

Re: Metal Buildings

Dear Sir or Madam:

Ken Blair of Steel Buildings by Design, LLC in Council Bluffs, IA is interested in bidding a Star Building on the above referenced project and respectfully requests that Star Building Systems be considered as an approved manufacturer on this project and all future projects utilizing metal buildings.

Star Building Systems is a leading manufacturer of pre-engineered metal buildings. For over 90 years, Star has maintained the highest reputation of quality and customer service. Star has manufactured more than 300,000 metal buildings and currently produces approximately 4000 buildings annually.

Star is an integrated part of the NCI Group. NCI is one of the largest manufacturers and marketers of metal coil coating solutions, metal components, and custom metal building systems. As an NCI company, we share manufacturing facilities with other NCI brands, including Ceco Building Systems, who is approved. Star's product manufactures and ships from the same facilities as Ceco.

Star's products are approved by various code bodies and include certifications from UL, Factory Mutual, US Army Corp of Engineers, the International Accreditation Service (IAS) and others. Star's in-house engineering department is staffed by the industry's foremost engineers and is licensed in all 50 States. Our buildings are used by most Fortune Five Hundred companies and most agencies of the federal government.

You can learn more about us on our website at [www.starbuildings.com](http://www.starbuildings.com). If I can be of any assistance, please don't hesitate to call me at 1-800-879-7827.

Sincerely,



Jeffrey L. Koos  
Manager-Star Brand and Marketing

Building a Lasting *Impression*



**STAR**<sup>TM</sup>  
BUILDING SYSTEMS®  
AN NCI COMPANY

**PLANNING GUIDE**





## Welcome to Star

At Star Building Systems, we design building solutions that last the test of time. If you're planning a building project and you want security, both in the integrity of your structure and in your supplier, then Star Building Systems should be your first call. At Star, you're not given parameters. You're given a comprehensive list of options to meet your building needs, regardless of end use. Schools. Factories. Retail Centers. Warehouses. Star Building Systems does it all. Our state-of-the-art metal construction solutions help ensure your building's longevity.

Star knows firsthand about the importance of longevity. Founded in 1927, Star Building Systems has seen and done it all, from supplying tool sheds for oil derrick drilling sites in the early oil boom days to air hangars during World War II. The key to Star's longevity? Changing with the times and trends and evolving to better serve the construction project at hand.

As a technological leader in the industry, Star sets the standard for innovation. Because of this, a Star building will go the distance. A Star building can be a green building. A Star building can be a beautiful building. A Star building can be your building.

As you read through the Star Planning Guide, consider the longevity and magnitude of Star Building Systems, itself. With nearly a century of experience and over 300,000 satisfied customers, Star Building Systems has more than withstood the test of time. So can your building.

## The Power of Star

Star Building Systems is an international provider of quality, long lasting metal building systems and metal building components. Looking for longer overall life spans? New or additional roofing solutions? Star has you covered. Our construction capabilities allow you to design and build structures that are multi-functional and multi-faceted. Our vast product lines give you the freedom to create a building that is attractive and cost effective. Star works with you, the architect, the contractor, the builder, the owner, to meet budgetary needs and make room for expansion possibilities later on. Waste reduction practices utilized in the design phase ensure financial value.



Star products are inspected frequently throughout the manufacturing process ensuring your receipt of a top quality and dependable system. Star's national manufacturing facilities function at maximum operating efficiency, promising you timely delivery.

Working with Star is easy. Easy and fast. That's because Star and your Star Builder are there from start to finish. As your business grows, Star grows with you, offering expansion and upgrade opportunities along the way. The benefits of building with Star Steel are numerous and far from limited:

- Building with metal allows for faster construction times, saving time and money.
- Metal construction offers more design flexibility and versatility when compared against more traditional materials like wood or concrete.
- Star metal buildings and products require less long term maintenance.
- Star offers a long line of green solutions that are environmentally and economically friendly.
- Star products are available in multiple colors, finishes and silhouettes for additional design options.
- Star metal construction products can be used in conjunction with other, more traditional building materials.



# The Star Builder Network

Star is proud to partner with hundreds of Builders that sell Star Building Systems to a variety of end users. Star and Star Builders work together as a team to provide you with the very best solution for your building needs. Star Builders are some of the most qualified, reputable builders in the industry who understand local building codes and permitting requirements. They're full service contractors offering expertise from concept to completion, delivering your project on time and on budget.



## Products



**Long Bay®** – Star Building Systems offers a proven solution for your large-scale project requirements. The patented Long Bay® System (LBS) is custom-engineered to accommodate structures requiring expanded areas of open floor space. The Long Bay System does so without prohibiting architectural design opportunities.

Star's LBS is ideal for any building requiring few interior columns: manufacturing facilities, warehouses, retail buildings and recreational buildings. Open web truss sub-framing provides roof support and simplifies the installation of mechanical and electrical systems.

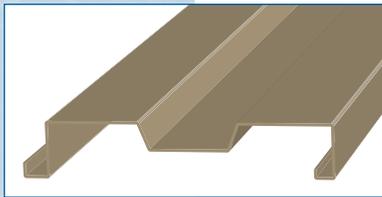
The Long Bay System has proven overall in-place construction cost savings from reduced foundation costs, ease of erection and predictable deliveries. Compatibility with multiple wall and roofing systems gives you increased flexibility in construction design.

## Long Bay® features:

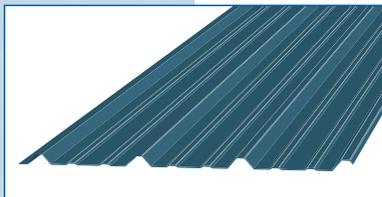
- Offered in bays up to 70'
- Superior strength-to-weight ratios
- Less bridging required than with traditional bar-joist installations
- Greater design flexibility – can be used with hard wall and metal cladding applications
- Machine rolled for accuracy and tighter tolerances
- Entire system erected without welding, all connections are bolted or screwed
- Long Bay® Systems have proven erection cost savings over other types of joist construction

# Roof and Wall Systems

A Star building is more than structurally sound. A Star building is beautiful, eye-catching, attractive. This is due in part to our wide selection of superior-quality roof and wall panels, all of which are available in a variety of colors, coats and applied finishes. Regardless of your project application, Star has the products to get the job done, from simple screw-down panels to state-of-the-art standing seam roof panels. Take a look.



**ShadowRib™ Wall Panel** – ShadowRib™ is a concealed fastener wall system that provides performance and compatibility. Clean, contemporary looks are achieved by the 1 ½" deep sculptured profile, embossed texture, and interior attachment. Available in 24 gauge steel and formed into 16" wide, 3" deep sections.



**PBR Roof and Wall Panels** – PBR is a 36" wide panel that works well for roof and wall, as well as liner, mansard and soffit panel applications. Its 1 ¼" deep ribs create an even-shadowed appearance and the area between the ribs is reinforced with minor ribs. The attachment of the panel is made from the exterior with color matched fasteners. Available in 26 and 24 gauge.

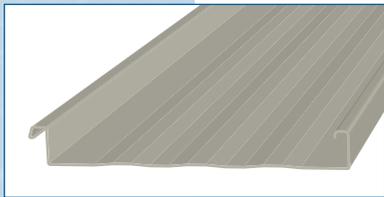


**AVP Wall Panel** – AVP is a 36" wide panel with semi-concealed fasteners. The panel profile produces a decorative shadow line resulting in a distinctive architectural effect. Ribs are 1 ⅛" deep and major corrugations are spaced 12" on center. The attachment of the panel is made from the exterior with color matched fasteners. Available in 26 and 24 gauge.

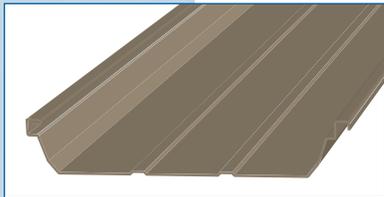




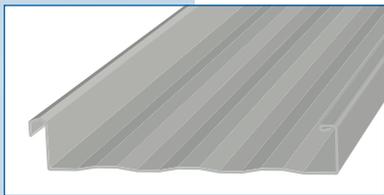
## Standing Seam Roof Systems



**BattenLok® HS Roof Panel** – BattenLok HS is a 16" wide, 24 gauge mechanically field-seamed, high strength standing seam roof system capable of transitioning from roof to fascia applications. BattenLok HS has a 2" tall vertical seam and can be installed directly over purlins or bar joists. BattenLok HS does not require a solid substructure for support. Recommended for roof slopes of ½:12 or greater. Also available in 12".



**Double-Lok® Roof Panel** – Double-Lok is a 24" standing seam panel attached to the subframing using a concealed fastening clip system that provides for thermal movement and minimal panel penetrations. The field-seamed panel can be used on all types of construction – masonry, metal or wood – for either new construction or retrofit. The 24 gauge panel provides ultimate weathertightness and wind uplift resistance. Recommended for roof slopes of ¼:12 or greater.



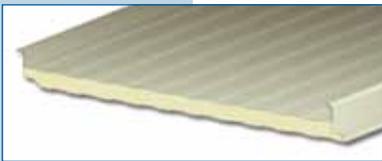
**SuperLok® Roof Panel** – The SuperLok standing seam panel blends the aesthetics of an architectural panel with the strength of a structural panel. The mechanically field-seamed system combines a 2" tall slim rib with exceptional uplift resistance to withstand the most rigorous weather conditions. The 16" wide panel can be installed directly over purlins or bar joists. Available in 24 gauge steel and recommended for roof slopes of ½:12 and greater. Also available in 12".



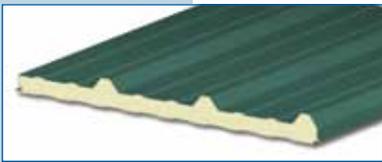
**Ultra-Dek® Roof Panel** – Ultra-Dek is a 24" wide snap-together, trapezoidal leg standing seam roof system. It is ideal for industrial, commercial and architectural applications. The standard offering for the Ultra-Dek system is a sliding clip that allows for thermal movement. Ultra-Dek panels can be installed on various types of construction. Recommended for roof slopes of ¼:12 or greater.

# Insulated Panel Systems

Insulated metal panels are the ideal solution for energy efficiency when it comes to roof and wall applications. They are strong and can be utilized with fewer structural supports than most single skin panels. This is due to their greater spanning and load bearing capabilities. Their incredible green attributes can be found in the *Green In Star* portion of the Star Planning Guide.



**CFR Roof Panel** – The CFR insulated metal standing seam roof panel has a Mesa profile for both the exterior and interior skins. The CFR roof panel has a 2" high standing seam and is attached to the structure with two-piece concealed clips. CFR offers a maximum R-value of 42.9.



**LS-36™ Roof & Wall Panel** – The versatility of the LS-36 insulated metal roof and wall panel offers a multitude of design options. The overlapping, through fastened joint allows for quick installation. The exterior profile features 1 ¼" high major ribs at 12" centers with Mesa in between ribs at 4" centers. The interior skin has a Mesa profile. LS-36 offers R-values to R-42.9.



**CF Mesa Wall Panel** – The Mesa panel is well suited for exterior wall and interior partition wall applications. The lightly corrugated Mesa profile on both faces of the panel ensures symmetry and uniform appearance from outside to inside and from room to room in partition applications. Mesa offers R-values of up to R-42.9.



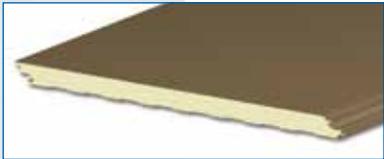
**CF Flute Wall Panel** – The ribbed profile of the CF Fluted wall panel provides bold vertical lines complimentary to almost any commercial or industrial building. Inverted ribs in the profile enhance the high-tech industrial look. The interior skin has a Mesa profile. The CF Fluted panel offers a maximum R-value of up to R-42.9.



