warranty certificate. At the completion of the project the Contractor shall furnish signed copies of the 5 year Warranty for Metal Building Roof System, a sample copy of which is attached to this section, the 20-year Manufacturer's Material Warranties, and the Manufacturer's 20-year System Weathertightness Warranty where one is required.

Insulation

Certificate attesting that the polyisocyanurate insulation furnished for the project contains recovered material, and showing an estimated percent of such recovered material.

1.3 GENERAL REQUIREMENTS

NOTE: The structural steel design must meet the requirements of OSHA Steel Erection Standard, 29 CFR Part 1926, Subpart R-Steel Erection, Effective Date January 18, 2002.

The metal building system covered under this specification shall be provided by a single manufacturer and shall include all components and assemblies that form a building. Structural Standing Seam Metal Roofing System, when specified, shall be furnished as part of a single manufacturer's system.

1.3.1 Building Configurations

Drawings will show roof slope in accordance with the guidance provided in TI 809-29 based on the type of roofing system specified. Drawings will show required width and length dimensions from inside face of wall covering; minimum inside clear dimensions; size, type, and number of windows, doors, louvers, ventilators, and skylight panels; hardware requirements, if not scheduled in the specifications, including requirements for door weather stripping and thresholds; and other information as required to supplement the specifications.

Roof slope shall be as shown on the drawings. Buildings shall be single-span structures with one of the following framing systems: self-framing or rigid frame. [Exterior doors] [windows] [overhead doors] [louvers] and [_____] shall be included in the metal building system. Building shall be a manufacturer's advertised product, except that dimensions shall be not less than those indicated. The minimum inside clear dimensions shall be as shown on the drawings.

1.3.2 Qualifications

1.3.2.1 Manufacturer

Metal building shall be the product of a recognized steel building systems manufacturer who has been in the practice of manufacturing steel buildings for a period of not less than 5 years. The manufacturer shall be chiefly engaged in the practice of designing and fabricating metal building systems.

1.3.2.2 Installer

Erector shall have specialized experience in the erection of steel building systems for a period of at least 3 years. The erector shall furnish temporary guys and bracing where needed for squaring, plumbing, and securing the structural framing against loads acting on the exposed framing, such as wind loads and seismic forces, as well as loads due to erection equipment and erection operation. Structural members shall not be field cut or altered. Welds, abrasions, and surfaces not [shop primed] [galvanized] shall be primed after erection.

1.4 DESIGN REQUIREMENTS

NOTE: Metal buildings should be specified using
MBMA criteria except that loads and load
combinations will be in accordance with TI 809-01,
which refers to ASCE 7 for wind, live and snow loads
and TI 809-04 for earthquake loads.

Designer has the option to delete or replace the
referenced TI's with applicable criteria, here and
in other paragraphs.

Criteria and definitions for metal building systems shall be in accordance with MBMA MBSM, except criteria for seismic loads shall be in accordance with TI 809-04 and other loads and load combinations in accordance with ASCE 7.

1.4.1 Foundations

NOTE: The following paragraph is intended to be a
synopsis of the foundation report, and will be
supplemented with additional data as required. When
dealing with soil, a larger factor of safety is
used. Unlike steel and concrete, which are
manufactured, controlled, and tested to meet
prescribed standards, soils are natural materials.
Therefore it is common practice to apply a factor of
safety of at least 3.0 in soil engineering work.

Foundations shall be designed for an allowable soil bearing pressure of [_____] Pa, psf, a minimum bottom of footing depth of [_____] mm feet below finish floor elevation, a factor of safety of 1.5 for overturning, sliding and uplift, and a concrete compressive strength as specified in Section [03300A CAST-IN-PLACE STRUCTURAL CONCRETE] [03300N CAST-IN-PLACE CONCRETE].

1.4.2 Structural Members and Connections

Structural steel members and their connections shall be designed in accordance with AISC 316 or AISC 350. Structural cold-formed steel framing members and their connections shall be designed in accordance with TI 809-07.

Aluminum structural members and their connections shall be designed in accordance with AA ADM1. Framed openings shall be designed to structurally replace the covering and framing displaced.

1.4.3 Roofing and Siding Design

Steel or aluminum roofing and siding shall be designed in accordance with MBMA MBSM.

1.4.4 Gutters And Downspouts

Gutters and downspouts shall be designed according to the requirements of SMACNA Arch. Manual for storms which should be exceeded only once in 5 years, with adequate provision for thermal expansion and contraction.

