

SECTION 07 14 00.02

COLD FLUID APPLIED REINFORCED ROOFING - TWO COMPONENT REINFORCED POLYURETHANE ROOFING SYSTEM - OPTION 2

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. All requirements for Cold Fluid Applied Reinforced Roofing - Two Component Reinforced Polyurethane Roofing System

1.02 RELATED REQUIREMENTS

- A. The Contract Documents include: the "Contract Drawings"; the "Specifications"; the "Special Notice to Contractors", "Special Conditions", NYC Housing Authority Contracts", latest edition; the "Form of Proposal", "Form of Bid Bond", and all amendments and addenda, all of which govern the work of this Contract.
- B. The Contractor is also directed to Division 01 and other Divisions of this specification. They include a description of additional work for removal and replacement of roofing with all related work described herein under Division 07.
- C. Section 02 82 13 - Asbestos Abatement of Roofing Materials.
- D. Section 03 01 00 - Concrete Restoration.
- E. Section 04 20 00 - Masonry Restoration
- F. Section 07 71 00 - Roof Specialties.
- G. Section 22 14 23 - Storm Drainage Piping Specialties.

1.03 REFERENCE STANDARDS

- A. National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual.
- B. ACI-308 - Recommended Practice for Curing Concrete
- C. ANS/SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems
- D. ASTM - D638 - Test Methods for Tensile Properties of Plastics
- E. ASTM - D4258 - Standard Practice for Surface Cleaning Concrete for Coatings
- F. ASTM - D4259 - Standard Practice for Abrading Concrete
- G. ASTM - D4541 - Method for Pull-Off Strength of Coatings using Portable Adhesion Tester
- H. ASTM - E96(A) - Test Methods of Moisture Transmission of Material
- I. ASTM E-108, ANSI/UL 790 for fire resistance.
- J. Factory Mutual (FM Global) - Approval Guide
- K. Cool Roof Rating Council (CRRC) - Standard 1 - 2012
- L. ASTM E903-96, Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres in conjunction with ASTM E891-87, Tables for Terrestrial Direct Normal Solar Spectral Irradiance Tables for Air Mass 1.5.
- M. ASTM C1371-04a, Standard Test Method for Determination of Emittance of Materials.
- N. ASTM E1918-06, Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
- O. ASTM C1549-09, Standard Test Method for Determination of Solar Reflectance.
- P. CRRC - 1, Test Method 1
- Q. International Concrete Repair Institute Guideline 03732 Concrete Surface Preparation

- R. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) - Architectural Sheet Metal Manual
- S. Steel Structures Painting Council (SSPC)

1.04 GENERAL

- A. Prior to submission of bid, visit the work site to verify the existing conditions, dimensions and quantities as set forth in the Contract Documents.
- B. The roofing replacement requires a highly reflective & emissive, fully reinforced, cold fluid-applied, 2 component polyurethane, liquid resin roofing and waterproofing membrane and flashing system, and all other ancillary waterproofing work including but not limited to installation of insulation, cover boards, sealants and metal work as specified to provide A MINIMUM COMPLETE MANUFACTURER'S NO DOLLAR LIMIT 30 YEAR FULL SYSTEM GUARANTEE ON INSTALLATION AND MATERIALS. As such the contractor must be certified as an installer by roofing manufacturer providing the guarantee. Further the certified installer must pre- register the 30 year guarantee with manufacturer and submit a copy of that pre registration at the pre start meeting and prior to beginning work. The actual guarantee must be provided to the Authority PRIOR to the close out of the Job.
- C. The work to be performed under this specification shall include but is not limited to the following: Attend necessary job meetings and furnish competent and full time supervision, experienced roof mechanics, all materials, tools, and equipment necessary to complete, in an acceptable manner, the roof installation in accordance with this specification. Comply with the latest written application instructions of the manufacturer of the primary roofing products. In addition, application practice shall comply with requirements and recommendations contained in the latest edition of the Handbook of Accepted Roofing Knowledge (HARK) as published by the National Roofing Contractors Association.
- D. Local Regulations: Conform to regulations of public agencies, including any specific requirements of the city and/or state of jurisdiction.
- E. Manufacturer Requirements: The primary roofing materials manufacturer shall provide direct trained Field Technical Representative to attend necessary job meetings, perform periodic inspections, and conduct a final inspection upon successful completion of the project.
- F. Roofing Conference: To finalize the scope of work for each roof, a roofing conference must be held prior to beginning any work, between the NYCHA, Development Supervisor, and NYCHA's Representative, the certified roofing installer, contractor, The NYCHA field representative the Field Technical Representative of roofing manufacturer providing the 30 Year NDL Guarantee. At that conference the type of replacement roofing system will be confirmed, and the roofing manufacturer's representative will perform the required inspection for registering the 30 year NDL Guarantee.
- G. Installation of all roofing materials and systems must conform to minimum FM-I-90 wind uplift or any more stringent specific height and location uplift requirements. Fascia, sumps and gravel stops must conform and be tested to meet ANSI/SPRI ES-1 wind resistance for 110 mph. See Section 07 71 00 Roof Specialties.
- H. Phasing and Coordination
 - 1. Phasing work in Overall Development:
 - a. See Division 01 General Requirements and the Schematic Sidewalk Shed Drawing for details and information.
 - 2. Phasing/Coordinating Work at Each Building
 - a. Temporary Roofing Protection: The contractor must provide temporary roofing protection from water infiltration of the exposed roof and brick.
 - 1) This includes temporary protection immediately after asbestos abatement of waterproofing and flashing at roofs and bulkheads walls as well as abatement of roofing and flashing at other locations. All abatement of roofing materials

involves complete removal of roofing down to slab. Temporary roofing protection includes:

- (a) Temporary torch down / vapor barrier to be manufacturer's approved modified cap sheet for use as water stopping on existing slab and up onto existing roofing.
 - (b) Installer of Torch Down Roofing: Must be a certified installer trained in and adhering to all FDNY and New York City Codes and Industry Standards Regulation and Requirements for utilizing gas/torch equipment and installing torch down roofing.
- b. General roofing removal and replacement shall only commence once:
- 1) Asbestos abatement has been completed.
 - 2) Railing replacement has been completed.
- c. Criteria which allow the Contractor to remove roofing assembly over an entire roof leaving to existing sound waterproof vapor barrier as temporary waterproofing membrane.
- 1) The ambient temperatures must remain above 45 degrees for the entire period a roofing system will be replaced.
 - 2) If inspection of the existing vapor barrier by the NYCHA representative/CM finds the existing vapor barrier sound, dry and waterproof the contractor may still under direction of the field representative/CM patch any areas of the existing vapor barrier to assure that the roof is water tight.
 - 3) Then the contractor may be allowed to do a complete removal of all roofing down to the existing waterproof vapor barrier which will act as temporary waterproofing.
 - 4) Subsequently, as per this specification, the Contractor must remove only that portion of the existing vapor barrier and provide the new roofing system, as can be completed in a work day. This includes scarify patching and priming the slab after that portion of the existing vapor barrier has been removed and providing the new roofing system (water stopping, insulation, cover board, roofing membrane and flashing, fascia and cap flashing).
 - 5) If any of these criteria and or conditions can't be met then the contractor may only remove as much roofing as can be replaced within one day (which includes removing existing vapor barrier).
- d. Coordinating 2 Piece Cap Flashing Heights: Where shown on drawings new stainless steel regleted cap flashing are being provided under masonry work. Coordinate to ensure that the cap flashing are installed at adequate height above the finished roofing.
- e. No asbestos-containing materials shall be permitted on site or for any use, as either a temporary or permanent part of construction.

