SECTION  – cold fluid-applied planter waterproofing

1. General
   1. SUMMARY
      1. The following specification outlines the requirements for a fully reinforced cold fluid-applied polyurethane liquid resin waterproofing membrane and flashing system, and all other ancillary waterproofing work including but not limited to installation of work as specified.
      2. Section Includes:
         1. Adhered fully reinforced, cold fluid-applied, polyurethane liquid resin waterproofing membrane system including membrane, penetration flashings, base flashings, and expansion joints.
         2. Substrate preparation, cleaning, leveling, and patching.
         3. Temporary waterproofing and priming.
         4. Waterproofing membrane installation.
         5. Flashing installation and expansion joint installation.
         6. Protective surfacing.
         7. Alkalinity protection.
      3. Related Requirements:
         1. Section 01 35 46 – Indoor Air Quality (IAQ) Procedures.
         2. Section 01 35 49 – Indoor Air Quality (IAQ) Testing.
         3. Section 01 35 51 – VOC Limit Requirements.
         4. Section 01 74 19 – Construction Waste Management & Disposal.
         5. Section 01 81 33 – Sustainable Design Requirements – Embodied Carbon.
   2. reference standards
      1. US Green Building Council (USGBC):
         1. Reference guide for Building Design and Construction 2013, Jan 2016 edition
         2. LEED v4 Project Scorecard
   3. SUBMITTALS
      1. Provide required information in accordance with Section 01 33 00 – Submittal Procedures.
      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: Provide 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. Provide 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. Provide copies of current Material Safety Data Sheets (MSDS) for all components of the work.
      6. Membrane Shop Drawings: Provide shop drawings of cold fluid-applied reinforced polyurethane system showing all a project plan, size, flashing details, and attachment for review and approval by the Owners Representative and Membrane Manufacturer.
   4. sustainable design submittals
      1. Upon award of contract, provide supporting documentation for the following:
         1. Building Life-Cycle Impact Reduction
         2. Sourcing of Raw Materials
         3. Construction and Waste Management Practices
         4. Low-Emitting Materials
         5. Construction Indoor Air Quality Management and Testing
         6. Construction Activity Pollution Prevention
         7. Fundamental Commissioning and Verification
         8. Enhanced Commissioning
         9. Site Development - Protect or Restore Habitat
      2. Provide construction and demolition waste tracking information for LEED Prerequisite Construction and Demolition Waste Management Planning and LEED credit Construction and Demolition Waste Management, Option 1 as outlined in the project's Construction and Demolition Waste Management and Disposal Plan and as specified in Section 01 74 19 – Construction Waste Management and Disposal.
   5. sustainable design credits
      1. Credit MRp CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT PLANNING.
         1. Requirements: Develop and implement a construction and demolition waste management plan:
            1. Establish waste diversion goals for the project by identifying at least five materials (both structural and non-structural) targeted for diversion. Approximate a percentage of the overall project waste that these materials represent.
            2. Specify whether materials will be separated or comingled and describe the diversion strategies planned for the project. Describe where the material will be taken and how the recycling facility will process the material.
            3. Provide a final report detailing all major waste streams generated, including disposal and diversion rates.
      2. Credit MRc BUILDING LIFE-CYCLE IMPACT REDUCTION.
         1. Requirements: Demonstrate reduced environmental effects during initial project decision-making by reusing existing building resources or demonstrating a reduction in materials use through life-cycle assessment.
         2. Parameters - Whole-Building Life-Cycle Assessment:
            1. Conduct a life-cycle assessment of the project's structure and enclosure that demonstrates a minimum of 10% reduction, compared with a baseline building, in at least three of the six impact categories listed below, one of which must be global warming potential. No impact category assessed as part of the life-cycle assessment may increase by more than 5% compared with the baseline building. Data sets must be compliant with ISO 14044.
            2. Select at least three of the following impact categories for reduction:

Global warming potential (greenhouse gases), in CO2e.

Depletion of the stratospheric ozone layer, in kg CFC-11.

Acidification of land and water sources, in moles H+ or kg SO2.

Eutrophication, in kg nitrogen or kg phosphate.

Formation of tropospheric ozone, in kg NOx, kg O3 eq, or kg ethene.