1.4.5 Louvers

Louvers shall be [fixed-blade] [adjustable] type designed for a minimum net open area of [_____] square meters, square feet, to be rainproof, and to resist vibration when air is passed at the rate of [_____] cubic meters per second.cubic feet per minute.

1.4.6 Ventilators

1.4.6.1 Circular Ventilators

Circular roof ventilators shall be gravity [directional] [stationary] [revolving] type, [with] [without] dampers, designed for a minimum capacity of [_____] cubic meters of air per second cubic feet of air per minute for each ventilator, based on a wind velocity of 8 km per hour 5 miles per hour and an exterior-interior temperature differential of 6 degrees C 10 degrees F and without screens in place.

1.4.6.2 Continuous Ventilators

Continuous roof ventilators shall be ridge mounted gravity type, [with] [without] dampers, designed for a minimum capacity of [_____] cubic meters of air per second cubic feet of air per minute for each 3 m 10 foot section based on a wind velocity of 8 km per hour 5 miles per hour and an exterior-interior temperature differential of 6 degrees C 10 degrees F and without screens in place.

1.4.7 Grounding and Lightning Protection

Grounding and lightning protection shall be provided as specified in Section 13100A LIGHTNING PROTECTION SYSTEM.

1.5 DESIGN ANALYSIS

NOTE: Metal Building System manufacturers do not design foundations; foundation investigation and design may be performed by the Contractor. The

project design structural engineer must design and detail the foundations based on loads obtained for similar building types with the specified loading. The drawings should contain notes indicating that the foundations are provided for bid purposes only and that actual foundations, using similar details, will be provided by the Contractor using project specific geotechnical data.

The Contractor shall obtain the services of a licensed Professional Engineer to design the foundations. Seismic loads shall be computed in accordance with TI 809-04 SEISMIC DESIGN FOR BUILDINGS.

1.6 DELIVERY AND STORAGE

Materials shall be delivered to the site in a dry and undamaged condition and stored out of contact with the ground. Materials other than framing and structural members shall be covered with weathertight coverings and kept dry. Storage accommodations for roofing and siding shall provide good air circulation and protection from surface staining.

1.7 WARRANTIES

The Metal Building System (roofing, siding, and related components provided as part of the system) shall be warranted as described below against material and workmanship deficiencies, system deterioration caused by ordinary exposure to the elements and service design loads, leaks and wind uplift damage. Any emergency temporary repairs conducted by the owner shall not negate the warranties.

1.7.1 Prime Contractor's Weathertightness Warranty

The Metal Building System shall be warranted by the Contractor on a no penal sum basis for a period of five years against materials and workmanship deficiencies; system deterioration caused by exposure to the elements and/or inadequate resistance to specified service design loads, water leaks, and wind uplift damage. The Metal Building System covered under this warranty shall include, but is not limited to, the following: framing and structural members, roofing and siding panels and seams, interior or exterior gutters and downspouts, accessories, fasteners, trim, flashings and miscellaneous building closure items such as doors and windows (when furnished by the manufacturer), connectors, components, and fasteners, and other system components and assemblies installed to provide a weathertight system; and items specified in other sections of these specifications that become part of the metal building system. All material and workmanship deficiencies, system deterioration caused by exposure to the elements and/or inadequate resistance to specified service design loads, water leaks and wind uplift damage shall be repaired as approved by the Contracting Officer. See the attached Contractor's written warranty for issue resolution of warrantable defects. This warranty shall warrant and cover the entire cost of repair or replacement, including all material, labor, and related markups. The Contractor shall supplement this warranty with written warranties from the installer and/or system manufacturer, which shall be submitted along with Contractor's warranty. However, the Contractor is ultimately responsible for this warranty. The Contractor's written warranty shall be as outlined in attached **WARRANTY FOR METAL BUILDING SYSTEMS**, and start upon final acceptance of the facility. The Contractor shall provide a separate bond in an amount equal to the

installed total metal building system cost in favor of the owner (Government) covering the Contractor's warranty responsibilities effective throughout the five year Contractor's warranty period for the entire metal building system as outlined above.

