Specifications for
Texas Parks and Wildlife Department
Austin Headquarters
Exterior Renovation

Project # 1110099

100% Construction Documents
28 April 20

Owner: Texas Parks and Wildlife Department
4200 Smith School Rd.
Austin, Texas 78744

Architect: MWM DesignGroup, Inc.
305 East Huntland Drive, Suite 200
Austin, Texas 78752

MEP Engineer: Encotech Engineering Consultants, Inc.
8500 Bluffstone Cove, Suite B-103
Austin, Texas 78759

Roofing Consultant: Jim Whitten Roof Consultants, LLC
P.O. Box 200925
Austin, Texas 78720
## INTRODUCTORY INFORMATION

<table>
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<th>Document Number</th>
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</tbody>
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1. **Project Title:** Headquarters Building Exterior Renovations
2. **Description of Work:**
   - Replace roofs on Buildings A, B and C
   - Replace roof on Fitness Center
   - Replace exterior façade seals on Buildings A, B and C
   - Install polyurethane coating at eyebrows on Buildings A, B and C
   - Seal through-wall penetrations on Buildings A, B and C

3. **Architect:** MWM DesignGroup, Inc.
   - 305 E. Huntland Drive, Suite 200
   - Austin, Texas 78752
   - Tel: (512) 453-0767

4. **MEP Engineer:** Encotech Engineering Consultants, Inc.
   - 8500 Bluffstone Cove, Suite B-103
   - Austin, Texas 78759
   - Austin, Tx. 78730
   - Tel: (512) 338-1101

5. **Roofing Consultant:** Jim Whitten Roof Consultants, LLC
   - P.O. Box 200925
   - Austin, TX 78720
   - Tel: (512) 250-0999
# TECHNICAL SPECIFICATIONS

## DIVISION 1
- **011000** Summary of Work
- **012100** Allowances
- **014100** Regulatory Requirements
- **014200** References
- **017329** Cutting and Patching

## DIVISION 2
- **020000** Existing Conditions PV Record Drawings – For Information Only.
- **024100** Demolition

## DIVISION 4
- **045000** Masonry Cleaning

## DIVISION 5
- **054000** Cold-Formed Metal Framing

## DIVISION 6
- **061053** Miscellaneous Rough Carpentry

## DIVISION 7
- **070150.19** Preparation for Reroofing
- **071800** Traffic Coatings
- **072200** Roof and Deck Insulation
- **073113** Asphalt Shingles
- **075419** Polyvinyl-Chloride (PVC) Roofing
- **075600** Fluid-Applied Roofing
- **076200** Sheet Metal Flashing and Trim
- **077200** Roof Accessories
- **079200** Joint Sealants

## DIVISION 9
- **092900** Gypsum Board Assemblies
- **099100** Painting

END OF TABLE OF CONTENTS
PART 1 - GENERAL

1.1 DESCRIPTION

A. The Scope of Work generally includes roof replacement, limited roof repairs, and building envelope repairs at the Texas Parks and Wildlife Department Headquarters building and the Fitness Center located at 1300 Smith School Road in Austin, Texas.

B. Headquarters building roof replacement system shall meet UL Class A, comply with State of Texas applicable current building codes, and qualify for roof membrane manufacturer’s 20 year no dollar limit roof system guarantee.

1.2 STORAGE

A. Limited storage area will be provided by Owner where available. Supply temporary storage required for storage of equipment and materials for duration of Project. Utilize only areas designated by Owner for storage.

1.3 BUILDING OCCUPANCY

A. Owner will occupy premises during periods of construction for the conduct of his normal operations. Cooperate with Owner to minimize conflict and to facilitate Owner’s operations.

B. Pre-determine and obtain approval, in advance from Owner, for vertical and horizontal transportation of labor and construction materials onto and out of buildings.

1.4 WORKING HOURS AND SCHEDULE

A. Submit work schedule to Owner. Working hours shall generally between the hours of 7:00 A.M. and 6:00 P.M., Monday through Friday, except holidays.

B. Obtain approval from Owner prior to altering Work schedule.

C. Obtain approval from Owner prior to performing weekend or after hours work.

1.5 PRE-JOB DAMAGE SURVEY OF FACILITY

A. Perform a thorough survey of property and all affected areas of the buildings with Owner prior to starting the work in order to document existing damage and operational status of existing equipment. Non-functional or damaged items identified on this list will not be the responsibility of Contractor unless further damaged by Contractor during execution of Project.

B. Consider any damage to buildings or property not identified in the pre-job damage survey as having resulted from execution of this Contract and correct at no additional expense to Owner.

1.6 GUARANTEE AND WARRANTY

A. Provide Roof Manufacturer’s 20-Year No Dollar Limit (NDL) System Guarantee

B. Both the Contractor’s Warranty and the Manufacturer’s Guarantee shall list the specific building by name and identify roof area/section by Owner’s roof area/section designation.
D. Both the Contractor's Warranty and the Manufacturer's Guarantee shall cover damage to Work resulting from failure to resist penetration of moisture and replacement of assembly components that fail due to material failure or faulty workmanship.

E. Should roof samples be required by manufacturer issuing guarantee and if, for any reason, deficiencies are found within the samples, the Contractor shall at its expense, make repairs, etc., as necessary, to correct deficiencies and satisfy the requirements of the manufacturer issuing the guarantee.

END OF SECTION 011000
SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
   A. Section includes administrative and procedural requirements governing allowances.
   B. Types of allowances include the following:
      1. Unit-cost allowances.

1.3 DEFINITIONS
   A. Allowance: A quantity of work or dollar amount included in the Contract, established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

1.4 SELECTION AND PURCHASE
   A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.
   B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
   C. Purchase products and systems selected by Architect from the designated supplier.

1.5 ACTION SUBMITTALS
   A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.
1.6 INFORMATIONAL SUBMITTALS
   A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
   B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
   C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.7 UNIT-COST ALLOWANCES
   A. Allowance shall include cost to Contractor of specific products and materials selected by Architect under allowance and shall include freight and delivery to Project site.
   B. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
      1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION
   A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.
3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Unit-Cost Allowance: Include the sum of $60,000.00 for Building A and Building C existing TPO eyebrow roof TPO roof membrane and flashing repairs per the following:

1. Cut out unsealed perimeter edge strip-in flashing, remove and dispose, clean and prepare substrate, install new self-adhering 60-mil TPO edge strip-in flashing, min 12” wide.
   a. Unit Cost Per Linear Foot: $\ldots$ / LF

2. Cut out TPO roof membrane blisters, unadhered laps, fishmouths, and wrinkles, remove and dispose; clean and prepare substrate, install new 60-mil TPO repair patch, extending over cut edge a minimum of 4-inches each direction, heat weld entire perimeter of repair patch with minimum 1-1/2” wide weld.
   a. Unit Cost Per Square Foot: $\ldots$ / SF

END OF SECTION 012100
PART 1 - GENERAL

1.1 GOVERNING CODES

A. Materials shall meet fire and wind uplift criteria as indicated in the most current available publications of the following authorities and classifications:


1.2 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original containers, dry, undamaged, with seals and labels intact.

B. Store all roof system materials in enclosed trailers or storage containers. When the roof is to be stocked, store materials off the ground or on roof deck on pallets. Store rolled materials on end. Unprotected, moist or otherwise damaged materials or materials with evidence of moisture damage such as staining shall be conspicuously marked for permanent removal from the job. Store emulsions at temperatures above 40 degrees Fahrenheit. Handle rolled goods with care to prevent damage to edges or ends.

C. Materials will be checked for general conformance to specifications. Materials found that are not approved or do not meet required standards shall be marked as rejected and permanently removed from the jobsite.

D. Use care in transporting materials across the roof surface. Repair existing roof and re-roofed areas where workmen have damaged the roof system. Do not transport materials over re-roofed area unless protected by plywood.

E. Scatter material stored on the roof surface over the roof deck to avoid damage to the structural roof system. High concentrated loads will not be permitted on the roof. It is the Contractor's responsibility to ensure that the roof is not overloaded with stored materials.

F. Overnight rooftop storage of roof system materials is prohibited. Only those materials required for immediate installation will be permitted on the roof.

G. If rooftop hoisting equipment is used, it shall be properly assembled and maintained. Only employees of the Contractor that are thoroughly familiar with hoisting equipment shall operate such equipment. All such equipment shall be erected and supported so that it will not damage the existing structural deck, the walls or new roofing. Repair to pre-damaged condition any deck, walls, walks, or other existing surfaces that are damaged as a result of Contractor's Work.

H. Furnish plywood walkways and take any other precautions required to prevent tracking of aggregate from existing membrane to be removed into new work areas where aggregate pieces can be trapped within the new membrane. Instruct and monitor Contractor's workers to assure that aggregate is not tracked into new work area on workmen's shoes or equipment wheels. Discovery of entrapped aggregate within the
new membrane is sufficient cause for rejection of that Work. Weigh down plywood walkways to ensure that they are not lifted or moved by wind.

I. No use of building interiors will be allowed.

1.3 GENERAL ENVIRONMENTAL REQUIREMENTS

A. Refer also to individual technical specification sections.

B. Do not apply roofing membrane during inclement weather or when air temperature may fall below 40 degrees Fahrenheit. Deck temperature must be at a minimum of 50 degrees Fahrenheit.

C. Do not apply roofing membrane to damp or frozen deck surface.

D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

E. Do not apply glazing sealants to wet or frost-laden surfaces.

F. Make a reasonable effort to prevent fumes, odors, and smoke from entering the interior spaces.

END OF SECTION 014100
PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. The date of the standard is that in effect as of the Bid date.

1.2 SCHEDULE OF REFERENCES

<table>
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<tbody>
<tr>
<td>AA - Aluminum Association</td>
<td>818 Connecticut Avenue, N.W. Washington, DC 20006</td>
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<tr>
<td>ANSI - American National Standards Institute</td>
<td>1430 Broadway New York, NY 10018</td>
</tr>
<tr>
<td>APA - American Plywood Association</td>
<td>P.O. Box 11700 Tacoma, Washington 98411</td>
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<tr>
<td>ARMA - Asphalt Roofing Manufacturers Association</td>
<td>1156 15th Street N.W. Suite 900 Washington, DC 20005</td>
</tr>
<tr>
<td>ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers</td>
<td>1791 Tullie Circle, N.W. Atlanta, GA 30329</td>
</tr>
<tr>
<td>AWPA - American Wood-Preservers' Association</td>
<td>7735 Old Georgetown Road Bethesda, MD 20014</td>
</tr>
<tr>
<td>CDA - Copper Development Associates</td>
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<tr>
<td>FM - Factory Mutual System (FM Global)</td>
<td>1151 Boston-Providence Turnpike Norwood, MA 02062</td>
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<tr>
<td>EPA - Environmental Protection Agency</td>
<td>401 M. St. S.W. Washington, DC 20460</td>
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<td>FS - Federal Specifications General Services Administration</td>
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Texas Parks and Wildlife Austin Headquarters
Headquarters Exterior Renovations

Specifications and Consumer Information
Distribution Section (WFSIS)
Washington Navy Yard, Bldg. 197
Washington, DC 20407

NRCA
National Roofing Contractors Association
10255 W. Higgins Road, Suite 600
Rosemont, IL 60018

NEMA
National Electrical Manufacturers Association
2101 L. St. N. W.
Washington, DC 20037

NFPA
National Fire Protection Association
Battery March Park
Quincy, MA 02269

NFPA
National Forest Products Association
1619 Massachusetts Avenue, N.W.
Washington, DC 20036

OSHA
Occupational Safety and Health Administration
200 Constitution Avenue
Washington, DC 20210

SDI
Steel Deck Institute
Box 3812
St. Louis, MO 63122

SFPA
Southern Forest Products Association
P.O. Box 52468
New Orleans, La 70152

SMACNA
Sheet Metal and Air Conditioning Contractors' National Association
8224 Old Court House Road
Vienna, VA 22180

SPRI
Single Ply Roofing Institute
77 Rumford Avenue, Suite 3B
Waltham, MA 02453

UL
Underwriters' Laboratories, Inc.
333 Kingston Road
Northbrook, IL 60062

END OF SECTION 014200
SECTION 017329
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 SUBMITTALS

A. Cutting and Patching: Submit cutting and patching procedures at least 3 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.

2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building’s appearance and other significant visual elements.

3. Products: List products to be used and firms or entities that will perform the Work.

4. Dates: Indicate when cutting and patching will be performed.

5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.

6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.

7. Architect's/Roof Consultant's Approval: Obtain approval of cutting and patching Bid before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:
1. Primary operational systems and equipment.
2. Air or smoke barriers.
3. Fire-suppression systems.
4. Mechanical systems piping and ducts.
5. Control systems.
6. Communication systems.
7. Conveying systems.
8. Electrical wiring systems.
9. Operating systems of special construction in Division 13 Sections.
10. Security alarm system.
11. Fire alarm system.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:
1. Water, moisture, or vapor barriers.
2. Exterior curtain-wall construction.
3. Equipment supports.
4. Piping, ductwork, vessels, and equipment.
5. Noise- and vibration-control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.6 WARRANTY
A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS
A. General: Comply with requirements specified in other Sections.
B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
   1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
   2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize [prevent] interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer’s written recommendations.
   1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
   3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
   4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of
Pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

5. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
   b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
   a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017329
SECTION 020000

EXISTING CONDITIONS PV RECORD DRAWINGS

1. OVERVIEW

The following record drawings, prepared by Meridian Solar and entitled Texas Parks and Wildlife Austin Headquarters are the original construction drawings for the rooftop photovoltaic array that will be impacted by the Headquarters Exterior Renovations. These documents are included for informational purposes only.

END
EXISTING CONDITIONS PV RECORD DRAWINGS - FOR INFORMATION ONLY

KEYED NOTES TO SHEET E1:

A) Existing Austin Energy transformer-rated revenue meter
B) Existing 4000A main-lug switchboard, 480Y/277V, in basement electric room
C) PV service tap conductors terminated on supply side with cable limiters, Bussmann KDF
D) PV service disconnect; 200A fusible safety switch; Square D H364N, with #HRX1020 Class R fuse kits;
   150A 600V Class RK1 Ferraz Shawmut fuses; A6D15OR; do not bond neutral at this location
E) PV utility lockable disconnect; 200A non-fusible safety switch; Square D #HU364NRB
F) PV 7-terminal meter socket, Milbank #40407-025; replace neutral terminal with NSI #AL-R2-H12;
   do not bond neutral at this location
G) PV Form 165 production meter, Landis & Gyr 94E
H) Panel PV; 400A, 480V/277V; see Sheet E9.2
I) AC wire management gutter; NEMA 1, 8"x8", furnish sections to fit space; see Sheet E5
J) SMA 800US inverter, NRTL-listed to UL 1741
K) SMA 600US inverter, NRTL-listed to UL 1741
L) Delta LA603 lightning arrester
M) SMA factory-integrated fusible combiner and DC disconnect, with Delta LA602DC lightning arrester;
   Littelfuse KLD015 on each string

P) DC wire management gutter, 8"x8", furnish sections to fit space; see Sheet E5
Q) Transition box; (18) Entrelac #115 129 R1400 terminals on DIN rail, in 12"x10"x5" minimum NEMA 4 enclosure
R) Transition box; (10) Entrelac #115 129 R1400 terminals on DIN rail, in 12"x10"x5" minimum NEMA 4 enclosure
S) Transition box; (16) Entrelac #115 129 R1400 terminals on DIN rail, in 12"x10"x5" minimum NEMA 4 enclosure
T) Transition from free air to 1" IMC through weatherhead attached to wall pan
U) Schott POLY 230 modules; 13 in series, 3 strings
V) Schott POLY 230 modules; 13 in series, 2 strings
W) Common conduit; 1-1/4" IMC on 6" pipe piers, circuits 7, 8, 9; 50% derated
X) Common conduit; 1-1/4" IMC on 6" pipe piers, circuits 10, 11, 12; 50% derated
Y) Common conduit; 1" IMC on 6" pipe piers, circuits 13, 14; 50% derated
Z) Common conduit; 1-1/4" IMC on 6" pipe piers, circuits 15, 16, 17; 50% derated

GENERAL NOTES:

1. Shading issues were identified during the site survey of the installation area.
   Part of the design process included ensuring the installation meets the shading requirements of the Austin Energy Solar PBI program guidelines.
Fed from AE transformer bank in adjacent underground vault.

Panel MDP
480Y/277 VAC, 3P4W
400A BUS, ML-O
(EXISTING)

200A
3P

150AF

200A
3P

GENERAL NOTES:
1. REFER TO E91 FOR CIRCUIT SCHEDULE
2. REFER TO E0 FOR KEYED NOTES
3. TEMPERATURE DESIGN CRITERIA: 99°F

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<th>MANUFACTURER</th>
<th>MODEL #</th>
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MODULE
PMP VMP IMP VDC ISC %C MCA
SCHOTT 230 230 30 7.66 36.9 8.33 -0.33 12.99

Panel PV
480Y/277 VAC, 3P4W
400A BUS, ML-O
EXISTING CONDITIONS PV RECORD DRAWINGS - FOR INFORMATION ONLY

Keyed Notes
1. Transition Box, 12"x10"x5", NEMA 4, with grounding terminals
2. Inverter - SMA, 6 kW
3. Inverter - SMA, 8 kW
4. PV Aggregation panel
5. PV Meter
6. PV Utility Disconnect Switch, Lockable, Visible; do not bond neutral
7. PV Service Disconnect Switch, Fusible, Lockable, Visible; do not bond neutral
8. Grounding Electrode terminal inside existing #400A switchboard
9. Existing bond to structural steel
10. Inverter Grounding Electrode Conductor; shall be continuous; connect to identified external point using Bundy CL50-1 lay-in lug
11. Irreversible crimp connector, Bundy #YGHLC29C26
12. Existing Grounding Electrode Conductor between earth ground and roof structure
13. PV Array: Schott POLY 230, 2 strings of 13
14. PV Array: Schott POLY 230, 3 strings of 13
15. Module frame equipment grounding conductor; 6 AWG bare stranded, continuous run; connect to each frame using Tyco SOLKLM #2106831-1

Equipment ground
GEC

Legend
EXISTING CONDITIONS PV RECORD DRAWINGS - FOR INFORMATION ONLY

Detail 1 - System Diagram

Detail 2 - SMA Comm. Wiring Diagram, Typical
Keyed Notes:
A. PV aggregation panel, 400A, 480V/277, top-fed, NEMA 1 enclosure with flush-mount front, 150A MCB with 40kAIC rating.
B. AC wire management gutter, NEMA 1, 8"x8"x132", fabricate standard sections sufficient for correct length.
C. Inverter, 6kW, SMA SB6000US, listed to UL 1741, with integrated fusible DC disconnect.
D. DC wire management gutter, NEMA 1, 8"x8"x134", fabricate standard sections sufficient for correct length.
E. EMT through penetrations in CMU wall; patch on exterior with elastomeric sealant.
F. Vertical support, back-to-back 1-5/8" shut, P1000T or equal, secure to floor by post base, Unistrut #P2073 or equal, secure to roof trusses.
G. Horizontal support, 1-5/8" shut, P1000T or equal, attached to vertical supports by 3/8" hardware.
H. DC distribution gutter, NEMA 3R, 8"x8"x60".
I. Wire mesh partition to be removed.
J. Adjacent storage cages to remain.

