

Division 13

	<u>Page Nos.</u>
Section 13-A Prefabricated Buildings	13A-1 to 21
Section 13-B Welding and Nondestructive Testing	13B-1 to 9

Section 13A

Prefabricated Buildings

	<u>Page No.</u>
1.0 Scope	13A-1
2.0 General	13A-1
2.1 Codes and Standards	13A-1
3.0 Detailed Requirements	13A-2
3.1 Material	13A-2
3.2 Substitutions	13A-2
3.3 Design Criteria	13A-3
3.4 Prefabricated Building Components	13A=3
3.5 Other Components	13A-10
4.0 Installation	13A-17
4.1 Dissimilar Materials	13A-19
5.0 Testing	13A-20
6.0 Information to be Submitted	13A-20
6.1 Technical Data	13A-20
6.2 Drawings	13A-20
6.3 Certificates	13A-20
6.4 Design Calculations	13A-20

DIVISION 13

SECTION 13A

PREFABRICATED BUILDINGS

1.0 SCOPE

This Specification Section includes the furnishing and installation of the Treatment Plant and Pump House buildings all as indicated on the drawings and described in the specification.

2.0 GENERAL

2.1 Codes and Standards

The Work shall conform to the latest edition and latest addenda thereto, as of date of award, of the following codes and standards.

- .1 Metal Building Manufacturers' Association  
Recommended Design Practices Manual
- .2 American Welding Society  
Standard Code for Arc and Gas Welding  
in Building Construction
- .3 American Institute of Steel Construction  
Specifications for the Design, Fabrication  
and Erection of Structural Steel for Buildings
- .4 American Iron and Steel Institute  
Specifications for the Design of Light Cold-  
Formed Steel Structural Members
- .5 American Iron and Steel Institute Publication  
Specifications for the Design of Light Gage  
Cold Formed Steel Structural Members
- .6 Architectural Aluminum Manufacturers Association  
Aluminum Windows Specifications
- .7 Commonwealth of Pennsylvania Code and Regulations

.8 American Society for Testing and Materials

A36 Structural Steel  
A141 Structural Rivet Steel  
A325 High Strength Steel Bolts for  
Structural Steel Joints, including  
suitable nuts and plain hardened  
washers

.9 Federal Specification

QQ-S-775 Steel Sheets, Carbon, Zinc Coated

TT-P-86 Paint: Red-Lead Base,  
Ready-Mixed, Type II

3.0 DETAILED REQUIREMENTS

3.1 Material

Prefabricated rigid frame buildings with extension shall be the product of Butler Manufacturing Company; Kansas City, Missouri or equal approved by Engineer.

Prefabricated construction shall include but shall not be limited to the following:

- .1 Structural Steel
- .2 Roof purlins, girts, bracing
- .3 Exterior wall and roof panels
- .4 Properly flashed curbs and supports for roof fans on roofs
- .5 Louvers, doors, door frames and hardware
- .6 All required fasteners and erection hardware
- .7 Windows, glass and glazing
- .8 Properly framed and flashed openings for boiler stack conduits pipes and ductwork through walls and roof
- .9 Flashing and trim
- .10 Factory painting

3.2 Substitutions

The materials hereinafter specified describe minimum acceptable requirements. Deviation from details and construction

procedures using manufacturer's specified standards are acceptable provided such deviations are equal to, or exceed, those specified herein.

### 3.3 Design Criteria

Design of all prefabricated metal buildings shall be in accordance with the Metal Building Manufacturers Association's "Recommended Design Practices Manual".

Rigid frame structures shall be designed for a wind load of 20 pounds per square foot on walls and 30 pounds per square foot on roofs. Structures also shall be designed for any additional imposed loads. Fasteners for roof uplift forces shall conform to the MBMA design requirements. Roof slope shall be 1:12.

### 3.4 Prefabricated Building Components

Rigid frame buildings, as shown on drawings, shall be gabled, rigid frame with tapered column and rafter sections of shop welded steel plate. All base plates, cap plates, ridge plates, and stiffener plates shall be factory welded into place and have the proper bolt connection holes shop fabricated. Contractor shall furnish all anchor bolts.

Steel framework shall be in accordance with the Steel Construction Manual of the American Institute of Steel Construction. Steel framing less than 3/16 inch thick shall be in accordance with the American Iron and Steel Institute's Light Gauge Steel Design Specification.

All splice plates shall be shop fabricated in proper sizes with bolt connection holes shop fabricated.

Columns and roof beams shall be shop fabricated complete with holes in webs and flanges for attachment of secondary structural members and bracing.

Purlins shall be 9-1/2" deep "Z" shaped, precision roll formed. Purlins shall be attached to rigid frames by manufacturer's standard connection.

Girts shall be "Z" shaped, precision rolled formed. Outer flange of all girts and purlins shall be factory punched holes for panel connections.

Eave struts shall be 9-1/2" deep, unequal flange, "C" shaped cold formed members. The web and outer flange of all eave struts shall contain factory punched holes for panel connections.

End wall structurals shall consist of end wall columns, end wall roof beams and end wall posts as required by design criteria. Drainage Treatment Plant east end wall shall be rigid frame end wall capable of future expansion.

Bracing shall be as required by design criteria. Flange braces, sag rods and sag angles shall be cold formed and installed as required. No diagonal bracing will be permitted in column bays containing windows and/or exterior doors.

All structural steel components shall be factory cleaned to remove all loose dirt, grease and mill scale, and chemically treated with phosphoric type cleaner and then painted with one coat of zinc chromate red oxide alkyd primer. Erection marks shall be located so as not to be visible on erected steel.

