

SECTION 07 5600  
FLUID-APPLIED PMMA ROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. The project plans, details and general Contract requirements apply to this Section.
- B. Section includes furnishing and installing the following existing Gutter Waterproofing:
  - 1. Basis of Design (BOD) Assembly:
    - a. Prepare substrates.
    - b. Roof insulation.
    - c. Cement Cover panel Board.
    - d. PMMA Fluid-applied Roofing.
    - e. Flashing materials.
    - f. Adhesives
  - 2. Bid Alternate Assembly:
    - a. Prepare substrate.
    - b. Roof insulation.
    - c. Cement Cover panel Board.
    - d. SBS modified bituminous self-adhering membrane roofing.
    - e. PMMA Fluid-applied Roofing.
    - f. Flashing materials.
    - g. Adhesives.
- C. Section includes contractor engaging a State of Hawaii licensed engineer to provide structural calculations for the project site to confirm in writing by roofing/waterproofing manufacturer that roofing/waterproofing assembly and adhesive application accommodate wind speed & wind uplift values for corner conditions, in compliance with 2018 IBC & ASCE 7-16.

1.03 ABBREVIATIONS

- A. DFT: Dry Film Thickness.
- B. WFT: Wet Film Thickness.

1.04 REFERENCES

- A. References in these specifications to standards, test methods and codes, are implied to mean the latest edition of each such standard adopted. The following is an abbreviated

SECTION 07 6200  
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes furnishing and installing the following sheet metal components:
1. General:
    - a. Custom fabricated flashing.
    - b. Refer to Drawings.
  2. Metal Flashing:
    - a. Stainless: Passivated.
      - 1) Concealed.
        - a) Refer to, but not limited to Detail 1/WP5.01.
        - b) Refer to, but not limited to Detail 8/WP5.01.
- B. Section includes furnishing and installing the following Accessories:
1. Sealants: Sealants associated with sheet metal work.
    - a. Reference: Refer to, but not limited to 1 & 8/WP5.01, WP9.01 & WP9.02)
    - b. Butyl rubber.
    - c. Polyurethane as approved by Fluid-Applied gutter waterproofing coating mfr.
      - 1) Refer to Section 07 5600 "Fluid-Applied Roofing."
    - d. Silicone:
  2. Tapes-two sided: Associated with sheet metal work.
    - a. Reference: Refer to, but not limited to 1 & 8/WP5.01, WP9.01 & WP9.02)
    - b. Butyl rubber pressure sensitive two-sided tape.
  3. Fasteners:
    - a. Stainless steel Rivets.
    - b. Stainless steel fasteners.
    - c. Replacement fasteners for existing standing seam metal roofing exposed fasteners.
- C. Section includes adhesion testing of sealants, and two-sided tapes by contractor in accordance with product manufacturers requirements.

1.03 RELATED REQUIREMENTS

- A. Section 07 5600 "Fluid-Applied Roofing".

#### 1.04 REFERENCES

- A. SMACNA, Architectural Sheet Metal Manual, 7<sup>th</sup>. Edition, January, 2012.
- B. SMACNA, Figure 3-3 Locks and Seams Design Data:
  - 1. No. 21. Cover Plate With Backup Plate, page 3.7.
- C. ASTM C1193 Standard Guide for Use of Joint Sealant.
- D. Dow Corning Americas, Technical Manual.

#### 1.05 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with waterproofing, roofing, wall materials, joints, and seams to provide leak proof, secure, and noncorrosive installation.
- C. Coordinate sheet metal flashing with fluid-applied gutter / roof coating waterproofing.

#### 1.06 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.
  - 1. A preinstallation meeting shall be held at the project site prior to commencement of field installation to establish procedures to maintain required working conditions and to coordinate this Work with related and adjacent Work. Verify that final details comply with current recommendations published in SMACNA's "Architectural Sheet Metal Manual" and NRCA's Roofing and Waterproofing Manual.
    - a. Meeting attendees shall include representatives for the:
      - 1) Building Envelop Consultant (ABB).
      - 2) Architect. (WCIT).
      - 3) Contractor.
      - 4) Sheet metal contractor and installers of related and adjacent Work.
      - 5) Owners Representative.
      - 6) Construction Manager.
  - 2. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 3. Review requirements for insurance and certificates if applicable.
  - 4. Review sheet metal flashing observation and repair procedures after flashing installation.
  - 5. Conduct as part of roofing / gutter installation Pre-installation Conference, if possible, for the various roof assemblies.
  - 6. Review special roof / gutter details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.

## 1.07 ACTION SUBMITTALS

- A. Comply with Section 01 3300 "Submittal Procedures"
- B. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- C. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Reference applicable Contract Drawing detail. Include the following, but not limited to:
  - 1. Distinguish between shop- and field-assembled work.
  - 2. Detail formed flashing and trim at a scale of not less than 3 -inches per 12 -inches.
  - 3. Include plans, elevations, sections, and attachment details.
  - 4. Identification of material, thickness, weight, and finish for each item and location in Project.
  - 5. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
  - 6. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
  - 7. Details of termination points and assemblies, including fixed points.
  - 8. Details of perimeter conditions.
  - 9. Details of specialized conditions including saddles, transitions, and terminations in sheet metal flashing.
  - 10. Include details for forming, including profiles, shapes, seams, and dimensions.
  - 11. Include details for joining, supporting, and securing, including layout, and spacing of fasteners, cleats, clips, and other attachments.
    - a. Include pattern of seams.
  - 12. Include details of termination points and assemblies.
  - 13. Include details of special conditions.
  - 14. Include details of connections to adjoining work.
  - 15. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashing's as applicable.
  - 16. Detail formed flashing and trim at scale of not less than 3-inches per 12-inches.
- D. Samples for Initial Selection: For each type of sheet metal flashing and accessory indicated with factory-applied color finishes involving color selection.
  - 1. Three (3) 6-inch square samples of specified sheet metal materials to be exposed as finished surfaces.
  - 2. Three (3) 12-inch long samples of factory-fabricated products exposed as finished Work. Provide complete with specified factory finish.
- E. Samples for Initial Selection: For each type of accessory indicated.
  - 1. One (1) 11 oz. tube of each specified sealant.
  - 2. One (1) sample of Butyl rubber Sealant Tape.
  - 3. Three (3) samples each of proposed fasteners and accessories to be used.
- F. Samples for Verification: For each type of exposed finish.

1. General:
  - a. Sheet Metal flashing: 12-inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
  - b. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 -inches long and in required profile. Include fasteners and other exposed accessories.
  - c. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
2. Materials:
  - a. Stainless Steel

#### 1.08 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Product Certificates: For each type of coping and roof edge flashing that is SPRI ES-1 tested.
- D. Sample Warranty: For special warranty.

#### 1.09 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

#### 1.10 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
  1. For exposed copings, roof edge flashings, and counterflashing (Skirt) shall be SPRI ES-1 tested, shop shall be fabricated by a ES-1
    - a. Certified shop listed as able to fabricate to this standard including required details.
- B. Installer Qualifications: Engage an experience Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- C. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

- D. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless one of the following approves in writing:
    - a. Building Envelop Consultant (ABB).
    - b. Construction Manager.
  2. Build mockup of each fabrication, including, but not limited to, reglet and counterflashing, approximately 10 -feet long, including inside corners, outside corners, supporting construction cleats, seams, attachments, underlayment, and accessories.
    - a. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by;
      - 1) Building Envelop Consultant (ABB).
    - b. Notify the appropriate parties one week in advance of the dates and times when mockups will be constructed.
      - 1) Building Envelop Consultant (ABB).
      - 2) Architect.
      - 3) Construction Manager.
    - c. Demonstrate the proposed range of aesthetic effects and workmanship.
    - d. Obtain approval of mockups before start of final unit of Work with the following.
      - 1) Building Envelop Consultant (ABB).
    - e. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation.

#### 1.11 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

#### 1.12 WARRANTY – SHEET METAL WORK

- A. The Contractor agrees to repair or replace sheet metal flashing and trim that fail within the specified period.
1. The warranty shall include labor and materials.
  2. Warranty Period: Five (5) years from date of Project Acceptance.

## 1.13 WARRANTY – SEALANTS AND TWO-SIDED TAPES

- A. Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Five (5) years from date of Substantial Completion.
- B. Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. 100 percent silicone: Twenty (20) years from date of Substantial Completion.
  - 2. Non Silicone: Five (5) years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
  - 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
  - 2. Disintegration of joint substrates from causes exceeding design specifications.
  - 3. Mechanical damage caused by individuals, tools, or other outside agents.
  - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Termination Bars and fasteners as specified.
- B. Shop fabricated metal components by a qualified Fabricator.
- C. Replacement fasteners.
  - 1. Type: As specified.
  - 2. Applications:
    - a. Refer to drawings.
    - b. At existing standing seam roofing.
    - c. At added metal flashing
  - 3. Basis of Design (BOD): As specified.
    - a. Alternate: Or Approved Substitute.
- D. Fasteners, Screws.
  - 1. Type: As specified.
  - 2. Applications:

- a. Refer to drawings.
- 3. Basis of Design (BOD): As specified.
  - a. Alternate: Or Approved Substitute.
  
- E. Sealants as specified.
  - 1. Applications:
    - a. Refer to drawings.
  - 2. Basis of Design (BOD): As specified.
    - a. Alternate: Or Approved Substitute.
  
- F. Two-sided tapes as specified.
  - 1. Applications:
    - a. Refer to drawings.
  - 2. Basis of Design (BOD): As specified.
    - a. Alternate: Or Approved Substitute.
  
- G. Rivets as specified.
  - 1. Applications:
    - a. Refer to drawings.
    - b. At soldered joints.
  - 2. Basis of Design (BOD): As specified.
    - a. Alternate: Or Approved Substitute.

## 2.02 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction.
  - 1. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
  
- B. Install systems to allow movement of components without causing buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subjected to 100-year seasonal temperature ranges.
  
- C. Sheet Metal Standard for Flashing and Trim:
  - 1. Stainless Steel: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
  
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.



- E. Install specialized, custom fabricated, sheet metal saddles for waterproof performance at terminations and transitions of sheet metal flashing and trim such as multi-plane intersects, and:
  - 1. Where indicated in Drawings.
  - 2. Where constructed conditions will not provide watertight performance without saddles.
- F. Contractor shall inspect transitions and terminations to make Project watertight. Contract Documents indicate design intent and may not indicate all instances where saddles apply. Field verify locations where saddles are required.
- G. Temperature Change: 120 deg F , ambient; 180 deg F , material surfaces.

## 2.03 SHEET METAL

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Stainless-Steel Sheet: ASTM A 240 or ASTM A 666, Type 304, dead soft, fully annealed; with smooth, flat surface.
  - 1. General:
    - a. Treatment: Passivated all surfaces.
    - b. Gauge: Refer to Drawings.
  - 2. Finish: (Exposed)
    - a. No. 4 (polished directional satin)
  - 3. Finish: (Concealed)
    - a. No. 4 (polished directional satin)

## 2.04 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Provide fasteners as specified, and as indicated in drawings.
- C. General fasteners include, but not limited to:
  - 1. Description: Metal screws, wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, sheet metal screws, ring shank at wood and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
- D. Fasteners:
  - 1. Self-drilling type screws typically.
  - 2. Exposed Fasteners: Head type and washers as specified.
  - 3. Provide metal-backed EPDM sealing washers under heads of exposed fasteners bearing on weather side of metal.