1.7.2 Manufacturer's Materials and System Weathertightness Warranties

The Contractor shall furnish, in writing, the following manufacturer's material warranties to the Contracting Officer which cover all Metal Building System components:

a. A manufacturer's 20 year material warranty warranting that the specified aluminum, zinc-coated steel, aluminum-zinc alloy coated steel or aluminum-coated steel will not rupture, structurally fail, fracture, deteriorate, or become perforated under normal design atmospheric conditions and service design loads. Liability under this warranty shall be limited exclusively to the cost of either repairing or replacing nonconforming, ruptured, perforated, or structurally failed securement system, including fasteners and coil material.

b. A manufacturer's 20 year exterior material finish warranty on the factory colored finish warranting that the finish, under normal atmospheric conditions at the site, will not crack, peel, or delaminate; chalk in excess of a numerical rating of eight, as determined by ASTM D 4214 test procedures; or change colors in excess of five CIE or Hunter Lab color difference (delta E) units in accordance with ASTM D 2244. Liability under this warranty is exclusively limited to replacing the defective coated material.

PART 2 PRODUCTS

2.1 FRAMING AND STRUCTURAL MEMBERS

Steel 3 mm 1/8 inch or more in thickness shall conform to ASTM A 36/A 36M, ASTM A 529/A 529M, ASTM A 572/A 572M, or ASTM A 588/A 588M. Uncoated steel less than 3 mm 1/8 inch in thickness shall conform to ASTM A 570/A 570M, ASTM A 606, or ASTM A 607. Galvanized steel shall conform to ASTM A 653/A 653M, G 90 coating designation, 1.143 mm 0.045 inch minimum thickness. Aluminum-zinc coated steel shall conform to ASTM A 792/A 792M, [AZ 55] [AZ50] coating designation, 1.143 mm 0.045 inch minimum thickness. Aluminum sheet shall conform to ASTM B 209M ASTM B 209; 0.813 mm (0.032 inch) 0.032 inch minimum thickness. Aluminum structural shapes and tubes shall conform to ASTM B 221M ASTM B 221, or ASTM B 308/B 308M. Structural pipe shall conform to ASTM A 53/A 53M, ASTM A 252, ASTM A 500, ASTM A 501, ASTM A 618, ASTM B 221M ASTM B 221, ASTM B 241/B 241M or ASTM B 429. Holes for structural connections shall be made in the shop.

2.2 ROOFING AND SIDING

Roofing and siding shall be either steel or aluminum and shall have a [factory color] [mill] finish.

2.2.1 Roofing

Length of sheets shall be sufficient to cover the entire length of any unbroken roof slope unless otherwise approved. Width of sheets with [overlapping configurations shall provide not less than 610 mm (24 inches of coverage in place) [interlocking ribs shall provide not less than 305 mm 12 inches of coverage in place]. Panel shall have configurations for

overlapping sheets. Roof deck assemblies shall be Class 90 as defined in UL 580. Height of corrugation at overlap of adjacent roof sheets shall be the building manufacturer's standard.

2.2.2 Siding

Length of sheet shall be sufficient to cover the entire height of any unbroken height of wall surface unless otherwise approved. Width of sheets with [overlapping configurations shall provide not less than 610 mm 24 inches of coverage in place] [interlocking ribs shall provide not less than 305 mm)12 inches of coverage in place]. Siding shall have [configurations for overlapping adjacent sheets] [or] [interlocking ribs for securing adjacent sheets]. Siding shall be fastened to framework using [exposed] [or] [concealed] fasteners.

2.2.3 Steel Panels

Roofing and Siding shall be zinc-coated steel conforming to ASTM A 653/A 653M, G 90 coating designation; 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 T2E5. Panels shall be 0.610 mm 0.024 inch thick minimum.

2.2.4 Aluminum Panels

Roofing and Siding shall be aluminum alloy conforming to ASTM B 209M ASTM B 209, temper as required for the forming operation, minimum 0.813 mm 0.032 inch thick.

2.2.5 Factory Insulated Panels

NOTE: Factory insulated panels shall only be used to meet portability requirements or other operational requirements. This paragraph will be used in conjunction with the previous paragraphs properly edited as required for the design.

Select flame spread rating of 25 and smoke developed rating of 450 for Class A interior finish as defined in NFPA 101, and select 75/450 for Class B interior finish.

The designer will determine the required R-value of the assembled panel at 24 degrees C (75 degrees F) in accordance with ASTM C 236, and will show the R-value at the appropriate detail on the drawing.

Insulated [wall] [wall and roof] 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 or aluminum of composition and gauge specified for covering, constructed in a manner that will eliminate condensation on interior of panel. Panels shall have a [factory color] [mill] finish. Insulation shall 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 450

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.

