# PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

A. Section Includes:
1. Rubberized-asphalt waterproofing membrane, reinforced.
2. Insulation.
3. Molded-sheet drainage panels.
4. Concrete pavers.
5. Garden roof components.

B. Related Sections:
1. Section 033000 “Cast-in-Place Concrete.”
2. Section 079200 "Joint Sealants" for joint-sealant materials and installation.
3. Section 329300 “Plants” for plants installed as part of garden roof/planters.

## 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins to adjoining waterproofing, and other termination conditions.

## 1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Warranties: Sample of special warranties.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that is approved or licensed by manufacturer for installation of waterproofing required for this Project and is eligible to receive special warranties specified.

B. Source Limitations: Obtain waterproofing materials, molded-sheet drainage panels, including protection course, from single source from single manufacturer.

C. Mockups: Install waterproofing to 100 sq. ft. of deck to demonstrate surface preparation, crack and joint treatment, corner treatment, thickness, texture, and execution quality.
1. If Architect determines mockups do not comply with requirements, reapply waterproofing until mockups are approved.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Preinstallation Conference: Conduct conference at Project site.
1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.

B. Remove and replace liquid materials that cannot be applied within their stated shelf life.

C. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, or when temperature is below 0 deg F (minus 18 deg C).
1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.8 WARRANTY

A. Total System Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace the roof assembly, including membrane, flashing, insulation and pavers. Includes removal and replacement of the insulation, growing media and pavers when installed per manufacturer’s requirements and replacement of manufacturer supplied roof substrate board.
1. Warranty Period: 20 years from date of Substantial Completion.
2. Warranty Period for Pavers: 10 years from date of Substantial Completion.
a. Pavers shall be warrantied against cracking, splitting or disintegration due to freeze-thaw.

B. Special Installer's Warranty: Specified form signed by Installer, covering Work of this Section, for warranty period of two years.

PART 2 - PRODUCTS

2.1 WATERPROOFING MEMBRANE

A. Hot Fluid-Applied, Rubberized-Asphalt Waterproofing Membrane: Single component; 100 percent solids; hot fluid-applied, rubberized asphalt.
1. Products: Subject to compliance with requirements, provide one of following:
a. American Hydrotech, Inc.; Monolithic Membrane 6125 FR (Basis-of-Design).
b. Cetco-Building Materials Group; Stratseal HR
c. Or Equal.

2.2 FLASHING SHEET MATERIALS

A. Elastomeric Flashing Sheet: 50-mil-minimum, uncured sheet neoprene as follows:
   1. Tensile Strength: 1400 psi minimum; ASTM D 412, Die C.
   2. Elongation: 300 percent minimum; ASTM D 412.
   3. Tear Resistance: 125 psi minimum; ASTM D 624, Die C.
   4. Brittleness: Does not break at minus 30 deg F; ASTM D 2137.

2.3 AUXILIARY MATERIALS

A. Refer to Section 079200 "Joint Sealants" for joint-sealant materials and installation.

B. Surface Primer: Asphaltic surface conditioner for concrete surfaces.
   1. Products: Subject to compliance with requirements, provide the following:
      a. American Hydrotech, Inc., Surface Conditioner or equal from waterproofing manufacturer.

C. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum termination bars; approximately 1 by 1/8 inch thick; with anchors.

D. Sealants and Accessories: Manufacturer's recommended sealants and accessories.

E. Reinforcing Fabric: Manufacturer's recommended, spun-bonded polyester fabric.

F. Flexible Flashing Membrane: Thermoset material made from uncured neoprene rubber; 60 mils thick in widths required.
   1. Products: Subject to compliance with requirements, provide the following:
      a. American Hydrotech, Inc., Flex-Flash UN or equal from waterproofing manufacturer.

G. Protection/ Root Barrier Course: Fiberglass reinforced rubberized asphalt sheet.
   1. Products: Subject to compliance with requirements, provide the following:
      a. American Hydrotech, Inc., Hydroflex 30 with Root Stop HD or equal from waterproofing manufacturer.