4. Concealed fasteners: Flat pan or pancake heads, typically.
  5. Heads matching color of sheet metal using plastic caps or factory-applied coating.
  6. Blind / concealed Fasteners: Type as specified
  7. Rivets: Where indicated, where specified.
- E. Solder:
1. For Stainless Steel: ASTM B 32, Grade Sn96, with acid flux of type recommended by stainless-steel sheet manufacturer.
- F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- G. Sealing Washers: Stainless steel backed EPDM washers.

## 2.05 JOINT SEALANTS - BUTYL RUBBER

- A. General: Provide materials and types of sealants and tapes compatible with the substrates. Coordinate sealants with Section 07 9200 "Exterior Joint Sealants".
- B. Concealed Butyl Rubber Sealant:
1. Description: ASTM C 1311, gun-grade, single-component, non-curing, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement and NSF Certified.
    - a. Service Temperature: -40 F° min. to 200° F min.
  2. Subject to compliance with requirements, provide:
    - a. Basis of Design: **Millennium Water Block Mastic, (BP-300)** by H.B.Fuller (formally Royal Elastiseal BP-300 by Royal Adhesives).
    - b. Alternates:
      - 1) SikaLastomer -511butyl sealant by Sika.
      - 1) CRL Black 777 (777BL) by CR Laurence.
      - 2) CRL Black 777 (777BRZ) by CR Laurence.
      - 3) CRL Gray 777 (777GRY) by CR Laurence.
      - 4) CRL White 777 (777W) by CR Laurence.
      - 5) Or Approved Substitute.
  3. Colors:
    - a. Black.
    - b. Gray.
    - c. Buff (Tan)
    - d. White.

## 2.06 TWO SIDED PRESSURE SENSITIVE TAPE - BUTYL RUBBER

- A. General: Provide materials and types of sealants and tapes compatible with the substrates. Coordinate sealants with Section 07 9200 "Exterior Joint Sealants".
- B. Concealed Butyl Rubber Sealant Tape:
1. Description: Pressure-sensitive, 100 percent solids, cross linked, butyl, polyisobutylene compound pre-formed sealant tape with release-paper backing.

Provide permanently elastic, nonsag, nontoxic, nonstaining tape. Comply with AAMA Standards; 804.3, 806.3, 807.3 and ASTM C1281.

2. Subject to compliance with requirements, provide:
  - a. Basis of Design: **GT Series** by C. R. Laurence Co., Inc.
    - 1) Performance:
      - a) Solids Content: 100 percent
      - b) Color: Black
      - c) Application Temperature: 20°F to 120°F.
      - d) Service Temperature: 40°F to 190°F
      - e) Hardness: 20 durometer Shore "A" at 77°F
      - f) VOC: 0 percent.
      - g) Service Life: Twenty (20) Years.
    - 2) Model & Sizes: (Select thickness in field to accommodate conditions)
      - a) GT206: 1/8-inch by 1/2-inch x black.
      - b) GT207: 1/8-inch by 1/2-inch x gray.
      - c) GT406: 1/4-inch by 1/2-inch.
      - d) GT407: 1/4-inch by 1/2-inch x black.]
  - b. Alternates:
    - 1) 440 Tape by TREMCO: (Available sizes) (Select thickness in field to accommodate conditions)
      - a) 1/8" x 3/8"
      - b) 1/8" x 1/2"
      - c) 1/8" x 1"
      - d) 1/4" x 1/2"
    - 2) WeatherBan Model 5354 VHB Tape by 3M: (Available sizes) (Select thickness in field to accommodate conditions)
      - a) 1/4" x 1/4" x 50 feet
      - b) 1/8" x 3/8" x 50 feet
      - c) 1/8" x 3/8" x 59 feet
      - d) 1/8" x 3/4 x 50 feet
      - e) 1/8" x 1/4" x 50 feet
    - 3) Or Approved Substitute.
- C. Concealed Butyl Rubber Sealant Tape with Internal Shim: (See Exhibit "A")
  1. Description: Pressure-sensitive, 100 percent solids, cross linked, butyl, polyisobutylene compound pre-formed sealant tape with release-paper backing and internal shim to not allow full compression. Provides permanently elastic, nonsag, nontoxic, nonstaining tape.
  2. Application: Provide pre-shimmed butyl sealant tape between sheet metal laps, at concealed locations, and where indicated.
  3. Subject to compliance with requirements, provide:
    - a. Basis of Design: **Tremco POLYshim II Butyl Architectural Tape** by CRL, C.R. Laurence Co., Inc.
      - 1) Colors:
        - a) Black
        - b) Bronze
      - 2) Sizes:
        - a) 1/8-inch thick by 3/8-inch wide: No: 7241XC3.
        - b) 1/4-inch thick by 3/8-inch wide: No: 7241SB3.

- 3) Comply with AAMA 800-91, 804.3, 804.6 & 807.3
- 4) Solids Content: 100 percent
- 5) Hardness: 57 Shore "00".
- 6) Temperature Range:
  - a) Service: -65°F to 200°F
  - b) Application: +20°F to 120°F
- 7) Shelf Life: One (1) year stored below 80°F.
- 8) Heat Resistance: Excellent resistance to heat, cold and sun; no sagging and weeping or staining after 2 months @ 200°F, --20°F and then to ultraviolet.

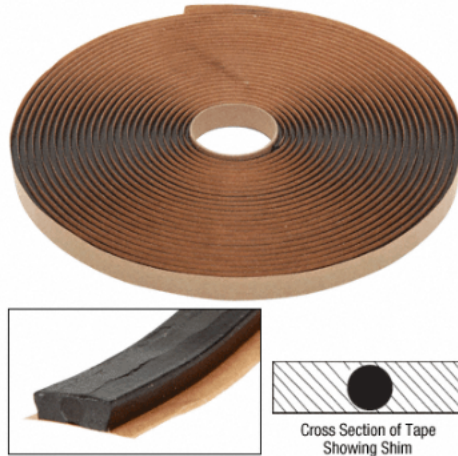


Exhibit A

- b. Or Approved substitute.

2.07 JOINT SEALANTS - SILICONE

- A. Silicone (non-staining): Typical, U.N.O
  1. Single-component, non-staining, medium-modulus, neutral-cure, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, silicone joint sealant; ASTM C 920, C661, C1248, Type S, Grade NS, Class 50, For Use NT, G, A and O; SWRI validated.
    - a. Basis of Design: **Dowsil 795 Silicone Weatherproofing Sealant** by Dowsil.
    - b. Alternates:
      - 1) Silpruf SCS 2000 by GE.
      - 2) Or Approved Substitute.
  2. Primer: As recommended by sealant manufacturer for each substrate.
    - a. See Exhibit "C" Primer Schedule.
  3. Color: As selected by Architect.
  4. Note: Where Dowsil 123 tape is used, Dowsil 795 must be used.
- B. Primers for Silicone Sealants: (Exhibit "C")

Primer Matrix	Sealant		
Substrate	DOWSIL 790	DOWSIL 791	DOWSIL 795

EIFS-Base Coat (Sto BTS Plus)	No Primer	P	Use 790 or 791
DEFS-Base Coat (Sto BTS Plus)	No Primer	P	Use 790 or 791
STO Gold Coat A&WB (WRB)	-	1200-OS	Use 790 or 791
PVC/Vinyl	Field Test*	1200-OS	1200-OS
Stainless Steel Metal	1200-OS	1200-OS	1200-OS
Copper	**	1200-OS	1200-OS
Aluminum - Unfinished	1200-OS	1200-OS	1200-OS
Aluminum - Anodized	1200-OS	No Primer	No Primer
Aluminum - Kynar/Painted	1200-OS or C-OS	No Primer	C-OS
Stone	** Typ. None	P	P
Concrete	No Primer	P	P
Masonry	No Primer	P	P
GE Elemax A&WB FA WP (Silicone)	No Primer	No Primer	No Primer

## 2.08 FASTENERS

### A. Exposed Fasteners:

1. Applications:
  - a. Standing Seam Aluminum Metal Roofing, exposed fasteners
2. Scope:
  - a. Replace all existing fasteners with larger diameter screws.
  - b. Fasteners to incorporate, and secure supplemental added flashing with existing standing seam metal roofing.
    - 1) Refer to, but not limited to Details 1/WP5.01 & 8/WP5.01.
3. Basis-Of-Design (BOD): **Bi-Metal Self-Drilling Screws, SD300 Bi-Metal Screws by Blazer.**
  - a. Alternate: Or Approved Substitute.
4. Product:
  - a. Description: Self-Drilling with sealing washers.



- b. Material: Bi-metal
  - 1) Head and threads: Type 304 stainless steel.
  - 2) Sealing washer: 15MM O.D. type 304SS with non-conductive EPDM sealing washer.
  - 3) Drill point: Hardened carbon steel welded to the body.
- c. Head: Hex
- d. Size:
  - 1) 5/16-inch AF HWH diameter by length to penetrate lowest substrate by 3 threads.

- 2) 3/8-inch AF HWH diameter by length to penetrate lowest substrate by 3 threads.
- 3) NOTE: Where replacing existing fasteners, field verify that fastener diameter is a size larger than existing. Submit as part of product Submittal.

e. Sizes Chart Exhibit:

Head Style	Description	Drilling Thickness	Load Bearing Length W/W	Part Number	
				No Washer	With Washer
5/16" AF HWH	A #12-14 x 1" DP1	.090" max	.470"		12100HWT1S3BMBW
	#12-14 x 1" DP3	.059" - .236"	.350"	12100HWT3S3BM	12100HWT3S3BMBW
	#12-14 x 1-1/4" DP3		.550"	12125HWT3S3BM	12125HWT3S3BMBW
	#12-14 x 1-3/8" DP3		.750"	12137HWT3S3BM	12137HWT3S3BMBW
	#12-14 x 2" DP3		1.375"	12200HWT3S3BM	12200HWT3S3BMBW
	#12-14 x 1-1/2" DP5		.500"	12150HWT5S3BM	12150HWT5S3BMBW
C #12-14 x 2-1/4" DP5	.157" - .472"	1.220"	12225HWT5S3BM	12225HWT5S3BMBW	
3/8" AF HWH	D 1/4-14 x 1" DP2	.047" - .118" (AL = .125")	.468"	14100HWT2S3BM	14100HWT2S3BMBW
	1/4-14 x 1-1/2" DP2		.970"	14150HWT2S3BM	14150HWT2S3BMBW
	1/4-14 x 2" DP2		1.4327"	14200HWT2S3BM	14200HWT2S3BMBW
	E 1/4-20 x 1-1/8 DP4	.100" - .312"	.375"	14112HWT4S3BM	14112HWT4S3BMBW
	1/4-20 x 1-1/2" DP4		.718"	14150HWT4S3BM	14150HWT4S3BMBW
	1/4-20 x 2" DP4		1.203"	14200HWT4S3BM	14200HWT4S3BMBW
F 1/4-20 x 2" DP5	.125" - .500"	.937"	14200HWT5S3BM	14200HWT5S3BMBW	
1/4-20 x 4" DP5		1.3968"	14400HWT5S3BM	14400HWT5S3BMBW	

B. Concealed fasteners:

1. Applications:
  - a. Aluminum materials.
  - b. Galvanized steel – un-painted & painted.
  - c. Galvalume steel.
  - d. Stainless steel.
2. Scope:
  - a. Fasteners to incorporate, and secure supplemental added flashing.
    - 1) Refer to, but not limited to Details 1/WP5.01 & 8/WP5.01.
3. Basis-Of-Design (BOD): **Bi-Metal Self-Drilling Screws, SD300 Bi-Metal Screws by Blazer.**
  - a. Alternate: Or Approved Substitute.
4. Product:
  - a. Description: Self-Drilling.