#### 3.4.1 Exterior Wall Panels

Treatment Plant Building shall be enclosed with "Monopanel", "Modular Wall" insulated metal wall units and "Monolite", as shown on drawings and as manufactured by Butler Manufacturing Company, Kansas City, Missouri, or equal approved by Engineer. Pump House Building shall be enclosed with Butler "Monopanel" or equal approved by Engineer.

#### 3.4.2 "Monopanel" Wall Panels

Panels shall be self contained, factory assembled, insulated units, having a nominal covering width of 12 inches and a nominal thickness of 3 inches.

Exterior and interior face sheets shall be of first quality zinc-coated steel, minimum 24 gauge, conforming to Federal Specification QQ-S-775, Type I, Class D.

Exterior and Interior face sheets shall be finished in Butler-tone-baked on synthetic resin type finish in standard Butler-tone color selected by Engineer.

The exterior face shall be roll formed with 6 inch box type rib, 1-1/4 inches deep, and 6 inches on center when adjacent panels are installed. The exterior face shall contain four vertical beads in its surface.

The interior face shall be roll formed into a single plane surface.

Exterior and interior faces shall be securely fastened together by stitch rivets to form a box type beam section.

The panels shall be capable of withstanding normal wind loads without exceeding on actual thickness of metal a maximum fiber stress of 24,000 psi for galvanized steel. Deflection shall not exceed a deflection to span ratio of 1/180.

Metal to metal contact on vertical edges shall be prevented by the use of plasterized polyvinyl chloride gaskets between the exterior face and the interior face of the panel. A double interlocking vertical joint having a thermal break and providing for mechanical, as well as thermal, horizontal movement shall be provided.

The panels shall be of sufficient length to reduce horizontal joint to a minimum.

Insulation between exterior and interior face sheets shall be non-combustible, of a type and kind standard with the building manufacturer and shall be 1-3/4 inches thick, 2 to 2-1/2 pound density, in the form of batts of proper dimension to fill compactly the width and length of the panel. The "U" factor through the panel shall be greater than 0.14. The "U" factor through the panel wall without opening shall be no greater than 0.21.

#### 3.4.3 "Modular" Wall Panel

Panels shall be self contained in welded galvanized steel perimeter frames, factory assembled to contain solid panel areas, windows and doors as shown on the drawings.

Nominal coverage width of unit shall be 4 feet and nominal unit thickness shall be 2 11/16 inches.

The panels shall consist of metal faces securely bonded, to a foamed plastic case. The exterior face shall have a back up material to insure a high dent resistance. The panel face shall be of such flatness that when measured at 75 degrees Fahrenheit the maximum slope of the surface at any point measured from the nominal plane of the surface shall not exceed 1.0 percent.

The units shall provide for expansion and contraction as will be caused by an ambient temperature range of 120 degrees Fahrenheit without causing harmful buckling, opening of joints and other detrimental effects.

All sealants used within the unit and at the battens shall be either Butyl Elastomeric Hydrocarbon or Silicone Rubber Building sealant.

The wall unit design shall be in accordance with the AISI "Specifications for the Design of Light Gage Cold Formed Steel Structural Members."

The wall unit shall be designed so that a 14 foot clear span will be capable of supporting a 20 PSF wind load normal to the plane of the wall, with a minimum safety factor of 2 and without exceeding a deflection ratio of 1/175 of the clear span of the panel. All anchorage and fasteners shall be concealed.

The exterior and interior face shall be 0.032 inch hammered embossed 3105-H264 aluminum alloy.

The exterior face back-up material shall be resin tempered hard board 0.125 inches thick.

The core shall be of foamed Polystyrene with a minimum density of 1.25 pounds per cubic foot. The core of the panel shall have no distortion due to core temperatures up to 180 degrees Fahrenheit. The core shall be self-extinguishing and shall have no corrosive effects on aluminum, steel or hardboard material.

The "U" factor through the panel shall be no greater than .10 BTU/Hr/Sq.Ft./Deg. F.

The average sound transmission loss through the panel shall be a minimum of 25 decibels.

Windows shall be aluminum, fixed, and project out type, and shall be an integral part of the curtain wall system as shown on drawings.

All extruded aluminum parts shall be 6063-T5 alloy.

Windows shall have an anodized finish 204-R1 which shall consist of parts having a caustic etch finish and anodic coating of four-tenths of a mil minimum thickness, and a minimum coating weight of 17 milligrams per square inch.

All windows shall be factory glazed on the interior of the glass with vinyl glazing beads.

Glass shall be 1/8 inch double strength glass for all units.



Window screen frames shall be roll-formed from 0.025 inch, 5050-H36 mill finish aluminum alloy. The screen cloth shall be Alclad aluminum cloth 18 x 14 mesh natural color.

Windows in modular wall shall be in accordance with architectural aluminum Manufacturers Association Specifications, PA-2.

Doors in modular wall shall be aluminum narrow style doors, designed for 1/4 inch plate glass and be an integral part of the curtain wall system as shown on drawings.

All extruded aluminum parts shall be 6063-T5 alloy.

Aluminum shall have an anodized finish 204-A1-R1 which shall consist of parts being polished, having a caustic etch, and anodic coating of four tenths of a mil minimum thickness, and a minimum coating weight of 17-milligrams per square inch.

Vinyl weatherstripping shall be furnished at the head and jambs of the frame.

Door closers shall be furnished with all doors and the finish shall be sprayed aluminum color compatible with the anodized finish of the aluminum door.

Hardware shall be supplied as shown on door schedule.

All joints between units shall be covered by exterior battens and snap on interior battens which shall be attached by concealed clips and fasteners.

Void areas at the joints of the units shall be insulated.

Tape sealants shall be used to weatherseal both exterior and interior battens.

The sill flashing shall be extruded from 6063-T5 mill finish aluminum alloy.

All other extrusions shall be extruded from 6063-T5 aluminum alloy with an anodized finish 204-R1.

