WALTER P MOORE

Addendum 002

Project: UT Health Cyclotron Facility Roofing Repairs
6431 Fannin
Houston, Texas 77030

UTHealth RFP No: 744-R1505

Owner: Mr. Judson Lloyd
UT Health
7000 Fannin, Suite M100
Houston, Texas 77030

Addendum No: 002

Issue Date: 11/19/2014

Addendum Issued by: Walter P Moore
1301 McKinney, Suite 1100
Houston, Texas 77010

Note: This Addendum forms a part of the Contract Documents and modifies the original Bidding Documents and previously issued addenda as noted below. Acknowledge receipt of this Addendum in the space provided in the Bid Form. Failure to do so may subject Bidder to disqualification.

Modifications to Previous Addendum 001:

SPECIFICATIONS:

A. Added text in modified Addendum 001 specification sections are indicated by bolded and italicized fonts.
B. Deleted text in modified Addendum 001 specification sections are indicated by strikethrough fonts.
C. The following Addendum 001 specification sections have been modified and are attached to this addendum:
    1. Section 077100 – Roof Specialties: Modified to include requirements for wall mounted tieback anchors on lower roof.

DRAWINGS:

A. The following Addendum 001 drawing sheets have been modified as indicated by cloud callouts and are attached to this addendum:
    1. Sheet S-3.5 – Guard Rail Details: Modified guardrail attachments to be wall mounted on exterior face of existing parapet wall.
    2. Sheet S-3.6 – Access Ladder Details: Modified detail to show guardrail attachments as wall mounted on exterior face of existing parapet wall. Included requirement for corner return of guardrail assembly to ladder attachment posts at upper roof.

Modifications to Original Contract Documents:

SPECIFICATIONS:

A. Added text in modified original specification sections indicated by bolded and italicized fonts.
B. Deleted text in modified original specification sections indicated by strikethrough fonts.
C. The following original specification sections have been modified and are attached to this addendum:
    1. Section 000110 – Table of Contents: Modified to include referenced to added specification sections 014500 “Quality Control”, 051200 “Structural Steel Framing, and 075216 “SBS Modified Bituminous Membrane Roofing.”
    2. Section 011000 – Task Items: Modified Task Item 1.2, Fall Protection System to include requirements for wall mounted tieback anchors on lower roof. Modified Roofing Task Items to include provisions for alternate roofing system.
    3. Section 075213 – APP Modified Bituminous Membrane Roofing to include references for added alternate roofing system

WALTER P MOORE

Addendum 002

DRAWINGS:

A. Modified sections of the original drawing sheets are indicated by clouded callouts as shown on the attached drawings.
B. The following original drawing sheets have been modified and are attached to this addendum:
   1. Sheet S-0.0 – Cover, Site Map, Sheet Index, Task Items: Updated Sheet Index.
   2. Sheet S-2.2 – Roof Plan-Replacement: Modified conceptual locations of permanent fall protection guard rail and access ladder. Added wall anchor provisions and conceptual locations. Added requirements for liquid resin flashing at non-removable rooftop unit on upper roof.
   3. Sheets S-3.0, S-3.1, and S-3.2: Removed requirement for attachment of cover board to concrete structural deck.

Additions to Original Contract Documents:

SPECIFICATIONS:

A. The following original specification sections have been added and are attached to this addendum:
   1. Sections 014500 “Quality Control” and 051200 “Structural Steel Framing” for technical requirements for wall mounted tieback anchors on lower roof.
   2. Section 075216 – SBS Modified Bituminous Membrane Roofing added to include alternate roofing system for bidding purposes.

DRAWINGS:

A. The following original drawing sheets have been modified as indicated by cloud callouts and are attached to this addendum:
   1. Sheet S-3.5A – Conceptual Detail for Wall Mounted Connection at Permanent Fall Protection Guardrail System
   2. Sheet S-3.7 – Conceptual Detail for Fall Restraint Wall Mounted Tieback Assembly
   3. Sheet S-3.8 – Liquid Resin Flashing at Mechanical RTU Curb

See attached specifications and drawings for additional information.

Issued by: Walter P Moore and Associates

Walter P. Moore and Associates, Inc.
TBPE Firm Registration No. 1856

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Project Manager: Kimani Augustine, P.E.

ADDENDUM 002 ATTACHMENTS

SECTION 000110

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END OF SECTION 000110

SECTION 011000

TASK ITEMS

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section is for the convenience of the Contractor only and shall not be construed as a complete accounting of all work to be performed.

B. The extent of the Task Items is indicated on the drawings and by the requirements of each section of the specifications.

C. **Field Verification**: The Contractor shall examine the site and shall be responsible for verifying all existing construction, conditions, and dimensions. No extra payment will be considered for work additional to that shown or noted, if such work would have been apparent in an inspection of the premises.

D. **Coordination**: Coordinate the work throughout the duration of the project as to minimize disruption of facility operations.

a. As indicated in certain task items below which require Engineer review of existing conditions, provide Engineer minimum 7 working days notice to prevent delays to construction.

E. **Unit Price Work**: Several task items below include instructions for performing work per unit price. Contractor shall include in the Base Bid a cost for performing the number of units assumed in the Task Item. Contractor shall also provide an Add/Deduct cost for performing a single unit of the work. The Base Bid amount will be adjusted using this Add/Deduct cost according to actual work units completed.

PART 2 – PRODUCTS (See EXECUTION section)

PART 3 – EXECUTION

3.1 TASK ITEM (T.I.) – DESCRIPTION – **BASE BID**
UTHSCH CYF ROOFING REPAIRS

T.I. 1.1 PROJECT MOBILIZATION AND GENERAL CONDITIONS

A. Scope of Work

1. Work consists of coordinating, scheduling, obtaining and assembling at construction site all equipment, materials, permits, supplies, manpower and other essentials and incidentals necessary to perform Work.
2. Coordinate all aspects of work with Owner and all trades.
3. Provide protective measures in and around the building as directed by the Owner prior to beginning work. The Contractor shall take measures as necessary to keep access to the building free and clear of all hazards.
4. **Contractor is advised that the roof does not have OSHA compliant parapet walls or fall protection systems. Fall protection must be installed prior to performing any work on the roof and must remain in place for the duration of the repairs.**
5. Perform disruptive or noisy work during times indicated by Owner. Coordinate with Owner if weekend or evening hours are required.
6. Salvage existing material which has been indicated for reinstallation according to work items below. Store salvaged materials in clean, dry locations and protect from moisture, extreme temperatures, and direct sunlight.
7. Properly dispose of all debris and waste construction materials in accordance with all applicable laws and regulations.

B. Materials

1. Not Applicable.

C. Repair Drawings and Specifications

1. Not Applicable

T.I. 1.2 FALL PROTECTION SYSTEM

A. Scope of Work
1. Provide a railing system ***and wall mounted tieback anchor system*** that meets the performance requirements outlined in the specifications and drawings.
2. Install new railing system per OSHA requirements. See roof plans for locations.
3. Install new wall mounted anchor for fall restraint during <u>Roof Level work</u> at the lower roof.
4. Load test and certify new railing and tieback system to meet OSHA requirements.

B. Materials
1. See Specification Section “Roof Specialties” for material requirements.

C. Drawings and Specifications
1. Refer to Sheet S-2.2 for locations of work.
2. Refer to Sheets S-3.5, ***S3.5A, and S3.7*** for installation details and other requirements.
3. Refer to specification sections “Roof Specialties” and to General Notes and drawings for work requirements, performance requirements, materials, and procedures.

T.I. 2.1 DEMOLITION AND SUBSTRATE PREPARATION

A. Scope of Work

1. Work consists of coordinating, scheduling, obtaining and assembling at the construction site all equipment, materials, permits, supplies, manpower and other essentials and incidentals necessary to perform Work.

2. Coordinate all aspects of demolition work with Owner's Representative and all other trades.

3. Provide protective measures in and around the building as directed by the Owner's Representative prior to beginning roofing work. The building will be in use throughout the project with public traffic in and out continuously. The contractor shall take measures as necessary to keep access to the building free and clear of all hazards.

4. Interior Protection: Contractor is to include in their bid all costs and equipment required to protect interior of building from water infiltration and debris that could enter the building during this work. This includes plastic drape dust protection and protection of all interior finishes and furniture. The contractor shall clean all areas affected by any interior operations. Where curbs are being removed and existing openings filled in, provide protection in the area below the work area and coordinate the work with the facilities management so that personnel in affected areas can be notified.

5. Existing roofing system:
   a. Hot-applied asphalt built-up roofing membrane
   b. 1-1/2” polyisocyanurate insulation
   c. Hot-applied asphalt built-up vapor barrier
   d. Concrete structural roof, sloped to drains

6. Remove all existing roofing and insulation down to the concrete structural roof. Tear off all base flashings. Remove all existing wood and fiber cants at base of curbs and walls.

7. Remove obsolete roof penetrations and curbs identified on the roof plan or as otherwise directed by Owner or Engineer. Where curbs and supports are removed, patch or fill in the metal deck as required. Contractor shall coordinate equipment removal with the Owner. Contractor shall perform all necessary service disconnects and relocations as may be required.

8. Contractor shall inspect the condition of the concrete structural roof. Where spalling or other distress or deterioration of the concrete is observed, contact the Engineer immediately for review. **Do not proceed with roofing work until provided further direction in writing by Engineer.**

9. Remove and dispose of existing sheet metal.

10. Remove all debris from roof area and properly dispose of all materials off site.

11. At the end of each day, ensure that all drains are in proper working order and that drain lines are clear to the first elbow and downspouts are completely clear. Implement any required corrective measures before leaving the job site that day.

B. Materials

1. Not Applicable.

C. Drawings and Specifications

1. Refer to Sheet S-2.1 for location of work.

2. Refer to specification section “Selective Demolition” for work requirements, materials, and procedures.

T.I 3.2 DECK REPAIR/REPLACEMENT – PATCH CONCRETE DECK

A. Scope of Work

1. Work consists of repair and/or replacement of damaged, spalled, or otherwise deteriorated concrete roof deck.

2. Contractor shall locate and mark all work areas as specified in Section “Surface Preparation for Patching.” Marking will be done with methods approved by Engineer and Owner. Contractor shall identify all critical repair work areas before starting the work.

3. Procedure for delaminated, spalled, and unsound concrete removal shall be as specified in Section “Surface Preparation for Patching.”

4. All steel exposed within cavities shall be cleaned to bare metal by abrasive methods or other approved methods as specified in Section “Surface Preparation for Patching.”

5. Exposed wire mesh with concrete cover less than 1-inch shall be removed. Consult with Engineer prior to any removal of reinforcement.

6. Exposed steel shall be epoxy coated with an approved epoxy product as specified in Section “Surface Preparation for Patching.”

7. Contractor shall prepare cavities for repair placement as specified in Section “Surface Preparation for Patching.”

8. Patch installation procedures shall be in accordance with referenced specifications for selected material.

9. For bidding purposes, the contract price will include the following allowances for this task item repair, to be adjusted by unit costs listed in Owner's bid form:

   a. 100 SF

B. Materials

1. Epoxy coating material
2. Polymer modified cementitious patching mortar.

C. Drawings and Specifications

1. Refer to Detail 1/S-3.3 of Drawings for repair details.
2. Refer to specification sections "Surface Preparation for Patching" and "Concrete Repair Materials" for work requirements, materials, and procedures.

T.I. 5.1 CROSSOVER BRIDGES

A. Scope of Work

1. Work consists of the installation of new pre-engineered crossover bridge at elevated piping and mechanical equipment on the roof. Bridge shall be engineered to support the live load requirements provided on Sheet S-0.1 of the Drawings in accordance with all relevant codes and regulations.
2. New bridge shall be 6 feet wide minimum and provide a minimum of 4 inches clearance above the elevated piping and mechanical equipment at the location show on the Plan Sheets. Field verify all dimensions prior to fabrication/purchase of bridge.
3. Submit shop drawings or product data to Engineer for review prior to fabrication/purchase of bridges.
4. Bridge shall be pre-fabricated and all tubular members shall be capped and fully sealed prior to installation. Field welding shall not be allowed.
5. Install new bridges and anchors in compliance with all OSHA and ADA requirements. See plans for locations of work.
6. New bridge supports shall not penetrate into the roofing system. Install sacrificial cap sheet where new bridge supports will bear on new roofing membrane.

B. Materials

1. Metal bridge assembly shall be hot-dipped galvanized steel. Refer to General Notes on Sheet S-0.1 of Drawings.

C. Drawings and Specifications

1. Refer to Sheet S-2.2 for location of work.

T.I. 5.2 ACCESS LADDER

A. Scope of Work

1. Work consists of the installation of new pre-engineered access ladder at the transition between the upper and lower portions of the roof. The ladder shall be engineered to support the live load requirements provided on Sheet S-0.1 of the Drawings in accordance with all relevant codes and regulations.
2. New ladder shall comply with all OSHA and ANSI A14.3 requirements including but not limited to ladder widths, extension heights, rung spacing.
3. Submit shop drawings or product data to Engineer for review prior to fabrication/purchase of ladders.
4. Ladder shall be pre-fabricated and all tubular members shall be capped and fully sealed prior to installation. Field welding shall not be allowed.
5. Install sacrificial cap sheet where new ladder supports will bear on new roofing membrane (if applicable).

B. Materials

1. See Specification Section “Roof Specialties” for material requirements.

C. Drawings and Specifications

1. Refer to Sheet S-2.2 for location of work.
2. Refer to Sheet S-3.6 for installation details
3. Refer to specification sections “Roof Specialties” and to General Notes and drawings for work requirements, performance requirements, materials, and procedures.

T.I. 6.1 ROUGH CARPENTRY

A. Scope of Work

1. Work consists of installation of lumber nailers, sleepers, curbs, and edging as required for installation of new roofing system. For bidding purposes, assume 10% of all existing lumber will require replacement.
2. Install replacement nailers where deteriorated components were removed or new nailers as indicated by project details. Add nailers along roof edges to accommodate new insulation board.
3. Install new curbs and platforms as necessary to provide a minimum of 8 inch freeboard as required by the membrane manufacturer.

B. Materials

1. Lumber and plywood.
2. Fasteners, sealants, and other accessories.

C. Drawings and Specifications

1. Refer to Sheet S-2.2 for location of work.

2. Refer to Sheets S-3.0 through S-3.2 ***and S3.8*** for installation details.

3. Refer to specification section “Rough Carpentry” for work requirements, materials, and procedures.

T.I. 6.2 AIR BARRIER

A. Scope of Work

1. Work consists of installing an air barrier layer over the structural concrete roof slab.

2. Install a 120-mil APP ***smooth surfaced*** modified bitumen base sheet or a ***118 mil*** **average** ***SBS smooth surfaced*** modified bitumen base sheet over the concrete structural deck and walls in accordance with the membrane manufacturer’s instructions. Nominal sheets will not be acceptable. Fully adhere in cold adhesive or, if acceptable to Owner, air barrier may be torch applied. Electric heat weld all seams.

6. Cover board and base sheet attachment to substrate shall be designed to resist the following wind uplift pressures based on ASCE 7:
   a. Interior (Zone 1): - 20 psf
   b. Edge (Zone 2): - 24 psf
   c. Corner (Zone 3): - 24 psf
   d. Perimeter and Corner width is 6-feet

3. Seal base sheet at all penetrations, edges, and terminations to form a continuous air barrier layer.

B. Materials

1. 1/2-inch thick cover board.

2. Air barrier membrane.

3. Fasteners, adhesives, and other accessories.

C. Drawings and Specifications

1. Refer to Sheets S-2.0 and S-2.2 for location of work.

2. Refer to Sheets S-3.0 through S-3.2 ***and S3.8*** for installation details.

3. Refer to specification sections “APP Modified Bituminous Membrane Roofing” and ***“SBS Modified Bituminous Membrane Roofing”*** for work requirements, materials, and procedures.

T.I. 7.1 ROOFING INSULATION – FLAT POLYISO WITH COVER BOARD

A. Scope of Work

1. Work consists of providing flat polyisocyanurate insulation for insulating purposes and to introduce slope for positive drainage.

2. Install two continuous layers of polyisocyanurate insulation. Stagger joints between layers of insulation.

a. Fully adhere all layers of insulation.

3. Install 1/2-inch thick cover board on top of new insulation. Fully adhere in cold adhesive to substrate.

4. Install tapered insulation crickets at:
   a. The high side of the rooftop curbs.
   b. Other areas as indicated on the project plans.

6. Insulation attachment to substrate shall be designed to resist the following wind uplift pressures based on ASCE 7:
   a. Interior (Zone 1): - 20 psf
   b. Edge (Zone 2): - 24 psf
   c. Corner (Zone 3): - 24 psf
   d. Perimeter and Corner width is 6-feet

7. Provide tapered sumps to the drains.

B. Materials

1. Flat polyisocyanurate insulation board.

2. Tapered polyisocyanurate insulation board for crickets.

3. 1/2-inch thick cover board.

4. Fasteners, adhesives, and other accessories.

C. Drawings and Specifications

1. Refer to Sheet S-2.2 for location of work.

2. Refer to Sheets S-3.0 through S-3.2 ***and S3.8*** for installation details.

3. Refer to specification section “APP Modified Bituminous Membrane Roofing” and ***“SBS Modified Bituminous Membrane Roofing”*** for work requirements, materials, and procedures.

T.I. 7.2 LOW SLOPE ROOFING MEMBRANE – 2-PLY APP MODIFIED BITUMEN

A. Scope of Work

1. Work consists of installation of a 2-ply APP ***/ SBS*** modified bitumen roofing membrane, all membrane flashings, and other accessories.

2. Install a 120-mil ***APP*** modified bitumen base sheet ***or a 118 mil average SBS smooth surfaced*** on top of the cover board substrate in accordance with the membrane manufacturer’s instructions. Nominal sheets will not be acceptable. Fully adhere in cold adhesive. Electric heat weld all seams.

3. Install a 140-mil ***APP*** modified bitumen highly reflective cap sheet or a ***130-mil average SBS modified bitumen highly reflective cap sheet*** in accordance with the membrane manufacturer’s instructions. Nominal sheets will not be acceptable. Fully adhere in cold adhesive to substrate. Electric heat-weld all seams.

Cap sheet shall meet the following cool roofing requirements:
Minimum initial total solar reflectance: 0.70
Minimum initial thermal emittance: 0.75

4. Install base flashing per manufacturer's specifications.

5. Install sacrificial sheet membrane under all pipe, duct, and conduit supports.

6. Where indicated, install liquid resin flashing around penetrations. Apply a primer, a two part resin, woven fleece membrane and a second coat of the two part resin.

7. Install walkway pad and/or sacrificial caps sheets at areas indicated.

8. Membrane attachment to substrate shall be designed to resist the following wind uplift pressures based on ASCE 7-05:
   a. Interior (Zone 1): - 20 psf
   b. Edge (Zone 2): - 24 psf
   c. Corner (Zone 3): - 24 psf
   d. Perimeter and Corner width is 6-feet

B. Materials

1. Modified bitumen base and cap sheets.
2. Base flashings, adhesive, sealants, fasteners, and other accessories.

C. Drawings and Specifications

1. Refer to Sheets S-2.0 and S-2.2 for location of work.
2. Refer to Sheets S-3.0 through S-3.2 ***and S3.8*** for installation details.
3. Refer to specification section "APP Modified Bituminous Membrane Roofing" and ***"SBS Modified Bituminous Membrane Roofing"*** for roofing system performance requirements, work requirements, materials, and procedures.

T.I. 7.3 FLASHING AND SHEET METAL TRIM

A. Scope of Work

1. Work consists of installation of all sheet metal flashing and trim as indicated on project drawings and specifications.
2. Install new edge metal and flashing.
3. Install new counter-flashings.
4. Install new metal pitch pans, filler and collars. Bonnets shall be installed on all pitch pans.
5. Install new continuous sheet metal caps for all new curbs. Provide a minimum vertical lip of 4" on the cap.

6. Install new formed metal flashings at flues, pipes, etc.
7. Install new soil pipe lead flashings.
8. Install reinforced resin flashing where indicated.
9. Provide gooseneck hoods at all HVAC line penetrations to eliminate gang pitch pans. All hoods shall extend above the finished roof system a minimum of 8".
10. Provide all necessary sealants, sealant tapes, and fasteners to ensure a watertight installation.

B. Materials

1. Base flashings, adhesive, sealants, fasteners, and other accessories.
2. Prefinished sheet metal flashing and trim. Color shall be per Owner's selection from Manufacturer's standard colors.
3. Stainless steel sheet metal flashing and trim.