General Notes:
1. Structure is of reinforced concrete, except roof decks and columns are steel.
2. All walls to be penetrated are CMU.
3. No drilling or boring of concrete between 8:00 AM and 5:00 PM, Monday through Friday.
4. All interior penetrations to be sealed with 2-hour rated fire caulk.
DC POWER PLAN

KEYED NOTES:

A CONDUIT EXPANSION JOINTS, 1" AX-100 AND 1 1/2" AX-125 WITH BONDING JUMPERS BJ-1012-14

(403) SCHOTT POLY 230 MODULES
(31) STRINGS OF 13
92.69 kw
POWER PLAN - BASEMENT

SCALE: 1"=80'

EXAMINER'S NOTES:
A Existing AE transformer vault
B Existing 3000A service switchboard, 480/277V
C Existing 100A service switch to emergency distribution
D New 200A service switch, fused, 600V, bonded solid neutral; with 150A Class R fuses
E PV AC service tap in 2-1/2" EMT
F PV AC feeder in 2-1/2" EMT
G Pull box or conduit body within fire-rated access door; see Sheet 2.2
## Circuit Schedule

<table>
<thead>
<tr>
<th>Item</th>
<th>From</th>
<th>To</th>
<th>Conductor Quantity</th>
<th>Conductor Size</th>
<th>Insulation</th>
<th>Ground Size</th>
<th>OCPD Rating</th>
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**Notes:**
1. Conduit to be supported on pipe piers, minimum 6" separation from roof surface.
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<th>VA 1</th>
<th>A 1</th>
<th>B 1</th>
<th>C 1</th>
<th>KVA 1</th>
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**EXISTING CONDITIONS PV RECORD DRAWINGS - FOR INFORMATION ONLY**

**Existing Roof Notes:**
Load comparisons for the building roof indicate that the existing concrete roof structure is adequate to support the additional dead loads of all photovoltaic arrays. Existing gravel overlay on built-up roof to be removed below array footprints. See accompanying Engineering Letter dated November 5, 2010 for additional information.

**ARRAY & BALLAST LAYOUT**

**Ballast Notes:**
Numbers on the layout above represent number of ballast blocks placed in ballast tray. Ballast blocks are solid concrete blocks with the dimensions of 4" x 8" x 16" and weigh 32.5 pounds each. Ballast blocks should meet ASTM standards that allow them to be repeatedly frozen and heated without loss of material integrity. All perimeter ballast blocks must be adhered to the racking system with Builder's Choice subfloor and Construction adhesive (HC-490 or equal).
SUBMITTAL 1

for

TPWD Austin Headquarters Solar Installation

Project Number 125385, Contract Number 403388

PV MATERIALS AND SHOP DRAWINGS

November 5, 2010

Prepared by:

Meridian SOLAR

4109 Todd Lane, Suite 900
Austin, TX 78744
(512) 448-0055
SCHOTT Solar POLY™
Polycrystalline Solar Modules

SCHOTT Solar has been a leading global developer and manufacturer of solar products for over 52 years. Engineered in Germany and manufactured in America, the high-quality SCHOTT Solar PV modules are extremely durable and reliable as demonstrated in several important ways:

Industry leading warranty: SCHOTT Solar offers an industry-leading linear power output warranty for 25 years in addition to five years warranty for any defects in materials or workmanship. This enhancement provides 6% more guaranteed power over the 25 year period compared to standard step-down warranties common in the industry.

Narrow output tolerance: SCHOTT Solar POLY™ modules are among the industry leaders in power output tolerances. SCHOTT Solar sorts all modules to a positive tolerance (minus zero watts) which provides for a stable, high-energy output you can feel secure in.

Long-term reliability: SCHOTT modules are environmentally tested to double the industry certification standards for thermal cycling and damp heat tests to ensure consistent and superior performance over the long term. In addition, SCHOTT has performance data from over 25 years of actual field testing that supports our high-quality products.

High resistance to mechanical loads: SCHOTT Solar modules are tested to an extreme loading pressure of 5,400 Pa to ensure additional security for your investment.

Up-to-date features: SCHOTT Solar modules offer up-to-date electrical features such as double insulated PV cables for use with transformerless inverters and locking connectors.

Environmentally friendly: Due to our concern with jobsite waste and disposal costs, we bulk pack our modules in a manner that significantly reduces cardboard waste.
Technical Data

Electrical data

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STC (1,000 W/m², AM 1.5, cell temperature 25°C)
Power tolerance (as measured by flasher): +0.00 Watts / +4.99 Watts
Power measurement accuracy: ± 4%

Data at normal operating cell temperature (NOCT)

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<tr>
<td>Short-circuit current [A]</td>
<td>I_{sc}</td>
<td>6.53</td>
<td>6.60</td>
<td>6.67</td>
<td>6.75</td>
</tr>
<tr>
<td>Temperature [°C]</td>
<td>T_{NOCT}</td>
<td>47.2</td>
<td>47.2</td>
<td>47.2</td>
<td>47.2</td>
</tr>
</tbody>
</table>

NOCT (800 W/m², AM 1.5, windspeed 1 m/s, ambient temperature 20°C)
Power measurement accuracy: ± 4%

Data at Low Irradiation

At a low irradiation intensity of 200 W/m² (AM 1.5 and cell temperature 25°C) 97% of the STC module efficiency (1000 W/m²) will be achieved.

Temperature coefficients

<table>
<thead>
<tr>
<th>Power [%/°C]</th>
<th>-0.45</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open-circuit voltage [%/°C]</td>
<td>-0.33</td>
</tr>
<tr>
<td>Short-circuit current [%/°C]</td>
<td>+0.03</td>
</tr>
</tbody>
</table>

Characteristics data

<table>
<thead>
<tr>
<th>Solar cells, per module</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell type</td>
<td>5&quot; (156 mm x 156 mm), full square</td>
</tr>
<tr>
<td>Front panel</td>
<td>Low-iron solar glass, 4 mm thick</td>
</tr>
<tr>
<td>Frame material</td>
<td>Anodized aluminum</td>
</tr>
<tr>
<td>Connection</td>
<td>Junction box with 3 bypass diodes</td>
</tr>
<tr>
<td></td>
<td>PV WIRE, 43.3&quot; (1,100 mm) x 4 mm²</td>
</tr>
<tr>
<td></td>
<td>TYCO SolarLok connectors</td>
</tr>
</tbody>
</table>

Dimensions and weight

| Dimensions          | 66.34" (1,685 mm) x 39.09" (993 mm) |
|                    | tolerance ± 0.118" (3 mm) |
| Thickness           | 1.97" (50 mm) tolerance ± 0.04" (1 mm) |
| Weight              | approx. 50.6 lbs (23.0 kg) |

Limits

<table>
<thead>
<tr>
<th>System voltage [V_{oc}]</th>
<th>600</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum reverse current [A]^</td>
<td>15</td>
</tr>
<tr>
<td>Operating module temperature [°C]</td>
<td>-40 to +85</td>
</tr>
<tr>
<td>Maximum load (I_{sc})</td>
<td>75</td>
</tr>
<tr>
<td>Fire classification</td>
<td>C</td>
</tr>
</tbody>
</table>

* No external current greater than V_{oc} shall be applied to the module.

Qualifications

The SCHOTT POLY™ 220/225/230/235 Watt modules are certified to and meet the requirements of UL 1703.

SCHOTT Solar reserves the rights to make specification changes without notice. For detailed product drawings and specifications, please contact SCHOTT Solar or an authorized reseller.
SCHOTT Solar POLY™ Modules
SCHOTT Solar, Inc.

LIMITED WARRANTIES

(1) The limited warranties specified in paragraphs (2) and (3) below extend only to the first retail purchaser of SCHOTT's standard solar cell module, and subsequent owners of building(s) on which the module is first installed (the "Buyer").

(2) SCHOTT Solar Inc. ("SCHOTT") warrants to Buyer that modules furnished hereunder, for a period of two (2) years from the date of sale to the first retail purchaser, will be free from defects in material and workmanship and will conform to SCHOTT's applicable specifications. SCHOTT's obligations under this paragraph and Buyer's exclusive remedies shall be limited, at its option, to repair or replace the modules, or refund to Buyer of the purchase price paid for the modules, which do not conform to this warranty.

(3) SCHOTT further warrants to Buyer that (i) for a period of ten (10) years from the date of sale to the first retail purchaser that the power output of the modules will not be less than ninety percent (90%) of the minimum rated power output specified in the applicable module data sheet as of the date of original sale by SCHOTT and (ii) for a period of twenty-five (25) years from the date of sale to the first retail purchaser that the power output of the modules will not be less than eighty percent (80%) of the minimum rated output specified in the applicable module data sheet as of the date of original sale by SCHOTT (the "Performance Warranty"). In the event of a breach of the Performance Warranty during the periods specified above, SCHOTT will at its option either: (a) Repair or replace existing modules or provide additional modules in order to make up for any measured power loss (as determined by testing procedures approved by SCHOTT and, at SCHOTT's option, tested under the supervision of authorized SCHOTT personnel) but only to the extent such loss is greater than ten percent (10%) during the first ten (10) years or greater than twenty percent (20%) during the first twenty-five (25) years, and which is determined by SCHOTT to be due to defective materials or workmanship with respect to the SCHOTT modules; or (b) Pay compensation limited to the original purchase price (from SCHOTT) of the module(s) that are subject to the warranty claim, less a 10% or 4% reduction (depending on whether the payment is for a 10 year or 25 year warranty claim, respectively) for each year following the original purchase until the warranty is enforced.

(4) All claims under the warranties specified herein must be made in writing addressed to SCHOTT Solar Customer Service, 2260 Lava Ridge Court, Suite 102, Roseville, CA 95661, within ten (10) days after discovery of the basis for the claim and must set forth the complete details of such claim and the Buyer must provide written proof of the date of first retail purchase of the module for which the claim is made. Every claim under the limited warranties specified in paragraph (2) above shall be deemed waived by Buyer unless made in writing to SCHOTT within six (6) years from the date of the first retail sale to the purchaser of the modules to which such claim relates. Every claim under the Performance Warranty specified in paragraph (3) shall be deemed waived by Buyer unless made in writing to SCHOTT within the ten (10) year warranty period for claims under paragraph (3)(i) above, and (ii) the twenty-five (25) year warranty period for claims under paragraph (3)(ii) above, measured from the date of SCHOTT's sale of the modules to which such claim relates. No modules may be returned to SCHOTT without written authorization from SCHOTT. Authorized returns must be made to SCHOTT at the following address: SCHOTT Solar, 5201 Hawking Dr SE, Albuquerque NM 87109. All shipping costs for returns must be prepaid by Buyer, within thirty (30) days of a written return authorization. SCHOTT will pay shipping costs for return to Buyer of any module, which is repaired or replaced under the terms of this limited warranty. However, if a module returned to SCHOTT is found not to be defective or the warranties have expired, Buyer is responsible to pay for return shipping costs. Unless made in strict conformance with this paragraph, any warranty claims hereunder shall be deemed waived by Buyer and void.

(5) The warranties specified herein shall not apply to any modules that SCHOTT determines have been subjected to: any assembly or processing that alters physical or electrical properties; failure to follow the installation guidelines; improper installation, maintenance or use; mishandling; abuse; neglect; vandalism; improper testing; repair; alteration; damage; fire; flood; civil disturbances; war; or other acts or omissions of
persons other than SCHOTT, which alter physical or electrical properties of the modules. The warranties also shall not apply to any modules that are used in automotive, marine, or recreational vehicle applications or that are installed at any location other than North America and South America, unless expressly authorized in writing by SCHOTT. All modules repaired or replaced or any additional modules provided as remedies under these warranties shall be subject to the same warranties and the original warranty term of the modules that are the subject of the warranty claim and the original term of the warranty shall not be reset or extended. If the originally supplied module type is no longer manufactured in a series, then the current standard types will be delivered to serve as the replacement or additional modules. SCHOTT may at its discretion use new, used or remanufactured parts or modules when repairing or replacing modules. SCHOTT will not be responsible under any warranty claim or otherwise for any costs of installation, removal, testing, or transportation of any module, except as otherwise expressly set forth herein or agreed to in writing by SCHOTT.

(6) The warranties expressed herein are in lieu of all other warranties and the only warranties given by SCHOTT with respect to the modules. ALL WARRANTIES IMPLIED BY LAW, IF ANY, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED AND EXCLUDED, OR IF THEY CANNOT LAWFULLY BE DISCLAIMED OR EXCLUDED, ARE LIMITED IN DURATION TO THE MINIMUM REQUIRED BY LAW OR ONE (1) YEAR FROM THE DATE OF PURCHASE BY BUYER, WHICHEVER IS LESS.

(7) SCHOTT's entire liability to Buyer under these warranties is expressly limited to performance of the remedies specified herein and shall not exceed SCHOTT’s original sale price for the module which is the subject of any warranty claim. IN NO EVENT SHALL SCHOTT BE LIABLE UNDER THIS WARRANTY FOR PERSONAL INJURY OR PROPERTY DAMAGE OR FOR ANY INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOST PROFITS, WHETHER SUCH DAMAGES ARE BASED ON NEGLIGENCE, CONTRACT, TORT, STRICT LIABILITY OR OTHERWISE. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF PERSONAL INJURY OR PROPERTY DAMAGES OR OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY TO BUYER.

(8) THIS WARRANTY GIVES BUYER SPECIFIC LEGAL RIGHTS, AND BUYER MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.

To contact SCHOTT Solar, Inc. Customer Service:
Tel: 888-457-6527; Fax: 916-784-9781
Email: customer.service@us.schott.com
Mail: 2260 Lava Ridge Court, #102 Roseville, CA 95661
**[1.] Installer responsibility**

⚠️ **The installer is solely responsible for:**

- Complying with all applicable local or national building codes, including any that may supersede this manual;
- Ensuring that Unirac and other products are appropriate for the particular installation and the installation environment;
- Ensuring that the roof, its rafters, connections, and other structural support members can support the array under building live load conditions (this total assembly is hereafter referred to as the roof rafter assembly);
- Using only Unirac parts and installer-supplied parts as specified by Unirac (substitution of parts may void the warranty);
- Ensuring that lag screws have adequate pullout strength and shear capacities as installed;
- Maintaining the waterproof integrity of the roof, including selection of appropriate flashing; and
- Ensuring safe installation of all electrical aspects of the PV array.

**[2.] Tools required for assembly**

![7/16 Wrench]

**[3.] Components list**

1. **Bay frame** – Module mounting frame for all modules south of north most row. 6105-T5 aluminum extrusion.
2. **Module bracket** – (No. 10 x 3/4”) – Used to secure module to 2-bay and 1-bay frame. 10° tilt angle. 6105-T5 aluminum extrusion. Integral PEM nuts for quick assembly.
3. **Hex Bolt** (1/4” x 3/4”) – Use with all components of RapidRac™ except bracket connections to module. 304 stainless steel.
4. **Flat Washer** (5/16”) – Use with all components of RapidRac™. 304 stainless steel.
5. **Serrated Flange nut** (1/4”) – Use one per hex bolt and washer during assembly. 304 stainless steel. Required torque: 5 foot-pounds.
6. **WEEB 9.5** – Use with per hex bolt and washer during assembly on frame holes facing in towards the array. 304 stainless steel.
[4.] Assembly

Step 1
Lay bay frames on roof where array will be installed. Connect bay frames using bolts, washers and flange nuts. Consult RapidRac Code Compliance for proper uses of WEEB 9.5.

Step 2
Attach 2 module brackets to each module using hex bolts, washers and flange nuts on all four connections points, using WEEB 9.5 on frame holes facing in towards the array.

Note: Make sure to use a piece of cardboard to protect the module from the surface of the roof.

Step 3
Lower module with module brackets between rows of bay frames. Connect using hex bolts and washers on all six connections points. Pressed nuts have been attached to the inside of brackets to speed installation.
Step 4

Parts provided by installer:
Solid Cap Concrete Blocks (4” x 8” x 16”), 26 lbs.

WEEB 9.5 Instructions
Use 4 WEEB 9.5s per module bracket and bay frame. (Circles indicate where WEEB 9.5s can be placed to properly ground an array.)

Note: Make sure to use WEEB 9.5s on one side of the array. Refer to the RapidRac™ Code Compliance Documentation, Installation manual for more information.

10 year limited Product Warranty, 5 year limited Finish Warranty

Unirac, Inc., warrants to the original purchaser ("Purchaser") of product(s) that it manufactures ("Product") at the original installation site that the Product shall be free from defects in material and workmanship for a period of ten (10) years, except for the anodized finish, which finish shall be free from visible peeling, cracking or chalking under normal atmospheric conditions for a period of five (5) years, from the earlier of 1) the date the installation of the Product is completed, or 2) 30 days after the purchase of the Product by the original Purchaser ("Finish Warranty"). The Finish Warranty does not apply to any foreign residue deposited on the finish. All installations in corrosive atmospheric conditions are excluded. The Finish Warranty is VOID if the practices specified by AAMA 609 & 610-02 — “Cleaning and Maintenance for Architecturally Finished Aluminum” (www.aamanet.org) are not followed by Purchaser. This Warranty does not cover damage to the Product that occurs during its shipment, storage, or installation. This Warranty shall be VOID if installation of the Product is not performed in accordance with Unirac's written installation instructions, or if the Product has been modified, repaired, or reworked in a manner not previously authorized by Unirac IN WRITING, or if the Product is installed in an environment for which it was not designed. Unirac shall not be liable for consequential, contingent or incidental damages arising out of the use of the Product by Purchaser under any circumstances. If within the specified Warranty periods the Product shall be reasonably proven to be defective, then Unirac shall repair or replace the defective Product, or any part thereof, in Unirac’s sole discretion. Such repair or replacement shall completely satisfy and discharge all of Unirac’s liability with respect to this limited Warranty. Under no circumstances shall Unirac be liable for special, indirect or consequential damages arising out of or related to use by Purchaser of the Product. Manufacturers of related items, such as PV modules and fastings, may provide written warranties of their own. Unirac’s limited Warranty covers only its Product, and not any related items.
SUNNY BOY 5000US / 6000US / 7000US / 8000US

The best in their class

Our US series inverters utilize our proven technology and are designed specifically to meet IEEE-1547 requirements. Sunny Boy 6000US, Sunny Boy 7000US and Sunny Boy 8000US are also compatible with the Sunny Tower. Increased efficiency means better performance and shorter payback periods. All four models are field-configurable for positive ground systems making them more versatile than ever. With over 750,000 fielded units, Sunny Boy is the benchmark for PV inverter performance and reliability throughout the world.
## Existing Conditions PV Record Drawings - For Information Only

<table>
<thead>
<tr>
<th>SB 5000US</th>
<th>SB 6000US</th>
<th>SB 7000US</th>
<th>SB 8000US</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV Power (Module STC)</td>
<td>6250 W</td>
<td>7500 W</td>
<td>8750 W</td>
</tr>
<tr>
<td>Peak Power Tracking Voltage</td>
<td>250-480 V</td>
<td>250-480 V</td>
<td>250-480 V</td>
</tr>
<tr>
<td>DC Maximum Input Current</td>
<td>21 A</td>
<td>25 A</td>
<td>30 A</td>
</tr>
<tr>
<td>Number of Fused String Inputs</td>
<td>3 (inverter), 4 x 20 A (DC disconnect)</td>
<td>3 (inverter), 4 x 20 A (DC disconnect)</td>
<td>3 (inverter), 4 x 20 A (DC disconnect)</td>
</tr>
<tr>
<td>PV String Voltage</td>
<td>300 V</td>
<td>300 V</td>
<td>300 V</td>
</tr>
<tr>
<td>AC Nominal Power</td>
<td>5000 W</td>
<td>6000 W</td>
<td>7000 W</td>
</tr>
<tr>
<td>AC Maximum Output Power</td>
<td>6000 W</td>
<td>7000 W</td>
<td>7000 W</td>
</tr>
<tr>
<td>AC Nominal Voltage Range</td>
<td>163 – 229 V @ 208 V</td>
<td>163 – 229 V @ 208 V</td>
<td>163 – 229 V @ 208 V</td>
</tr>
<tr>
<td>AC Frequency: nominal / range</td>
<td>60 Hz / 59.3 – 60.5 Hz</td>
<td>60 Hz / 59.3 – 60.5 Hz</td>
<td>60 Hz / 59.3 – 60.5 Hz</td>
</tr>
<tr>
<td>Power Factor (Nominal)</td>
<td>0.99</td>
<td>0.99</td>
<td>0.99</td>
</tr>
<tr>
<td>Peak Inverter Efficiency</td>
<td>96.8%</td>
<td>97.0%</td>
<td>97.1%</td>
</tr>
<tr>
<td>CEC Weighted Efficiency</td>
<td>95.5% @ 208 V</td>
<td>95.5% @ 208 V</td>
<td>95.5% @ 208 V</td>
</tr>
<tr>
<td>Dimensions: W x H x D in inches</td>
<td>18.4 x 24.1 x 9.5</td>
<td>18.4 x 24.1 x 9.5</td>
<td>18.4 x 24.1 x 9.5</td>
</tr>
<tr>
<td>Weight / Shipping Weight</td>
<td>141 lbs / 148 lbs</td>
<td>141 lbs / 148 lbs</td>
<td>141 lbs / 148 lbs</td>
</tr>
<tr>
<td>Ambient Temperature Range</td>
<td>10 to 113 °F</td>
<td>10 to 113 °F</td>
<td>10 to 113 °F</td>
</tr>
<tr>
<td>Power Consumption: standby / nighttime</td>
<td>&lt;7 W / 0.1 W</td>
<td>&lt;7 W / 0.1 W</td>
<td>&lt;7 W / 0.1 W</td>
</tr>
<tr>
<td>Topology</td>
<td>Low frequency transformer, true sine wave</td>
<td>Low frequency transformer, true sine wave</td>
<td>Low frequency transformer, true sine wave</td>
</tr>
<tr>
<td>Cooling Concept</td>
<td>OptiCool™, forced active cooling</td>
<td>OptiCool™, forced active cooling</td>
<td>OptiCool™, forced active cooling</td>
</tr>
<tr>
<td>Mounting Location: Indoor / Outdoor (NEMA 3R)</td>
<td>Included</td>
<td>Optional</td>
<td>Included</td>
</tr>
<tr>
<td>LCD Display</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lid Color: Aluminum / Red / Blue / Yellow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication: RS485 / Wireless</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warranty: 10 years / 15 years / 20 years</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Efficiency Curves

Tel. +1 916 625 0870  
Toll Free +1 888 4 SMA USA  
www.SMA-America.com  
SMA America, LLC
SMA Factory Warranty

10 Year Warranty

5 Year Warranty
A five year warranty applies to the following products: SB 1100U, SWR 1800U, SWR 2100U, SWR 2500U, SB 3300U, SB 3800US, SB 6000US, SI 4248, SI 5048. A five year warranty also applies to Sunny Boy Control (Light, Plus), Sunny Beam, Sunny WebBox, Sunny Matrix, Sunny Sensor Box, SC/SB Combiner Boxes purchased after April 1, 2005.