All formed trim and flashings shall be 5005-H14 aluminum alloy.

Formed parts used at the unit joints shall be anodized 204-R1.

Sill flashing parts shall be mill finish.

Panels shall be factory finished on the interior and exterior faces with Butler-Tone 515 air dry enamel in standard Butler-Tone 515 or equal. Colors as selected by the Engineer.

#### 3.4.4 "Monolite" Wall Panels

Panels shall be permanent, insulating, light transmitting sandwich panels enclosed in aluminum extrusions consisting of plastic faces bonded to an aluminum architectural grid system which permits installation of color inserts.

Face sheets shall be laminated to a grid core of 6063-T5 extruded aluminum I-beams with interlocking provisions at joints.

The thickness of the finished panel shall be 2-3/4 inches. Over-all width shall be nominal 4 feet - actual 3 feet 9-1/4 inches.

The grid core shall be mechanically interlocked preventing high and low muntin-mullion intersections and allowing full bonding surface contact with face materials in a factory laminated process bonding the faces to the core.

The grid pattern shall be 8 23/32 inches wide by 24 inches long rectangles with each rectangle spanning half of two rectangles on either side of a 3 5/16 inch wide full panel length rectangle with insert slot at bottom end.

The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat sharp edge.

The panel shall be adequately marked to show top, bottom and exterior.

The deflection to span ratio shall be not more than 1/140 for a 15 PSF wind load on a 13 foot clear span panel.

The panel faces shall be able to withstand 90 foot pounds of impact with no fracturing of the face material.

The coefficient of thermal expansion shall not exceed an average of  $1.24 \times 10^{-5}$  in./in./Deg. F.

The system shall permit expansion and contraction with an ambient temperature range of 120 degrees Fahrenheit

without causing opening of joints, harmful buckling, or other detrimental effects.

The exterior face material shall be 0.060 inches nominal thickness fiber glass reinforced polyester resin plastic sheet with an erosion resistant surfacing material.

The interior face material shall be 0.045 inch nominal thickness fiber glass reinforced polyester resin plastic sheet.

Panel faces shall be uniform in color, thickness, strength, and resistant to acids and sharp blows. Faces shall be made with light stabilized resins and colorfast pigments.

The exterior face shall have a special protective surfacing which produces a weather and erosion resistant surface.

The core shall be extruded aluminum 6063-T5 I-beams with minimum flange width of 7/16 inches, with mechanically interlocked muntins, mullions and perimeter. All aluminum shall be mill finish and clean, free of dents, scratches, grease, discoloration, or other damage.

The Aluminum Associations latest edition of Aluminum Extruded and Tubular Products Standard Tolerances shall apply.

A black synthetic waterproof resin shall bond the faces to the aluminum grid system. The resin shall withstand normal exterior construction impact and temperature shock, and shall provide 400 psi bond strength with no reduction for aging.

The bond shall successfully withstand the Forest Products Laboratory 6 Cycle Accelerated Aging Test, ASTM D-1037-55T.

All battens and perimeter closures shall be 6063-T5 aluminum extrusions supplied with stainless steel screws. Clamp channel members at head, sill, and jamb shall have a minimum fillet 0.090 inches. Receiving channels for self-tapping stainless steel screws shall be continuous the length of each member and extruded as part of the member.

Three translucent plastic inserts, with light transmitting plastic coating on one side shall be furnished with

each panel and shall not deteriorate during life of panel. Inserts shall fit into the 2-7/8 inch wide slots provided in the end of the panel.

A 3/32 inch diameter black bead, and a 1/8 inch diameter black bead, both of extruded modified butyl compound with a reinforcing cord center and protected by release paper, shall be supplied in rolls by the panel manufacturer to be used as interior sealant and exterior sealant.

A 1/16 inch by 3/8 inch gray tape of extruded modified butyl compound with a reinforcing cord center and protected by release paper, shall be supplied in rolls by the panel manufacturer to be used as a sealant for extrusion expansion gaps.

Sealants shall never harden under pressure and shall be supplied in sufficient amounts to adequately seal all panel joints.

The over all coefficient of heat transmission of the panel shall average not more than 0.24 Btu/Hr./Sq.Ft./Deg.F. when calculated from test data per ASTM C-177-63.

The light transmission shall be 20 percent and the radiant energy transmission shall be not more than 25 percent.

### 3.5 Other Components

#### 3.5.1 Roof Panels

All roofs shall be covered with F-103 panels as manufactured by Butler Manufacturing Company, Kansas City, Missouri; or equal approved by Engineer.

Roof panels shall be self contained, factory assembled, composed of four parts consisting of the exterior panel face, interior panel face, foamed-in-place polyurethane core material and joiner zee member.

Roof panels shall have a nominal covering width of 3'-0" and a nominal thickness of 1".

The exterior face shall be roll formed, 3" wide with 4 major corrugations, 1-1/2" high and 2 minor corrugations between each of the major corrugations the entire length of the panel.

The interior face shall be a flat surface, 3' wide with beads simulating the panel joint 4" on center.

The panel design shall provide for expansion and/or contraction as caused by an ambient temperature range of 120 degrees F without causing harmful buckling, opening of joints, and other detrimental effects.

All roof panels shall be capable of withstanding a live load of 40 psf on a 4.76 foot span with a safety factor of 2.5.

Through metal-to-metal contact (interior to exterior face) shall be prevented by the use of the reinforced plastic joiner zee member which shall also provide a positive connection between the exterior and interior face.

Exterior face of roof panels shall be fabricated from first quality zinc-coated steel, minimum 26 gage. Interior face of roof panels shall be fabricated from first quality zinc-coated steel, minimum 27 gage.

Insulation core in roof panels shall be noncombustible, of a type and kind standard with the building manufacturer. The "U" factor through the panel shall be no greater than 0.10. The average sound transmission loss through roof panels shall be 27 decibels. The sound transmission class shall be 25.