C. Drawings and Specifications

1. Refer to Sheet S-2.2 for location of work.
2. Refer to Sheets S-3.0 through S-3.2 ***and S3.8*** for installation details.
3. Refer to specification section "APP Modified Bituminous Membrane Roofing," ***"SBS Modified Bituminous Membrane Roofing,"*** and "Flashing and Sheet Metal Trim" for work requirements, materials, and procedures.

T.I. 7.4 ROOFING SYSTEM WARRANTY

A. Scope of Work

1. Work consists of providing a manufacturer and contractor warranties for new roofing system.
2. Provide a 20 Year "Roof System/Labor Guaranty" material and labor warranty for the new roofing system, including the membrane, insulation, overlay board, and other accessories.
3. Warranty shall be the shared responsibility of the Roofing Contractor and the Roofing Membrane Manufacturer for the first **five (5)** years. The contactor shall provide a standard NRCA warranty form.
4. The Contractor shall make all necessary notices for warranty purposes to the primary roofing manufacturer, to secure timely inspections and issuance of the warranty.

B. Materials

1. Not applicable.

C. Drawings and Specifications

1. Refer to Sheet S-2.2 for location of work.

2. Refer to specification section “APP Modified Bituminous Membrane Roofing,” ***“SBS Modified Bituminous Membrane Roofing,”*** and “Product Warranties” for work requirements, materials, and procedures.

T.I. 7.5 JOINT SEALANT REPLACEMENT

A. Scope of Work

1. Work consists of removal and replacement of sealant joints.
2. Remove existing sealant from joints.
3. All joints shall be thoroughly cleaned by either abrasive methods or grinding to remove all laitance, unsound substrate, and curing compounds which may interfere with adhesion. Joint shall be air blasted to remove remaining debris.
4. Prime joint surfaces as needed.
5. Install backer rod or bond breaker in strict accordance with manufacturer’s instructions.
6. Install sealant with concave profile and overall dimensions to conform with manufacturer’s recommendations for best practice for sealant installation.
7. Do not allow sealant to ooze or sag.
8. Where double sealant joints are indicated, allow the inner sealant joint to fully cure before installation of the outer sealant joint.

B. Materials

1. Joint sealants shall be as specified in Specification Section “Joint Sealants.”

C. Repair Drawings and Specifications

1. Refer to Sheets S2.2**, S3.5A, and S3.7** for locatiosn of work.
2. Refer to 2/S-3.3 for repair details.
3. Refer to Specification Section “Joint Sealants” for work requirements, materials, and procedures.

T.I. 22.1 PLUMBING WORK

A. Scope of Work

1. Work consists of cleaning existing drain lines, repairing damaged drains, and other drain related work items.
2. Clean and rod out all drains.
3. **Check drain bowl to deck connection to ensure watertight connection prior to roofing tear-off.** Check drain bowl to interior downspout connection to ensure watertight connection prior to roofing tear-off. Contact Engineer prior to roofing tear-off if existing interior drain connections may lead to interior water leakage.
4. Reuse existing drain bowls and deck plates. Reuse existing clamping rings, fasteners, and strainers. Report missing or damaged drain bowls and clamping rings to the Engineer. Clean and coat steel if required.

5. Install new metal strainers at all drains where strainer is missing or damaged.

6. Install piping extensions as required to raise curbs, vents, stacks, and soil pipes to a minimum of 8-inches above the finished roof surface.

7. Install new pipe supports on top of new roofing membrane with sacrificial pad.

B. Materials

1. Roof drain strainer; Contractor to submit product.

2. Anti-corrosion coating for drain bowl.

3. Piping extensions and accessories, as needed; Contractor to submit products.

C. Drawings and Specifications

1. Refer to Sheet S-2.2 for location of work.

T.I. 23.1 MECHANICAL WORK

A. Scope of Work

1. Work consists of raising equipment curbs, conduits, gas lines, ducts, and pipes to accommodate and protect new roofing system.

2. Remove abandoned curbs and rooftop equipment as indicated in project drawings.

3. Raise all curbs and platforms to a minimum of 8 inches or as indicated in project details above the finished roof surface and flash over the tops of the curbs to install proper counter-flashing.

4. Raise all gas lines as necessary to provide 8 inches clearance above finished roofing for new insulation thicknesses.

5. Install new gas line supports on top of new roofing membrane with sacrificial pad.

B. Materials

1. Pipe supports, fasteners, and other accessories, as needed.

C. Drawings and Specifications

1. Refer to Sheet S-2.2 for location of work.

T.I. 26.1 ELECTRICAL WORK

A. Scope of Work

1. Work consists of removing and reinstalling conduits, wiring, cameras, lights, and other electrical work (except the existing lightning protection system) during installation of new roofing system.

2. All electrical work shall be performed by a licensed and experienced

electrician and shall be performed according to current code.

3. Raise existing electrical conduit to a minimum of 8 inches above the finished roof surface. Provide extensions of services to allow for goosenecks to be installed.

4. Install new conduit supports on top of new roofing membrane with sacrificial pads of modified bitumen cap sheet.

B. Materials

1. Conduit supports, fasteners, and other accessories, as needed.

C. Drawings and Specifications

1. Refer to Sheet S-2.2 for location of work.

END OF SECTION 011000

SECTION 014500

QUALITY CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for quality control services.

B. Quality control services include inspections, tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by Engineer.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.

D. Related Sections: Following Sections contain requirements that relate to this Section:

1. Division 01 Section "Cutting and Patching" specifies requirements for repair and restoration of construction disturbed by inspection and testing activities.
2. Division 01 Section "Submittal Procedures" specifies requirements for development of a schedule of required tests and inspections.

1.3 RESPONSIBILITIES

A. Contractor Responsibilities:

1. Retesting: Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.

a. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.

2. Associated Services: Cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:

a. Provide access to the Work.

b. Furnish incidental labor and facilities necessary to facilitate inspections and tests.

B. Owner Responsibilities: Owner will provide inspections, tests and similar quality control services specified to be performed by independent agencies and not by the Contractor, except where they are specifically indicated as the Contractor's responsibility or are provided by another identified entity. Costs for these services are not included in the Contract Sum.

1. Owner will employ and pay for the services of an independent agency, testing laboratory or other qualified firm to perform services which are the Owner's responsibility.

C. Coordination: Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. Contractor is responsible for scheduling times for inspections, tests and similar activities.

1.4 SUBMITTALS

A. Testing Agency shall submit a certified written report of each inspection, test or similar service, to Engineer, in duplicate, unless Contractor is responsible for the service. If Contractor is responsible for the service, submit a certified written report of each inspection, test or similar service through the Contractor, in duplicate.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
2. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:

a. Date of issue.
b. Project title and number.
c. Name, address and telephone number of testing agency.
d. Dates and locations of tests or inspections.
e. Names of individuals making the inspection or test.
f. Designation of the Work and test method.
g. Identification of product and Specification Section.
h. Complete inspection or test data.
i. Test results and interpretations of test results.
j. Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements.
k. Name and signature of laboratory inspector.
l. Recommendations on retesting.

1.5 QUALITY ASSURANCE

A. Qualification for Testing Agencies: Engage testing agencies, including independent testing laboratories, which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

1. Each independent testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in Texas.

PART 2 - PRODUCTS (NOT APPLICABLE).

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes. Comply with Contract Document requirements.

B. Protect construction exposed by or for quality control service activities, and protect repaired construction.

C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION 014500

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

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 work of this section.

1.2 SUMMARY

A. Section includes labor, materials, services, equipment, and appliances required in conjunction with or related to the furnishing, fabrication, delivery, and erection of all structural steel, as defined below. Include all supplementary parts, members, and connections necessary to complete the structural steel work, regardless of whether all such items specifically are shown or specified on the drawings. Miscellaneous metal fabrications, metal ramps and ladders, handrails are specified in Section 07 71 00, “Roof Specialties.”

B. Related Requirements:

1. Specification 01 45 00 “Quality Control” for requirements of material testing and inspection.

1.3 PRICE AND PAYMENT PROCEDURES

A. Alternates: Substitutions for the member sizes, type(s) of steel connection details, or any other modifications proposed will be considered by the Engineer only under the following conditions:

1. The request has been made and accepted prior to the submission of shop drawings. All substitutions shall be marked clearly and indicated on the shop drawings as a substitute.
2. There is a substantial cost advantage or time advantage to the Owner or that the proposed revision is necessary to obtain the required materials or methods at the proper times to accomplish the work in the time scheduled.
3. Sufficient sketches, engineering calculations, and other data have been submitted to facilitate checking by the Engineer, including cost reductions or savings in time to complete the work.
4. In no case shall such substitutions result in additional cost to the Owner.

1.4 REFERENCES

A. Definitions:
1. Professional Engineer: A professional engineer who is licensed to practice engineering in the state where the project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for projects with structural steel framing that are similar to that indicated for this Project in material.
2. Shop Drawings: Drawings of the individual structural steel shipping pieces that are to be produced in the fabrication shop.

3. Structural Steel: Structural steel shall be defined as that work prescribed in Section 2.1 of AISC 303.

B. Reference Standards:

1. Codes and Standards: Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified.

a. All federal (OSHA), state, and local laws that govern safety requirements for steel erection and other requirements if more stringent than the codes and standards enumerated below. OSHA requirements include regulation 29 CFG 1926, Part R, “Safety Standard for Steel Erection”.
b. AISC, “Steel Construction Manual.”
c. AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," except as noted herein.

1) Certain sections in this specification contain requirements that are more restrictive and/or different than contained in this standard. In such cases, the requirements of this specification shall control.
d. ANSI/AISC 360, “Specification for Structural Steel Buildings.”
e. ANSI/AWS D1.1, "Structural Welding Code – Steel.”
f. ANSI/AWS D1.3, "Structural Welding Code – Sheet Steel.”
g. The Society of Protective Coatings, "SSPC Painting Manual", Volumes 1 and 2.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Quality Control:

a. The Contractor is responsible for quality control, including workmanship and materials furnished by his subcontractors and suppliers.
b. The Contractor shall coordinate the fabrication and installation of all structural steel work with the work of other trades.
c. The Fabricator alone shall be responsible for all errors of detailing, fabrication, and for the correct fitting of the structural members.

2. Document Conflict and Precedence:

a. In case of conflict among the structural drawings and specifications, notify Engineer prior to submitting proposal. In case of conflict between and/or among the structural drawings and specifications, the strictest interpretation shall govern, unless specified otherwise in writing by the Engineer.

b. Questions about Contract Documents: The Contractor shall notify promptly the Engineer whenever design of members and connections for any portion of the structure are not indicated clearly or when other questions exist about the Contract Documents. Such questions shall be resolved prior to the submission of shop drawings.

3. Materials and installed work may require testing and retesting, as directed by the governing building code or the Engineer, at any time during progress of work.

a. The Contractor shall provide adequate notification to the Owner's Testing Agency of construction operation including the project schedule to allow the Testing Agency to schedule inspections. Failure to notify sufficiently may result in additional costs incurred by the Testing Laboratory that may be back-charge to the Contractor by the Owner.
b. The Contractor shall cooperate with laboratory personnel, provide access to the work, and provide access to manufacturer's operations.
c. The Contractor shall cooperate with the Owner's Testing Laboratory when Arbitration Testing and Inspection is called for due to a disagreement regarding the tension in installed bolts that have been inspected according to the Testing and Inspection portion of this specification section.
d. The Contractor shall make adequate arrangement with the Owner's Testing Agency for inspection of material stockpiles and facilities.
e. The Contractor shall provide to the laboratory certificates and representative samples of materials proposed for use in the work in quantities sufficient for accurate testing as specified.
f. The Contractor shall furnish labor, equipment, and facilities as required for sampling and testing by the laboratory and other facilitate the required inspections and test.
g. Inspection or testing by the Owner does not relieve the Contractor of his responsibility to perform the Work in accordance with the Contract Documents. Test not specifically indicated to be done at the Owner's expense, including retesting of rejected materials and installed work, shall be done at the Contractor's expense. See the Testing and Inspection portion of this specification section.

B. Preinstallation Meetings:

1. At least 14 days prior to beginning structural steel erection, the Contractor shall hold a meeting to review the detailed quality control and construction requirements and to determine the procedures for producing proper structural steel construction. Also, review requirements for submittals, status of coordinated work, and availability of materials. Establish work progress schedule and procedures for materials inspection, testing, and certification.
2. The Contractor shall require responsible representatives of every party who is concerned with the structural steel work to attend the conference, including, but not limited to, the following:

    a. Contractor's Superintendent.
    b. Laboratory responsible for field quality control.
    c. Special Inspector or Laboratory responsible for shop inspection or testing.
    d. Structural steel fabricator.
    e. Owner's and Engineer's Representative.
    f. Engineer.

3. Minutes of the meeting shall be record, typed, and printed by the contractor and distributed to all parties concerned within five days of the meeting. One copy of the minutes shall be transmitted to the following for information purposes:

    a. Owner's Representative.
    b. Engineer.

4. The Engineer shall be present at the conference. The Contractor shall notify the Engineer at least seven days prior to the scheduled date of the conference.

1.6 SUBMITTALS

A. Product Data: Submit producer's or manufacturer's specifications and installation instructions for following products to show compliance with specifications, including the specified standards):

1. Shrinkage-Resistant Grout.
2. Welding Electrodes.
3. Structural Steel Primer Paint.

B. Shop Drawings:
1. Detailed Shop Drawings: Submit drawings showing complete details and schedules for fabrication and assembly of structural steel members for fall protection systems. Drawings shall include the following minimum information:

a. Details of cuts, connections, holes, and other pertinent data.
b. Indication of welds by standard AWS symbols, and show size, length, and type of each weld.
c. Indication of type, size, and length of bolts, distinguishing between shop and field bolts. Identify the type of high-strength bolted connection (slip-critical, direct-tension, or bearing connections).
d. Connection material specification and sizes.
e. Joints or groups of joints in which a specific assembly order, welding sequence, welding technique, or other special precautions are required.
f. Holes, flange cuts, slots, and openings shall be made as required by the structural drawings, all of which shall be properly located by means of templates.
g. Setting drawings, templates, and directions for installation of anchor rods and other anchorages to be installed by others.
h. Non-Destructive Testing (NDT) to be performed by the Fabricator, if any.
i. A letter sealed by the Fabricator's Professional Engineer responsible for the design of any of the connections shown on the shop drawings attesting that the engineer has reviewed the shop drawings and that the connections detailed and shown on the shop drawings conform to the engineer's design.

2. All drawings submitted for review shall have blank space for a 2" high and 3.5" wide shop drawing stamp of the Engineer as part of the title block

C. Samples:

D. Certificates:

1. Structural Steel: Submit for each type.

E. Delegated Design Submittals:
1. Connection Design Submittals: The Fabricator's licensed professional engineer shall submit complete design calculations show all information as specified in the "Connections" section under Part 2. The Engineer reserves the right to reject all shop drawings submitted without complete design calculations.
2. Connection Design Validation Letter: The Fabricator's licensed professional engineer responsible for the design of any of the connections shown on the shop drawings shall submit a letter that is sealed attesting that the connection design engineer has reviewed the shop drawings and that the connections detailed and shown on the shop drawings conform to the engineer's design.

F. Qualification Statements:

1. Submit qualification data, including required certifications, for firms and persons specified in the “Qualifications” section under Part 1, to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
2. Submit a resume from the structural steel detailer showing a minimum of two years of experience selecting or completing structural steel connection details using information found in tables in the AISC “Steel Construction Manual”.
3. Submit Welding Procedure Specifications (WPS) in accordance with ANSI/AWS D1.1 for all welded joints. Submit test reports showing successful passage of qualification tests for all non-prequalified WPSs.
4. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests as specified in the “Qualifications” section under Part 1. If recertification of welders is required, retesting will be at Contractor's responsibility.
5. A fabricator that is registered with the local building official and is approved to perform fabrication without special inspection shall submit a certificate of compliance stating that the work was performed in accordance with the approved construction documents.

G. Record Documentation:

H. Minutes of Preinstallation Meeting: Submit for review.

1.7 QUALITY ASSURANCE

A. Scope of Work:

1. Contract Obligations:

a. Owner Responsibility: The Owner shall pay for initial shop and field inspections and tests as required during the fabrication and erection of the structural steel.
b. Testing Laboratory Responsibility: The inspection by the Testing Laboratory of the Fabricator’s work shall be in sequence, timely, and performed in such a manner so that corrections can be made without delaying the progress of the work. Inspections shall be performed by qualified technicians with a minimum of two years of experience in structural steel testing and inspection. Refer to “Qualifications of Welding Inspectors” Paragraph below. The Testing Laboratory shall provide test reports of inspections. All test reports shall indicate types and locations of defects found during inspection, the measures required and performed to correct such defects, statements of final approval of welding and bolting of shop and field connections, and other fabrication and erection data pertinent to the safe and proper welding and bolting of shop and field connections. Weld inspection reports shall be signed by an inspector with current certification as an AWS Certified Welding Inspector (CWI). In addition to the parties listed in this Specification the Fabricator and Erector shall receive copies of the test reports.
c. Rejection of Material or Workmanship: The Owner, Engineer, and Testing Laboratory reserve the right to reject any material or workmanship not in conformance with the Contract Documents at any time during the progress of the work. However, this provision does not allow waiving the obligation for timely, in sequence inspections.

B. Testing Laboratory Requirements: The Owner’s Testing Laboratory shall:

1. Verify the fabrication shop’s certification from AISC.

2. Verify that the fabricator's fabrication and quality control procedures provide a sound basis for inspection control of workmanship and of the ability to conform to construction documents and industry standards. Review the procedures for completeness and adequacy relative to code requirements for the fabricator's finished product.
3. Review field welder qualifications by certification or verify by retesting. Obtain welder certificates.

C. Qualifications:

1. Fabricator:
   a. The structural steel fabricator shall have not less than five years of experience in the successful fabrication of structural steel similar to this project.
   b. The structural steel fabricator must participate in the AISC Quality Certification Program and be designated an AISC Certified Plant in Category STD, Standard for Steel Building Structures.
   c. The structural steel fabricator must be registered and approved by the local building official to perform fabrication work without special inspection. Should the fabricator not be so approved, the fabricator shall reimburse the Owner for the cost of the special inspections required by the local building official.

2. Detailer:

   a. The structural steel detailer shall have not less than five years of experience in the successful detailing of structural steel similar to this project including experience in selecting or completing structural steel connection details using information found in tables in the AISC "Steel Construction Manual.
   b. The structural steel detailer firm shall be certified under the Quality Procedures Program of the National Institute of Steel Detailing. The project shall be detailed by qualified structural steel detailers who are either personally certified under the National Institute of Steel Detailing as a Class I or Class II Detailer in the Structural/Miscellaneous discipline or are supervised by a detailer certified as a Class I Senior Detailer in the Structural/Miscellaneous discipline.

3. Installer:

   a. The structural steel installer shall have not less than two years of successful experience in the erection of structural steel of a similar nature to this project.

4. Welding Qualifications: Qualify welding processes and welding operators in accordance with AWS "Structural Welding Code – Steel". Professional Engineer:

   a. The Professional Engineer employed by the Fabricator for connection design shall be experienced in the specific area of structural steel connection design with demonstrated experience of not less than three projects of similar scope and complexity.

5. The requirement to have a Independent Testing Laboratory:

   a. Any testing laboratory retained to perform tests that are required by this specification shall meet the basic requirements of ASTM E 329 and shall submit to the Owner, and Engineer evidence of current accreditation from the American Association for Laboratory Accreditation, the AASTHO Accreditation Program or the "NIST" National Voluntary Laboratory Accreditation Program.

b. The Testing Laboratory shall be an Approved Agency by the Building Official to perform Special Inspections and other tests and inspections as outlined in the applicable building code.
c. Tests and inspections shall be conducted in accordance with specified requirements, and if not specified, in accordance with the applicable standards of the American Society for Testing and Materials or other recognized and accepted authorities in the field.
d. Qualification of Welding Inspectors:

1) Inspectors performing visual weld inspection shall meet the requirements of AWS D1.1 Section 6.1.4. Inspectors shall have current certification as an AWS Certified Welding Inspector (CWI). Assistant inspectors, if any, shall be supervised by an Inspector and shall be qualified by training and experience to perform the specific functions to which they are assigned.
2) Inspectors performing nondestructive examinations of welds other than visual inspection (MT, PT, UT, and RT) shall meet the requirements of AWS D1.1, Section 6.14.6.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.