2.2.6 Factory Color Finish

Wall and roof panels shall have a factory applied [polyvinylidene fluoride] [_____] finish on the exposed side. The exterior finish shall consist of a baked-on topcoat with an appropriate prime coat. Color shall match the color indicated on the drawings. The exterior coating shall be a nominal 0.025 mm 1 mil thickness consisting of a topcoat of not less than 0.018 mm 0.7 mil dry film thickness and the paint manufacturer's recommended primer of not less than 0.005 mm 0.2 mil thickness. The interior finish shall consist of the manufacturer's recommended thickness primer coating.

2.2.7 Accessories

Flashing, trim, metal closure strips and curbs, fascia, caps, diverters, and similar metal accessories shall be the manufacturer's standard products. Exposed metal accessories shall be finished to match the building finish. Molded closure strips shall be bituminous-saturated fiber, closed-cell or solid-cell synthetic rubber or neoprene, or polyvinyl chloride premolded to match configuration of the roofing or siding and shall not absorb or retain water.

2.3 WALL LINERS

NOTE: Height of wall liners will be shown on drawings.

Wall liners shall be 0.6 mm 0.024 inch thick minimum for aluminum or 0.45 mm 0.018 inch thick minimum for steel. Matching metal trim shall be provided [at base of wall liner,] [at top of wall liner,] [around openings in walls] [and over interior and exterior corners]. Wall liners shall have [the same factory color finish as specified for the exterior face of the wall panels.] [manufacturer's standard finishes.] Colors shall be [selected from manufacturer's standard finishes] [as indicated].

2.4 FASTENERS

Fasteners shall be as recommended by the manufacturer to meet the design strength requirements.

2.5 WINDOWS

Windows shall be as recommended by the manufacturer; windows shall be indicated on the drawings.

2.6 DOORS

NOTE: Select door types for commercially framed openings. Delete unused door types, and renumber paragraphs as appropriate. Referenced door specification sections will be made a part of the project specifications and coordinated.

2.6.1 Hinged Doors

Hinged doors and frames shall receive a galvanic coating and factory primer and shall conform to [SDI 100, Type, Grade and size as indicated] [the requirements of Section 08110 STEEL DOORS AND FRAMES]. Exterior doors shall have top edges closed flush and sealed against water penetration. Hardware shall be [as scheduled [herein] [on the drawings]] [as specified in Section 08710 DOOR HARDWARE].

2.6.2 Sliding Doors

Sliding doors shall be of the metal framed or self-framing metal type. Covering shall be of same material and finish as the siding, except that heavier gauge material shall be used if required to provide rigidity. All hardware necessary for the complete installation of the doors shall be furnished. Accessories shall include galvanized steel track, brackets, permanently lubricated dual wheel trolley hangers, operating handle, slide bolt latch assembly permitting padlocking from either inside or outside of building, and rubber or elastomeric weather stripping.

2.6.3 Overhead Rolling Doors

Overhead rolling doors shall conform to the requirements of Section 08330 OVERHEAD ROLLING DOORS. Hardware shall be [as scheduled [herein] [on the drawings]] [as specified in Section 08710 DOOR HARDWARE].

2.6.4 Sectional Overhead Doors

Sectional overhead doors shall conform to the requirements of Section 08361 SECTIONAL OVERHEAD DOORS. Hardware shall be [as scheduled [herein] [on the drawings]] [as specified in Section 08710 DOOR HARDWARE].

2.6.5 Vertical Lift Doors

Vertical lift doors shall conform to the requirements of Section 08370 VERTICAL LIFT DOORS. Hardware shall be [as scheduled [herein] [on the drawings]] [as specified in Section 08710 DOOR HARDWARE].

2.7 INSULATION

NOTE: Flame spread and smoke development ratings of insulation, to include facing, must comply with the requirements of MIL HDBK 1008C. Exposed insulation must be faced, mineral fiber type, only; cellular plastic insulation will not be exposed.

If prefabricated insulated sandwich panels are used for siding and roofing, delete this paragraph in its entirety.