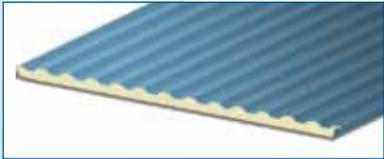
**CF Striated Wall Panel** – The Striated Wall Panel is an attractive and economical alternative to typical flat wall panels. The exterior face is lightly profiled with narrow longitudinal striations and exhibits a virtually flat appearance while blending the panel side joints. The Striated panel achieves R-values of up to R-28.6.



**CF Santa Fe Wall Panel** – The Santa Fe insulated metal wall panel has a flat exterior profile with a heavily embossed, stucco texture that resembles the look of a masonry stucco finish. The interior skin has a Mesa profile. Santa Fe offers R-values up to R-28.6.



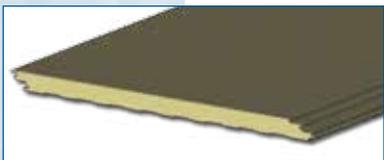
**CF Architectural Wall Panel** – The Architectural wall panel employs a flat appearance providing a monolithic look that is ideal for high-profile architectural applications. Both the interior and exterior skins are stucco embossed and the interior skin has a Mesa profile. The Architectural wall panel offers R-Values up to R-28.6.



**CF 7.2 Insul-Rib™ Wall Panel** – The 7.2 Insul-Rib insulated metal wall panel combines a traditional 7.2 rib panel design with a polyurethane foam core, providing exceptional insulating properties in various thicknesses. The exterior profile is a 1 ½" deep, 7.2" on center rib pattern. The interior skin has a Mesa profile. The 7.2 Insul-Rib panel offers R-values to R-28.6.



**HPCI Barrier™ Wall Panel** – The HPCI Barrier metal wall panel is an air, water, thermal and vapor barrier panel that can be used behind any type of façade. Installed in a horizontal orientation, completely outside of structural supports, there are no thermal bridges to reduce energy efficiency. The interior profile is Mesa. R-values of up to R-28.6 can be achieved with the HPCI Barrier Wall Panel.



**CF Tuff Wall® Panel** – Tuff Wall is an exceptionally attractive stucco-like insulated wall panel that provides the masonry look that many designers and communities desire. The exterior stucco-like surface is factory applied and is an extremely durable, impact and abrasion resistant finish. Tuff Wall achieves maximum R-values of up to R-42.9.



**CF Tuff-Cast™ Panel** – Tuff-Cast is an exceptionally attractive insulated wall panel that provides the appearance of finished precast concrete. The exterior textured surface is factory applied. The Tuff-Cast finish offers an extremely durable, impact and abrasion resistant coating. The interior face is an attractive Mesa profile. Tuff-Cast offers R-values of up to R-42.9.

## Accessories

From gutters and downspouts to ventilators, windows and canopies, Star offers a complete line of worry-free accessories. All of which add to a finished building with a unique presence. Our accessories are specifically designed to work with Star's durable roof and wall systems. They reinforce the building's structural integrity. They ensure its weather tightness and energy efficiency. If you need overhangs, entry doors, store fronts or thermal windows, Star accessories compliment the appearance and functionality of your building.

## The Green in Star

Building energy efficiently has become a priority in the construction industry. Star Building Systems, along with parent company NCI Group, Inc., is leading the way. Our environmentally friendly construction products and practices help reduce excess waste and energy consumption. Simultaneously, Star's products and practices add to the longevity of your structure.

Star's metal roof and wall panels consist of at least 25 percent recycled material. When utilized with Star structural members, a complete Star building can contain anywhere from 30 to 50 percent recycled material.

In an effort to build smarter, Star is proud to provide insulated metal panels (IMPs) and other steel components supplied by Star's sister companies, Metl-Span and MBCI.

## Green Products

Star offers a wide range of energy efficient, sustainable solutions including IMPs, Retrofit Roofing Systems and Cool Roof Colors.

**Insulated Metal Panels (IMPs)** – IMPs are roof and wall panels consisting of two single-skin metal panels with a foamed-in-place core. They are sealed at the side laps and all perimeter boundaries. IMPs provide impressive R-values, enhancing the building's overall energy performance. Thermal bridges are prevented due to the unique interlocking application of the panels. This technique also provides resistance to moisture and air infiltration.

**Retrofit Roofing Systems** – Star's Retrofit Roofing System assists in improving energy efficiency of pre-existing roofs. LEED Certification can be achieved on existing buildings through the use of this system, in part because the existing roof materials will not become waste added to landfills. When applied at a specified slope and with the addition of cool roof colors, the retrofit system improves Solar Reflective values and provides excellent water runoff solutions.

**Cool Roof Colors** – Cool Roof Colors can reduce energy consumption, minimize urban heat islands and improve cost savings. Many of Star's Cool Roof Color Options meet the reflectivity and emissivity performance levels required by LEED and ENERGY STAR. Excellent reflectivity properties require less energy to heat and cool the building overall.





## Building Applications

Whether you need a small, simple building or a large, complex structure, you will find that Star's time-tested processes and products are an excellent choice for any end use application. If you require modifications to an existing building or your construction project is still in the planning stages, Star stands up to the challenge. Star's wide range of non-residential construction possibilities is endless. Our products are designed for optimal strength and efficiency, resulting in unmatched long-term value and cost savings, benefiting you before, during and after construction.



Our **Retail and Commercial** facilities are attractive, functional and cost effective. Whether you are considering a one-of-a-kind free standing commercial center or a chain of centers across the country, Star Building Systems can offer a solution to fit your needs. Eye-catching design options are possible with Star's broad collection of exterior veneers, finishes and colors. Quick construction times and long-term low maintenance equals unparalleled savings.



Star excels when it comes to **Manufacturing and Industrial** facilities. Complete with design flexibility and expandability, steel structures are inherently weather and pest resistant. Overhead crane systems requiring 90-foot eave heights, storage mezzanines and conveyor systems might pose a design threat for other companies. Not Star. Star Building Systems has been providing safe housing space for these applications and more for years.



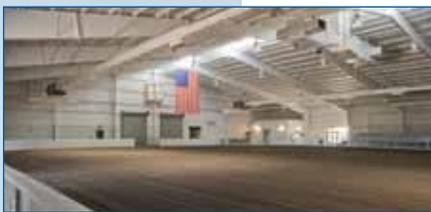
A dependable **Warehouse** offers space and is low maintenance, cost effective and durable. Star is proud to offer creative and dependable warehouse solutions that cater to your every need. Special concerns are eliminated when utilizing Star's clear span design or Long Bay® System. It's guarantee of uninterrupted space saves time and room by removing structural columns, while maintaining the utmost structural integrity.



**Institutional and Government Construction** accounts for some of the nation's most important facilities: schools, hospitals, fire and police stations and more. These projects are completely customizable to fit your budget and your specifications. Want the building to be functional and visually stunning? Star is your brand. With the additional benefit of green building solutions, your institutional facility can be built to last while building a lasting impression.



Star's **Agricultural and Livestock** facilities are designed with the modern farmer in mind. Thermal efficiency and sustainable ventilation are key elements when constructing from the ground up. Unique drainage techniques are often specified when designing for feed, milk and housing facilities. Star routinely designs these facilities to include light transmitting panels and lofts as a means of increasing storage space. Large clear span interiors provide uninterrupted floor space. Combine this option with concrete, concrete screed flooring or rubber matting and a waterproof surface, and your Star structure will be sure to impress.



Our **Recreational** designs are created with the user in mind. From small gyms to large arenas, Star will make sure your building is a winner. Need to accommodate a swimming pool? Maybe an ice rink? Star does it all. Maintenance costs can remain low due to Star's outstanding performance-proven quality materials. Contact a Star Builder to learn what it's like to be part of the winning team.



**Aviation Hangars** house an array of costly airplanes, helicopters and more. They must be accommodating to all shapes and sizes while providing security from the elements. Using Star for your aviation hangar will help your building project take off. Reach new heights in quality design and efficiency. Streamline the hangar's look and feel with exterior options including precast concrete, glass, brick, stone and more! Let Star be your co-pilot to success.

\*All Star construction projects can be designed and built to meet local building codes.



## Retrofit and Re-Roof Solutions

Tired of your existing roof? Has your existing roof tired out on you? Star's retrofit and re-roof capabilities help you bring your worn roofing system back to life. Increase water runoff and energy efficiency by taking advantage of Star's retrofit and re-roof products and techniques. Whether your Star roof is constructed atop an existing roof, or stands as the master roof, weathertightness is assured. The Star Retrofit roofing system also lasts longer than traditional wood and shingle roof options. Utilizing one of Star's numerous cool roof colors increases your roof's reflectivity. This keeps internal temperatures lower.





## Star's Network

Star Building Systems is a division of NCI Group (NYSE: NCS), a family of companies and people dedicated to delivering a higher standard of performance to you and your business. NCI Group is the largest integrated manufacturer and marketer of custom designed metal building systems, metal building components and metal coil coaters in North America.

Some products offered through Star are manufactured by Star's sister companies, MBCI, Metl-Span and DBCI. Star Building Systems is proud to align itself with these companies.

MBCI is the industry-leading manufacturer of metal construction components. MBCI supplies metal roof and wall panels to the architectural, industrial, commercial, institutional, residential and agricultural markets. With manufacturing facilities located strategically throughout the U.S., MBCI has the capability to serve you in an efficient manner.

Metl-Span is a leading manufacturer of insulated metal panels. Metl-Span produces top quality IMPs for both roof and wall applications, which are ideal for a wide range of building projects and green building construction.

Since 1990, DBCI has remained a leading manufacturer and marketer of commercial-grade steel curtain roll-up doors and self-storage doors, components and solutions. DBCI provides our customers with the highest quality products and services in the industry.



A Star Building System stands the test of time. A Star building is never out of place. Our building solutions allow for endless construction possibilities. As your next project approaches, reach for Star.

*Star Building Systems is not liable for damages incurred as the result of improper erection procedures. Star buildings are erected by independent contractors who are not agents of Star. Descriptions and specifications contained herein were in effect at the time this publication was approved for printing. Star reserves the right to discontinue or change specifications and/or designs without notice and without incurring obligation.*



For more information about how Star can add to your success,  
call 1-800-879-7827 or visit [www.StarBuildings.com](http://www.StarBuildings.com).  
Join the team you know you can depend on.

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SECTION 13 34 19

METAL BUILDING SYSTEMS



This guide specification is being provided to the building design community as a recommended starting point for architects, engineers and building specifiers that utilize metal building systems in their projects. It is based on the products provided by Star Building Systems, located at 8600 South Interstate 35 Service Road, Oklahoma City, OK 73149, [www.StarBuildings.com](http://www.StarBuildings.com). It is not intended that this specification cover all project conditions and as such a thorough review by a licensed construction professional should be conducted prior to utilizing this specification for actual projects. Note: Requirements related to USGBC LEED v4 are shown in green and may be removed as necessary for projects not requiring green building certification.

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PART 1 - GENERAL

1.1 SECTION INCLUDES:

- A. Metal building systems including:
  - 1. Metal framing components.
  - 2. Metal wall panels and trim.
  - 3. Metal roof panels and trim.
  - 4. Metal building accessories.

1.2 RELATED SECTIONS:

- A. Section 01 33 29 LEED™ Documentation.
- B. Section 07 92 00 - Joint Sealants.
- C. Section [03 30 00 - Cast-In-Place Concrete:] [\_\_\_\_ - \_\_\_\_:] Concrete slabs and footings.
- D. Section [05 12 00 - Structural Metal Framing:] [\_\_\_\_ - \_\_\_\_:] Metal wall and roof framing.
- E. Section [05 40 00 - Cold-Formed Metal Framing:] [09 22 00 - Metal Support Assemblies:] [\_\_\_\_ - \_\_\_\_:] Metal partition wall framing.

1.3 REFERENCES

Specifier: The standards referenced below are in general chosen to match those required by the 2015 version of the International Building Code. Review and edit as necessary to reflect the applicable building code for the project.