1.05 SCOPE OF WORK

- A. Sloped Insulation Drawing. Though the liquid applied roofing system specified is a waterproofing system and can tolerate standing water, NYCHA the owner requires at minimum a hybrid taper and where possible a full taper sloped system which will move water towards drains. Therefore the Contractor must survey the roofs and provide sloped insulation drawings. The Schematic Sloped Insulation Plans (in the bid set drawings) are only conceptual but can assist in making Bids as well as serve as a background for final sloped insulation drawings.
1. Provide Survey: The accepted Contractor shall have Licensed surveyor perform a survey of roof elevations/slopes, door saddle heights, cap flashing/weep holes, heights of curbs and railing/parapet above the roof slab.
 2. Provide sloped insulation shop drawing: The Contractor shall then send that Survey on a scaled roof plan to a taper insulation Designer and coordinate with them to obtain a detailed insulation layout drawing which directs water towards drains and does not

overwhelm door saddles, cap flashing/weep holes and leaves minimum contract required 48" between the top of the proposed finished roofing and the top of the perimeter fence or parapet.

3. For roof sections where insulation cannot provide a 1/8" slope then 1/16" sloped insulation or drainage enhancers/sumps/crickets/kickers to may effectively drain roof. The Contractor shall then incorporate the final sloped insulation drawing into a Shop Drawing for submission and approval by NYCHA.

NOTE:

1. NYS Energy Code and HUD CF24R value requirements for roofing insulation: NYS/NYC ECC and HUD require a minimum weighted average R-value of 30 for roofing insulation assemblies (insulation and cover board) above the roof deck.
2. The Manufacturer's Insulation Layout Design is integral to a 30 year NDL guaranteed roofing system. Deviations from their layout may void the guarantee and as such must not be done without be signed pre-approval by the Roofing Manufacturer and the Authority. Layout design must indicate minimum thicknesses, taper layout, drainage enhancers, and sumps.
3. GENERAL CONTRACTOR'S COORDINATION OF CAP FLASHING UNDER MASONRY RESTORATION (Section 04 20 00): Since installation the new through wall and regulated cap flashing are being performed under masonry restoration the General Contractor must coordinate the installation height of the 2 piece with the final finished height of the roofing installation.

B. Roof Drains, Leaders and Traps

1. Prior to commencement of work, NYCHA's Representative, the Contractor, Development Superintendent and Contract Inspector shall conduct a joint survey to determine which (if any) of the roof drain leaders are blocked. The contractor shall be responsible for performing this test. Contractor shall provide all tools, equipment, and manpower required to evaluate every roof drain
2. Attach to the minutes of the pre-construction meeting, three copies of a form listing the condition of each drain line and signed by the Development Superintendent and Contractor.
3. The contractor shall unclog blocked drains and leaders in a timely manner to allow the beginning of roofing work. Contractor shall provide all tools, equipment, and manpower required to evaluate every roof drain
4. No roofing work shall commence until the Contractor and Development Superintendent certify in writing to NYCHA that all roof drain and leaders are in working order and free of blockages. Any subsequent blockages encountered shall be the responsibility of the Contractor and will be treated as a punch list item.
5. Clean debris and all foreign matter from the drain bodies.
6. If located in the cellar or crawl space replace all existing roof drain traps.
7. Provide new Vandal Resistant stainless steel perforated gravel guard.
8. Provide wood protection plugs in roof drains during and work. Remove them at the end of each work day and once work is completed.
9. Provide replacement/retrofit roof drain (all hardware to be Vandal resistant). See Section 22 14 23 Storm Drainage Specialties.

C. Description of Work

1. Consists of removal of the existing roofing system down to the concrete structural roof slab, repairing and mechanically preparing slab for new roof system installation, providing a fully reinforced, cold fluid applied, insulated roof system assembly and performing related work.
2. Main, Bulkhead and Low Roofs:
 - a. After abatement and partial removal of allowable amounts of existing roofing down to the slab:

- 1) Scarify the slab.
 - 2) Patch structural roof slab with quick curing patch.
 - 3) Prime with asphalt primer.
 - 4) Torch down temporary roofing / vapor barrier.
 - 5) Temporary flash around all penetrations.
- b. Provide Torch down SBS Base sheet adhered to roof slab / vapor Barrier, and up onto vertical walls.
 - c. Provide tapered / sloped / or hybrid roof insulation with water stopping every 400 sq. ft., as indicated in the drawings, installed / adhered in compatible roof insulation adhesive.
 - d. Provide cement roofing cover board installed / adhered in compatible roof insulation adhesive.
 - e. Provide SBS top cap sheet adhered to primed cement board to provide a uniform substrate and cover all joints in cement board.
- D. Cold Fluid Applied, Reinforced, Liquid Applied Roofing
1. Primer:
 - a. Epoxy two (2) component, solvent free, Low VOC, odor free for use on all concrete, masonry, cement board and porous substrates.
 - b. Polyurethane two (2) component, solvent free, Low VOC, odor free for use on non-porous substrates such as plywood, pvc, metal, glass, and some cap sheets and cover boards.
 2. Reinforcement:
 - a. Needle punched polyester fleece reinforcement with a minimum weight of 165 grams per square meter.
 3. Membrane Resin:
 - a. Two (2) component Polymethyl Methacrylate (PMMA), solvent free, Low VOC, odor free for use in field and flashings.
 4. Aggregate Walkway Surfacing:
 - a. Supplemental coat of two (2) component PMMA textured finish topcoat with integrally mixed color and aggregate for slip-resistant surfacing and aesthetic finish.
- E. Roofing metal edge systems: Fascias, sumps, and cap flashing metal systems shall be stainless steel and each location's specific profile shall be tested and certified for ANSI/SPRI ES-1 wind resistance for 110 mph. See Section 07 71 00 Roof Specialties.

1.06 SUBMITTALS

- A. Also SEE GENERAL REQUIREMENTS: SECTION 01 33 00 - SUBMISSIONS, for other specific requirements
1. No work shall begin, or any materials be ordered, until receipt of written approval from the Authority on all requested materials, items, Submissions or Shop Drawings. Final approved copies of all Shop Drawings must be completed without added corrections, in pencil or ink.
 2. Membrane System Product Data: Provide current standard printed product literature indicating characteristics of membrane materials, flashing materials, components, and accessories product specification and installation.
 3. Product Samples: Submit product samples of membrane and flashing materials showing color, texture, thickness and surfacing representative of the proposed system for review and approval by the Owners Representative.
 4. Submit sample copies of both the Manufacturer and Applicator warranties for the periods stipulated. Each specimen must be a preprinted representative sample of the issuing company's standard warranty for the system specified.
 5. Submit copies of current Material Safety Data Sheets (MSDS) for all components of the work.

6. FM / UL testing data showing that the system assembly complies with the local wind uplift requirements and provides a Class A fire-rated roof assembly.
7. CRRRC (Cool Roof Rating Council) report data showing that the product is listed on the CRRRC website coolroofs.org and that the initial solar reflectance, thermal remittance, and SRI values comply with LEED requirements, local building code requirements, and any specific project requirements.
8. Survey of existing roof slab elevations, by licensed surveyor.
9. Product data for roof inculcation
10. Shop drawings for Drainage enhancers' layout and details. All elevations and thickness shall be coordinated with field survey. The diagrammatic layout shown on the contract drawings should be used only as a guide.
11. Samples of roof insulation materials and accessories
12. Final executed warranties, from both Manufacturer and applicator.