B. Deliver anchor rods and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time so as not to delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration. Do not store materials on structure in a manner that might exceed allowable loads on or cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed by Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel:

1. All hot rolled steel plates, shapes, and bars shall be new steel conforming to ASTM A 6.
2. Comply with the provisions of the following ASTM Specifications as appropriate for the grades and types, and at the locations as specified on the drawings:
a. Structural Steel Plates and Bars: Carbon Steel, ASTM A 36.

B. Electrodes for Welding:

1. Provide electrodes that comply with AWS D1.1, "Structural Welding Code - Steel" and that can produce welds that have a minimum Charpy V-notch toughness of 20 ft-lbs at 40° F, unless noted otherwise in these specifications or on the drawings.
2. Electrodes for various welding processes shall be as specified below:

a. SMAW:

1) E70XX low hydrogen.

b. SAW:

1) F7X-EXXX.

c. GMAW:

1) ER70S-X.

d. FCAW:

1) E7XT-X.

3. Weathering Steel Electrodes shall conform to Table 3.3 of the ANSI/AWS D1.1 Manual.
4. Electrodes shall be compatible with parent metal joined.

C. Hot-Dip Galvanizing:

1. Scope: All structural steel items and their connections permanently exposed to exterior conditions or that are within areas of unconditioned airspace, whether specified on the drawings or not, shall be hot-dip galvanized after fabrication.
2. Surface Preparation: All steel to be hot-dip galvanized shall undergo the following surface preparation as specified by the Society for Protective Coatings (SSPC), Volume 2.

   a. Remove all grease, oil, grime and foreign contaminants by thorough cleaning with an alkaline or organic solvent followed by thorough rinsing in cold water.
   b. Remove scale by pickling in diluted sulfuric or hydrochloric acid. Pickling shall be followed by a rinse in warm water and a second rinse in cold water. As an alternative to pickling, the steel may be white metal blast cleaned according to SSPC-SP-5.
   c. Dip in a flux solution of zinc ammonia chloride followed by drying at room temperature.

3. Zinc Coating: The zinc coating for steel shapes and plates shall conform to ASTM A 123. Weight of zinc coating per square foot of surface for 1/8 inch and 3/16 inch thick steels shall average not less than 3.0 mils with no individual thickness less than 2.6 mils. The coating weight shall average not less than 3.9 mils for 1/4" thick and heavier steel with no individual thickness less than 3.3 mils.

2.2 FABRICATION

A. Structural steel members for which shop drawings have not been reviewed shall not be fabricated. Any steel detailed or fabricated prior to the Initial Survey from Part 3 below is at contractor's risk.

B. The omission from the shop drawings of any materials required by the Contract Documents shall not relieve the Contractor of the responsibility of furnishing and installing such materials, even though the shop drawings may have been reviewed.

C. Shop Fabrication and Assembly:

1. Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specification and as indicated on approved final shop drawings. Provide camber in structural members where indicated.
2. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

3. Clearly mark the grade of steel on each piece, distinguishable in the field from floor surfaces, for purpose of field inspection and confirmation of grade of steel.

D. Dimensional Tolerances: Dimensional tolerances of fabricated structural steel shall conform to Section 6.4 of the AISC Code of Standard Practice.

E. Cutting: Manual oxygen cutting shall be done only with a mechanically guided torch. An unguided torch may be used provided the cut is not within 1/8 inch of the finished dimension and final removal is completed by means such as chipping or grinding to produce a smooth surface quality free of notches or jagged edges. All corners shall be smooth and rounded to a minimum 1/2" radius.

2.3 WELDING

A. Code: All shop and field welding shall conform to all requirements in the "Structural Welding Code – Steel", ANSI/AWS D1.1, as published by the American Welding Society (AWSWelder certifications never expire unless the welder has not welded for more than 6 months or there is a specific reason to question a welder's ability. For complicated welding jobs, consider requiring requalification if certification is over two years old. Requalification testing should be at contractor's expense.

B. Welder Certification: All shop and field welders shall be certified according to all the applicable AWS procedures for the welding process and welding position used. Each welder shall be assigned an identifying symbol or mark and all shop and field welded connections containing complete or partial joint penetration welds, multi-pass fillet welds, and fillet welds greater than 5/16” shall be identified by the symbol or mark of the welder responsible for the connection.

C. Minimum Size and Strength:

1. Fillet Welds: Minimum size of fillet welds shall be as specified in Table J2.4 in AISC Specification, Chapter J.
2. Minimum Strength of Welded Connections: Except as specified below in "Connections" or noted otherwise on the drawings, all shop and field welds shall develop the full tensile strength of the member or element joined. All members with moment connections as indicated on the drawings shall be welded to develop the full flexural capacity of the member, unless noted otherwise on the drawings.

D. Filler Metal Requirements: Weld metal shall be as specified in Table J2.5 in AISC Specification, Chapter J and other requirements of this specification.

E. Welding Procedure Specification:

1. All welding shall be performed in accordance with a Welding Procedure Specification (WPS) as required in AWS D1.1 and reviewed by the Owner’s Testing Laboratory and by the Engineer. The WPS variables shall be within the parameters established by the filler-metal manufacturer. Engage the services of an independent Testing Laboratory to provide the qualification testing required by AWS D 1.1, Chapter 4, part B to qualify any non-prequalified WPS needed for the project. The independent Testing Laboratory shall prepare Welding Procedure Qualification Records (WPQR) documenting the successful qualification of each Welding Procedure Specification.

F. Welding Procedures:

1. All welding processes shall comply with the requirements of ANSI/AWS D1.1 unless noted otherwise.

2.4 CONNECTIONS

A. Conceptual connection details with the required member design forces are shown on the drawings for bidding purposes and are applicable to all connections not designed and completely detailed on the drawings. The conceptual details are provided only to indicate the connection type required and may not fully represent the complexity of the connection as required by the final connection design for the forces they must resist. Except as noted below, the Fabricator is responsible for engaging the services of a professional engineer to prepare a final connection design for submission that meets the requirements of the conceptual connection details and resists the indicated design forces. Refer to the drawings and specifications for complete requirements.

2.5 SOURCE QUALITY CONTROL

A. The Testing Laboratory shall provide the following tests at the designated fabrication shops:

1. Test welds completed in the shop according to “Weld Testing” Paragraph below.

B. Source Inspection: The Testing Laboratory shall provide the following inspections at the designated fabrication shops:

1. Shop Inspection Waiver: The requirement to perform fabricating shop inspections may be waived if the Fabricator produces evidence from the Building Official of being a registered, approved fabricating shop and if allowed by the Engineer.
2. An initial shop inspection prior to the start of any fabricating work shall be made to accomplish the following:

    a. Perform tasks outlined in “Weld Inspection and Process Monitoring” Paragraph below when shop welding is to be performed.
    b. Perform tasks outlined in “High-Strength Bolt Inspection and Process Monitoring” The following section is to be included when Special Inspections according to IBC 2006 is required and there are the types of welding or bolting that triggers continuous monitoring of the process that are anticipated to be done in the shop. Keep for most Florida projects with a substantial amount of steel fabrication.

3. Process Monitoring:

    a. Provide continuous or periodic monitoring of welding as described in “Weld Inspection and Process Monitoring” Paragraph below.
    b. Provide continuous or periodic monitoring of bolting as described in “High-Strength Bolt Inspection and Process Monitoring” Paragraph below of high-strength bolt installation in pre-tensioned or slip-critical joints using turn-of-the-nut without matchmarking or calibrated wrench method of bolt installation.
    c. Provide periodic verification of specified camber of steel beams.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspection Prior to Fall Protection Installation: Installer shall examine areas and conditions under which structural steel work is to be installed and notify the Contractor and the Engineer in writing of conditions detrimental to proper and timely completion of the work.

3.2 PREPARATION

A. Field Modifications to Structural Steel: Errors in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and structural fitting of parts shall be reported immediately to the Engineer, and approval of the method of correction shall be obtained. Approved corrections shall be made at no additional cost to the Owner. Do not use cutting torches, reamers, or other devices in the field for unauthorized correction of fabrication errors.

B. Clean Up: Clean up all debris caused by the Work of this Section, keeping the premises neat and clean at all times.

3.3 FIELD QUALITY CONTROL

A. Field Testing: The Testing Laboratory shall provide the following tests in the field:

1. Test welds completed in the field according to “Weld Testing” Paragraph below.

B. Field Inspection: The Testing Laboratory shall provide the following inspections in the field:
1. Provide continuous or periodic monitoring of field welding as described in “Weld Inspection and Process Monitoring” Paragraph below.
2. Inspect welded or bolted connections that were completed, but not inspected, in the shop. Perform inspections according to “Weld Inspection and Process Monitoring” Paragraph below and/or “High-Strength Bolt Inspection and Process Monitoring” Paragraph below as appropriate.
3. Endeavor to guard the Owner against the Contractor cutting, grinding, reaming, or making any other field modification to structural steel without the prior approval of the Engineer. Report any noted unauthorized modifications to the Owner and Engineer.

C. Weld Inspection and Process Monitoring: The Testing Laboratory shall make the following inspections of the welds and welding processes. Welds performed in the fabricating shop may be inspected in the field unless continuous monitoring of the welding process is herein specified or if access in the field due to other work or shop finishes makes field inspection impractical:

1. Approve Welding Procedure Specifications submitted by the Contractor. Approve any changes submitted by the Contractor to any WPS that has already been approved. Obtain the Welding Procedure Qualification Record (WPQR) for each successful WPS qualification.
2. Periodically verify welding electrodes to be used and other welding consumables as the job progresses.
3. Periodically observe joint preparation, assembly practice, welding techniques including preheating and sequence, and the performance of welders with sufficient frequency to assure compliance with code and contract document requirements. Check preheating to

assure conformance with AWS D1.1, Section 5.6. Verify procedure for control of distortion and shrinkage stresses.

4. Continuously observe joint preparation and fit up, backing strips, and runout plates for welded moment connections and column splices.
5. Periodically provide visual inspection of the root pass of partial and complete joint penetration welds.
6. Visually inspect 100 % of welds for proper size, length, location, and weld quality in accordance with AWS D1.1 requirements. Unless specifically noted otherwise, all welding shall be considered statically loaded nontubular connections.
7. In addition to the inspections above, perform the following:

    a. Continuously monitor and observe joint preparation, assembly practice, welding techniques including preheating and sequence, and the performance of welders for 100% of complete and partial joint penetration welds, plug and slot welds, multiple-pass fillet welds, and single-pass fillet welds greater than 5/16 inch. Check preheating to assure conformance with AWS D1.1, Section 5.6. Verify procedure for control of distortion and shrinkage stresses.
    b. Periodically monitor welding of single-pass fillet welds that are less than or equal to 5/16 inch.

D. Weld Testing:

1. Perform nondestructive examination services using a qualified technician with the necessary equipment to perform the following:

    a. Nondestructive examination conducted in accordance with the specific requirements for the item being examined including radiographic (RT), ultrasonic (UT), magnetic particle (MT), or dye-penetrant inspection (PT). Nondestructive inspection procedures shall conform to AWS D1.1.
    b. Interpret, record, and report results of the nondestructive tests.
    c. Mark for repair, any area not meeting Specification requirements. Correction of rejected welds shall be made in accordance with AWS D1.1.
    d. Re-examine repair areas and interpret, record, and report the results of examinations of repair welds.
    e. Verify that quality of welds meet the requirements of AWS D1.1.

2. Fillet Welds: Provide the following:

    a. MT test a minimum of 10% of the length of each fillet weld exceeding 5/16".
    b. Periodic MT testing of representative fillet welds 5/16" and less but need not exceed 10% of all such welds, except as required for high rejection rates as indicated in the following paragraph.
    c. Increase MT testing rate for welders having a high rejection rate as required to ensure acceptable welds.

3. Acceptance Criteria:

    a. Visual, MT, PT shall be per AWS D1.1 Table 6.1.
    b. UT testing shall be per AWS D1.1 6.13.1 and Table 6.2.

4. Base metal thicker than 1.5 inches, where subjected to through-thickness weld shrinkage strains, shall be UT tested for discontinuities behind and adjacent to such welds. UT testing shall occur no sooner than 24 hours after the weld has cooled to ambient temperatures. Any material discontinuities shall be recorded on the basis of ASTM A 435 or ASTM A 898 (Level 1 criteria) and reported for Engineer disposition.

5. The costs of repairing defective welds and the costs of retesting by the Testing Laboratory providing services for the Owner shall be borne by the Contractor. If removal of a backing strip is required by the Testing Laboratory to investigate a suspected weld defect, such cost shall be borne by the Contractor.

END OF SECTION 05 12 00

SECTION 075213

APP MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. APP Modified Bituminous Roof Systems.

B. Roof Insulation.

C. Roof Flashing and Accessory Application

1.2 RELATED SECTIONS

A. Division 01 Specifications.

B. Section 061000 - Rough Carpentry: Roof blocking installation and requirements.

C. Section 076200 - Sheet Metal Flashing and Trim: Metal flashing and counter flashing scuppers and downspouts installation and requirements.

D. Section 079200 - Joint Sealants: joint sealant material and installation requirements.

1.3 REFERENCES.

References in these specifications to standards, test methods, codes etc., are implied to mean the latest edition of each such standard adopted. The following is an abbreviated list of associations, institutions, and societies which may be used as references throughout these specifications.

ASTM	American Society for Testing and Materials, Philadelphia, PA
FM	Factory Mutual Engineering Research Corp., Norwood, MA
NRCA	National Roofing Contractors Association, Rosemont, IL
CERTA	Certified Roofing Torch Applicator, Rosemont, IL
OSHA	Occupational Safety and Health Administration, Washington, DC
SMACNA	Sheet Metal and Air Conditioning Contractors National Association, Chantilly, VA
UL	Underwriters Laboratories, Northbrook, IL

The following is a specific list of references that apply to this specification, but is not necessarily all applicable standards.

A. American Society of Civil Engineers (ASCE).
   1. ASCE 7 – Minimum Design Loads for Buildings and Other Structures.
   2. ASTM International (ASTM) – Annual Book of ASTM Standards.
   3. ASTM C 728 – Standard Specification for Perlite Thermal Insulation Board.
   4. ASTM C 1289 – Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
   5. ASTM D 41 – Standard Specification for Asphalt Primer Used in Roofing, Dampproofing and Waterproofing.
   6. ASTM D 312 – Standard Specification for Asphalt Used in Roofing.
   7. ASTM D 4586 – Standard Specification for Asphalt Roof Cement, Asbestos-

Free.

8. ASTM D 4601 – Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.
9. ASTM D 5147 – Standard Test Method for Sampling and Testing Modified Bituminous Sheet Materials.
10. ASTM D 6223 – Standard specifications for APP modified bitumen sheet materials using a combination of polyester and fiberglass reinforcements.
11. ASTM D 6509 – Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Base Sheet Materials Using Glass Fiber Reinforcements.
12. ASTM E 408 – Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.

B. Federal Specification # HH-I-1972: Faced polyisocyanurate roof insulation board.

C. Membrane Immersion Test: Modified Bitumen Membrane Asphaltic Impregnation Evaluation, as published in the "Proceedings of the Fourth International Symposium on Roofing Technology".

D. National Roofing Contractors Association (NRCA) - Low Slope Roofing and Waterproofing Manual, Current Edition.

E. NBS-BSS #55: Tensile strength for fully adhered, asphalt based roof systems.

F. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal Manual.

G. Underwriters Laboratories (UL) - Roofing Systems and Materials Guide (TGFU).

1.4 DEFINITIONS

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

1.5 PERFORMANCE REQUIREMENTS

A. Provide an installed roofing membrane and base flashing system that does not permit the passage of water, and will withstand the design pressures calculated in accordance with the most current revision of ASCE 7.

1.6 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.
4. Manufacturer's published specifications, base flashing details, and installation instructions for the specified system.
5. Submit Material Safety Data Sheets on all roofing materials to be used.

C. Shop Drawings: Provide plan, section, elevation and perspective drawings as necessary to depict all flashing and project conditions on the project, including but not limited to the

following:

1. Roof system and base flashing configuration.
2. Penetration details.
3. Termination details.
4. Fastening patterns.
5. Tapered insulation design.

D. Submit written proof of contractor's approval by specified roof system manufacturer including written confirmation that the manufacturer has reviewed the project documents and that the roof system as specified meets the requirements for the manufacturers guaranty.

E. Submit copies of proposed manufacturer's guaranty.

F. Selection Samples: For each product specified, two samples representing manufacturer's full range of available colors and types.

G. Verification Samples: For each finish product specified, two samples representing actual product, color, and finish.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten (10) years experience.

1. ISO 9000 Certification: The manufacturer must provide documentation showing the manufacturer has current ISO 9001:2000 certification for the specific manufacturing plant where the modified bitumen membrane products are produced.
2. ISO 14000 Certification: The manufacturer must provide documentation showing current ISO 14001:1996 certification for the specific manufacturing plant where the modified bitumen membrane products are produced.

B. Product Performance Requirements:

1. Minimum Solar Reflectance: Initial Value – See Article 1.8
   3-Year Aged Value (un-cleaned surface) – 0.68

2. Minimum Thermal Emittance: Initial Value – See Article 1.8
   3-Year Aged Value (un-cleaned surface) – 0.75

3. Solar Reflective Index: Initial Value – 0.92
   3-Year Aged Value (un-cleaned surface) – 0.82

4. Reflective Cap Sheet products are required to have a minimum of 10 years of performance and manufacturing track record in the United States.

5. Laminated or post-manufacturing coated Cap Sheet products will not be accepted.

6. Reflective Cap Sheet products must be PH neutral and are required to have been tested as having no impact on the quality of water run-off.

7. Reflective Cap Sheet products must be grease and fungus resistant.

C. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products

of the same type and scope as specified.

D. A pre-installation conference will be held approximately two weeks prior to commencing Work specified in this section. Representatives of the owner, engineer/specifier, roofing contractor, sub-contractors, and manufacturer must be present.
   1. Review installation procedures, materials to be used, submittals, schedules, and all related work required under this section. Finalize construction schedule and confirm availability of materials, equipment, contractor's personnel, and facilities needed to complete work as planned.
   2. Review forecasted weather conditions and procedures for coping with unfavorable conditions, and maintaining the water tightness of the roof system.
   3. Tour representative areas of roofing substrates, inspect and discuss condition of substrate, roof drains, penetrations, curbs, and any work performed by other trades.
   4. Review structural loading limitations of deck and inspect deck for acceptability as roof substrate.
   5. Review inspection and quality control procedures to be used.
   6. The contractor shall record discussions of conference, including decisions and agreements reached. Furnish copy of record minutes to each party attending. If disagreements exist at the conclusion of the conference, determine how disagreements will be resolved, and set a date for reconvening conference.

E. The roofing systems manufacturer will provide qualified company personnel to attend pre-construction and in-progress meetings, and to perform periodic job site visits as necessary. The manufacturer will also provide non-sales related field auditors for the purpose of performing quality assurance inspections, both in-progress and final inspections. Provide copies of the manufacturer's field auditor inspection report to the contractor, engineer/specifier, and building owner.

F. Project Acceptance: Submit a completed manufacturer's application for roof guarantee form along with shop drawings of the roofs showing all dimensions, penetrations, and details. The form shall contain all the technical information applicable to the project including deck types, roof slopes, base sheet and/or insulation assemblies (with method of attachment, and fastener type), and manufacturer's membrane assembly proposed for installation. The form shall also contain accurate and complete information requested including proper names, addresses, zip codes and telephone numbers. The project must receive approval, through this process, prior to shipment of materials to the project site.

1.8 REGULATORY REQUIREMENTS

A. Perform work in accordance with all federal, state and local codes.

B. Exterior Fire Test Exposure: Provide a roofing system achieving a UL Class rating for roof slopes indicated on the Contract Drawings.
   1. UL Class A rating.

C. Windstorm Classification: Provide a roofing system which will achieve the required uplift resistance as calculated in accordance with the most current revision of ASCE 7 or as listed in the current FM Approval Guide.
   1. Wind Loads at Main Roof Area:
      a. -20 psf of uplift resistance in the Interior (Zone 1)
      b. -24 psf of uplift resistance at the Edges (Zone 2)
      c. -24 psf of uplift resistance at the Corners (Zone 3)
      d. Edge and Corner width is 6-feet

D. Energy Star – Roof system shall meet or exceed the initial and aged reflectivity required by the U.S. Federal Government's Energy Star Program.