Depletion of non-renewable energy resources, in MJ.

* + 1. Credit MRc BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION - SOURCING OF RAW MATERIALS.
       1. Requirements:
          1. General: For credit achievement calculation, submit location of products sourced (extracted, manufactured, and purchased), indicating number of miles from the project site.
          2. Option 1: Raw Material Source and Extraction Reporting:

Products sourced from manufacturers with self-declared reports are valued as one half (1/2) of a product for credit achievement.

Third-party verified corporate sustainability reports (CSR) are valued as one whole product for credit achievement calculation.

* + - 1. Option 2: Leadership Extraction Practices: Use products that meet at least one of the responsible extraction criteria below for at least 25%, by cost, of the total value of permanently installed building products in the project.
         1. Extended producer responsibility. Products purchased from a manufacturer (producer) that participates in an extended producer responsibility program or is directly responsible for extended producer responsibility. Products meeting extended producer responsibility criteria are valued at 50% of their cost for the purposes of credit achievement calculation.
         2. Materials Reuse: Reuse includes salvaged, refurbished, or reused products. Products meeting materials reuse criteria are valued at 100% of their cost for the purposes of credit achievement calculation.
         3. Recycled content. Recycled content is the sum of postconsumer recycled content plus one-half (1/2) the pre-consumer recycled content, based on cost. Products meeting recycled content criteria are valued at 100% of their cost for the purposes of credit achievement calculation.
    1. Credit MRc CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT.
       1. Requirements:
          1. Recycle and/or salvage nonhazardous construction and demolition materials. Calculations can be by weight or volume but must be consistent throughout.
          2. Diversion - Path 2: Divert at least 75% of the total construction and demolition material; diverted materials must include at least four material streams.
    2. Credit EQc LOW-EMITTING MATERIALS.
       1. Requirements:
          1. General Emissions Evaluation: Building products must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1-2010. The manufacturers or third-party certification must state the exposure scenario used to determine compliance. Claims of compliance for wet-applied products must state the amount applied in mass per surface area.
       2. Product Evaluation:
          1. Category: Interior paints and coatings applied on site:

Threshold: At least 90%, by volume, for emissions; 100% for VOC content.

Emissions and Content Requirements:

General Emissions Evaluation for paints and coatings applied to walls, floors, and ceilings.

VOC content requirements for wet applied products.

* + - * 1. Category: Interior adhesives and sealants applied on site (including flooring adhesive)

Threshold: At least 90%, by volume, for emissions; 100% for VOC content.

Emissions and Content Requirements:

General Emissions Evaluation.

VOC content requirements for wet applied products.