- A. American Institute of Steel Construction (AISC):
  - 1. AISC 360 - Specification for Structural Steel Buildings, June 22, 2010.

2. AISC 341 - AISC Seismic Provisions for Structural Steel Buildings, June 22nd, 2010.
  3. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges, April 14th, 2010.
- B. American Iron and Steel Institute (AISI) :
1. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members, 2012 Edition.
- C. American Welding Society (AWS)
1. AWS D1.1/D1.1M - Structural Welding Code – Steel, 2010.
  2. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel, 2008
- D. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE):
1. ASHRAE 90.1-2013 - Energy Standard for Buildings Except Low-Rise Residential Buildings (I-P Edition).
- E. ASTM International (ASTM): Latest versions of:
1. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel.
  2. ASTM A 475 - Standard Specification for Zinc-Coated Steel Wire Strand.
  3. ASTM A 500/A 500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  4. ASTM A 529/A 529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
  5. ASTM A 563 - Standard Specification for Carbon and Alloy Steel Nuts.
  6. ASTM A 572/A 572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
  7. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  8. ASTM A 792/A 792M - Standard Specification for Steel Sheet, 55 Percent Aluminum-Zinc Alloy-Coated by Hot-Dip Process.
  9. ASTM A 992/A 992M - Standard Specification for Structural Steel Shapes.
  10. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength, Low-Alloy and High-Strength Low-Alloy with Improved Formability and Ultra-High Strength
  11. ASTM A 1018/A 1018A - Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Carbon, Commercial, Drawing, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
  12. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
  13. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus.
  14. ASTM D 635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
  15. ASTM D 1003 - Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics.
  16. ASTM D 1494 - Standard Test Method for Diffuse Light Transmission Factor of Reinforced Plastics Panels.
  17. ASTM D 1929 - Standard Test Method for Determining Ignition Temperature of Plastics.
  18. ASTM D 2240 - Standard Test Method for Rubber Property—Durometer Hardness.
  19. ASTM D 2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.

20. ASTM D 4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.
  21. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
  22. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
  23. ASTM E 283 - Standard Test Method for Determining Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across Specimen.
  24. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
  25. ASTM E 1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
  26. ASTM E 1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
  27. ASTM E 1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.
  28. ASTM E 1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
  29. ASTM F 436 - Standard Specification for Hardened Steel Washers
  30. ASTM F 1941 - Standard Specification for Electrodeposited Coatings on Threaded Fasteners (Unified Inch Screw Threads (UN/UNR))
  31. ASTM F 3125 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.
- F. Cool Roof Rating Council (CRRC):
1. ANSI/CRRC S100 - Standard Test Methods for Determining Radiative Properties of Materials, April 26<sup>th</sup>, 2016.
- G. Factory Mutual Approvals (FM Approvals):
1. FM 4471 - Approval Standard for Class 1 Panel Roofs.
  2. FM 4880 - Approval Standard for Class 1 Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coatings and Exterior Wall Systems.
  3. FM 4881 - Approval Standard for Class 1 Exterior Wall Systems.
- H. FM Global:
1. FM 1-28 – Property Loss Prevention Data Sheet 1-28, Wind Design, October 2015.
- I. International Accreditation Service (IAS):
1. Accreditation Criteria 472 (AC472) - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems, April 2017
- J. International Standards Organization (ISO)
1. ISO 14044 - Environmental management -- Life Cycle Assessment -- Requirements and Guidelines, 2006
  2. ISO 21930 - Sustainability in Building Construction -- Environmental Declaration of Building Products, 2007.
- K. Metal Building Manufacturers Association (MBMA):
1. Metal Building Systems Manual, 2012 Edition.

- L. National Fenestration Rating Council (NFRC):
  1. NFRC 100 - Procedure for Determining Fenestration Product U-factors, 2014
  2. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence, 2010.
- M. National Fire Protection Association (NFPA):
  1. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components, 2012 Edition.
- N. Research Council on Structural Connections (RCSC):
  1. Specification for Structural Joints Using High Strength Bolts, August 1, 2014.
- O. Underwriters Laboratories (UL):
  1. UL-580 - Tests for Uplift Resistance of Roof Assemblies.
  2. UL-790 - Standard Test Methods for Fire Tests of Roof Coverings.
  3. UL-2218 - Impact Resistance of Prepared Roof Covering Materials.
- P. United States Green Building Council (USGBC):
  1. LEED v4 - Leadership in Energy and Environmental Design for Building Design and Construction, January 27<sup>th</sup>, 2017.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Pre-installation Meeting: Prior to erection of framing, conduct pre-installation meeting at site attended by Owner, Architect, manufacturer's technical representative, inspection agency and related trade contractors.
- B. Coordinate work of Division 07 Sections "Roof Specialties" and "Roof Accessories" and openings and penetrations and manufacturer's accessories with installation of metal panels.

#### 1.5 DEFINITIONS

- A. Traditional Metal Building System: Building system using either continuous or simple span "Z" purlins for support of roof covering material.
- B. Long Bay System (LBS): Building system using simple span, cold-formed, open web purlins to support roof covering material.
- C. Gable Symmetrical: Continuous frame building with ridge in center of building, consisting of tapered or straight columns and tapered or straight rafters. Sidewall girts may be continuous (by-passing columns) or simple span (flush in column line). Rafters may or may not have interior columns.
- D. Gable Unsymmetrical: Continuous frame building with an off-center ridge, consisting of tapered or straight columns and tapered or straight rafters. Eave height and roof slope may differ on each side of ridge. Sidewall girts may be continuous (by-passing columns) or simple span (flush in column line). Rafters may or may not have interior columns.
- E. Single Slope: Continuous frame building which does not contain ridge, but consists of one continuous slope from side to side. Building consists of straight or tapered columns and tapered or straight rafters. Sidewall girts may be continuous (by-passing columns) or simple span (flush in column line). Rafters may or may not have interior columns.

- F. Lean-to (LT): Building extension, which does not contain ridge, but consists of one continuous slope from side to side, usually with same roof slope and girt design as building to which attached.
- G. Roof Slope: Pitch expressed as inches of rise for each 12 inches (305 mm) of horizontal run.
- H. Acrylic-Coated Galvalume: Aluminum-Zinc coated steel with a thin clear acrylic finish coating eliminating the need for roll-forming oil and reducing incidence of field marking by handling or foot traffic.
- I. Building Eave Height: Nominal dimension measured from finished floor to top flange of eave strut.
- J. Building Width: Measured from outside to outside of side wall secondary structural member.
- K. Building Length: Measured from outside to outside of end wall secondary structural member.
- L. Auxiliary Loads: Dynamic loads induced by cranes, conveyors, or material handling systems.
- M. Collateral Loads: Weight of any non-moving equipment or material, such as ceilings, electrical or mechanical equipment, sprinkler systems, plumbing, or ceilings.
- N. Dead Load: Actual weight of building system as supplied by manufacturer supported by given member.
- O. Floor Live Loads: Loads induced on floor system by building occupants and possessions including but not limited to furniture and equipment.
- P. Roof Live Loads: Loads produced by maintenance activities, rain, erection activities, and or movable or moving loads but not including wind, snow, seismic, crane, or dead loads.
- Q. Roof Snow Loads: Gravity load induced by weight of snow or ice on roof, assumed to act on horizontal projection of roof.
- R. Seismic Loads: Loads acting in any direction on structural system due to action of an earthquake.
- S. Wind Loads: Loads on structure induced by forces of wind blowing from any horizontal direction.

## 1.6 DESIGN REQUIREMENTS

- A. Governing Design Code: Structural design for the metal building system shall be performed by the manufacturer of the metal building system in accordance with the building code provided in the contract documents.
- B. Design Basis:
  1. Use standards, specifications, recommendations, findings, and interpretations of professionally recognized groups as basis for establishing design, drafting, fabrication, and quality criteria, practices, and tolerances, including the AISC Code of Standard Practice for Steel Buildings and Bridges.
  2. Design structures in accordance with MBMA Practices and Manual including fabrication and erection tolerances.
  3. Design structural mill sections and welded plate sections in accordance with AISC 360, ASD Method.
  4. Design the lateral force resisting systems and related components for seismic loads in accordance with AISC 341.

5. Design cold-formed steel structural members and panels in accordance with AISI S-100.
6. Design all bolted joints in accordance with RCSC Specification.

C. Design Loads:

1. In accordance with Contract Documents and manufacturer's standard design practices.
2. Design loads include dead loads, roof live loads, wind loads, seismic loads, collateral loads, auxiliary loads, floor live loads and applied or specified loads.

## 1.7 SUBMITTALS

A. Submittals for Review:

1. Shop Drawings:
  - a. Complete erection drawings with identification and assembly of building components.
  - b. Show anchor bolt settings, transverse cross-sections, sidewall, endwall, and roof framing, flashing and sheeting, and accessory installation details.
  - c. Bear seal and signature of Registered Professional Engineer responsible for metal building system design in accordance with state law.
2. Manufacturer installation manual showing:
  - a. Preparation instructions and recommendations.
  - b. Storage and handling requirements and recommendations.
  - c. Installation methods.
3. Structural Design Calculations: [ \_\_\_ sets] sealed and signed by a professional engineer licensed in accordance with applicable state law.

Specifier: Retain and modify the following item for projects requiring domestic materials

4. Buy American/ARRA Compliance Letter of Certification.
5. Documentation [including test reports] supporting Thermal Transmission Coefficients (U-factors) and Solar Heat Gain Coefficients (SHGC; for non-opaque components only) of building envelope components specified in this section.

Specifier: Retain following paragraph for LEED projects:

6. LEED Submittals: Provide documentation for the following:
  - a. SS Credit: Heat Island Reduction: Product data indicating conformance with 3-year aged solar reflectance index requirement as specified in Option 1: Non-Roof and Roof. Three-year aged data shall be in compliance with ANSI/CRRC S100.
  - b. MR Credit: Building Life-Cycle Impact Reduction: Provide a peer-reviewed, Life Cycle Assessment Report in compliance with ISO 14044 in accordance with Option 4, Whole-Building Life Cycle Assessment, based on industry-wide or product-specific data.
  - c. MR Credit: Building Product Disclosure and Optimization - Environmental Product Declarations: Provide a Type III Environmental Product Declaration in compliance with ISO 21930 in accordance with Option 1, Environmental Product Declarations, based on product-specific or industry-wide data.

- d. MR Credit: Building Product Disclosure and Optimization - Sourcing of Raw Materials: Provide product data in accordance with Option 2, Leadership Extraction Practices, for the following:
  - 1) Material costs for each product having recycled content.
  - 2) Percentages by weight of post-consumer and pre-consumer recycled content for each item.
  - 3) Total weight of products provided.

B. Samples:

- 1. Submit color chips showing manufacturer's full range of available colors and patterns for each finish product.
- 2. After color selection submit samples representing actual product, color, and patterns.

C. Quality Control Submittals:

- 1. IAS AC472 Certificate for each facility involved in the design and fabrication of the Metal Building System.
- 2. Certified Erector Certificate issued to the erector by the manufacturer.

Specifier: Retain this paragraph for when MTR submittal is required in the contract documents.

- 3. Material Test Reports (MTR) for all steel material used in the manufacture of primary and secondary framing members, panels and bolts specified in this section and when required by ASTM A 6/A 6M

## 1.8 QUALITY ASSURANCE

- A. Manufacturer and Fabricator Qualifications: Primary products furnished by single IAS AC472 accredited manufacturer/fabricator with minimum [5] [ ] years of experience.
- B. Erector Qualifications:
  - 1. Single installer with minimum [5] [ ] years of experience in installing products of same or similar type and scope.
  - 2. Installer must be certified by the metal building manufacturer.