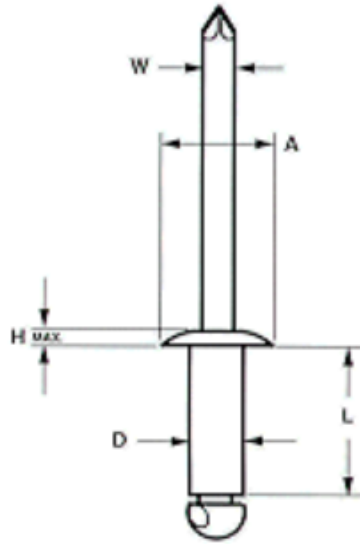


- b. Material: Bi-metal
  - 1) Head and threads: Type 304 stainless steel.

- 2) Sealing Washers: None
- 3) Drill point: Hardened carbon steel welded to the body.
- c. Head: Pancake
- d. Size:
  - 1) #12-14, by length to penetrate lowest substrate by 3 threads with #2 Square drive.
- e. Sizes Chart Exhibit:

Head Style		Description	Drilling Thickness	Load Bearing Length W/W	Part Number	
					No Washer	With Washer
#2 Square	H	#12-14 x 1" DP3	.059" - .210"	.375"	12100SPC3BM	
	I	#12-14 x 2" DP3		1.750"	12200SPC3BM	

- D. Rivets and Self-locking Rivets designed to withstand design loads and recommended by manufacturer for application.
1. Basis of Design: **Jay-Cee Sales & Rivet, Inc.**, (888) 527-4838, [sales@rivetinstock.com](mailto:sales@rivetinstock.com), [www.rivetsonline.com](http://www.rivetsonline.com)
    - a. Or Approved Substitute.
    - b. Product meeting performance criteria.
  2. Material: Type 316 or 18-8 stainless steel Rivet with SS mandrel.
  3. General:
    - a. Blind fastener application into predrilled holes.
    - b. Used in conjunction with a soldered joint.
  4. Body Diameter "D":
    - a. 1/4-inch unless approved to be 3/16-inch.
  5. Grip Range:
    - a. Sufficient to capture over all thickness on flashing materials.
  6. Head Style:
    - a. Dome.
  7. Fastener Length:
    - a. Rivets shall penetrate the surfaces being secure together, but not damage adjacent materials such as waterproofing, roofing, etc.



## DOME HEAD

Figure: Rivet

### 2.09 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
1. Sheet metal components requiring fabrication must have shop drawings submitted and reviewed for acceptance prior to fabrication and delivery to the project site.
  2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified or listed in drawings for each application and metal.
  3. Obtain field measurements for accurate fit before shop fabrication.
  4. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
  5. Conceal fasteners and expansion provisions where possible.
    - a. Exposed fasteners are not allowed on faces exposed to view.
  6. Field verify dimensions prior to fabrication.
  7. Flashings shall have minimum 4 -inch vertical back leg and 3 -inch overlap at exposed side unless indicated to be greater in drawings.
  8. At curved substrate conditions, fabricate to match radius of wall.
  9. Fabricate all inside, and outside corner flashing as single pieces with 12-inch long sections unless detailed otherwise.
    - a. Fully solder stainless steel assemblies watertight.



10. Solder stainless where indicated, and at watertight assemblies, and at sill plans, collars, and flashing boots.
  11. Materials delivered to the project site without the required Submittal review and acceptance shall be immediately removed from the site and not incorporated into the completed Work.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 -inch in 20 -feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to specified tolerance.
- D. Adhesion Tapes: Prepare surfaces in accordance with tape manufacturers written instructions and as specified.
1. Wipe clean all surfaces with specified cleaning solution using a lint-free cloth.
    - a. Mixture of Isopropyl Alcohol and potable water.
    - b. If surface has oil, silicones or mold release agents or will not come clean with the mixture of isopropyl alcohol and potable water, use tape manufacturers cleaner as specified.
  2. Prime surfaces with specified tape manufacturer's primer.
    - a. Shake primer container well before using.
    - b. Apply a thin uniform coating to the bonding surface using the minimum amount that will fully coat the surface.
    - c. Allow primer to dry thoroughly before applying the tape.
    - d. Be sure the primed surface remains free of contaminants prior to apply the tape.
    - e. Porous surfaces may require two (2) coats to establish a uniform coverage and good adhesion.
      - 1) Allow the first application of primer to dry before the second application.
    - f. Apply primer either with a brush or swab or a pressurized flow gun, knurled roller, or other similar type of application equipment.
    - g. Clean up may be accomplished with acetone.
      - 1) Ensure acetone is not applied to finished surfaces exposed to view.
      - 2) Ensure acetone does not contaminate other surfaces.
- E. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 -inch deep, filled with butyl sealant concealed within joints.
  2. Use lapped expansion joints only where indicated on Drawings.
  3. Where expansion assemblies are indicated in Drawings, submit for review specific assembly complying with Drawings.
- F. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

- G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- H. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.
- I. Hem exposed edges on underside 1/2- inch unless specifically indicated in drawings or details to be different.
- J. Fabricate head flashing, sill flashing and similar with end closures and end dams soldered/welded watertight.
- K. Provide drip edges where indicated on the Contract Drawings.
- L. Provide 4 -inch wide (minimum) horizontal flanges where dimension is not indicated on Contract Drawings
  - 1. Locations: Where flanges are stripped in or lapped for weather protection.
- M. Form pieces to maximum length of 10 -feet.
- N. Seams:
  - 1. Stainless Steel: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- O. Corners:
  - 1. Stainless Steel: Sheet metal corner flashing shall be fully soldered to form one watertight piece.

## 2.10 SHEET METAL FLASHING AND TRIM SCHEDULE – STAINLESS STEEL

- A. Miscellaneous Flashings: Fabricate with profiles as shown on the Drawings and from sheet metal materials and gauges as indicated.
  - 1. Galvanized / zinc flashing not allowed.
- B. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch long, but not exceeding 12-foot long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 -inches beyond each side of wall openings; and form with 3-inch high, end dams. Drawings listing longer dimensions shall govern. Fabricate from the following materials:
  - 1. Stainless Steel: 24 gauge unless listed heavier in Drawings.

## 2.11 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Saddles, Transitions, and Terminations in Sheet Metal Flashing and Trim: Fabricate from the following materials:
  - 1. Wall/Siding Related Flashing:
    - a. Type 316L passivated stainless steel 22 gage, unless otherwise noted.

- B. Provide specialized, custom fabricated, sheet metal saddles for waterproof performance at terminations and transitions of sheet metal flashing and trim and construction components such as multi-plane intersects, and:
  - 1. Where constructed conditions will not provide watertight performance without saddles.
  - 2. Contractor shall inspect transitions and terminations to make Project watertight. Contract Documents indicate design intent and may not indicate all instances where saddles apply.
    - a. Field verify locations where saddles are required.
  - 3. Where indicated.
- C. Fabricate saddles with diverters, minimum 1/2 -inch high by 1 -inch deep at multi-plane intersects and where indicated.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
  - 1. Verify compliance with requirements for installation tolerances of substrates.
  - 2. Verify that substrates are sound, dry, smooth, clean, sloped for drainage, and securely anchored.
  - 3. Verify that waterproofing coatings have been installed and fully cured.
  - 4. Verify that waterproofing sheet membranes have been installed and completed.
  - 5. Verify that waterproofing preparation and new waterproofing coatings have been installed and fully cured.
  - 6. Where waterproofing will be applied onto metal flashing, coordinate with waterproofing contractor on proper cleaning and preparation of metals for waterproofing application.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
  - 1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
  - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

3. Space cleats not more than 12 -inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
  4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
  5. Torch cutting of sheet metal flashing and trim is not permitted.
  6. Do not fabricate or install any sheet metal items not included in Construction documents, or changed from construction documents, and reviewed Shop Drawings without the Architect's written approval.
- B. Install all metal flashing and sheet metal in accordance with the recommendations of the following which are applicable to project:
1. SMACNA Architectural Sheet Metal Manual.
  2. NRCA Roofing and Waterproofing Manual.
  3. The requirements of this Section supersede the above noted references except where the requirements of the reference specification are more stringent.
  4. Drawings shall govern when more stringent.
- C. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard or SMACNA.
1. Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
  2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- D. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 -feet with no joints allowed within 24 -inches of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 -inch deep, filled with sealant concealed within joints.
  2. Use lapped expansion joints only where indicated on Drawings.
- E. Fasteners:
1. Metal substrate: Use screw type fasteners sized to penetrate substrate not less than three (3) threads minimum into substrate.
- F. Concealed fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage.
1. Cover and seal fasteners and anchors as required for a tight installation.
- G. Joints: (Sealed)
1. Application: Typical except where indicated to be soldered).
  2. Seal joints as required for watertight construction.
    - a. Use sealant-filled joints unless otherwise indicated.
      - 1) Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1- inch into sealant.

- 2) Form joints to completely conceal sealant.
  - 3) When ambient temperature at time of installation is moderate, between 40 and 70 degrees F, set joint members for 50 percent movement each way.
  - b. Adjust setting proportionately for installation at higher ambient temperatures.
    - 1) Do not install sealant-type joints at temperatures below 40 degrees F. Lap sheet metal flashing and trim 4 -inches minimum in a full bed of sealant.
      - 1) Lap in greater dimension where detailed.
      - 2) Sealant shall be fully concealed.
      - 3) Remove visible sealant.
  - d. Install compatible sealants where required to prevent direct weather penetration.
  - e. Prepare joints and apply sealants to comply with requirements in Section 07 9200 "Exterior Joint Sealants."
  - f. Fit flashings tight in place, however, allow for 3/4 -inch minimum clearance to install components. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
  - g. Rivets:
    - 1) Rivet sealed laps at 1 -inch on center.
    - 2) Apply silicone sealant typically over rivets, except at soldered conditions where top of rivet is covered with solder.
  3. Lap joints in direction of water flow.
  4. End joints shall typically be overlapped and set in butyl sealant unless indicated otherwise.
- H. Soldered Joints:
1. Application:
    - a. Where indicated.
    - b. At saddles, boots, pans and at transition conditions.
  2. Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.
    - a. General:
      - 1) Do not solder metallic-coated steel and pre-finished aluminum sheet.
      - 2) Do not use torches for soldering.
        - a) Heat surfaces to receive solder and flow solder into joint. Fill joint completely.
        - b) Completely remove flux and spatter from exposed surfaces.
      - 3) Neatly solder all sheet metal to be soldered.
      - 4) All flat lock seams and lap seams, where soldered, shall be at least 1/2 -inch.
        - a) Pop rivet pieces together 1 -inch on center prior to soldering. Sweat solder under the lap.
        - b) Do not bead solder.
        - c) Solder rivet holes to be watertight.
      - 5) Thoroughly wash all flux off work after soldering.
        - a) Failure to do this may result in back charges as a result of damages to finishes.

