SECTION 13120

PRE-ENGINEERED METAL BUILDING FACILITY

1.01 GENERAL

A. SUMMARY-The intent of this specification and drawings is to establish a quality and performance level for structural design, material, durability, and workmanship in the construction of the building involved.

B. CODES AND REFERENCES

1. Other References. The following publications and standards shall be used where applicable in the structural design of the building herein specified (latest editions).

   a. Metal Building Systems Manual (MBMA) (Except for wind loads - see Section 1.01.C.4.a below)
   b. Manual of Steel Construction (AISC)
   c. Cold-Formed Steel Design Manual (AISI)
   d. Structural Welding Code (AWS D1.1)
   e. Annual Book of ASTM Standards (ASTM)
   f. AISC 4.1.2 - AISC Steel Design Guide Series 3 - Serviceability Design Consideration for Low-Rise Buildings
   g. AISI SG-2000-1 - Specification for the Design of Cold-Formed Steel Structural Members
   h. ASCE 7 - Minimum Design Loads for Buildings and Other Structures
   i. ASTM A653 – Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
   j. ASTM A123 - Standard Specification for Zinc “Hot Dipped Galvanized” Coating on Iron and Steel Products
   k. SSPC SP1 - Surface Preparation Specification No. 1, Solvent Cleaning
   l. SSPC SP3 - Surface Preparation Specification No. 3, Power Tool Cleaning
   m. SSPC SP7 - Surface Preparation Specification No. 7, Brush-Off Blast Cleaning

C. SYSTEM DESCRIPTION

1. Building Code. The latest edition of the Building Code used by the local, county or state building permit agency, Occupational Safety and Health Administration Standards and the Americans with Disabilities Act (28 CFR Part 36 architectural guidelines) shall govern. Use the most stringent requirements of Monsanto Specifications or the Building Code. If a building code has not been adopted, use the latest edition of the IBC. Any conflicts or inconsistencies between the specification and other documents shall be brought to Monsanto’s attention for resolution.

2. Foundations Unless otherwise instructed by Monsanto, the Contractor shall engage the services of a registered geotechnical engineer, registered in the State the project is constructed, to develop and present final recommendations for the design of all building foundations, including foundations for connecting structures to existing buildings if applicable.

   The net allowable soil bearing pressure shall be shown on the design drawings and shall be as stated in the Geotechnical Exploration and Foundation Investigation Report or as required by the Building Code.

One copy of the Geotechnical Exploration and Foundation Investigation Report shall be provided to the Monsanto representative.

In addition to any/all foundations required to support loads from the building's frame, parts/portions of the building (walls, partitions etc.), where interior slab surfaces are required, a 6" minimum thick slab-on-grade reinforced with 6x6-W4xW4 minimum (or heavier wherever required) welded wire fabric shall be provided over the interior of all buildings. The final slab thickness shall be determined by a registered structural engineer engaged by the Contractor.

The design loads, including uplift, shall meet or exceed those of the building code having jurisdiction. Basic design loads shall include live and wind, in addition to dead load. All other design loads, whether they are of static, dynamic, or kinetic nature, shall be considered as auxiliary loads.

3. All framed openings for windows, doors, and other appurtenances shall be designed to structurally replace the wall, roof covering, or framing they displace.

4. The drawings shall indicate the design loads subject to the following minimum requirements:

   a. **Wind Load. Per ASCE 7, exposure "C", 3 second gust wind speed (90 mph).**

   b. Snow Load. Minimum ground snow load (30 pounds per square foot).

   c. Roof Live Load. The minimum roof live load considered to act vertically upon the horizontal projection of the roof shall not be less than 20 pounds per square foot.

   d. Collateral Loads. These additional (minimum) dead loads shall be applied as 5 pounds per square foot for roof systems supporting sprinkler systems and 3 pounds per square foot for all other roof systems. These loads are for hanging loads for ducts, piping, conduit, lighting, etc. The structural purlins and frames shall be designed to carry these loads.

   e. Seismic Loads. Shall comply with governing code requirements.

   f. Frame Loading. The tributary roof loads, plus any concentrated special loads, wind shears, etc. shall govern frame design.

5. Combination of Loads. The combining of normal loads and auxiliary loads for design purposes shall be as prescribed and recommended by the Metal Building Manufacturers Association "Metal Building Systems Manual".

   In addition, the building's foundations and anchorage to same shall be adequate to resist a worst case of uplift due to wind or seismic in which the collateral loading is assumed not to exist.

6. Energy Conservation. New construction of walls, roofs, and glazing shall meet the energy investment equivalents requirements as designated by local regulation.