E. "Cool Roofing" – The roof system shall meet or exceed the reflectivity and emissivity criteria to qualify for local "cool" roofing requirements.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials in the manufacturer's original sealed and labeled containers and in quantities required to allow continuity of application.

B. Storage: Store materials out of direct exposure to the elements. Store roll goods on a clean, flat and dry surface. All material stored on the roof overnight shall be stored on pallets. Do not double stack. Rolls of roofing must be stored on ends. Store materials on the roof in a manner so as to preclude overloading of deck and building structure. Store pail materials such as solvents, adhesives and asphalt cutback products in their original undamaged containers in clean dry protected locations away from open flames, sparks or excessive heat and within their specified temperature range. Cover all material using a breathable cover such as a canvas. Polyethylene or other non-breathable plastic coverings are not acceptable.

C. Handling: Handle all materials in such a manner as to preclude damage and contamination with moisture or foreign matter. Handle rolled goods to prevent damage to edges or ends.

D. Damaged Material: Any materials that are found to be damaged or stored in any manner other than stated above will be automatically rejected, removed and replaced at the Contractor's expense.

1.10 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Notification: Give a minimum of 5 days notice to the Owner and manufacturer prior to commencing any work and notify both parties on a daily basis of any change in work schedule.

C. Safety: Familiarize every member of the application crew with all fire and safety regulations recommended by OSHA, NRCA and other industry or local governmental groups.

D. Environmental Requirements
   1. Precipitation: Do not apply roofing materials during precipitation or in the event there is a probability of precipitation during application. Take adequate precautions to ensure that materials, applied roofing, and building interiors are protected from possible moisture damage or contamination.
   2. Temperature Restrictions - cold adhesive: At low temperatures, the specified cold adhesive becomes more viscous, making even distribution more difficult. The optimal temperature of the adhesive at point of application is 70°F (21°C). To facilitate application when ambient temperatures are below 50°F (10°C), store the adhesive and roll goods in a warm place immediately prior to use. Roll or broom the sheets to ensure contact with the underlying adhesive. Suspend application in situations where the adhesive cannot be kept at

temperatures allowing for even distribution.

E. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

F. Protection Requirements
1. Membrane Protection: Provide protection against staining and mechanical damage for newly applied roofing and adjacent surfaces throughout this project.
2. Torch Safety: Crew members handling torches shall be trained by an Authorized Certified Roofing Torch Applicator (CERTA) Trainer, be certified according to CERTA torch safety guidelines as published by the National Roofing Contractor's Association (NRCA), and follow torch safety practices as required by the contractor's insurance carrier. Designate one person on each crew to perform a daily fire watch. The designated crew member shall watch for fires or smoldering materials on all areas during roof construction activity, and for the minimum period required by CERTA guidelines after roofing material application has been suspended for the day.
3. Debris Removal: Remove all debris daily from the project site and take to a legal dumping area authorized to receive such materials.
4. Site Condition: Complete, to the owner's satisfaction, all job site clean-up including building interior, exterior and landscaping where affected by the construction.

1.11 WARRANTY

A. Provide manufacturer's roof system guaranty with single source coverage and no monetary limitation (NDL) where the manufacturer agrees to repair or replace components in the roofing system, which cause a leak due to a failure in materials or workmanship.
1. Duration: Twenty (20) years from the date of completion.
2. The guarantee must have unlimited dollar coverage for the entire guaranty period.
3. Perimeter metal fascias and copings shall be guaranteed for wind speed coverage up to 150 mph. Counterflashings shall be guaranteed for wind speed coverage up to 110 mph for a maximum of 15 years.

B. The Applicator shall supply the Owner with a separate workmanship warranty. In the event any work related to roofing, flashing, or metal is found to be within the Applicator warranty term, defective or otherwise not in accordance with the Contract Documents, the Applicator shall repair that defect at no cost to the Owner. The Applicator's warranty obligation shall run directly to the Owner, and a copy shall be sent to the membrane manufacturer.
1. Duration: Two (2) years from the date of completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers
1. Derbigum, Kansas City, MO
2. Approved equal based on roofing membrane performance requirements specified herein. Requests to use equivalent products of other manufacturers shall be submitted minimum **five (5) working days (one calendar week) prior**

to the bid due date for review and approval/rejection by Engineer and Owner. Requests for substitutions not submitted for approval during the bidding process will NOT be considered.

2.2 SCOPE / APPLICATION

A. Install a roof specification consisting of one ply of APP modified ply sheets and one ply of APP surfaced cap sheet qualifying for the specified warranty.

B. Where located on the Contract Drawings, remove and properly dispose of the existing roof membrane, base flashings, roof insulation, and sheet metal flashing and trim.

C. Install a new roof system consisting of new rigid roof insulation, a multiple ply modified bitumen membrane system installed in cold adhesive, and new sheet metal flashing & trim.

2.3 INSULATION AND SUBSTRATE MATERIALS

A. Rigid Board Insulation: Rigid polyisocyanurate board with a glass fiber facer. Meets or exceeds the requirements of ASTM C 1289 and Fed. Spec. # HH-I-1972.
   1. Dimensions: 48 inch by 48 inch (1219mm x 1219mm) for fully adhered boards. 48 inch by 96 inc (1219mm x 2438mm) for mechanically fastened boards only.
   2. Minimum Thickness: 2 inches continuous thickness, with additional thickness as needed to create slope to drains.
   3. Average Thermal Resistance (LTTR value): 9 per 1-1/2 inch thick board.
   4. Available Products: Derbiboard and Derbiboard Tapered.

B. Cover Board: ***1/2-inch*** fiber reinforced cementitious roof board. Thickness: ***1/2 inch*** (6mm).
   1. Dimensions: 48 inch by 48 inch (1219mm x 1219mm) for fully adhered boards. 48 inch by 96 inch (1219mm x 2438mm) for mechanically fastened boards only.
   2. Available products: Securock.

C. Modified Bitumen cant Strip: Atactic Polypropylene (APP) cant strip cut at angles to provide a 45 degree angle between horizontal and vertical surfaces.

D. Perlite Tapered Edge Strip: Tapered expanded perlite edge strips meeting or exceeding the requirements of Fed. Spec. HH-I-529b and ASTM C 728.

2.4 AIR BARRIER PLY

A. Base Sheets: Smooth, fiberglass reinforced, Atactic Polypropylene (APP) base ply. Waterproof when side and end laps are welded.
   1. Thickness: 120 mils (3mm).
   2. Tensile Strength at 77 F (MD/XD): 90 lbf/in / 80 lbf/in.
   3. Available Products: Derbibase Ultra.

2.5 BASE PLY

A. Base Sheets: Smooth, fiberglass reinforced, Atactic Polypropylene (APP) base ply. Waterproof when side and end laps are welded.
   1. Thickness: 120 mils (3mm).
   2. Tensile Strength at 77 F (MD/XD): 90 lbf/in / 80 lbf/in.

3. Available Products: Derbibase Ultra

2.6 MODIFIED BITUMINOUS CAP PLY

A. Cap Sheet: ASTM D 6223 Type II dual reinforced, Atactic Polypropylene (APP) membrane with fiberglass and polyester dual reinforced mat.
   1. Thickness: 140 mils (3.5mm).
   2. Tensile Strength at 77 F (MD/XD): 85 lbf / 85 lbf
   3. Elongation at 77 F (MD/XD): 5.50 percent / 5.50 percent.
   4. Tear Resistance at 77 F (MD/XD): 130 / 130
   5. Low Temperature Flex: -20 C.
   6. Available Products: Derbibrite

2.7 WALKWAY PLY

A. Walkway Ply: Where indicated on roof plans, provide a fully-adhered walkway ply. Walkway pad material shall be the same as the modified bituminous cap ply, unless directed otherwise by manufacturer.

2.8 ISOLATION PLY

A. Isolation Ply: Where indicated on roof plans, provide a fully-adhered ply to isolate equipment supports, sleepers, lightning protection systems, and other rooftop equipment from the cap ply. Isolation pad material shall be the same as the modified bituminous cap ply, unless directed otherwise by manufacturer.

2.9 ADHESIVES, COATINGS AND PRIMERS

A. Cold Applied Roofing Adhesive: Cold applied adhesive for use with modified bitumen membranes and base sheets.

   1. Application Rate: 1.5 to 2.5 gallons per 100 square feet, depending on substrate (0.6 – 0.8 l/sm).
   2. Volatile Organic Compound (VOC) limits: 200 g/l.
   3. Available Products: Permastic.

B. Cold Applied Roofing Isolation Adhesive: Cold applied adhesive for use with roofing insulation boards and cover boards.

   1. Application Rate: 1/4-inch to 1/2 –inch beads of adhesive at 12-inches on center, unless recommended otherwise by manufacturer.
   2. Available Products: Derbibond LR.

C. Cold Applied Flashing Cement: Cold applied asphalt flashing cement for adhering modified bitumen membranes to vertical surfaces and flashing modified bituminous membranes to metal components.
   1. Application Rate: 7.5 gallons per 100 square feet (3.0 l/sm) at a 1/8 inch (3mm) bed.
   2. Volatile Organic Compound (VOC) limits: 165 g/l.
   3. Available Products: Perflash

D. Cold Applied Liquid Flashing Resin: Cold applied, seamless, self-terminating flashing resin that is reinforced and UV stable, specifically formulated for use on atypical and/or rigid roof penetrations.

1. Available Products: Derbiflash

E. Reflective Tough-Up Coating: Water-based, white, reflective, high-performance roof coating specifically formulated to touch-up edges and seams of reflective cap sheets.
1. Available Products: Permacool

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Structural Concrete Decks:

1. Minimum deck thickness for structural concrete is 4 inches (102 mm).

2. When insulation or roofing is to be adhered with hot asphalt, prime the deck with ASTM D 41 primer, at one (1) gallon per 100 square feet (0.4 l/sm). Allow the primer to dry prior to the application of the roofing system.

3.3 AIR BARRIER INSTALLATION

A. The air barrier must be securely attached to the roof deck. Verify attachment requirements in the codes and FM manual.
1. The air barrier membrane shall be fully adhered or, if acceptable to Owner, torch applied to the ***structural concrete deck and walls*** ~~cover board~~, sealed around all penetrations, and sealed at all terminations and perimeters.

3.4 INSULATION INSTALLATION

A. Do not apply roof insulation until all other Work which requires foot equipment traffic on the roof.

B. The insulation must be securely attached to the roof deck using the required fastener density and pattern as listed in the current FM Specifications and Details Guide. Verify attachment requirements in the codes and FM manual.

1. Insulation board shall be fully adhered,
2. Final cover board shall be fully adhered to insulation.

C. Do not install wet, damaged or warped insulation boards.

D. Install insulation boards with staggered board joints in one direction (unless taping joint).

E. Install insulation boards snug. Gaps between board joints must be less than 1/4 inch (6 mm). Fill all gaps in excess of 1/4 inch (6 mm) with insulation material of the same type.

F. Wood Nailers: Install minimum 3 1/2 inches (89 mm) wide nailers at all locations noted in the Construction Drawings. Nailers must be of equal thickness as the insulation with a minimum 1 inch (25 mm) and securely fastened to the deck.

G. Install cant strips at the transition between roof deck and wall/curb surfaces in all membrane flashing applications. Where necessary to accommodate differential movement between the wall and roof deck, vertical wood nailers, of sufficient height to provide a minimum 8 inch (203mm) base flashing height, may be mechanically fastened to the insulation stops in accordance with NRCA recommendations and the Contract Drawings.

H. Miter and fill the edges of the insulation boards at ridges, valleys and other changes in plane to prevent open joints or irregular surfaces. Avoid breaking or crushing of the insulation at the corners.

I. Do not install insulation over old lightweight insulating concrete decks without the use of a vapor retarder.

J. Do not install any more insulation than will be completely waterproofed each day.

3.5 BASE PLY INSTALLATION

A. Apply approved base sheets over insulation or deck surfaces using methods approved by the manufacturer for the specified roof system.

B. Strap and backnail base and interply sheets where roof slopes exceed 2 inches per foot (2:12).

3.6 ***CAP PLY*** MEMBRANE INSTALLATION

A. Apply roof system in strict accordance with manufacturer's published recommendations.

B. Unroll membranes and allow them to relax prior to application. Application of sheet materials directly from the factory roll may increase the incidence of wrinkling during or subsequent to application.

C. Starting at the low point of the roof area, unroll membrane into position with 3 inch (76mm) side laps and 4 inch (102mm) end laps staggered a minimum of 18 inches (455mm).

D. Cold Process Membrane Application:
   1. Plan Work and foot traffic so adhesive is not tracked across the top of the finished base ply membrane.
   2. Starting at the low point of the roof area, rolls of modified cap sheet shall be unrolled into position with 3 inch (76mm) side laps and 4 inch (102mm) end laps staggered a minimum of 18 inches (455mm).
   3. Pull the end of each sheet straight back onto itself so that the sheet is folded approximately in half, maintaining alignment of the individual sheets and uniformity of the side laps.
   4. Apply adhesive uniformly over the previously marked area with a 1/4 inch notched squeegee at the minimum rate of 1 1/2 to 2 gallons per 100 SF at membrane-to-membrane applications, keeping the adhesive from the side and end lap areas of adjacent rolls. At membrane-to-insulation or coverboard

installations, apply adhesive uniformly over the previously marked area with a 3/8 inch notched squeegee at the minimum rate of 2 to 2 ½ gallons per 100 SF.

5. Roll the sheet into the adhesive commencing with the first roll in the gang, maintaining alignment of the roll and uniformity of the side laps. Broom the membrane as necessary to insure embedment of the membrane into the adhesive.
6. Repeat the procedure on the opposite end of the rolls of the membrane. Side and end laps must be left clean and fee of adhesive.
7. Provide heat welded or finishing of membrane edged and laps as required by manufacturer.

3.7 MEMBRANE BASE FLASHING

A. Maximum flashing length is 10 ft. (3.05m) when the membrane flashings are between 8 inches (203mm) and 14 inches (356mm) high.

B. Priming: Prime all metal surfaces with asphalt primer and allow them to dry prior to application of the flashing membrane.

C. Sequence of Base Flashing Membrane:
1. Install the first base flashing ply after completing the field base ply.
2. At the conclusion of the field top ply, install the second ply of base flashing membrane. This will result in "lacing" of the field and base flashing membranes.

D. Stripping Plies:
1. At metal flanges, install a stripping ply over the field base ply, extending a minimum of four (4) inches (102mm) beyond the flange of the metal.
2. Set the metal flange over the stripping ply in a bed of flashing cement and mechanically anchor.
3. Apply top ply over the primed metal flange.
4. Where the edge of stripping plies meets the metal detail (i.e., outside edge of perimeter metal or against vent pipes), apply a bead of flashing cement to provide a continuous seal and fill in any gaps that may allow standing water at this point.

E. High Wall Flashings: When flashing vertical surfaces above 14 inches (356mm) high, the membrane must be installed the width of the roll and pre-cut to the desired height.

F. Seal the top edges of all base flashings with asphalt flashing cement and reinforcing fabric to provide protection until metal counter flashing is installed.

G. Curb and Corner Flashings:
1. All inside and outside corners require a boot to provide weather protection at the lap joint. Boot must be a minimum 2 inch (51mm) radius beyond all intersecting surfaces, and have a maximum of 1/4 inch (6mm) follow of modified bitumen beyond all edges.
2. Install boots at the inside and outside corners (underneath) prior to installing the flashing membrane.
3. In lieu of membrane boots, the corners may be reinforced with a five-course treatment, consisting of alternating layers of flashing cement and glass fabric mesh.

H. Mechanically fasten the top of all vertical base flashing membranes. Install fasteners appropriate to the substrate 8 inches (203mm) on center. A minimum of 3 coarse is required before covering with counterflashing.

I. Metal Counter Flashing: All vertical base flashings must be covered by metal counter flashing to form a continuous water shedding surface over the top of membrane flashing. Extend metal counter flashing a minimum of 3 inches (76mm) over the top of the membrane flashing.

J. Metal Face Securement: Install Hook strips (cleats) on all metal extending over roof edges (coping metal, gravel stop/eave strip, perimeter curb metal, etc.) in accordance with recommendations in the NRCA Roofing and Waterproofing Manual. Appropriate provision must be made in accessory metal to allow for expansion and contraction of the metal sections without interrupting the integrity of the waterproofing assembly.

K. Roof Drains:
1. All roof drains must be sumped and free of all rust, debris and dirt. Drain targets must be free of wrinkles or folds.
2. Install the base ply and cut so that the base ply stops short of the clamping ring.
3. Install a 36 inch square piece of smooth membrane over the drain opening, in accordance with manufacturers recommendations for the roof system specified. Cut a hole to the inside edge of the drain base.
4. Thoroughly clean the drain bowl flange, and primed to receive the membrane. Apply flashing cement to the clamping ring area.
5. Install a 30 inch (762mm) square, 4 lb (1.81 kg) lead flashing over the membrane into a bed of flashing cement and install the top layer of field membrane extending to the inside edge of the drain bowl.
6. The field membrane, the new drain lead, and stripping membrane are to extend under the properly secured and tightened compression clamping ring assembly. Cut holes in the membrane to align with the clamping bolts, install the clamping ring and tighten the bolts to provide uniform compression of the flashing membrane at the drain.

L. Pitch Pockets:
1. Fabricate and install new pitch pockets from galvanized steel in accordance with NRCA recommendations.
2. Fill the pocket halfway to the top with non-shrink grout and the remainder with pourable sealer.
3. Slope fill away from the penetration to the edge of the pocket.
4. Install metal rain collars with drawbands that cover and overlap the entire pocket and caulk the top of the drawband with sealant.
5. Strip in the metal flanges of the pitch pocket per the sequence described above for stripping plies.

M. Catalyzed Acrylic Resin Flashing System:
1. Install the liquid-applied primer and flashing system in accordance with the membrane system manufacturer's printed installer's guidelines and other applicable written recommendations as provided by the manufacturer. All installers of the system shall be fully trained by a manufacturer's technical representative and shall be competent in the application of the system.

N. Water Cut-Off: At end of day's work, or when precipitation is imminent, construct a water cut-off at all open edges. Cut-offs can be built using asphalt or plastic cement and roofing felts, constructed to withstand protracted periods of service. Cut-offs must be completely removed prior to the resumption of roofing.

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

3.8 INSPECTION AND QUALITY CONTROL

A. The primary manufacturer will provide a qualified, trained auditor to perform a final inspection to insure the roof system has been installed properly and according to the manufacturer's recommendations and guaranty requirements. Upon completion of the inspection, copies of the inspection report will be provided to the Owner and Contractor. Any corrective action deemed necessary to comply with the manufacturer's specifications must be completed by the contractor prior to final close-out.

B. Issuance of the Guarantee: Complete all post installation procedures and meet the manufacturer's final endorsement for issuance of the specified guarantee.

3.9 PROTECTION AND CLEANING

A. Protect new roof system during remainder of construction period. Plan work so traffic over new roof system is kept to a minimum. Where traffic must continue over new roof system, provide protection for the finished roof.

B. Provide protection for masonry and other building surfaces against damage of staining from roofing operations. Any surfaces damaged or stained as a result of roofing operations shall be cleaned, repaired or replaced as necessary by the roofing contractor.

C. Job site shall be maintained in a clean, orderly fashion, and free of debris. Store materials and equipment so operations of building are not interrupted.

END OF SECTION 075213

SECTION 075216

SBS MODIFIED BITUMEN MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. SBS Modified Bituminous Roof System Application

B. Roof Insulation

C. Roof Flashing and Accessory Application

1.2 RELATED SECTIONS

A. Division 01 Specifications.

B. Section 061000 – Rough Carpentry: Roof blocking installation and requirements

C. Section 075213 – APP Modified Bituminous Roofing

D. Section 076200 – Sheet Metal Flashing and Trim: Metal flashing and counter flashing, scuppers, gutters and downspout installation and requirements. Modify if no scuppers gutters and downspouts are a part of the project

1.3 REFERENCE STANDARDS

References in these specifications to standards, test methods, codes etc., are implied to mean the latest edition of each such standard adopted. The following is an abbreviated list of associations, institutions, and societies which may be used as references throughout these specifications.