Ridge panels shall be single face, factory curved to match roof slope. Cross section shall match roof panels.

Roof panels shall be factory pre-punched at panel ends and shall match punching in structurals for proper alignment.

### 3.5.2 Windows In Monopanel Walls

Windows shall be 6 feet 0 inches wide by 4 feet 0 inches high, steel frame, sliding type; furnished completely assembled, glazed, and with screens where called for on drawings. Manufacturer's standard mullions shall be furnished for multiple installations.

Frame sections of window frames and glass panels and mullions shall be rolled tubular, lock seal construction formed from 24 gage galvanized steel. Steel shall conform to SAE 1010, zinc-coated, low carbon steel, proper for rolling and forming the window sections. Zinc coating shall be hot dipped with a nominal coating class of 0.85 to 1.00 oz. per square foot in accordance with ASTM A-93 (latest issue).

Header, sill and jamb adapters shall be formed from 18 gage galvanized steel. Steel and zinc coating shall meet or exceed the requirements listed above.

Weatherstripping shall be finest grade, resilient, water repellent, moth proof wool felt, wood pile and vinyl plastic. Rigid and semi-rigid plastics shall be used in combination with pile weatherstripping and/or high density polyethylene to prevent metal-to-metal contact during operation of the window.

Tubular window frames shall be brazed on both sides and ground smooth at all corners or mechanically assembled with special internal corner reinforcers for rigidity. The outside of the joints shall be closed adequately by brazing to be rain tight.

Screen panel frames shall be assembled with special corner reinforcers for rigidity.

Glass shall be clear, flat drawn window glass, double strength (nominal 1/8" thick). Grade B quality.

Mastic or glazing compound used in glazing of the windows shall be non-hardening, non-corrosive, non-staining and compounded for minimum shrinkage and long life.

Glazing splines shall be preformed plasticized Virgin Polyvinyl Chloride, Grade 5 or better per ASTM D-1432 (latest issue).

Screen cloth shall be 16-18 mesh, plastic coated fibrous glass retained with plastic installation splines.

Hardware parts shall be made of corrosion resistant materials or finish.

Wearing parts or assemblies shall be equipped with antifriction materials for maximum performance.

Any parts or accessories of dissimilar metals shall be insulated from each other.

### 3.5.3 Hollow Metal Doors and Frames in Monopanel Walls

Doors shall be flush, of the three section type, consisting of lock and hinge stile and center panel. Door stiles and panels shall be of 20 gage zinc-coated steel. Vertical joints shall be tight and flush and designed to assure full length positive interlocking between center panels and stiles. Lower half of center panel to have louver where shown on drawings.

Doors shall be 3 feet 0 inches wide by 7 feet 0 inches high by 1-3/4 inches thick. Doors shall be stiffened and sound deadened with phenolic resin impregnated Kraft honeycomb laminated to the inside of the center panels. Doors shall be provided with top and bottom reinforcing channels to provide rigidity, and doors shall have a top cap to seal against moisture.

Doors shall be mortised and reinforced for hinges and locks. Doors shall be bonderized and shall receive baked on prime coat of paint before receiving finish painting hereinafter specified.

Door frames shall be of minimum 16 gage zinc-coated steel, 3 inches deep, of building manufacturer's standard configuration for wall panels being used to enclose facility. Frames shall be knocked down. Corners shall be mitered and shall have heavy reinforcements with four integral tabs for securing and easy interlocking of joints to head at each corner.

Frames shall be mortised and reinforced for strikes and hinges. Frames shall be furnished with two rubber bumpers installed at the factory. Frames shall be bonderized and shall receive a baked on prime coat of paint before receiving finish painting hereinafter specified.

Building manufacturers standard weatherstripping consisting of the following shall be supplied and installed on each door and frame.

a. A vinyl bulb with two rigid vinyl keepers at bottom of each door.

b. A prepared strip of polyurethane foam weatherstripping around each door frame.

Each hollow metal door shall be provided with the following hardware:

1 - 1/2 pair butt hinges, wrought steel, button tip, full mortise, template type, primed for painting. Butt hinges shall be 4-1/2 inches in size, minimum .137 gage, with non-removable pins.

1 door closer, exposed surface type, equipped with parallel arm and keyed valve. Closer shall conform to U.S. Government Type 3009, Federal Specification FF-H-121C.

1 lockset, keyed in knob type with 2-3/4 inch back-set. Each lock shall be keyed separately and two keys shall be provided for each lock. knobs and trim shall have U.S. Government No. 28 anodized aluminum finish.

Inactive leaf of pairs of doors shall have sliding type head and foot bolts and flat bar astragal.

One threshold shall be provided at each hollow metal door. Threshold shall be of extruded aluminum drilled and countersunk for attachment to the floor.

#### 3.5.4 Aluminum Entrance Doors - Treatment Plant

Building entrance doors shall be approximately 6 feet wide by 7 feet high by 1-3/4 inches thick, aluminum, narrow stile doors designed for 1/4 inch thick glass. Door frames shall be of extruded aluminum sections, approximately 1-3/4 inches by 4-1/2 inches, to match curtain wall framing sections.

All extruded aluminum parts of doors and frames shall be of 6063-T5 alloy. Aluminum shall have an anodized finish conforming to Alcoa Specification Alumilite 204-R1.

Each pair of doors shall be provided with three pairs of chrome finish butt hinges, aluminum push-pull hardware, cylinder operated dead bolt, and concealed door closer.

Doors shall be provided with vinyl weatherstripping on all sides and extruded aluminum threshold drilled and countersunk for attachment to the floor.