Thermal resistance of insulation shall be not less than the R-values shown on the contract drawings. R-values shall be determined at a mean temperature of 24 degrees C 75 degrees F in accordance with ASTM C 518. [Roof] [Roof and wall] insulation shall be a standard product with the insulation manufacturer, factory marked or identified with insulation

manufacturer's name or trademark and R-value. [Insulation] [Insulation including facings] shall have a flame spread not in excess of [_____] and a smoke developed rating not in excess of [_____] when tested in accordance with ASTM E 84. Contractor shall comply with EPA requirements in accordance with Section 01670 RECYCLED / RECOVERED MATERIALS.

2.7.1 Rigid Board Insulation

2.7.1.1 Polyisocyanurate

NOTE: Detailed information concerning EPA requirements on recycled/recovered materials is available at the following URL's:
<http://www.epa.gov/cpg/products/> and then click on the appropriate item from the list (building.htm for building insulation, for example).
<http://www.epa.gov/cpg/products.htm> (similar results).
<http://www.epa.gov/cpg/pdf/back.pdf> which opens up EPA530-R-98-003 (dated July, 1998, titled BACKGROUND DOCUMENT FOR PROPOSED CPG III AND DRAFT RMAN III).

Using data from listed locations, fill in blank space for required percentage of recycled or recovered material. This is in accordance with the requirements of 40 CFR 247 and Section 1670 which should be included in all projects.

Polyisocyanurate insulation shall conform to ASTM C 1289, Type I, Class 2 (having a minimum recovered material content of [_____] percent by weight of core material in the polyisocyanurate portion). For impermeable faced polyisocyanurate (Ex: aluminum foil) the maximum design R-value per 25 mm 1 inch of insulation used shall be 1.27.7.2.

2.7.1.2 Polystyrene

Insulation shall conform to ASTM C 578, Type IV

2.7.1.3 Blanket Insulation

Blanket insulation shall conform to [ASTM C 991] [ASTM C 553].

2.7.1.4 Mineral Fiber

Insulation shall conform to ASTM C 612.

2.7.2 Insulation Retainers

Retainers shall be type, size and design necessary to adequately hold the insulation and to provide a neat appearance. Metallic retaining members shall be nonferrous or have a nonferrous coating. Nonmetallic retaining members, including adhesives used in conjunction with mechanical retainers or at insulation seams, shall have a fire resistance classification not less than that permitted for the insulation.

2.8 SEALANT

Sealant shall be an elastomeric type containing no oil or asphalt. Exposed sealant shall be [colored to match the applicable building color] [clear] and shall cure to a rubber like consistency.

2.9 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.

2.10 VAPOR RETARDER

NOTE: The term vapor retarder has been selected to describe the membrane used to reduce moisture vapor transmission. The location of the vapor retarder is determined by the climate and the building type.

The vapor retarder goes on the side of the insulation with the greatest vapor pressure during the course of the year; therefore it goes on the outside in a climate predominately warm, and on the inside in a climate predominately cool. The designer should determine the most appropriate application/installation of the vapor retarder based on project circumstances. See TM 5-810-1 for humid climate definition.

Detail the use of insulation on the drawings.
Coordinate with Sections 07412 NON-STRUCTURAL METAL ROOFING and 07416 STRUCTURAL STANDING SEAM METAL ROOF (SSSMR) SYSTEM for vapor retarder requirements.

2.10.1 Vapor Retarders as Integral Facing

Insulation facing shall have a permeability of [1.15] [_____] ng per Pa-second-square meter [0.02] [_____] perm or less when tested in accordance with ASTM E 96. Facing shall be [white] [black] reinforced polypropylene kraft laminate (PSK). Facings and finishes shall be factory applied.

2.10.2 Vapor Retarders Separate from Insulation

Vapor retarder material shall be polyethylene sheeting conforming to the requirements of ASTM D 4397. A single ply of 0.25 mm 10 mil polyethylene sheet; or, at the option of the Contractor, a double ply of 0.15 mm 6 mil polyethylene sheet shall be used. A fully compatible polyethylene tape shall be provided which has equal or better water vapor control characteristics than the vapor retarder material. A cloth industrial duct tape in a utility grade shall also be provided to use as needed to protect the vapor retarder from puncturing.

2.11 SHOP PRIMING

Ferrous surfaces shall be cleaned of oil, grease, loose rust, loose mill scale, and other foreign substances and shop primed. Primer coating shall

be in accordance with the manufacturer's standard system.