7. Deflection. Deflection requirements shall be in accordance with the applicable provisions of the AISC Steel Design Guide Series 3 - Serviceability Design Considerations for Low-Rise Buildings. Members directly supporting metal roof covering shall be so

proportioned that the maximum live load deflection will not exceed 1/180 of the span.

D. SUBMITTALS

1. Certification. All bidders must submit with their bid proposal, a letter certifying that the building proposed will meet or exceed all of the above design criteria. The roof shall be certified with a UL90 uplift rating.

After the awarding of the contract, submit one copy of all design calculations sealed by a registered professional engineer for the metal building including:

a. Un-factored reactions to the foundation shall be provided separately for each load type and combination.
b. Deflection calculations as required per the System Performance Requirements.

Calculations shall include separate structural design criteria sheets stating the legal codes, design loads, load combinations and other design criteria for the metal building design.

2. Drawings.
Submittal drawings shall be provided to Monsanto for review and comment prior to erection. Drawing submittals shall include:

a. Assembly and erection for the metal building structural framing system, components and accessories prepared by or under the supervision of a professional engineer legally authorized to practice in the state where the project is located.
b. Final checked and sealed shop fabrication drawings and erection drawings. All shop drawings shall identify materials of construction by type material, ASTM, or other identification, gage, thickness, etc.
c. Foundation loads and reactions, accompanied by anchor bolt setting plans and anchor bolt specifications.
d. Final drawings shall be made compatible with Monsanto's computer drawing system. Drawing format shall be either Microstation DGN format or DXF format.

3. Warranties. The Contractor shall furnish the metal building manufacturer's three (3) year limited warranty against failures caused by faulty or substandard material within limits set by the warranty. This warranty shall also certify the design criteria for the structural design of the building. In addition, the warranty shall include a one (1) year workmanship guarantee against any defects due to faulty erection, a twenty (20) year water tightness roof warranty against leaks arising out of or caused by ordinary wear and tear under normal weather and atmospheric conditions and a twenty (20) year warranty period for factory applied exterior finishes on roof and wall panels and associated trim.

4. Maintenance and Installation Manual. Submit two (2) identical bound three-ring binder manuals to include the following: Outer jacket labeling to read "Maintenance Manual" - name of project, completed date; table of contents; list of prime and subcontractors with key personnel, addresses and phone numbers; letter of one year guarantee; copies of extended warranties; maintenance instructions and installation instructions.

5. Permits. The Contractor is responsible for obtaining all necessary permits to design, construct and occupy the building.

E. QUALITY ASSURANCE

1. Installer Qualifications. Dealer/Installer must be certified as a manufacturer's authorized and franchised dealer to sell and install the system to be furnished. Dealer/Installer must have been regularly engaged in the installation of metal building systems of the same or equal construction for at least two (2) years.

2.. Manufacturer's Qualifications AISC Certification - The building system manufacturer shall be American Institute of Steel Construction-Category MB certified. Pre-engineered metal buildings must be manufactured by an accepted firm experienced in manufacturing metal building systems that are similar to those indicated for this project and have a record of successful in-service performance.

F. DELIVERY, STORAGE AND HANDLING

1. Delivery. Deliver primary frames, secondary framing, panels, trim flashing, accessories, bolts, nuts, washers and other erection hardware in building manufacturer's unopened packs and containers identified with building manufacturer's name and contents of each carton or pack.

2. Storage. Store materials off ground and protect from damage. Slope galvanized secondary material and panel packages to avoid moisture accumulation and provide drainage.

3. Handling. Handle material properly to protect from damage.

2.01 PRODUCTS

All materials shall be new, unused, and free from defects. All parts of the building are to be accurately made and true to dimension so that during erection all parts shall fit together easily. Brochures describing all material shall be included with the shop and/or erection drawings.

A. FRAMING MATERIALS

1. Steel Sections Greater Than 1/8" in Thickness. Structural members shall be hot rolled structural sections, cold formed shapes, or built-up shapes of welded plate construction. All structural members 1/8" and thicker shall conform to the requirements of ASTM A36 and shall be uncoated.

2. Steel Sections or Members Less Than 1/8" in Thickness. Material for fabricated structural members less than 1/8" thick and at least 16-gage shall be galvanized steel conforming to Grade B (37,000 yield) per ASTM A653 or equivalent specification. This requirement for galvanizing shall not apply to bar joists.

3. Painting. Unless otherwise specified, all uncoated structural framing and components except anchor bolts and fasteners shall be given the building manufacturer's standard prime coat of paint. The primer color should be grey, unless otherwise specified.

