SECTION 05165 - SPECIFICATIONS FOR RETROFIT ROOF FRAMING SYSTEMS

PART 1– GENERAL

1.01 DESCRIPTION

1. General
    1. The retrofit framing system shall provide support for a new metal roof panel system over the existing building roof and shall accommodate the irregularities of the existing roof to form a structural framework for supporting the new metal roof panels at the specified slope. Furnish all labor, material, tools, equipment and services for the retrofit framing system as indicated, in accord with the provisions of the contract documents. The metal roof panel system manufacturer will provide all components required for a complete single-supplier system including base members, clips, purlins, purlin supports, bracing and structural member-to-member fasteners as well as panels, panel clips, trim/flashing, fascias, ridge, closures, sealants, fillers and any other required items as specified in related sections.

B. Related work specified elsewhere:
    2. Section 07411 – Metal Roof Panels
    3. Section 07620 – Sheet Metal Flashing and Trim

1.02 QUALITY ASSURANCE **[Specifier Note:** Delete references to sections not used and add any references that are specific to the project**]**

A. Applicable Standards: All following referenced publications shall be the most current edition in effect on the date of solicitation.
    1. American Institute of Steel Construction (AISC)
        a. AISC - Specification for Structural Steel for Buildings
    2. American Iron and Steel Institute (AISI)
        a. AISI CF00-01 – A Design Guide for Standing Seam Roof Panels
        b. AISI CF97-01 – A Guide for Designing with Standing Seam Roof Panels.
        c. AISI "Cold Form Steel Design Manual"
    3. American Society of Civil Engineers (ASCE)
        a. ASCE-7 - Minimum Design Loads for Buildings and other Structures
    4. American Society for Testing and Materials (ASTM) (As Applicable)
        a. ASTM A 36/A 36M - Structural Steel
        b. ASTM A 307 - Steel Bolts and Studs
        c. ASTM A 446 - Steel Sheet, Zinc Coated (Galvanized) By The Hot-Dip Process
        d. ASTM A 525/A 525M - Steel Sheet, Zinc-Coated by the Hot-Dip Method
        e. ASTM A 529/A 529M – Structural Steel with 42 KSI Minimum Yield Point
        f. ASTM A 1101 – Steel Sheet and Strip, Carbon, Hot-Rolled
        g. ASTM A 653/A 653M – Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy - Coated (Galvannealed) By Hot-Dip Method
        h. ASTM E 1514 –Structural Standing Seam Steel Roof Panel Systems.
        i. ASTM E 1592 - Structural Performance Test for Metal Panel and Siding Systems by Uniform Static Air Pressure Difference
        j. ASTM A792 – Specification for Galvalume Coated Steel
    5. Metal Building Manufacturers Association
        a. MBMA – Metal Building Systems Design Practices Manual
    6. Factory Mutual
        a. FM-4471 – Wind Uplift Test for Metal Roof Panel Systems
    7. American Welding Society
        a. AWS D1.1 Structural Welding Code – Steel
        b. AWS D1.3 Structural Welding Code – Steel Sheet
    8. Steel Structures Painting Council
        a. SSPC- SP10 - Steel Structures Painting Manual

9. Underwriters Laboratories, Inc. (UL)
    a. UL 580 - Tests for Uplift Resistance of Roof Assemblies
10. American Society Of Heating, Refrigerating And Air-Conditioning Engineers (ASHRAE)
    a. ANSI/ASHRAE Standard 90.1, Energy Standard for Buildings

B. Manufacturers Qualifications
    1. Manufacturer of the retrofit framing system shall be experienced in fabricating complete single-supplier metal roof systems of similar size and scope to this project for a minimum of five (5) years.

C. Installing Contractor Qualifications
    1. Installer shall be experienced in installation of structural light-gage retrofit framing and metal roof panel systems for a minimum of two (2) years and shall meet the following minimum criteria.
        a. Shall be a factory-authorized installer of the manufacturer trained in the installation of the retrofit framing system specified.
        b. Maintain $1,000,000 minimum general liability insurance coverage.
        c. Maintain statutory limits of worker's compensation coverage as mandated by law.
        d. Will provide a full-time project foreman/superintendent at the jobsite that has been trained by the metal retrofit roofing system manufacturer for the supervision of the installation of all materials.