## 1.9 DELIVERY, STORAGE AND HANDLING

- A. Store packaged products in original, unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials and materials used with solvent-based materials in accordance with requirements of the authority having jurisdiction.
- C. Protect steel products from weather as specified by manufacturer instructions.

## 1.10 PROJECT CONDITIONS

- A. Do not install systems when temperature, humidity, or ventilation is outside of limits recommended by manufacturer.

## 1.11 WARRANTIES

- A. Special Manufacturer's Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace metal building system components that fail in materials and workmanship within one year from date of Substantial Completion.

- B. Special Weathertightness Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace metal building system components that fail to remain weathertight, including leaks, [without monetary limitation] [up to cost limitation of seven dollars (\$7.00) per square foot of covered area] [up to cost limitation of fourteen dollars (\$14.00) per square foot of covered area] within [5] [10] [15] [20] years from date of Substantial Completion.
- C. Special Panel Finish Warranty: On Manufacturer's standard form, in which Manufacturer agrees to repair or replace metal panels that evidence deterioration of factory-applied finish within the specified number years from date of Substantial Completion, including:
  - 1. Acrylic Coated Galvalume (Galvalume® Plus): Product will not rupture, fail structurally, or perforate within period of 20 years due to normal atmospheric corrosion.
  - 2. Fluoropolymer Two-Coat System (PVDF):

Specifier: Confirm warranted performance values below for custom colors. Second options in subparagraphs below are for Star Building System's Brite Red.

- a. Color fading in excess of [5] [10] Hunter units per ASTM D 2244 for [30] [25] years.
- b. Chalking in excess of No. [8] [6] rating per ASTM D 4214 for [30] [25] years.
- c. Failure of adhesion, peeling, checking, or cracking for 40 years.
- 3. Metallic Fluoropolymer Two-Coat System (Metallic PVDF):
  - a. Chalking in excess of No. 6 rating per ASTM D 4214 for 25 years.
  - b. Failure of adhesion, peeling, checking, or cracking for 25 years.
- 4. Modified Silicone-Polyester Two-Coat System (SMP):

Specifier: Confirm warranted performance values below for custom colors. Second options in subparagraphs below are for Star Building System's Crimson Red. Star's Polar White Polyester does not carry a warranty against chalking.

- a. Color fading in excess of [5] [7] Hunter units per ASTM D 2244, for vertical applications for [30] [25] years.
- b. Color fading in excess of [7] [10] Hunter units per ASTM D 2244, for non-vertical applications for [30] [25] years.
- c. Chalking in excess of No. [8] [7] rating per ASTM D 4214, for vertical applications for [30] [25] years.
- d. Chalking in excess of No. [6] [5] rating per ASTM D 4214, for non-vertical applications for [30] [25] years.
- e. Failure of adhesion, peeling, checking, or cracking for 40 years.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis of Design Manufacturer: Star Building Systems, subsidiary of NCI Building Systems, Inc. ([www.starbuildings.com](http://www.starbuildings.com)). Other acceptable manufacturers include:
  - 1. A&S Building Systems, subsidiary of NCI Building Systems, Inc. ([www.a-s.com](http://www.a-s.com))
  - 2. All-American Systems, subsidiary of NCI Building Systems, Inc. ([www.allamericansys.com](http://www.allamericansys.com))
  - 3. Ceco Building Systems, subsidiary of NCI Building Systems, Inc. ([www.cecobuildings.com](http://www.cecobuildings.com))

4. Garco Building Systems, a subsidiary of NCI Building Systems, Inc. (www.garcobuildings.com)
5. Mesco Building Solutions, subsidiary of NCI Buildings, Inc. (www.mescobuildingsolutions.com)
6. Metallic Building Co., subsidiary of NCI Building Systems, Inc. (www.metallic.com)
7. Mid-West Steel Building Company, subsidiary of NCI Building Systems, Inc. (www.midweststeel.com)
8. Robertson Buildings, subsidiary of NCI Building Systems, Inc. (www.robertsonbuildings.com)

B. Substitutions: [Under provisions of Division 01] [Not permitted].

## 2.2 MATERIALS

Specifier: Retain and modify the following section when project has domestic content requirements, which would be all federal government work and most state government work. Also note that there was a significant change in how ferrous products apply made to the Buy American Act by the American Reinvestment and Recovery Act of 2009. Specifically, many of the cost limitations and exceptions provided to foreign materials processed in America in the original act were disallowed for ferrous products, requiring them to be 100% domestic steel.

A. Buy American Act/American Reinvestment and Recovery Act (ARRA) requirements: Provide materials in compliance with the following requirements:

1. Buy American Act of 1933 BAA-41 U.S.C §§ 10a – 10d for non-ferrous products.
2. Buy American provisions of Section 1605 of the American Recovery and Reinvestment Act of 2009 (ARRA), for ferrous products.

B. Primary Framing Steel:

Specifier: Recycled content is required for some sustainable building programs and standards. Retain as necessary here and elsewhere. Primary framing recycled content is based on the Steel Recycling Institute (SRI) data for Electric Arc Furnace (EAF) method. Secondary framing and panel recycled content is based on SRI data for Basic Oxygen Furnace (BOF) method.

1. **Recycled Content: Post-consumer recycled content plus one-half of pre-consumer recycled content not less than 75 percent.**
2. Hot-rolled shapes: ASTM A 36 or ASTM A 992, minimum yield of 36 ksi (248 MPa) or 50 ksi (345 MPa).
3. Built-up sections:
  - a. Webs:
    - 1) ASTM A 1011 or ASTM A1018, SS or HSLAS, Grade 55 (380) for webs 3/16 inch (4.76 mm) thick and thinner.
    - 2) ASTM A 572 Grade 50 (340) or ASTM A572 Grade 55 (380) or ASTM A 529 Grade 55 for webs thicker than 3/16 inch (4.76 mm).
  - b. Flanges: ASTM A 529 Grade 55 (380) or ASTM A 572 Grade 50 (340) or 55 (380).
4. Round tube: ASTM A 500, Grade B or C with minimum yield strength of 42 ksi (290 MPa).
5. Square and rectangular tube: ASTM A 500, Grade B or C, minimum yield strength of 42 ksi (290 MPa).
6. Cold-formed C sections: ASTM A 1011, Grade 55 (380), or ASTM A 653, Grade 55 (380).

7. X-bracing: ASTM A 529 or A 572 for rod bracing 36 ksi (248 MPa) or 50 ksi (345 MPa), ASTM A 36 for angle bracing or ASTM A 475 for cable bracing.

C. Secondary Framing Steel:

1. Purlins, girts, and eave struts: ASTM A 1011 Grade 55 (380), or ASTM A 653, Grade 55 (380).
2. Recycled Content: Post-consumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.

Specifier: Gauge is an insufficient way to specify thickness for cold-formed steel coil material due to outdated standards which have built-in tolerances greater than current coil steel manufacturing technology requires. However, much of the construction industry continues to specify thickness by gauge alone, which opens up possible gamesmanship in material thickness specification by allowing manufacturers to intentionally use tolerances to reduce supplied minimum thickness. In order to ensure the material provided meets the intended specification, it is recommended that the gauge designations be used only as descriptors that reference a minimum uncoated decimal thickness defined explicitly in a common area of the specification as shown below. Specifying material by gauge alone will default to outdated standards being used to provide a minimum or nominal thickness.

3. Thickness:
  - a. 16 gauge: 0.056 inch (1.421 mm) minimum uncoated thickness.
  - b. 14 gauge: 0.067 inch (1.689 mm) minimum uncoated thickness.
  - c. 13 gauge: 0.081 inch (2.051 mm) minimum uncoated thickness.
  - d. 12 gauge: 0.100 inch (2.534 mm) minimum uncoated thickness.
4. Finish: [G-90 Pre-galvanized] [Red Oxide] [Gray] Shop Coat. Shop coat only intended to provide temporary protection during transportation and erection.

D. Panels:

1. Materials: ASTM A 792.
2. Recycled Content: Post-consumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
3. Thickness and yield strength:
  - a. 26 gauge: 0.0172 inch (0.437 mm) minimum uncoated thickness, 80 ksi (550 MPa) yield strength.
  - b. 24 gauge: 0.0212 inch (0.538 mm) minimum uncoated thickness, 50 ksi (340 MPa) yield strength.
  - c. 22 gauge: 0.0272 inch (0.690 mm) minimum uncoated thickness, 50 ksi (380 MPa) yield strength.
4. Finishes:

Specifier: Delete brand names here and replace them with references to this section going forward if required.

- a. Galvalume: Aluminum-Zinc Alloy Coating, 55% Aluminum, 50% Zinc coated steel per ASTM A 792 AZ55.
- b. Galvalume® Plus: Acrylic-Coated Aluminum-Zinc Alloy Coating, 55% Aluminum, 50% Zinc coated steel per ASTM A 792 AZ55 with acrylic finish with no added lubricant.
- c. Exterior Paint:

Specifier: Retain one or more of the following three finish paragraphs as applicable to the project.  
Coordinate with Warranty article in Part 1.

- 1) Modified Silicone-Polyester Two-Coat System (SMP): 0.20 – 0.25 mil primer with 0.7 – 0.8 mil color coat. Basis of Design: Signature 200.

Specifier: Fluoropolymer coatings are based on Arkema, Inc. Kynar 500 and Solvay Solexis Hylar 500 PVF2 resins.

- 2) Fluoropolymer Two-Coat System (PVDF): 0.2 – 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat. Basis of Design: Signature 300.
  - 3) Fluoropolymer Two-Coat Metallic System (PVDF Metallic): 0.2 – 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF metallic fluoropolymer color coat. Basis of Design: Signature 300 Metallic.
- d. Interior Paint: 0.5 mil total dry film thickness consisting of primer coat and wash coat of manufacturer's standard light-colored acrylic or polyester backer finish.
5. Fasteners:
    - a. Through-fastened panels: Self-drilling with sealing washer.
    - b. Standing seam panels: Long life self-drilling with sealing washer.
    - c. Ridge: Long-life self-drilling with sealing washer.
    - d. Clips to purlin or bar joists: Long-life self-drilling with hex washer head and washer.
  6. Clips:
    - a. Low or high fixed clips: Use where moderate thermal expansion and contraction in roof panel is expected.
    - b. Low or high sliding clips: Provide 2 to 4 inches of travel for panel thermal expansion and contraction.
  7. Sealants and closures:
    - a. Side-laps: Factory applied, hot melt, foamable mastic.
    - b. End-laps, eave, ridge assembly, gable flashings: Field-applied non-skinning sealant as specified in Section 07 92 00.
    - c. Standing Seam Roof Closures:
      - 1) Outside closures: 24 gauge steel sheet.
      - 2) Inside closures: 18 gauge Galvalume or G-40 galvanized coated steel complying with ASTM A 653/A 653M.
    - d. Through-Fastened Roof Closures: Provide closed-cell polyethylene inside [and outside] foam closures.
      - 1) Bulk Density: 2 pounds per cubic foot.
      - 2) Service Temperature: -100 to 180 degrees Fahrenheit.
      - 3) Shore Hardness: 7 on AA scale or 51 on 00 scale when tested to ASTM D 2240.

## 2.3 PRIMARY FRAMING

- A. Frame Design: [As indicated on Drawings] [Gable Symmetrical] [Single Slope] [Lean-to].
- B. Sidewall Column Profile: [Tapered or Prismatic] [Prismatic] [As indicated on Drawings].

- C. Frame Span: [Modular or Clear Span as indicated on Drawings] [Modular Span as indicated on Drawings] [Clear Span].
- D. Modular Frame Interior Column Profile: H Shape, Round Pipe, or Tube] [H Shape] [Round Pipe] [Tube Sections] [As indicated on Drawings].
- E. Bracing: [Standard X-Bracing or Portal Frames as allowed by accessories] [X-Bracing] [Portal Frames] [Shear Walls by others].