- 6) Heat surfaces to receive solder, and flow solder into joint.
    - a) Fill joint completely. Completely remove flux and spatter from exposed surfaces.
  - 7) Fit flashings tight in place, however, allow for 3/4 -inch minimum clearance to install components.
    - a) Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
  - 8) Do not pre-tin zinc-tin alloy-coated stainless steel and zinc-tin alloy-coated copper.
- b. Stainless-Steel Soldering:
- 1) Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering.
  - 2) Comply with solder manufacturer's recommended methods for cleaning and neutralization.
- I. Rivets:
1. Rivet joints in prefinished aluminum.
    - a. Where indicated.
    - b. For necessary strength.
  2. Rivet joints where indicated.
  3. Riveted joints where soldered.
- J. Saddles: Secure with fasteners and sealing washers and continuous cleats.
1. Refer to details for additional requirements.
- K. Exercise care when cutting materials on site, to ensure cuttings do not remain on finished surfaces. Carefully clean and dispose of cuttings so not to damage adjacent materials. Repair or replace damaged materials at no additional cost to the City.
- L. Use concealed fasteners except where specifically approved by the Building Envelope Consultant (ABB) .
1. Provide expansion joints concealed within system.
- M. Flash and counter flash mechanical and electrical items projecting through roof or other waterproofing membranes.
- N. Seal open ends of all skirt flashings with soldered end caps.
1. When approved by Building Envelope Consultant (ABB) install backer rod and sealant.
- O. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- P. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

- Q. Soldered Joints: Solder all joints watertight. Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 -inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not solder coil-coated or membrane-clad sheet metal.
  2. Neatly solder all sheet metal to be soldered.
  3. Do not use torches for soldering.
    - a. Heat surfaces to receive solder and flow solder into joint.
    - b. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
  4. Stainless-Steel Soldering:
    - a. Tin edges of uncoated sheets using solder recommended for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering.
    - b. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
  5. All flat lock seams and lap seams, where soldered, shall be at least 1/2 inch.
    - a. Pop rivet pieces together 1 -inch on center prior to soldering.
    - b. Sweat solder under the lap. Do not bead solder. Solder rivet holes to be water tight.
  6. Thoroughly wash all flux off work after soldering. Failure to do this may result in back charges as a result of damages to finishes.
  7. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
  8. Fit flashings tight in place, however, allow for 3/4 -inch minimum clearance to install components. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- R. Adhesion Two-Sided Tapes: Prepare surfaces in accordance with tape manufacturers written instructions and as specified.
1. Wipe clean all surfaces with specified cleaning solution using a lint-free cloth.
    - a. Mixture of Isopropyl Alcohol and potable water.
    - b. If surface has oil, silicones or mold release agents or will not come clean with the mixture of isopropyl alcohol and potable water, use tape manufacturers cleaner as specified.
  2. Prime surfaces with specified tape manufacturer's primer.
    - a. Shake primer container well before using.
    - b. Apply a thin uniform coating to the bonding surface using the minimum amount that will fully coat the surface.
    - c. Allow primer to dry thoroughly before applying the tape.
    - d. Be sure the primed surface remains free of contaminants prior to apply the tape.
    - e. Porous surfaces may require two (2) coats to establish a uniform coverage and good adhesion.
      - 1) Allow the first application of primer to dry before the second application.
    - f. Apply primer either with a brush or swab or a pressurized flow gun, knurled roller, or other similar type of application equipment.
    - g. Clean up may be accomplished with acetone.
      - 1) Ensure acetone is not applied to finished surfaces exposed to view.

2) Ensure acetone does not contaminate other surfaces.

- S. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
1. Space movement joints at a maximum of 10 -feet with no joints allowed within 24 -inches of corner or intersection.
  2. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 -inch deep, filled with sealant concealed within joints.

### 3.03 MISCELLANEOUS FLASHING INSTALLATION

- A. Saddles, Transitions, and Terminations: Coordinate installation of saddles, transitions, and terminations with installation of siding, self-adhering sheet waterproofing, weather resistive barrier, and other components of the construction.
1. Miscellaneous flashing not installed in accordance with the Contract Documents will require the removal and reinstallation of construction to properly install the required flashing at no additional cost to the Owner.
  2. Fully solder all components watertight.

### 3.04 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 -inch in 20 -feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

### 3.05 ROOF / GUTTER FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Install sheet metal flashing and trim as indicated on Drawings and details.
- C. Overlaps of flashing with hemmed edges shall be nested into each other and crimped to align with typical hemmed edge.

### 3.06 EXAMINATION - SEALANTS

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.



### 3.07 PREPARATION - SEALANTS

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  2. Clean, porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
  3. Remove laitance and form-release agents from concrete.
  4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    - a. Metal including stainless steel and aluminum, and steel.
    - b. Glazed surfaces of ceramic and/or porcelain tile.
    - c. Glass.
    - d. Pre-finished aluminum.
    - e. Stainless steel.
    - f. Galvanized metal
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.08 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
  2. Do not stretch, twist, puncture, or tear sealant backings.
  3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
  2. Completely fill recesses in each joint configuration.
  3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
  2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
  4. Provide flush joint profile at locations requiring it per substrate configuration according to Figure 8B in ASTM C 1193.
    - a. Refer also to Drawings.
  5. Provide recessed joint configuration of recess depth and at locations requiring it per substrate configuration according to Figure 8C in ASTM C 1193.
    - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
    - b. Refer also to Drawings.
- G. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
- H. Install fillet sealant in accordance with drawings, and ASTM C1193.

### 3.09 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials.
- C. Clean off excess solder.

- D. Clean off excess sealants.
- E. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturers written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- F. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

### 3.10 INSTALLATION OF TWO SIDED BUTYL TAPE

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Clean substrates per manufacturers recommendations.
- C. Prime substrates per manufacturers recommendations.

### 3.11 FIELD QUALITY CONTROL – SEALANTS AND TWO SIDED TAPE

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
  - 1. Extent of Testing: Test completed, and cured sealant joints as follows:
    - a. Perform three (3) tests for each substrate of joint length for each kind of sealant and joint substrate.
  - 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
    - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
  - 3. Inspect tested joints and report on the following:
    - a. Whether sealants filled joint cavities and are free of voids.
    - b. Whether sealant dimensions and configurations comply with specified requirements.
    - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
  - 4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations,

whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

END OF SECTION

## SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

### 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. Metal pipe hangers and supports.
  - 2. Trapeze pipe hangers.
  - 3. Fastener systems.
- B. Related Sections:
  - 1. Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment" for vibration isolation devices.

#### 1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
  - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
  - 2. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings:
- C. Show fabrication and installation details and include calculations for the following; include Product Data for components:
  - 1. Trapeze pipe hangers.
  - 2. Metal framing systems.
- D. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 1. Detail fabrication and assembly of trapeze hangers.
  - 2. Design Calculations: Calculate requirements for designing trapeze hangers.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

## 1.7 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

## PART 2 - PRODUCTS

### 2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Stainless-Steel Pipe Hangers and Supports:
  - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
  - 2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

### 2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

## 2.3 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, [zinc-coated] [stainless-] steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

## 2.4 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
  - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
  - 2. Design Mix: 5000-psi, 28-day compressive strength.

## PART 3 - EXECUTION

### 3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
  - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
  - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- D. Fastener System Installation:
  - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

### 3.2 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.



### 3.3 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

### 3.4 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are required.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

### 3.5 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.
- D. Use padded hangers for piping that is subject to scratching.
- E. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
  - 2. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
  - 3. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
  - 4. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
  - 5. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
  - 6. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.

- F. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
  2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- G. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
  2. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
  3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
  4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- H. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
  2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
  3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
  4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
  5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
  6. C-Clamps (MSS Type 23): For structural shapes.
  7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
  8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
  9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
  10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
  11. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    - a. Light (MSS Type 31): 750 lb.
- I. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- J. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- K. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

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END OF SECTION 220529

## SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

### 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. Pipe labels.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.

### PART 2 - PRODUCTS

#### 2.1 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to **cover full** circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
  - 1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
  - 2. Lettering Size: **Size letters according to ASME A13.1 for piping.**

## PART 3 - EXECUTION

### 3.1 PIPE LABEL INSTALLATION

- A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
  - 1. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
  - 2. Spaced at maximum intervals of **50 feet** along each run. Reduce intervals to **25 feet** in areas of congested piping and equipment.
  - 3. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- B. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.
- C. Pipe Label Color Schedule:
  - 1. **Storm Drainage Piping:**
    - a. Background Color: **Safety gray.**
    - b. Letter Color: **Black.**

END OF SECTION 220553

## SECTION 221413 - FACILITY STORM DRAINAGE PIPING

### 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. Pipe, tube, and fittings.
  - 2. Specialty pipe fittings.
- B. Related Sections:
  - 1.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
  - 1. Storm Drainage Piping: 10-foot head of water.
- B. Seismic Performance: Storm drainage piping and support and installation shall withstand the effects of earthquake motions determined according to SCE/SEI 7-10.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Sustainable Design Submittals:
  - 1. Not applicable
- C. Shop Drawings: For piping.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For storm drainage piping, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

## 1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF/ANSI 14, "Plastics Piping System Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer" for plastic sewer piping.

## 1.7 PROJECT CONDITIONS

- A. Interruption of Existing Storm-Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
  1. Notify Architect and Owner no fewer than seven days in advance of proposed interruption of storm-drainage service.
  2. Do not proceed with interruption of storm-drainage service without Architect's and Owner's written permission.

## PART 2 - PRODUCTS

### 2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

### 2.2 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- B. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.
- C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- D. Adhesive Primer: ASTM F 656.
- E. Solvent Cement: ASTM D 2564.

## 2.3 SPECIALTY PIPE FITTINGS

### A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in ODs or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified-piping-system fitting.
3. Shielded, Nonpressure Transition Couplings:
  - a. Standard: ASTM C 1460.
  - b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

## PART 3 - EXECUTION

### 3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations from layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 22 0548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- I. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.



- J. Install storm drainage piping at the following minimum slopes unless otherwise indicated:
  - 1. Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.
- K. Install aboveground PVC piping according to ASTM D 2665.
- L. Install storm drainage piping and specialties in locations indicated. Coordinate with existing building systems.
- M. Plumbing Specialties:
  - 1. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers in storm drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping. Comply with requirements for cleanouts specified in Section 221423 "Storm Drainage Piping Specialties."
  - 2. Install drains in storm drainage gravity-flow piping. Comply with requirements for drains specified in Section 221423 "Storm Drainage Piping Specialties."
- N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- O. Firestop all penetrations through horizontal and vertical assemblies per building code requirements.