#### 3.5.5 Louvers

Louvers shall be stormproof type, of Type 6063-T5 extruded aluminum alloy. Blades and frames shall be not less than No. 12 gage materials, 0.081 inch in thickness. All louver parts shall be entirely assembled by welding. Blades shall be truly parallel and accurately spaced. Edges of all louver blades shall be beaded for rigidity.

Louvers shall have removable bird screen consisting of 1/4 inch mesh .063 gauge aluminum wire in 3/4 inch aluminum channel frame fitting with spring clips or catches for fastening in place. The web of channel shall be a minimum of 1/8 inch thick. The frames shall be tenoned and riveted or mitered and welded at corners. The ends of the wires shall be



let into the frame, then clinched and soldered, or the edges of the fabric shall be secured by solid metal binding strips screwed to the frame every 6 inches.

Louvers shall have anodized finish in accordance with Alcoa Specification No. 204-R1 or approved equal.

### 3.5.6 Trim Gutters and Downspouts

Gable trim shall be factory formed and punched for attachment to roof panels at gable of the building. Color of trim shall be trim gray and white, factory applied. Lengths shall be supplied to extend from eave to eave of building.

Gutters shall be standard Butler configuration, in factory applied trim gray and white color. Gutters shall be furnished complete with painted hangers and preformed corner closure to match configuration of gable trim.

Downspouts shall be supplied factory painted to match colors of wall panels. Quantity, locations and lengths shall be as shown on drawings.

### 3.5.7 Roll-Up Shutter

Roll up shutter shall be push up type; mounted face of wall with lift handle on bottom bar.

Curtain shall be fabricated of extruded aluminum alloy. 1-1/4" flat faced slats .050" thick, with plated malleable end locks on both ends of alternate slats. Lower edge of curtain shall be finished with extruded aluminum bottom bar and vinyl astragal.

Drum shall be of proper size to prevent deflection of more than .03" per foot of width. Shaft to contain helical torsion type counter balance springs. Each spring designed for the opening size to assure proper counter balance.

Guides shall be of extruded aluminum alloy not less than 1-1/2" deep and 1/8" thick, grooved for wool pile lining.

Brackets shall be high grade cast iron 1/4" thick.

Hood to be aluminum alloy

Finish shall be mill type

Provide cremone type, lock on interior side of bottom bar.

### 3.5.8 Factory Finish

The following zinc-coated steel components of the building shall be factory prepared for and shall receive factory applied baked enamel finish in colors to be selected by Engineer. Exposed aluminum components of building shall not be painted.

Roofing sheets (Exterior face sheets and interior metal liner sheets)

Insulated Metal Wall Panels (Exterior face sheets and interior metal liner sheets)

Insulated Metal Curtain Wall Units (Exterior and interior faces of insulated panels)

Building Overhangs (Metal soffits, gable and eave fascia trim)

Louvers, Doors and Windows (Exterior and interior face)

Exposed trim, flashing, closure pieces, fillers, connectors and similar items.

Surfaces of components listed above that are exposed to weather shall receive Butler-Tone 515 Finish System, or equal approved by Engineer. Surfaces of components listed above that are exposed to interior of building shall receive Butler-Cote Finish System, or equal approved by Engineer.

Exterior galvanized steel surfaces shall be given a chemical conversion treatment which shall equal or exceed Government Specification MIL-C-490A, Type 1, Grade 1.

After the conversion treatment, the exterior exposed surface shall be precision coated with Butler-Tone 515 thermosetting silicone-type finish to dry film thickness of 1 mil  $\pm$  0.2 mils over the entire material dimension prior to forming of panels.

Gloss of finish shall be maintained evenly over entire surface at  $30 \pm 5$  units as measured on a photovolt meter for pleasing appearance, balance, reflectivity, and durability.

Interior exposed surface shall be coated with a thermosetting alkyd color coat.

The physical characteristics of the exterior coating shall provide resistance to failure through cracking, checking, crazing, spotting, or loss of adhesion.

Finish colors shall be selected from building manufacturer's standard colors.

A guarantee shall be issued guaranteeing the factory-applied Butler-Tone 515 finish or equal against failure resulting from normal exposure to weather for five years from date of shipment.

Interior galvanized steel surfaces shall be given a chemical conversion treatment which shall equal or exceed Government Specification MIL-C-490A, Type 1, Grade 1.

After the conversion treatment, the exterior metal surface shall be precision coated with a thermosetting vinyl finish to a dry film thickness of 1 mil  $\pm$  0.2 mils over the entire material surface.

Gloss of finish shall be maintained evenly over entire surface at  $30 \pm 5$  units as measured on a 60 degree photovolt meter for pleasing appearance, balance, reflectivity, and durability.

Interior surface shall be coated with a thermosetting vinyl color coat.

The physical characteristics of the exterior coating shall provide resistance to failure through cracking, checking, crazing, spotting, or loss of adhesion.

Finish colors shall be selected from building manufacturers standard colors.

#### 4.0 INSTALLATION

Erection shall be performed in strict accordance with approved shop drawings, details and instructions on building manufacturer's assembly drawings, and accepted trade practices of the Metal Building Manufacturers Association.

The building erector shall inspect and approve the foundation before structural steel work is started. Anchor bolts and appurtenances shall be installed while the concrete work is in progress in accordance with specific anchor-bolt plans and templates furnished by the building manufacturer.

Rigid frame bases and sill members shall be set accurately using a non-shrinking grouting mortar to obtain uniform bearing on the concrete. Grouting mortar shall be a mixture of 1 part Portland cement to 2 parts well-graded fine aggregate with water to provide a maximum water-cement ratio of 0.50. Surface to receive mortar shall be clean and thoroughly moistened immediately before placement of mortar. Exposed surfaces of mortar shall be water cured with wet burlap for seven days. Rigid frames shall be plumbed in both directions and guyed and stayed, and framing element shall be accurately spaced to assure the proper fitting of prefabricated wall and roof coverings.