## 2.4 SECONDARY FRAMING

### A. Roof Zee Purlins:

1. Horizontal structural members which support roof coverings.
2. Depth: As required by design, [8] [10] [12] inches ([203] [216] [254] [305] mm) minimum.
3. Thickness: As required by design, 16 gauge minimum.
4. Finish: [Red Oxide] [Gray] shop coat. Shop coat only intended to provide temporary protection during transportation and erection.

### B. Long Bay Purlins:

1. Horizontal structural members that support roof systems, with virtual square shaped top and bottom chords and web members.
2. Open Web Purlins for Long Bay applications.
3. Finish: Gray shop coat. Shop coat only intended to provide temporary protection during transportation and erection.

### C. Wall Zee Girts:

1. Horizontal structural members that support vertical panels.
2. Depth: As required by design, [8] [10] [12] inches ([203] [216] [254] [305] mm) minimum.
3. Gauge: As required by design, 16 gauge (0.056 inch (1.424 mm) minimum uncoated thickness).
4. Finish: [Red Oxide] [Gray] shop coat. Shop coat only intended to provide temporary protection during transportation and erection.

- D. Spandrel Beams: ASTM A 36/A 36M or ASTM A 992/A 992M wide flange shapes, minimum yield 50 ksi for support of wall systems provided by others, as required by design.

## 2.5 BOLTS

### A. Rigid Frame Connections: Provide High Strength Bolts, Nuts and Washers:

1. Bolts: ASTM F 3125 Grade A325 Heavy Hex Structural Type I.
2. Washers: [ASTM F 436 Type 1 Hardened Steel] [Not Required].
3. Nuts: ASTM A 563 Grade C Heavy Hex. Nuts shall be wax coated by emulsion such that the torque required to complete a Rotational Capacity (RC) test shall be reduced by 40% from the un-waxed state.
4. Coating: [ASTM F 1941 Electrodeposited Yellow Zinc] [Hot-Dipped Galvanized].

### B. Other Connections: Provide High Strength or Machine Bolts as required by manufacturer design:

1. High Strength Bolts and Nuts:
  - a. Bolts: ASTM F 3125 Grade A325 Heavy Hex Structural Type I.

- b. Nuts: ASTM A 563 Grade C Heavy Hex.
- c. Coating: ASTM F 1941 Electrodeposited Yellow Zinc.

2. Machine Bolts:

- a. Bolts: ASTM A 307 Grade Carbon Steel.
- b. Nuts: ASTM A 563 Grade A Hex Nut.
- c. Coating: ASTM F 1941 Electrodeposited Clear Zinc.

2.6 ROOF SYSTEMS

- A. Assembly Performance Requirements: Provide roof products and assemblies meeting the following requirements:

Specifier: Coordinate these requirements with applicable national codes and standards. Roof radiative properties are particular to climate and standards and may not be required. UL and/or FM Global requirements may be needed for insurance purposes.

- 1. Class 90 rated and listed in accordance with UL-580 for Wind Uplift.
- 2. Class A rated and listed in accordance with UL-790 for External Fire.
- 3. Class 4 rated and listed in accordance with UL-2218 for Impact Resistance.

Specifier: Review and retain the following item for LEED projects pursuing credit SS 7.2 - Heat Island Effect. SRI may also be an energy code requirement.

- 4. Third-party listed and rated in a nationally recognized program in accordance with ANSI/CRRS S100 with an [Initial] [3-year Aged] Solar Reflectance and [Initial] [3-year Aged] Thermal Emittance such that a minimum [Initial] [3-year Aged] Solar Reflectance Index (SRI) of \_\_\_ per ASTM E 1980 assuming medium wind conditions is provided.

B. Through-Fastened Panels:

- 1. Type: Single skin ribbed panels with exposed fasteners.
- 2. Strength: Determine and certify allowable panel strengths in accordance with AISI S100.
- 3. Panel profile(s): PBR; 1-1/4 inch (32 mm) ribs at 12 inch (305 mm) centers, 1/2:12 minimum roof slope.
  - a. Thickness: [26 gauge] [24 gauge] [22 gauge]
  - b. Finish:[Galvalume® Plus] [SMP] [PVDF] [PVDF Metallic]

Specifier: Delete color for unpainted finishes such as Galvalume® and Galvalume® Plus.

- c. Color: [Selected from manufacturer standard colors] [As shown on drawings].
- d. Air Infiltration: Maximum air infiltration of 0.04 cubic feet per minute per square foot of specimen area when tested to ASTM E 1680 at a pressure differential of +/- 1.57 psf (75 Pa).
- e. Water Infiltration: No uncontrollable water leakage when tested to ASTM E 1646 at a 20 psf (955 Pa) pressure differential when sprayed with 5 gallons of water per hour per square foot (203 liters per square meter) of specimen area.

Specifier: Retain FM Approvals' listing requirement for FM Global-insured projects or where FM Global requirements are used as minimum design standard. Select required windstorm classification based upon calculation method in FM Global Loss Prevention Sheet 1-28; note that FM Approvals' windstorm classification does not correlate directly to design wind speed.

- f. FM Approvals Rating: Provide FM 4471 Approved assemblies on the basis of the following ratings. Identify materials with FM Approvals markings:
  - 1) External Fire: Class A.
  - 2) Internal Fire: Class 1.
  - 3) Hail: Severe.
  - 4) Wind: [1-60] [1-75] [1-90] [1-120] [As determined by FM 1-28]
- 4. Panel Profile(s): [PBU; 3/4 inch (19 mm) ribs at 6 inch (152 mm) centers, 1:12 minimum roof slope.] [7.2; (1-1/2 inch (39 mm) ribs at 7.2 inch centers, 1/2:12 minimum roof slope.)]
  - a. Thickness: [26 gauge] [24 gauge] [22 gauge]
  - b. Finish:[Galvalume® Plus] [SMP] [PVDF] [PVDF Metallic]

Specifier: Delete color for unpainted finishes such as Galvalume® and Galvalume® Plus.

- c. Color: [Selected from manufacturer standard colors] [As shown on drawings].
  - 5. Panel fasteners: [Long-life finish.] [410 Series stainless steel] [300 Series stainless steel].
  - 6. Sidelap mastic: [1 inch x 3/32 inch (25 mm x 2.4 mm)] [1/2 inch x 3/32 inch (13 mm x 2.4 mm)].
- C. Standing Seam Panels:
- 1. Type: Single skin panels with concealed clips.
  - 2. Panel Strength: Determine and certify panel strength as follows:
    - a. Positive Loading (Toward Panel Supports): Determine in accordance with AISI S100.
    - b. Negative Loading (Away from Panel Supports): Determine in accordance with ASTM E 1592.
  - 3. Panel profile: Double-Lok:
    - a. Panel Type: Trapezoidal machine seamed, 1/4:12 minimum roof slope.
    - b. Panel width: [24 inches wide x 3 inches high (610 mm wide x 76 mm high)] [24 inches wide x 3 inches high (610 mm wide x 76 mm high)] [18 inches wide x 3 inches high (457 mm wide x 76 mm high)] [12 inches wide x 3 inches high (305 mm wide x 76 mm high)].
    - c. Thickness: [24 gauge] [22 gauge].
    - d. Finish: [Galvalume® Plus] [PVDF] [SMP] [PVDF Metallic].

Specifier: Delete color for unpainted finishes such as Galvalume® and Galvalume® Plus.

- e. Color: [Selected from manufacturer standard colors] [As shown on drawings].
- f. Air Infiltration: Maximum air infiltration of 0.04 cubic feet per minute per square foot of specimen area when tested to ASTM E 1680 at a pressure differential of +/- 1.57 psf (75 Pa).
- g. Water Infiltration: No uncontrollable water leakage when tested to ASTM E 1646 at a 20 psf (955 Pa) pressure differential when sprayed with 5 gallons of water per hour per square foot (203 liters per square meter) of specimen area.

Specifier: Retain FM Approvals' listing requirement for FM Global-insured projects or where FM Global requirements are used as minimum design standard. Select required windstorm classification based upon calculation method in FM Global Loss Prevention Sheet 1-28; note that FM Approvals' windstorm classification does not correlate directly to design wind speed.

h. FM Approvals Rating: Provide FM 4471 Approved assemblies on the basis of the following ratings. Identify materials with FM Approvals markings:

- 1) External Fire: Class A.
- 2) Internal Fire: Class 1.
- 3) Hail: Severe.
- 4) Wind: [1-60] [1-75] [1-90] [1-120] [As determined by FM 1-28]

4. Panel profile: Ultra-Dek:

- a. Panel Type: Trapezoidal snap lock, 1/4:12 minimum roof slope.
- b. Panel width: [24 inches wide x 3 inches high (610 mm wide x 76 mm high)] [24 inches wide x 3 inches high (610 mm wide x 76 mm high)] [18 inches wide x 3 inches high (457 mm wide x 76 mm high)] [12 inches wide x 3 inches high (305 mm wide x 76 mm high)].
- c. Thickness: [24 gauge] [22 gauge].
- d. Finish: [Galvalume® Plus] [PVDF] [SMP] [PVDF Metallic].

Specifier: Delete color for unpainted finishes such as Galvalume® and Galvalume® Plus.

e. Color: [Selected from manufacturer standard colors] [As shown on drawings].

5. Panel profile: SuperLok; vertical leg architectural SSR machine seamed, 1/2:12 minimum roof slope.

- a. Panel width: [16 inches wide x 2 inches high (406 mm wide x 51 mm high)] [12 inches wide x 2 inches high (305 mm wide x 51 mm high)].
- b. Seaming Type: Machine seamed.
- c. Thickness: [24 gauge] [22 gauge].
- d. Finish: [Galvalume® Plus] [PVDF] [SMP] [PVDF Metallic].

Specifier: Delete color for unpainted finishes such as Galvalume® and Galvalume® Plus.

- e. Color: [Selected from manufacturer standard colors] [As shown on drawings].
- f. Air Infiltration: Maximum air infiltration of 0.04 cubic feet per minute per square foot of specimen area when tested to ASTM E 1680 at a pressure differential of +/- 1.57 psf (75 Pa).
- g. Water Infiltration: No uncontrollable water leakage when tested to ASTM E 1646 at a 12 psf (574 Pa) pressure differential when sprayed with 5 gallons of water per hour per square foot (203 liters per square meter) of specimen area.

Specifier: Retain FM Approvals' listing requirement for FM Global-insured projects or where FM Global requirements are used as minimum design standard. Select required windstorm classification based upon calculation method in FM Global Loss Prevention Sheet 1-28; note that FM Approvals' windstorm classification does not correlate directly to design wind speed.

h. FM Approvals Rating: Provide FM 4471 Approved assemblies on the basis of the following ratings. Identify materials with FM Approvals markings:

- 1) External Fire: Class A.
- 2) Internal Fire: Class 1.
- 3) Hail: Severe.
- 4) Wind: [1-60] [1-75] [1-90] [1-120] [As determined by FM 1-28].

6. Panel profile: BattenLok HS; vertical leg architectural SSR machine seamed, 1/2:12 minimum roof slope.

- a. Panel width: [16 inches wide x 2 inches high (406 mm wide x 51 mm high)] [12 inches wide x 2 inches high (305 mm wide x 51 mm high)].
- b. Seaming Type: Machine seamed.
- c. Thickness: [24 gauge] [22 gauge].
- d. Finish: [Galvalume® Plus] [PVDF] [SMP] [PVDF Metallic].

Specifier: Delete color for unpainted finishes such as Galvalume® and Galvalume® Plus.

- e. Color: [Selected from manufacturer standard colors] [As shown on drawings].
  - f. Air Infiltration: Maximum air infiltration of 0.04 cubic feet per minute per square foot of specimen area when tested to ASTM E 1680 at a pressure differential of +/- 1.57 psf (75 Pa).
  - g. Water Infiltration: No uncontrollable water leakage when tested to ASTM E 1646 at a 12 psf (574 Pa) pressure differential when sprayed with 5 gallons of water per hour per square foot (203 liters per square meter) of specimen area.
- 7. Panel clips: [As required by design and insulation requirements] [High Floating Clips] [Low Floating Clips] [High Sliding Clips] [Low Sliding Clips].
  - 8. Thermal spacers: As Required for insulation system and panel clip.