* 1. QUALITY ASSURANCE
     1. 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:
        1. Substrates and conditions are acceptable for purpose of providing specified warranty.
        2. Materials supplied shall meet the specified requirements.
     2. 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.
     3. 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.
     4. Evaluate surface moisture content by means of a Tramex Concrete Moisture Encounter Meter. A surface moisture content of under 5% is required to allow for proper primer penetration into the substrate.
     5. Frothing, 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.
     6. Continued frothing, 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 F 2170. A relative moisture content of 75% or greater indicates the need for more extensive substrate priming and sealing. Contact Membrane Manufacturer for recommendations.
     7. 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 220 psi (1.5 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.
     8. Monitor quantities of installed materials. Monitor application of resin mixture, reinforcing fleece and flashing. Perform Work in accordance with manufacturer's instructions.
  2. REGULATORY REQUIREMENTS
     1. Conform to applicable building and jurisdictional codes for roofing/waterproofing assembly and fire resistance requirements.
     2. Comply with requirements of OSHA, NIOSH or local governing authority for workplace safety.
     3. Comply with authority or agency "Confined Space Policy" during and throughout all work to be performed.
  3. pre-installation meeting
     1. Convene a pre-installation meeting at the job site (1) week before starting work of this section. Require attendance of parties directly affecting work of this section, including but not limited to, Waterproofing Specifier, Owner's Representative, Waterproofing Contractor, and Membrane Manufacturer's Representative. Review waterproofing preparation and installation procedures, coordination and scheduling required with related work, and condition and structural loading limitations of deck/substrate.
  4. FIELD INSPECTION SERVICES
     1. Manufacturer's technical representative shall provide the following inspections of the membrane application:
        1. Job-start inspection at the beginning of each phase of the project, to review special detailing conditions and substrate preparation.
        2. Periodic in-progress inspections throughout duration of the project to evaluate membrane and flashing application.
        3. Final punch-list inspection at the completion of each phase of the project prior to installation of any surfacing.
        4. Warranty inspection to confirm completion of all punch list items, surfacing.
  5. DELIVERY, STORAGE, AND PROTECTION
     1. 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.
     2. 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.
     3. Roll goods shall be stored horizontally on platforms sufficiently elevated to prevent contact with water and other contaminants.
     4. 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.
     5. 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.
     6. 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 workplace safety.
  6. environmental requirements
     1. Do not apply waterproofing membrane during or with the threat of inclement weather.
     2. Application of cold fluid-applied reinforced polyurethane Waterproofing membrane may proceed while air temperature is between 40 deg F (5 deg C) and 85 deg F (30 deg C) providing the substrate is a minimum of 5 deg F above the dew point.
     3. When ambient temperatures are at or expected to fall below 50 deg F (10 deg C) or reach 85 deg F (30 deg C) or higher, follow Membrane System Manufacturer's recommendations for weather related additives and application procedures.
     4. 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.
     5. 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 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 construct¬ed 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.
     6. When disposing of all refuse or unused materials, observe all EPA, OSHA or local disposal requirements.
  7. COORDINATION & PROTECTION
     1. Coordinate the work with the installation of associated metal flashings, accessories, appurtenances, etc. as the work of this section proceeds.
     2. Building components shall be protected adequately (with tarp or other suitable material) from soil, stains, or spills at all hoisting points and areas of application. Contractor shall be responsible for preventing damage from any operation under its Contract. Any such damage shall be repaired at Contractor's expense to Owner's satisfaction or be restored to original condition.
     3. Provide barricades, retaining ropes, safety elements (active/passive) and any appropriate signage required by OSHA, NIOSH, and NSC and/or the Owner or designated Representative.
     4. Protect finished roofing/waterproofing membrane from damage by other trades by the use of a cushioning layer such as 1" thick expanded polystyrene insulation and an impact layer such as 1/2" thick exterior-grade plywood.
  8. WARRANTY
     1. Manufacturer's Premier Warranty: Provide ten (10) year manufacturer's material only warranty under provisions of this section. This warranty provides for cost of materials for loss of water tightness, limited to amounts necessary to effect repairs necessitated by defective material limited to amount of purchased materials pro-rated.
     2. Waterproofing Contractor's Warranty: Provide two (2) year "Applicator Maintenance Warranty" covering workmanship for all work of this section including installation of membrane, flashings, metal work, and roofing/waterproofing accessories.
     3. Submit two (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.

1. Products
   1. general
      1. The products herein specified are totally pre-engineered products of the listed manufacturer 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 polymeric 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 the physical performance characteristics of the specified materials. PMMA or single component primers or resin systems will not be accepted. A minimum 165 g/m2 fleece reinforcement is required.
   2. MEMBRANE
      1. Membrane: Two-component, cold fluid-applied reinforced polyurethane waterproofing membrane with a 360-degree needle punched non-woven 165 g/m2 polyester reinforcing fleece, for a finished dry film membrane thickness of 0.090-inch nominal per ply. Provide products manufactured and supplied by the following:
         1. Kemper System America's Kemperol 2K-PUR resin for use in an adhered waterproofing system.
      2. Physical Properties:

|  |  |  |
| --- | --- | --- |
| **Property** | **Value** | **Test Method** |
| Color | Gray-Green | - |
| Physical state | Cures to solid | - |
| Nominal thickness (165 fleece) | 90 mils | - |
| Tensile strength @ break | 120 lb/in | ASTM D-751 |
| Elongation | 50% | ASTM D-751 |
| Tearing strength | 5.0 lbs | ASTM D-751 |
| Puncture resistance | 140 lbf | FTMS 101-2031 |
| Dimensional stability | 0.1% | ASTM D-1204 |
| Water absorption | 2.2% | ASTM D-471 |
| Surface hardness | Shore A 85 | ASTM D-2240 |
| Water vapor transmission | 0.04 perms | ASTM E-96 |
| Usage time\* | 30 minutes | - |
| Rainproof after\* | 2 hours | - |
| Solid to walk on after\* | 24 hours | - |
| Solid to drive on with air rubber tires after\* | 48 hours | - |
| Surfacing to be applied between\* | 16-48 hours |  |
| Overburden may be applied after | 2 days | - |
| Completely hardened after | 3 days | - |
| Crack spanning | 2 mm/0.08 inch | - |
| Resistance to temperatures up to (short term) | 250 deg C/482 deg F | - |
| \*all times are approximate and depend upon air flow, humidity and temperature. | | |