Extended Warranty
For the following devices you can acquire an extension of 5 or 10 years on the SMA factory warranty, from the date of the original warranty period.

5 Year Extended Warranty: Sunny Boy 2000HFUS/2500HFUS/3000HFUS
Sunny Boy 8000TLUS/9000TLUS/10000TLUS
Sunny Boy 700U, Sunny Boy 3000US/4000US
Sunny Boy 5000US/6000US/7000US/8000US
Windy Boy 3000US

10 Year Extended Warranty: Sunny Boy 2000HFUS/2500HFUS/3000HFUS
Sunny Boy 8000TLUS/9000TLUS/10000TLUS
Sunny Boy 700U, Sunny Boy 3000US/4000US
Sunny Boy 5000US/6000US/7000US/8000US
Windy Boy 3000US

Please contact the SMA service hotline for more details at +1 916 625 0870 or by fax +1 916 625 0871.

The SMA factory warranty covers any repair or replacement part costs incurred during the agreed period, beginning on the device's purchase date, subject to the conditions listed below. This is not associated with the durability warranty.
Warranty Conditions

If a device becomes defective during the relevant SMA factory warranty period, one of the following services, as selected by SMA, will be performed at no charge for materials or labor costs:

- Repair at SMA, or
- Repair On-Site, or
- Exchange for a Replacement Device (of equivalent value according to model and age).

In the case of an exchange, the remainder of the warranty eligibility will be transferred to the replacement device. In such an event, you would not receive a new certificate, as your eligibility is documented at SMA.

For determination of warranty eligibility, please submit a copy of the purchase receipt, or a copy of the warranty certificate, and if applicable, evidence of the warranty extension. The type label on the device must be completely legible. Otherwise, SMA is entitled to refuse to provide warranty services.

Please report defective devices to our service hotline at +1 916 625 0870 or by fax to +1 916 625 0871 providing a brief description of the fault. On workdays, we generally send an equivalent replacement device, packaged appropriately for transport, within 48 hours. The defective device is to be packed in this transport packaging for return transport to SMA. If the warranty applies, and if SMA has a branch, or service partner, in the country in which the device is operated, the transport costs are covered by SMA.

Exclusion of Liability

Warranty claims and liability for direct or indirect damage are excluded if arising from:

- Transport Damage,
- Incorrect Installation or Commissioning,
- failure to Observe the Maintenance Regulations and Intervals,
- Modifications, Changes or Attempted Repairs,
- Incorrect Use or Inappropriate Operation,
- Insufficient Ventilation of the Device,
- failure to Observe the Applicable Safety Regulations,
- force Majeure (e.g. lightning, overvoltage, storm, fire), or
- Cosmetic Shortcomings (which do not influence the supply of energy)

Further-reaching or additional claims due to direct or indirect damage, especially claims for compensation for damages due to loss of profits or due to costs arising from disassembly and mounting, are excluded if no legally mandatory liability applies.

In addition, our general terms and conditions of delivery apply. They can be downloaded from www.SMA-America.com. If requested, we can also send you a copy of our general terms and conditions of delivery. Please contact our service hotline at +1 916 625 0870.
**SUNNY WEBBOX**

Web-enabled data logging and control

The Sunny WebBox is a powerful communications tool that allows the performance data of your solar power system to be logged and easily transmitted via modem or Ethernet to the internet or directly to your PC. It can also send the data to SMA’s internet portal (Sunny Portal), which provides free long-term data storage and graphical display of your system’s performance data. Collected information is stored in common file formats so that it can be used in various spreadsheets, graphs or your own web site. The Sunny WebBox is extremely versatile, making the storage, transmission, management and display of your system data easier than ever before.
Technical Data

**Sunny WebBox**
- RS485 (up to 50 inverters, max. 4000 ft. cable)
- Ethernet (only Sunny Central Communication)
- Internal analog modem
- 10 / 100 MB, connection to LAN, Sunny Portal
- Up to 2 GB integrated LEDs
- 115 - 230 V, 50 / 60 Hz
- Typ. 4 W / max. 12 W
- 4 to 131° F
- 5% to 95%
- 8.85 x 2.25 x 5.11
- 1.63 lbs
- Wall mounting, tabletop device

**Inverter Communication**
- Modem for Sunny Portal Interface (optional)
- Ethernet Interface
- SD Card Data Storage
- Status Display
- Power Supply
- Plug-In Power Consumption
- Operating Ambient Temperature
- Operating Relative Air Humidity
- Dimensions: W x H x D in inches
- Weight
- Installation Options

Tel. +1 916 625 0870
Toll Free +1 888 4 SMA USA
www.SMA-America.com

SMA America, LLC
1.1 SECTION INCLUDES

A. Removal and disposal of existing roof membrane, roof insulation, membrane flashings, and sheet metal flashings from roof areas A, B, BU, and C.

B. Removal and disposal of existing shingle roofing, flashings, and underlayment from the Fitness Center building.

C. Removal and disposal of existing non-functional, water damaged, or otherwise deteriorated perimeter edge wood blocking.

D. Removal and disposal of existing non-functional, water damaged, or otherwise deteriorated lightweight insulating fill.

E. Removal and disposal of existing emergency overflow through-wall scuppers from roof areas A and C.

1.2 SUBMITTALS

A. Submit demolition and removal procedures and schedule under provisions of Division 1.

B. Submit record documents under provisions of Division 1.

1.3 SEQUENCING AND SCHEDULING

A. Sequence and schedule demolition work in accordance with the provisions of Section 013000, Administrative Provisions.

B. Sequence and schedule work to accommodate Owner's use of premises.

1.4 EXISTING CONDITIONS

A. Contractor is responsible for stability and safety of all existing structures within and adjacent to the Contractor's Scope of Work until demolition work is completed. Promptly repair or replace existing property damaged during the course of this Work to the original state at no extra cost to the Owner.

B. Conduct demolition to minimize interference with adjacent roofing, roof-mounted equipment, and roof deck and structure to remain, except as noted on Drawings.

C. Provide, erect, and maintain temporary barriers and security devices.

D. Conduct operations with minimum interference to public or private thoroughfares. Maintain egress and access at all times.

E. Do not close or obstruct roadways or sidewalks without Owner's written consent.
PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that areas to be demolished are clear of encumbrances.
B. Beginning of demolition means acceptance of existing conditions.
C. Obtain and review the AISD record of asbestos containing materials prior to performing any demolition of existing roof related materials. Refer any requirements for the abatement of asbestos containing material to the AISD Project Manager.

3.2 PREPARATION

A. Protect existing landscaping materials, appurtenances, structures, paving, roofing and siding, roof mounted equipment, roof deck and structure, which are not to be demolished.
B. Verify abandoned equipment and penetrations to be removed and obtain written confirmation from Owner’s representative prior to removal and repair of deck opening.

3.3 EXECUTION

A. Evenly cut edges of existing materials that are to be expanded, replaced, or modified. Perform the Work to minimize wind-borne debris.
B. Cease operations and notify Owner immediately if adjacent structures or materials appear to be endangered. Do not resume operations until corrective measures have been taken.
C. Except when instructed otherwise, immediately remove demolished material from site daily.
D. Remove materials to be re-installed or retained by Owner in a manner to prevent damage.
E. Do not burn or bury materials on site.
F. Keep work sprinkled to minimize dust. Provide hoses and water main or hydrant connections for this purpose. Do not allow water to pond or saturate the deck. Monitor interior of space to ensure water does not enter building. Cease operations and mitigate infiltration immediately.
G. Remove demolished materials from site daily as the work progresses. Keep the grounds and common areas free of debris at all times. Leave site in clean condition at the end of each work period.
H. Remove only as much existing roof area as can be made watertight by the end of the work period. Consider the potential of rain events in scheduling the Work.
I. Stop demolition work and notify the Owner and Roof Consultant immediately if suspected hazardous or unknown materials are encountered.

J. Exercise care in demolition work to prevent damage to interior finishes.

END OF SECTION 024100
PART 1 GENERAL

1.1 SUMMARY

A. General provisions of Contract, including General and Supplementary Conditions, apply to work of this section.

1.2 DESCRIPTION OF WORK

A. Masonry cleaning work includes the following:
   1. Cleaning all precast, stucco, concrete, and masonry walls;

B. Related Sections:
   1. Section 079200 – Joint Sealants
   2. Section 071800 – Traffic Coatings

1.3 QUALITY ASSURANCE

A. Restoration Specialist: Work must be performed by a firm having not less than 5 years successful experience in comparable masonry restoration projects and employing personnel skilled in the restoration processes and operations indicated.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each product indicated including recommendations for their application and use. Include test reports and certifications substantiating that products comply with requirements.

B. Mock-up: Perform sample cleaning at pre-approved area of building.

1.5 SEQUENCING/SCHEDULING

A. Perform masonry cleaning work in the following sequence:
   1. Clean precast, concrete, stucco, and masonry walls after roof demo is complete.
   2. Chemically clean masonry at isolated problem stain areas.

PART 2 PRODUCTS

2.1 CLEANING MATERIALS AND EQUIPMENT

A. For spot problem stains where required: Prosoco Enviro Klean® ReVive, or approved equivalent meeting the following:
   1. Form: Clear, low-odor liquid, slight amber color
   2. Specific Gravity: 1.00
   3. pH: 5.5 to 6.5
   4. Weight/Gallon: 8.34 pounds
   5. Active Content: not applicable
   6. Total Solids: not applicable
   7. VOC Content: not applicable
   8. Flash Point: not applicable
9. Freeze Point: 32 degrees F (0 degrees C)  
10. Shelf Life: 3 years in tightly sealed, unopened container  
11. Solubility In Water: Complete

B. Water for Cleaning: Clean, potable, free of oils, acids, alkalis, salts, and organic matter.  
1. Warm Water: Heat water to temperature of 140 deg. F to 180 deg. F.

C. Brushes: Fiber bristle only.

D. Spray Equipment: Provide equipment for controlled spray application of water and chemical cleaners at rates indicated for pressure, measured at spray tip, and for volume.  
1. For spray application of chemical cleaners provide low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray-tip.  
2. For spray application of water provide fan-shaped spray-tip which disperses water at angle of not less than 15 degrees.

PART 3 EXECUTION

3.1 MASONRY CLEANING

A. Preparation:  
1. Comply with recommendations of manufacturers of chemical cleaners for protecting building surfaces against damage from exposure to their products.  
2. Protect persons, motor vehicles, surrounding surfaces of building whose masonry surfaces are being restored, and building site. Mask windows and window frames.  
3. Do not clean masonry during wind events that may spread cleaning solutions to unprotected surfaces.  
4. Dispose of run-off from cleaning operations by legal means and in manner which prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.  
5. Erect temporary protection covers over pedestrian walkways and at points of entrance and exit for persons and vehicles, which must remain in operation during course of masonry restoration work.  
6. Protect glass and unpainted metal trim from contact with chemical cleaners by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape. Apply masking agent to comply with manufacturer's recommendations. Do not apply liquid masking agent to painted or porous surfaces.

B. Cleaning application, typical:  
1. Pressure wash all precast, concrete, stucco, and masonry surfaces using a minimum pressure of 2100 PSI with a nozzle no greater than 15 degree. The designated areas are to be cleaned in their entirety.  
2. Contractor will be responsible for protecting all windows during pressure washing application.

C. Cleaning application for excessive stained areas:  
1. For light biological soiling, mix 1 part ReVive with up to 10 parts clean water. For moderate biological soiling, mix 1 part ReVive with up to 5 parts clean water. For heavy biological soiling, use in concentrate.  
2. Rinsing pressure and water volume shall be performed using masonry washing equipment generating 400-1000 psi with a water flow rate of 6-8 gallons per minute delivered through a 15-45 degree fan spray tip. Equipment should be adjustable to reduce water flow rate and rinsing pressure as required for controlled cleaning of more sensitive surfaces.
3. Working from bottom to top, apply generously to dry surface until surface is thoroughly wet.
4. Leave on the surface for 2-3 minutes. If needed, apply more to keep the surface wet.
5. Mist treated surfaces with water and gently scrub with a non-metallic, short-fibered scrub brush to loosen biological soiling.
6. Working from bottom to top, rinse thoroughly with clean water. Reduce rinsing pressure as needed for fragile or deteriorated stone.

END OF SECTION 045000
PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 DEFINITIONS
   A. Minimum Uncoated Steel Thickness: Minimum uncoated thickness of cold-formed framing delivered to the Project site shall be not less than 95 percent of the thickness used in the cold-formed framing design. Lesser thicknesses shall be permitted at bends due to cold forming.
   B. Producer: Entity that produces steel sheet coil fabricated into cold-formed members.

1.3 SUBMITTALS
   A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

1.4 QUALITY ASSURANCE
   A. Installer Qualifications: An experienced installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
   B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS Available Manufacturers capable of showing similar work experience over the past three years.

2.2 PARTITION FRAMING
A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, complying with ASTM C 955, and as follows:
   1. Minimum Uncoated-Steel Thickness: 0.0359 inch – 20 Gauge. Studs of thicker gauge will be accepted, if furnished without additional cost to Owner, provided all studs and tracks installed in any continuous length of partition shall be of the same gauge.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, complying with ASTM C 955, and as follows:
   1. Minimum Uncoated-Steel Thickness: Matching steel studs.
   2. Flange Width: 1-1/4 inches (32 mm).

2.3 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories of the same material and finish used for framing members, with a minimum yield strength of 33,000 psi.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated.

2.4 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36, zinc coated by hot-dip process according to ASTM A 123.

B. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

C. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

D. Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws.
   1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

E. Welding Electrodes: Comply with AWS standards.

2.5 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
   1. Fabricate framing assemblies using jigs or templates.
   2. Cut framing members by sawing or shearing; do not torch cut.
   3. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.
5. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete or masonry construction.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to ASTM C1007, unless more stringent requirements are indicated.

C. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer’s written recommendations and requirements in this Section.

   1. Cut framing members by sawing or shearing; do not torch cut.
   2. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

   a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

D. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.

E. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
F. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, which are inaccessible on completion of framing work.

G. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

H. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

I. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
   1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings.
   2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

J. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
   1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

K. Install horizontal bridging in stud system as required. Fasten at each stud intersection.
   1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle.

L. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

M. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.4 FIELD QUALITY CONTROL

A. Testing: Authority will engage a qualified independent testing agency to perform field quality-control testing.

B. Remove and replace Work that does not comply with specified requirements.

3.5 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
B. Touchup Painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on fabricated and installed prime-painted, cold-formed metal framing. Paint framing surfaces with same type of shop paint used on adjacent surfaces.

C. Protect paper-surfed gypsum sheathing that will be exposed to weather for more than 30 days by covering exposed exterior surface of sheathing with a securely fastened air-infiltration barrier. Apply covering immediately after sheathing is installed.

D. Protect cutouts, corners, and joints in sheathing by filling with a flexible sealant or by applying tape recommended by sheathing manufacturer at time sheathing is applied.

END OF SECTION 054000
SECTION 061053
MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
A. Section Includes:
   1. Rooftop equipment bases and support curbs.
   2. Wood blocking and nailers.

1.3 DEFINITIONS
A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
B. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

1.4 ACTION SUBMITTALS
A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
   3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
   4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 INFORMATIONAL SUBMITTALS
A. Evaluation Reports: For the following, from ICC-ES:
   1. Preservative-treated wood.
   2. Fire-retardant-treated wood.
4. Post-installed anchors.
5. Metal framing anchors.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.

B. Maximum Moisture Content of Lumber: 19 percent for 2-inch nominal thickness or less, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC3b for exterior construction not in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
2.3 DIMENSION LUMBER FRAMING

A. Other Framing: No. 2 Construction, Stud grade of any of the following species:

1. Hem-fir (north); NLGA.
2. Douglas fir-larch; WCLIB or WWPA.
3. Southern pine or mixed southern pine; SPIB.
4. Spruce-pine-fir; NLGA.
5. Douglas fir-south; WWPA.
6. Hem-fir; WCLIB or WWPA.
7. Douglas fir-larch (north); NLGA.
8. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.

B. Dimension Lumber Items: Construction or No. 2 Standard, Stud, or No. 3 grade lumber.

C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 and ICC-ES AC193 for mechanical anchors in masonry and concrete, respectively; and ICC-ES AC58 and ICC-ES AC308 for adhesive anchors in masonry and concrete.
3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

C. Do not splice structural members between supports unless otherwise indicated.

D. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

E. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
   1. Use inorganic boron for items that are continuously protected from liquid water.
   2. Use copper naphthenate for items not continuously protected from liquid water.

F. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   2. ICC-ES evaluation report for fastener.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILER

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

END OF SECTION 061053
SECTION 070150.19

PREPARATION FOR REROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Full tear-off of entire roof system.
2. Removal of flashings and counterflashings.

B. RELATED REQUIREMENTS:

1. Section 011000 "Summary" for use of premises and for phasing requirements.

1.3 UNIT PRICES

A. Work of this Section is affected by dimensional lumber removal and replacement unit price, Tectum deck removal and replacement unit price, and concrete plank deck removal and replacement unit price.

1.4 DEFINITIONS

A. Full Roof Tear-off: Removal of existing roofing system down to existing roof deck.

B. Roofing Terminology: Definitions in ASTM D1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.5 PREINSTALLATION MEETINGS


1. Meet with Owner, Architect, roofing Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing tear-off, including, but not limited to, the following:
   a. Reroofing preparation, including roofing system manufacturer's written instructions.
b. Temporary protection requirements for existing roofing system components that are to remain.
c. Existing roof drains and roof drainage during each stage of reroofing, and roof-drain plugging and plug removal.
d. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to avoid delays.
e. Existing roof deck conditions requiring Architect notification.
f. Existing roof deck removal procedures and Owner notifications.
g. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
h. Structural loading limitations of roof deck during reroofing.
i. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that affect reroofing.
j. HVAC shutdown and sealing of air intakes.
k. Shutdown of fire-suppression, -protection, and -alarm and -detection systems.
l. Asbestos removal and discovery of asbestos-containing materials.
m. Governing regulations and requirements for insurance and certificates if applicable.
n. Existing conditions that may require Architect notification before proceeding.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1. Include certificate that Installer is approved by warrantor of new roofing system.