### 3.2 JOINT CONSTRUCTION

- A. Hubless, Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- B. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- C. Plastic, Nonpressure-Piping, Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendices.
  - 3. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendices.

### 3.3 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
  - 1. Install transition couplings at joints of piping with small differences in ODs.

2. In Drainage Piping: Shielded, nonpressure transition couplings.

### 3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
  1. Install stainless steel pipe hangers for horizontal piping.
  2. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
  3. Vertical Piping: MSS Type 8 or Type 42, clamps.
  4. Individual, Straight, Horizontal Piping Runs:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
  5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  6. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
  1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
  2. NPS 3: 48 inches with 1/2-inch rod.
  3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
  4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
  5. NPS 10 and NPS 12: 48 inches with 7/8-inch rod.
- G. Install supports for vertical PVC piping every 48 inches.
- H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.5 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

- C. Connect storm drainage piping to roof drains and storm drainage specialties.
  - 1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.
  - 2. Comply with requirements for cleanouts and drains specified in Section 221423 "Storm Drainage Piping Specialties."
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

### 3.6 IDENTIFICATION

- A. Identify exposed storm drainage piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

### 3.7 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
  - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
  - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
  - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  - 2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  - 3. Test Procedure: Test storm drainage piping on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.
  - 4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
  - 5. Prepare reports for tests and required corrective action.

- 3.8A. ~~CLEANING~~ **CLEANING** of piping. Remove dirt and debris as work progresses.

- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

### 3.9 PIPING SCHEDULE

- A. Aboveground storm drainage piping NPS 6 and smaller shall be the following:
  - 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
  - 2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- B. Aboveground, storm drainage piping NPS 8 and larger shall be the following:
  - 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
  - 2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION 221413

## SECTION 22 1423 - STORM DRAINAGE PIPING SPECIALTIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. General-purpose roof drains.
2. Cleanouts.

B. Related Requirements:

1. Section 076200 "Sheet Metal Flashing and Trim" for penetrations of roofs.
2. Section 078413 "Penetration Firestopping" for firestopping roof penetrations.

#### 1.2 ACTION SUBMITTALS

A. Product Data:

1. General-purpose roof drains.
2. Cleanouts.

#### 1.3 QUALITY ASSURANCE

- A. Provide drainage piping specialties are to bear label, stamp, or other markings of specified testing agency.

### PART 2 - PRODUCTS

#### 2.1 GENERAL-PURPOSE ROOF DRAINS

A. Cast-Iron Roof Drains:

1. Cast-Iron, Medium-Sump, General-Purpose Roof Drains: RD-1.
  - a. **BOD: Zurn** (or approved equal)
  - b. Standard: ASME A112.6.4.
  - c. Body Material: Cast iron.
  - d. Body Coating: Acid Resistant, Epoxy Coating
  - e. Dimension of Body: **12-inch** diameter.
  - f. Dome Material: **Aluminum**.
  - g. Combination flashing ring and gravel stop.
  - h. Outlet: **Bottom**.

- i. Outlet Size: Per Plans
- j. Outlet Type: **Threaded**.
- k. Options:
  - 1) Underdeck clamp.
  - 2) Secondary Clamping Collar.

## 2.2 CLEANOUTS

### A. Plastic Cleanouts:

- 1. Plastic Cleanouts:
  - a. Size: Same as connected branch.
  - b. Body Material: **PVC**.
  - c. Closure Plug: **PVC**.
  - d. Type: **Wall**.
  - e. Frame and Cover Material and Finish: **Nickel-bronze, copper alloy**.
  - f. Frame and Cover Shape: **Round**.
  - g. Riser: Drainage pipe fitting and riser to cleanout of same material as drainage piping.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install roof drains in accordance with roof membrane manufacturer's written installation instructions at low points of roof areas.
  - 1. Install flashing collar or flange of roof drain to maintain integrity of waterproof membranes where penetrated.
  - 2. Install expansion joints, if indicated, in roof drain outlets.
  - 3. Position roof drains for easy access and maintenance.
- B. Install cleanouts in aboveground piping and building drain piping in accordance with the following instructions unless otherwise indicated:
  - 1. Use cleanouts the same size as drainage piping up to **NPS 4**. Use **NPS 4** for larger drainage piping unless larger cleanout is indicated.
  - 2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
  - 3. Locate cleanouts at minimum intervals of **50 ft.** for piping **NPS 4** and smaller and **100 ft.** for larger piping.
  - 4. Locate cleanouts at base of each vertical storm piping conductor.
- C. Install test tees in vertical conductors and near floor.
- D. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.
- E. Install through-penetration firestop assemblies for penetrations of fire- and smoke-rated assemblies.

1. Comply with requirements in Section 078413 "Penetration Firestopping."

### 3.2 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221414 "Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

### 3.3 INSTALLATION OF FLASHING

- A. Fabricate flashing from single piece of metal unless large pans, sumps, or other drainage shapes are required.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
- C. Secure flashing into sleeve and specialty clamping ring or device.

### 3.4 CLEANING

- A. Clean piping specialties during installation and remove dirt and debris as work progresses.

### 3.5 PROTECTION

- A. Protect piping specialties during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of each day and when work stops.

END OF SECTION 221423

list of associations, institutions, and societies which may be used as references throughout this specification section.

1. ASCE: American Society of Civil Engineers.
  - a. Minimum Design Loads and Associated Criteria for Buildings and Other Structures (7-16).
2. ASTM: American Society for Testing and Materials
  - a. ASTM C1289.
  - b. ASTM D41
  - c. ASTM D920
  - d. ASTM D6163
  - e. ASTM E108
3. FM: Factory Mutual Engineering and Research
4. NRCA: National Roofing Contractors Association
5. OSHA: Occupational Safety and Health Administration
6. SMACNA: Sheet Metal and Air Conditioning Contractors National Association
7. UL: Underwriters Laboratories
  - a. UL 790 guidelines
8. ACI: American Concrete Insititute
9. ICRI: International Concrete Repair Institute
10. SSPC: The Society for Protective Coatings
11. ISO 9001 certified.

#### 1.05 DESCRIPTION OF WORK

##### A. Base Bid Assembly

1. Substrate: Galvanized sheet metal.
  - a. Existing substrate thoroughly cleaned to a Brite finish prior to waterproofing (roofing) material installation.
2. Tapered Insulation: Tapered Paratherm CG system, providing a slope of 1/4 - inch (2 percent) applied in Parafast Insulation Adhesive.
3. Cover Board Panel: Securock Gypsum-Fiber Roof Board, having a thickness of 1/2 -inch, applied in Parafast Insulation Adhesive.
4. Substrate and Cover Panel Preparation: All joints and breaks in the substrate surfaces shall be stripped in with 6 -inch wide reinforced Parapro 123 Flashing Membrane System before installation of the Parapro Roof Membrane System.
5. Waterproofing (Roof) System: Parapro Reinforced Liquid Roof Membrane System, liquid applied (PMMA).
6. Flashing System: Parapro 123 Reinforced Liquid Roof Flashing System, liquid applied (PMMA).
7. Installation conditions including, but not limited to:
  - a. Roof Drains.
  - b. Transitions to new and existing roof flashing.

##### B. Bid Alternate Assembly

1. Substrate: Galvanized sheet metal.
  - a. Existing substrate cleaned to meet manufacturers requirements for the installation of ProBase SA self-adhering membrane.
2. Tapered Insulation: Tapered Paratherm CG system, providing a slope of 1/4 - inch (2 percent) applied in Parafast Insulation Adhesive.



3. Cover Board Panel: Securock Gypsum-Fiber Roof Board, having a thickness of 1/2 -inch, applied in Parafast Insulation Adhesive.
4. Waterproofing (Roof) System: ProBase SA, self-adhered followed by;
  - a. Parapro Reinforced Liquid Roof Membrane System, liquid applied over the ProBase SA.
5. Flashing System: ProBase SA, self-adhered followed by;
  - a. Parapro 123 Reinforced Liquid Roof Flashing System, liquid applied.
6. Installation conditions including, but not limited to:
  - a. Roof Drains.
  - b. Transitions to new and existing roof flashing.

#### 1.06 PREINSTALLATION MEETINGS

- A. Pre-installation Roofing Conference at Jobsite: Hold a meeting with the Owners Representative, Construction Manager, Waterproofing Consultant, Architect, Roofing Contractor, Roofing Manufacturer's Representative, and other applicable trades to discuss the means and methods related to roofing / waterproofing demolition, preparation and installation. The Roofing Contractor shall examine the substrates that will receive the specified roofing materials and confirm its suitability for installation of the specified roofing / waterproofing system.

#### 1.07 ACTION SUBMITTALS

- A. Requirements: (As specified, and also as indicated in drawings)
  1. Submit manufacturer's product data for all components.
  2. Submit manufacturer's preparation requirements.
- B. Installation procedures. Submit manufacturer's written instructions.
- C. Wind Uplift Pressures, and compliance with project specific requirements: Submit as specified.

#### 1.08 INFORMATIONAL SUBMITTALS

- A. Qualification Data:
  1. Installer: Submit written confirmation that they have a minimum of two (2) years of experience in successfully installing the same or similar roofing materials and be certified in writing by the roofing materials manufacturer to install the primary roofing products.
  2. Manufacturer: Submit written confirmation that the manufacturer of the primary roofing products has been successfully producing the specified types of primary products for not less than ten (10) years with a consistent composition for a minimum of five (5) years.
- B. System Qualification:
  1. Intent to Warrant Letter: Submit a signed letter on the roof membrane manufacturer's letterhead, confirming that specified roofing system complies with the warranty/guarantee requirements specified and the materials and performance criteria specified in Part 2.

2. Sample Warranty/Guarantee: Submit a sample copy of the manufacturer's proposed Warranty/Guarantee.

#### 1.09 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Submit the manufacturer's care and maintenance guide.
- B. Executed Guarantee: Provide the Contractor and Owner with an executed version of the specified guarantee.

#### 1.10 BID ALTERNATE PRODUCT / SYSTEM SUBMITTAL

- A. Consideration of Alternate Systems: Submit in accordance with Bidding Documents. Submit alternate system for the specified roof systems to be considered as equivalent to the specified roof system no greater than duration indicated in Bid documents. Alternate proposed roof system will need to be reviewed and accepted as equivalent system meeting performance criteria to the specified roof system. Alternate product submittals shall include the following:
  1. Two 3 -inch x 5 -inch samples of the primary roofing and flashing membranes.
  2. Latest edition of the roofing system manufacturer's specifications and installation instructions.
  3. Evidence that the manufacturer of the proposed roofing system utilizes a quality management system that is ISO 9001 certified. Documentation of ISO 9001 certification of foreign subsidiaries without domestic certification will not be accepted.
  4. Evidence of Underwriters' Laboratories Class A acceptance of the proposed roofing system (including mopping asphalt or cold adhesive) without additional requirements for gravel or coatings.
  5. Evidence that the roof configuration (including fastening of insulation) has been tested by an accredited independent testing agency to meet the design wind load pressure as specified.
  6. List of three (3) of the proposed primary roofing manufacturer's projects, located in the United States, of equal size and degree of difficulty which have been performing successfully for a period of at least ten (10) years.
  7. Sample copy of the proposed guarantee.
- B. Technical Product Data: Submit the manufacturer's technical product data sheets for each type of product.
- C. Shop Drawings: Include plans, sections, and shop drawings/details for all applicable conditions.
- D. Product Samples: Submit product samples of the specified base, finish, flashing reinforcing, and flashing membrane.