All connections of "Monopanel" type wall panels to structural members shall be made with Butler wall type Low Profile Lock-Rivets set by a special Lock-Rivet tool. Color caps of matching colors shall be applied on the exposed heads of all wall panel Lock-Rivets. Flashing fasteners for "Monopanel" wall panels shall be number 8 x 12 inch binding head Type a stainless steel sheet metal screws. Locations of all fasteners shall be as shown on building manufacturer's erection drawings.

"Modular Wall" type curtain wall units shall be installed in strict accordance with manufacturer's instructions. Vertical and horizontal mullions shall meet in tight, hair-line joints. No screws or fasteners shall be used within the wall system, except to anchor peripheral channels to opening, or for special situations involving components such as entrance doors. All portions of curtain wall system containing glass and entrance doors shall be flush glazed with  $\frac{1}{4}$  inch thick polished plate glass, using NS (non-stretch) vinyl glazing beads on both sides of the glass or panels. Glass shall be installed in strict accordance with manufacturer's instructions.

"Monolite" shall be installed where shown on drawings in strict accordance with building manufacturer's instructions.

"F-103" type roof panels shall be applied with corrugations in the direction of roof slope. All connections of roof panels, panel to panel and panel to structural members, shall be made with Butler roof type Low Profile Lock Rivets set by a special Lock Rivet tool. All side laps shall be one full corrugation. End laps shall be at least 6 inches and fastened together over and to structural members. A non-hardening prepared mastic shall be used along all side and end laps. Locations of all fasteners shall be as shown on building manufacturer's erection drawings.

Windows shall be installed in accordance with manufacturer's instructions. All glass shall be installed, embedded in mastic or glazing compound hereinbefore specified and held in place with reusable vinyl glazing splines. Corners of the vinyl glazing splines shall be neatly formed and mitered. Upon completion, all sliding glazed panels shall move freely without binding and all operable glass and screen panels shall be easily removable from the inside without tools.

Building accessories such as doors, door frames, louvers, framed openings for pipe penetrations. Conduit, duct and boiler stack penetrations as well as properly flashed, supports for roof fans on roofs and similar items shall be installed in accordance with details and instructions on building manufacturer's assembly drawings, together with accepted trade practices of the Metal Building Manufacturer's Association.

Flashing, trim, closure pieces, fillers, and similar items required for a complete, weathertight installation shall be provided and installed in accordance with details and instructions on building manufacturer's assembly drawings, together with accepted trade practices of the Metal Building Manufacturer's Association.

#### 4.1 Dissimilar Materials

Where aluminum surfaces contact steel or other incompatible metals, the aluminum surfaces shall be kept from direct contact with such dissimilar material by one of the following methods:

a. Painting the incompatible metal with a coating of heavy-bodied bituminous paint.

b. Painting the incompatible metal with a prime coat of zinc-chromate primer followed by one or two coats of aluminum metal-and-masonry paint or other suitable protective coating excluding those containing lead pigmentation.

c. An approved non-absorptive gasket.

d. An approved caulking placed between the aluminum and the incompatible metal.

5.0 TESTING

No additional tests beyond those normally employed either in manufacturing, installation or construction processes or as called for by the specified codes and standards are required under this article.

6.0 INFORMATION TO BE SUBMITTED

The following information and data shall be submitted.

6.1 Technical Data

Technical data included hereinafter in Table 1 shall be submitted completely filled out by Bidder. After acceptance by Engineer, this data shall become part of the Technical Specification for this work.

With Bid

6.2 Drawings

Contractor shall submit Drawings showing plans and elevations of each building; structural details; size, shape and thickness of materials; door and hardware schedule; finish wall material with color charts and other information to demonstrate compliance with the Contract Documents.

30 Days  
After Award

6.3 Certificates

Contractor shall submit to Owner a certificate specifying the length of time the manufacturer's roof and wall panel finish is guaranteed against failure resulting from normal exposure.

30 Days  
After Award

Contractor shall also submit a certificate showing welder qualifications.

6.4 Design Calculations

Contractor shall submit, for approval by Engineer, engineering design calculations and stress diagrams of all structural or load bearing components.

30 Days  
After Award

EBENSBURG DISTRICT OFFICE  
LIBRARY  
DER Bureau of Operations  
122 SOUTH CENTER STREET  
EBENSBURG, PA 15931

TABLE I

TECHNICAL DATA TO BE FURNISHED WITH BID (Rigid Frame Structures)

The following technical information and data shall be submitted with Bid.

1. Gauges of purlins, girts, secondary bracing, and other required members \_\_\_\_\_
2. Gauges of wall and roof panels \_\_\_\_\_
3. Manufacturer's type wall panel sheet proposed for use \_\_\_\_\_
4. Manufacturer's type roof panel sheet proposed for use \_\_\_\_\_
5. Wall panel finish \_\_\_\_\_
6. Roof panel finish \_\_\_\_\_
7. Panel finish, dry mil thickness \_\_\_\_\_
8. Panel finish guarantee \_\_\_\_\_
9. Steel members, panels, or other components, factory prepunched or field drilled \_\_\_\_\_
10. Method of fastening panels for removal and replacement without damage \_\_\_\_\_
11. Length of guarantee period \_\_\_\_\_

Section 13B

Welding and Nondestructive Testing

	<u>Page No.</u>
1.0 Scope	13B-1
2.0 General	13B-1
2.1 Codes and Standards	13B-1
3.0 Detailed Requirements	13B-1
3.1 Welding Requirements	13B-1
3.2 Welding Processes	13B-1
3.3 Welding Qualification	13B-2
3.4 Welder Qualification	13B-2
3.5 Materials for Base and Filler Metal	13B-2
3.6 Base Material Preparation	13B-3
3.7 Welds	13B-3
3.8 Weld Inspection	13B-4
4.0 Installation	13B-8
5.0 Testing	13B-8
6.0 Information to be Submitted	13B-9
6.1 With Bid	13B-9
6.2 After Award	13B-9



DIVISION 13

SECTION 13B

WELDING AND NONDESTRUCTIVE TESTING

1.0 SCOPE

This Specification Section includes the requirements for Field and Shop Welding, and Nondestructive Testing all as indicated on the drawings and described in the specification.