B. Field Test Reports:

1. Fastener pull-out test report.

C. Photographs or Video: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces that might be misconstrued as having been damaged by reroofing operations.

1. Submit before Work begins.

D. Landfill Records: Indicate receipt and acceptance of demolished roofing materials by a landfill facility licensed to accept them.

1.8 FIELD CONDITIONS

A. Owner will occupy portions of building immediately below reroofing area.

1. Conduct reroofing so Owner's operations are not disrupted.
2. Provide Owner with not less than 72 hours' written notice of activities that may affect Owner's operations.
3. Coordinate work activities daily with Owner so Owner has adequate advance notice to place protective dust and water-leakage covers over sensitive equipment and furnishings,
shut down HVAC and fire-alarm or detection equipment if needed, and evacuate occupants from below work area.

4. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below affected area.

   a. Verify that occupants below work area have been evacuated before proceeding with work over impaired deck area.

B. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.

C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

D. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing building.

   1. Remove only as much roofing in one day as can be made watertight in the same day.
   2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.

      a. Hazardous materials will be removed by Owner under a separate contract.

PART 2 - PRODUCTS

2.1 TEMPORARY PROTECTION MATERIALS

   A. EPS Insulation: ASTM C578.

   B. Plywood: DOC PS 1, Grade CD, Exposure 1.

   C. OSB: DOC PS 2, Exposure 1.

PART 3 - EXECUTION

3.1 PREPARATION

   A. Protection of In-Place Conditions:

      1. Loosely lay 1-inch minimum thick, EPS insulation over existing roofing in areas not to be reroofed.

         a. Loosely lay 15/32-inch plywood or OSB panels over EPS. Extend EPS past edges of plywood or OSB panels a minimum of 1 inch.

      2. Limit traffic and material storage to areas of existing roofing that have been protected.

      3. Maintain temporary protection and leave in place until replacement roofing has been completed. Remove temporary protection on completion of reroofing.

      4. Comply with requirements of existing roof system manufacturer’s warranty requirements.

   B. Seal or isolate windows that may be exposed to airborne substances created in removal of existing materials.
C. Shut off rooftop utilities and service piping before beginning the Work.

D. Test existing roof drains to verify that they are not blocked or restricted.
   1. Immediately notify Architect of any blockages or restrictions.

E. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work.
   1. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

F. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

G. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday.
   1. Prevent debris from entering or blocking roof drains and conductors.
      a. Use roof-drain plugs specifically designed for this purpose.
      b. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.
   2. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new roofing system, provide alternative drainage method to remove water and eliminate ponding.
      a. Do not permit water to enter into or under existing roofing system components that are to remain.

3.2 ROOF TEAR-OFF

A. Full Roof Tear-off: Remove existing roofing and other roofing system components down to the existing roof deck.
   1. Remove roof insulation and cover board.
   2. Remove base flashings and counterflashings.
   3. Remove perimeter edge flashing and gravel stops.
   4. Remove copings.
   5. Remove expansion-joint covers.
   6. Remove flashings at pipes, curbs, mechanical equipment, and other penetrations.
   7. Remove roof drains indicated on Drawings to be removed.
   8. Remove all bitumen and felts bonded to decks.
   9. Remove fasteners from deck, do not damage deck surface.
  10. Inspect wood blocking, curbs, and nailers for deterioration and damage.
      a. If wood blocking, curbs, or nailers have deteriorated, immediately notify Architect and Roof Consultant.

3.3 DECK PREPARATION

A. Inspect deck after tear-off of roofing system.
B. If broken or loose fasteners that secure deck panels to one another or to structure are observed, or if deck appears or feels inadequately attached, immediately notify Architect and Roof Consultant.
   1. Do not proceed with installation until directed by Architect.

C. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect and Roof Consultant.
   1. Do not proceed with installation until directed by Architect.

3.4 BASE FLASHING REMOVAL

A. Remove existing base flashings.
   1. Clean substrates of contaminants, such as asphalt, sheet materials, dirt, and debris.

B. Inspect parapet substrate, wood blocking, curbs, and nailers for deterioration and damage.
   1. If parapet substrate, wood blocking, curbs, or nailers have deteriorated, immediately notify Architect.

3.5 FASTENER PULL-OUT TESTING

A. Perform fastener pull-out tests according to SPRI FX-1, and submit test report to Architect and Roof Consultant before installing new roofing system.
   1. Obtain Architect's approval to proceed with specified fastening pattern.
      a. Architect may furnish revised fastening pattern commensurate with pull-out test results.

3.6 DISPOSAL

A. Collect demolished materials and place in containers.
   1. Promptly dispose of demolished materials.
   2. Do not allow demolished materials to accumulate on-site.
   3. Storage or sale of demolished items or materials on-site is not permitted.

B. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION 070150.19
SECTIO N 071800

TRAFFIC COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes traffic coatings for concrete girder horizontal and vertical surfaces.

1.2 SUBMITTALS

A. Product Data: For each type of traffic coating product and expansion joint accessory specified, including installation instructions.

B. "Product Test Reports for Credit SS 7.2" Subparagraph below applies to LEED-NC, LEED-CS, and LEED for Schools; coordinate with requirements for traffic coatings that are roof coverings.

C. "Product Data for Credit IEQ 4.2" Subparagraph below applies to LEED-NC and LEED-CS. Coordinate with requirements for paints and coatings.

D. "Laboratory Test Reports for Credit IEQ 4" Subparagraph below applies to LEED for Schools.

E. Samples for Initial Selection: For each type of exposed finish.

F. Samples for Verification: For each type of exposed finish, prepared on rigid backing.

G. Product Certificates: For each type of traffic coating.

H. Sample Warranty: For special warranty.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An Installer who is trained and approved by manufacturer.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Apply traffic coatings within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply traffic coatings to damp or wet substrates, when temperatures are below 40 deg F, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.

B. Do not apply traffic coatings (or expansion joint accessories if applicable) in snow, rain, fog, or mist, or when such weather conditions are imminent during the application and curing period. Apply only when frost-free conditions occur throughout the depth of substrate.

C. Do not install traffic coating until items that penetrate membrane have been installed.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace traffic coating that fails in materials or workmanship within specified warranty period.
B. Failures include, but are not limited to, the following:
   1. Adhesive or cohesive failures.
   2. Abrasion or tearing failures.
   3. Surface crazing or spalling.
   4. Intrusion of water, oils, gasoline, grease, salt, deicer chemicals, or acids into deck substrate.

C. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Material Compatibility: Provide primers, polyurethane waterproofing pedestrian coating system, and accessory materials that are compatible with one another and with substrate under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Source Limitations: Obtain primary traffic-coating materials, including primers and joint sealants from traffic coating manufacturer. Obtain accessory materials including aggregates, sheet flashings, expansion joints material, and substrate repair materials of types and from sources recommended in writing by primary material manufacturer.

2.2 TRAFFIC COATING

A. Traffic Coating: Manufacturer's standard aliphatic urethane, low-odor, low-VOC, exterior exposure, traffic-bearing, seamless, high-solids-content, cold liquid-applied, elastomeric, waterproofing membrane system with integral wearing surface for pedestrian traffic.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Tremco Incorporated; Vulkem OC 810 One Coat Pedestrian Deck Coating
   2. Sika Corporation; Sikalastic – 726 Balcony One Shot Pedestrian Traffic Coating
   3. Master Builders Solutions; Masterseal Pedestrian Traffic 1500

C. Primer: Liquid waterborne primer recommended for substrate and conditions by traffic coating manufacturer.

D. Polyurethane Waterproof Traffic Coating System:
   1. Application: Roller-applied
   2. Thickness: Minimum wet film thickness of 40 wet mils.
   3. Color: As selected by Architect from manufacturer's standard range.

E. VOC Content: Traffic coating shall have a VOC content of 30 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 ACCESSORY MATERIALS

A. Single Component, NonSag, Traffic-Grade, polyurethane Joint Sealant: ASTM C920, Type NS, Class 50, for Use T, NT. Subject to compliance with requirements, provide one of the following:
   1. Tremco Incorporated; Dymonic 100
   2. Sika Corporation; Sikaflex 1A
   3. Master Builders Solutions; MasterSeal NP 1
TRAFFIC COATINGS

B. Expansion Joint Pre-compressed, Monolithic Foam System. Subject to compliance with requirements, provide one of the following:

1. Tremco/Willseal; Willseal Seismic
2. Emseal/Sika; Sikaseal Seismic
3. Watson Bowman Acme; Wabo Seismic WeatherSeal

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of traffic-coating work.

B. Verify that substrates and joints are visibly dry and free of moisture. Test for moisture content by method recommended in writing by traffic-coating manufacturer.

C. Submit written report listing conditions detrimental to performance of traffic-coating work.

D. Proceed with installation only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before applying traffic coatings, clean and prepare substrates according to ICRI CSP 2-4 and manufacturer's written instructions to produce clean, dust-free, dry substrate for traffic-coating application. Remove projections, fill voids, and seal joints if any, as recommended in writing by traffic-coating manufacturer.

B. Schedule preparation work so dust and other contaminants from process do not fall on wet, newly coated surfaces.

C. Mask adjoining surfaces not receiving traffic coatings to prevent overspray, spillage, leaking, and migration of coatings. Prevent traffic-coating materials from entering deck substrate penetrations and clogging weep holes and drains.

D. Concrete Substrates: Mechanically abrade surface to a uniform profile acceptable to manufacturer, according to ICRI CSP 2-4. Do not acid etch.

E. Remove grease, oil, paints, and other penetrating contaminants from concrete.

F. Remove concrete fins, ridges, and other projections.

G. Remove laitance, glaze, efflorescence, curing compounds, concrete hardeners, form release agents, and other incompatible materials that might affect coating adhesion.

H. Remove remaining loose material to provide a sound surface, and clean surfaces.

3.3 TERMINATIONS AND PENETRATIONS

A. Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains, and sleeves according to ASTM C1127 and manufacturer's written instructions.
B. Provide sealant cants at penetrations and at reinforced and non-reinforced, deck-to-wall butt joints.

C. Terminate edges of deck-to-deck expansion joints with preparatory base-coat strip.

3.4 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout, and fill joints and cracks in substrates according to ASTM C1127 and manufacturer's written recommendations. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D4258.
   1. Fill expansion joints greater than 1-1/2” with specified expansion joint material. Do not apply traffic coating over expansion joints.
   2. Fill joints smaller than 1-1/2” with specified sealant.

B. Apply reinforcing strip in traffic-coating system where recommended by traffic coating manufacturer.

3.5 TRAFFIC-COATING APPLICATION

A. Apply traffic coating according to ASTM C1127 and manufacturer's written instructions.

B. Start traffic-coating application in presence of manufacturer's technical representative.

C. Verify that wet film thickness of minimum 40 wet mils complies with requirements every 100 sq. ft.

D. Apply traffic coatings to prepared vertical wall surfaces. Application shall not be limited to one coat if sagging of material occurs at vertical surfaces. Thinner application of coating may be necessary to avoid sagging.

E. Cure traffic coatings. Prevent contamination and damage during application and curing stages.

3.6 FIELD QUALITY CONTROL

A. Final Traffic-Coating Inspection: Arrange for traffic-coating manufacturer's technical personnel to inspect membrane installation on completion.

B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

C. Prepare test and inspection reports.

3.7 PROTECTING AND CLEANING

A. Protect traffic coatings from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071800
SECTION 072200

ROOF AND DECK INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Roof and deck insulation.

1.2 RELATED WORK

A. Section 061050 – Rough Carpentry
B. Section 070150 – Preparation for Reroofing
C. Section 075419 – Polyvinyl-Chloride (PVC) Roofing
D. Section 076000 – Flashing and Sheet Metal

1.3 SYSTEM DESCRIPTION

A. Install board insulation as required to achieve a complete and proper substrate for the roof membrane system.
B. Insulation installed within the weatherproofed building interior shall contain No Added Urea Formaldehyde.
C. All sealants, adhesives, coatings and sealant primers shall comply with SCAQMD rules 113 and 1168 as consistent with performance and warranty requirements.

1.4 REFERENCES

A. ASTM International:

1.5 SUBMITTALS

A. Submit manufacturer's installation instructions, samples and product data, in accordance with the provisions of Section 013300.
B. Submit fastening pattern per deck type, include field, perimeter, and corner patterns.
C. Submit scaled tapered insulation plans for all roof areas, include sumps and crickets.
D. Submit Report of fastener pull-out testing performed by technical representative of the fastener manufacturer.
E. Submit full thickness samples of each insulation board type and thickness.
Texas Parks and Wildlife Austin Headquarters
Headquarters Exterior Renovations

F. Submit manufacturer’s certificate, in accordance with the provisions of Section 013300, that products meet or exceed specified requirements.

G. Submit certification from roof membrane manufacturer that board insulation materials are acceptable for use with roof membrane materials.

H. Submit product data from manufacturer showing insulation contains no added urea-formaldehyde.

I. Submit product data and MSDS for all sealants, adhesives, coatings and sealants primers indicating the VOC content in g/l.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in accordance with the provisions of Division 1.

B. Place insulation bundles on raised pallets or platforms at least 3 inches above ground and store flat. Place pallets on a finished surface other than dirt or grass.

C. Cover with a waterproof, breathable cover such as a canvas tarpaulin. Manufacturer’s transportation protective wrap is not an approved cover.

D. Do not store polyiso roof insulation outdoors for more than two weeks prior to installation. If polyiso needs to be stored more than two weeks prior to installation, it shall be stored indoors in a dry, well ventilated warehouse, or in a dry, watertight, temporary storage container.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Polyisocyanurate Insulation, closed cell foam core bonded to inorganic coated glass facers, ASTM C1289, Type II, Class 2, Grade 20.

B. Tapered polyisocyanurate insulation, ASTM C1289, closed cell foam core bonded to inorganic coated glass facers, 1/8” per foot in the field, ½” per foot at crickets and sumps, starting thickness as shown in Drawings.

C. Insulation shall contain no added urea-formaldehyde.

D. Insulation Coverboard: 1/2” Densdeck Prime or Securock roof insulation coverboard.

E. Fasteners:
   1. Insulation Board: polymer coated case-hardened heavy duty steel screw with pre-assembled galvanized 3” diameter steel plate, from primary roofing materials manufacturer, or approved equivalent, length to penetrate steel deck ¾” minimum, 1-1/4” maximum.
   2. Fiberglass Venting Base Sheet: one-piece, dual pronged, coated G-90 galvanized steel, pre-assembled with a 2.75-in. diameter galvalume plate.

2.2 INSULATION MATERIAL ACCESSORIES
A. Fiberglass Venting Base Sheet: ASTM D4897, Type II, UL Type G2, heavyweight venting base sheet, fiberglass mat coated with weathering-grade asphalt. Bottom surface embedded with mineral granules to enhance venting of vapor beneath base ply.

B. Insulation and Coverboard Adhesive:

1. Two-component low-rise polyurethane adhesive that is solvent free and VOC free, and contains no harmful HCFC or CFCs, as approved by the insulation and membrane manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare existing substrate to receive new roofing in accordance with Section 070150.

B. Clean deck. If necessary, repair deteriorated or non-serviceable decking in accordance with Section 070150. Seal penetrations to prevent debris from entering building.

3.2 INSTALLATION

A. Verify and document in Daily Report that the existing deck/substrate is functional, substrate is intact, and repairs have been made. Verify insulation board is free from moisture and suitable as substrate for roof membrane.

B. Mechanically fasten fiberglass venting base sheet to existing lightweight insulating fill deck in accordance with the following minimum specified wind uplift pressures, Roof Areas A, B, and C:

<table>
<thead>
<tr>
<th>Area</th>
<th>Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field</td>
<td>37 psi</td>
</tr>
<tr>
<td>Perimeters</td>
<td>49 psi</td>
</tr>
<tr>
<td>Corners</td>
<td>67 psi</td>
</tr>
</tbody>
</table>

C. Mechanically fasten fiberglass venting base sheet to existing lightweight insulating fill deck in accordance with the following minimum specified wind uplift pressures, Roof Areas BU:

<table>
<thead>
<tr>
<th>Area</th>
<th>Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field</td>
<td>40 psi</td>
</tr>
<tr>
<td>Perimeters</td>
<td>53 psi</td>
</tr>
<tr>
<td>Corners</td>
<td>72 psi</td>
</tr>
</tbody>
</table>

D. Install base layer insulation to fiberglass venting base sheet and subsequent layers of tapered insulation system and coverboard at all roof areas in low rise adhesive. Adhesive ribbons shall be spaced at a maximum of 6” o.c., extending to within 2” of board edges, to provide proper adhesive coverage to meet the specified uplift resistance and prevent edge curling of boards. Do not allow adhesive application to precede the board placement by more than three board lengths. Firmly press each insulation board into adhesive by “walking-in” each board immediately after placement. Set weighted buckets at the edges of each board after placement. Leave buckets in place until adhesive has fully set, ten (10) minutes minimum.

E. Coordinate installation of roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
1. At end of each day’s work, provide tie-offs to cover exposed roofing membrane sheets and insulation in accordance with roof membrane manufacturer’s instructions, with joints and edges sealed.
   a. Do not trim all layers of insulation to be even at tie-offs. Use loosely set sections that can be removed with the tie-off to allow staggered insulation layers to continue.
2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
3. Remove and discard temporary seals before beginning work on adjoining roofing.

F. If substrate conditions prevent the specified system from achieving minimum slope indicated on drawings, Contractor shall notify Roof Consultant prior to proceeding with installation that will result in less than the minimum specified slope.

G. Stagger end joints in adjacent boards. Stagger successive layers 24 inches in both vertical and horizontal directions.

H. Butt edges for snug contact. Repair voids greater than ¼” wide by filling with like material.

I. If substrate conditions prevent the specified system from achieving minimum slope indicated on drawings, Contractor shall notify Roof Consultant prior to proceeding with installation that will result in less than the minimum specified slope.

END OF SECTION 072200
PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
2. Underlayment materials.
3. Ridge vents.
4. Metal flashing and trim.

1.2 DEFINITIONS
A. Roofing Terminology: See ASTM D1079 for definitions of terms related to roofing Work in this Section.

1.3 PREINSTALLATION MEETINGS
A. Preinstallation Conference: Conduct conference at project site.

1.4 ACTION SUBMITTALS
A. Product Data: For the following:
   1. Asphalt shingles.
   2. Underlayment materials.
   3. Asphalt roofing cement.
   4. Elastomeric flashing sealant.
B. Shop Drawings: For metal flashing and trim.

1.5 INFORMATIONAL SUBMITTALS
A. Sample Warranty: For manufacturer's materials warranty.
B. Sample Installer's Warranty: For installer's material and workmanship warranty.

1.6 CLOSEOUT SUBMITTALS
A. Maintenance Data: For asphalt shingles to include in maintenance manuals.
B. Materials warranties.
C. Roofing Installer's warranty.

1.7 MAINTENANCE MATERIAL SUBMITTALS
A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Asphalt Shingles: 500 sq. ft. of each type and in each color and blend, in unbroken bundles.

1.8 QUALITY ASSURANCE
A. Installer Qualifications: An authorized installer who is trained and approved by manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING
A. Store roofing materials in a dry, well-ventilated location protected from weather, sunlight, and moisture in accordance with manufacturer's written instructions.
B. Store underlayment rolls on end, on pallets or other raised surfaces. Do not double-stack rolls.
C. Protect unused roofing materials from weather, sunlight, and moisture when left overnight or when roofing Work is not in progress.

D. Handle, store, and place roofing materials in a manner to prevent damage to roof deck or structural supporting members.

1.10 FIELD CONDITIONS
A. Environmental Limitations: Proceed with installation only when existing and forecasted weather conditions permit product installation and related Work to be performed in accordance with manufacturer's written instructions and warranty requirements.

1. Install self-adhering, polymer-modified bitumen sheet underlayment within the range of ambient and substrate temperatures recommended in writing by manufacturer.