D. Installation Quality Control
    1. The metal roof panel system manufacturer shall conduct inspections of the retrofit framing system prior to metal roof panel installation to ensure straightness and proper alignment to minimize oil-canning and to confirm the system components have been installed in accordance with the installation documents.

1.03 EXISTING ROOF SYSTEM AND TESTING

A. The existing roof assembly consists of a **[Specifier Note:** Briefly describe the construction of the existing roof support system, substrate and membrane assembly. If these vary, you may wish to disregard this section or expand the description. *Example: structural open-web steel bar joist system with 22 gauge metal decking, 2" of rigid insulation and built-up roof membrane*].

B. Where conditions permit and are required, the contractor shall obtain field measurements and forward them to the retrofit system manufacturer for coordination and integration into the installation documents and submittals. This shall be done prior to commencing any engineering and design work and before fabrication of any materials.

C. The contractor shall have conduct field pullout testing for evaluation and selection of framing system anchors to attach the new retrofit framing base members to the existing roof support system. The testing will be conducted at multiple locations of the existing roof area using a calibrated pullout tester. Pullout values shall be recorded at each location for each specific anchor used. All anchors shall penetrate and attach to existing structural support members. The contractor shall have the attachment connection designed to satisfy wind uplift values, as provided by the retrofit system manufacturer, multiplied by a safety factor of 2.5. This analysis shall be submitted for review and approval.

D. The contractor shall conduct field compressive strength testing performed for evaluation of the existing roof substrate and membrane assembly. These values, recorded in pounds per square inch (PSI), will be analyzed to determine if each retrofit framing system base member's bearing surface area is adequate in size, to distribute the imposing positive loads as to not exceed the compressive strength of the existing roof substrate and membrane assembly. If the values exceed the compressive strength, then an additional bearing component of sufficient size will be added between the base member and the existing roof.

1.04 DESIGN REQUIREMENTS

A. General
    a. Design for approval and installation in accordance with the included drawings and these specifications, a complete retrofit framing and metal roof panel system as a structural

package, engineered and factory fabricated by one manufacturer in accordance with AISI, MBMA and ASCE references.

b. Any additions/revisions to framing members as a result of field conditions and/or demands, shall be the contractor's responsibility, and shall be submitted for review and approval by the manufacturer.

B. Building Code

a. The retrofit metal roof system manufacturer shall engineer the entire system to meet the **[Specifier Note:** choose one: International Building Code (IBC), Southern Building Code (SBC), Uniform Building Code (UBC) or Building Officials and Code Administrators International Code (BOCA)**]** or **[**if the project is located within a State that has its own adopted building code such as Florida, North Carolina and others, then write the appropriate code name here**]** code and per the current edition of ASCE-7 as applicable.

C. Wind Load Design

a. The assembly shall withstand a wind load miles per hour (MPH) velocity as required by the code. The metal roof panel assembly, which includes portions of the retrofit framing system, must be tested in accordance with the UL-580 test procedure and the ASTM E 1592 Structural Performance Test for Metal Roof and Siding Systems by Uniform Static Air Pressure. The metal roof panel system shall be classified as a UL-90 rated assembly.

D. Live and Snow Load Design

a. Horizontal Assemblies shall withstand minimum live and snow loads as required by the code plus the weight of the retrofit framing and metal roof panel assembly.

b. The retrofit framing system shall transfer loads from the new roof system to the existing roof structure in such a manner as to not overload the existing roof's structural support members as well as the substrate and membrane assembly - refer to 1.03.C.

c. Horizontal deflection shall be L/180 of span after installation of equipment and vertical deflection in framing members shall not exceed H/60th of their length.

1.05 SUBMITTALS

A. The following shall be submitted by the retrofit framing system manufacturer for approval in a timely manner after award of contract.

B. Detail drawings shall consist of catalog cuts, design and installation drawings and other data necessary to clearly describe design, materials, gages, sizes, layouts, construction details, fasteners and erection. Detail drawings shall be accompanied by engineering design calculations for the structural properties of the retrofit framing components and metal roof panel system, which shall bear the seal and signature of a Professional Engineer registered to practice in the State of **[Specifier Note:** insert name of the State, which the project is located**].**

C. Manufacturer's product literature for retrofit framing system components including purlins and supports, clips, bracing and connection fasteners.

D. A minimum of six (6) project references of similar use and size listing the Architect, owner, location, scope and name of project as provided by the manufacturer.