ASTM	American Society for Testing and Materials Philadelphia, PA
FM	Factory Mutual Engineering Research Corp. Norwood, MA
NRCA	National Roofing Contractors Association Rosemont, IL
CERTA	Certified Roofing Torch Applicator Rosemont, IL
OSHA	Occupational Safety and Health Administration Washington, DC
SMACNA	Sheet Metal and Air Conditioning Contractors National Association Chantilly, VA
UL	Underwriters Laboratories Northbrook, IL

The following is a specific list of references that apply to this specification, but is not necessarily all applicable standards.

A. ASTM International (ASTM) - Annual Book of ASTM Standards:
   1. ASTM C 728 - Standard Specification for Perlite Thermal Insulation Board.
   2. ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
   3. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing and Waterproofing.
   4. ASTM D 312 - Standard Specification for Asphalt Used in Roofing.
   5. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
   6. ASTM D 4601 - Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.
   7. ASTM D 5147 - Standard Test Method for Sampling and Testing Modified Bituminous Sheet Materials.
   8. ASTM D 6162-00a: Standard specifications for Styrene Butadiene Styrene (SBS) modified bitumen sheet materials using a combination of polyester and fiberglass reinforcements.
   9. ASTM D 6163-00(2008) - Standard Specification for Styrene Butadiene Styrene (SBS)) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.
   10. ASTM D 6163-00(2008) - Standard Specification for Styrene Butadiene Styrene (SBS)) Modified Bituminous Sheet Materials Using polyester Reinforcements.
   11. ASTM E 408 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.

B. Factory Mutual (FM Global) - Factory Mutual Standard 4470 - Approval Standard for Class 1 Roof Covers.

C. Federal Specification # HH-I-1972: Faced polyisocyanurate roof insulation board.

D. Membrane Immersion Test: Modified Bitumen Membrane Asphaltic Impregnation Evaluation, as published in the "Proceedings of the Fourth International Symposium on Roofing Technology".

E. National Roofing Contractors Association (NRCA) - Low Slope Roofing and Waterproofing Manual, Current Edition.

F. NBS-BSS #55: Tensile strength for fully adhered, asphalt based roof systems.

G. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal Manual.

H. Underwriters Laboratories (UL) - Roofing Systems and Materials Guide (TGFU).

1.4 DEFINITIONS

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

1.5 PERFORMANCE REQUIREMENTS

A. Provide an installed roofing membrane and base flashing system that does not permit the passage of water, and will withstand the design pressures calculated in accordance with the most current revision of ASCE 7 and as shown on the Drawings.

1.6 SUBMITTALS

All submittals which do not conform to the following requirements will be rejected.

A. Submit under provisions of Section 013300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Manufacturer's published specifications, base flashing details, and installation instructions for the specified system.
   5. Submit Material Safety Data Sheets on all roofing materials to be used.

C. Shop Drawings: Provide plan, section, elevation and perspective drawings as necessary to depict all flashing and project conditions on the project, including but not limited to the following:
   1. Roof system and base flashing configuration.
   2. Penetration details.
   3. Termination details.
   4. Fastening patterns.
   5. Tapered insulation design.

D. Submit written proof of contractor's approval by specified roof system manufacturer including written confirmation that the manufacturer has reviewed the project documents and that the roof system as specified meets the requirements for the manufacturers guaranty.

E. Submit copies of proposed manufacturer's guaranty.

F. Selection Samples: For each product specified, two samples representing manufacturer's full range of available colors and types.

G. Verification Samples: For each finish product specified, two samples representing actual product, color, and finish.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten (10) years experience.
   1. ISO 9000 Certification: The manufacturer must provide documentation showing the manufacturer has current ISO 9001:2000 certification for the specific manufacturing plant where the modified bitumen membrane products are produced.
   2. ISO 14000 Certification: The manufacturer must provide documentation showing current ISO 14001:1996 certification for the specific manufacturing plant where the modified bitumen membrane products are produced.

B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of ten (10) years demonstrated experience in installing products of the same type and scope as specified.

C. A pre-installation conference will be held approximately two weeks prior to commencing Work specified in this section. Representatives of the owner, engineer, roofing contractor, sub-contractors, and manufacturer must be present.
   1. Review installation procedures, materials to be used, submittals, schedules, and all related work required under this section. Finalize construction schedule and confirm availability of materials, equipment, contractor's personnel, and facilities needed to complete work as planned.
   2. Review forecasted weather conditions and procedures for coping with unfavorable conditions, and maintaining the water tightness of the roof system.
   3. Tour representative areas of roofing substrates, inspect and discuss condition of substrate, roof drains, penetrations, curbs, and any work performed by other trades.
   4. Review structural loading limitations of deck and inspect deck for acceptability as roof substrate.
   5. Review inspection and quality control procedures to be used.
   6. The contractor shall record discussions of conference, including decisions and agreements reached. Furnish copy of record minutes to each party attending. If disagreements exist at the conclusion of the conference, determine how disagreements will be resolved, and set a date for reconvening conference.

D. The roofing systems manufacturer will provide qualified company personnel to attend pre-construction and in-progress meetings, and to perform periodic job site visits as necessary. The manufacturer will also provide non-sales related field auditors for the purpose of performing quality assurance inspections, both in-progress and final inspections. Provide copies of the manufacturer's field auditor inspection report to the contractor, engineer, and building owner.

E. Project Acceptance: Submit a completed manufacturer's application for roof guarantee form along with shop drawings of the roofs showing all dimensions, penetrations, and details. The form shall contain all the technical information applicable to the project including deck types, roof slopes, base sheet and/or insulation assemblies (with method of attachment, and fastener type), and manufacturer's membrane assembly proposed for installation. The form shall also contain accurate and complete information requested including proper names, addresses, zip codes and telephone numbers. The project must receive approval, through this process, prior to shipment of materials to the project site.

1.8 REGULATORY REQUIREMENTS

A. Perform work in accordance with all federal, state and local codes.

B. Exterior Fire Test Exposure: Provide a roofing system achieving a UL Class rating for roof slopes indicated on the Contract Drawings.
   1. UL Class A rating.

C. Windstorm Classification: Provide a roofing system which will achieve the required uplift resistance as calculated in accordance with the most current revision of ASCE 7 as shown in the Drawings.

D. Energy Star – Roof system shall meet or exceed the initial and aged reflectivity required by the U.S. Federal Government’s Energy Star Program.

E. “Cool Roofing” – The roof system shall meet or exceed the reflectivity and emissivity criteria to qualify for local “cool” roofing requirements.

1.9 PRODUCT DELIVERY STORAGE AND HANDLING

A. Delivery: Deliver materials in the manufacturer's original sealed and labeled containers and in quantities required to allow continuity of application.

B. Storage: Store materials out of direct exposure to the elements. Store roll goods on a clean, flat and dry surface. All material stored on the roof overnight shall be stored on pallets. Do not double stack. Rolls of roofing must be stored on ends. Store materials on the roof in a manner so as to preclude overloading of deck and building structure. Store pail materials such as solvents, adhesives and asphalt cutback products in their original undamaged containers in clean dry protected locations away from open flames, sparks or excessive heat and within their specified temperature range. Cover all material using a breathable cover such as a canvas. Polyethylene or other non-breathable plastic coverings are not acceptable.

C. Handling: Handle all materials in such a manner as to preclude damage and contamination with moisture or foreign matter. Handle rolled goods to prevent damage to edges or ends.

D. Damaged Material: Any materials that are found to be damaged or stored in any manner other than stated above will be automatically rejected, removed and replaced at the Contractor's expense.

1.10 PROJECT/SITE CONDITIONS

A. Requirements Prior to Job Start
   1. Notification: Give a minimum of 5 days notice to the Owner and manufacturer prior to commencing any work and notify both parties on a daily basis of any change in work schedule.
   2. Safety: Familiarize every member of the application crew with all fire and safety regulations recommended by OSHA, NRCA and other industry or local governmental groups.
   3. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Environmental Requirements
   1. Precipitation: Do not apply roofing materials during precipitation or in the event there is a probability of precipitation during application. Take adequate precautions to ensure that the materials, applied roofing, and building interiors are protected from possible moisture damage or contamination.
   2. Temperature Restrictions - cold adhesive: At low temperatures, the specified cold adhesive becomes more viscous, making even distribution more difficult. The optimal temperature of the adhesive at point of application is 70°F (21°C). To facilitate application when ambient temperatures are below 50°F (10°C), store the adhesive and roll goods in a warm place immediately prior to use. Roll or broom the sheets to ensure contact with the underlying adhesive. Suspend application in situations where the adhesive cannot be kept at temperatures allowing for even distribution.

C. Protection Requirements
   1. Membrane Protection: Provide protection against staining and mechanical damage for newly applied roofing and adjacent surfaces throughout this project.
   2. Torch Safety: Crew members handling torches shall be trained by an Authorized Certified Roofing Torch Applicator (CERTA) Trainer, be certified according to

CERTA torch safety guidelines as published by the National Roofing Contractor's Association (NRCA), and follow torch safety practices as required by the contractor's insurance carrier. Designate one person on each crew to perform a daily fire watch. The designated crew member shall watch for fires or smoldering materials on all areas during roof construction activity, and for the minimum period required by CERTA guidelines after roofing material application has been suspended for the day.

3. Debris Removal: Remove all debris daily from the project site and take to a legal dumping area authorized to receive such materials.
4. Site Condition: Complete, to the owner's satisfaction, all job site clean-up including building interior, exterior and landscaping where affected by the construction.

1.11 WARRANTY

A. Roof Membrane Warranty: Upon successful completion of the project, and after all post installation procedures have been completed, furnish the Owner with the manufacturer's 20 year labor and materials membrane warranty, including insulations, adhesives, fasteners and specialty penetration flashings, where the manufacturer agrees to repair or replace components in the roofing system, which cause a leak due to a failure in materials or workmanship. The warranty shall be a term type, without deductibles or limitations (NDL) on coverage amount, and shall be issued at no additional cost to the Owner. This warranty shall not exclude random areas of ponding from coverage.

1. Duration: Twenty (20) years from the date of completion

B. The Applicator shall supply the Owner with a separate workmanship warranty. In the event any work related to roofing, flashing, or metal is found to be within the Applicator warranty term, defective or otherwise not in accordance with the Contract Documents, the Applicator shall repair that defect at no cost to the Owner. The Applicator's warranty obligation shall run directly to the Owner, and a copy shall be sent to the membrane manufacturer.

1. Duration: Two (2) years from the date of completion.

C. Provide roofing accessory warranty for sheet metal finish assemblies.

1. Duration: Fifteen (15) years from the date of completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers.
1. Siplast

B. Approved equal based on roofing membrane performance requirements specified herein. Requests to use equivalent products of other manufacturers shall be submitted to the Engineer and Owner minimum five (5) days prior to the bid due date for review and approval/rejection by the Engineer and Owner.

2.2 BASE SHEET

A. Smooth, fiberglass reinforced, SBS modified asphalt reinforced with lightweight random fibrous glass mat impregnated and coated with high quality styrene-butadiene-styrene modified bitumen. Intermediate ply sheet shall meet ASTM D 6163, Type II, Grade S.
   1. Siplast Paradiene 20 EG
      a. Thickness: 118 mils avg.

2.3 CAP PLY SHEET

A. Granular-surfaced, fiberglass reinforced, SBS modified asphalt reinforced consisting of a lightweight random fibrous glass mat impregnated, coated with high quality styrene-butadiene-styrene modified bitumen, and surfaced with reflective, white synthetic chips.. Cap sheet shall meet ASTM D 6163, Type I, Grade G.

   1. Siplast Paradiene 40 CR FR

      a. Thickness: 130 mils avg.

2.5 FLASHING PLY

A. High performance modified bitumen finish ply designed for use in multi-layer modified bitumen roof systems consisting of a fiberglass scrim/fiberglass mat composite impregnated and coated with high quality styrene-butadiene-styrene (SBS) modified bitumen. Meets or exceeds the requirements of ASTM D 6298.

   1. Siplast Paradiene 40 CR FR
      a. Thickness: 130 mils avg.

2.6 INSULATION AND SUBSTRATE MATERIALS

A. See Article 2.3 in specification Section 075213

2.7 SHEET METAL AND FLASHINGS

A. See Section “Sheet Metal Flashing and Trim.”

2.8 ADHESIVES, COATINGS AND PRIMERS

A. Cold applied adhesive for use with modified bitumen membranes, intermediate ply sheets, and other cold process roofing system components as specified by membrane manufacturer.
   1. Siplast PA 311M Adhesive.

B. Mopping Asphalt: Type IV asphalt certified for full compliance with the requirements listed in Table I, ASTM D 312. Each container or bulk shipping ticket shall indicate the equiviscous temperature, EVT, the finished blowing temperature, FBT, and the flash point, FP. Mopping asphalt shall be approved in writing by the roof membrane manufacturer.

C. Primer: A high flash, quick drying, asphalt solvent blend which meets or exceeds ASTM D 41 requirements.

1. Siplast PA-1125 Asphalt Primer.

D. Ceramic Granules: No. 11 grade specification ceramic granules of color scheme matching the granule surfacing of the finish ply.

E. Perlite Cant Strips: A cant strip composed of expanded volcanic minerals combined with waterproofing binders. The top surface shall be pre-treated with an asphalt based coating. The face of the cant shall have a nominal 4 inch dimension.

F. Sealant: A moisture-curing, non-slump elastomeric sealant designed for roofing applications. The sealant shall be approved by the roof membrane manufacturer for use in conjunction with the roof membrane materials. Acceptable types are as follows:

G. Ceramic Granules: No. 11 grade specification ceramic granules of color scheme matching the granule surfacing of the finish ply.

H. Walktread: Where indicated on roof plans, provide a fully-adhered walkway ply. Walkway pad material shall be the same as the modified bituminous cap ply, unless directed otherwise by manufacturer.

I. Isolation Ply: Where indicated on roof plans, provide a fully-adhered ply to isolate equipment supports, sleepers, lightning protection systems, and other rooftop equipment from the cap ply. Isolation pad material shall be the same as the modified bituminous cap ply, unless directed otherwise by manufacturer.

J. Fasteners
1. Standard Roofing Fastener: Manufacturer approved drill point fasteners for installation of insulation/cover/sheet metal flashing to concrete, steel, and wood substrates, where applicable.

K. Cold Applied Liquid Flashing PMMA Resin: Cold applied, seamless, self-terminating flashing resin that is reinforced and UV stable, specifically formulated for use on atypical and/or rigid roof penetrations.
1. Available Products: Siplast Parapro 123 Flashing

L. Reflective Tough-Up Coating: Manufacturer approved water-based, white, reflective, high-performance roof coating specifically formulated to touch-up edges and seams of reflective cap sheets.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. General: Sweep or vacuum all surfaces, removing all loose aggregate and foreign substances prior to commencement of roofing.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Lightweight Insulating Concrete Decks:
   1. Lightweight insulating concrete decks must have a minimum thickness of 2 inches (51 mm), a minimum compressive strength of 125 psi (0.86 MPa) and a minimum density of 22 pcf (352 kg/sm).
   2. Lightweight insulating concrete decks are acceptable only on slopes up to 1 inch per foot (83 mm/m).
   3. Prior to installing new roofing materials, patch existing lightweight concrete deck as specified in Division 01 Section “Task Items”.

3.3 BASE PLY INSTALLATION

A. See Article 3.5 in Section 075213.

3.4 CAP PLY MEMBRANE INSTALLATION

A. See Article 3.6 in Section 075213.

3.5 MEMBRANE BASE FLASHING AND OTHER MISCELLANEOUS INSTALLATIONS

A. See Article 3.7 in Section 075213.

B. Water Cut-Off: At end of day's work, or when precipitation is imminent, construct a water cut-off at all open edges. Cut-offs can be built using asphalt or plastic cement and roofing felts, constructed to withstand protracted periods of service. Cut-offs must be completely removed prior to the resumption of roofing.

C.

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

3.6 FIELD QUALITY CONTROL AND INSPECTIONS

A. Site Condition: Leave all areas around job site free of debris, roofing materials, equipment and related items after completion of job.

B. Notification of Completion: Notify the manufacturer by means of manufacturer's printed Notification of Completion form of job completion in order to schedule a final inspection date.

C. Final Inspection/Post-Installation Meeting: 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 Contractor and the manufacturer's representative. Complete, sign, and mail the punch list form to the manufacturer's headquarters.

D. Issuance of the Guarantee: Complete all post installation procedures and meet the manufacturer's final endorsement for issuance of the specified guarantee.

3.7 PROTECTION AND CLEANING

A. Protect new roof system during remainder of construction period. Plan work so traffic over new roof system is kept to a minimum. Where traffic must continue over new roof

system, provide protection for the finished roof.

B. Provide protection for masonry and other building surfaces against damage of staining from roofing operations. Any surfaces damaged or stained as a result of roofing operations shall be cleaned, repaired or replaced as necessary by the roofing contractor.

C. Job site shall be maintained in a clean, orderly fashion, and free of debris. Store materials and equipment so operations of building are not interrupted.

END OF SECTION 075216

SECTION 077100

ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following roof specialties and accessories:
   1. Roof Wall Anchor
   2. Roof Guard Rail
   3. Roof Access Ladder

B. Related Sections include the following:
   1. Section 075213 – APP Modified Bituminous Roofing Membrane
   2. Section 075216 – SBS Modified Bituminous Roofing Membrane

1.3 REFERENCES

A. 29 CFR 1910.23 - Occupational Health and Safety Standards for General Industry.
B. 29 CFR 1910.28 - Walking/Working Surfaces, Subpart D.
C. 29 CFR 1926.500 - Safety and Health Regulations for Construction, Subpart M-Fall Protection.
D. AISC S342L-1993
E. AISI SG-971-1996
F. ANSI Z359.1 - Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components.
G. ANSI ASC A14.3-2008 - Safety Requirements for Fixed Ladders
H. ASME A120.1-2001
I. ASTM A 36 - Standard Specification for Carbon Structural Steel.
J. ATM A 182 - Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
K. ASTM A 193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications.
L. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
M. ASTM F 593C - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
N. AWS D1.1/D1 - American Welding Society, Structural Welding Code.
O. AWS-D1.2/D1.2M:2003
P. OSHA (29 CFR 1920.66 App C to 1910 Subpart F (Personal Fall Arrest Systems). 1910 Subpart D (Walking and Working Surfaces) c. 1910.66 Appendix C (Personal Fall Arrest) d. 1910.66 Subpart F (Powered Platforms) e. OSHA Procedures and precautions for employees using descent control equipment.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

A. Provide Fall Protection System in compliance with OSHA, ANSI, and all applicable state and federal regulatory requirements.

B. Design of fall restraint safety systems, and equipment shall meet or exceed the following:

1. Wall Anchors: designed to a maximum fall arresting force of typically 1800 lbs (8.0 k) when wearing a body harness with a safety factor of 2 without any permanent deformation; and to 5000 lbs (22.24 k) against fracture or detachment.

2. Ensure design of primary support equipment is capable of sustaining without failure at least four times the maximum static working load applied or transmitted to the components.

1.5 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

B. Shop Drawings: Plans and details of entire fall protection layout, showing member sizes and part identification, fasteners, anchors, fittings and evidence of compliance with structural performance requirements.
   1. Include system layout, design analysis, and calculations prepared and sealed by a Registered Professional Engineer licensed in the State of Texas.
   2. Provide manufacturer's certifications that the ultimate strength of the fall protection system is equal to or greater than those specified.
   3. Include data regarding all necessary Restrictive and Non-Restrictive General Safety and Usage Notes.

C. Operation and Maintenance Data:
   1. Include parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying part numbers.
   2. Include technical information for servicing equipment.
   3. Include detailed operating procedures indicating proper use of equipment for safe operation of the system.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

E. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for annual inspection, re-certifications, periodic checking and adjustment of cable tension and periodic cleaning and maintenance of all railing and infill components.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Work of this Section to be executed by manufacturer specializing in the design, fabrication and installation. Must carry specific product liability insurance in the amount of $10,000,000.00 to protect against product failure. Companies, such as miscellaneous metal fabricators, who do not typically engage in the design and manufacturing of suspended maintenance equipment, are not permitted to bid.

B. Professional Engineer: A professional engineer who is legally qualified to practice in the jurisdiction where the project is located and who is experienced in providing engineering services of the kind required.

C. Welding to be executed by certified welders in accordance with AWS requirements.

D. Installer Qualifications: Specializing in the Work of this section and trained and certified by the fall protection system manufacturer.

E. Single-Source Requirement: The DESIGN, FABRICATION, INSTALLATION, CERTIFICATION AND WARRANTY of the fall protection system must be SINGLE-SOURCED.