1.11 WARRANTY
A. Materials Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Manufacturing defects

2. Materials Warranty Period: 30 years from date of Substantial Completion, prorated, with first five years non-prorated.

3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to 55 mph for 30 years from date of Substantial Completion.

4. Algae-Resistance Warranty Period: Asphalt shingles will not discolor for five years from date of Substantial Completion.

5. Workmanship Warranty Period: Two years from date of Substantial Completion.

B. Roofing Installer's Warranty: On warranty form at end of this Section, signed by Installer, in which Installer agrees to repair or replace components of asphalt shingle roofing that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS
A. Obtain each type of product from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS
A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance in accordance with ASTM E108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

B. Wind Resistance: Provide asphalt shingles that comply with requirements of ASTM D3161/D3161M, Class F, and with ASTM D7158/D7158M, Class H.

C. Energy Performance, ENERGY STAR: Provide asphalt shingles that are listed on the DOE's "ENERGY STAR Roof Product List" for steep-slope roof products.

2.3 GLASS-FIBER-REINFORCED ASPHALT SHINGLES


2. Strip Size: Manufacturer's standard.
3. Algae Resistance: Granules resist algae discoloration.
4. Color and Blends: As selected by Owner from manufacturer's full range.

B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.4 UNDERLAYMENT MATERIALS

A. Synthetic Underlayment: UV-resistant polypropylene, polyolefin, or polyethylene polymer fabric with surface coatings or treatments to improve traction underfoot and abrasion resistance; evaluated and documented to be suitable for use as a roof underlayment under applicable codes by a testing and inspecting agency acceptable to authorities having jurisdiction.


2.5 ACCESSORIES

A. Asphalt Roofing Cement: ASTM D4586/D4586M Type II, asbestos free.

B. Elastomeric Flashing Sealant: ASTM C920, Type S, Grade NS, one-part, non-sag, elastomeric polymer sealant; of class and use classifications required to seal joints and remain watertight; recommended in writing by manufacturer for installation of flashing systems.

C. Roofing Nails: ASTM F1667, aluminum, stainless steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch diameter, sharp-pointed, with a 3/8- to 7/16-inch diameter flat head and of sufficient length to penetrate 3/4-inch into solid wood decking or extend at least 1/8-inch through sheathing less than 3/4-inch thick.
   1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

D. Underlayment Nails: Aluminum, stainless steel, or hot-dip galvanized-steel wire nails with low-profile metal or plastic caps, 1-inch minimum diameter.
   1. Provide with minimum 0.0134-inch thick metal cap, 0.010-inch thick power-driven metal cap, or 0.035-inch thick plastic cap; and with minimum 0.083-inch thick ring shank or 0.091-inch thick smooth shank of length to penetrate at least 3/4 inch into roof sheathing or to penetrate through roof sheathing less than 3/4 inch thick.

2.6 METAL FLASHING AND TRIM

A. Comply with requirements in Section 07 60 00 "Flashing and Sheet Metal"

B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item unless otherwise specified in this Section.
   1. Apron Flashings: Fabricate with lower flange a minimum of 4 inches over and 4 inches beyond each side of downslope asphalt shingles and 6 inches up the vertical surface.

   2. Step Flashings: Fabricate with a headlap of 2 inches and a minimum extension of 4 inches over the underlying asphalt shingle and up the vertical surface.

   3. Cricket and Backer Flashings: Fabricate with concealed flange extending a minimum of 24 inches beneath upslope asphalt shingles and 6 inches beyond each side of chimney and 6 inches above the roof plane.

   4. Counterflashings: Fabricate to cover 4 inches of base flashing measured vertically; and in lengths required so that no step exceeds 8 inches and overall length is no more than 10 feet.
5. Drip Edges: Fabricate in lengths not exceeding 10 feet with minimum 2-inch roof-deck flange and 1-1/2-inch fascia flange with 3/8-inch drip at lower edge.

6. Vent-Pipe Flashings: ASTM B749, Type L51121, at least 1/16 inch thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof, and extending at least 4 inches from pipe onto roof.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored and that provisions have been made for flashings and penetrations through asphalt shingles.
3. Verify that vent stacks and other penetrations through roofing are installed and securely fastened.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. INSTALLATION OF UNDERLAYMENT MATERIALS

A. Comply with asphalt shingle and underlayment manufacturers' written installation instructions and with recommendations in NRCA's "The NRCA Roofing Manual: Steep-Slope Roof Systems" applicable to products and applications indicated unless more stringent requirements are specified in this Section.

B. Synthetic Underlayment:

1. Install on roof deck parallel with and starting at the eaves.
   a. Lap sides and ends as recommended in writing by manufacturer, but not less than 4 inches for side laps and 6 inches for end laps.
   b. Stagger end laps between succeeding courses at interval recommended in writing by manufacturer, but not less than 72 inches.
   c. Fasten with underlayment nails in accordance with manufacturer's written instructions.
   d. Cover underlayment within period recommended in writing by manufacturer.
2. Install in single layer on roofs sloped at 4:12 and greater.
3. Install in double layer on roofs sloped at less than 4:12.
4. Install synthetic underlayment on roof deck not covered by self-adhering, polymer-modified bitumen sheet unless otherwise specified in this Section.
   a. Lap sides of underlayment over self-adhering sheet not less than 4 inches in direction to shed water.
   b. Lap ends of underlayment not less than 6 inches over self-adhering sheet.
5. Install fasteners in a grid pattern of 12 inches between side laps with 6-inch spacing at side and end laps.

C. Self-Adhering, Polymer-Modified Bitumen Sheet: Install, wrinkle free, on roof deck.

1. Comply with low-temperature installation restrictions of underlayment manufacturer.
2. Install lapped in direction that sheds water.
a. Lap sides not less than 4 inches.
b. Lap ends not less than 6 inches, staggered 24 inches between succeeding courses.
c. Roll laps with roller.
3. Valleys: Extend from lowest to highest point 18 inches on each side of centerline.
4. Hips: Extend 18 inches on each side.
5. Ridges: Extend 36 inches on each side without obstructing continuous ridge vent slot.
6. Sidewalls: Extend 18 inches beyond sidewalls and return vertically against sidewalls not less than 4 inches.
7. Dormers, Chimneys, Skylights, and Other Roof-Penetrating Elements: Extend 18 inches beyond penetrating elements and return vertically against penetrating elements not less than 4 inches.
8. Cover underlayment within seven days.

D. Metal-Flashed, Open-Valley Underlayment: Install two layers of minimum 36-inch wide underlayment centered in valley.
   1. Use same underlayment as installed on field of roof.
   2. Stagger end laps between layers at least 72 inches.
   3. Lap ends of each layer at least 12 inches in direction that sheds water, and seal with asphalt roofing cement.
   4. Fasten each layer to roof deck with underlayment nails located as far from valley center as possible and only to extent necessary to hold underlayment in place until installation of valley flashing.
   5. Lap roof-deck underlayment over first layer of valley underlayment at least 6 inches.

3.3. INSTALLATION OF METAL FLASHING AND TRIM
A. Install metal flashings and trim to comply with requirements in Section 076000 " Flashing and Sheet Metal."
   1. Install metal flashings in accordance with recommendations in ARMA's "Asphalt Roofing Residential Manual - Design and Application Methods" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
   2. Bed flanges of metal flashings using asphalt roofing cement or elastomeric flashing sealant.

B. Apron Flashings: Extend lower flange over and beyond each side of downslope asphalt shingles and up the vertical surface.

C. Step Flashings: Install with a headlap of 2 inches and extend over underlying shingle and up the vertical face.
   1. Install with lower edge of flashing just upslope of, and concealed by, butt of overlying shingle.
   2. Fasten to roof deck only.

D. Cricket and Backer Flashings: Install against roof-penetrating elements extending concealed flange beneath upslope asphalt shingles and beyond each side.

E. Counterflashings: Coordinate with installation of base flashing and fit tightly to base flashing. Lap joints a minimum of 4 inches secured in a waterproof manner.
   1. Install in reglets or receivers.

F. Open-Valley Flashings: Install centered in valleys, lapping ends at least 8 inches in direction that sheds water. Fasten upper end of each length to roof deck beneath overlap.
   a. Place strips parallel to and over flanges so that they will be just concealed by installed shingles.

G. Rake Drip Edges: Install over underlayment materials and fasten to roof deck.

H. Eave Drip Edges: Install below underlayment materials and fasten to roof deck.

I. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.4. INSTALLATION OF ASPHALT SHINGLES

A. Install asphalt shingles in accordance with manufacturer's written instructions and recommendations in ARMA's "Asphalt Roofing Residential Manual - Design and Application Methods" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."

B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip with tabs removed at least 7 inches wide with self-sealing strip face up at roof edge.
   1. Extend asphalt shingles 1/2 inch over fascia at eaves and rakes.
   2. Install starter strip along rake edge.

C. Install first and remaining courses of laminated asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

D. Fasten asphalt shingle strips with a minimum of four roofing nails, but not less than the number indicated in manufacturer's written instructions for roof slope and design wind speed indicated and for warranty requirements specified in this Section.
   1. Locate fasteners in accordance with manufacturer's written instructions.

E. Open Valleys: Cut and fit asphalt shingles at open valleys, trimming upper concealed corners of shingle strips.
   1. Maintain uniform width of exposed open valley from highest to lowest point.
   2. Extend shingle a minimum of 4 inches over valley metal.
   3. Set valley edge of asphalt shingles in a 3-inch wide bed of asphalt roofing cement.
   4. Do not nail asphalt shingles to metal open-valley flashings.

F. Hip and Ridge Shingles: Maintain same exposure of cap shingles as roofing-shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds.
   1. Fasten with roofing nails of sufficient length to penetrate sheathing.

END OF SECTION 073113
SECTION 075419

POLYVINYL-CHLORIDE (PVC) ROOFING

PART 1 - GENERAL

1.1 DESCRIPTION

A. 80-mil reinforced PVC roof membrane and membrane flashings, fully adhered, full coverage adhesive application, all roof membrane seams heat welded.

B. Roof system shall meet the minimum requirements for the State of Texas current, applicable building codes, meet requirements of a UL Class A Fire Rated Assembly, and qualify for roof membrane manufacturer’s 20-Year No Dollar Limit (NDL) Roof System Guarantee.

1.2 DESCRIPTION

A. Section 061050 – Rough Carpentry
B. Section 070150 – Preparation for Reroofing
C. Section 072200 – Roof and Deck Insulation
D. Section 076000 – Flashing and Sheet Metal

1.3 EXTENT OF WORK

A. Provide all labor, material, tools, equipment, and supervision necessary to complete the installation of the specified roof system, including flashings and insulation as specified and as indicated on the Drawings in accordance with the manufacturer's most current specifications and details.

B. Contractor shall be fully knowledgeable of all requirements of the Contract Documents and shall be fully aware of all existing job site conditions that will affect their work prior to commencing with the Work.

1.4 SUBMITTALS

A. Prior to starting work, the Contractor must submit the following in accordance with Section 013300:

1. Shop drawings of details that differ from those shown in the Drawings, indicating details of construction and identification of materials.
2. Sample of the manufacturer's 20-Year NDL Membrane System Warranty, and copy of the Application for Warranty.
3. Copy of Project Information Notice submitted to manufacturer.
4. Letter of project-specific certification from the manufacturer, listing all layers of the new roofing assembly with required number of fasteners to achieve the specified uplift requirements.
5. Letter of contractor certification from the manufacturer, which certifies the Contractor is authorized to install the manufacturer's 20-Year No Dollar Limit Guaranteed Roof Systems, with the date of original certification and a list of Contractor personnel who have received training from the manufacturer along with the dates training was received.
4. Membrane Certification from the membrane manufacturer indicating the membrane thickness over the reinforcing scrim (top ply membrane thickness) is nominal 0.030” (30-mil).
5. Submit product data and MSDS for all sealants, adhesives, coatings and sealant primers, indicating the VOC content in g/l of each product.

B. Upon completion of the installed work, submit:

1. Copies of the manufacturer’s final inspection to the Roof Consultant prior to the issuance of the manufacturer’s warranty.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the job site in the manufacturer's original, unopened containers or wrappings with the manufacturer's name, brand name and installation instructions intact and legible. Deliver in sufficient quantity to permit work to continue without interruption.

B. No overnight rooftop storage will be permitted.

C. Store all rolled goods and curable materials in lockable weathertight storage containers.

D. Store curable materials (adhesives and sealants) between 60 degrees F and 80 degrees F in dry areas protected from water and direct sunlight. If exposed to lower temperature, restore to 60 degrees F minimum temperature before using.

E. Store materials containing solvents in dry, well-ventilated spaces with proper fire and safety precautions. Keep lids on tight. Use before expiration of their shelf life.

F. Any materials which are found to be damaged shall be removed and replaced at the applicator’s expense.

1.6 WORK SEQUENCE

A. Schedule and execute work to prevent leaks and excessive traffic on completed roof sections. Care should be exercised to provide protection for the interior of the building and to ensure water does not flow beneath any completed sections of the membrane system.

B. Do not disrupt activities in occupied spaces.

1.7 EXISTING CONDITIONS

A. If discrepancies are discovered between the existing conditions and those noted in the Contract Documents, immediately notify Owner and Consultant by phone and solicit the manufacturer’s approval prior to commencing with the Work. Necessary steps shall be taken to make the building watertight until the discrepancies are resolved.

1.8 JOB SITE PROTECTION

A. Do not overload any portion of the building, either by use of or placement of equipment, temporary storage of debris, or storage of materials.

B. Protect against fire and flame spread. Maintain proper and adequate fire extinguishers.

C. Take precautions to prevent drains from clogging during the roofing application. Remove debris at the completion of each day’s work and clean drains.
D. Prior to Substantial Completion, coordinate and schedule with Owner and Consultant, roof drain testing to ensure the system is free running and drains are watertight. Remove strainers and plug drains to test for a minimum of 24 hours, verify that there will be 0% chance of precipitation during the 24 hour test. Be prepared to dispatch Contractor personnel to site to remove plugs in the event precipitation occurs at the site during the test. Install flags or other telltales on plugs. Remove plugs immediately after test has been documented.

1.9 WORKMANSHIP

A. Applicators installing new roof, flashing and related work shall be factory trained and approved by the manufacturer they are representing.

B. All work shall be of highest quality and in strict accordance with the manufacturer's published specifications and to the Owner's and Roof Consultant’s satisfaction.

1.10 QUALITY ASSURANCE

A. Unless otherwise noted in this specification, the Contractor must strictly comply with the manufacturer's current specifications and details.

B. The roofing system must be installed by an applicator authorized and trained by the manufacturer in compliance with shop drawings as approved by the manufacturer.

C. Provide adequate number of experienced workmen regularly engaged in this type of work who are skilled in the application techniques of the materials specified.

D. Provide at least one thoroughly trained and experienced, non-working, English speaking superintendent on the job at all times that Work of this Contract is in progress.

E. There shall be no deviations made from this specification or the approved shop drawings without the prior written approval of the Roof Consultant and Owner. Any deviation from the manufacturer's installation procedures must be supported by a written certification on the manufacturer's letterhead and presented for the Roof Consultant's consideration.

F. Before commencement of the roof construction, the Contractor shall arrange for inspections to be made by a non-sales technical representative of the membrane manufacturer, as follows:
   1. On the first day of roof membrane installation,
   2. A minimum of three (3) interim inspections,
   3. A final inspection in order to determine whether corrective work will be required before the warranty will be issued.
   4. Notify the Roof Consultant seventy-two (72) hours prior to the manufacturer's inspections, and coordinate the inspection visits to coincide with visits by the Roof Consultant.
   5. Provide copies of the membrane manufacturer's inspection reports to the Owner and Consultant within five business following manufacturer's inspection.

G. Pre-installation Conference: Conduct conference at Project site. Comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to roofing system including, but not limited to, the following:
   1. Meet with Owner, Architect, Roof Consultant, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including
manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.11 JOB CONDITIONS, CAUTIONS, AND WARNINGS

A. Material Safety Data Sheets (MSDS) must be on location at all times during the transportation, storage and application of materials.

B. When positioning membrane sheets, exercise care to locate all field splices away from low spots and out of drain sumps. All field splices should be shingled to prevent bucking of water.

C. When loading materials onto the roof, take care not to overload the roof structure. Coordinate with Owner and do not overload or damage the building structure.

D. Proceed with roofing work only when weather conditions are in compliance with the manufacturer's recommended limitations, and when conditions will permit the work to proceed in accordance with the manufacturer's requirements and recommendations.

E. Proceed with work so new roofing materials are not subject to construction traffic. When necessary, new roof sections shall be protected and inspected upon completion for possible damage.

F. Provide protection for all roof areas exposed to traffic during construction. Protection shall consist of ¾" insulation board underneath 5/8" plywood. Do not allow plywood to contact new roof membrane.

G. The surface on which the insulation or roofing membrane is to be applied shall be clean, smooth, dry, and free of projections or contaminants that would prevent proper application of or be incompatible with the new installation, such as fins, sharp edges, foreign materials, oil and grease.

H. New roofing shall be complete and weather tight at the end of the workday.

I. Contaminants such as grease, fats and oils shall not be allowed to come in direct contact with the roofing membrane.

1.12 PERFORMANCE REQUIREMENTS

A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.
B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

C. Roofing System Design, Roof Areas A, B, and C: Provide a membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE 7.

2. Perimeter Uplift Pressure: 49 lbf/sq. ft.
4. Hail Resistance: SH

D. Roofing System Design, Roof Area B-U: Provide a membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE 7.

1. Corner Uplift Pressure: 40 lbf/sq. ft.
4. Hail Resistance: SH

PART 2 - PRODUCTS

2.1 GENERAL

A. All components of the specified roofing system shall be products of pre-bid approved manufacturers or accepted by manufacturers the as compatible.

B. All products (including insulation, fasteners, fastening plates and edgings) must be manufactured and supplied by the roofing system manufacturer and covered by the warranty. Any products required by the Project not manufactured by the roofing system manufacturer shall be approved for use, in writing, by the roofing systems manufacturer.

2.2 MEMBRANE

A. PVC Sheet: ASTM D4434, Type III.

1. Membrane thickness: 80-mils
2. Exposed Face Color: white
3. Minimum thickness above reinforcement: 30 mils
4. Energy Star Initial Solar Reflectance: 0.86, ASTM C1549
5. Energy Star 3-Year Aged Reflectance: 0.63, ASTM C1549
6. Energy Star Initial Emittance: 0.89, ASTM C1371
7. Energy Star 3-Year Aged Emittance: 0.87, ASTM C 1371

2.3 MANUFACTURERS

A. Carlisle SynTec

B. GAF

C. IB Roof Systems

D. Johns Manville
E. Versico
F. Approved equivalent

2.4 ADHESIVES AND CLEANERS
A. All products shall be furnished by the pre-bid approved manufacturer and specifically formulated for the intended purpose.

2.5 ACCESSORIES
A. Bonding Adhesive: high-strength, solvent based contact adhesive that allows bonding of PVC membrane to various porous and non-porous substrates, as manufactured or approved by membrane manufacturer.
B. Edge Sealant: membrane manufacturer’s cut edge sealant.
C. Sealer: membrane manufacturer’s water cut-off mastic and sealant.
D. Cleaner: membrane manufacturer’s weathered membrane cleaner.
E. Walk Tread: membrane manufacturer’s standard.
F. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, and color as PVC sheet, minimum 60-mils.
G. Prefabricated Flashings and Accessories: as manufactured by roof membrane manufacturer.

2.6 FASTENERS AND PLATES
A. Membrane Fasteners: An oversized diameter (.315") non-corrosive steel threaded fastener used in conjunction with heavy-duty plates for membrane securement into deck as required.

2.7 METAL EDGING AND MEMBRANE TERMINATIONS
A. Termination Bar: A 1-inch wide and .098-inch-thick extruded aluminum bar pre-punched 6 inches on center; with and without sealant ledge to support lap sealant.
B. PVC-Coated Metal: manufacturer’s standard 24 gauge, G-90 galvanized steel sheet.