E. Obtain approval of all submittals prior to fabrication and installation.

1.06 DELIVERY AND STORAGE

A. Materials shall be delivered to the site in a dry and undamaged condition and stored out of contact with the ground. Materials shall be covered with weathertight coverings and kept dry.

PART 2 – PRODUCTS

2.01 APPROVED MANUFACTURERS

A. The retrofit framing and metal roof panel system as specified in section elsewhere in this specification shall be as manufactured by the following or a prior approved equal with all roof panel, framing components and accessories from a single source manufacturer

McElroy Metal Inc. - Corporate Office - 1500 Hamilton Road - Bossier City, LA 71111
(800) 562-3576

B. Supply all products specified in this section from the same manufacturer as for Sections 07411 and 07620

2.02 FRAMING SYSTEM COMPONENTS

A. The retrofit framing manufacturer shall engineer the framing system to comply with the "Design Intent" of the existing roof's supporting structure to ensure that all new load-bearing or load-transferring members are anchored to and located directly over existing secondary or primary load bearing support members. The retrofit framing system shall consist of any of the following components based on the Manufacturer's design and in accordance with the specifications herewith.
   a. Base clips for purlin supporting member attachment shall be a minimum 4"x4"x3½"x14-gage steel angle having of 14.0 square inches of bearing surface area.
   b. Base channel members shall be a minimum 4-3/16"x2"x16-gage x 12" long having 50.25 square inches of bearing surface area.
   c. Continuous base members shall be a minimum of 16-gage formed steel channel, cee or zee shape.
   d. Purlin supports (vertical members) shall be a minimum 4"x2"x18-gage formed steel channel or cee shape.
   e. Purlins shall be a minimum 3½"x1½"x16-gage formed steel zee shape.
   f. Purlin clips shall be a minimum 16-gauge formed steel angle shape.
   g. Perimeter elevated wall framing members shall be a minimum of 16-gage formed steel, channel, and cee or custom shapes to satisfy conditions.
   h. Transverse and longitudinal angle bracing shall be a minimum of 18-gage formed steel with a minimum 4" pre-formed girth.
   i. Purlin stabilization shall be a minimum 0.023" thick x 2" wide x 55 KSI steel strapping.
   j. Hat channels used for bracing, girts, struts or other members shall be a minimum of 22-gage steel with galvanized, G-90 coating, in accordance with ASTM A 525.

2.03 MATERIALS

A. Steel sheet for roll-formed or press-broke members of the gage indicated herein, conforming to ASTM A 1011 and minimum yield strength 55,000 PSI.
B. Structural shapes if required for special conditions shall conform to ASTM A 36 and minimum yield strength of 36,000 PSI.
C. Cold form steel framing system members of the minimum gages indicated herein shall have a protective shop primer coating conforming to FS TT-P-646 with base steel prepared in accordance with SSPC-SP10.
D. Supply all hardware items required for installation of retrofit framing system in accordance with manufacturer's installation instructions and other indicated items.

2.04 MISCELLANEOUS PRODUCTS

A. Fasteners And Anchors
   a. Anchors used for the attachment of the new retrofit framing system to the existing roof structural support system shall be of the type and size that is appropriate for secure attachment to satisfy the required wind uplift pressure values at each location, as specified by the retrofit system manufacturer. All anchors shall attach directly into existing structural members. A minimum of two (2) anchors shall be used for base clips and channels.
   b. Fasteners used for the retrofit framing system shall be a minimum ¼" diameter with 14 threads per inch having a stress relief head and a corrosion resistant coating.
B. Anchor Penetration Sealant
   a. Temporary construction sealant shall be used at each anchor penetration at attachment locations of the new retrofit framing system to the existing roof structural support system. The Installer shall select the appropriate sealant type that is compatible with the existing roof membrane, which will provide a leak-free condition throughout the erection of the framing and the completion of the metal roof panel system installation. The installing contractor is responsible for any and all leaks including damage to the building contents.