1.07 QUALITY ASSURANCE

- A. Membrane Manufacturer: Company specializing in manufacturing fully reinforced cold fluid applied liquid resin waterproofing membrane systems with a minimum of ten (10) years of documented applications in the United States. Membrane Manufacturer shall submit the following certifications for review:
 - B. Substrates and conditions are acceptable for purpose of providing specified warranty.
 - C. Materials supplied shall meet the specified requirements.
 - D. Applicator: Company specializing in performing the work of this section with (3) years documented experience and approved by system manufacturer for warranted membrane installation. Applicator shall submit the following certification for review:
 1. Applicator shall submit documentation from the membrane manufacturer to verify contractor's status as an approved applicator for warranted installations.
 - E. Evaluate moisture content of cementitious substrate materials. Contractor shall determine substrate moisture content throughout the work and record with Daily Inspection Reports or other form of reporting acceptable to the Owner or designated Representative, and Membrane Manufacturer.
 - F. Evaluate surface moisture content by means of a Tramex Concrete Moisture Encounter Meter. A surface moisture content of < 6% is required to allow for proper primer penetration into the substrate.
 - G. Bubbling, or pinholes within the primer indicates excessive moisture content within the substrate. Blistering of membrane may result from excessive substrate moisture. Primer application during late afternoon/early evening will reduce vapor pressure within the substrate and may alleviate these conditions.
 - H. Continued bubbling or pinholes indicates excessive moisture content that requires more substantial measures. Evaluate substrate moisture content by means of relative humidity (RH) probes in accordance with ASTM F2170. Relative moisture content of 75% or greater indicates the need for more extensive substrate priming and sealing. Contact Membrane Manufacturer for recommendations.
 - I. Random tests to determine tensile bond strength of membrane to substrate shall be conducted by the Contractor at the job site using an Elcometer Adhesion Tester Model 106 or similar device, or by the performance of a manual pull test. Contractor shall perform tests at the beginning of the Work, and at intervals as required to assure specified adhesion with a minimum of three (3) tests per 5000 square feet. Smaller areas shall receive a minimum of three (3) tests. Test results shall be submitted to the Owner or his designated Representative and the Membrane Manufacturer. Contractor shall immediately notify the Owner or his designated Representative and Membrane Manufacturer in the event bond test results are below specified values.

1. Adequate surface preparation will be indicated by tensile bond strength of membrane to substrate greater than or equal to 116 psi (0.8 N/mm²), as determined by use of an adhesion tester.
 2. Adequate surface preparation will be indicated by 135° peel bond strength of membrane to substrate such that cohesive failure of substrate or membrane occurs before adhesive failure of membrane/substrate interface.
 3. In the event the bond strengths are less than the minimum specified, additional substrate preparation is required. Repeat testing to verify suitability of substrate preparation.
- J. Monitor quantities of installed materials. Monitor application of resin mixture, reinforcing fleece and flashing. Perform Work in accordance with manufacturer's instructions.
- K. Mock-up areas shall be used to determine required methods and tools to obtain degree of substrate preparation required by the membrane manufacturer. Conduct tests as required to verify that substrate preparation meets specified requirements. Tests shall include, but are not limited to, tensile bond strength and moisture content of substrate.
1. Prepare and clean a three (3) foot by three (3) foot area of each substrate material type.
 2. Submit findings in writing to Owner or his designated Representative and Membrane Manufacturer.
 3. Mock-up areas shall be maintained for quality control for the entire project.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. The Contractor together with the Owner or his designated Representative shall define a storage area for all components. The area shall be cool, dry, out of direct sunlight, and in accordance with manufacturer's recommendations and relevant regulatory agencies. Materials shall not be stored in quantities that will exceed design loads, damage substrate materials, hinder installation or drainage.
- B. Store solvent-bearing solutions, resins, additives, inhibitors or adhesives in accordance with the MSDS and/or local fire authority. After partial use of materials replace lids promptly and tightly to prevent contamination.
- C. Roll goods shall be stored horizontally on platforms sufficiently elevated to prevent contact with water and other contaminants. DO NOT use rolls that are wet, dirty or have damaged ends.
- D. Roofing/waterproofing materials must be kept dry at all times. If stored outside, raise materials above ground or roof level on pallets and cover with a tarpaulin or other waterproof material. Plastic wrapping installed at the factory should not be used as outside storage covers.
- E. Follow manufacturer's directions for protection of materials prior to and during installation. Do not use materials that have been damaged to the point that they will not perform as specified. Fleece reinforcing materials must be clean, dry and free of all contaminants.
- F. Copies of all current MSDS for all components shall be kept on site. Provide any and all crew members with appropriate safety data information and training as it relates to the specific chemical compound he or she may be expected to deal with. Each crew member shall be fully aware of first-aid measures to be undertaken in case of incidents. Comply with requirements of OSHA, NIOSH or local governing authority for work place safety.

1.09 ENVIRONMENTAL REQUIREMENTS

- A. Protection of adjacent areas from system-related contamination shall be the responsibility of the installer.
- B. Do not apply roofing / waterproofing membrane during or with the threat of inclement weather.
- C. Application of cold fluid-applied reinforced polyurethane roofing / waterproofing membrane may proceed while air temperature is between 40°F (5°C) and 85°F (30°C) providing the substrate is a minimum of 5°F above the dew point.

- D. When ambient temperatures are at or expected to fall below 50°F (10°C), or reach 85°F (30°C) or higher, follow Membrane System Manufacturer's recommendations for weather related additives and application procedures.
- E. Ensure that substrate materials are dry and free of contaminants. DO NOT commence with the application unless substrate conditions are suitable. Contractor shall demonstrate that substrate conditions are suitable for the application of the materials.
- F. Modified bitumen membrane should not be installed in extremely cold temperatures unless precautions have been taken to protect the rolls from freezing.
- G. Correct solvent, heat welding, adhesive, and/or bitumen application temperatures must be maintained.
- H. Verify adhesion regularly during application. Hot-applied bituminous roofing materials must be applied promptly.
- I. In cold weather conditions, store rolls in a heated location until needed on the roof.
- J. Asphalt mopping is not recommended at consistent temperatures below 40°F. Recommended EVT must be maintained.
- K. All materials to be installed must be kept dry.

1.10 SAFETY

- A. Contractor and contractor's crew members shall observe and enforce all appropriate safety and fire department regulations during installation and handling of roofing materials and asphalts.
- B. A fully operational fire extinguisher shall be maintained within reasonable access to each applicator, at propane tanks, and and/or as required by local fire department regulations.
- C. Protect all partially and fully completed roofing work from other trades until completion. Whenever possible, stage materials in such a manner that foot traffic is minimized over completed roof areas. When it is not possible to stage materials away from locations where partial or complete installation has taken place, temporary walkways and platforms shall be installed in order to protect all completed roof areas from traffic and point loading during the application process.
- D. Temporary tie-ins shall be installed at the end of each workday and removed prior to commencement of work the following day.
 - 1. Additional Criteria:
 - a. Provide protection against staining and mechanical damage for newly applied roofing and adjacent surfaces throughout this project.
 - b. Limited Access: Prevent access by the public to materials, tools and equipment during the course of the project.
 - c. Debris Removal: Remove all debris daily from the project site and take to a legal dumping area authorized to receive such materials.
 - d. Site Condition: Complete, to the NYCHA Field Inspector's satisfaction, all job sites clean-up including building interior where applicable, exterior and landscaping where affected by the construction.
- E. Torch Safety (If torch down application is used for vapor barrier and base sheet over Cement Board): 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 Contractors 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.

NOTE: The use of Torch down application may require a variance from the NYC Fire Department.

1.11 REQUIREMENTS PRIOR TO START OF JOB

- A. NOTIFICATION: Give a minimum of five (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.
- B. PERMITS: Obtain all permits required by local agencies and pay all fees, which may be required for the performance of the work.
- 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. See also Section 3.12.