#### 1.11 QUALITY ASSURANCE

- A. Fire Rating: Submit evidence of exterior fire-test exposure by an approved third-party testing agency in accordance with ASTM E108 or UL 790 guidelines.
  1. Class A.

- B. Wind Uplift Pressures: (Contractor & roofing manufacturer shall confirm the following including uplift pressures)
1. General:
    - a. Contractor shall engage, and submit State of Hawaii licensed structural calculations which are confirmed by roofing manufacturer as evidenced by an approved third-party testing agency that the roof configuration has been tested to meet the confirmed wind uplift design.
    - b. Roofing manufacturer shall provide written confirmation that the installed assembly shall meet or exceed the following performance requirements as confirmed.
    - c. All loads are at service level Allowable Stress Design (ASD) divided by 0.6 for Load Resistance Factor Design applications and include a safety factor of 2.0 applied in accordance with ASTM D 6630 Standard Guide for Low Slope Insulated Roof Membrane Assembly Performance.
      - 1) Negative pressures are working away from the building (uplift)
  2. Design Criteria:
    - a. Applicable Code: 2018 IBC with Hawaii Amendments.
    - b. Roof Area: 334 linear feet by 2 feet wide gutter.
    - c. Mean Building roof Height: 110 feet
    - d. Roof Slope: Flat: 1-1/2 in12 or less.
    - e. Parapet(s) (Min. 36-inches high): None
    - f. Building Configuration: Enclosed
    - g. Exposure: B
    - h. Risk Category: II
    - i. Basic Wind Speed (Three second gust, mph): **135mph**
      - 1) Refer to State of Hawaii Wind Speed Maps.
    - j. Roof Deck Type: Steel
    - k. Roof Covering: Modified Bitumen & Fluid-Applied, reinforced
    - l. Class 1.
  3. Uplift Pressures: (Values include 2.0 Safety Factor)(Contractor to confirm)
    - a. Zone 1 (Field): 82.1 pounds per square foot (Not applicable)
    - b. Zone 2 (Roof Sides): 128.8 pounds per square foot (Not applicable)
    - c. Zone 3 (Corners): 175.5 pounds per square foot (Use for narrow gutter)

#### 1.12 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Storage: Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing manufacturer.
1. Protect stored liquid material from direct sunlight, heat, open fire, ignition sources, oxidizing agents, strong acids, and strong alkalis.
  2. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

- C. Protection: Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Comply with the insulation manufacturer's written instructions for handling, storing, and protecting materials during installation.
- D. Handling: Handle and place roofing materials and equipment in a manner to avoid permanent deflection of deck.

#### 1.13 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing to be installed in accordance with manufacturer's written instructions and warranty requirements.
- B. Membrane Protection: Provide protection against staining and mechanical damage for newly applied roofing and adjacent surfaces throughout this project.
- C. Debris Removal: Remove all debris daily from the project site and take to a legal dumping area authorized to receive such materials.
- D. Site Condition: Complete, to the owner's satisfaction, all job site clean-up including building interior, exterior and landscaping where affected by the construction.

#### 1.14 GUARANTEE/WARRANTY

- A. Manufacturer's Guarantee/warranty: Provides that the Manufacturer will repair leaks through the covered roofing materials due to material or workmanship defects, subject to certain exclusions, during the specified time period. Refer to guarantee for complete coverage and restrictions.
  - 1. The Guarantee shall provide coverage for the roofing membrane, base flashings, roof insulation, fasteners, insulation adhesive, and cover panel. The Guarantee shall be non-prorated and contain no deductibles or limitations on coverage amount.
  - 2. Guarantee Period: Twenty (20) years from date of Substantial Completion.
- B. Special Project Warranty: Submit roofing contractor's warranty signed by the Installer, including all components of the roofing and insulation system for the following warranty period:
  - 1. Warranty Period: Two (2) years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURER'S

- A. Basis-Of-Design (BOD): System and components specified by Siplast. Representative: Rob Worthing, Cell: 415-802-8918, [rob@rwmaterialreps.com](mailto:rob@rwmaterialreps.com)
1. Alternates:
    - a. Or Approved Substitute.
- B. Fluid-applied roofing/waterproofing: **Parapro Roof Resin** by Siplast, Inc.
1. Alternate: Or Approved Substitute
  2. Description: Resin for Finish Ply Membrane Construction: A multi-component, fast-curing, flexible PMMA-based resin for use in combination with fleece fabric to form a monolithic, reinforced roofing membrane. Physical and mechanical values are based on testing/evaluation of a 90-mil PMMA roof membrane reinforced with the specified fleece reinforcement.
  3. Performance:
    - a. Thickness (avg): 90 mils at 0.31 kg/ft<sup>2</sup> (3.3 kg/m<sup>2</sup>) coverage rate (ASTM D5147, section 5).
    - b. Peak Load (avg) @ 73°F : 70 lbf/in (12.3 kN/m) (ASTM D5147 section 6)
    - c. Peak Load (avg) @ 73°F : 90 lbf/inch (15.8 kN/m) (ASTM D412, dumbbell)
    - d. Elongation at Peak Load (avg) @ 73°F: 35% (ASTM D5147, section 6)
    - e. Elongation at Peak Load (avg) @ 73°F: 35% (ASTM D412, dumbbell)
    - f. Shore A Hardness (avg): 81 (ASTM D2240)
    - g. Water Absorption, Method I (24h @ 73°F): 0.8% (ASTM D570)
    - h. Water Absorption, Method II (48h @ 122°F): 1.2% (ASTM D570)
    - i. Low temperature flexibility @ 23 F (-5°C): PASS (ASTM D5147, section 11)
    - j. Dimensional Stability (max): 0.15% (ASTM D5147, section 10)
    - k. Tear Strength (avg): 90 lbf (ASTM D5147, section 7)
    - l. Approvals: UL Class listed, FM Approved (products shall bear seals of approval)
- C. Reinforcing: **Pro Fleece** by Siplast, Inc.
1. Fleece for Membrane Reinforcement: A non-woven, 110 g/m<sup>2</sup>, needle-punched polyester fabric reinforcement as supplied by the membrane system manufacturer.
  2. Alternate: Or Approved Substitute.

### 2.02 BASE FLASHING SHEET MATERIALS - TYPICAL

- A. Stripping and Flashing Reinforcing Ply: (Self-Adhering)
1. **Pro Base SA** by Siplast, Inc.
    - a. Alternate: Or Approved Substitute
  2. Description: Stripping and Flashing Reinforcing Ply: An ASTM D6163, Type I, Grade S homogenous membrane with a glass-fiber reinforcing mat impregnated/saturated and coated each side with SBS modified bitumen blend with a factory applied polymer modified asphalt self-adhesive on the back surface of the sheet to provide full adhesion to the total surface area of the substrate. The

back side of the base ply shall be surfaced with a removable film, and the top of the sheet shall be surfaced with a factory-applied acrylic coating.

- B. Liquid Flashing System:
  - 1. **Parapro 123 Flashing** by Siplast, Inc.
    - a. Alternate: Or Approved Substitute
  - 2. Description: The specified liquid flashing system shall consist of a catalyzed PMMA-based membrane fully reinforced with a non-woven polyester fleece that is installed over a prepared or primed substrate.
- C. Low VOC Asphalt Primer: Asphalt / solvent blend primer for self-adhering Siplast SBS Roofing and Flashing systems primer for metal, concrete, masonry, and other approved substrates surfaces to facilitate adhesion of SBS modified flashing membranes.
  - 1. **917 Primer** by Siplast, Inc.
    - a. Alternate: Or Approved Substitute
  - 2. Performance:
    - a. Standard: Meets ASTM D41.
    - b. VOC Content: Less than 350 g/L.

## 2.03 AUXILIARY ROOFING MATERIALS

- A. Sealant: A flexible, moisture-curing, self-leveling elastomeric sealant designed for roofing applications.
  - 1. **PS-209 Elastomeric Sealant** by Siplast, Inc.
    - a. Performance:
      - 1) Standard: Meets ASTM D920.
      - 2) Accommodates dynamic movement.
      - 3) Adhesion to dissimilar materials.
      - 4) Bonds to:
        - a) Asphalt.
        - b) Aluminum.
        - c) Galvanized steel.
        - d) Wood.
        - e) Masonry.
        - f) Fiberglass-reinforced plastic.
        - g) Vinyl.
        - h) Coated metals.
      - 5) Does not shrink.
      - 6) VOC: Less than 19 g/L.
      - 7) Service Temperature: -40°F to 200°F.
    - 2. Alternate: Or Approved Substitute
- B. Sealant: A moisture-curing, non-slumping elastomeric sealant designed for roofing applications. Polyurethane hybrid composition.
  - 1. **PS-715 NS Elastomeric Sealant** by Siplast, Inc.
    - a. Performance:
      - 1) Color: Limestone Grey.
      - 2) Accommodates dynamic movement.
      - 3) Adhesion to dissimilar materials.
      - 4) VOC: Less than 15 g/L.

- 5) Service Temperature: -40°F to 200°F.
2. Alternate: Or Approved Substitute

## 2.04 ROOF INSULATION

- A. General: Insulation shall be approved in writing by the insulation manufacturer for intended use and for use with the specified roof assembly. Maintain a maximum panel size of 4 feet by 4 feet where polyisocyanurate / fiberboard insulation is specified to be installed in insulation adhesive or hot asphalt. Install only as much insulation as can be made watertight during the same work day.
- B. Tapered Polyisocyanurate Board Insulation (inorganic coated glass facer): A closed cell, rigid polyisocyanurate foam core material, integrally laminated between glass fiber reinforced organic facers, and meeting the criteria established by ASTM C1289, Type II, Class 2, Grade 2. The tapered system shall incorporate fill panels of a nominal thickness and provide for a roof slope of 1/4- inch. Acceptable types are as follows:
  1. **Tapered Paratherm CG** system by Siplast, Inc.
    - a. Alternate: Or Approved Substitute
- C. Uniform thickness Polyisocyanurate Board Insulation (inorganic coated glass facer): A closed cell, rigid polyisocyanurate foam core material, integrally laminated between glass fiber reinforced organic facers, and meeting the criteria established by ASTM C1289, Type II, Class 2, Grade 2. The tapered system shall incorporate fill panels of a nominal thickness and provide for a roof slope of 1/4- inch. Acceptable types are as follows:
  1. **Paratherm G CG** system by Siplast, Inc.
    - a. Alternate: Or Approved Substitute

## 2.05 INSULATION ACCESSORIES

- A. Tapered Edge Strips: A tapered panel composed of expanded volcanic minerals combined with waterproofing binders. The top surface shall be pre-treated with an asphalt based coating. The panels shall have a dimension sufficient to provide for a smooth transition and provide proper support for the membrane layer or subsequent layer of insulation when there are transitions of 1/4 -inch or greater.