1.7 DELIVERY, STORAGE AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

1.8 SEQUENCING

A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.
B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.9 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 MAINTENANCE SERVICE

A. Furnish service and maintenance for fall protection system and components for a period of one year from Date of Substantial Completion with an option for extending maintenance service on an annual basis thereafter.

1.11 WARRANTY

A. Roof Wall Anchor: Provide with manufacturer's 25 year limited warranty.
B. Roof Guard Rail: Provide with manufacturer's 1 year limited warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Rooftop Anchors Inc
   2. Thompson Fabricating, LLC.
B. Substitutions: May be considered provided manufacturer's qualifications and job references are furnished to Owner.

2.2 MATERIAL

A. Exposed Structural Components Finish: Hot Dip Galvanized Steel
   1. Steel: ASTM A 53, Grade B.
   2. Steel: ASTM A 36.
   3. Stainless Steel: 304 ASTM A 182.

B. Exposed Structural Components Finish: Stainless Steel (wall anchor connection rings)

1. Stainless Steel: 304 ASTM A 182.

C. Non-Structural Components:
   1. Sheet and Plate: ASTM A 36
   2. Extruded Bars, Rods, Shapes, and Tubes

D. Nuts, Bolts, and Washers:
   1. Stainless Steel: 304 ASTM A 193 Grade B8 or ASTM F 593C

E. Anchor Bolts for securing base plates:
   1. Metal: Stainless Steel, 304 Stainless Steel; ASTM A 193 Grade 8, B8 2. Size: 5/8 inch (16 mm) diameter minimum.

2.3 ROOF WALL ANCHOR

A. Retrofit

1. Bolt Through: Capable of withstanding 5000 lbs. (2272.2 kg) in any direction without fracture or detachment. Capable of withstanding 2500 lbs. (1136.1 kg) in any direction without permanent deflection. Bolt through anchor consists of four major components:

a. Wall plate is 304 stainless steel plate HRA&P, ASTM A 240.

b. Loop is 3⁄4 inch (19 mm) 304 stainless round bar, ASTM A 182.

c. Threaded stainless steel bolt, washer and nut.

d. Carbon steel components hot dip galvanized after fabrication.

2. Epoxy Adhesive: Capable of withstanding 5000 lbs. (2272.2 kg) in any direction without fracture or detachment. Capable of withstanding 2500 lbs. (1136.1 kg) in any direction without permanent deflection. Epoxy anchor consists of four major components:

a. Wall plate is 304 stainless steel plate HRA&P, ASTM A 240.

b. Loop is 3⁄4 inch (19 mm) 304 stainless round bar, ASTM A 182.

c. Chemical Adhesive Anchoring System.

d. Stainless steel rod with stainless steel nut and washer.

2.4 ROOF GUARD RAIL

A. General: Fabricate pipe handrails and railing systems to comply with requirements indicated for design, dimensions, details, finish and member sizes including wall thickness of post, post spacing and anchorage, but not less than that required to support the structural loads.

B. Handrails shall be made of pipes joined together with component fittings. Samples of all components, bases, toe plate, and pipe shall be submitted for approval at the request of the Engineer. Components that are pop-riveted of glued at the joints will not be acceptable. All components must be mechanically fastened with stainless steel hardware.

C. Posts shall not interrupt the continuation of the top rail at any point along the railing, including corners and end terminations. The top surface of the top railing shall be smooth and shall not be interrupted by any projected fittings.

D. To provide safety to workers near the edge of a rooftop, safety guardrails are to be installed along open-sided walking surfaces, roofs, terraces, balconies, stairways, ramps, and landings located more than 48" above floor level. Minimum height of 42". Design to OSHA guidelines.

E. Concrete anchors shall be stainless steel type 303 or 304 and shall be designed by the handrail manufacturer.

F. Railings Structural Requirements:
   1. Handrail, wall rail and guardrail assemblies and attachments shall withstand a minimum concentrated load of 200 pounds (90719 g) applied in any direction on the top rail.
   2. Mid-rail shall withstand a minimum concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
   3. Minimum 4" high toe board, where applicable.

G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrication by preventing buckling, opening of joints, overstressing of components, failure of connections and other detrimental effects. Expansion couplers to be inserted a minimum of every 20'

H. Isolate dissimilar metals

I. Flashing/Water Tight Finish: Coordinate with roofing contractor for proper flashing of each penetration. Additionally, ensure moisture cannot bypass flashing via weep/vent holes required for galvanizing

J. Openings in the Guard Rail: Openings shall be guarded by self-closing gates. Safety chains shall not be used.

2.5 ROOF ACCESS LADDER

A. General: Fabricate access ladder to comply with requirements indicated for design, dimensions, details, finish and member sizes, but not less than that required to support the structural loads.

B. Rungs shall be fabricated to provide a non-slop power grip surface.

C. Design to ANSI-A14.3 and OSHA guidelines.

D. Ladder Structural Requirements:
   1. Ladder rungs shall be designed to withstand a concentrated load of 250 pounds plus 30% impact. Maximum rung deflection shall not exceed L/360. The design load shall be applied at the center of the rung over a 4-inch area.
   2. Ladder side rails shall be designed to withstand a minimum live load of two 250 pound concentrated loads plus 30% impact concentrated between any two consecutive attachments.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrication by preventing buckling, opening of joints, overstressing of components, failure of connections and other detrimental effects.

F. Provide a swinging, self-closing gate at the opening through the guard rail for the ladder per OSHA 1910.23(a)(2).

G. Isolate dissimilar metals

H. Flashing/Water Tight Finish: Coordinate with roofing contractor for proper flashing of each penetration. Additionally, ensure moisture cannot bypass flashing via weep/vent holes required for galvanizing.

2.6 FABRICATION

A. Fabricate work true to dimension, square, plumb, level, and free from distortion or defects detrimental to appearance and performance.
B. Grind off surplus welding material to ensure exposed surfaces are smooth so as not to abrade workers ropes.
C. Coordinate anchorage system with supporting structure.
D. Welding shall be in accordance with the AWS Structural Welding Code D1.1/D1. AWS-D1.2/D1.2M:2003

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.
B. Examine project prior to installation and report in writing any defects or other site conditions that would cause problematic installation of products or possible deficiency.
C. Confirm site dimensions.
D. If substrate preparation is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with Roof Fall Protection manufacturer's instructions and approved shop drawings.
B. Roof Fall Protection manufacturer shall supervise, inspect, and test installation of fall protection system.
C. Assure that all anchors are level, tightly fitted and flush with adjoining surfaces as required.
D. Isolate dissimilar materials as required to prevent electrolytic corrosion.
E. Coordinate with roofing specified in the drawings for the installation of flashings to assure a watertight installation.
F. Chemical Adhesive Anchoring System:
    1. Install using accredited installers using manufacture's installation instructions.
    2. Load test each installed anchor assembly to 50 percent of its rated capacity. Test results shall be certified by a certified installer with experience in suspended access equipment.
G. Adjust and leave properly functioning equipment.

3.4 MANUFACTURER'S FIELD SERVICES

A. Testing and certification shall be provided under supervision of the fall protection manufacturer or original installer.
B. Annual inspection plus 5 and 10 year recertification provided by the manufacturer or their authorized representatives.

C. Repair or replace parts whenever required. Use parts produced by manufacturer of original equipment.
D. Provide emergency call back service at all hours for this maintenance period.
E. Perform maintenance work using competent and qualified personnel under supervision of the fall protection manufacturer or original installer.

3.5 PROTECTION

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

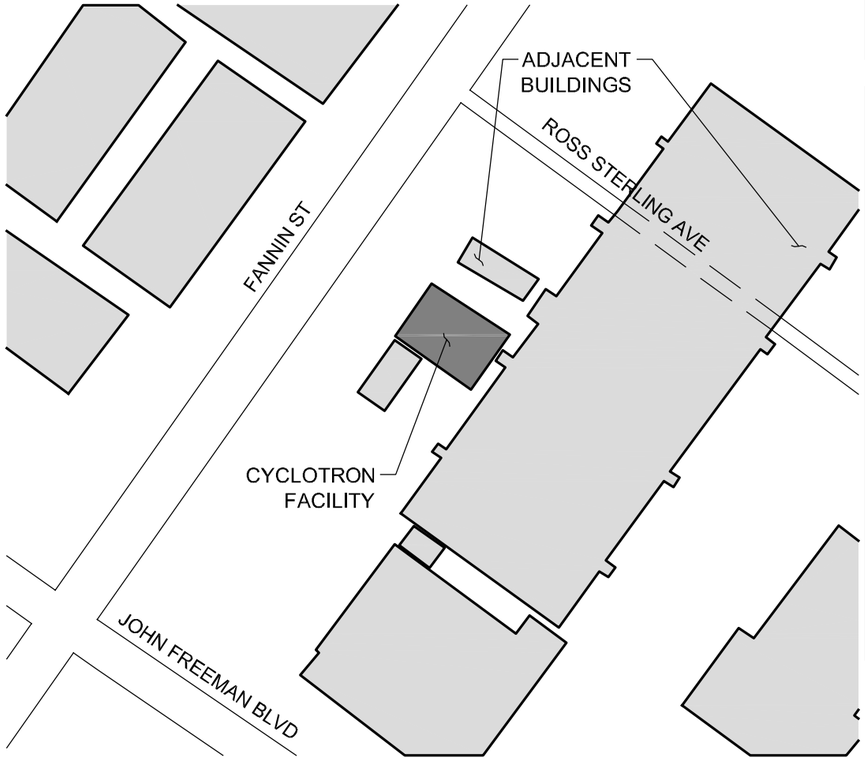
END OF SECTION 077100

UTHSCH CYCLOTRON FACILITY ROOFING REPAIRS

HOUSTON, TEXAS

1 PARTIAL VIEW OF ROOFTOP

NTS



2 SITE MAP

NTS

TASK ITEMS

T.I.	1.1	PROJECT MOBILIZATION AND GENERAL CONDITIONS
T.I.	1.2	FALL PROTECTION SYSTEMS
T.I.	2.1	DEMOLITION AND SUBSTRATE PREPARATION
T.I	3.2	DECK REPAIR/REPLACEMENT - PATCH CONCRETE DECK
T.I.	5.1	CROSSOVER BRIDGES
T.I.	5.2	ACCESS LADDER
T.I.	6.1	ROUGH CARPENTRY
T.I.	6.2	AIR BARRIER
T.I.	7.1	ROOFING INSULATION - FLAT POLYISO WITH COVER BOARD
T.I.	7.2	LOW SLOPE ROOFING MEMBRANE - 2-PLY APP MODIFIED BITUMEN
T.I.	7.3	FLASHING AND SHEET METAL TRIM
T.I.	7.4	ROOFING SYSTEM WARRANTY
T.I.	7.5	JOINT SEALANT REPLACEMENT
T.I.	22.1	PLUMBING WORK
T.I.	23.1	MECHANICAL WORK
T.I.	26.1	ELECTRICAL WORK

1

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11X17 SHEETS

S-0.0	COVER, SITE MAP, SHEET INDEX, TASK ITEMS
S-0.1	GENERAL NOTES
S-0.2	GENERAL NOTES, ROOF LEGEND
S-1.0	SCHEMATIC SITE PLAN
S-2.0	ROOF PLANS - WIND PRESSURE ZONES
S-2.1	ROOF PLAN - DEMOLITION
S-2.2	ROOF PLAN - REPLACEMENT
S-3.0	FLASHING AT VERTICAL WALL, ROOF DRAINS
S-3.1	FLASHING AT RIGID PENETRATIONS, ROOF TOP UNIT CURBS
S-3.2	FLASHING AT SCUPPERS, SLEEPERS
S-3.3	DECK REPAIR/REPLACEMENT - PATCH CONCRETE DECK, JOINT SEALANT REPLACEMENT
S-3.4	FLASHING AT HEATED VENT STACK, PARAPET COPING
S-3.5	GUARD RAIL DETAILS
S-3.6	ACCESS LADDER DETAILS
S-3.7	WALL MOUNTED TIEBACK ANCHOR DETAILS
S-3.8	LIQUID FLASHING DETAIL AT RTU CURB

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STATE OF TEXAS
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CYCLOTRON FACILITY
ROOFING REPAIRS
HOUSTON, TX

Project Name:

UTHSCH

Client:

No.	Date	Description
.	01/07/2013	90% Owner's Review Set
.	05/22/2013	Issued for Construction
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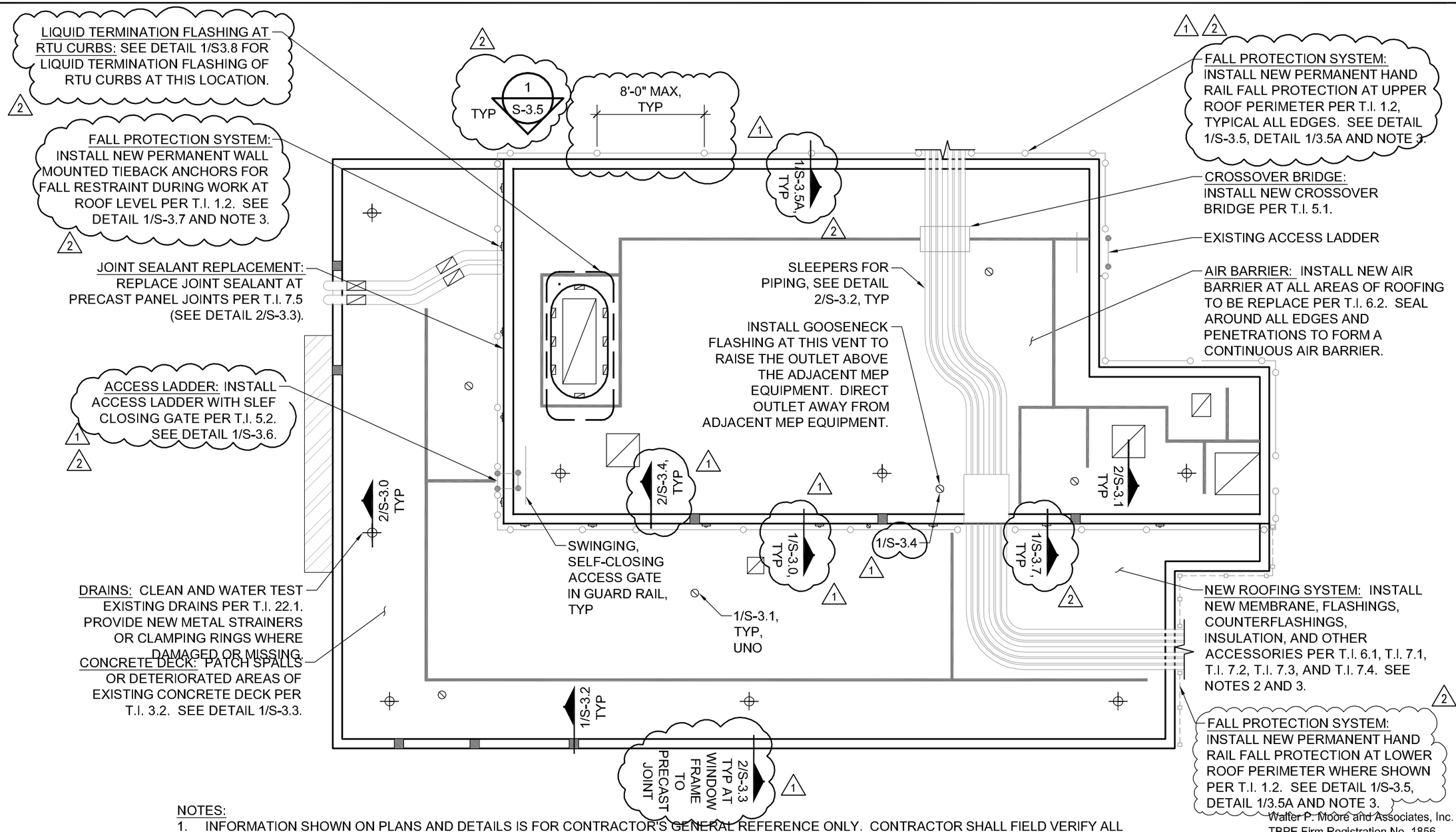

NOTES:

1. INFORMATION SHOWN ON PLANS AND DETAILS IS FOR CONTRACTOR'S GENERAL REFERENCE ONLY. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS AND REPORT DISCREPANCIES BETWEEN EXISTING CONDITIONS AND THE CONTRACT DOCUMENTS TO ENGINEER PRIOR TO STARTING WORK.
2. EXISTING STRUCTURE IS SLOPED TO DRAINS. NEW INSULATION SHALL BE FLAT BOARD STOCK, EXCEPT WHERE ADDITIONAL TAPERING OR THICKNESS IS REQUIRED TO PROVIDE SUFFICIENT SLOPE TO THE DRAINS TO ELIMINATE PONDING WATER.
3. CONTRACTOR IS ADVISED THAT THE ROOF DOES NOT HAVE OSHA-COMPLIANT PARAPET WALLS. FALL PROTECTION MUST BE INSTALLED PRIOR TO PERFORMING ANY WORK ON THE ROOF. LAYOUT OF GUARDRAIL AND WALL TIEBACKS IS CONCEPTUAL IN NATURE AND FINAL DESIGN, INCLUDING LAYOUT AND STRUCTURAL ATTACHMENTS SHALL BE PROVIDED BY THE FALL PROTECTION MANUFACTURER.

1 ROOF PLAN - REPLACEMENT

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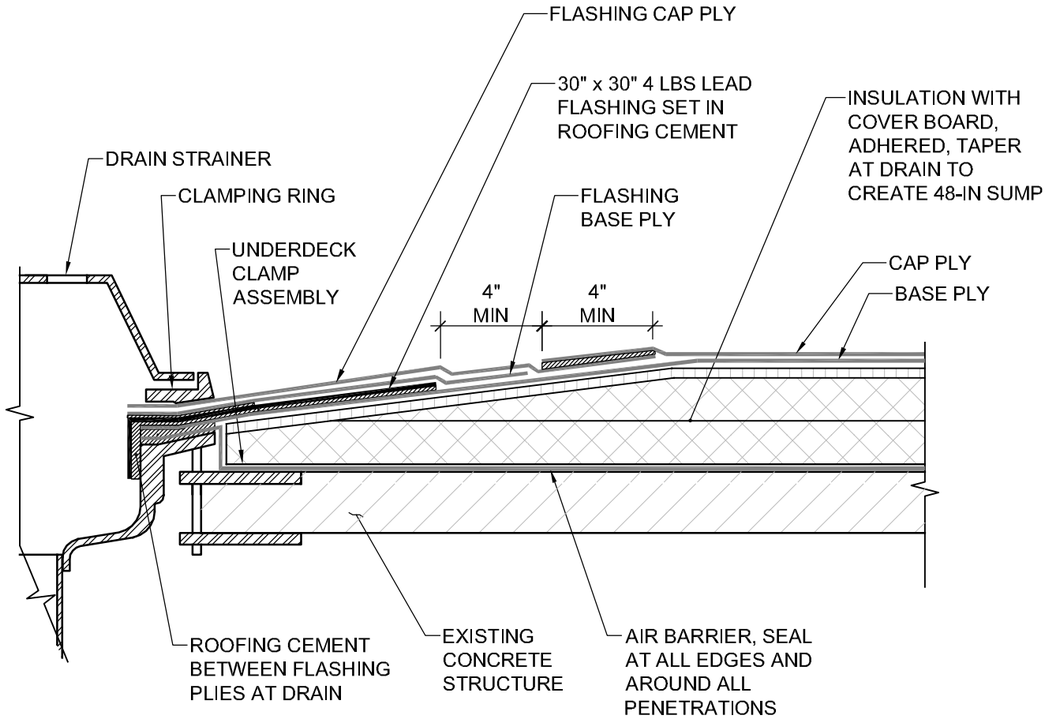

NOTES:

1. CONTACT ENGINEER IMMEDIATELY TO REVIEW DRAIN FLASHING IF DRAIN ASSEMBLY DIFFERS FROM THAT SHOWN.
2. EXISTING DRAIN BOWL, CLAMPING RING, AND DRAIN ACCESSORIES ARE TO BE CLEANED FREE OF ALL CONTAMINANTS.