* 1. flashings
     1. Membrane Flashings: A composite of the same resin material as field membrane with 165 g/m2 fleece reinforcement.
  2. SUBSTRATE PRIMERS AND RESIN ADDITIVES
     1. Epoxy Primer: Two-component, solvent-free epoxy resin for use in improving adhesion of membrane to cementitious/masonry substrate surfaces, as provided by the following manufacturer:
        1. Basis of Design Materials: Kemper System America, Inc.'s Kempertec EP/EP5 primer.
     2. Cold Weather Additive: Additive specifically designed to accelerate the resin reaction time at ambient temperatures below 50 deg F (10 deg C). Accelerator to be used with cream resin Component A prior to mixing of multi-component resin, as provided by the following manufacturer:
        1. Basis of Design Materials: Kemper System America Inc.'s Kemperol A 2K-PUR Accelerator.
  3. SURFACINGS AND COATINGS
     1. Colour Coating: Approved coating suitable for use as a colored coating, as provided by the following Manufacturer:
        1. Basis of Design Materials: Kemper System America, Inc.'s Kemperdur Deko Finish, acceptable for submerged applications.
  4. accessories
     1. Application Tools, Accessories, and Cleaners: Supplied and/or approved by membrane manufacturer for product installation.
     2. Solvent-Based Cleaner for Tools and Membrane Tie-Ins: Methyl Ethyl Ketone (MEK) or acetone.
     3. Water-Based Cleaner for Membrane: Simple Green HD.
     4. 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)
     5. Mixing Proportions shall be a ratio of resin to sand at 1:2 by volume for leveling, 1:4 by volume for patching, or as approved by membrane manufacturer.
     6. Backer Rod: Expanded, closed-cell polyethylene foam designed for use with cold-applied joint sealant.
     7. Caulking: Single component, non-sag elastomeric polyurethane sealant meeting ASTM C 920, Type S, Grade NS, Class 35 for use in sealing cracks and joints, and making watertight seals where required.
     8. Wood Nailers and Cant Strips: New wood nailers and cant strips shall be pressure treated for rot resistance (e.g., "Wolmanized" or "Osmose K-33"), #2 or better lumber. Asphaltic or creosote treated lumber is not acceptable.
  5. SUSTAINABLE DESIGN PRODUCT DISCLOSURE AND OPTIMIZATION
     1. Sustainable design requirement submittals shall support the prerequisites and credits identified in the LEED v4 Scorecard, as described in Requirements and Documentation within the reference guide.