4. Galvanizing and Painting. All hot-rolled forms and built-up sections shall be shop-primed. All cold-formed sections shall be galvanized.

5. Shop-Prime. Surfaces to be primed shall be cleaned of loose mill scale, rust, dirt, oil, grease and other matter precluding paint bond. Follow procedures of SSPC SP3 for power tool cleaning, SSPC SP7 for brush-off blast cleaning and SSPC SP1 for solvent cleaning. Prime the primary and secondary structural framing members with the manufacturer's standard rust-inhibitive primer, unless otherwise indicated.

6. Galvanizing. Galvanize cold-formed sections in accordance with ASTM A653 - Standard Specification for Steel Sheet Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

7. Anchor Bolts. Foundation anchor bolts shall be ASTM A307 or A36 and of proper size to adequately resist all applicable design loads at bases of columns, frames, and walls. They shall be positioned according to the dimensions and locations shown on the anchor bolt layout. The bolts shall be furnished according to the pre-engineered metal building manufacturer's specifications.

8. Bolting. High strength bolts shall be hot-dipped galvanized and shall conform to ASTM A325 and shall be used in all primary structural and bracing connections. All other secondary bolted connections shall use galvanized bolts conforming to either ASTM A307 or A325.

9. Wall Panel Fasteners. Provide manufacturer's standard self-drilling stainless steel screws with sealing washers for liner panels and/or exterior single sheet wall panels. All exposed fastener heads will be factory colored to match color of panels.

10. Roof Panel Fasteners. Panel clips for standing seam panels; provide manufacturer's standard sliding design to allow for unrestrained expansion and contraction movement of panels. Provide complete with plated self-drilling fasteners at each clip.

11. Other Items. Manufacturer's standard self-drilling stainless steel screws with sealing washer. All exposed fastener heads will be factory colored to match color of panels.

B ROOF PANELS AND INSULATION.

1. Standing Seam Corrugated Roof Panel (TYPES R1 and R3) (Note: Type R3 is for building space that is heated or air-conditioned.)

   Building Manufacturer shall provide standing seam roof panels precision roll-formed to provide 24" coverage from 24-gage, 50,000 psi minimum yield steel. Exterior finish shall be G-90 Galvalume. The panel edges shall join together to form a standing seam. The seam shall be a machine-closed, double lock (360°) design with factory-applied sealant. Panels shall be longest length possible to minimize end splices. The panels shall be secured to the structure with concealed clips designed to accommodate the roof expansion/contraction and to provide a 1" insulation stand-off.

   Contractor shall furnish and install single layer insulation system consisting of fiberglass insulation, covered with a heavy duty polyethylene fabric protective barrier to conceal the insulation. Insulation and barrier shall be installed, bonded and banded to provide uniform insulation properties throughout the roof panel. The insulation property for the roofing system shall be 0.053 U Factor (for Type R1) or 0.033 U Factor (for Type R3) in accordance with ASTM C-236.

   Roof shall carry a UL90 uplift rating.

   In cold weather climate area, provide snow and ice protection. Equipments and people must be protected from falling snow and ice by use of canopies or snow/ice guards. An approved manufacturer is Sno-Gem, Inc. Screws through the roof are not allowed to be used to fasten the guard to the roof. Design and installation must be per manufacturer requirements.

2. Pre-Insulated Standing Seam Roof Panel (TYPE R2)

Building Manufacturer shall provide a 2" high standing seam factory-insulated roof panels; Mesa wave pattern between the seams. Panels shall provide 42" wide net coverage and shall be 4" thick. The panel shall be a composite of 26-gage, stucco embossed metal skins bonded to a rigid polyurethane foam insulation core. The exterior face metal skin shall have a stucco embossed G-90 Galvalume finish. The interior face metal skin shall have a stucco embossed G-90 Galvalume finish with white siliconized polyester finish; 1/8" deep Mesa wave pattern. Panels will have an interlocking joint design with a repeating pattern to conceal the side joint. The insulation property of the pre-insulated roof panel system shall be 0.031 U Factor in accordance with ASTM C-236.

Roof shall carry a UL90 uplift rating.

In cold weather climate area, provide snow and ice protection. Equipments and people must be protected from falling snow and ice by use of canopies or snow/ice guards. An approved manufacturer is Sno-Gem, Inc. Screws through the roof are not allowed to be used to fasten the guard to the roof. Design and installation must be per manufacturer requirements.