PART 3 - EXECUTION
3.01 GENERAL
A. Inspect the deck and verify it’s preparation to provide an acceptable surface for the installation of the membrane system.
B. Comply with the manufacturer's published instructions for the installation of the membrane roofing system including proper substrate preparation, jobsite considerations and weather restrictions.
C. Position sheets to accommodate contours of the roof deck and shingle splices to avoid bucking water.
3.02 MEMBRANE PLACEMENT AND ATTACHMENT

A. Unroll and position membrane without stretching. Allow membrane to relax minimum 15 minutes if temperature is above 55 degrees Fahrenheit; allow to relax minimum 30 minutes if temperature is below 55 degrees Fahrenheit. Provide and secure both perimeter and field membrane sheets in accordance with the manufacturer’s most current specifications and details.

B. Position membrane over the acceptable substrate. Fold membrane sheet back lengthwise (onto itself) so half the underside of the membrane is exposed.

C. Apply full coverage bonding adhesive in accordance with the manufacturer’s published instructions, to the corresponding substrate area. Do not apply bonding adhesive along the splice edge of the membrane to be hot air welded over the adjoining sheet. Allow the adhesive to dry until it is tacky but will not string or stick to a dry finger touch.

1. Install the membrane into the adhesive while avoiding wrinkles. Roll the membrane immediately into the adhesive with a 150 lb., 24” diameter roller to achieve maximum contact.

2. Fold back the un-bonded half of the sheet lengthwise and repeat the bonding procedures.

D. Position adjoining sheets to allow a minimum overlap of 2 inches.

E. Clean laps with manufacturer’s membrane cleaner prior to hot air welding.

F. Prior to hot air welding, perform peel test on new membrane in accordance with manufacturer’s requirements, documenting proper heat welding. Apply date, time, and name of person performing test to the test strip and submit to Roof Consultant for observation.

G. Hot air weld all membrane sheet laps in accordance with the manufacturer’s hot air welding procedures.

H. Continue to install adjoining membrane sheets in the same manner, overlapping edges a minimum of 2 inches and complete the bonding procedures as stated previously, in accordance with the manufacturer’s specifications.

3.03 MEMBRANE SPLICING/HOT AIR WELDING PROCEDURES

A. Hot air weld the membrane using an automatic hot air welding machine in accordance with the manufacturer's specifications. At all splice intersections, roll the seam with a silicone roller prior to membrane seam cooling. Hot air weld non-reinforced flashing over splice intersection.

B. Probe all seams once the hot air welds have thoroughly cooled (approximately 30 minutes). Include name of person performing daily probing and evidence that probing was performed in Contractor’s Daily Report.

C. Repair all seam deficiencies the same day they are discovered.

D. Apply cut edge sealant on all cut edges of reinforced membrane (where the scrim reinforcement is exposed) after seam probing is complete.
3.04 WALKWAYS

A. Install walkways at all traffic concentration points (such as access doors, HVAC units, roof ladders, rooftop hatches) and all locations as required by the membrane manufacturer, Owner and Consultant.

B. Hot air weld walkway pads to the membrane in accordance with the manufacturer's specifications.

3.05 DAILY SEAL

A. When the completion of flashings and terminations is not achieved by the end of the work day, a daily seal must be performed to temporarily close the membrane to prevent water infiltration.

B. Complete a watertight membrane seal in accordance with the manufacturer's requirements.

3.06 CLEAN UP

A. Perform daily clean-up to collect all wrappings, empty containers, paper, and other debris from the project site. Upon completion, all debris must be disposed of in a legally acceptable manner.

B. Prior to the manufacturer's inspection for warranty, the applicator must perform a pre-inspection to review all work and to verify all flashing has been completed as well as the application of all caulking.

C. Remove all excess adhesive from roof surfaces and adjacent surfaces.

D. Power-wash all roof membrane surfaces in accordance with roof membrane manufacturer's requirements.

END OF SECTION 075419
SECTION 075600
FLUID-APPLIED ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Provide a cold-fluid-applied polyurethane roofing system on concrete girders.

1. Work includes substrate preparation.
2. Work includes bridging and sealing air leakage and water intrusion pathways and gaps including penetrations of the building envelope including piping, conduit, ducts and similar items.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 079200 – JOINT SEALANTS

1.3 PERFORMANCE REQUIREMENTS

A. The cold fluid applied Polyurethane roof coating system is intended to perform as a continuous barrier against liquid water. The coating system is expected to remain exposed and shall accommodate movements of building materials as required with accessory sealant materials at such locations such as, changes in substrate, perimeter conditions and penetrations.

B. Installed roof coating system shall not permit the passage of water.

C. Manufacturer shall provide all primary roofing/waterproofing materials that are physically and chemically compatible when installed in accordance with manufacturers current application requirements.

1.4 SUBMITTALS

A. Submittals: Comply with project requirements for submittals as specified in Division 01.

B. Product Data: For each product.

C. Shop Drawings: Manufacturer’s standard details and shop drawings for the specified system.

D. Installer’s Authorization: Installer shall provide written documentation from the manufacturer of their authorization to install the system, and eligibility to obtain the warranty specified in this section.

E. Manufacturer’ Certification: Certification showing full time quality control of production facilities and that each batch of material is tested to ensure conformance with the manufacturer's published physical properties.
1.5 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Manufacturer shall demonstrate qualifications to supply materials of this section by certifying the following:

1. Membrane Manufacturer shall have available an in-house technical staff to assist the contractor when necessary in the application of the products and site review of the assembly.

B. Installer's Qualifications: The Contractor shall demonstrate qualifications to perform the Work of this Section.

C. Source Limitations: All components listed in this section shall be provided by a single manufacturer or approved by the primary roofing/waterproofing manufacturer.

D. Materials Compatibility: All materials included in the roof coating assembly, as well as associated materials adhered to/applied beneath the roofing/waterproofing membrane shall have been tested and verified to be compatible. Include written testing documentation and test reports if requested by Architect.

E. Applicable Regulations: Comply with local code and requirements of authorities having jurisdiction. Do not exceed VOC regulations as established by the State in which they are being installed; including total VOC content, in grams per liter, for all system components (i.e. primers, adhesives, coatings, and similar items).

F. Roofing Terminology: Refer to ASTM D1079 and the glossary of the National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual for definitions of roofing terms related to this section.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver all roofing/waterproofing materials to the site in original containers, with factory seals intact.

B. Store all pail goods in their original undamaged containers in a clean, dry location within their specified temperature range.

C. Do not expose materials to moisture in any form before, during, or after delivery to the site. Reject delivery of materials that show evidence of contact with moisture.

D. Remove manufacturer supplied plastic covers from materials provided with such. Use "breathable" type covers such as canvas tarpaulins to allow venting and protection from weather and moisture. Cover and protect materials at the end of each work day. Do not remove any protective tarpaulins until immediately before the material will be installed.

E. Materials shall be stored above 55°F (12.6°C) a minimum of 24 hours prior to application.
1.7 PROJECT CONDITIONS

A. Weather: Proceed with roofing/waterproofing only when existing and forecasted weather conditions permit. Membrane application shall not be proceeded when precipitation is imminent. Ambient temperatures shall be above 41°F when applying the roofing/waterproofing system.

B. All surfaces to receive the roofing/waterproofing membrane shall be free from visible water, dew, frost, snow and ice. Application of roofing/waterproofing membrane shall be conducted in well ventilated areas.

C. Roofing Coating:

1. Roofing coating is not intended to be exposed or in contact with a constant temperature below -22°F to 176°F.
2. Specified roofing/waterproofing membrane is non-flammable and VOC compliant. Consult container, packaging labels and Safety Data Sheets (SDS) for specific safety information.
3. Specified roof coating is resistant to gasoline, paraffin, fuel oil, mineral spirits, and moderate solutions of acids and alkalis, acid rain and detergents. Some low molecular weight alcohols can soften. Any exposure to foreign materials or chemical discharges shall be presented to membrane manufacturer for evaluation to determine any impact on the waterproof membrane assembly performance prior to warranty issuance.

D. Contractor shall ensure adequate protection during installation of the roof coating system.

1.8 WARRANTY

A. System warranty shall be for the following duration in accordance with specified system.

1. Warranty Length: 20 years - Material and Labor

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Sika Corporation
B. Tremco Incorporated
C. The Garland Company

2.2 ROOF COATING SYSTEM


1. Base Coat: 25 mils wet (1.56 gal/100 SF)
2. Top Coat: 15 mils wet (0.95 gal/100 SF)

2.3 COATINGS

A. Single component, cold, fluid applied, polyurethane roof coating in accordance with ASTM C836.
B. Liquid Property Requirements at 75 °F and 50 % R.H.
1. VOC     ASTM D2369-81: 38 g/l
2. Volume Solids   ASTM D2697: 88%

C. Film Physical Property Requirements:

1. Tensile Strength   ASTM D412: 700 psi
2. Elongation   ASTM D412: 250%.
3. Static Puncture   >55 lb/f
4. Solar Reflectance Index   ASTM C1549: 108 (white)

2.4 LOCALIZED REINFORCEMENT

A. Localized reinforcement of the roofing/waterproofing membrane system shall be:

1. Nylon mesh specifically designed for local reinforcement of the roofing/waterproofing membrane at structural cracks, expansion joints and transitions between dissimilar materials.
2. Self-adhering polymeric rubberized tape with plastic release liner on underside and woven polyester facer on top side.

2.5 FILLET BEAD AND PENETRATION SEALANT

A. One-part polyurethane sealant suitable for fillet bead transition compound to be applied prior to the installation of the membrane system at changes in substrate direction, sealing reglet terminations, cracks in the substrate and penetrations of the roof/waterproofing system.

2.6 PRIMERS

A. Primer for concrete, masonry: Single component rapid curing high solids and low VOC solvent based polyurethane primer.
B. Metal primer: Two-component, cyclo-aliphatic, amine cured material with a high level of corrosion resistance for metal, modified bitumen surfaces, and chemically treated wood.
C. Membrane over-coating primer: Single component polyurethane-based primer specifically designed for the reactivation of existing roof/waterproofing system applications prior to membrane over-coating.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the Work of this section. Notify Architect in writing of any discrepancies. Commencement of the Work in an area shall mean Installer’s acceptance of the substrate.

B. Surfaces shall be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants. Existing membranes to be coated shall be in good condition without significant damage. Fill voids, gaps and spalled areas in substrate to provide an even plane. Strike masonry joints full flush.
3.2 SURFACE PREPARATION

A. Verify that the concrete is clean and smooth, free of depressions, waves, or projections. Ensure all preparatory work is complete prior to applying membrane.

B. All surfaces shall be blown clean using an air compressor to remove any remaining loose debris.

C. All cracks and voids greater than 0.040 inches shall be routed and caulked with a polyurethane sealant. Allow to cure per roof/waterproofing membrane manufacturer's technical data sheets prior to over-coating with the specified roof/waterproofing membrane system.

D. At all inside corners, gaps or voids at the juncture of the deck and penetrations apply a minimum 3/4-inch fillet bead of polyurethane sealant and allow to cure per roof/waterproofing membrane manufacturer's technical data sheets prior to installing the roof/waterproofing membrane system.

E. At all moving cracks, moving joints between dissimilar materials, and similar conditions, create a minimum 1-inch-wide bond break utilizing bond breaker tape, centered over the crack or joint.

F. Membrane terminations shall be established prior to project start-up and documented in shop drawings. Terminations shall occur in raked-out mortar joints, saw cut terminations or under installed counter-flashing materials.

G. Use tape lines to achieve a straight edge detail.

3.3 SUBSTRATE PREPARATION

A. Pressure wash the concrete to remove all dust, dirt and debris from the surface.

B. Metal Surfaces:
   1. Aluminum, galvanized, cast iron, copper, lead, brass, stainless steel, zinc.
   2. Surface evaluation and field adhesion is recommended.
   3. Exposed pipes, and other metal surfaces shall be cleaned by power tool cleaning (SSPC SP-3) to remove corrosion deposits back to a clean, bright metal followed by a solvent wipe prior to application of the specified primer.

C.

3.4 PRIMING

A. Pressure prior to coating any surface, be sure the coating will adhere by performing an adhesion test (ASTM D-903). Coating may be applied by brush, roller, or airless spray equipment. Do not apply when temperatures are below 41 °F or when precipitation is in the forecast within 24 hours.

B. Mix and apply specified primer for specified surfaces by brush or roller at the application rate shown on the technical data sheet. Porous, rough or absorbent surfaces will decrease coverage rates.

C. Allow to cure and dry in accordance with manufacturer's technical data sheets.

3.5 MEMBRANE REINFORCEMENT

A. Reinforcement of Cracks, Metal Joints and Flashing Transitions:
1. For all locations where the specified coating system is to be applied directly to the substrate surface, provide reinforcement of cracks, joints, seams, and transitions of dissimilar material prior to applying the specified coating system.

2. For all moving cracks and joints, create a minimum 1-inch-wide bond break centered over the crack or joint by applying bond break tape centered over each crack or joint.

3. For all non-moving cracks and joints, rout and seal with polyurethane sealant.

4. For all horizontal-to-vertical transitions, provide a ¾” x ¾” polyurethane sealant cant.

5. Apply a minimum of a 3-inch-wide strip of joint tape. Back roll reinforcement to fully embed tape into the wet liquid polyurethane membrane. Add more liquid membrane as needed to fully embed the reinforcement.

6. Start with details round projections, machine legs, guide wire straps, inside and outside, corners, parapet walls, penetrations and similar areas should be flashed. Repair any damaged metal and caulk and seal watertight all seams, transitions, terminations, penetrations, joints, pipes, voids, protrusions and any area where water could enter through the substrate.

7. Ensure reinforcement is not in tension during embedment.

3.6 COLD FLUID APPLIED FIELD COATING APPLICATION

A. Apply coating according to the rates listed in Section 2.2 for the agreed upon system length. Coating may be applied by brush, roller, or airless spray equipment. Do not apply when temperatures are below 41 °F or when precipitation is in the forecast within 24 hours.

B. Allow detail coats to cure before applying base coat.

C. Allow base coat to cure before applying top coat.

D. If any coat is left exposed for more than 7 days, use manufacturer’s recoat primer or reactivation primer and allow to cure before applying the subsequent coat.

E. Protection: After completion of application, do not allow traffic on coated surfaces for a period of at least 48 hours at 75° F and 50% R.H., or until completely cured.

3.7 PARAPET AND WALL FLASHINGS

A. Clean, prepare and prime flashing substrate surfaces ready to receive membrane flashing applications.

B. All parapet, wall, and curb flashings shall be provided with a sealant cant bead and all cold joints reinforced with either joint tape prior to base coat application.

C. Terminate roofing/waterproofing membrane system at raked-out mortar joints, termination saw cut joint, or under installed counter-flashing materials. Then, seal all termination joints with sealant and a top coat of coating.

3.8 ROOF PENETRATIONS

A. Clean, prepare and prime surfaces ready to receive membrane flashing applications. Ensure that penetrations are secured to prevent movement.

B. Apply joint tape around all roof penetrations.
3.9 APPLICATION OF PENETRATION SEALANT

A. Seal reglet-based membrane terminations, heads of exposed mechanical fasteners, around penetrations, duct work, electrical and other apparatus extending through the roofing/waterproofing membrane with specified penetration sealant.

3.10 CLEAN-UP

A. Work areas are to be kept clean, clear and free of debris at all times.

B. Do not allow trash, waste, and/or debris to collect on the roof deck area. Trash, waste, and/or debris shall be removed from the roof daily.

C. All tools and unused materials shall be collected at the end of each workday and stored properly off of the finished roof surface and protected from exposure to the elements.

D. Dispose of or recycle all trash and excess material in a manner conforming to current EPA regulations and local laws.

E. Properly clean the finished roof surface after completion, and make sure the drains and gutters are not clogged.

F. Clean and restore all damaged surfaces to their original condition

END OF SECTION 075600
SECTION 076200
FLASHING AND SHEET METAL

PART I - GENERAL

1.1 WORK INCLUDED

A. Install flashing and sheet metal as indicated on Drawings and in these specifications as required for a complete and proper installation. The following items are included:

1. Perimeter edge flashing/fascia.
2. Expansion joint cap.
3. Area divider cap.
4. Roof to wall counterflushing.
5. Equipment curb counterflushing.

1.2 RELATED WORK

A. Section 061000 – Rough Carpentry
B. Section 072200 – Roof And Deck Insulation
C. Section 075419 – Polyvinyl-Chloride (PVC) Roofing

1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 013300.
B. Describe material profile, jointing pattern, jointing details, fastening methods, and installation details.
C. Submit samples under provisions of Section 013300.
D. Provide full sized sample of metal flashing and post supports illustrating typical seam, external corner, internal corner, material, and finish.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA and NRCA standard details and requirement.

1.5 QUALIFICATIONS

A. Company specializing in sheet metal flashing work with a minimum of 10-years documented experience.

1.6 STORAGE AND HANDLING

A. Stack pre-formed materials to prevent twisting, bending, or abrasion, and to provide ventilation.
B. Prevent contact with materials during storage that may cause discoloration, staining, or damage.
C. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label.
1.7 WARRANTY

A. Sheet Metal work and accessories to be included in Two-Year Contractor's Warranty, Section 017836.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. Sheet metal flashing not exposed to public view: 24 gauge galvanized steel.

B. Sheet metal flashing exposed to public view: pre-finished 24 gauge galvanized steel, Kynar 500.

C. Sheet metal flashing embedded into roof membrane system: roof membrane manufacturer’s 24 gauge galvanized steel, TPO coated to provide a surface acceptable for heat welding roof membrane and flashing.

2.2 SHEET METAL COMPONENTS

A. Gutters and downspout: pre-finished 24-gauge galvanized steel.

B. Gutter spacers, gutter hangers, and downspout straps: 1/8” x 1” paint grip galvanized steel.

C. Cover plates, end caps and miscellaneous sheet metal: same materials, gauge and profile as edge metal or expansion joint material.

D. Cleats: 22 gauge galvanized steel.

2.3 ACCESSORIES

A. Solder: ANSI/ASTM B 32 50/50 type.

B. Blind Pop-Rivets: Stainless steel.

2.4 SEALANT

A. Type I: Application exposures to sunlight, ASTM C-920-87, Federal Specification TT-S-00230-C one component gun-grade polyurethane sealant suitable for continuous immersion.

B. Type II: Applications not exposed to sunlight, butyl rubber based.

C. Hot vent sealant: One-component neutral moisture curing silicone sealant.

D. Sealant Primer: sealant manufacturer’s approved primer.

2.5 SCHEDULE OF FASTENERS

A. Exposed fasteners: stainless steel with stainless steel bonded neoprene or EPDM washers.

B. Fasteners shall be compatible to all materials to which they come in contact.

C. Non-exposed fasteners:
1. Wood Substrate: No. 10 stainless steel wood screws of length necessary to penetrate wood substrate one inch.
2. Metal Substrate: Minimum No. 10 stainless steel sheet metal screws or as necessary to suit application.

2.6 FABRICATION

A. Form sections to match existing profiles, true to shape, accurate in size, square, and free from distortion or defects.
B. Fabricate continuous cleats and starter strips of same material as sheet, inter-lockable with sheet.
C. Form pieces in longest practical lengths.
D. Hem exposed edges of metal 1/2-inch; miter and seam corners.
E. Form materials with cover plate seam.
F. Fasten and seal metal joints.
G. Fabricate corners from one piece with minimum 18-inch and maximum 36-inch long legs; fasten for rigidity, seal with sealant.
H. Fabricate vertical faces with bottom edge formed outward 1/4-inch and hemmed to form drip.
I. Form edge metal/fascia as existing profiles as specified herein and as shown on Drawings.
J. Form sections square, true, and accurate in size, in maximum possible lengths and free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
K. Enlarge holes for fastening counter flashing, coping, and pressure bars as necessary to allow for thermal expansion and contraction. Cover exposed holes with appropriate washers.
L. All fabrication and installation of sheet metal shall be in accordance with the latest published SMACNA and NRCA guidelines and recognized roofing and sheet metal industry standards.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set and in place, and nailing strips located.
B. Verify membrane termination and base flashings are in place, sealed, and secure.
C. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Field measure site conditions prior to fabricating work.
B. Tie-ins or contact with dissimilar metals: Install separation layer of elastomeric membrane between metal surfaces.
3.3 INSTALLATION - GENERAL

A. Provide flashings of materials indicated on Drawings at all junctures of the roof with perimeters, curbs, mechanical, electrical equipment, etc., that a completely watertight installation is achieved.