2.0 GENERAL

2.1 Codes and Standards

The Work and Materials shall conform to the latest edition and latest addenda thereto, as of date of award, of the applicable codes hereinafter specified.

3.0 DETAILED REQUIREMENTS

3.1 Welding Requirements

This paragraph covers the welding of ferrous materials. Included are quality standards for the acceptance of weldments. The welding filler materials shall meet the requirements of the American Society for Testing and Materials standards.

Contractor shall direct and supervise the qualification tests and shall bear the expense of conducting all qualification and requalification tests. Upon completion of a qualification test, Contractor shall certify that the test was conducted in accordance with the requirements herein. Contractor shall also maintain the necessary records verifying current welder qualification status.

Welding procedure qualifications shall be submitted to Engineer for approval.

3.2 Welding Processes

All welding shall be made with the addition of filler materials and the welding processes shall be limited to one or a combination of the following:

- .1 Manual, shielded metal-arc process (covered electrode)
- .2 Semiautomatic, inert gas metal-arc process (consumable electrode)
- .3 Automatic, inert gas metal-arc process (consumable electrode)
- .4 Semiautomatic, submerged arc process
- .5 Automatic, submerged arc process
- .6 Manual, inert gas tungsten arc process
- .7 Automatic, inert gas tungsten-arc process

### 3.3 Welding Qualification

Procedure Qualification: Procedure qualification shall be in accordance with Section IX of the ASME Boiler and Pressure Vessel Code.

### 3.4 Welder Qualification

Performance qualification for welding shall be in accordance with the ASME Boiler and Pressure Vessel Code, Section IX and the additional requirements of this specification. This applies to welders and, unless otherwise approved, to welding operators working on all vessels, including those who are not within the jurisdiction of the ASME Boiler and Pressure Vessel Code.

### 3.5 Materials for Base and Filler Metal

Typical base material and filler materials shall be as shown in Table 2 or those specified in the approved welding procedure.

For base materials not specified herein, filler materials shall be selected by Contractor and shall be subject to all the provisions specified herein.

Permanent marking shall be performed with interrupted type low stress stamps. All marking fluids and tapes used for temporary marking shall be removed prior to being exposed to thermal treatment temperatures.

For all welds the material of the packing strips, rings or spacer blocks shall be of the same P-number category as the base material.

Low hydrogen type covered electrodes shall be dry when used. The electrode manufacturer's recommendations for drying shall be used. In the absence of the electrode manufacturer's recommendations, covered electrodes shall be used within four hours of removal from sealed container or if not used within four hours, shall be held in a vented electric oven maintained at a temperature not less than 150°F and not more than 350°F for at least eight hours. The electrodes removed from the holding oven shall be used within four hours. Electrodes which have come in contact with water shall not be used.

### 3.6 Base Material Preparation

The weld preparation and adjacent base metal surface for a minimum of  $\frac{1}{2}$  inch on each side of the weld preparation shall be smooth, clean and free of any foreign matter.

### 3.7 Welds

#### 3.7.1 Manual Welds

All manual welds shall have a minimum of two layers of weld metal, except that welds attaching nameplates and similar items, may have one layer. String beading is preferred. Weave beading with covered electrodes shall not result in a weld bead with a width greater than 2- $\frac{1}{2}$  times the electrode diameter or as specified in the approved welding procedure specification.

#### 3.7.2 Tack Welds

All tack welds shall be made in accordance with an approved welding procedure by a qualified welder with the same grade electrode or filler metal as the final weld. Where inert gas purging is used for welding, tack welds shall also be purged. Cracked or broken tack welds or those of poor quality shall be removed.

#### 3.7.3 Arc Strikes, Stops and Starts

Arc strikes in the weld shall be visually inspected and shall be free of cracks, slag, porosity and overlaps. Defects shall be removed by grinding.

### 3.7.4 Preheating and Maintenance of Interpass Weld Temperatures

Preheating and techniques and preheat and interpass temperature measurement procedures shall be such as to ensure that the full thickness of the weld joint preparation and adjacent base material is at the specified temperatures as shown in Table 2. When flame heating is used, only a neutral flame shall be employed in order to avoid local carburization or oxidation. All material which is to be welded shall meet the specified requirements for preheat and interpass temperature ranges. Temperatures may be determined by surface contact pyrometers, temperature indicating crayons, or thermocouples, but not by low melting metallic alloys.

### 3.7.5 Repair Welding

Approval is required from Engineer for repair of base material defects exceeding the size permitted in the material specification or for repair of defects after final heat treatment or hydrotest.

Contractor, before performing any repair, shall submit a repair procedure to Engineer for approval. The repair procedure shall include the method of verifying that the defect has been removed.

Records of defect location and repair history shall be maintained and reference description of defect, approximate size and repair procedure used.

## 3.8 Weld Inspection

### 3.8.1 General

This section contains the minimum requirements for the type, the area and the extent of inspection required to help assure the acceptance standards specified in Section VIII of ASME Boiler and Pressure Vessel Code. The requirements of this section shall not be construed as limiting Contractor from performing more extensive inspection. Nondestructive test procedures shall be submitted to Engineer for approval.

When Engineer has reason to believe that the quality of any weldment is doubtful Engineer may require additional inspection.