D. Foam Insulated Metal Panels

- 1. Basis of Design Manufacturer: Metl-Span. Other approved manufacturers include:
  - a. CENTRIA, subsidiary of NCI Building Systems, Inc. ([www.centria.com](http://www.centria.com))

Specifier: Although FM Approvals requirements are not required for the majority of projects, the International Building Code does reference FM Approval Standard 4880 in Chapter 26 to qualify foam plastics for the thermal barrier exemption and requires them to be labeled when that exemption is exercised.

- 2. Labeling: Labeled through [a nationally recognized program] [FM Global], identifying the manufacturer, product name and model and product listings required in this section.
- 3. Panel Core: Foamed in-place, Zero Ozone Depletion Potential polyurethane or polyisocyanurate.
- 4. Fire Resistance:
  - a. FM 4880 Class 1 Approval with no height restrictions.
  - b. Flame Spread and Smoke Developed Index: The Flame Spread Index shall not exceed 25 and the Smoke Developed Index shall not exceed 450 when tested to ASTM E 84.
- 5. Panel Strength: Determine and certify panel allowable strengths as follows:
  - a. Positive Loading (Toward Panel Supports): Determine in accordance with ASTM E 72.
  - b. Negative Loading (Away from Panel Supports): Determine in accordance with ASTM E 1592.
- 6. U-Factor Determination: ASTM C 1363 conducted in accordance with ASHRAE 90.1 Section A9.3.2 or by Finite Element Modeling per ASHRAE 90.1 Section A9.4 and using core insulation thermal conductivity (k-factor) determined using ASTM C 518 conducted at 75 degree F mean temperature in the calculation.
- 7. Through-fastened Insulated Panels:
  - a. Panel profile: LS-36.

- b. Panel Thickness: [1-1/2] [2] [2-1/2] [3] [4] [5] [6] inches ([39] [51] [64] [76] [102] [127] [154] mm).
- c. Panel Width: 36 inches (91 mm)
- d. Exterior Face:
  - 1) Profile: [Stucco Embossed] 1-1/4 inch (32 mm) high ribs at 12 inch (305 mm) centers.
  - 2) Thickness: [26 gauge] [24 gauge] [22 gauge].
  - 3) Finish: [Galvalume®] [PVDF] [SMP] [PVDF Metallic].

Specifier: Delete color for unpainted finishes such as Galvalume® and Galvalume® Plus.

- 4) Color: [Selected from manufacturer standard colors] [As shown on drawings].
- e. Interior Face:
  - 1) Profile: Stucco Embossed [1/8 inch (3.2 mm) Mesa] [1/16 inch (1.6 mm) Mesa] symmetrical ribs nominally 4 inches (10 mm) on centers.
  - 2) Thickness: [26 gauge] [24 gauge] [22 gauge]
  - 3) Finish: [Polyester] [SMP] [PVDF].
  - 4) Color: [Igloo White] [Selected from manufacturer standard colors] [As shown on drawings].

Specifier: When specifying insulated panels, it is generally advisable to specify a maximum U-factor on the basis of the prescriptive requirements of the applicable energy code and have the contractor coordinate with other disciplines once the supplier is selected and thickness is determined. Alternatively, thickness can be specified below and then have the contractor verify code compliance via a trade-off calculation using acceptable compliance software such as ComCheck (<http://www.energycodes.gov/comcheck>) once the supplier is selected as the U-factor will not match ASHRAE requirements exactly in this case. **It is not recommended to specify insulation R-value since there is no nationally recognized standard for determining the R-value of IMPs** and not all manufacturers report equivalent R-values due to different handling of the effects of joints, air films, temperature differentials, etc. Determination of U-factor of generic assemblies is addressed in Appendix A of ASHRAE 90.1 and this generally leads to comparable numbers between manufacturers. Retain item d or e below as appropriate here and similarly below.

- f. Maximum U-factor: \_\_\_\_\_ BTU/hour-square foot-degree F.
- g. Air Infiltration: Maximum air infiltration of 0.04 cubic feet per minute per square foot of specimen area when tested to ASTM E 1680 at a pressure differential of +/- 1.57 psf (75 Pa).
- h. Water Infiltration: No uncontrollable water leakage when tested to ASTM E 1646 at a 20 psf (955 Pa) pressure differential when sprayed with 5 gallons of water per hour per square foot (203 liters per square meter) of specimen area.

Specifier: Retain FM Approvals' listing requirement for FM Global-insured projects or where FM Global requirements are used as minimum design standard. Select required windstorm classification based upon calculation method in FM Global Loss Prevention Sheet 1-28; note that FM Approvals' windstorm classification does not correlate directly to design wind speed.

- i. FM Approvals Rating: Provide FM 4471 Approved assemblies on the basis of the following ratings. Identify materials with FM Approvals markings:
  - 1) External Fire: Class A.
  - 2) Internal Fire: Class 1.
  - 3) Hail: Severe.
  - 4) Wind: [1-60] [1-75] [1-90] [1-120] [As determined by FM 1-28].

8. Standing Seam Insulated Roof Panels:

- a. Panel profile: CFR
- b. Panel thickness: [2] [2-1/2] [3] [4] [5] [6] inches ([51] [64] [76] [102] [127] [152] mm).
- c. Panel Width: [42] [36] [30] inches ([1067] [914] [762] mm).
- d. Exterior Face:
  - 1) Profile: Stucco embossed 1/8" (3.2mm) Mesa symmetrical ribs nominally 4 inches (10mm) on centers with 2" vertical leg standing seam side laps.
  - 2) Sheet Thickness: [26 gauge] [24 gauge] [22 gauge]
  - 3) Finish: [Galvalume®] [PVDF] [SMP] [PVDF Metallic].

Specifier: Delete color for unpainted finishes such as Galvalume® and Galvalume® Plus.

- 4) Color: [Selected from manufacturer standard colors] [As shown on drawings].
- e. Interior Face:
  - 1) Profile: Stucco embossed [1/8" (3.2mm) Mesa] [1/16" (1.6 mm) Mesa] symmetrical ribs nominally 4 inches (10mm) on centers.
  - 2) Sheet Thickness: [26 gauge] [24 gauge] [22 gauge]
  - 3) Finish: [Polyester] [SMP] [PVDF]
  - 4) Color: [Igloo White] [Selected from manufacturer standard colors] [As shown on drawings].
- f. Maximum U-factor: \_\_\_\_\_ BTU/hour-square foot-degree F.
- g. Air Infiltration: Maximum air infiltration of 0.04 cubic feet per minute per square foot of specimen area when tested to ASTM E 1680 at a pressure differential of +/- 1.57 psf (75 Pa).
- h. Water Infiltration: No uncontrollable water leakage when tested to ASTM E 1646 at a 20 psf (955 Pa) pressure differential when sprayed with 5 gallons of water per hour per square foot (203 liters per square meter) of specimen area.

Specifier: Retain FM Approvals' listing requirement for FM Global-insured projects or where FM Global requirements are used as minimum design standard. Select required windstorm classification based upon calculation method in FM Global Loss Prevention Sheet 1-28; note that FM Approvals' windstorm classification does not correlate directly to design wind speed.

- i. FM Approvals Rating: Provide FM 4471 Approved assemblies on the basis of the following ratings. Identify materials with FM Approvals markings:
  - 1) External Fire: Class A.
  - 2) Internal Fire: Class 1.
  - 3) Hail: Severe.
  - 4) Wind: [1-60] [1-75] [1-90] [1-120] [As determined by FM 1-28]

E. Roof Light Transmitting Panels:

- 1. Material: Provide UV-resistant, Woven Roving fiber-reinforced acrylic Light Transmitting Panels (LTP) meeting the following requirements:
  - a. Self-Ignition Temperature: 650 degrees Fahrenheit (343 degrees Celsius) when tested in accordance with ASTM D 1929.
  - b. Diffuse Light Transmission: Not less than 50% when tested to ASTM D 1494.
  - c. Burn Rate: Less than 2.5 inches per minute when tested in accordance with ASTM D 635.

- d. Smoke Developed Index: Not greater than 450 when tested in accordance with ASTM E 84.
- e. Haze Value: Not less than 90% when tested in accordance with ASTM D 1003.

Specifier: LTPs are not generally recognized by ASHRAE 90.1 and as such, don't have explicit U-factor or SHGC requirements or accepted methods other than testing to determine their performance levels. Therefore, it is recommended that the supplier be asked to provide the values in their submittals so that they can be used in code compliance calculations, rather than set them specifically.

- f. Thermal Transmission: Provide U-Factor determined by ASTM C 1363 conducted in accordance with ASHRAE 90.1 Section A9.3.2, NFRC 100 or by Finite Element Modeling per ASHRAE 90.1 Section A9.4.
  - g. Solar Heat Gain Coefficient: Provide SHGC determined by NFRC 200.
- 2. Through-Fastened Roof LTP: Provide [single] [double] layer LTP that match the profile of the roof panel.
  - 3. Standing Seam Roof LTP: Provide [single] [double] layer [field-located] [factory-assembled] LTP.

F. Accessories

- 1. Pipe flashing: [\_\_\_\_\_].
- 2. Roof curbs: [\_\_\_\_\_].
- 3. Roof Vents:
  - a. Source: [By metal building system manufacturer] [\_\_\_\_\_].
  - b. Type: [12 inches x 10 feet (305 mm x 3.05 m) ridge gravity] [20 inch (508 mm) round gravity] [24 inch (610 mm) round gravity] [Include operable dampers].
  - c. Finish: [Unpainted Galvalume®] [Prefinished white] [Field paint over white] [\_\_\_\_\_].
- 4. Eave trim condition: [Standard gutters and downspouts] [Low profile snow gutters and downspouts] [Simple eave] [Sculptured eave].
- 5. Valley gutters: [\_\_\_\_\_].
- 6. Parapet gutters: [\_\_\_\_\_].

2.7 WALL, LINER, SOFFIT, AND FASCIA PANEL SYSTEMS

- A. Assembly Performance Requirements: Provide assemblies that function as exterior walls that meet the following requirements:
  - 1. Air Infiltration: Maximum air infiltration of 0.04 cubic feet per minute per square foot of specimen area when tested to ASTM E 283 at a pressure differential of +/- 1.57 psf (75 Pa).
  - 2. Water Infiltration: No uncontrollable water leakage when tested to ASTM E 331 at a 6.24 psf pressure differential when sprayed with 5 gallons of water per hour per square foot of specimen area.
- B. Through-Fastened Panels:
  - 1. Panel type: Single skin ribbed panels with exposed fasteners.
  - 2. Panel Strength: Determine in accordance with AISI S100.
  - 3. Panel profiles:
    - a. PBR: 12 inch x 1 inch (305 mm x 25 mm) Rib. 1-1/4 inch (32 mm) ribs x 12 inch (305 mm) centers.
    - b. Reverse Rolled PBR: 1-1/4 inch (32 mm) inverted ribs x 12 inch centers.
    - c. AVP: 1-1/8 inch (28.5 mm) inverted ribs x 12 inch (305 mm) centers.

- d. PBU: 3/4 inch (19 mm) ribs x 6 inch (152 mm) centers.
  - e. Reverse Rolled PBU: 3/4 inch (19 mm) ribs x 6 inch (152 mm) centers.
  - f. 7.2: 1-1/2 inch (39 mm) ribs x 7.2 inch (183 mm) centers.
  - g. PBC: 7/8 inch (22 mm) corrugated x 2.67 inch (68 mm) centers.
  - h. PBD: 5/8 inch (16 mm) ribs x 2.67 inch (68 mm) centers.
- 4. Thickness: [26 gauge] [24 gauge].
  - 5. Finish: [Galvalume® Plus] [PVDF] [SMP] [PVDF Metallic].