## 2.06 INSULATION AND COVER BOARD ADHESIVE

- A. Adhesive: single or dual component low-rise polyurethane foam adhesive designed specifically for the adhesion of roof insulation to substrate, as well as subsequent layers of insulation. Acceptable manufacturers are as follows:
  1. Options:
    - a. **Parafast 1-Step LRF Cartridges** by Siplast, Inc. used with "Spot Shot Cartridge Applicators".
    - b. **Parafast PG-1 EF LRF Canister** by Siplast, Inc.
      - 1) Note: Part A Box includes Part A Canister, applicator, hoses, four dual-purpose static mixers, wrench, petroleum jelly, gloves. Part B Box Includes: Part B Canister. Do not need a pace cart for this adhesive type.
    - c. Alternates: Or Approved Substitute.

## 2.07 CEMENT COVER BOARD (PANEL)

- A. Substrate Cover Board: A cement-based panel conforming to ASTM C1325, Standard for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units. Provide panels having a nominal thickness as specified and approved for roofing application.
1. **USG Securock Cement Roof Board** by United States Gypsum Corporation.
    - a. Alternate: Or Approved Substitute.
  2. Performance:
    - a. UL Classified (Type DCB) as to Surface Burning Characteristics and Noncombustibility in accordance with ASTM E84 (CAN/ULC-S102).
    - b. Meets Factory Mutual (FM) Class 1 and Underwriters Laboratories (UL) Class A fire ratings for unlimited slope in fire-barrier applications per UL 790.
    - c. Moisture and Mold: Scored a maximum "10" for mold resistance on ASTM D3273 and is highly water durable.
    - d. Mold Resistance: Score of 10 as rated according to ASTM D 3273.
    - e. ASTM E96: 5.84.
    - f. Surface-Burning Characteristics per ASTM E84:
      - 1) Flame Spread: 0.
      - 2) Smoke Developed: 0.
    - g. Flute Span-ability: 12-inches per ASTM E661.
    - h. R value: per ASTM C518.
      - 1) 0.39 at 1/2-inch thick.
    - i. Compressive Strength: 1,800 psi.
    - j. Weight:
      - 1) 2.4 lb./ft<sup>2</sup>.at 1/2-inch thick.
    - k. Bending Radius: 6'-0"
    - l. Long Edges: Square.
  3. Sizes:
    - a. 48-inches by 48-inches
    - b. 48-inches by 96-inches.
  4. Thickness:
    - a. 1/2-inch.

## 2.08 ROOFING MEMBRANE SHEET MATERIALS – BID ALTERNATE ASSEMBLY

- A. Application: Apply onto cover board, prepared substrates prior to PMMA roof coating application.
- B. Bid Alternate: **Pro Base SA** by Siplast, Inc.
1. Alternate: Or Approved Substitute
  2. Base Ply: An ASTM D6163, Type I, Grade S homogenous membrane with a glass-fiber reinforcing mat impregnated/saturated and coated each side with SBS modified bitumen blend with a factory applied polymer modified asphalt self-adhesive on the back surface of the sheet to provide full adhesion to the total surface area of the substrate. The back side of the base ply shall be surfaced with a removable film. The cross sectional area of the sheet material shall contain no oxidized or non-SBS modified bitumen. The base ply shall be surfaced with a factory-applied acrylic coating and possess the following physical/mechanical properties.
  3. Performance:



- a. Thickness (avg): 102 mils (2.6 mm) (ASTM D5147)
  - b. Thickness (min): 98 mils (2.5 mm) (ASTM D5147)
  - c. Weight (min per 100 ft<sup>2</sup> of coverage): 69 lb (3.4 kg/m<sup>2</sup>)
  - d. Peak filler content in elastomeric blend - 35% by weight
  - e. Low temperature flexibility @ -15°F (-26°C): PASS (ASTM D5147)
  - f. Peak Load (avg) @ 73°F (23°C): 30 lbf/inch (5.3 kN/m) (ASTM D5147)
  - g. Peak Load (avg) @ 0°F (-18°C): 75 lbf/inch (13.2 kN/m) (ASTM D5147)
  - h. Ultimate Elongation (avg.) @ 73°F (23°C): 50% (ASTM D5147)
  - i. Compound Stability (max): 0.1% (ASTM D5147)
  - j. High Temperature Stability (min): 250°F (121°C) (ASTM D5147)
- C. Primer for Self-Adhesive Membranes: Primer for self-adhesive membranes shall be a single component, water-based resinous primer formulated to condition masonry, wood, plywood, concrete, asphaltic, and gypsum surfaces to facilitate adhesion of self-adhesive membranes.
1. **TA-119 Primer** by Siplast, Inc.
    - a. Alternate: Or Approved Substitute
  2. Performance:
    - a. Color: Milky Pink.
    - b. VOC Content: Less than 50 g/L.
    - c. Flash Point: Greater than 212°F
    - d. Non-Asphaltic.

## 2.09 PMMA FLUID-APPLIED RESIN ACCESSORIES

- A. Cleaning Solution/Solvent: A clear solvent used to clean and prepare transition areas of in-place catalyzed resin to receive subsequent coats of resin and to clean substrate materials to receive resin. For use at clean metal as well.
1. **Pro Prep M** by Siplast, Inc.
    - a. Alternates: Or Approved Substitute.
- B. Preparation Paste: A PMMA-based paste used for remediation of depressions in substrate surfaces or other irregularities.
1. **Pro Paste Resin** by Siplast, Inc.
    - a. Alternates: Or Approved Substitute.
- C. Catalyst: A peroxide-based reactive agent used to induce curing of PMMA-based resins.
1. **Pro Catalyst Powder** by Siplast, Inc. and **Pro Catalyst Liquid** by Siplast, Inc.
    - a. Alternates: Or Approved Substitute.
- D. Primers for PMMA Resin-based Roof Membrane and Flashing
1. Primer for Wood, Plywood and Rigid Insulation, Masonry and Vertical Concrete Substrates: A fast-curing PMMA-based primer for use in over wood, plywood, and rigid insulation substrates.
    - a. **Pro Primer W** by Siplast, Inc.
      - 1) Alternates: Or Approved Substitute.
- E. Joint Tape: A thermoplastic/rubber based sheet having a woven polyester backing used to treat joints between rigid insulation, flashing substrate panels and joints at cover plates used over sheet metal components. The tape shall have a minimum width of 4 -inches.
1. **Eternabond Webseal** by Eternabond, Inc.

- a. Alternates: Or Approved Substitute.
- F. Spray Primer for Stainless Steel, Aluminum and Copper Substrates: An enamel spray primer for metal substrates to receive PMMA-based flashings.
  - 1. **Rust-Oleum™ High Performance V2100 System Enamel Spray Primer** by Rust-Oleum™, Vernon Hills, IL.
    - a. Alternates: Or Approved Substitute.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Substrate Qualification: The installing contractor shall examine all substrates where the specified roofing and flashing system will be applied and confirm their suitability to receive the specified roofing materials.

### 3.02 PREPARATION OF SUBSTRATES

- A. Preparation of Steel Substrates: Grind to generate a "bright metal" surface and remove loose particles.
  - 1. Extend preparation area a minimum of 1/2-inch beyond the termination of the roofing/flashing system.
  - 2. Notch steel surfaces to provide a rust-stop where detailed.
- B. Preparation of Stainless Steel, Aluminum and Copper Substrates: Hand tool (SSPC-SP-2) or power tool (SSPC-SP-3) clean to remove loose rust, mill scale, and deteriorated previous coatings as well as to generate a tooth.
  - 1. Protect surrounding surfaces from overspray.
  - 2. Shake can for one minute after mixing ball is heard.
  - 3. Hold can 10-14 inches from surface.
  - 4. Apply several light coats a few minutes apart to avoid drips and runs.
  - 5. Recoat within 1 hour or after 24 hours; allow more time in cooler temperatures.
    - a. Monitor ambient and substrate temperatures/conditions to ensure that they are within the paint manufacturer's acceptable range.
- C. Rigid Plastic Flashing Substrates: Evaluate the plastic for compatibility with the resin materials.
  - 1. Lightly abrade the surface to receive the flashing system, clean plastic substrates using the specified the cleaner/solvent and allow to dry.
  - 2. Extend the preparation area a minimum of 1/2 -inch beyond the termination of the flashing system.
- D. Preparation of galvanized steel for Parapro:
  - 1. Substrate must be clean and dry and free from gross irregularities, loose material, unsound material, or any foreign material (such as dirt, ice, snow, water, grease, bitumen/coal tar, oil, release agents, lacquers, paint coverings), or any other condition that would be detrimental to the adhesion of the catalyzed primer and/or resin to the substrate.
  - 2. Remove rust or other oxidation layers.
  - 3. Abrade surface to bright finish prior to cleaning with Pro Prep or Pro Prep M.

4. Wipe down thoroughly with Pro Prep or Pro Prep M prior to coating. Allow Pro Prep/Pro Prep M a minimum of 20 minutes drying time after application before continuing. The next application process should be completed within 60 minutes of cleaning with Pro Prep/Pro Prep M.

- E. Preparation of galvanized steel for ProBase SA:
  1. Make sure surface is clean, dry, and free of any debris to accept Primer.
  2. Prime with Siplast TA-119 Primer.

### 3.03 CLEANING PREPARATION

- A. Sweep and vacuum all surfaces, removing all loose aggregate and foreign substances including existing adhesives prior to commencement of roofing.
  1. Remove all of the following existing conditions:
    - a. As indicated in drawings.
    - b. Roof membrane.
    - c. Insulation.
    - d. Base flashings.
    - e. Edge metal.
    - f. Flanged metal flashings.
    - g. Cants.
    - h. Drain assemblies.
      - 1) Refer also to Plumbing Drawings.
    - i. Metal trim, counter flashing.
      - 1) Install new metal flashing as detailed / noted.
      - 2) Reinstall existing metal flashing as detailed / noted.

### 3.04 INSTALLATION OF ROOFING, GENERAL GUIDLEINES

- A. General Appearance: Ensure that the finished roofing application has an aesthetically pleasing overall appearance and is acceptable to the Waterproofing Consultant, Architect, Construction Manager, and Owners representative.
- B. Manufacturers approved technical representative shall inspect roofing assembly during preparation, installation and after completion to confirm compliance with manufacturers requirements, and to meet warranty criteria and wind pressure uplift.

### 3.05 INSTALLATION OF INSULATION

- A. Install insulation panels with end joints offset with edges in moderate contact in accordance with the insulation manufacturer's requirements. Where insulation is installed in two or more layers, stagger joints between layers. Maintain a maximum panel size of 4 feet by 4 feet for polyisocyanurate insulation applied in insulation adhesive. Install only as much insulation as can be made watertight within the same work day.
- B. Install cover board adhered to substrate to meet project specific wind uplift pressures, wind speed, and meet all code requirements.
- C. Crickets: Construct crickets of tapered insulation panels in a layout as indicated on the roof plan.