1.12 DECK REQUIREMENTS

- A. Weight limits on Roof Slab. Do not overload any portion of the building either by use of or placement of equipment, storage of debris or storage of materials.
 - 1. The total live and dead load is not to exceed 160 lbs /sq ft.
- B. The roof deck must be sound, smooth, dry, and free from deformation. Provide patching to level areas prior to start of reroofing
- C. The roof deck must be suitable for the type of roofing system selected and must meet all the deck requirements.

1.13 PRE-INSTALLATION CONFERENCE

- A. Prior to scheduled commencement of the roofing installation and associated work, conduct a meeting at the project site with the installer, NYCHA construction Inspector, The roofing Manufacturer's technical representative and any other persons directly involved with the performance of the work. The installer shall record conference discussions to include decisions and agreements reached (or disagreements), and furnish copies of recorded discussions to each attending party. The main purpose of this meeting is to review foreseeable methods and procedures related to roofing work.

1.14 REGULATORY REQUIREMENTS

- A. All work shall be performed in a safe, professional manner, conforming to all federal, state and local codes.
- B. Exterior Fire Test Exposure: Provide a roofing system that will achieve a rating for roof slopes indicated.
- C. FM /UL Class A.
- D. Windstorm Classification: Provide a roofing system, which will achieve a wind uplift rating, as listed in the current FM Approval Guide of FM-I-90.
- E. Roof Perimeter Metal Edge Wind Design: Provide a roofing system in compliance with ANSI/SPRI ES-1 "Wind Design Standard for Edge Systems Used with Low Slope Roof Systems" for the performance for Maximum Wind Speed and the Building Height required for the project. Provide a ANSI/SPRI ES-1 Certificate of Compliance.
- F. Conform to applicable New York Building code for roof assembly fire hazard.
- G. Conform to applicable New York Building code for cool/reflective roofing based on product listings available thru CRRS (Cool Roof Rating Council) coolroofs.org.

1.15 PROJECT CONDITIONS

- A. Protection of adjacent areas from splash or other system-related contamination shall be the responsibility of the Waterproofing installer. Provide adequate protection and windbreaks where necessary.

- B. Install materials in accordance with manufacturers Technical Data Sheets, MSDS or as modified by applicable rules and regulations of NIOSH, and local state and federal authorities having jurisdiction.
- C. Odor control and elimination measures are not typically necessary, but if required by the Owner or his designated Representative, Contractor shall implement odor control and elimination measures prior to and during the application of the roofing/waterproofing materials. Control/elimination measures shall be field tested at off-hours and typically consists of one (1) or a multiple of the following measures:
 - 1. Sealing of air intakes with activated carbon filters. Install filters in accordance with requirements and recommendations of the filter manufacturer. Seal filters at joints and against building exterior walls to prevent leakage of unfiltered air.
 - 2. Sealing of doorways, windows, and skylights with duct tape and polyethylene sheeting to prevent leakage of air into the building.
 - 3. Erection and use of moveable enclosure(s) sized to accommodate work area(s) and stationary enclosure for resin mixing station. Enclosure shall be field constructed or pre-manufactured of fire retardant materials in compliance with local code requirements in accordance with requirements of the Owner or his designated Representative. Equipment enclosure(s) with mechanical air intake/exhaust openings and Odor Control Air Cleaners, as required to clean enclosed air volume and to prevent odor migration outside the enclosure. Exhaust opening shall be sealed with activated carbon filter.
 - 4. Protection of Contractor personnel and occupants of the structure and surrounding buildings as necessary to comply with requirements of OSHA, NIOSH and/or governing local authority.
- D. When disposing of all refuse or unused materials, observe all EPA, OSHA or local disposal requirements.
- E. The General Contractor shall ensure that adequate protection is provided for the duration of the contract to prevent damage to the system by others negligence.

1.16 WARRANTY

- A. Manufacturer's Premier Warranty: Provide (30) year manufacturer's premier full system warranty under provisions of this section. This warranty provides for cost of labor and materials for loss of water tightness, limited to amounts necessary to effect repairs necessitated by either defective material or defects in related installation workmanship, with no dollar limitation ("NDL").
- B. Waterproofing Contractor's Warranty: Provide (5) year "Applicator Maintenance Warranty" covering workmanship for all work of this section including installation of membrane, flashings, metal work, and roofing/waterproofing accessories.
- C. Submit (2) executed copies of both the manufacturer and applicator warranties for the periods stipulated, starting from the date of substantial completion. Each warranty must be signed by an authorized representative of the issuing company.

PART 2 PRODUCTS

2.01 GENERAL

- A. The products herein specified are totally pre-engineered products of the listed manufacturers and establish criteria for the approval of substitutions. Products must be part of a virtually odorless, pre-engineered, low VOC fully reinforced cold liquid applied 2 component polyurethane resin waterproofing membrane system, equivalent in function, quality, composition and method of application to be considered for approval as an "Approved Substitute". Substitute materials must meet or exceed all physical performance characteristics of the specified materials. PMMA, PUMA, or single component primers or resin systems will not be accepted. A minimum 165 g/m² fleece reinforcement is required.

2.02 FLASHINGS

- A. Membrane Flashings: A composite of the same resin material as field membrane with 165 g/m² fleece reinforcement.

2.03 SUBSTRATE PRIMERS AND RESIN ADDITIVES

- A. Polyurethane Primer: Two-component, solvent-free polyurethane resin for use in improving adhesion of membrane to wood, metal and bituminous substrate surfaces, as provided by the manufacturer.
- B. Epoxy Primer: Two-component, solvent-free epoxy resin for use in improving adhesion of membrane to cementitious/masonry substrate surfaces, as provided by the membrane manufacturer.
- C. Cold Weather Additive: Additive specifically designed to accelerate the resin reaction time at ambient temperatures below 50°F (10°C). Accelerator to be used with resin Component A prior to mixing of multi-component resin, as provided by the membrane manufacturer.

2.04 ACCESSORIES

- A. Application Tools, Accessories, and Cleaners: Supplied and/or approved by membrane manufacturer for product installation.
- B. Solvent-Based Cleaner for Tools and Membrane Tie-Ins: Methyl Ethyl Ketone (MEK) or acetone.
- C. Water-Based Cleaner for Membrane: Simple Green HD or approved equal.
- D. Topcoat Surfacing Aggregate: Silica sand, ceramic-coated quartz, or specialty aggregate shall be washed, kiln-dried, and dust-free with the following size specification:
 - 1. Alkalinity/Adhesion Key: 0.5 - 1.2 mm
 - 2. Light Pedestrian Traffic: 0.4 - 1.0 mm
- E. Leveling and Patching Aggregate: Silica sand shall be washed, kiln-dried, and dust-free, suitable for troweling or pourable self-leveling, round grain or angular with the following size specification:
 - 1. For voids less than 1" in depth: #00 (0.3 - 0.6 mm)
 - 2. For voids 1" to 2" in depth: #0 (0.5 - 1.2 mm)
- F. Mixing Proportions shall be a ratio of primer / resin to sand at 1:2 by volume for leveling, 1:4 by volume for patching, or as approved by membrane manufacturer.
- G. Backer Rod: Expanded, closed-cell polyethylene foam designed for use with cold-applied joint sealant.
- H. Caulking: Single component, non-sag elastomeric polyurethane sealant meeting ASTM C920, Type S, Grade NS, Class 35 for use in sealing cracks and joints, and making watertight seals where required.
- I. Wood Nailers and Cant Strips: New wood nailers and cant strips shall be pressure treated for rot resistance (e.g., "Wolmanized" or "Osiose K-33"), #2 or better lumber. Asphaltic or creosote treated lumber is not acceptable.