Specifier: Delete color for unpainted finishes such as Galvalume® and Galvalume® Plus.

- 6. Color: [Selected from manufacturer standard colors] [As shown on drawings].
- 7. Panel fasteners: [Long-life finish] [Stainless steel].

C. Concealed Fastener Panels:

- 1. Panel type: Single skin panels with concealed fasteners.
- 2. Panel Strength: Determine and certify panel strength as follows:
  - a. Positive Loading (Toward Panel Supports): Determine in accordance with AISI S100.
  - b. Negative Loading (Away from Panel Supports): Determine in accordance with ASTM E 1592.
- 3. Panel Profiles:
  - a. ShadowRib: 16 inches x 3 inches (mm x 76 mm).
  - b. NuWall: 12 inches x 2-1/2 inches (305 mm x 63.5 mm).
  - c. Designer Series: 12 inches x 1-3/4 inch (305 mm x 44.5 mm) flat.
  - d. Designer Series: 16 inches x 1-3/4 inches (406 mm x 44.5 mm) fluted.
  - e. Artisan Panel: 12 inches x 1 inch (305 mm x 25 mm); soffits or interior liner only.
- 4. Thickness: [26 gauge] [24 gauge] [22 gauge].
- 5. Finish: [Galvalume® Plus] [PVDF] [SMP] [PVDF Metallic].

Specifier: Delete color for unpainted finishes such as Galvalume® and Galvalume® Plus.

- 6. Color: [Selected from manufacturer standard colors] [As shown on drawings].
- 7. Panel fasteners: [Long-life finish] [Stainless steel].

D. Foam Insulated Metal Panels

- 1. Basis of Design Manufacturer: Metl-Span. Other approved manufacturers include:
  - a. CENTRIA, subsidiary of NCI Building Systems ([www.centria.com](http://www.centria.com))

Specifier: Although FM Approvals requirements are not required for the majority of projects, the International Building Code does reference FM Approval Standard 4880 in Chapter 26 to qualify foam plastics for the thermal barrier exemption and requires them to be labeled when that exemption is exercised.

- 2. Labeling: Labeled through [a nationally recognized program] [FM Global], identifying the manufacturer, product name and model and product listings required in this section.
- 3. Panel Core: Foamed in-place, Zero Ozone Depletion Potential polyurethane or polyisocyanurate.

Specifier: IBC exempts IMPs from having to be NFPA 285 approved assemblies when they are used as exterior walls one-story buildings equipped with an automatic sprinkler. IBC also exempts IMPs from having to be used with an interior thermal barrier when tested and listed under FM 4880 Class 1 Approval. Retain or edit the following section as necessary.

4. Fire Resistance:
  - a. Third-party listed assembly tested to and meeting the requirements of NFPA 285.
  - b. FM 4880 Class 1 Approval with no height restrictions.
  - c. Flame Spread and Smoke Developed Index: The Flame Spread Index shall not exceed 25 and the Smoke Developed Index shall not exceed 450 when tested to ASTM E84.
5. Panel Strength: Determine and certify panel strength as follows:
  - a. Positive Loading (Toward Panel Supports): Determine in accordance with ASTM E 72.
  - b. Negative Loading (Away from Panel Supports): Determine in accordance with ASTM E 1592.

Specifier: See note regarding specification of U-factor and thickness for IMPs in roof section above.

6. U-Factor Determination: ASTM C 1363 conducted in accordance with ASHRAE 90.1 Section A9.3.2 or by Finite Element Modeling per ASHRAE 90.1 Section A9.4 and using core insulation thermal conductivity (k-factor) determined using ASTM C 518 conducted at 75 degree F mean temperature in the calculation.

Specifier: Retain FM Approvals' listing requirement for FM Global-insured projects or where FM Approval requirements are used as minimum design standard. Select required windstorm classification based upon calculation method in FM Global Loss Prevention Sheet 1-28; note that FM Approvals' windstorm classification does not correlate directly to design wind speed.

7. FM Approvals Rating: Provide FM 4881 Approved panels on the basis of the following ratings. Identify materials with FM Approvals markings:
  - a. Hail: Severe.
  - b. Wind: Class + \_\_\_\_/- \_\_\_\_, Zone H.
8. Through-Fastened Insulated Wall Panels:
  - a. Panel Profile: LS-36.
  - b. Panel Thickness: [1-1/2] [2] [2-1/2] [3] [4] [5] [6] inches ([39] [51] [63.5] [76] [102] [127] [152] mm).
  - c. Panel Width: 36 inches (91 mm)
  - d. Exterior Face:
    - 1) Profile: Stucco embossed 1-1/4 inch (32 mm) high ribs at 12 inch (305 mm) centers.
    - 2) Sheet Thickness: [26 gauge] [24 gauge] [22 gauge].
    - 3) Finish: [PVDF] [SMP] [PVDF Metallic].
    - 4) Color: [Selected from manufacturer standard colors] [As shown on drawings].
  - e. Interior Face:
    - 1) Profile: Stucco embossed [1/8" (3.2mm) Mesa] [1/16" (1.6 mm) Mesa] symmetrical ribs nominally 4 inches (10mm) on centers.

- 2) Sheet Thickness: [26 gauge] [24 gauge] [22 gauge].
  - 3) Finish: [Polyester] [SMP] [PVDF]
  - 4) Color: [Igloo White] [Selected from manufacturer standard colors] [As shown on drawings].
- f. Maximum U-factor: \_\_\_\_\_ BTU/hour-square foot-degree F.
- g. Panel fasteners: Stainless steel.
9. Concealed Fastener Insulated Panels:
- a. Panel profile: CF Vertical.
    - 1) Panel thickness: [2] [2-1/2] [3] [4] inches ([51] [63.5] [76] [102] mm).
    - 2) Panel width: [36] [30] [24] inches ([914] [762] [610] mm).
    - 3) Exterior Face:
      - a) Profile: Flat stucco embossed
      - b) Sheet Thickness: 22 gauge.
      - c) Finish: [SMP] [PVDF] [PVDF Metallic]
      - d) Color: [Selected from manufacturer standard colors] [As shown on drawings].
    - 4) Interior Face
      - a) Profile: Stucco embossed [1/8" (3.2mm) Mesa] [1/16" (1.6 mm) Mesa] symmetrical ribs nominally 4 inches (10mm) on centers.
      - b) Sheet thickness: 22 gauge.
      - c) Finish: [Polyester] [SMP] [PVDF].
      - d) Color: [Igloo White] [Selected from manufacturer standard colors] [As shown on drawings].
    - 5) Maximum U-factor: \_\_\_\_\_ BTU/hour-square foot-degree F.
  - b. Panel profile: CF Mesa.
    - 1) Panel thickness: [2] [2-1/2] [3] [4] [5] [6] inches ([51] [63.5] [76] [102] [127] [152] mm).
    - 2) Panel width: [36] [42] inches ([914] [1067] mm).
    - 3) Exterior Face
      - a) Profile: Stucco Embossed [1/8" (3.2mm) Mesa] [1/16" (1.6 mm) Mesa] symmetrical ribs nominally 4 inches (10mm) on centers.
      - b) Sheet thickness: [26 gauge] [24 gauge] [22 gauge].
      - c) Finish: [SMP] [PVDF] [PVDF Metallic].
      - d) Color: [Selected from manufacturer standard colors] [As shown on drawings].
    - 4) Interior Face
      - a) Profile: Stucco embossed [1/8" (3.2mm) Mesa] [1/16" (1.6 mm) Mesa].
      - b) Sheet Thickness: [26 gauge] [24 gauge] [22 gauge].
      - c) Finish: [Polyester] [SMP] [PVDF]
      - d) Color: [Igloo White] [Selected from manufacturer standard colors] [As shown on drawings].
    - 5) Maximum U-factor: \_\_\_\_\_ BTU/hour-square foot-degree F.

- c. Panel profile: CF Fluted
- 1) Panel Thickness: [2] [2-1/2] [3] [4] [5] [6] inches ([51] [63.5] [76] [102] [127] [152] mm).
  - 2) Panel Width: 42 inches (1067 mm).
  - 3) Exterior Face
    - a) Profile: Stucco Embossed, flutes 1" wide and nominal 3/8" deep, 8-1/2 inch (21.6 mm) on centers.
    - b) Sheet thickness: 26 gauge.
    - c) Finish: [SMP] [PVDF] [PVDF Metallic]
    - d) Color: [Selected from manufacturer standard colors] [As shown on drawings].
  - 4) Interior Face
    - a) Profile: Stucco Embossed [1/8 inch (3.2mm) Mesa] [1/16 inch (1.6 mm) Mesa] symmetrical ribs nominally 4 inches (10mm) on centers.
    - b) Sheet thickness: 26 gauge.
    - c) Finish: [Polyester] [SMP] [PVDF].
    - d) Color: [Igloo White] [Selected from manufacturer standard colors] [As shown on drawings].
  - 5) Maximum U-factor: \_\_\_\_\_ BTU/hour-square foot-degree F.
- d. Panel profile: Santa Fe
- 1) Panel thickness: [2] [2-1/2] [3] [4] inches ([51] [63.5] [76] [102] mm).
  - 2) Panel width: [42] [36] inches ([1067] [914] mm).
  - 3) Exterior Face:
    - a) Profile: Flat Aztec (heavy stucco) embossed.
    - b) Sheet Thickness: [24 gauge] [22 gauge].
    - c) Finish: [SMP] [PVDF] [PVDF Metallic].
    - d) Color: [Selected from manufacturer standard colors] [As shown on drawings].
  - 4) Interior Face
    - a) Profile: Stucco Embossed [1/8" (3.2mm) Mesa] [1/16" (1.6 mm) Mesa] symmetrical ribs nominally 4 inches (10mm) on centers.
    - b) Sheet thickness: [26 gauge] [24 gauge] [22 gauge].
    - c) Finish: [Polyester] [SMP] [PVDF].
    - d) Color: [Igloo White] [Selected from manufacturer standard colors] [As shown on drawings].
  - 5) Maximum U-factor: \_\_\_\_\_ BTU/hour-square foot-degree F.
- e. Panel profile: CF Striated
- 1) Panel thickness: [2] [2-1/2] [3] inches ([51] [63.5] [76] mm).
  - 2) Panel width: [30] [36] [42] inches ([762] [914] [1067] mm).
  - 3) Exterior Face:
    - a) Profile: Stucco Embossed longitudinal striations 1" (25mm) wide and nominal 1/32 inches (0.8mm) deep.
    - b) Sheet thickness: [24 gauge] [22 gauge].

- c) Finish: [SMP] [PVDF] [PVDF Metallic].
  - d) Color: [Selected from manufacturer standard colors] [As shown on drawings].
- 4) Interior face:
- a) Profile: Stucco embossed [1/8 inch (3.2mm) Mesa] [1/16 inch (1.6 mm) Mesa] symmetrical ribs nominally 4 inches (10mm) on centers.
  - b) Sheet thickness: [26 gauge] [24 gauge] [22 gauge].
  - c) Finish: [Polyester] [SMP] [PVDF].
  - d) Color: [Igloo White] [Selected from manufacturer standard colors] [As shown on drawings].
- 5) Maximum U-factor: \_\_\_\_\_ BTU/hour-square foot-degree F.
- f. Panel Profile: 7.2 InsulRib
- 1) Panel thickness: [2-1/2] [3] [4] [5] [6] inches ([63.5] [76] [102] [127] [152] mm).
  - 2) Panel width: 36 inches (762 mm).
  - 3) Exterior Face:
    - a) Profile: Stucco Embossed longitudinal trapezoidal ribs 1 ½ inches (3.8mm) deep and 7.2 inches (18.3mm) on center.
    - b) Sheet Thickness: [26 gauge] [24 gauge] [22 gauge].
    - c) Finish: [SMP] [PVDF] [PVDF Metallic]
    - d) Color: [Selected from manufacturer standard colors] [As shown on drawings].
  - 4) Interior Face:
    - a) Profile: Stucco embossed [1/8 inch (3.2mm) Mesa] [1/16 inch (1.6mm) Mesa] symmetrical ribs nominally 4 inches (10mm) on centers.
    - b) Sheet thickness: [26 gauge] [24 gauge] [22 gauge].
    - c) Finish: [Polyester] [SMP] [PVDF].
    - d) Color: [Igloo White] [Selected from manufacturer standard colors] [As shown on drawings].
  - 5) Maximum U-factor: \_\_\_\_\_ BTU/hour-square foot-degree F.