2 TYPICAL - 2-PLY MOD BIT - FLASHING AT EXISTING ROOF DRAIN

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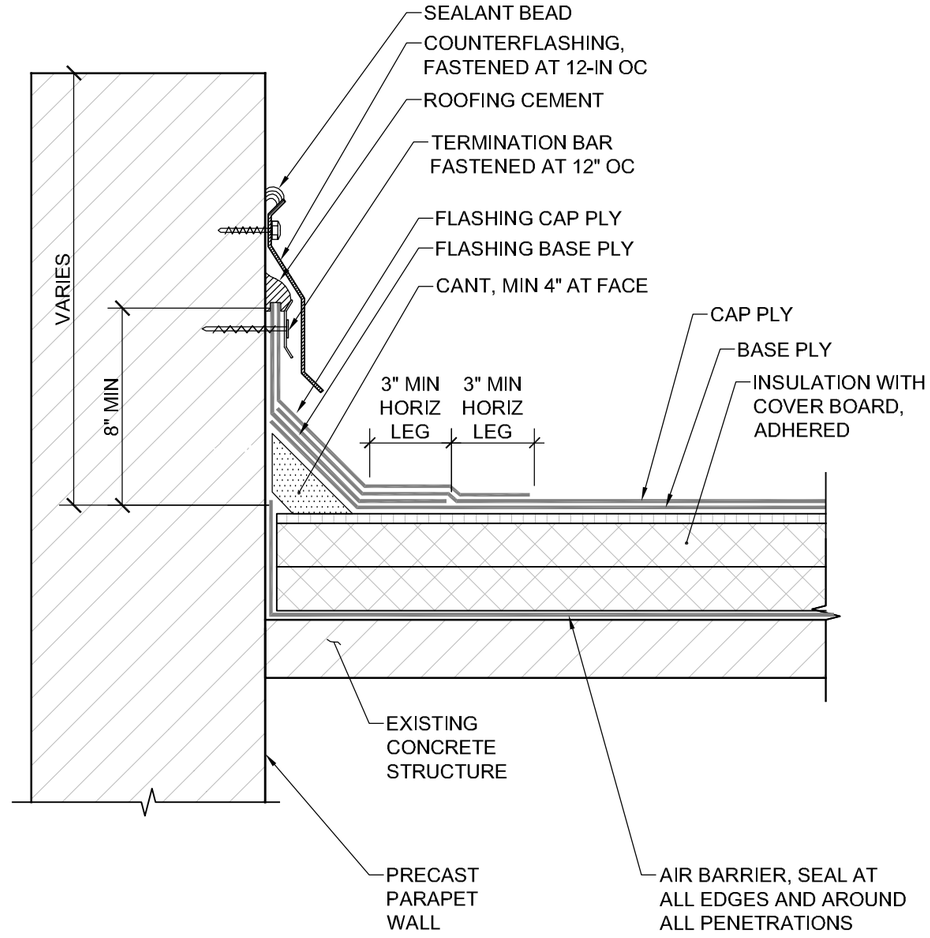

1 TYPICAL - 2-PLY MOD BIT - FLASHING AT VERTICAL WALL

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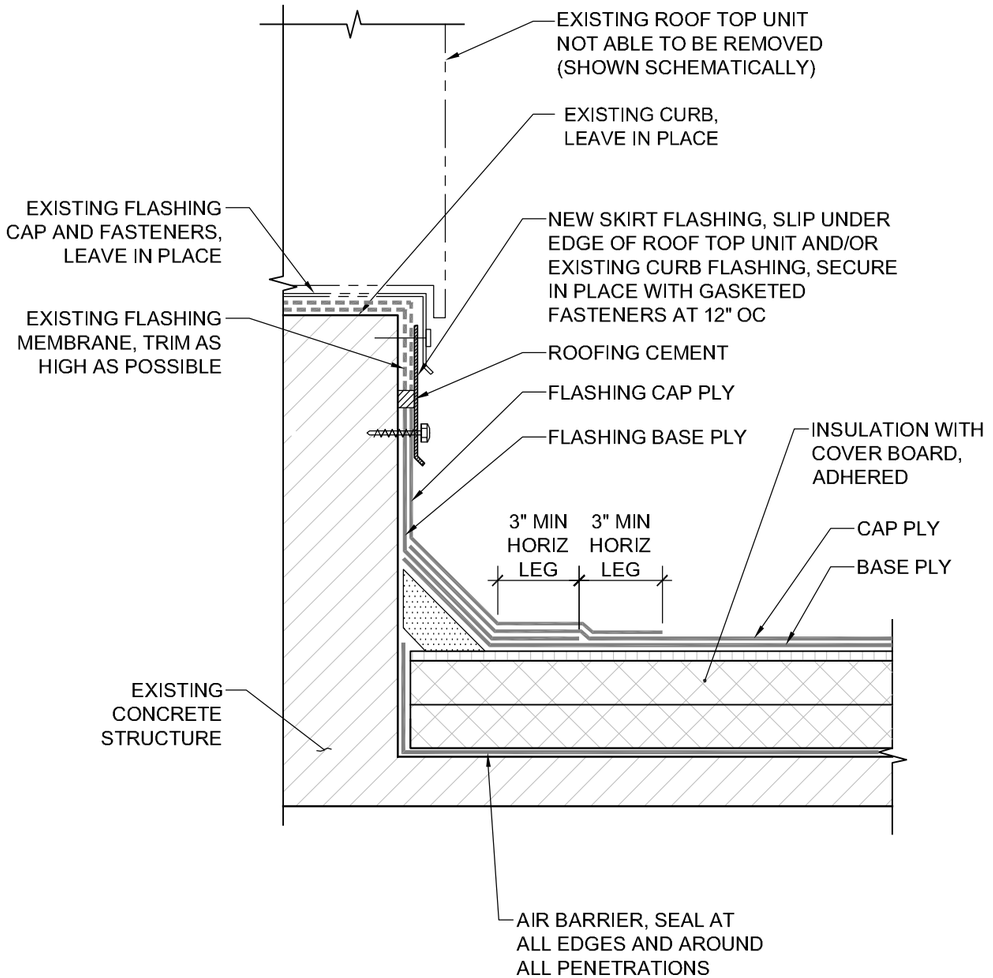

2 TYPICAL - 2-PLY MOD BIT - FLASHING AT NON-REMOVABLE ROOF TOP UNIT

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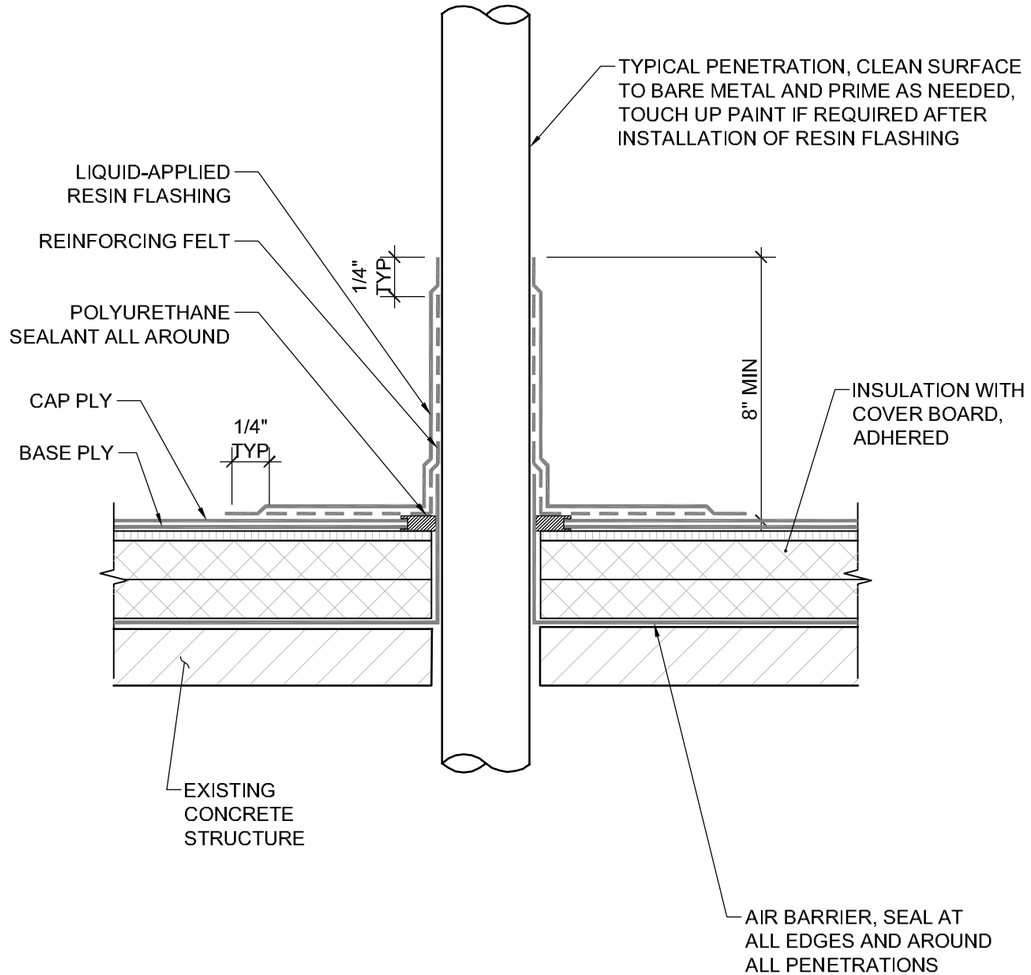

1 TYPICAL - 2-PLY MOD BIT - RESIN FLASHING AT RIGID PENETRATIONS

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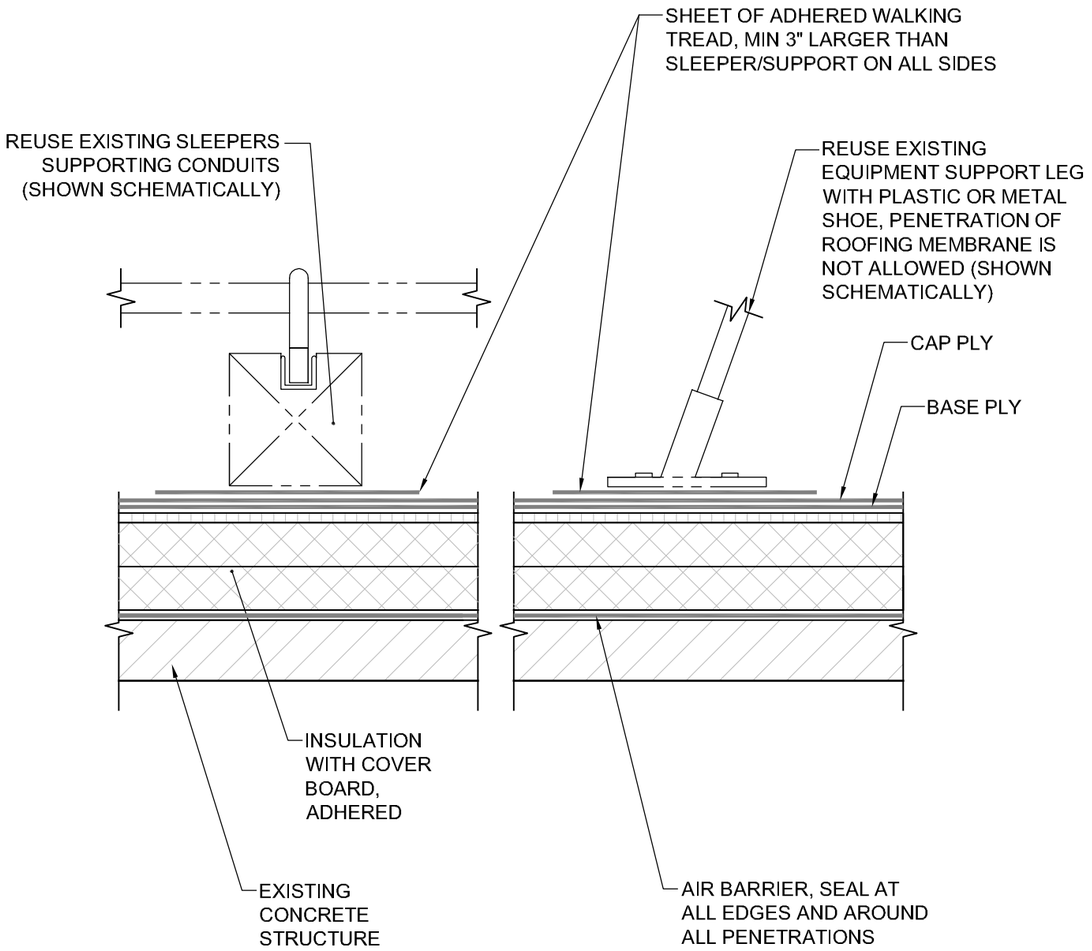

2 TYPICAL - 2-PLY MOD BIT - FLASHING AT SLEEPER AND/OR EQUIPMENT SUPPORT

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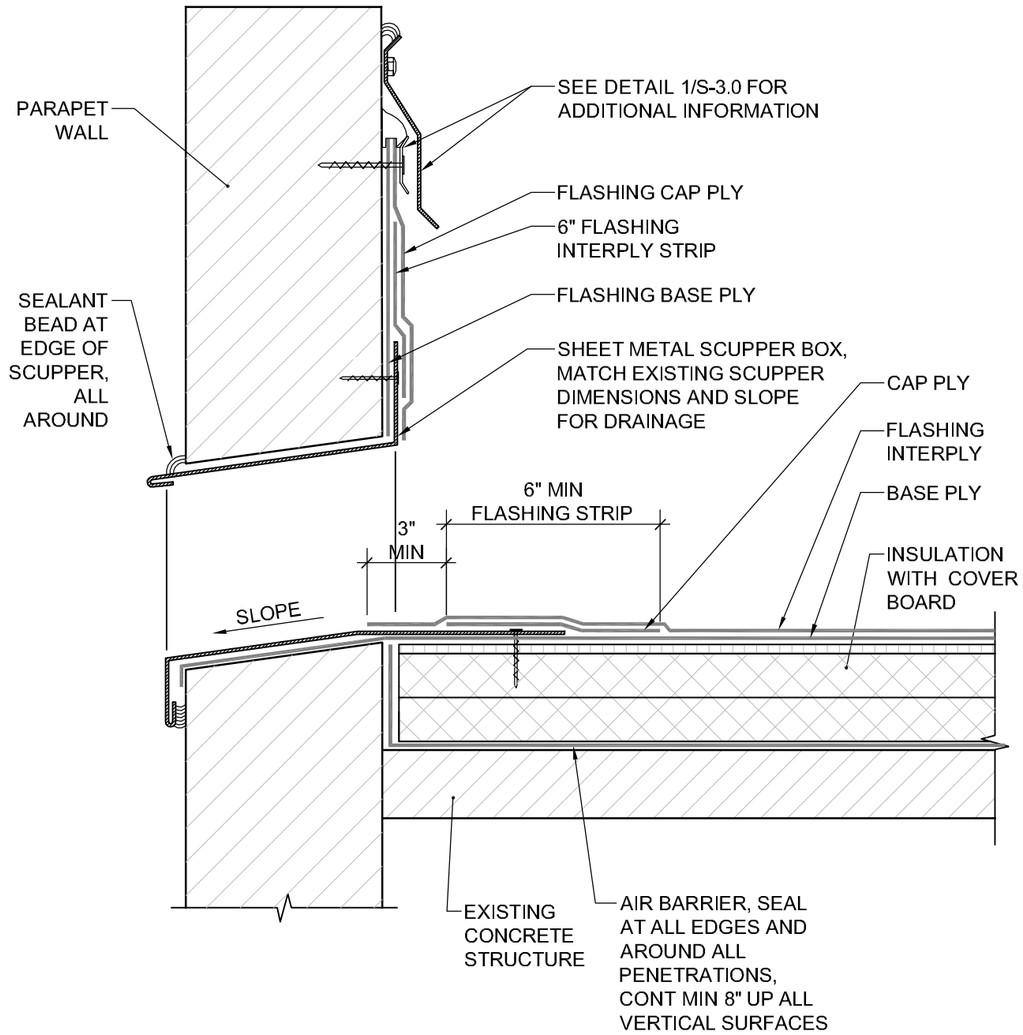

1 TYPICAL - 2-PLY MOD BIT - FLASHING AT SCUPPER

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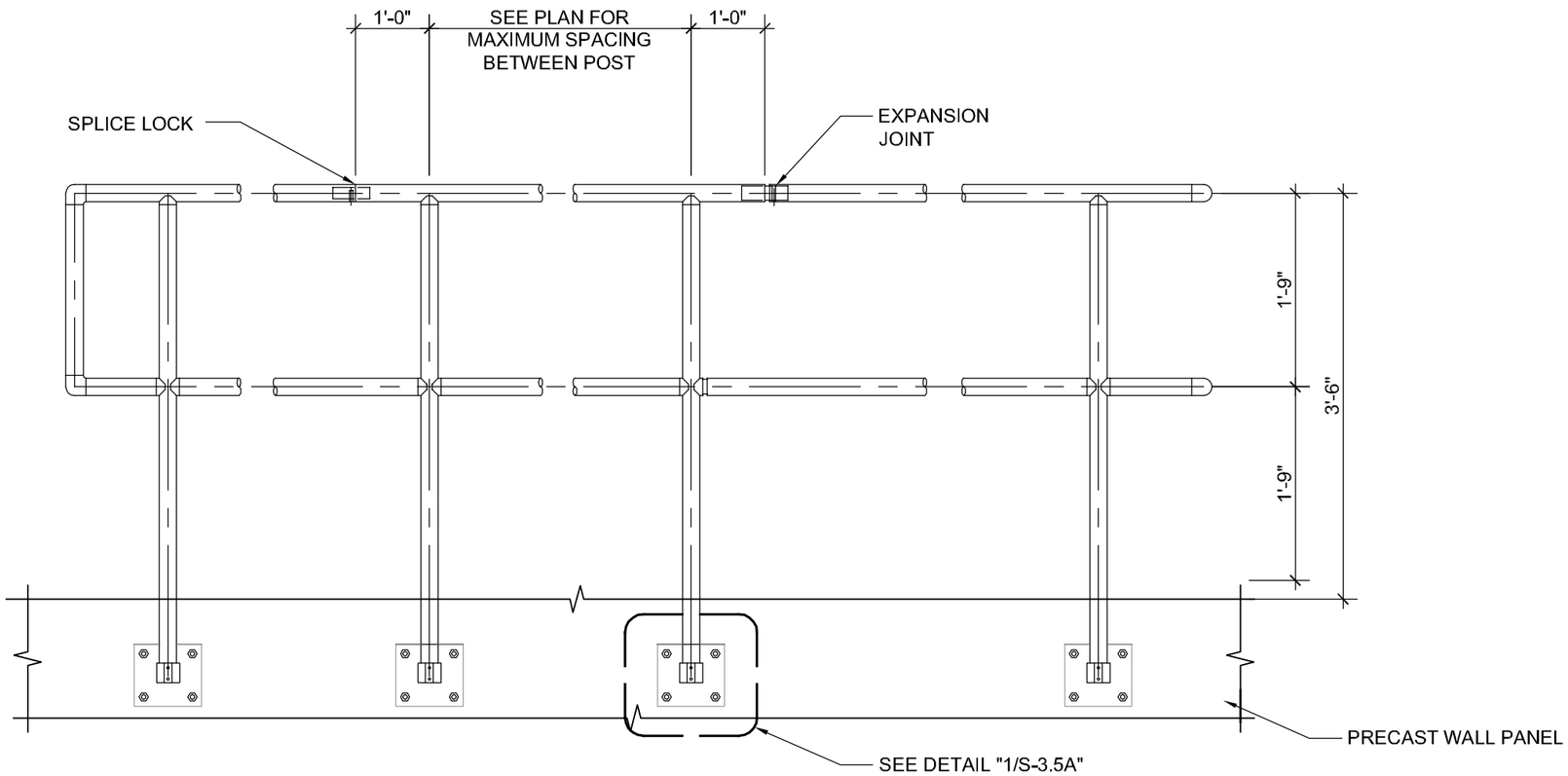

LOOP END

CORNER RETURN

NOTES:

1. GUARDRAIL IS SHOWN CONCEPTUALLY FOR BIDDING PURPOSES. FINAL DESIGN OF CONNECTIONS, GUARDRAIL POSTS, HANDRAILS, SPLICES, AND EXPANSION JOINTS SHALL BE PER THE GUARDRAIL MANUFACTURER.
2. ROOFING SYSTEM NOT SHOWN FOR CLARITY. SEE DETAIL 1/S-3.1 (SIMILAR) FOR FLASHING OF GUARDRAIL POSTS AT ACCESS LADDER LOCATIONS.