2.05 TEMPORARY / VAPOR BARRIER

- A. VAPOR BARRIER
 - 1. APP Cap Sheet: Mineral-surfaced polyester-reinforced APP-modified bitumen Base sheet conforming to ASTM D-6222, suitable for torch application and adhesion of polyisocyanurate insulation directly above it.
 - 2. SBS Base Sheet: Mineral surfaced fiberglass reinforced SBS modified bitumen sheet conforming to ASTM D-6163; Grade S, suitable for torch application and adhesion of polyisocyanurate insulation board directly above it.

- a. NOTE: The temporary roofing/waterproofing to be provided as existing roofing is removed shall remain and function as the vapor barrier for the new roofing system.

2.06 UNDERLAYMENT PLY MEMBRANE (SUITABLE FOR COLD FLUID APPLICATION ABOVE IT)

- A. A. SBS Cap Sheet: Mineral surfaced polyester reinforced SBS modified bitumen sheet conforming to ASTM D-6164; Grade S, suitable for torch and self-adhesive application prior to the PMMA membrane installation.

2.07 COVER BOARD / INSULATION

- A. Cement Roof Board: High compressive strength, non-combustible, roof underlayment board consisting of aggregated portland cement slurry with polymer-coated glass-fiber mesh, with the following characteristics:

1. Board Weight	2.4 lbs/sq.ft.	
2. Board Size	[48 x 96] inches	
3. Board Thickness	1/2 inch	
4. Flexural Strength	>750 psi,	ASTM C-947
5. Compressive Strength	>1000 psi nominal	
6. Flute Spannability	12 in.	ASTM E-661
7. Permeance	5.84 perms	ASTM E-96
8. Thermal Conductivity	R-value of 0.39	ASTM C-518
9. Coefficient of thermal expansion	4.5 x 10 ⁶	ASTM E-831
10. Linear variation w change in moisture	<0.07% max	ASTM D-1037
11. Water absorption	<15 % max	ASTM C-473
12. Mold resistance	10	ASTM D-3273
13. Board Edges	Square	

2.08 INSULATION

- A. Polyisocyanurate Insulation with Nonasphaltic Facers: Meeting or exceeding the requirements for ASTM C1289-06, Type II, Class 1, Grade 3 (25 psi), 1.5 inch minimum thickness, with the following characteristics:

1. Board Density	2.0 lb/cu ft
2. Board Size	48x48 or 48 x 96 inches
3. Board Thickness	As required to meet performance requirements.
4. Thermal Conductivity	K factor of 0.17 per ASTM C177
5. Board Edges	square

- B. Tapered Polyisocyanurate Insulation with Nonasphaltic Facers: Meeting or exceeding the requirements for ASTM C1289-06, Type II, Class 1, Grade 3 (25 psi), 0.5 - 4.5 inch thickness, with the following characteristics:

1. Board Density	2.0 lb/cu ft
2. Board Size	48x48 or 48 x 96 inches
3. Board Taper	As required
4. Total Thickness	As required to achieve an average R value of 30 for total roofing system.
5. Thermal Conductivity	K factor of 0.17 per ASTM C177,
6. Board Edges	square

2.09 INSULATION AND COVER BOARD SECUREMENT

- A. Polyurethane Adhesive: FM-approved single component moisture-cured, or two component reactive-cured polyurethane adhesive. Adhesive application rate shall be in accordance with specified wind uplift rating for system application. Roofing adhesive shall be a type approved by membrane and insulation manufacturer.

2.10 WATER-STOPPING

- A. A. Water-stopping (every 400 sq. ft.) shall consist of 2 plies of roof felt extending 10" under and 6" over the top of the insulation. These water stops felt shall using cold applied flashing cement be first set in and adhered to the roof slab, saturated turned up on the vertical edges of the insulation and then turned over fixed to the top of the insulation. ASTM D2178, Type IV Felts.

2.11 SBS MODIFIED BASE-PLY

- A. A. SBS Base Sheet: A prefabricated, reinforced, homogeneous Styrene-Butadiene-Styrene (SBS) block copolymer modified asphalt membrane applied over a prepared substrate, covered with a liquid applied membrane formed by the combination of resin and fleece fabric. The reinforcement mats in the SBS ply shall be impregnated/saturated and coated each side with an SBS modified bitumen blend. The cross sectional area of the SBS sheet material shall contain no oxidized or non-SBS modified bitumen. The adhesive layer of torch-grade membranes shall be manufactured using a process that embosses the surface with a grooved pattern to provide optimum burn-off of the plastic film and to maximize application rates. The top surface of the modified bitumen ply sheet shall be coated with a white acrylic coating to enhance resin bond and to minimize surface temperatures.

PART 3 EXECUTION

3.01 GENERAL

- A. Verify deck/substrate openings, curbs, and protrusions through deck/substrate, wood cant strips and reglets are in place and solidly set.
- B. Verify that surfaces and site conditions are ready to receive work.
- C. Verify deck/substrate is structurally supported, secure and sound.

3.02 INSPECTION

- A. NYCHA's field inspector, Installer shall inspect and approve the prepared substrate prior to application of the sealer/primer coat.
- B. Random tests for adequate tensile strength of the substrate shall be conducted (using an Elcometer Adhesion Tester) on the substrate by the installer (for an agreed fee), at a minimum frequency of one per 5000 sf. For roofs 15,000 sq. ft. and smaller, a minimum of three tests shall be conducted and the results recorded.
- C. The minimum tensile bond strength of the concrete shall be 150 psi.

3.03 ROOFING SYSTEM SUBSTRATE PREPARATION

- A. General: Surfaces to be prepared as a substrate for the new waterproofing system as follows:
 1. The contractor shall determine the condition of the existing structural deck/substrate. All defects in the deck or substrate shall be corrected before new waterproofing work commences. Areas of deteriorated deck/substrate, porous or other affected materials must be removed and replaced with new to match existing.
 2. Prepare flashing substrates as required for application of new waterproofing membrane flashings.
 3. Inspect substrates, and correct defects before application of new waterproofing. Fill all surface voids greater than 1/8 inch wide with an acceptable fill material.
 4. Remove all ponded water, snow, frost and/or ice from the work substrate prior to installing new waterproofing materials.
 5. The final substrate for waterproofing shall be clean, dry, free of loose, spalled or weak material including coatings, mineral aggregate, and flood coat/gravel surfacing, oil, grease, contaminants, abrupt changes in level, waterproofing agents, curing compounds, and free of projections which could damage membrane materials.
- B. Structural Concrete:

1. New concrete shall have cured a minimum of 28 days in accordance with ACI-308, or as approved by Waterproofing Manufacturer's Technical Department.
 2. New or existing concrete shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, bituminous products and previous waterproofing materials.
 3. New or existing concrete shall be dry with a maximum moisture content of five (5) percent. Determinations of moisture content shall be performed by the Contractor. Contractor shall be responsible to perform periodic evaluations of moisture content during the work. Moisture evaluation results shall be submitted in writing to the Owner or his designated Representative and Waterproofing manufacturer for acceptance.
 4. Where required, concrete shall be abrasively cleaned in accordance with ASTM D4259 to provide a sound substrate free from laitance. Achieve an open concrete surface in accordance with ICRI surface profiles CSP 3-5. When using mechanical methods to remove existing waterproofing products or surface deterioration, the surface profile is not to exceed ¼ inch (peak to valley).
 5. The substrate shall be sound and all spalls, voids and blow holes on vertical or horizontal surfaces must be repaired prior to placement of the primer coat. Spalls and other deterioration shall be repaired in accordance with the requirements of the Owner or his designated Representative and Membrane manufacturer.
 6. Areas of minor surface deterioration of 0.25" (6 mm) or greater in depth shall be repaired to prevent possible pooling of the liquid applied materials, leading to excessive usage of primer and resin.
 7. Hollow-core panels, T-panels, and Twin-T panels shall have grouted joints between panels and shall be provided with mechanical securement from panel to panel.
 8. For concrete materials with a compressive strength of less than 3,000 psi contact Waterproofing Manufacturer's Technical Department for substrate preparation requirements.
- C. Masonry:
1. Walls shall be built with hard kiln dried brick or waterproof concrete block construction.
 2. Areas of soft or scaling brick or concrete, faulty mortar joints, or walls with broken, damaged or leaking coping shall be repaired in accordance with the requirements of the Owner or his designated Representative and Flashing Membrane Manufacturer.
- D. Steel/Metal:
1. Clean and prepare metal surfaces to near white metal in accordance with SSPC - SP3 (power tool clean) or as required by membrane manufacturer. Extend preparation a minimum of one (1) inch beyond the termination of the membrane flashing materials.
 2. In addition to cleaning, all metal surfaces shall be abraded to provide a rough open surface. A wire brush finish is not acceptable.
- E. Wood/Plywood:
1. Plywood shall be identified with American Plywood Association (APA) grade trademarks and shall meet the requirements of product standard PS1. Strip plywood joints with four inch (4") wide strip of flashing membrane. Cover knot holes or cracks with strips of flashing membrane.
- F. Other Flashing Surfaces:
1. Remove all contaminants as required by membrane manufacturer. Surface preparation shall be performed by means approved by NYCHA or designated Authority Representative.
- G. Finish Leveling, Patching and Crack Preparation:
1. General: epoxy primer/sand mix is the preferred material for all concrete and masonry substrate finish leveling, crack and wall/deck preparation and patching. Epoxy primer/sand patching mix provides a set time of approximately twelve (12) hours and does

not require surface grinding. Primer/sand mix is typically applied in conjunction with general surface priming.

2. Concrete and Masonry Substrate Leveling & Patching: Substrate conditions are to be evaluated by the Contractor, the Owner, or his designated Representative, and Membrane manufacturer. Perform leveling and patching operations as follows:
 - a. Level uneven surfaces with a leveling mixture of primer and approved kiln-dried silica sand in a 1:2 primer to sand ratio by volume. Spread and plane this compound with a squeegee and trowel to achieve a flat surface.
 - b. Fill cavities with a patching mixture of primer and approved kiln-dried sand in a 1:4 primer to sand ratio by volume.
 - c. Silica sand must be kept absolutely dry during storage and handling.
 - d. Any surface to be leveled or filled must first be primed with an appropriate primer.
- H. Joint and Crack Preparation: Joints, cracks and fractures in the structural deck/substrate shall be prepared as defined below prior to installation of the waterproofing membrane. Note: Joints, cracks, and fractures may telegraph through the waterproofing membrane.
 1. Non-Moving Cracks, Joints, and Voids: Determine that crack/joint is non-moving. Clean out crack/joint by brushing and oil-free compressed air. Fill crack/joint with polyurethane sealant. Voids require the installation of backer rod or other backing material prior to application of the polyurethane sealant. Allow for a minimum of twelve (12) hours cure or as required by sealant Manufacturer.
 2. Moving Cracks: Determine that crack is moving. Clean out crack by brushing and oil-free compressed air. Fill crack with polyurethane sealant. Allow for a minimum of twelve (12) hours cure or as required by sealant Manufacturer. Following full curing of primer, apply waterproofing resin and 4 inch (10 cm) wide strip of membrane (resin and fleece) in strict accordance with Membrane manufacturer's written instructions.

3.04 CAP SHEET / SBS BASE SHEET TEMPORARY ROOF / VAPOR RETARDER INSTALLATION

- A. Install Cap Sheet: Install mineral-surfaced cap sheet in accordance with sheet manufacturer's current published specifications and recommendations for use with adhered roofing.
- B. Mineral Surfaced Cap Sheet/SBS Base sheet Torch-Applied Attachment: Follow cap sheet manufacturer's recommendations for the appropriate application procedure. Roll each cap sheet into molten bitumen. Limit bitumen bleed-out at laps to 1/4" or less.
- C. Mineral Surfaced Cap Sheet Self-Adhered Attachment: Follow cap sheet manufacturer's recommendations for the appropriate application procedure.
- D. Fit Cap Sheet/SBS Base Sheet: Neatly fit cap sheet to all penetrations, projections, curbs, and walls. Extend over all nailers. Cap sheet shall be overlapped a minimum of 3" for side laps and 6" for end laps. Seal at penetrations, projections, curbs and walls with urethane-based sealant. Do not use asphaltic flashing cement.

3.05 INSULATION / COVER BOARD INSTALLATION

- A. General: Insulation and cover board shall be installed in accordance with the insulation/cover board manufacturer's current published specifications and recommendations for use with adhered roofing.
- B. Install Insulation/Cover Board: Install only as much insulation and cover board as can be primed, sealed, and protected before the end of the day's work or before the onset of inclement weather.
- C. Fit Insulation/Cover Board: Neatly fit insulation/cover board to all penetrations, projections, and nailers. Insulation shall be loosely butted, with gaps not greater than 1/4". All gaps greater than 1/4" shall be filled with acceptable insulation. Cover board shall be loosely butted, with gaps not greater than 1/4". All gaps greater than 1/8" shall be filled with primer; all gaps greater than 1/4" shall be filled with polyurethane sealant.

1. Strip-In Cover Board Joints: Strip all cover board joints with four inch (4") wide strip of flashing membrane. Under no circumstances shall the membrane be left unsupported over a space greater than 1/4".
2. Stagger Insulation/Cover Board Joints: When installing multiple layers of insulation, all joints between succeeding layers shall be staggered a minimum of 6" in each direction.
3. Steel Deck Substrates: Place boards perpendicular to steel deck flutes with edges over flute surface for bearing support. Edges shall be checked so that no edges are left substantially unsupported along the flutes.
4. Drain Sumps: Insulation shall be feathered or tapered to provide a sump area a minimum of 36" x 36" where possible at all drains. Taper insulation around roof drains so as to provide proper slope for drainage. In areas where feathered or tapered insulation leaves insulation core exposed, cover with an appropriate cover board or base sheet/cap sheet assembly to provide a sound and smooth substrate surface.
5. Polyurethane Adhesive Attachment: Follow insulation/cover board and adhesive manufacturers' recommendations for the appropriate adhesive application rate and application procedure. Under normal application rate, dispense the first bead 3" inside the outside edges of the insulation/cover board to be attached, with sequential beads equidistant. Place the boards onto the roofing adhesive beads. Walk on the boards to spread the roofing adhesive for maximum contact. Periodically walk on the boards until firmly attached. Reference FM approvals for adhesive application patterns that satisfy FM wind uplift requirements. Typical application is a 3/4" bead of roofing adhesive at a rate of one lineal foot per square foot of insulation/cover board to be attached. Note: additional adhesive is required in the corner and perimeter regions of the roof. Secure insulation/cover board in accordance with approval requirements.

3.06 PRIMER APPLICATION

A. General:

1. Mix and apply single and two-component primer in strict accordance with written instructions of Membrane Manufacturer. Use only proprietary materials, as supplied by the membrane manufacturer.
2. The substrate surface must be dry, with any remaining dust or loose particles removed using clean, dry, oil-free compressed air, industrial vacuum, cloth wipe or a combination of methods.
3. Do not install primer on any substrate containing newly applied and/or active asphalt, coal-tar pitch, creosote or penta-based materials unless approved in writing by Membrane Manufacturer. Some substrates may require additional preparation before applying primer.