1. Execution
   1. EXAMINATION
      1. Verify that surfaces and site conditions are ready to receive work.
      2. Verify deck/substrate openings, curbs, and protrusions through deck/substrate, wood cant strips and reglets are in place and solidly set.
      3. Verify deck/substrate is structurally supported, secure and sound.
   2. PREPARATION OF SUBSTRATE
      1. 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.
      2. Structural Concrete:
         1. Concrete shall have cured a minimum of twenty-eight (28) days in accordance with ACI-308, or as approved by Waterproofing Manufacturer's Technical Department.
         2. 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. 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 D 4259 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. For concrete materials with a compressive strength of less than 3,000 psi contact Waterproofing Manufacturer's Technical Department for substrate preparation requirements.
      3. 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. Kemperol 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:
            1. 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.
            2. Fill cavities with a patching mixture of primer and approved kiln-dried sand in a 1:4 primer to sand ratio by volume.
            3. Silica sand must be kept absolutely dry during storage and handling.
            4. Any surface to be leveled or filled must first be primed with an appropriate primer.
         3. 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. PRIMER APPLICATION
      1. 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.
      2. Mixing of Primer:
         1. Premix primer Component A thoroughly with a spiral agitator or stir stick. Pour primer Component B into Component A and mix the components for approximately 2 minutes with a clean spiral agitator on slow speed or stir stick without creating any bubbles or streaks. DO NOT AERATE. The Primer solution should be a uniform color, with no light or dark streaks present.
         2. Do not thin primer. Determine required primer coverage for each substrate material/condition and apply in strict accordance with written instructions of Membrane Manufacturer.
         3. Mix only that amount of primer components A & B that can be used in 30 minutes.
      3. 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. For application over cementitious substrates where protection from substrate wetness is required, apply primer coat at a heavier application rate until pore saturation is achieved.
         4. For all primer applications, apply kiln-dried sand into the final coat of primer while still wet at the rate of 50 lbs. per 100 square feet.
         5. Allow standard primers to cure for a minimum of twelve (12) hours before membrane application. Allow quick-dry primers to cure for a minimum of four (4) hours before membrane application. Membrane must be applied to primer only when completely dry and without tack.
         6. Exposure of the primer in excess of eight (8) days or premature exposure to moisture may require removal and application of new primer.
      4. 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.
   4. membrane application
      1. General:
         1. 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.
         2. 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.
         3. 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.
         4. 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.
         5. Closely follow the Membrane Manufacturer's recommendation for hot and cold weather application. Monitor surface and ambient temperatures, including the effects of wind chill.
      2. Mixing of Resin:
         1. Mix resin Component A (cream formulation) with a spiral agitator until the liquid is a uniform cream color. If the ambient temperature is below 50 deg F (10 deg C), then a weather-related additive should be combined and mixed into the Component A.
            1. Accelerator should be added to resin Component A when the ambient temperature is 50 deg F (10 deg 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 at a 4:1 ratio (by weight) and thoroughly mix the components with a clean spiral agitator. 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.
      3. 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. The appearance of the saturated fleece should be light opaque amber with no white spots. White spots are indications of unsaturated fleece or lack of adhesion. 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 correct amount of resin will leave no whiteness in fleece and there will be a slightly fibrous surface texture. 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 removes 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.
      4. 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, provincial, and federal regulation. Do not throw uncured resin away.
   5. FLASHING APPLICATION
      1. 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.
      2. 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.
      3. 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.
      4. 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.
      5. 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.
      6. 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.
      7. 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.
   6. MEMBRANE PREPARATION FOR SURFACINGS AND COATINGS
      1. 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.
      2. 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.
      3. 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.
   7. surfacing and finishes
      1. Coating-Type Finish Surfacing:
         1. Where specified, provide and install Membrane Manufacturer's approved urethane-based or acrylic-based coating applied over clean, fully cured membrane at the manufacturer's recommended application rate.
         2. Pre-mix single-component and two-component coatings prior to application to achieve an even consistency and color. Mix thoroughly for approximately 2 minutes with a clean spiral agitator or stir stick without creating any bubbles or streaks.
         3. Apply coating at the manufacturer's recommended application rate. Two coating applications are recommended for best coverage and appearance. After completion of coating, avoid any traffic for a minimum of two (2) days to allow for surfacing to cure.
      2. 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.
   8. TEMPORARY CLOSURES & WATERSTOPS
      1. 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.
   9. PROTECTION
      1. Upon completion of waterproofing and flashings (including all associated work), institute appropriate procedures for surveillance and protection of waterproofing during remainder of construction period. Protect all areas where membrane has been installed.
   10. FLOOD TEST
       1. A flood test of the completed membrane and flashing system shall be conducted prior to the installation of any overburden/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.
   11. CLOSEOUT
       1. 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.
       2. 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.
   12. SITE TESTING AND INSPECTIONS
       1. Indoor Air Quality Control Requirements: Perform work in accordance with the project's Indoor Air Quality Control plan for LEED credit Construction Indoor Air Quality Management Plan and as specified in Section 01 35 49 – Indoor Air Quality (IAQ) Testing.
       2. Perform work in accordance with Fundamental Commissioning and Verification, and Enhanced Commissioning as per the LEED v4 Reference Guide.

END OF SECTION