B. Fabricate and install sheet metal work with lines, arises and angles sharp and true, and plane surfaces free from warps and buckles. Bead or return all exposed edges. Tin metal for full area of contact on soldered seams and joints. Do soldering slowly with well heated coppers, thoroughly heating seams and completely filling them with solder.

C. Apply bed of roof membrane manufacturer’s water block mastic directly below sheet metal that is set over roofing membrane or in other areas as required by the Drawings, and the manufacturer’s specifications.

D. Submit details not covered in Drawings for approval by Owner or Roof Consultant.

E. Install starter and edge strips, and cleats before starting installation.

F. Secure flashings in place using concealed fasteners. Use exposed fasteners only in locations approved by Roof Consultant.

G. Lock and seal all joints.

H. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

I. Fasten sheet metal with approved fasteners at a minimum of 12 inches on centers unless otherwise specified in these Specifications or the Drawings.

J. Apply sealant manufacturer’s approved primer to all surfaces that will receive sealant, regardless if sealant manufacturer permits installing sealant to unprimed surfaces.

3.4 CLEAT INSTALLATION

A. Install cleats for edge flashing with specified fasteners on eight-inch centers.

3.5 METAL EDGE FLASHING INSTALLATION

A. Install edge flashing in a uniform application of water block mastic over roof membrane.

B. Apply sealant, Type I, under cover plates at all joints prior to installation.

C. Fasten horizontal flange in a staggered pattern on three-inch centers.

D. Prime with asphalt primer.

E. Strip-in edge flashing with SBS modified base sheet in hot asphalt.

3.6 CLEANING

A. Remove all stains and markings from exposed sheet metal.

END OF SECTION 076200
PART 1 - GENERAL

1.1 WORK INCLUDED

A. Equipment, pipe/conduit, and duct supports.

B. Factory-fabricated fixed roof hatch fall protection safety guard rail in accordance with OSHA fall protection regulations (29 CFR 1910.23).

C. Factory fabricated wall mounted roof access ladders.

1.2 SUBMITTALS

A. Product Data: Submit for all products proposed for use, describing physical characteristics and method of installation.

B. Shop Drawings: Show installation layout, sizes of units, and details of installation.

C. Warranty: Submit executed copy of manufacturer’s standard warranty.

1.3 QUALITY ASSURANCE

A. Manufacturer: A minimum of 5 years’ experience manufacturing similar products.

B. Manufacturer’s Quality System: Registered to ISO 9001:2008 Quality Standards including in-house engineering for product design activities.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer’s original packaging. Store materials in a dry, protected, well-vented area. Inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier’s freight bill of lading.

1.5 WARRANTY

A. Manufacturer’s Warranty: Provide manufacturer’s standard warranty. Materials shall be free of defects in material and workmanship for a period of five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

PART 2 – PRODUCTS

2.1 ROOF HATCH FALL PROTECTION SAFETY GUARD RAIL

A. Basis-of-Design Manufacturer: Type Bil-Guard® 2.0 Roof Hatch Railing System by The BILCO Company, P.O. Box 1203, New Haven, CT 06505, 800-366-6530, Web: www.bilco.com.

B. Performance characteristics:
   1. High visibility safety yellow powder coat paint finish.
2. Hatch rail system shall attach to the cap flashing of the roof hatch and shall not penetrate any roofing material.
3. Hatch rail system shall satisfy the requirements of OSHA 29 CFR 1910.23 and shall meet OSHA strength requirements with a factor of safety of two.
4. Corrosion resistant construction with a five-year warranty.
5. Hinged gate shall ensure continuous barrier around the roof hatch.
6. Self-closing gate hinge and positive latching system provided with hatch rail system.
8. Hardware: Mounting brackets shall be 3/8” thick extruded aluminum. Pivoting post guides with compression fittings and latching mechanism shall be cast aluminum.
9. Self-closing hinges and all fasteners shall be type 316 stainless steel.

2.2 PIPE, CONDUIT, EQUIPMENT, AND DUCT SUPPORTS

A. Manufacturer Basis of Design:

1. PHP Systems/Design i.e. Portable Pipe Hangers; 5534 Harvey Wilson Drive, Houston, Texas 77020, Tel: (800) 797-6585; www.phpsd.com; Email: info@phpsd.com.

B. Applications:

1. Support pipes, conduit, cable trays, and ducting, a minimum of 8 inches above roof surface.
   a. Support Spacing: 10 feet maximum.
   b. For Electrical Conduit 2-1/2 inches in diameter or less, up to 10 inches above roof; Portable Pipe Hanger Model number SS8.
   c. For Electrical Conduit 3-1/2 inches in diameter or less, up to 16 inches above roof; Portable Pipe Hanger Model number PP10.
   d. For Gas Lines up to 6 inches in diameter, up to 12 inches above roof; Portable Pipe Hanger Model number RB18 with roller.
   e. For single Electrical and Gas Lines 3 to 8 inches in diameter; Portable Pipe Hanger Model number PS 1-2.
   f. For Multiple Lines: Portable Pipe Hanger Model number PSE custom.
   g. For Ductwork: Portable Pipe Hanger Model number PPH-D – Goal Post style.
   h. Accessories for PSE Custom and Other Applications when required.
      i. Un-insulated Piping: Roller support or clevis hanger.
      ii. Insulated Piping: Band hanger supported from horizontal channel or clevis hanger with Insulation Protection Shield.
      iii. Conduit: Band hanger supported from horizontal channel.
      iv. Bracing required when using base with swivel; when pipe exceeds 24 inches (610 mm) above roof, or when thermal expansion of pipe is great.

2. Equipment supports shall consist of Portable Pipe Hanger Model number RTU-20.
   a. Support Spacing: Install supports at locations indicated on the Drawings.

C. Portable Support System: Engineered, portable system specifically designed for installation without the need for roof penetrations, or flashings, and without causing damage to the roofing membrane.

1. Design system using high density, high impact polypropylene bases with carbon black, anti-oxidants for UV protection, and steel framing of 1-5/8 inch (41 mm) B22TH or 1-7/8 inch (46 mm) BTS22TH for support.
2. Custom design system to fit piping, conduits and, equipment to be installed and actual conditions of service and loading.
3. Piping Supports: Provide suitable hangers and supports.
4. Duct and Equipment Supports: Factory fabricated to support exact duct sizes and equipment to be installed.
D. Bases: Injection molded high density, high impact polypropylene with UV-inhibitors and anti-oxidants, conforming to the following:
1. Moisture Content: Negligible.
2. Shrinkage/Swelling Due to Moisture: Negligible.
3. Density: 55.8 lb/cu ft (894 kg/cu m).
4. Insect Resistance: No known insect damage potential.
5. Chemical Resistance (oil, brake fluid, gasoline, diesel, antifreeze, battery acid, and sulfuric acid) No visual or physical change apparent.
6. Flammability: No ignition after 10 minutes, 25 kW/m, when tested in accordance with ASTM D 1929.
7. Sized as required by loading conditions and as indicated on the drawings.
8. Shop fabricated with inserts for square tubing or threaded rods as required.
9. Color: Integral black color as molded.
10. Bases for Mechanical Attachment: Sealant chamber around penetration point, with injection port for sealing after fastening; beveled lip for sealant bead around entire diameter.
11. Do not use bases containing carbonated plastics, press molded recycled rubber and plastics, steel, stainless steel, or any injection molded threaded receivers.

E. Pipe Supports and Hangers: Conform to MSS SP-58 and MSS SP-69 and as follows:
1. Fabricated of carbon steel where framing is carbon steel; fabricated of stainless steel where framing is stainless steel; finished same as framing.
2. Sizes 2-1/2 inch (63 mm) and smaller: Single roller supports for piping subject to expansion and contraction; 3-sided channels and pipe clamps.
3. Sizes 3 inch (76 mm) and larger: Rollers, clevis hangers, or band hangers, to allow for expansion and contraction without movement of the bases or framing.

F. Stainless Steel Framing:
1. Channel Types: 1-5/8 inch (41.3 mm) or 1-7/8 inch (47.6 mm), as required for loading conditions.
2. Thickness: 12 gage (2.7 mm).
3. Form: Roll-formed 3-sided or tubular channel.
5. Do not use tubing or tube steel.

G. Accessories: Clamps, bolts, nuts, washers, and other devices as required for a complete system.

2.3 FACTORY FABRICATED ALUMINUM WALL MOUNTED ROOF LADDERS

A. Aluminum Fixed Vertical Ladder and Components: Ladder, cage, rest platforms, wall mounting brackets, walk-thru, and side rails

B. Basis of Design: Model FL Aluminum Fixed Vertical Ladder as manufactured by Precision Ladders LLC.
1. Capacity: Unit shall support a 1000 lb loading without failure.
2. Performance Standard: Units designed and manufactured to meet or exceed ANSI A14.3 and OSHA 1910.27.

C. Components:
2. Ladder Tread: 2-1/4 inch by 3/4 inch by 1/4 inch extruded 6005-T5 aluminum with deeply serrated top surface.
3. Ladder Mounting Bracket: 8-1/2 inch by 2 inch by 3 inch by 1/4 inch thick aluminum angle.

D. Walk-Thru:

E. Safety Cage:
   2. Vertical Bars: 1/4 inch by 2 inch 6005-T5 aluminum.

F. Rest Platform:
   1. 1/8 inch aluminum tread plate.
   3. Toe Boards. 6005 T-5 aluminum.

G. Security Door: 0.125 inch 3003-H14 aluminum panel 84 inches tall with padlock provision.

H. Finish: Mill finish on aluminum ladder components

PART 3 - EXECUTION

3.1 INSTALLATION – SUPPORTS

A. Install in accordance with manufacturer's instructions.

B. Clean surfaces of roof in areas to receive portable support bases.
   1. Remove dirt, dust, oils, and other foreign materials.

C. Use care in handling portable support system components during installation, to avoid damage to roofing, flashing, equipment, or related materials.

D. Pipe, Duct, Cable, and Equipment Support Systems
   1. Locate bases and support framing as indicated on drawings and as specified herein. Provide complete and adequate support of all piping, ducting, and conduit; whether or not all required devices are shown.
   2. The use of wood for supporting piping is not permitted.
   3. Provide support spacing so deflection of piping does not exceed 1/240 of span.
   4. Install framing at spacing indicated, but in no case at greater than 8 feet on center.
   5. Accurately locate and align bases.
      a. Consult manufacturer of existing or new roofing system as to the type of protection pads required between the roof and base.
      b. Adhere bases to protection pads.
   6. Set framing posts into bases and assemble framing structure as indicated.
   7. Use galvanized fasteners for galvanized framing and stainless steel fasteners for stainless steel framing.

E. Duct Support Systems
   1. Locate bases and support framing as indicated on drawings and as specified herein. Provide complete and adequate support of all piping, ducting, and conduit, whether or not all required devices are shown.
   2. Accurately locate and align bases.
a. Consult manufacturer of existing or new roofing system as to the type of protection pads required between the roof and base.
b. Adhere bases to protection pads.

3. Place pre-assembled support onto bases, attaching framing post to base bracket with 1/2 inch bolts provided, and adjust as needed. Support shall be adjustable to maintain existing elevation and slope.

4. Use galvanized fasteners for galvanized framing and stainless steel fasteners for stainless steel framing.

F. Equipment Supports

1. Locate bases and support framing as indicated on drawings and as specified herein. Provide complete and adequate support of all structures.

2. Accurately locate and align bases.
   a. Consult manufacturer of existing or new roofing system as to the type of isolation pads required between the roof and base.
   b. Adhere bases to protection pads.

3. Set legs of substructures into bases as indicated.

3.2 INSTALLATION – ROOF HATCH FALL PROTECTION GUARD RAILS

A. Examination: Examine substrates and openings for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Installation: Install products in strict accordance with manufacturer’s instructions and approved submittals. Locate units level, plumb, and in proper alignment with adjacent work.

1. Test units for proper function and adjust until proper operation is achieved.
2. Repair finishes damaged during installation.
3. Restore finishes so no evidence remains of corrective work.

3.3 INSTALLATION – WALL MOUNTED LADDERS

A. Examination: Examine substrates and openings for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Installation: Install products in strict accordance with manufacturer’s instructions and approved submittals. Locate units level, plumb, and in proper alignment with adjacent work.

3.4 CLEANING AND PROTECTION

A. Remove all packaging, unused fasteners, adhesive and other installation materials from the project site.

B. Remove adhesive from exposed surfaces of supports and bases, and leave the work area in clean condition.

C. Provide protection as required, leaving the work area in undamaged condition at the time of completion of work.

END OF SECTION 077200
PART 1 - GENERAL

1.1 WORK INCLUDED
A. Equipment, pipe/conduit, and duct supports.
B. Crossover stair/ladder.
C. Factory fabricated wall mounted roof access ladders.

1.2 SUBMITTALS
A. Product Data: Submit for all products proposed for use, describing physical characteristics and method of installation.
B. Shop Drawings: Show installation layout, sizes of units, and details of installation.
C. Warranty: Submit executed copy of manufacturer’s standard warranty.

1.3 QUALITY ASSURANCE
A. Manufacturer: A minimum of 5 years' experience manufacturing similar products.
B. Manufacturer’s Quality System: Registered to ISO 9001:2008 Quality Standards including in-house engineering for product design activities.

1.4 DELIVERY, STORAGE AND HANDLING
A. Deliver products in manufacturer’s original packaging. Store materials in a dry, protected, well-vented area. Inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier’s freight bill of lading.

1.5 WARRANTY
A. Manufacturer’s Warranty: Provide manufacturer’s standard warranty. Materials shall be free of defects in material and workmanship for a period of five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

PART 2 – PRODUCTS

2.1 PIPE, CONDUIT, EQUIPMENT, AND DUCT SUPPORTS; CROSSOVER STAIRS
A. Manufacturer Basis of Design:
   1. PHP Systems/Design i.e. Portable Pipe Hangers; 5534 Harvey Wilson Drive, Houston, Texas 77020, Tel: (800) 797-6585; www.phpsd.com; Email: info@phpsd.com.

B. Applications:
   1. Support pipes, conduit, cable trays, and ducting, a minimum of 8 inches above roof surface.
a. Support Spacing: 10 feet maximum.
b. For Electrical Conduit 2-1/2 inches in diameter or less, up to 10 inches above roof; Portable Pipe Hanger Model number SS8.
c. For Electrical Conduit 3-1/2 inches in diameter or less, up to 16 inches above roof; Portable Pipe Hanger Model number PP10.
d. For Gas Lines up to 6 inches in diameter, up to 12 inches above roof; Portable Pipe Hanger Model number RB18 with roller.
e. For single Electrical and Gas Lines 3 to 8 inches in diameter; Portable Pipe Hanger Model number PS 1-2.
f. For Multiple Lines: Portable Pipe Hanger Model number PSE custom.
g. For Ductwork: Portable Pipe Hanger Model number PPH-D – Goal Post style.
h. Accessories for PSE Custom and Other Applications when required.
   i. Un-insulated Piping: Roller support or clevis hanger.
   ii. Insulated Piping: Band hanger supported from horizontal channel or clevis hanger with Insulation Protection Shield.
   iii. Conduit: Band hanger supported from horizontal channel.
   iv. Bracing required when using base with swivel; when pipe exceeds 24 inches (610 mm) above roof, or when thermal expansion of pipe is great.

2. Equipment supports shall consist of Portable Pipe Hanger Model number RTU-20. Support equipment supports a minimum of 8 inches above roof surface.
   a. Furnish and install equipment supports at one condensing unit and two satellite dishes.

3. Crossover stair shall consist of Portable Pipe Hanger Model PHP Crossover.
   a. Furnish and install one each crossover stair, over the parapet wall between roof area A and roof area B, and over the parapet wall between roof area B and roof area C, respectively.
   b. Crossover stair shall include four steps on each side and crossover to span each parapet wall.

C. Portable Support System: Engineered, portable system specifically designed for installation without the need for roof penetrations, or flashings, and without causing damage to the roofing membrane.
   1. Design system using high density, high impact polypropylene bases with carbon black, anti-oxidants for UV protection, and stainless steel framing of 1-5/8 inch (41 mm) B22TH or 1-7/8 inch (48 mm) BTS22TH for support.
   2. Custom design system to fit piping, conduits and, equipment to be installed and actual conditions of service and loading.
   3. Piping Supports: Provide suitable hangers and supports.
   4. Duct and Equipment Supports: Factory fabricated to support exact duct sizes and equipment to be installed.

D. Bases: Injection molded high density, high impact polypropylene with UV-inhibitors and anti-oxidants, conforming to the following:
   1. Moisture Content: Negligible.
   2. Shrinkage/Swelling Due to Moisture: Negligible.
   3. Density: 55.8 lb/cu ft (894 kg/cu m).
   4. Insect Resistance: No known insect damage potential.
   5. Chemical Resistance: (oil, brake fluid, gasoline, diesel, antifreeze, battery acid, and sulfuric acid) No visual or physical change apparent.
   6. Flammability: No ignition after 10 minutes, 25 kW/m, when tested in accordance with ASTM D 1929.
   7. Sized as required by loading conditions and as indicated on the drawings.
   8. Shop fabricated with inserts for square tubing or threaded rods as required.
9. Color: Integral black color as molded.
10. Bases for Mechanical Attachment: Sealant chamber around penetration point, with injection port for sealing after fastening; beveled lip for sealant bead around entire diameter.
11. Do not use bases containing carbonated plastics, press molded recycled rubber and plastics, steel, stainless steel, or any injection molded threaded receivers.

E. Pipe Supports and Hangers: Conform to MSS SP-58 and MSS SP-69 and as follows:
   1. Fabricated of stainless steel where framing is stainless steel; finished same as framing.
   2. Sizes 2-1/2 inch (63 mm) and smaller: Single roller supports for piping subject to expansion and contraction; 3-sided channels and pipe clamps.
   3. Sizes 3 inch (76 mm) and larger: Rollers, clevis hangers, or band hangers, to allow for expansion and contraction without movement of the bases or framing.

F. Stainless Steel Framing:
   1. Channel Types: 1-5/8 inch (41.3 mm) or 1-7/8 inch (47.6 mm), as required for loading conditions.
   2. Thickness: 12 gage (2.7 mm).
   3. Form: Roll-formed 3-sided or tubular channel.
   5. Do not use tubing or tube steel.

G. Accessories: Clamps, bolts, nuts, washers, and other devices as required for a complete system.

2.2 FACTORY FABRICATED ALUMINUM WALL MOUNTED ROOF LADDERS

A. Aluminum Fixed Vertical Ladder and Components: Ladder, wall mounting brackets, walk-thru, and side rails

B. Basis of Design: Model FL Aluminum Fixed Vertical Ladder as manufactured by Precision Ladders LLC.
   1. Capacity: Unit shall support a 1000 lb loading without failure.
   2. Performance Standard: Units designed and manufactured to meet or exceed ANSI A14.3 and OSHA 1910.27.

C. Components:
   2. Ladder Tread: 2-1/4 inch by 3/4 inch by 1/4 inch extruded 6005-T5 aluminum with deeply serrated top surface.
   3. Ladder Mounting Bracket: 8-1/2 inch by 2 inch by 3 inch by 1/4 inch thick aluminum angle.

D. Walk-Thru:

E. Finish: Mill finish on aluminum ladder components
PART 3 - EXECUTION

3.1 INSTALLATION – SUPPORTS

A. Install in accordance with manufacturer's instructions.

B. Clean surfaces of roof in areas to receive portable support bases.
   1. Remove dirt, dust, oils, and other foreign materials.

C. Use care in handling portable support system components during installation, to avoid damage to roofing, flashing, equipment, or related materials.