B. Application of Primer:

1. Roll or brush the primer evenly onto the surface to fully saturate the substrate in one application. Do not allow primer to pond or collect in low areas. Follow manufacturer's recommended application rates to ensure that a thin layer of cured primer remains on the substrate surface.
2. Apply primer only up to the edge of the membrane flashing terminations. Primer application past the membrane terminations requires surfacing with an approved material.
3. Allow standard primers to cure for a minimum of twelve (12) hours before membrane application or as indicated in manufacturer's written instructions. Allow quick-dry primers to cure for a minimum of four (4) hours before membrane application or as indicated in manufacturer's written instructions. Membrane must be applied to primer only when completely dry and without tack.
4. Exposure of the primer in excess of eight (8) days or premature exposure to moisture may require removal and application of new primer. DO NOT apply new primer over exposed primer older than eight (8) days, primer prematurely exposed to moisture, or primer used as temporary waterproofing, unless approved in writing by the Membrane Manufacturer.

C. Disposal of Primer:

1. Cured primer may be disposed of in standard landfills. This is accomplished by thoroughly mixing all components.
2. Uncured primer is considered a hazardous material and must be handled as such, in accordance with local, state and federal regulation. Do not through uncured resin away.

3.07 MEMBRANE APPLICATION

A. General:

1. Follow application procedures as indicated in manufacturer's written instructions
2. It is recommended to apply the waterproofing membrane immediately following full curing of the primer in order to obtain the best bond between primer and membrane.
3. Mix and apply cold fluid-applied reinforced polyurethane waterproofing membrane in strict accordance with written instructions of Membrane Manufacturer. Use only proprietary membrane resins and materials, as supplied by the membrane manufacturer.
4. The primed substrate surface shall be dry, with any remaining dust or loose particles removed using clean, dry, oil-free compressed air, industrial vacuum, cloth-wipe or a combination.
5. Protect all areas where membrane has been installed. Do not work off installed membrane during application of remaining work before forty-eight (48) hours of curing. Movement of materials and equipment across installed membrane is not acceptable. If movement is necessary, provide complete protection of affected areas.
6. Closely follow the Membrane Manufacturer's recommendation for hot and cold weather application. Monitor surface and ambient temperatures, including the effects of wind chill.

B. Mixing of Resin:

1. Mix resin Component A with a spiral agitator until the liquid is a uniform color. If the ambient temperature is below 50°F (10°C), then a weather related additive should be combined and mixed into the Component A.
 - a. Accelerator should be added to resin Component A when the ambient temperature is 50°F (10°C) and below. The accelerator should be mixed with the spiral agitator for 2 minutes or until both liquids are thoroughly blended.
2. Pour resin Component B into Component A and thoroughly mix the components with a clean spiral agitator. Do not break down resin units - MIX entire unit ONLY. The Resin solution should be a uniform color, with no light or dark streaks present.
3. Mix only that amount of resin components A & B that can be used in 30 minutes.

C. Application of Resin/Fleece:

1. Apply mixed resin to the prepared surface at the manufacturer's recommended application rate. The resin should be rolled or brushed liberally and evenly onto the surface using a broad, even stroke. Cover one working area at a time, between 15 - 20 ft.2 (1.4 - 1.9 m2).
2. Roll out dry polyester fleece onto the liquid resin mix, making sure the SMOOTH SIDE IS FACING UP (natural unrolling procedure), avoiding any folds and wrinkles. The fleece will begin to rapidly saturate with the liquid resin mix. Use a medium nap roller or brush to work the resin into the fleece, saturating from the bottom up, and eliminating air bubbles, wrinkles, etc. It is important to correct these faults before the resin cures.
3. Apply additional liquid resin mix on top of fleece at the manufacturer's recommended application rate to finish the saturation of the fleece. Roll this final coating into the fleece, which will result in a glossy appearance. The fleece can only hold so much resin and all excess should be rolled forward to the unsaturated fleece, eliminating ponding or excessive build-up of the resin. The final resin coating should be smooth and uniform.
4. Approximately 2/3 of the total resin should be applied to the substrate below the fleece reinforcement, and 1/3 of the total resin should be applied over the fleece reinforcement.
5. Prevent contact between mixed/unmixed resin and new/existing membrane. If any unmixed resin contacts membrane surface remove immediately and clean thoroughly with a cloth rag.

6. At all fleece seams, allow a 2" (5 cm) overlap for all side joints and a 4" (10 cm) overlap for all end joints.
 7. At membrane tie-offs, clean in-place membrane with MEK (methyl ethyl ketone) solvent or acetone once resin has cured. Allow solvents to fully evaporate before application of new resin.
- D. Disposal of Resin:
1. Cured resin may be disposed of in standard landfills. This is accomplished by thoroughly mixing all components.
 2. Uncured resin is considered a hazardous material and must be handled as such, in accordance with local, state and federal regulation. Do not throw uncured resin away.

3.08 FLASHING APPLICATION

- A. General:
1. Install flashing system in accordance with the requirements / recommendations of the Membrane manufacturer and as depicted on standard drawings and details. Provide system with base flashing, edge flashing, penetration flashing, counter flashing, and all other flashings required for a complete watertight system.
 2. Wherever possible, install the flashings before installing the field membrane to minimize foot traffic over newly installed field membrane.
 3. All membrane flashings shall be installed concurrently with the waterproofing membrane as the job progresses. Temporary flashings are not allowed without prior written approval from the Membrane manufacturer. Should any water penetrate the new waterproofing membrane because of incomplete flashings, the affected area shall be removed and replaced at the contractor's expense.
 4. Provide a minimum vertical height of 8" for all flashing terminations. Flashing height shall be at least as high as the potential water level that could be reached as a result of a deluging rain and/or poor slope. Do not flash over existing through-wall flashings, weep holes and overflow scuppers.
 5. All flashings shall be terminated as required by the Membrane Manufacturer.
 6. Alkalinity surface protection consisting of one application of EP primer and one application of approved broadcast mineral aggregate surfacing shall be applied wherever stone, concrete, or masonry elements will be placed directly over the flashing.
- B. Metal Flashing - General:
1. Metal flashings shall be fabricated in accordance with the current recommendations of SMACNA and in accordance with standard drawings and project details.
 2. Metal flashing flanges to which membrane is to be bonded shall be a minimum of four (4) inches in width, and secured to the substrate or wood nailers six (6) inches on center staggered with fasteners appropriate to the substrate type. The flanges shall be provided with a roughened surface that has been cleaned of all oil and other residue.
 3. Metal edges that will be overlaid with membrane shall be provided with a 1/4" min. hemmed edge.
 4. Apply primer, resin and fleece to metal flange, extending membrane to outside face of metal edging, and to vertical face of metal base/curb flashing.
- C. Membrane Flashing - General:
1. Membrane flashings shall be fabricated with primer appropriate for the substrate surface, resin of the same base chemical type as the field membrane, and fleece of the same weight as the field membrane unless specified otherwise.
 2. Primer, resin, and fleece mixing and application methods as specified for field membranes are also suitable for membrane flashing.
 3. Fleece shall overlap 2" (5 cm) minimum for all joints. Fleece shall be cut neatly to fit all flashing conditions without a buildup of multiple fleece layers. Work wet membrane with a

brush or roller to eliminate blisters, openings, or lifting at corners, junctions, and transitions.