E. Accessories:

- 1. Base condition:
  - a. Formed base: Pre-finished bronze, self-flashing, for through-fastened panels.
  - b. Base member: [Angle] [Channel] [Girt].
  - c. Base member flashing: [Drip] [Masonry] [As indicated on Drawings].
- 2. Framed openings:
  - a. Finish: [Match girt finish] [Pre-Galvanized].
  - b. Framed opening trim: [Standard jamb, head, sill trim package] [Standard trim plus full cover trim on exposed jambs and headers].
- 3. Trim profiles: [Manufacturer's standard profiles] [As indicated on Drawings].

F. Wall Light Transmitting Panels (LTP):

1. Material: Provide UV-resistant, [Chopped Glass] [Woven Roving] fiber-reinforced acrylic LTP meeting the following requirements:
  - a. Self-Ignition Temperature: 650 degrees Fahrenheit (343 degrees Celsius) when tested in accordance with ASTM D 1929.
  - b. Diffuse Light Transmission: Not less than 50% when tested to ASTM D 1494.
  - c. Burn Rate: Less than 2.5 inches per minute when tested in accordance with ASTM D 635.
  - d. Smoke Developed Index: Not greater than 450 when tested in accordance with ASTM E 84.
  - e. Haze Value: Not less than 90% when tested in accordance with ASTM D 1003.

Specifier: LTPs are not generally recognized by ASHRAE 90.1 and as such, don't have explicit U-factor or SHGC requirements or accepted methods other than testing or modeling to determine their performance levels. Therefore, it is recommended that the supplier be asked to provide the values in their submittal so that they can be used in code compliance calculations, rather than set them specifically.

- f. Thermal Transmission: Provide U-Factor determined by ASTM C 1363 conducted in accordance with ASHRAE 90.1 Section A9.3.2 or by Finite Element Modeling per ASHRAE 90.1 Section A9.4
    - g. Solar Heat Gain Coefficient: Provide SHGC determined by NFRC 200.
  2. Through-Fastened wall LTP: Provide [single] [double] layer LTP that match the profile of the wall panel.

G. Walk Doors:

1. Source: [Specified in other sections] [By metal building system manufacturer].
2. Size: [3 x 7 feet] [4 x 7 feet] [6 x 7 feet] [As indicated on Drawings].
3. Elevation: [Solid] [Narrow lite] [Half glass] [As indicated on Drawings].
4. Type: [Insulated] [Non-insulated].
5. Hardware:
  - a. [Cylindrical] [Mortise] lockset.
  - b. Exit device.
  - c. Weather stripping and threshold.
  - d. Closers.
  - e. Kick plate.
  - f. Latch guard.
  - g. Chain stops.
6. Frame type: [Self framing] [Framed openings].
7. Door assembly: [Knocked down for field assembly and glazing] [Pre-assembled with glazing included].
8. Glazing: [Laminated] [Tempered].
9. Finish: [White primer] [Bronze primer].

H. Windows:

1. See Section
2. Source: [Specified in other sections] [By metal building system manufacturer].

I. Louvers:

1. Source: [Specified in other sections.] [By metal building manufacturer].

2. Size: [To be selected from available sizes] [[2 x 2] [3 x 2] [3 x 3] [4 x 3] [3 x 4] [5 x 4] [\_\_ x \_\_] feet].
3. Type: [Fixed] [Adjustable].
4. Frame type: [Self framing] [Framed openings].
5. Finish: [Match adjacent wall color] [\_\_\_\_\_].

## 2.8 FABRICATION

### A. General:

1. Shop-fabricate framing members for field bolted assembly.
2. Surfaces of bolted connections: Smooth and free from burrs and distortions.
3. Shop connections to conform to manufacturer's standard design practices.
4. Mark framing members with identifying mark.
5. Welding to conform to AWS D1.1 and AWS D1.3 as applicable.

### B. Primary Framing:

1. Plates, stiffeners, and related members: Factory welded base plates, splice plates, cap plates, and stiffeners into place on structural members.
2. Bolt holes and related machining: Shop fabricate base plates, splices and flanges to include bolt connection holes. Shop-fabricate webs to include bracing holes.
3. Secondary structural connections (purlins and girts): Ordinary (not pretensioned) bolted connections with welded clips.
4. Welding inspection: Per IAS AC472 Part A.

### C. Long Bay Purlins:

1. Fabricate purlins from cold-formed open web long bay system assemblies with stiffened chords.
2. Install connection bolts through purlin seats.
3. Pre-punch assemblies to allow for attachment of frame flange brace angles, compression strut extensions, and diagonal X-bridging at centerline.
4. Furnish bridging as light-gauge cold-formed angles secured using self-drilling fasteners.
5. Manufacture sections in IAS AC472 Part A and B Accredited facility.
6. Top and bottom chords: Nominal 4 inch (102 mm) width formed so that top surface is continuous and flat to facilitate easy assembly of roof system.
7. Fabricate all elements of minimum 16 gauge steel.
8. Subject finished assemblies to periodic testing to loads equal to 110 percent of design loads.

### D. Zee Purlins:

1. Fabricate purlins from cold-formed Z-shaped sections with stiffened flanges.
2. Size flange stiffeners to comply with requirements of AISI S100.
3. Purlin flanges unequal in width for easier nesting during erection.
4. Purlins pre-punched at factory to provide for field bolting to rigid frame clips.

### E. Eave Struts:

1. Fabricate eave struts from cold-formed unsymmetrical C-shaped sections with stiffened flanges.
2. Size flange stiffeners to comply with requirements of AISI S100.
3. No welded splices permitted.
4. Eave Struts pre-punched at factory to provide for field bolting to rigid frame clips.

- F. Girts: Simple or continuous span as required by design. Connection bolts will install through webs not flanges.
- G. Bracing:
1. Diagonal Bracing:
    - a. Diagonal bracing in roof and sidewalls may be used to resist longitudinal loads in structure when panel diaphragm cannot be used.
    - b. Furnish to length and equipped with hillside washers and nuts at each end.
    - c. Bracing may consist of rods threaded at each end or galvanized cable with suitable threaded end anchors.
    - d. If load requirements dictate, bracing may be of structural angle or pipe, bolted in place.
  2. Special Bracing:
    - a. When diagonal bracing is not permitted in sidewall use rigid frame type portal or fixed base column.
    - b. Shear walls may be used where adequate to resist applied wind or seismic forces.
  3. Flange Braces: Brace compression flange of primary framing laterally with angles connecting to purlin or girt webs so that flange compressive stress is within allowable limits for any combination of loading.
  4. Bridging:
    - a. Laterally brace top chord of long bay purlins with horizontal bridging if roof system being used will not supply adequate lateral support to top chord.
  5. Horizontally bridge bottom chord for lateral bracing. One row of bolted diagonal bridging required for long span purlins 40 feet (12 192 mm) long and longer.
- H. Standing Seam Panels:
1. Provide factory fabricated and finished metal panels and accessories meeting performance requirements, indicated profiles and structural requirements.
  2. Fabricate metal joints configured to accept applied sealant providing weathertight seal and preventing metal to metal contact and minimizing noise resulting from thermal movement.
  3. Fabricate panels in continuous lengths for full length of detailed runs, except where otherwise indicated on drawings.
  4. Sheet Metal Flashing and Trim: Fabricate or install flashing and trim to comply with manufacturer's written instructions and construction drawings.
  5. Configure Ultra-Dek and Double-Lok panels with interlocking edges with factory applied hot-melt mastic inside female seam. Female side snaps over male side (Ultra-Dek) and when seamed (Double-Lok) creates continuous lock, forming 360 degree Pittsburgh seam.
  6. Notch Ultra-Dek and Double-Lok panels at factory at both ends so that field installation can commence or terminate from either end of building.
  7. Maximum panel length: 45 feet (13 716 mm) unless otherwise indicated.
- I. End Laps:
1. Fabricate with 16 gauge backup plates and eight end lap joint fasteners installed in six pre-punched holes in flat and in dimples in trapezoidal legs.

2. Apply mastic between panels and secure with self-drilling fasteners through panels and backup plate.
3. Through roof fasteners may be used only at end laps and eaves.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean surfaces prior to installation.
- B. Prepare surfaces using methods recommended by manufacturer for best result for substrate.

### 3.2 INSTALLATION

- A. Install system in accordance with manufacturer's instructions and approved Shop Drawings.
- B. Fit members square against abutting components.
- C. Position members plumb, square, and level.
- D. Temporarily brace members until permanently fastened.
- E. Do not splice load bearing members.
- F. Align and adjust various members forming parts of a complete frame or structure after assembly but before fastening.
- G. Welding to conform to AWS D1.1.
- H. Fasten panels to supports.
- I. Install trim to maintain visual continuity of system.
- J. Install joint sealant and gaskets to prevent water penetration.
- K. Flash penetrations through roofing with metal trim to match panels

### 3.3 PROTECTION

- A. Protect installed products until completion of project.

### 3.4 ADJUSTMENT

- A. Touch up, repair, or replace damaged products before Substantial Completion.

END OF SECTION

## **Professional Memberships and Licenses**

**American Institute of Steel Construction\***  
**American Welding Society\***  
**International Code Council (ICC) - Member**  
**Metal Building Manufacturers Association - Member**  
**American Society of Civil Engineers\***  
**National Society of Professional Engineers\***  
**Oklahoma Society of Professional Engineers\***  
**Oklahoma Structural Engineers Association\***

\*Star supports membership under one or more individual employee's names

**Professional Engineers Licensed in 50 States and Canada**

## **Design and Fabrication Approvals**

### **Canadian Standards Association Certifications**

CSA A660 Design & Fabrication Certification - Elizabethton, TN Plant  
CSA A660 Design & Fabrication Certification - Monticello, IA Plant  
CSA W47.1 Welding Certification - Elizabethton, TN Plant - Letter of Validation  
CSA W47.1 Welding Certification - Monticello, IA Plant - Letter of Validation

### **International Accreditation Service, Inc, Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems AC472, per Section 1704.2.2 of the International Building Code.**

Star Building Systems Design Facility, Oklahoma City, OK, MB-122  
Star Building Systems Design Facility, Lockeford, CA, MB-127  
NCI Building Systems Inc. Fabrication Facility, Monticello, IA, MB-136  
NCI Building Systems Inc. Fabrication Facility, Elizabethton, TN MB-129  
NCI Building Systems Inc. Fabrication Facility, Spokane, WA MB-142  
NCI Building Systems Inc. Fabrication Facility, Lexington, TN MB-118  
NCI Building Systems Inc. Fabrication Facility, Atwater, CA MB-125  
NCI Building Systems Inc. Fabrication Facility, Fairview Plant, Houston, TX MB-110  
NCI Building Systems Inc. Fabrication Facility, Monterrey, Mexico MB-111  
Metl-Span Fabrication Facility, Jackson, MS MB-202  
Metl-Span Fabrication Facility, Las Vegas, NV MB-230  
Metl-Span Fabrication Facility, Lewisville, TX MB-229  
Metl-Span Fabrication Facility, Mattoon, IL MB-231  
Metl-Span Fabrication Facility, Prince George, VA MB-232  
Metl-Span Fabrication Facility, Shelbyville, IN MB-233