H. Prefabricated Drainage Composite:
   1. Products: Subject to compliance with requirements, provide the following:
      a. American Hydrotech, Inc., Hydrodrain 300 or equal from waterproofing manufacturer.

I. Insulation: Extruded polystyrene rigid board insulation meeting the following requirements:
   1. Insulation shall meet ASTM C-578, Type VI or VII.
   2. Minimum compressive strength, ASTM D-1621, 60 psi.
   3. Maximum water absorption by volume per ASTM C-272, 0.1%.
   4. Water vapor permeance for 1-inch product per ASTM E-96,1.0 perm (max.).
   5. Insulation shall have an R value of 5.0 F ft2 h/Btu/in. of thickness when tested at 75 degrees F mean temperature in accordance with ASTM C-518.
   6. Product shall be free of CFC's.

J. Roof Ballast:
   1. Ballast Pavers:
      a. Products: Subject to compliance with requirements, provide the following:

1) American Hydrotech, Inc., Ballast Pavers or equal, meeting the following physical properties:

| PROPERTY | TEST METHOD | VALUES |
|---|---|---|
| Compressive Strength | ASTM C140 | ≥8,500 psi average min. |
| Flexural Strength | ASTM C293 | ≥1,100 psi average min. |
| Water Absorption | ASTM C140 | Not greater than 5% |
| Freeze/Thaw | ASTM C67 | ≤1% loss/dry weight (50 cycles) |
| Centerload | - | Min. 1,750 lbs. |

2. Architectural Finish Pavers:
   a. Products: Subject to compliance with requirements, provide the following:
      1) American Hydrotech, Inc., Hanover Architectural Pavers or equal, meeting the following physical properties:

| PROPERTY | TEST METHOD | VALUES |
|---|---|---|
| Compressive Strength | ASTM C140 | ≥8,500 psi average min. |
| Flexural Strength | ASTM C293 | ≥1,100 psi average min. |
| Water Absorption | ASTM C140 | Not greater than 5% |
| Freeze/Thaw | ASTM C67 | ≤1% loss/dry weight (50 Cycles) |
| Centerload | - | Min. 1,750 lbs. |

3. Paver Accessories:
   a. Fixed Height Pedestals as supplied by waterproofing manufacturer.
   b. Adjustable Height Pedestals as supplied by waterproofing manufacturer.

K. Filter Fabric Sheet: Non-woven, polymeric, geotextile fabric.
   1. Products: Subject to compliance with requirements, provide the following:
      a. American Hydrotech, Inc., Systemfilter or equal from waterproofing manufacturer.

L. Drainage/Water Retention Component: Three-dimensional, molded panels of recycled polyethylene with drainage channels top and bottom sides and water retention reservoirs top side shall meet the following physical properties.
   1. Products: Subject to compliance with requirements, provide the following:
      a. American Hydrotech, Inc., Gardendrain GR50 or equal from waterproofing manufacturer.

M. Growing Media:
   1. Custom growing media mix capable of supporting vigorous growth of the specified vegetation, complying with the following specification:
      a. Products: Subject to compliance with requirements, provide the following:
         1) American Hydrotech, Inc., Intensive LiteTop® Growing Media or equal from waterproofing manufacturer.

| Property | Intensive LiteTop Growing Media* |
|---|---|
| Grain Size Distribution (ASTM F1632 Method B) | |
| clay fraction (<0.002mm) | < 3% |
| silt fraction (0.075-0.002mm) | < 12% |
| passing #200 sieve (0.075mm) | < 15% |