C. WALL PANELS AND INSULATION

1. Roll-Formed Corrugated Wall Panel (TYPE W1-NC and TYPE W1-CC)

The exterior wall shall be semi-concealed fastener wall panel constructed of 26-gage precision roll-formed galvanized steel with minimum yield strength 50,000 psi. Exterior finish shall be G-90 Galvalume. The panels shall have a cross section profile consisting of trapezoidal ribs, 1" high and 12" on-center with two minor corrugations between the ribs. The panel type shall be such that the ribs protrude outward on the exterior face of the panel. For the new buildings in the existing Monsanto plants, the wall panel cross section profile shall match as closely as possible the existing wall panels of the adjacent plant building.

Panel side laps shall occur at the rib to semi-conceal the fasteners. Side-lap shall be a minimum of one full rib corrugation. The overlapping panel edge shall be hemmed to eliminate exposed raw edges. The panels shall be of the longest length possible to minimize end splices. Panel end splices shall be over a structural member and shall be a 4" minimum lap. Corner trim, base trim and transition flashing will be provided as required to complete the wall assembly. Closures and fasteners will be provided as required to provide a weather-tight installation.

Contractor shall furnish and install single layer insulation system consisting of fiberglass insulation, covered with a heavy duty polyethylene fabric protective barrier to conceal the insulation. Insulation and barrier shall be installed, bonded and banded to provide uniform insulation properties throughout the wall.

The wall panel color selection shall be in compliance with the bid documents' requirements and be submitted to the Monsanto for approval.

The insulation property for the wall system shall be in accordance with ASTM C-236 and as follows:

TYPE W1-NC: U Factor of 0.077.
TYPE W1-CC: U Factor of 0.0382

2. Pre-Insulated Wall Panel (TYPE W2)

The exterior wall shall be factory-insulated concealed fastener wall panels manufactured to provide a 42" wide net coverage. Each panel shall be a composite of 26-gage, stucco embossed metal skins, G-90 Galvalume, bonded to a rigid foamed-in-place polyurethane foam insulation core. Joint weather-tightness shall be provided by tongue and groove edge profile and field applied butyl caulk for vapor and condensation control. Panel lengths shall be longest possible to minimize splices. Panels shall be attached to the supporting structures at each panel joint with concealed clip and fasteners. The liner panels shall have shallow "V" grooves on 2" centers. The liner material shall be hot-dipped galvanized G-90 with white siliconized polyester finish. The insulation property of the insulated wall panel shall have a 0.0382 U Factor in accordance with ASTM C-236.

The wall panel color selection shall be in compliance with the bid documents' requirements and be submitted to the Monsanto for approval.

D. MANUFACTURED UNITS

Multi-span gable or single slope rigid frame structure

1. Concrete. All concrete work shall be proportioned to provide a minimum 28-day compressive strength of 4000 psi and comply with project cast-in-place concrete specification, Section 03300.

2. Fill and Backfill. All fill and backfill materials, their placement and compaction, as well as any/all site preparation necessary to construct the building facility, shall comply with project earthwork specifications, Sections 02100 and 02220.

3. Appurtenances. Appurtenances shall conform to the following minimum requirements. Building manufacturer shall design building framing for integral installation of appurtenances with the wall system.

   a. Windows. Aluminum windows shall comply with project window specification. Glazing for all windows shall be a minimum of ¼" laminated safety glass.
   b. Personnel Doors. Steel doors shall comply with project steel door specification and the door schedule. Locks shall be per plant standard.
   c. Steel Roll-Up or Vertical-Lift Doors. Shall comply with the project steel roll-up door and vertical-lift door specifications and the door schedule, as well as local building and fire codes.

4. Gutters and Downspouts. Gutters for standing seam roof shall be suspended box sections of 26-gage galvanized steel formed to match the configuration of the gable trim. Gutters shall be independent of the roof seal and shall be attached to the eave strut adapter by means of a gutter hanger.

Gutter hangers shall be spaced at 4'-0" centers and attached to one side face of gutter and eave adapter by #12 self-drilling screws and to outer face of gutter by trim fasteners.

Downspouts shall be 29-gage galvanized factory-colored steel with a minimum cross section of 20 square inches.

Downspouts shall be attached to a thimble installed in the gutter. Downspouts shall be attached to the wall panel using 26-gage galvanized factory-colored steel straps on 10'-0" centers.

A 75° elbow with concrete splash block or terminate in underground piping as shown on the drawings shall be provided at the base of all downspouts to direct the water flow away from the building.