D. Pipe, Duct, Cable, and Equipment Support Systems
   1. Locate bases and support framing as indicated on drawings and as specified herein. Provide complete and adequate support of all piping, ducting, and conduit; whether or not all required devices are shown.
   2. The use of wood for supporting piping is not permitted.
   3. Provide support spacing so deflection of piping does not exceed 1/240 of span.
   4. Install framing at spacing indicated, but in no case at greater than 8 feet on center.
   5. Accurately locate and align bases.
      a. Consult manufacturer of existing or new roofing system as to the type of protection pads required between the roof and base.
      b. Adhere bases to protection pads.
   6. Set framing posts into bases and assemble framing structure as indicated.
   7. Use galvanized fasteners for galvanized framing and stainless steel fasteners for stainless steel framing.

E. Duct Support Systems
   1. Locate bases and support framing as indicated on drawings and as specified herein. Provide complete and adequate support of all piping, ducting, and conduit, whether or not all required devices are shown.
   2. Accurately locate and align bases.
      a. Consult manufacturer of existing or new roofing system as to the type of isolation pads required between the roof and base.
      b. Adhere bases to protection pads.
   3. Place pre-assembled support onto bases, attaching framing post to base bracket with 1/2 inch bolts provided, and adjust as needed. Support shall be adjustable to maintain existing elevation and slope.
   4. Use galvanized fasteners for galvanized framing and stainless steel fasteners for stainless steel framing.

F. Equipment Supports
   1. Locate bases and support framing as indicated on drawings and as specified herein. Provide complete and adequate support of all structures.
   2. Accurately locate and align bases.
      a. Consult manufacturer of existing or new roofing system as to the type of isolation pads required between the roof and base.
      b. Adhere bases to protection pads.
   3. Set legs of substructures into bases as indicated.

G. Crossover Stairs
   1. Locate bases and support framing as indicated on drawings and as specified herein. Provide complete and adequate support of all structures.
   2. Accurately locate and align bases.
      a. Consult manufacturer of existing or new roofing system as to the type of isolation pads required between the roof and base.
b. Adhere bases to protection pads.
3. Set legs of substructures into bases as indicated.

3.2 INSTALLATION – WALL MOUNTED LADDERS

A. Examination: Examine substrates and openings for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Installation: Install products in strict accordance with manufacturer's instructions and approved submittals. Locate units level, plumb, and in proper alignment with adjacent work.

3.3 CLEANING AND PROTECTION

A. Remove all packaging, unused fasteners, adhesive and other installation materials from the project site.

B. Remove adhesive from exposed surfaces of supports and bases, and leave the work area in clean condition.

C. Provide protection as required, leaving the work area in undamaged condition at the time of completion of work.

END OF SECTION 077200
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Removal and replacement of existing joint sealants.
   2. Removal and replacement of existing surface fastened counterflashing sealants.
   3. Removal and replacement of expansion joint sealants.
   4. Related cleaning, priming, joint backing, tooling, and testing.

B. Related Sections:
   1. Section 045000 – Masonry Cleaning
   2. Section 075600 – Fluid-Applied Roofing

1.2 SUBMITTALS

A. Product data for silicone sealants, primers, joint backing, cleaning solvents, and other accessories. Include material safety data sheets (MSDSs) and certifications showing compliance with specified standards.

B. Manufacturer’s sealant color chart for selections by Owner.

C. Manufacturer’s instructions for removal, joint preparation, repair, and replacement.

D. Contractor and Manufacturer sample warranties.

1.3 QUALITY ASSURANCE

A. Installer qualifications: 5 years successful experience repairing and installing joint sealants and approved by sealant manufacturer for installing their products.

B. During construction period, each type of sealant and related primer and backing shall be products provided by a single manufacturer.

1.4 PRE-INSTALLATION ADHESION TESTS

A. Prior to application of sealants, test each condition in presence of Consultant to ensure sealant fully adheres to substrate.

B. Conduct all tests in field.

C. Apply sealant primer and sealant to sample substrate and perform hand-pull tab test in accordance with ASTM C1193, Method A.

D. Submit report to Architect with description of test, results, and recommended installation procedures to obtain specified adhesion.

1.5 FIELD MOCK-UPS
A. Renovate typical sealant joint to illustrate method, workmanship, adhesion, weatherproofing, tooling, and appearance at each condition.
   1. Minimum length: One bay that includes all joint substrates, minimum 100 linear feet.
   2. Accepted sample may remain as part of work and will be used as basis for acceptance of remaining sealant work. Unacceptable samples shall be removed.

1.6 PRE-INSTALLATION CONFERENCE

A. Convene a pre-installation conference at the site prior to starting Work.

B. Require attendance of entities directly concerned with Work of this Section.

C. Minimum Agenda:
   1. Schedule and coordination with other Work.
   2. Protection of installed items and finishes.
   3. Approved field mock-ups to be used as a measure of acceptance.
   4. Other items related to successful execution of work.

1.7 PRODUCT HANDLING

A. Deliver products in manufacturer's original containers clearly labeled with product identification, date of manufacture, and shelf life.

B. Store materials in clean, dry area at temperatures below 80 degrees F.

C. Do not use sealants and primers after manufacturer’s stated shelf life.

1.8 PROJECT CONDITIONS

A. Do not install sealants unless joint substrates are frost and moisture-free.

B. Optimum sealant application temperature: Between 50 and 95 degrees F.

C. Do not install sealants when temperature is:
   1. 5 degrees F below dew point.
   2. Above 120 degrees F.
   3. Below -20 degrees F.

1.9 WARRANTY

A. Special Installer’s Warranty: Original statement on Installer’s letterhead in which Installer agrees to repair or replace joint sealants that demonstrate deterioration or failure within warranty period specified.
   1. Warranty Period: Two (2) years from date of Substantial Completion.

B. Special Manufacturer’s Warranty: Manufacturer’s standard form in which joint sealant manufacturer agrees to furnish joint sealants to repair or replace those that demonstrate deterioration or failure under normal use within warranty period specified.
   1. Warranty Period for Silicone Sealants: Twenty (20) years from date of Substantial Completion for precast panel, hollow metal frame and aluminum frame joints.
   2. Warranty Period for Silicone Sealants: Ten (10) years from date of Substantial Completion for storefront (zipper gasketed) joints.
PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Dow Corning Corporation, P.O. Box 994, Midland, MI 48686-0994; (800) 248-2481; www.dowcorning.com/construction.

B. Tremco Commercial Sealants & Waterproofing, 3735 Green Road, Beachwood, OH 44122; (800) 321-7906; www.tremcosealants.com

C. Sika Corporation, 201 Polito Avenue, Lyndhurst, NJ 07071; (800) 933-7452; www.usa.sika.com

D. Requests to use equivalent products of other manufacturers shall be submitted to Owner’s Consultant minimum 10 business days before bid due date.

2.2 SILICONE SEALANT

A. Building joint sealant basis of design: Tremco Spectrem 1 silicone building sealant, as manufactured by Tremco Commercial Sealants & Waterproofing.

B. Building expansion joint sealant basis of design: Willseal 250 Pre-Compressed Expansion Seal, as manufactured by Willseal, LLC, a division of Tremco Commercial Sealants & Waterproofing.

2.3 ACCESSORIES

A. Cleaning solvents: As recommended by sealant manufacturer to be compatible with sealant and not adversely affect substrate.

B. Cleaning cloths: Clean, soft, absorbent, lint-free.

C. Substrate primer: Silicone sealant manufacturer’s primer.

D. Sealant backing: ASTM C1330 Type B non-absorbent, bi-cellular material with surface skin.

E. Bond breaker tape: Polyethylene or other plastic tape recommended by sealant manufacturer.

F. Masking tape: Non-staining, non-absorbent, compatible with silicone sealant and adjacent surfaces.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect existing joints and verify:
   1. Joint substrates and adjoining materials are structurally sound.
   2. Joint sealing materials can be satisfactorily installed with specified methods and materials.

B. Report to Consultant any condition that cannot be corrected in accordance with these Specifications and Manufacturer’s requirements. Do not proceed until outstanding issues are resolved.
3.2 GENERAL

A. Install joint sealants in accordance with manufacturer’s instructions, reviewed submittals and shop drawings.

B. Use silicone sealants only in applications approved by manufacturer.

C. Do not apply in confined spaces without ventilation for curing.

3.3 REMOVAL

A. Completely remove existing joint sealants and backing.

B. Clean joint with power or hand wire brush, grinding, saw cutting, or solvent cleaning to depth at which replacement backing and sealant are to be installed.

C. Blow out dust, loose particles, and debris with moisture and oil-free compressed air. Remove all caulk and backer rod lodged in joint.

D. Ensure surfaces are clean, dry, and free of frost, dust, and dirt.

3.4 INSTALLATION

A. Repair deteriorated or damaged substrates as recommended by silicone sealant manufacturer to provide suitable substrate for silicone seal. Allow repair materials to cure.

B. Primer: Apply primer to all substrates whether manufacturer requires or not.
   1. Pour primer into small, clean container. Use within 10 minutes to avoid contamination.
   2. Dip lint free cloth into primer and wipe a thin film onto substrate. Use brush for inaccessible areas. Do not over-apply.
   3. Allow primer to dry. Apply sealant the same day surfaces are primed.
   4. Do not apply primer to sealant joint backing.

C. Masking: Apply masking tape as required to protect adjacent surfaces and to ensure straight bead line and facilitate cleaning.

D. Sealant backing: Install without gaps, twisting, stretching, or puncturing backing material. Use gage to ensure uniform depth to achieve correct profile, coverage, and performance.

E. Bond breaker: Install on backside of joint where backing is not feasible.

F. Sealant:
   1. Use sealant-dispensing equipment to push sealant bead into opening. Fill joint opening to full and proper configuration. Apply in continuous operation. Ensure sealant fills entire joint and firmly contacts all surfaces.
   2. Tooling: Before skimming or curing begins, tool sealant with metal spatula. Provide concave, smooth, uniform, sealant finish. Eliminate air pockets and ensure complete contact on both sides of joint opening. Tool joints with one continuous stroke.

G. Cleaning: Remove masking tape and excess sealant.
3.5 FIELD QUALITY CONTROL

A. Perform adhesion tests in presence of Consultant in accordance with manufacturer’s instructions and ASTM C1193, Method A, Field-Applied Sealant Joint Hand-Pull Tab.

1. Perform 5 tests for first 1,000 linear feet of applied silicone sealant and 1 test for each 1,000 feet of applied sealant thereafter, minimum.
2. For sealants applied between dissimilar materials, test both sides of joint.

B. Sealants failing adhesion test shall be removed, substrates cleaned, seals re-installed, and re-testing performed.

C. Maintain test log and submit weekly reports to Consultant indicating tests, locations, dates, results, and remedial actions.

END OF SECTION 079200
Gypsum Board Assemblies

Section 092900

Part 1 - General

1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 Summary

A. This Section includes the following:
   1. Gypsum board assemblies attached to steel framing.
   2. Fiber cement board ceramic tile backing panels.
   3. Steel Suspended Ceiling & Soffit Framing

1.3 Assembly Performance Requirements

A. Fire Resistance: Provide gypsum board assemblies with fire-resistance ratings indicated.

1.4 Submittals

A. Product Data for each type of product specified.

B. Product certificates signed by manufacturers of gypsum board assembly components certifying that their products comply with specified requirements.

1.5 Quality Assurance

A. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.

B. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.

1.6 Delivery, Storage, and Handling

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

1.7 PROJECT CONDITIONS

A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum board manufacturer’s recommendations, whichever are more stringent.

PART 2– PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Gypsum Board and Related Products:
      a. American Gypsum Co.
      b. CertainTeed
      c. G-P Gypsum Corp.
      d. National Gypsum Company
   2. Fiber Cement Board Products:
      a. CertainTeed Fiber Cement Backer Board
      b. Custom Building Products: WonderBoard Backer Board
      c. FinPan, Inc. Util-A-Crete Concrete Backer Board
      d. G-P: Dens-Shield Tile Backer

2.2 GYPSUM BOARD PRODUCTS

A. General: Provide gypsum board of types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.
   1. Widths: Provide gypsum board in widths of 48 inches (1219 mm).

B. Gypsum Wallboard: ASTM C 36 and as follows:
   1. Type: Type X for all surfaces, unless otherwise indicated.
   2. Edges: Tapered.
   3. Thickness: 5/8 inch (15.9 mm) where indicated.

2.3 FIBER CEMENT TILE BACKER BOARD

A. Thickness: 5/8 inch

B. Width: 32 to 36 inches

C. Height: As required for wall condition.
2.4 STEEL SUSPENDED CEILING

A. Components, General: Comply with ASTM C 754 for conditions indicated.

B. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch-diameter wire.

C. Hanger Attachments to Steel Framing: As follows:
   1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching hanger wires and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by a qualified independent testing agency.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch, a minimum 1/2-inch-wide flange, with ASTM A 653/A 653M, zinc coating.
   1. Depth: 2 inches.

      a. Minimum Base Metal Thickness: 0.0179 inch.

F. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
   1. Products: Subject to compliance with requirements, provide one of the following:
      b. Chicago Metallic Corporation; Drywall Furring 640 System.
      c. USG Interiors, Inc.; Drywall Suspension System.

2.5 STEEL PARTITION AND SOFFIT FRAMING

A. Components, General: As follows:
   1. Comply with ASTM C 754 for conditions indicated.

B. Steel Studs and Runners: ASTM C 645.
   1. Minimum Base Metal Thickness: 0.027 inch.
   2. Depth: 2 inches and 3-5/8 inches.

C. Deep-Leg Slip (Deflection) Track: ASTM C 645 top runner designed to allow top of steel-framed walls and partitions to expand and contract with movement of structure while maintaining continuity of the structure. Designed to prevent buckling of wall framing and cracking of gypsum wallboard applied to interior walls and partitions resulting from deflection of the structure above. Thickness same as indicated for studs; width to accommodate size of studs. 2-1/2-inch deep flanges that have either V-shaped crimped offsets that compress when load is applied from structure above or 1-inch long slots in flanges that allow slipping of mechanical fasteners used to attach sliptrack to studs when load is applied.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
   1. Minimum Base Metal Thickness: 0.0179 inch.
E. Cold-Rolled Channel Bridging: 0.0538-inch bare steel thickness, with minimum 1/2-inch-wide flange.

F. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.6 TRIM ACCESSORIES

A. Accessories for Interior Installation: Cornerbead, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:

1. Material: Formed metal or plastic, with metal complying with the following requirement:
   a. Steel sheet zinc coated by hot-dip process or rolled zinc.

2. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:
   a. Cornerbead on outside corners, unless otherwise indicated.
   b. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim, unless otherwise indicated.
   c. L-bead with face flange only; face flange formed to receive joint compound. Use L-bead where indicated.
   d. U-bead with face and back flanges; face flange formed to be left without application of joint compound. Use U-bead where indicated.

2.7 JOINT TREATMENT MATERIALS

A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.

B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.

1. Use pressure-sensitive or staple-attached, open-weave, glass-fiber reinforcing tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.

C. Setting-Type Joint Compounds for Gypsum Board: Factory-packaged, job-mixed, chemical-hardening powder products formulated for uses indicated.

1. Where setting-type joint compounds are indicated as a taping compound only or for taping and filling only, use formulation that is compatible with other joint compounds applied over it.
2. For prefilling gypsum board joints, use formulation recommended by gypsum board manufacturer.
3. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by gypsum board manufacturer.
4. For topping compound, use sandable formulation.

D. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.

a. Taping compound formulated for embedding tape and for first coat over fasteners and face flanges of trim accessories.
b. Topping compound formulated for fill (second) and finish (third) coats.
c. All-purpose compound formulated for both taping and topping compounds.

   a. Taping compound formulated for embedding tape and for first coat over fasteners and face flanges of trim accessories.
   b. Topping compound formulated for fill (second) and finish (third) coats.
   c. All-purpose compound formulated for both taping and topping compounds.

2.8 MISCELLANEOUS MATERIALS

A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.

B. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot-grouting hollow metal door frames.

C. Steel drill screws complying with ASTM C 1002 for the following applications:
   1. Fastening gypsum board to wood members.

2.9 ACOUSTICAL SEALANT

A. Products: Subject to compliance with requirements, provide one of the following:
   1. Acoustical Sealant for Exposed and Concealed Joints:
      a. Pecora Corp.: AC-20 FTR Acoustical and Insulation Sealant.

B. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.

C. Acoustical Sealant for Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.
3.2 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.

B. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

C. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Avoid joints other than control joints at corners of framed openings where possible.

D. Spot grout hollow metal door frames for solid-core wood doors, hollow metal doors, and doors over 32 inches (813 mm) wide. Apply spot grout at each jamb anchor clip and immediately insert gypsum panels into frames.

E. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.
   1. Space screws a maximum of 12 inches (304.8 mm) o.c. for vertical applications.

3.3 INSTALLING TRIM ACCESSORIES

A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.

B. Install cornerbead at external corners.

C. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.
   1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
   2. Install L-bead where edge trim can only be installed after gypsum panels are installed.
   3. Install U-bead where indicated.

3.4 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.

B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.

C. Apply joint tape over gypsum board joints, except those with trim accessories having flanges not requiring tape.

D. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.
1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile
3. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.

E. Use joint compound combinations applicable to the finish levels specified.

F. Where Level 4 gypsum board finish is indicated, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories; and apply a thin, uniform skim coat of joint compound over entire surface. For skim coat, use joint compound specified for third coat, or a product specially formulated for this purpose and acceptable to gypsum board manufacturer. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects, tool marks, and ridges and ready for decoration.

3.5 CLEANING AND PROTECTION

A. Promptly remove any residual joint compound from adjacent surfaces.

B. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure gypsum board assemblies are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 092900
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and field painting of the following:

1. Exposed exterior items and surfaces.
2. Exposed interior items and surfaces.
3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.3 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
4. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.
1.4 SUBMITTALS

A. Product Data: For each paint system specified. Include block fillers and primers.

B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 PROJECT CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F (10 and 32 deg C).

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F (7.2 and 35 deg C).

C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.
1.8 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.

1. Quantity: Furnish the Owner with 1 gallon of each color and each type of paint used on the project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in the paint schedules. For all paint classifications, Sherwin Williams Co. (S-W) products are listed as representative examples. Products from other manufacturers that can be demonstrated to be equal in composition and material properties will also be acceptable upon approval by the Architect.

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer’s best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer’s product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer’s proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer’s material data and certificates of performance for proposed substitutions.

C. Colors: Provide color selections made by the Architect.

2.3 VOC LIMITATIONS

A. Notwithstanding any other provision of this Specification, paints furnished and utilized for this project shall not exceed the following VOC limitations.

1. Flat finish paints for interior use: 50 g/L.
2. Non-flat paints for interior use: 150 g/L.
3. Clear finishes for interior use: varnishes 350 g/L, lacquers 550 g/L.
4. Sealers: waterproofing sealers 250 g/L, sanding sealers 275 g/L, all other sealers 200 g/L.
5. Stains: 250 g/L.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.

1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.
2. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.
   a. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
   b. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
3. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures are in place. Extend coatings in these areas, as required.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
7. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer on metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

E. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

F. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

G. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

1. Provide satin finish for final coats.

H. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

I. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.5 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

3.6 INTERIOR PAINT SCHEDULE

A. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:

1. Low-Luster Finish: 2 finish coats over a primer.
   a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
1) S-W PrepRite 200 Latex Primer, B28W200.

b. First and Second Coats: Low-luster (eggshell or satin), latex interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils (0.071 mm).

1) S-W ProMar 200 Latex Eg-Shel, B20W200 Series.

B. Ferrous Metal: Provide the following finish systems over ferrous metal:

1. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over an enamel undercoater and a primer.

a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils (0.038 mm).

1) S-W: Kem Kromik Metal Primer B50N2/B50W1.

b. Undercoat: Alkyd, interior enamel undercoat or full-gloss, interior, alkyd-enamel finish coat, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

1) S-W: Industrial Enamel B-54 Series.

c. Finish Coat: Full-gloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

1) S-W: Industrial Enamel B-54 Series.

C. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated (galvanized) metal surfaces:

1. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a galvanized metal primer.

a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

1) S-W: Galvite Paint B50W3.

b. First and Second Coats: Full-gloss, exterior, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

1) S-W: Industrial Enamel B-54 Series.

END OF SECTION 099100