All component drawings which show fabrication by welding shall indicate the joints together with the required weld joint geometry, welding procedure number, extent and type of inspection in accordance with American Welding Society Standards A2.0 and A2.2.

Repair welds shall be inspected in accordance with the requirements for the original weld or the requirements in the material specification.

Welds not accessible for inspection after final assembly shall be inspected immediately prior to the assembly operation.

### 3.8.2 Visual Inspection

Inspection shall be performed on the final surface condition without the aid of magnifying devices.

All pressure vessel, nozzle and attachment welds shall be visually inspected for compliance with the requirements of this specification.

Weld dimensions shall meet the drawing requirements. All welds shall be free of slag, porosity, cracks, lack of fusion or penetration.

All welds shall be free from undercut. Edges of welds shall blend smoothly and gradually into the adjacent base metal.

### 3.8.3 Inspection Requirements

Liquid penetrant or magnetic particle inspection shall be performed on all welds in accordance with the requirements of the ASME Code, Section VIII, Mandatory Appendix VIII or Mandatory Appendix VI.

Penetrant materials shall be of low halide type.

Both liquid penetrant and magnetic particle inspection shall include base metal for at least one quarter inch on each side of the weld where possible.

All indications in the weld craters or in the line of fusion between base material and weld metal shall be treated as defects. Any indications which are believed to

be nonrelevant shall be explored by removing the surface roughness believed to have caused the type of indications to determine if defects are present. The absence of indications upon reinspection after removal of the surface roughness shall be considered to prove that indications were nonrelevant with respect to actual defects. Relevant indications are those that result from mechanical discontinuities. Linear indications are those indications in which the length is more than three times the width. Rounded indications are indications that are circular or elliptical with the length less than three times the width.

#### 3.8.4 Grit Blasting

Grit blasting prior to liquid penetrant or magnetic particle testing will not be permitted.

#### 3.8.5 Fillet Welds

The acceptability of fillet welds shall be established by suitable gages or templates or by comparison to workmanship samples prepared by Contractor and approved by Engineer. The minimum required size of each fillet weld shall be as specified in the applicable drawing or welding procedure. The maximum size of each leg shall be as follows:

<u>Minimum Specified Shorter Fillet Leg</u>	<u>Maximum Length of Either Fillet Leg</u>
Less than 3/10	1-3/5 times the minimum specified for the particular leg
3/10 inch to 3/8 inch	1-2/5 times the minimum specified
3/8 inch and over	1-1/4 times the minimum specified

If the leg size is specified, the throat thickness for a 1 by 1 fillet weld shall be from 0.7 to 1.0 times the required leg size.

The throat thickness for a 1 by 2 fillet weld shall be 0.7 to 1.2 times the size of the shorter leg.

Carbon steel material may be cut to size and shaped by flame-cutting, provided all accumulation of slag and oxide

are removed from the cut surface. Preheat for cutting is required. The preheat temperature for cutting shall be the same as for welding. Local preheat for cutting may be used with the approval of Engineer.

### 3.8.6 Welding Operations

All welding operations shall be conducted under sheltered conditions. All welding shall be planned and conducted so as to minimize warping or undue distortion of the assembled units. Machined surfaces and threads shall be protected against weld splatter and restrained against warping.

Any cracks, blow holes or other defects that appear on the surface of the weld beads shall be removed by chipping or grinding before the next covering weld bead is deposited. Peening will not be permitted.

Temporary welds on the base material of the component shall be located where possible on edges and areas that will be trimmed off. Preheating as for other welding shall be required.

The permissible gap or root opening between abutting edges of butt welds and weld grooves for nozzle attachments shall conform to the approved welding procedure.

Contractor shall not correct a plate edge deficiency unless approved by Engineer.

The fabricated vessels shall be designed to insure freedom from retention pockets and crevices. Welds shall be uniform and blend smoothly into the parent metal.

All joints shall be laid out so that openings in the shell for connections shall not intersect longitudinal or girth joints.

The following acceptance standards apply:

- a. Magnetic Particle: All surfaces shall be free of any cracks or linear indications. In addition, surfaces shall be free of rounded indications with dimensions greater than 3/32 in., four or more rounded indications in a line separated by 1/16 in. or less edge-to-edge, and ten or more rounded indications in any 6 square inches of

surface whose minor dimension is no less than 1 inch with these dimensions taken in the most unfavorable location relative to the indications being evaluated.

- b. Liquid Penetrant: All surfaces shall be free of any cracks or linear indications. In addition, surfaces shall be free of rounded indications with dimensions greater than 3/32 in., four or more rounded indications in a line separated by 1/16 in., or less edge-to-edge, and ten or more rounded indications in any 6 square inches to surface whose minor dimension is no less than 1 inch with these dimensions taken in the most unfavorable location relative to the indications being evaluated.

TABLE 2

WELDING MATERIAL AND  
TEMPERATURE REQUIREMENTS

MATERIAL P-NUMBER TYPICAL	FILLER MATERIAL		WELDING TEMPERATURE	
	SHIELDED METAL-ARC	OTHER	PREHEAT °F (MIN)	INTERPASS °F (MAX)
P1 (A285, A106)	A233-EXX16 EXX18	A558-TYPE F71-EL 12  A-559-TYPES E60S-3 E70S-5 E70S-6	50°	400°

4.0 INSTALLATION

Work covered by this specification does not involve installation.

5.0 TESTING

In addition to the tests and inspection specified elsewhere herein, final acceptance testing for work covered by this specification will be performed by others after installation of the involved equipment.



6.0 INFORMATION TO BE SUBMITTED

6.1 With Bid

There will be no technical information required in Bid Form.

6.2 After Award

The following information and data shall be submitted.

- .1 Welding procedure qualifications.
- .2 Nondestructive test procedures.
- .3 Certificates of conformance of all weld filler material.