1 TYPICAL GUARDRAIL DETAIL

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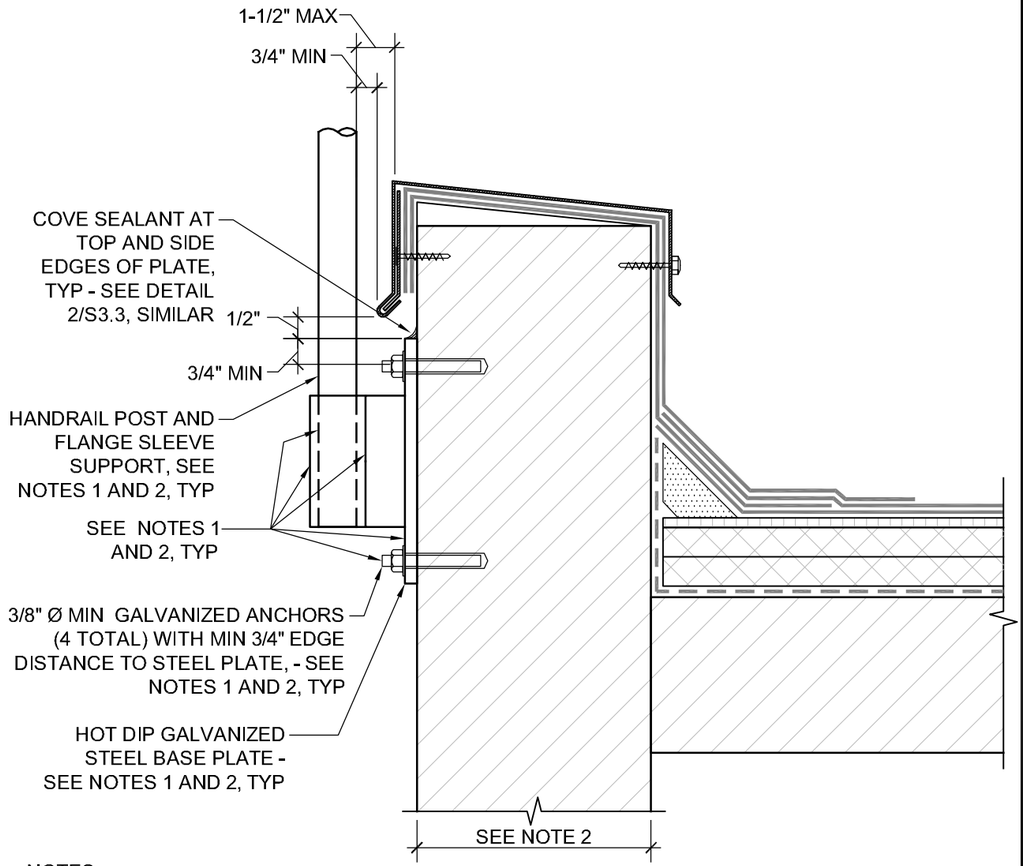

NOTES:

1. WALL MOUNTED CONNECTION FOR GUARDRAIL SUPPORT IS SHOWN CONCEPTUALLY FOR BIDDING PURPOSES. FINAL DESIGN OF HANDRAIL WALL CONNECTIONS SHALL BE PER THE GUARDRAIL MANUFACTURER.
2. FIELD VERIFY PRECAST WALL THICKNESS PRIOR TO DESIGN OF HANDRAIL WALL CONNECTIONS.

1 WALL MOUNTED HANDRAIL WALL CONNECTION

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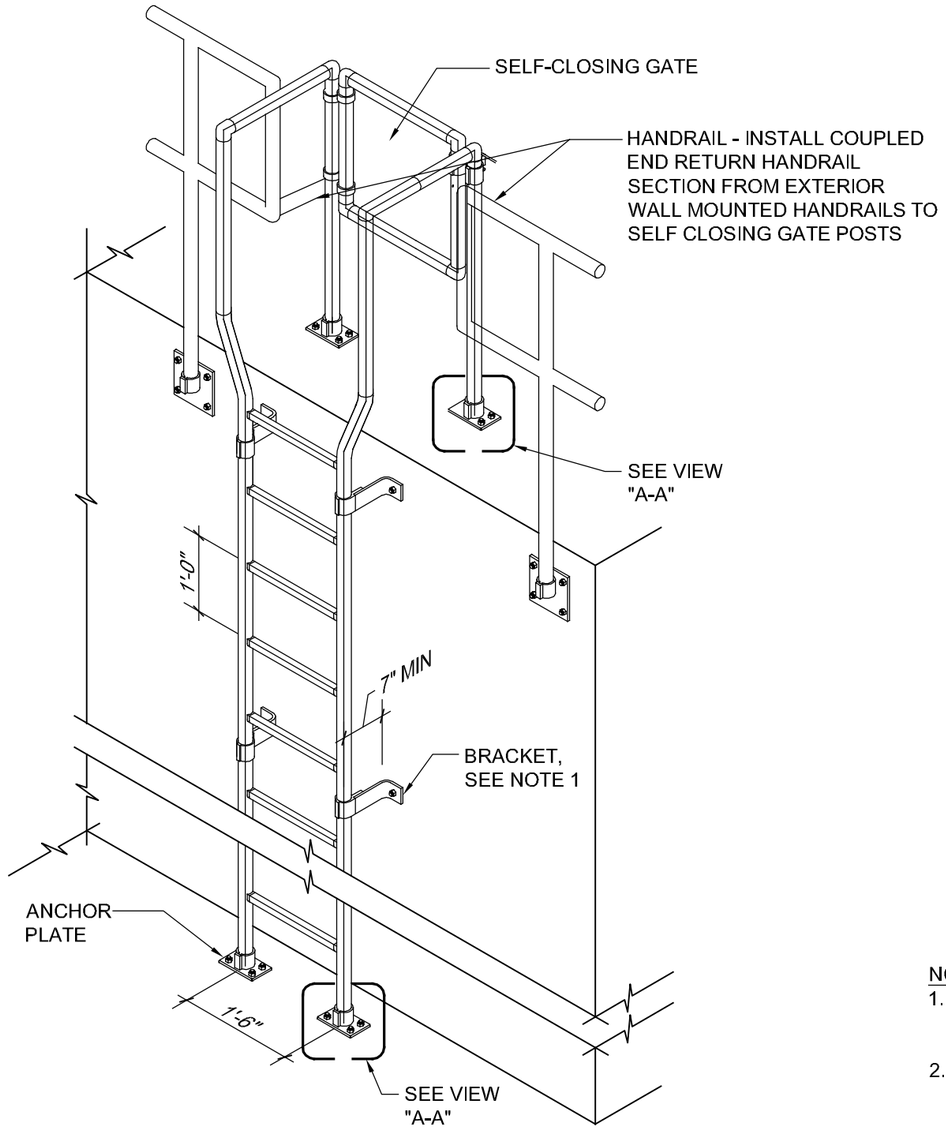

1 ISOMETRIC VIEW - ACCESS LADDER

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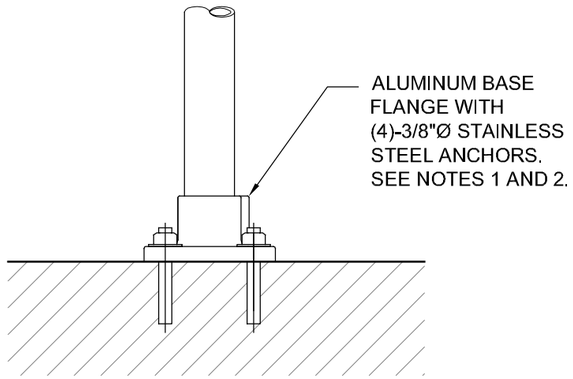

VIEW "A-A"

NOTES:

1. ACCESS LADDER IS SHOWN CONCEPTUALLY FOR BIDDING PURPOSES. FINAL DESIGN OF CONNECTIONS, LADDER ASSEMBLY, SPLICES, AND EXPANSION JOINTS SHALL BE PER THE ACCESS LADDER MANUFACTURER.
2. ROOFING SYSTEM NOT SHOWN FOR CLARITY. SEE DETAIL 1/S-3.1 (SIMILAR) FOR FLASHING OF LADDER SIDE RAILS AND SELF CLOSING GATE POSTS..

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WALL ANCHOR FALL RESTRAINT CONNECTIONS AND CERTIFICATION REQUIREMENTS

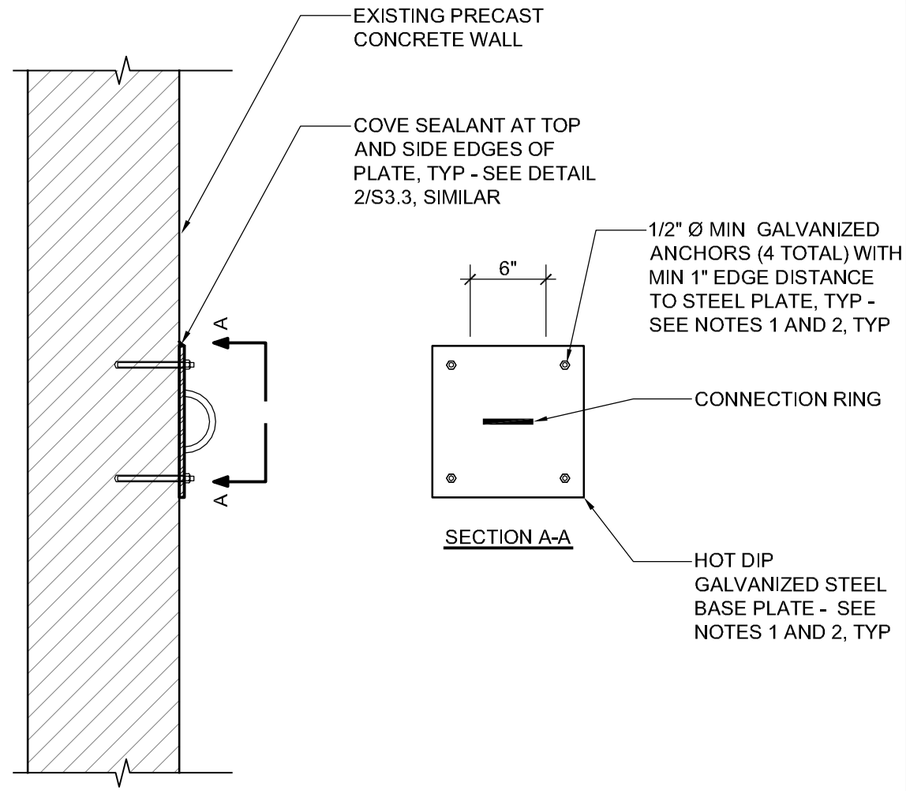
A. CONNECTION DESIGN RATING
   1. FALL RESTRAINT SAFETY CONNECTIONS SHALL BE DESIGNED TO COMPLY WITH OSHA 29 CFR 1910 - APPENDIX C AND ANSI Z359.1.
   2. FALL RESTRAINT WALL ANCHOR SAFETY CONNECTIONS HAVE BEEN DESIGNED TO WITHSTAND 5,000 LBS ULTIMATE LOAD IN ANY DIRECTION WITHOUT FRACTURE OR DETACHMENT.

B. WARRANTY
   1. PROVIDE WITH CONTRACTOR'S OR MANUFACTURER'S 25 YEAR LIMITED WARRANTY.

C. CONTRACTORS FIELD SERVICES
   1. TESTING AND CERTIFICATION SHALL BE PROVIDED UNDER SUPERVISION OF THE CONTRACTOR'S FALL PROTECTION INSTALLER.
   2. ANNUAL INSPECTION PLUS 5 AND 10 YEAR RE-CERTIFICATION PROVIDED BY THE CONTRACTOR'S FALL PROTECTION INSTALLER OR THEIR AUTHORIZED REPRESENTATIVES.
   3. FALL PROTECTION INFORMATION TAGS SHALL BE PLACED AT EACH LIFE LINE ANCHOR POST. TAGS SHALL BE METAL-PRINTED OR OTHER SIMILAR MATERIAL SUITABLE FOR EXTERIOR ENVIRONMENTS. INFORMATION OF THE TAG SHALL BE LEGIBLE AND SHALL INCLUDE THE FOLLOWING:
      a. “WARNING” - DO NOT REMOVE TAG”
      b. “READ FALL PROTECTION DOCUMENTS BEFORE USE AND FOLLOW ALL USAGE INSTRUCTIONS AND REQUIREMENTS”
      c. “USERS SHALL BE TRAINED IN THE USE OF FALL PROTECTION EQUIPMENT PER THE APPLICABLE OSHA, ANSI, AND ASME STANDARDS”
      d. “MAXIMUM ANCHOR WORKING LOAD CAPACITY = 1,250 LBS”
      e. “ALL FALL PROTECTION COMPONENTS SHALL BE RATED FOR USE BASED ON THE REFERENCE MAXIMUM CONNECTION WORKING LOAD CAPACITY AND MAXIMUM USER WEIGHT”

WALL ANCHOR FALL RESTRAINT USAGE REQUIREMENTS

1. THESE SYSTEMS SHALL BE FOR USED AS FALL RESTRAINT SYSTEMS BY AUTHORIZED PERSONS PERFORMING ROOFTOP REPAIRS AND MAINTENANCE ONLY AND SHALL NOT BE USED FOR SUSPENDED ACCESS WORK. THESE SYSTEMS SHALL BE DESIGNED BY THE FALL PROTECTION MANUFACTURER'S ENGINEER IN ACCORDANCE WITH THE OSHA AND ANSI STANDARDS DEFINING SUCH SYSTEMS. THE MANUFACTURER/INSTALLER SHALL NOT BE HELD RESPONSIBLE OR LIABLE FOR DAMAGE CAUSED TO THE FALL PROTECTION BY MISUE OR ABUSE OF THE SYSTEM OR BY USE IN A PROHIBITED MANNER. IN THESE INSTANCES, THE WARRANTY ON THE SYSTEM IS VOIDED AND AUTHORIZED REPAIRS SHALL BE MADE BEFORE THE SYSTEM BE CAN USED.
2. CONTRACTOR SHALL PROVIDE TWO SELF RETRACTING LIFELINE (SRL) SYSTEMS AS PART OF THE PROJECT DELIVERY. SRL SYSTEMS SHALL BE SUCH AS TO PREVENT THE CENTER OF MASS OF THE USER FROM APPROACHING WITHIN A SIX FOOT DISTANCE FROM ALL UNPROTECTED ROOF EDGES.
3. EACH USER SHALL TIE OFF TO AN INDEPENDENT ANCHORAGE POINT.
4. ROOF LIFE LINE SYSTEMS SHOULD ONLY BE CONNECTED TO AT THEIR INTENDED LOCATIONS AS DEMONSTRATED DURING THE SYSTEM TRAINING AT THE END OF THE INSTALLATION. CONNECTION BY ANY OTHER MEANS CONSTITUTES SYSTEM MISUSE, AND MAY RESULT IN INJURY OR DEATH.
5. INSPECT ALL FALL PROTECTION SYSTEMS AND PERSONAL PROTECTIVE EQUIPMENT (PPE) BEFORE EACH USE. IF ANY DAMAGE OR WEAR IS NOTED, DO NOT USE THE STEM OR THE PPE. NOTIFY THE PROPER PERSONNEL, RED-TAG THE SYSTEM AND REMOVE IT FROM SERVICE. CONTRACT THE MANUFACTURER FOR INSPECTION AND REPAIRS. SEE THE OPERATIONS AND MAINTENANCE MANUAL THAT IS ISSUED AT INSTALLATION COMPLETION FOR COMPLETE INSTRUCTIONS ON PRE-USE SYSTEM INSPECTIONS.
6. ALL FALL PROTECTION SYSTEMS REQUIRE YEARLY INSPECTION PER OSHA AND ANSI, AS WELL AS THE SYSTEM MANUFACTURES.
7. EACH WORKER SHALL BE RESPONSIBLE FOR PROTECTING THEIR FALL PROTECTION LIFELINES FROM ABRASION OR CHAFING. WORKERS SHALL USE A SHOCK ABSORBING LANYARD RATED FOR 900 LBS MAXIMUM ARRESTING FORCE.
8. WORKERS SHALL TAKE ADDITIONAL SAFETY MEASURES AND PRECAUTIONS DURING RIGGING TO PROTECT THE GENERAL PUBLIC AND OTHER WORKERS WHO MAY BE IN THE VICINITY OF THE DROP ZONE BELOW THE ROOF EDGES..



NOTES:
1. WALL MOUNTED CONNECTION AND SYSTEM COMPONENTS FOR WALL MOUNTED FALL RESTRAINT TIEBACK SUPPORT IS SHOWN CONCEPTUALLY FOR BIDDING PURPOSES. FINAL DESIGN OF WALL TIEBACK, INCLUDING CONNECTIONS AND AND OTHER SYSTEM COMPONENTS SHALL BE PER THE FALL PROTECTION MANUFACTURER.
2. FIELD VERIFY PRECAST WALL THICKNESS PRIOR TO DESIGN OF WALL TIEBACK ANCHOR CONNECTIONS.

1 WALL MOUNTED TIEBACK ANCHOR

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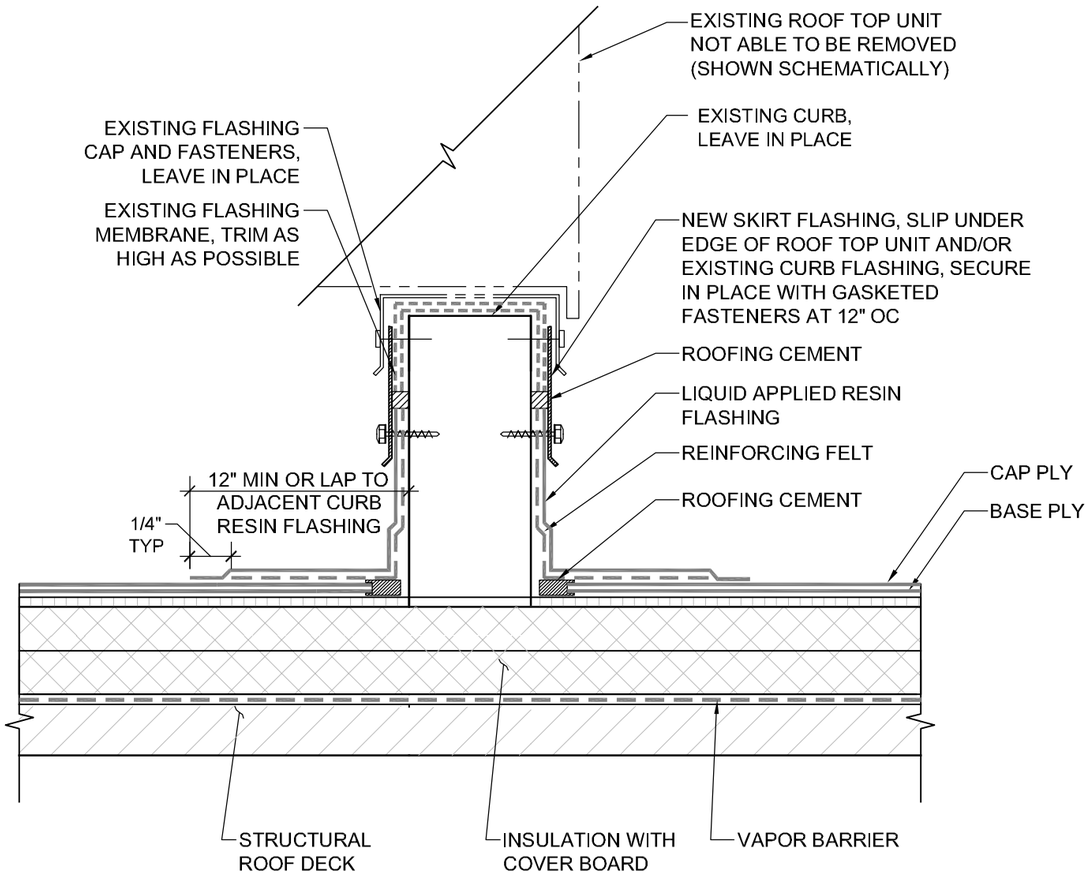

TYPICAL - 2-PLY MOD BIT - LIQUID FLASHING AT NON-REMOVABLE ROOF TOP UNIT

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