- D. Tapered Edge at Transitions: Field-cut, shape and install tapered edge strip at transitions of 1/4 -inch or greater between substrate components to provide a smooth transition and proper support for the subsequent insulation layer or membrane/flashing system components.
- E. Insulation - multiple layer: Install all layers in an application of the specified insulation adhesive in 3/4- to 1-inch wide beads spaced 4 -inches on center. Panels may be affected by post-growth of the insulation adhesive. Continuous walking in of the panels is recommended particularly in perimeter/corner areas with reduced bead spacing. Follow the requirements and guidelines of the insulation adhesive manufacturer/supplier. Stagger the panel joints between insulation layers.

### 3.06 INSTALLATION OF COVERBOARD

- A. Install coverboard panels with end joints offset with edges in moderate contact in accordance with the coverboard manufacturer's requirements.
- B. Boards to be laid with all joints staggered 12-inches minimum from adjacent rows and from joints of insulation board layer below.
- C. Closely cut each board to tightly fit around all roof penetrations.
- D. No boards shall be cut to less than 1 square foot in size.
- E. Fit each board snugly against adjacent boards so that no gap larger than 1/8 -inch exists.
- F. Carefully inspect the installation to ensure that each board fits flush with adjacent boards.
- G. Boards with broken corners or that display cupping or warping shall be replaced.
- H. Install cover board adhered to substrate to meet project specific wind uplift pressures, wind speed, and meet all code requirements, unless indicated to be more restringing.
- I. Foam Adhesive Attachment of Substrate Cover Board at Horizontal Applications:
  - 1. Using a ribbon pattern space 3/4-inch-wide beads of foam at required spacing meeting project uplift pressures. If fastening pattern set by manufacturer or necessary to meet ASCE 07-16 wind uplift requirements exceeds those of this section, the more stringent fastening requirements are to be followed. Fastening pattern to be increased in corners and perimeters per the requirements of ASCE 07-16.
    - a. Typical: As indicated in Drawings.
      - 1) Contractor and roofing manufacturer to confirm wind uplift pressures and adhesive spacing as specified.
  - 2. As adhesive is applied, immediately place board into wet adhesive. Do not allow adhesive to skin over. Eliminate un-even surfaces to ensure positive contact between the board and substrate. Foam cannot be applied to a wet substrate.
- J. Tapered Edge at Transitions: Field-cut, shape and install cover board to be a smooth transition including drain Sumps and crickets.

### 3.07 APPLICATION OF BITUMINOUS ROOFING MEMBRANE

- A. Apply the modified bitumen ply sheet with side laps running perpendicular to the direction of the slope. Exert sufficient pressure on the roll during application to ensure prevention of air pockets, wrinkles, creases or fishmouths.
  - 1. Refer to the manufacturer's guidelines for maximum sheet lengths and special fastening of the head laps where the roof deck slope exceeds 1/2 -inch per foot.
  
- B. Unroll the base ply and set the roll into place utilizing minimum 3 -inch side and end laps. Fold one end of the roll back onto itself by 24 -inches. Peel the release film off of the back of the 24 -inch end section of the sheet and lay into place, pressing the 24 -inch end section of the sheet firmly into place over the substrate. Pull the release film free from the underside of the remainder of the sheet while pressing the material into place with a follow tool as the film is being removed, leaving the end laps unadhered.
  - 1. Prior to adhering the end laps, cut a dog ear angle at each end lap on overlapping selvage edges. Torch seal or heat weld end laps, ensuring that the self-adhesive blend on the underside of the overlapping sheet and the top surface of the underlying sheet flow into a layer of continuously bonded or fused modified bitumen. Using a clean trowel, apply top pressure to top seal T-laps immediately following sheet application.
  - 2. To heat-weld the side laps, place a straight 2-inch x 6-inch or larger board adjacent to the modified bitumen sheet overlap to help reduce lifting of the overlapping sheet beyond the selvage area, inhibiting the potential for entrapped air during heat welding. Lay the board such that the hand held welder nozzle does not extend into the overlap beyond the specified lap width. Hand-roll the side laps, head laps, and T-laps of the membrane behind the heat welder. Stagger end laps a minimum of 3 -feet.
    - a. In cases where rapid onset of inclement weather occurs, seal exposed lap edges with a torch or hot-air welder and trowel.
  
- C. APPLICATION OF BITUMINOUS STRIPPING
  - 1. Apply the specified base flashing materials in accordance with the manufacturer's standard details. Notify the Waterproofing Consultant, Architect and Construction Manager immediately of any flashing heights below 8 -inches.
  - 2. Flash walls and curbs using the reinforcing sheet. Exert pressure on the flashing reinforcing sheet during application to ensure complete contact with the vertical/horizontal surfaces, preventing air pockets. Check and seal all loose laps and edges. Nail the top edge of the flashing reinforcing on 9 -inch centers minimum, or less as detailed. Install the specified liquid-applied flashing system in accordance with the membrane system manufacturer's printed installer's guidelines and other applicable written recommendations as provided by the manufacturer.
    - a. See the manufacturer's schematic for visual interpretation.

### 3.08 MIXING OF RESIN PRODUCTS

- A. Preparation/Mixing/Catalyzing Resin Products: Pour the desired quantity of resin into a clean container and using a spiral mixer or mixing paddle, stir the liquid for the time period specified by the resin manufacturer. Calculate the amount of catalyst powder or liquid needed using the manufacturer's guidelines and add the pre-measured catalyst to

the resin component. Mix again for the time period specified by the resin manufacturer, ensuring that the product is free from swirls and bubbles. To avoid aeration, do not use a spiral mixer unless the spiral section of the mixer can be fully contained in the liquid during the mixing process. Mix only enough product to ensure that it can be applied before pot life expires.

- B. Preparation/Mixing/Catalyzing Aggregate-Filled Resin Products: Pour the entire desired quantity of resin into a clean container and slowly add the pre-measured quantity of aggregate using a spiral mixer or mixing paddle, stirring the mixture for the time period specified by the resin manufacturer. Calculate the amount of catalyst powder or liquid needed using the manufacturer's guidelines and add the pre-measured catalyst to the resin/aggregate mixture. Mix again for the time period specified by the resin manufacturer, ensuring that the product is free from swirls and bubbles. To avoid aeration, do not use a spiral mixer unless the spiral section of the mixer can be fully contained in the liquid during the mixing process.
  - 1. Mix only enough product to ensure that it can be applied before pot life expires.

### 3.09 PREPARATION PASTE AND PRIMER APPLICATION

- A. Surface preparation for metals, refer to Part 3.02 PREPARATION OF SUBSTRATES.
- B. Primer Application: Apply catalyzed primer resin using a roller or brush at the rate specified by the primer manufacturer over qualified and prepared substrates. Apply primer resin at the increased rate specified by the primer manufacturer over Cement Cover Roof Board or other porous substrates. Do not let resin pool or pond. Do not under-apply or over-apply primers as this may interfere with proper primer catalyzation. Make allowances for waste, including saturation of roller covers and application equipment.
- C. Paste Application: Apply catalyzed preparation paste using a trowel over prepared and primed substrates. Before application of any resin product over cured paste, wipe the surface of the paste using the specified cleaner/solvent and allow to dry. Treat the surface again if not followed up by resin application within 60 minutes.
- D. Primer for Self-Adhesive Flashing Reinforcing Ply: Apply the specified tacky primer by roller or spray in an even film.
  - 1. Refer to the manufacturer's literature for the approved rate of application over various substrate types.
  - 2. Allow the primer to dry until it leaves a slightly sticky surface without transfer when touched. Cutting or alteration of the primer is not permitted.
- E. Asphaltic Primer for Modified Bituminous Sheets: Prime metal and concrete and masonry surfaces with a uniform coating of the specified asphalt primer according to the manufacturer's published application rate.
  - 1. Cutting or alteration of the primer is not permitted.

### 3.10 FLASHING AND FIELD MEMBRANE APPLICATION

#### A. Base Flashing Application:

1. Using masking tape, mask the perimeter of the area to receive the flashing system. Apply resin primer to substrates requiring additional preparation and allow primer to cure.
2. Pre-cut fleece to ensure a proper fit at transitions and corners prior to membrane application.
3. Apply an even, generous base coat of flashing resin to prepared surfaces using a roller at the rate specified by the resin manufacturer. Work the fleece into the wet, catalyzed resin using a brush or roller to fully embed the fleece in the resin and remove trapped air. Lap fleece layers a minimum of 2 -inch and apply an additional coat of catalyzed resin between layers of overlapping fleece. Again using a roller, apply an even top coat of catalyzed resin immediately following embedment of the fleece at the rate specified by the resin manufacturer, ensuring that the fleece is fully saturated. Ensure that the flashing resin is applied to extend beyond the fleece (maximum 1/4-inch. Remove the tape before the catalyzed resin cures. Make allowances for waste, including saturation of roller covers and application equipment.
4. Should work be interrupted for more than 12 hours or the surface of the cured resin becomes dirty or contaminated by the elements, wipe the surface to be lapped with new flashing resin using the specified cleaner/solvent. Allow the surface to dry for a minimum 20 minutes and a maximum 60 minutes before continuing work.

#### B. Field Membrane Application

1. Using the specified cleaner/solvent, wipe flashing membrane surfaces to be lapped with field membrane. Allow the surface to dry for a minimum 20 minutes before continuing work.
2. Apply an even, generous base coat of field membrane resin to prepared surfaces using a roller at the rate specified by the resin manufacturer. Work the fleece into the wet, catalyzed resin using a 9-inch roller to fully embed the fleece in the resin and remove trapped air. Lap fleece layers a minimum of 2 -inch and apply an additional coat of catalyzed resin between layers of overlapping fleece. Again using a roller, apply an even top coat of catalyzed resin immediately following embedment of the fleece at the rate specified by the resin manufacturer, ensuring that the fleece is fully saturated. Make allowances for waste, including saturation of roller covers and application equipment. Allow 2 hours cure time prior to exposing the membrane to foot traffic.

#### C. Color Finish Application

1. Ensure that the field and flashing membrane and has been in place for a minimum 2 hours. Using the specified cleaner/solvent, wipe field membrane surfaces to receive the color finish layer. Allow the surface to dry for a minimum 20 minutes before continuing work.
2. Apply an even top coat of catalyzed color finish resin at the rate specified by the resin manufacturer. Allow 2 hours cure time prior to exposing the membrane to foot traffic.

### 3.11 APPLICATION OF SEALANT

- A. Apply a smooth continuous bead of the specified sealant at the exposed finish ply edge transition to metal flashings incorporated into the roof system.

### 3.12 FIELD QUALITY CONTROL

- A. Notify the manufacturer of job completion in order to schedule a final inspection date. Hold a meeting at the completion of the project, attended by all parties that were present at the pre-job conference. A punch list of items required for completion shall be compiled by the manufacturer's representative. Complete, sign, and send the punch list form to the manufacturer's headquarters.
- B. Leave all areas around job site free of debris, roofing materials, equipment, and related items after completion of job.
- C. Complete all post installation procedures and meet the manufacturer's final endorsement for issuance of the specified guarantee.

END OF SECTION