- D. Pipes, Conduits, and Unusually Shaped Penetrations:
1. Flashing is typically constructed as a two part assembly consisting of a vertical wrap and a horizontal target patch. There must be a minimum of a two (2) inch (5 cm) overlap between vertical and horizontal flashing components.
- E. Drains and Scuppers:
1. Acceptable drain and scupper materials are cast iron, cast aluminum, and copper.
 2. Connect new drains and scuppers to existing storm sewer system.
 3. Alternatively, replace all broken or damaged parts of existing drains and scuppers.
 4. Flashing material shall extend four (4) inches minimum onto drain or scupper flange and into drain/scupper body.
 5. Install clamping ring if provided as part of the drain or scupper design. Install a strainer basket to prevent debris from clogging the drainage line.
- F. Hot Stacks:
1. Protect the membrane components from direct contact with steam or heat sources when the in-service temperature exceeds 170 degrees F. In all such cases flash to an intermediate "cool" sleeve.
 2. Fabricate "cool" sleeve in the form of a flanged metal cone using galvanized metal, mechanically attached to the structure or wood nailers.
 3. Flashing is typically constructed as a two part assembly consisting of a vertical wrap and a horizontal target patch. There must be a minimum of a two (2) inch (5 cm) overlap between vertical and horizontal flashing components.
- G. Flexible Penetrations:
1. Provide a weathertight gooseneck of round cross-section for each penetration or group of penetrations. Set in water cut-off mastic and secure to the structural substrate.
 2. Acceptable gooseneck material is copper, of a sheet weight appropriate for the application.
 3. Flashing is typically constructed as a two part assembly consisting of a vertical wrap and a horizontal target patch. There must be a minimum of a two (2) inch (5 cm) overlap between vertical and horizontal flashing components.
- H. Walls, Curbs and Base Flashings:
1. Wall, curb and base flashings shall be installed to solid substrate surfaces only. Adhering to gypsum-based panels, cementitious stucco, synthetic stucco, wood or metal siding, and other similar materials is not acceptable.
 2. Reinforce all transition locations and other potential wear areas with a four (4) inch wide membrane strip evenly positioned over the transition prior to installing the exposed flashing layer.
 3. Reinforce all inside and outside corners with a four (4) inch diameter conical piece of membrane prior to installing the exposed flashing layer.
 4. All pins, dowels and other fixation elements shall be flashed separately with a vertical flashing component prior to installing the exposed flashing layer.
 5. Extend flashing a minimum of four (4) inches onto the field substrate surface.
- I. Drip Edges and Gravel Stops:
1. Metal drip edges and gravel stops shall be installed to solid substrate surfaces or wood nailers only. Securement to gypsum-based panels, cementitious stucco, synthetic stucco, wood or metal siding or coping, and other similar materials is not acceptable.
 2. Flash all drip edges and gravel stops by extending the field membrane all the way to the edge of the exposed face prior to installing the metal edging. Strip in the metal flange with a separate 8 inch wide strip of membrane adhered to both the securement flange and to the field membrane.

3. For conditions where water infiltration behind the exposed drip edge or gravel stop face is possible, install a separate membrane layer positioned behind the face area and extending a minimum of four (4) inches past the securement flange onto the field substrate prior to installing the drip edge or gravel stop.
- J. Field Fabricated Control or Expansion Joint Flashing:
1. Control or expansion joints in excess of two (2) inches in width and all expansion joints subject to vehicular traffic require the use of a separate engineered joint system.
 2. Grind or otherwise bevel the inside edges of the joint opening to provide a smooth transition edge for the fleece.
 3. Flashing typically consists of a fully saturated membrane bottom layer looped into the joint as a cradle, a compressible foam or rubber insert at 25% compression fitted into the joint, and a membrane top layer applied over the joint. Extend both fleece layers four (4) inches minimum onto the field substrate on both sides of the joint.
 4. Apply the field membrane over the entire joint area.
- K. Electrical Conduit, Gas Lines and Lightning Protection
1. Supports for electrical conduit and gas lines greater than one (1) inch in diameter require the use of a separate engineered support system.
 2. Supports for electrical conduit and gas lines one (1) inch or less in diameter, and bases for lightning protection rods and cable, can be adhered directly to the membrane surface with a single-component, high quality polyurethane sealant.

3.09 MEMBRANE PREPARATION FOR SURFACINGS AND COATINGS

- A. Membrane must be clean and dry, and free of all contaminants that may interfere with the adhesion of the surfacing and coating to the membrane surface.
- B. Membrane exposed less than 48 hours prior to application of surfacing and coating materials does not require special surface preparation. It is highly recommended that all surfacing and coating materials be applied to the membrane surface within 48 hours.
- C. Membrane exposed longer than 48 hours will require sanding/scuffing of the surface to remove the hard gloss finish, followed by an MEK or acetone solvent wipe

3.10 PROTECTIVE SURFACING

- A. Aggregate Finish Walkway Surfacing
 1. Where specified, provide and install approved kiln-dried silica sand, or other approved mineral surfacing to achieve a non-skid walkway surface.
 2. Tape off areas designated to be walkway areas.
 3. Pre-mix single-component and two-component coatings prior to application to achieve an even consistency.
 4. Broadcast specified and approved sand or aggregate in excess into a supplemental bonding coat of membrane resin applied over clean, cured membrane at the manufacturer's recommended application rate. Aggregate shall be applied to excess to obtain uniform and full coverage.
 5. Following minimum 24 hour cure time remove loose/un-embedded mineral aggregate by blowing with oil-free compressed air or with a vacuum. Re-broadcast clean mineral aggregate as required to provide full embedment and coverage of membrane.
 6. Seal aggregate surface with a sealing coat application of Membrane Manufacturer's approved aggregate coating, applied at the manufacturer's recommended application rate. After completion of surfacing, avoid any traffic for a minimum of three (3) days to allow for surfacing to cure.
- B. Alkalinity Protection
 1. Where placement of concrete, mortar or adhesive setting beds are required over sections of the waterproofing membrane or flashing, apply manufacturer's epoxy primer/coating at

the manufacturer's recommended coverage rate, with broadcast to excess of kiln-dried silica sand into wet primer/coating.

2. Protection shall extend a minimum of one (1) foot (0.3m) past the concrete form on all sides.
3. Provide continuous cleaning with water and brush to eliminate settlement of concrete residues on in-place waterproofing membrane adjacent to area of concrete placement.

3.11 TEMPORARY CLOSURES AND WATER-STOPS

- A. Contractor shall be responsible to ensure that moisture does not damage any completed section of the new waterproofing system. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition. All temporary closures shall be made as recommended or required by the membrane manufacturer.

3.12 PROTECTION

- A. Upon completion of waterproofing and flashings (including all associated work), institute appropriate procedures for surveillance and protection of roofing during remainder of construction period. Protect all areas where membrane has been installed.

3.13 FIELD QUALITY CONTROL

- A. Site Condition: Leave all areas around job site free of debris, roofing materials, equipment and related items after job completion.
- B. Notification of Completion: Notify the membrane manufacturer of job completion and schedule a final inspection date.
- C. Final Inspection: A meeting at the completion of the project with the membrane manufacturer's technical field representative to evaluate the completed installation of the field and flashing membrane. All punch list items are to be completed prior to the scheduled meeting.
- D. Flood Test: A flood test of the completed membrane and flashing system shall be conducted prior to the installation of any surfacing. The flood test shall be of a 24 hr. minimum duration, and shall apply a water head of 2" over the entire application area. Any incidents of water entry shall be evaluated and all necessary repairs conducted, followed by an additional flood test.
- E. Issuance of the Warrantee: Complete all post installation procedures in accordance with the manufacturer's guidelines for warranty issuance of the specified warrantee.

3.14 CLOSE-OUT ACTIVITIES

- A. Correction of Work:
 1. Work that does not conform to specified requirements including tolerances, slopes, and finishes shall be corrected and/or replaced. Any deficiencies of membrane application, termination and/or protection as noted during the Membrane Manufacturer's inspections shall be corrected and/or replaced at Contractor's expense.
- B. Clean-Up:
 1. Site clean-up, including both interior and exterior building areas that have been affected by construction, shall be restored to preconstruction condition

END OF SECTION