[Specifier Note: If desired, you may include in this section additional specifications for insulation, ventilation and rooftop equipment that relate to the retrofit roof system. Typically, these are an integral part of a complete retrofit project. Refer to attachments that were included with this specification**]**

PART 3 – EXECUTION

3.01 DEMOLITION OF EXISTING ROOF MATERIALS

A. **[Specifier Note:** Choose if you desire to have the existing roof aggregate or ballast removed (if applicable as well)**]** The installer shall remove the existing loose and semi-loose aggregate from the built-up roofing membrane. Removal shall be accomplished by carefully spudding the existing aggregate so as to minimize damage to the roofing membrane. The removal shall be thorough and shall render a smooth substrate suitable for that attachment of base framing members to the exposed roofing membrane. The installer shall exercise care and shall prevent aggregate from entering roof drains and clogging the existing roof's drainage system. All aggregate surfacing shall be removed and disposed of properly and in accordance with local ordinances and regulations.

3.02 FRAMING SYSTEM INSTALLATION

A. General
   1. Installation shall be as specified and in accordance with the retrofit systems manufacturer's approved installation documents and erection drawings.
   2. Install the retrofit framing system with consistent purlins erected without waves, warpage, buckles, fastening stresses or other distortion. Every care should be taken in the installation of the retrofit framing to minimize oil canning in the metal roof panel system.
   3. Field cutting of framing members shall be done in a safe manner preventing damage to the existing roof or adjacent materials. The retrofit framing contractor shall use good construction practices to minimize scrap and to utilize the material as provided by the retrofit system manufacturer.
   4. Dissimilar materials that are not compatible when contacting each other shall be insulated from each other by means of gaskets or insulating compounds.

B. Erection Tolerances
   1. Variation from plumb: 1/8 inch, maximum
   2. Variation from level: 1/8 inch, maximum
   3. Variation from true plane: 1/8 inch, maximum
   4. Variation from true position: 1/4 inch, maximum
   5. Variation of member from plane: 1/8 inch, maximum

3.03 EXTENSION OF EXISTING COMPONENTS

[Specifier Note: the following addresses rehabilitation work that may be required on existing components and rooftop equipment. Use these as appropriate to the project to satisfy the conditions of the project and application of the new retrofit roof system**]**

A. Extension Of Electrical Service: When power vents are removed and reinstalled on curbs on the new metal roof panel system, the contractor shall extend the electrical service as required to render the power vent operational. Extensions shall be made with like gage and type wire. If the original service is run in conduit, conduit shall be installed on the extension. Junction boxes shall be provided at splices in wire or conduits. Junction boxes and conduit shall be secured to the steel framing structure. All work shall be accomplished to comply with the local electrical code.

B. Extension Of Existing Plumbing Vents: During the installation of the specified metal roof panel system, the extension and flashing of existing plumbing vents will be required. The contractor shall extend existing plumbing vents through the metal roof panels, as required and provide flexible vent pipe flashings at the roof panel penetration. Plumbing vent extensions shall be made with material of like composition of the plumbing vent being extended, and shall be securely braced within the attic space to ensure continued service of the vent. As often as possible, when extending plumbing vents, the contractor shall ensure that the roof penetration is located between the side seams of the metal

roof panels such that the malleable ring on the flexible vent pipe flashing will lay flat against the roof panel around it's entire circumference. The contractor shall install elbow fittings to horizontally displace the pipe if necessary. The metal roof panel system manufacturer must approve plumbing vents that do not fall between side seams.

C. Extension Of Existing Hot Flue Stacks: During the installation of the specified metal roof panel system, the extension and flashing of existing hot flue stacks will be required. The contractor shall extend existing hot flue stacks through the metal roof panels, as required and provide flashings at the roof panel's penetration. Flashings shall be flexible vent stack type or rooftop equipment curb type depending on the size of the existing stack. Hot flue stack extensions shall be of double wall construction made with material of like composition of the hot flue stack being extended, and shall be securely braced within the attic space to ensure continued service of the vent. Hot flue stacks shall be extended to be 3 feet higher than the elevation of any roof within a 10-foot radius of the hot flue stack penetration.

D. Extension Of Existing Ductwork: When existing gravity vents, power vents, gooseneck fresh air make-up, and other vents are installed on curbs on the new metal roof panel system, the extension of vent ductwork will be required. The contractor shall extend existing ductwork through the metal roof panel system, as required to ensure the continued service of the vent. Ductwork shall be securely attached to new rooftop equipment curb and joints shall be sealed tight to provide a leak-proof assembly. Ductwork extensions shall be made with material of like composition and gage of the ductwork being extended.