PART 3 EXECUTION

3.1 ERECTION

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 in panels 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 shall be kept clean and free from sealant, metal cuttings, excess material from thermal cutting, and other foreign materials. Exposed surfaces which have been thermally cut shall be finished smooth within a tolerance of 3 mm.1/8 inch. Stained, discolored or damaged sheets shall be removed from the site. Welding of steel shall conform to AWS D1.1/D1.1M; welding of aluminum shall conform to AA ADM1.

3.1.1 Framing Members and Anchor Bolts

Onsite flame cutting of framing members, with the exception of small access holes in structural beam or column webs, will not be permitted. Concrete work is specified in Section [03300A CAST-IN-PLACE STRUCTURAL CONCRETE] [03300N CAST-IN-PLACE CONCRETE]. Anchor bolts shall be accurately set by template while the concrete is in a plastic state. Members shall be accurately spaced to assure proper fitting of panels. As erection progresses, the work shall be securely fastened to resist the dead load and wind and erection stresses.

3.1.2 Roofing and Siding Installation

NOTE: When factory insulated panels are used, this paragraph will be modified as necessary to cover their installation.

Siding shall be applied with the longitudinal configurations in the vertical position. Roofing shall be applied with the longitudinal configurations in the direction of the roof slope. Accessories shall be fastened into framing members, except as otherwise approved. Closure strips shall be provided where necessary to provide weathertight construction. Fastener and fastener spacing shall be in accordance with manufacture design.

3.1.3 Installation of Gutters and Downspouts

Gutters and downspouts shall be rigidly attached to the building. Spacing of cleats for gutters shall be 400 mm 16 inches maximum. Spacing of brackets and spacers for gutters shall be 1 m 36 inches maximum. Supports for downspouts shall be spaced according to manufacturer's recommendations.

3.1.4 Louvers and Ventilators

Louvers and ventilators shall be rigidly attached to the supporting construction to assure a weather tight installation.

3.1.5 Doors and Windows

Doors and windows, including frames and hardware, shall be securely anchored to the supporting construction, shall be installed plumb and true, and shall be adjusted as necessary to provide proper operation. Joints at doors and windows shall be sealed according to manufacturer's recommendations to provide weathertight construction.

3.1.6 Insulation Installation

**NOTE: If factory insulated panels are used for
roofing and siding, delete this paragraph in its
entirety.**

Insulation shall be installed as indicated and in accordance with manufacturer's instructions.

3.1.6.1 Board Insulation with Blanket Insulation

Rigid or semirigid board insulation shall be laid in close contact. If more than one layer of insulation is required, joints in the second layer shall be offset from joints in the first layer.

3.1.6.2 Blanket Insulation

Blanket insulation shall be installed over the purlins and held tight against the metal roofing. It shall be supported by an integral facing or other commercially available support system.

3.1.7 Vapor Retarder Installation

NOTE: Choose one paragraph and delete the other.

3.1.7.1 Integral Facing on Blanket Insulation

Integral facing on blanket insulation shall have the facing lapped and sealed with a compatible tape to provide a vapor tight membrane.

3.1.7.2 Polyethylene Vapor Retarder

The polyethylene vapor retarder membrane shall be installed over the entire surface. A fully compatible polyethylene tape shall be used to seal the edges of the sheets to provide a vapor tight membrane. Sheet edges shall be lapped not less than 150 mm 6 inches. Sufficient material shall be provided to avoid inducing stresses in the sheets due to stretching or binding. All tears or punctures that are visible in the finished surface, at any time during the construction process, shall be sealed with polyethylene tape.

3.1.8 Wall Liner

Wall liner shall be securely fastened into place in accordance with the manufacturer's recommendation and in a manner to present a neat appearance.

3.2 SPECIAL INSPECTION AND TESTING FOR SEISMIC-RESISTING SYSTEMS

NOTE: Include this paragraph only when special inspection and testing for seismic-resisting systems is required by paragraph 3.2 of FEMA 302, NEHRP RECOMMENDED PROVISIONS FOR SEISMIC REGULATIONS FOR NEW BUILDINGS AND OTHER STRUCTURES.

This paragraph will be applicable to both new buildings designed according to TI 809-4, SEISMIC DESIGN FOR BUILDINGS, and to existing building seismic rehabilitation designs done according to TI 809-05, SEISMIC EVALUATION AND REHABILITATION FOR BUILDINGS.

The designer must indicate on the drawings all locations and all features for which special inspection and testing is required in accordance with Chapter 3 of FEMA 302. This includes indicating the locations of all structural components and connections requiring inspection.