5. Sealant.
Factory-Applied Roof Panel. Non-shrinking, non drying, butyl-based sealant specifically formulated for factory application in standing seams and to allow roof panel assembly at temperatures from –10°F to +140°F or manufacturer's standard type as approved by Monsanto.

Field-Applied Roof Panel Sealant. Approved type, non-shrinking, non-drying, butyl-based sealant specifically formulated for roof application at temperatures for 20°F to 120°F or manufacturer's standard type as approved by Monsanto.

6. Closures. The top and bottom ends of the steel sidewall panels must be closed off with closures. Closures must be placed to prevent deforming the side sheets when the screws are installed, preferably with the screws passing through the tabs of the closure strips. Closure shall consist of a dense rubber with 30 (+/-5) Shore - A durometer hardness, preformed to the panel profile. Foam closures are not acceptable.

Bottom closure shall include the dense rubber and a metal closure architecture flashing strip.

7. Louvers Wherever applicable and specified in the design drawings, louvers shall be of a minimum of 18-gage steel. Fold or bend blades at edges to set them at an angle that excludes driving rains, and secure blades to frames by riveting or welding. Provide galvanized steel bird/insect screens in rewirable frames on exterior face of louvers. Prime and finish to match wall panels. See HVAC Design Criteria for additional information.

3.01 EXECUTION

A. Erection and Installation. The erection of the metal building and the installation of appurtenances as set forth in the specifications and proposal shall conform to the Code of Standard Practices of the MBMA "Metal Building System Manual". The erection procedure outlined and recommended by the building manufacturer shall be followed as closely as possible and, together with acceptable trade practices, shall conform to details and instructions as shown on the erection or assembly drawings.

The erector shall be responsible for all grouting of structural steel columns. Grouting shall employ non-shrink cementitious grouts meeting the requirement of CRD-C621.

B. Roofing and Siding. All roofing/siding and accessories shall be installed in strict compliance with manufacturer's recommendations and final shop drawings. First horizontal girt shall be

installed such that the web is a maximum of 4 feet above the finished floor. Girt design and installation shall be such that the interior flange of either a “C” or “Z” shape is installed in the down-position on the inside of the building. Arrange and nest side lap joints away from prevailing winds when possible. Side lap joints shall have sealant applied. Install at base of wall a C-Channel attached to foundation or floor for bottom anchorage of plywood or liner panel.

C. Roof/Wall Openings. Openings 12" or smaller may be flashed and sealed to the roof panels providing this result in complete support and weather-tightness.

Openings larger than 12" round or square, shall be framed with a welded metal base fabricated from 14-gage minimum zinc coated steel. The base and its appurtenances shall be supported by the roof purlins or headers framing (if required). The base shall have a minimum projection of 6" above the weather surface of the roof, and shall be properly flashed and sealed to the roof panels, providing complete support and water-tightness.

All wall openings shall be constructed to be weather-tight.

D. Wall and Roof Fiberglass Insulation. All insulation shall be installed according to the Manufacturer installation bulletin. Contractor shall furnish and install single layer insulation system consisting of fiberglass insulation, U factor as specified under the roof and wall panel paragraphs. Insulation shall be covered with a heavy duty polyethylene fabric protective barrier to conceal the insulation. Insulation and barrier shall be installed, bonded and banded to provide uniform insulation properties throughout the wall. The wall and roof vapor barrier must have a permeance (perm) rating of 0.10 or less and be continuous. Joints, penetrations and other holes must be sealed with suitable caulks, sealants and tapes.

E. The installer shall be authorized by the panel manufacturer and the actual work shall be supervised by a person having a minimum of five (5) years installing composite foam panels on similar type and size projects.

F. Inspection, fastening, and erection of the climate-controlled buildings must be performed in strict compliance with the manufacturers written installation instructions, layout drawings, and specifications. All materials (wall and roof panels, fasteners, trim, sealant, tape, etc.) used in construction of the warehouse must comply with specifications of the manufacturer.

G. The slab under the climate-controlled buildings shall be designed with a ½” asphalt expansion joint between the climate-controlled building and adjoining slab. A polyethylene vapor barrier (8 mils thick minimum) shall be installed between the earth and the concrete flooring. The slab shall have crushed rock base to prevent moisture and temperature migration through the slab.

H. Rigid Foam Insulation Install rigid foam insulation on the inside face of foundation wall and footings. Insulation shall be 1-1/2” thick and extend 24-inches below the bottom of slab.

I. Cleaning and Touch-Up Paint Clean all component surfaces. Touch up paint abrasions, marks, skips, and other defects to finished surfaces with same type of finish.