3.04 REINSTALLATION OF EXISTING COMPONENTS

A. Reinstallation Of Existing Vents: During the installation of the specified metal roof panel system, the removal and reinstallation of existing power vents, gravity vents, and gooseneck vents shall be required. The contractor shall remove and reinstall vents indicated to extend through the metal roof panel system. The contractor shall have the responsibility to remove such vents without damage, and reinstall the vents on new rooftop equipment curbs. Vents shall be securely fastened to the equipment curb to prevent displacement and to provide a weathertight installation. In the case of power vents, the electrical service shall be extended to ensure continued service of the vent.

3.05 CLEAN UP

A. The Contractor shall protect installed products from damage by subsequent construction activities until final acceptance. The contractor shall collect and dispose of all framing system cuttings and debris including unused anchors, framing fasteners, sealant and associated material from the jobsite.

DISCLAIMER: McElroy Metal makes no warranty, express or implied, as to the merchantability or fitness for any particular purpose of any product by an optional manufacturer. If you choose to use a product not manufactured by the specified manufacturer, as defined herein, you take the product as is and at your own risk.

To ensure you have the most current information available, please contact McElroy Metal or visit our website at http://www.mcelroymetal.com to download the most current specifications.

The following can be added to PART 2 – PRODUCTS of the Retrofit Roof Systems Specification to include insulation and/or ventilation to the overall system.

2.05 INSULATION

A. **[Specifier Note:** Include this if you desire condensation control assistance. *It is highly recommended that this insulation method be used if the attic space created by the retrofit framing system is not going to be ventilated*] Insulation shall be 2" vinyl backed type condensation control blanket of sufficient thickness to provide a minimum "R" value of 6 when tested in accordance with ASTM C 177. Insulation shall have a vinyl backing providing permeability of 0.02 perms or less when tested in accordance with ASTM E 96. Vinyl backing shall have a flame spread rating of less than 25 when tested in accordance with ASTM C 84. Insulation shall conform to ASTM C 665, Type ll, Class A or Type lll, Class A.

B. **[Specifier Note:** Choose one of the following if you desire to improve the thermal efficiency of the building itself**]**

2. Un-faced fiberglass insulation shall be installed directly over existing roof. Thickness shall be 4" providing a minimum "R" value of 13 when tested in accordance with ASTM C 177 or
3. Un-faced fiberglass insulation shall be installed directly over existing roof. Thickness shall be 6" providing a minimum "R" value of 19 when tested in accordance with ASTM C 177.

2.06 VENTILATION

A. **[Specifier Note:** Include this if you desire to provide ventilation to the cavity/attic space between the existing and new roofs.**]** The contractor shall design and install ventilation components, accessories and/or assemblies that provide a minimum of 3-airchanges per hour for the cavity space between the existing and new roofs. Airflow calculations with appropriate literature shall be submitted for review and approval

The following can be added to PART 2 – PRODUCTS of the Retrofit Roof Systems Specification to include rooftop equipment related to the extension of existing rooftop equipment

2.07 ROOFTOP EQUIPMENT

A. Curbs shall be those manufactured by L&M Curb, Inc. of Longview, TX or equal. Metal roof system manufacturer shall provide all curbs and scuttles to ensure compatibility with the specified roof panel system.

B. Rooftop equipment curbs shall be prefabricated of minimum 0.080 aluminum and shall have fully mitered and welded corners, integral base plates and **[Specifier Note:** choose water diverter or welded-n cricket**]**. All welds shall be prime painted after fabrication. Internally reinforce curbs with steel angle on any side exceeding 3'-0". Factory install 1½" fiberglass insulation with 3# density. Minimum height above finished roof to be 8".

C. Roof scuttle shall be 2'-6" X 3'-0", with Ladder-Up access as manufactured by Metallic Products Corporation of Houston, TX or approved equal.

D. Curbs and scuttles shall be painted or powder coated to match the adjacent roof panel.

E. Roofing System Installer shall install in accordance with the manufacturer's instructions.

F. Flexible pipe flashing shall be the metal roof system manufacturer's standard product of a configuration to seal around circular pipe penetrations and prevent intrusion of water through the metal roofing membrane. Flexible pipe flashing shall consist of a flexible ring of EPDM or other suitable material bonded to a malleable steel draw-ring which when fastened to the roofing membrane will weatherproof the penetration.