Add any additional requirements as necessary.

Special inspections and testing for seismic-resisting systems and components shall be done in accordance with Section 01452 SPECIAL INSPECTION FOR SEISMIC-RESISTING SYSTEMS.

3.3 FIELD PAINTING

NOTE: Field painting covers touch-up painting of previously painted surfaces and finish painting of steel doors and steel windows. Additional requirements will be added as necessary to cover finish painting of wood doors and other items requiring a field applied paint finish. When required, field color finish will be specified in accordance with Section 09900 PAINTING, GENERAL.

Immediately upon detection, abraded or corroded spots on shop-painted surfaces shall be wire brushed and touched up with the same material used for the shop coat. Shop-primed ferrous surfaces exposed on the outside of the building and all shop-primed surfaces of doors and windows shall be painted with two coats of an approved exterior enamel. Factory color finished surfaces shall be touched up as necessary with the manufacturer's recommended touch-up paint.

CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY
FOR
METAL BUILDING 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
METAL BUILDING SYSTEM
(continued)

THE METAL BUILDING SYSTEM INSTALLED ON THE ABOVE NAMED BUILDING IS WARRANTED BY [] FOR A PERIOD OF FIVE (5) YEARS AGAINST WORKMANSHIP AND MATERIAL DEFICIENCIES, WIND DAMAGE AND STRUCTURAL FAILURE WITHIN PROJECT SPECIFIED DESIGN LOADS, AND LEAKAGE. THE METAL BUILDING SYSTEM COVERED UNDER THIS WARRANTY SHALL INCLUDE, BUT IS NOT LIMITED TO, THE FOLLOWING: FRAMING AND STRUCTURAL MEMBERS, ROOFING AND SIDING PANELS AND SEAMS, INTERIOR OR EXTERIOR GUTTERS AND DOWNSPOUTS, ACCESSORIES, TRIM, FLASHINGS AND MISCELLANEOUS BUILDING CLOSURE ITEMS SUCH AS DOORS AND WINDOWS (WHEN FURNISHED BY THE MANUFACTURER), CONNECTORS, COMPONENTS, AND FASTENERS, AND OTHER SYSTEM COMPONENTS AND ASSEMBLIES INSTALLED TO PROVIDE A WEATHERTIGHT SYSTEM; AND ITEMS SPECIFIED IN OTHER SECTIONS OF THESE SPECIFICATIONS THAT BECOME PART OF THE METAL BUILDING SYSTEM. ALL MATERIAL AND WORKMANSHIP DEFICIENCIES, SYSTEM DETERIORATION CAUSED BY EXPOSURE TO THE ELEMENTS AND/OR INADEQUATE RESISTANCE TO SPECIFIED SERVICE DESIGN LOADS, WATER LEAKS AND WIND UPLIFT DAMAGE SHALL BE REPAIRED AS APPROVED BY THE CONTRACTING OFFICER.

ALL MATERIAL DEFICIENCIES, WIND DAMAGE, STRUCTURAL FAILURE AND LEAKAGE ASSOCIATED WITH THE METAL BUILDING 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
METAL BUILDING SYSTEM
(continued)

THE CONTRACTOR SHALL SUPPLEMENT THIS WARRANTY WITH WRITTEN WARRANTIES FROM THE MANUFACTURER AND/OR INSTALLER OF THE METAL BUILDING 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.

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 BUILDING SYSTEM DUE TO ACTIONS BY THE OWNER WHICH INHIBIT FREE DRAINAGE FROM THE ROOF, GUTTERS AND DOWNSPOUTS; OR CONDITIONS WHICH CREATE PONDING WATER ON THE ROOF OR AGAINST THE BUILDING SIDING.
6. THIS WARRANTY APPLIES TO THE METAL BUILDING 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. REPORTS OF LEAKS AND BUILDING 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 SSSMR SYSTEM WITHIN SEVEN 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

CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY
FOR
METAL BUILDING SYSTEM
(Exclusions from Coverage Continued)

IN THE CONTRACT AND AS CONTAINED HEREIN, THE CONTRACTING OFFICER MAY HAVE THE METAL BUILDING SYSTEM REPLACED OR REPAIRED 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 10 DAYS JOINTLY REQUEST A LIST OF FIVE (5) ARBITRATORS FROM THE FEDERAL MEDIATION AND CONCILIATION SERVICE. THE PARTIES SHALL CONFER WITHIN 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 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 --