| | |
|---|---|
| passing #60 sieve (0.25mm) | 5 - 25 % |
| passing #18 sieve (1.0mm) | 20 - 50 % |
| passing #10 sieve (2.0mm) | 30 - 60% |
| passing 1/8-inch sieve | 35 - 70 % |
| passing 1/4-inch sieve | 60 - 95% |
| passing 3/8-inch sieve | 95 - 100 % |
| Density (ASTM E2399) | |
| Initial Media Density | 55 lbs – 75 lbs/cf |
| Maximum Media Density | 76 lbs – 93 lbs/cf |
| Water/Air Management (ASTM E2399) | |
| saturated water capacity | > 40% |
| saturated air content | > 10% |
| total pore space | > 45% |
| Water Permeability | |
| Hydraulic Conductivity | > 10 in/hr |
| pH, Lime, and Salt Content | |
| pH (saturated paste) | 6.0 – 8.0 |
| EC salts content (water extract) | <3.0 mmhos/cm |
| Organics (LOI 550°C) (ASTM F1647 | |
| Organic Matter content | 6 – 12 % |
| Compost Fraction | |
| 1) Meet or exceed USEPA Class A standard, 40 CFR 503.13, Tables 1 & 3 (chemical contaminants) and 40 CFR 503.32(a) (pathogens) and/or be permitted in the state of origin to produce Class A material. | |
| 2) Meet US Compost Council STA/TMECC criteria or equal for Class I or II stable, mature product. | |
| *Values shall be adjusted due to availability of local materials or special project conditions related to plant selection and/or environmental conditions. | |

2. Expanded lightweight aggregate for use as fill material for drainage/water retention component as required.
   a. Products: Subject to compliance with requirements, provide the following:
      1) American Hydrotech, Inc., LiteTop® Lightweight Aggregate (5/16-inch to 3/8-inch expanded, lightweight aggregate) or equal from waterproofing manufacturer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
   2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

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

3.2 PREPARATION

A. Clean and prepare substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.

D. Remove grease, oil, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

E. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

F. Check to determine if concrete has been properly cleaned by applying a test patch of waterproofing membrane to the surface and check adhesion.

G. Prepare and treat substrates to receive waterproofing membrane, including joints and cracks, deck drains, corners, and penetrations according to manufacturer's written instructions.
   1. Rout and fill joints and cracks in substrate. Before filling, remove dust and dirt according to ASTM D 4258.

3.3 INSTALLATION

A. Install waterproofing membrane and auxiliary materials as recommended by manufacturer.

B. Install elastomeric flashing sheets at terminations of waterproofing membrane according to manufacturer's written instructions.

C. Apply surface condition as recommended by manufacturer.

D. Extend elastomeric flashing sheet up walls a minimum of 8 inches above plaza deck pavers and 6 inches onto deck to be waterproofed or as recommended by manufacturer.

E. Install termination bars and mechanically fasten to top of elastomeric flashing sheet at terminations.

F. Heat and apply rubberized asphalt according to manufacturer's written instructions.

G. Start application with manufacturer's authorized representative present.

H. Reinforced Membrane: Apply hot rubberized asphalt to substrates and adjoining surfaces indicated. Spread to a thickness of 90 mils; embed reinforcing fabric, overlapping sheets 2 inches; spread another 125-mil thick layer to provide a uniform, reinforced, seamless membrane 215 mils thick.

I. Apply waterproofing over prepared joints and up wall terminations and vertical surfaces to heights indicated or required by manufacturer.

J. Cover waterproofing with protection course with overlapped joints before membrane is subject to backfilling, construction or vehicular traffic.

K. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate according to manufacturer's written instructions. Use methods that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

L. Insulation Placement:
   1. Loose lay in a staggered manner and tightly butt together all insulation boards. The maximum acceptable opening between insulation boards is 3/8-inch. Insulation shall be installed within 3/4-inch of all projections and penetrations.
   2. For multi-layer insulation applications, the bottom layer of insulation shall be the thickest layer and shall be a minimum of 2-inches thick. All layers shall be installed unadhered to each other and all joints in relation to underlying layers staggered.
   3. Install filter fabric over insulation per manufacturer’s installation instructions.

M. Architectural Finish Paver Placement: Install architectural pavers on tabs or pedestals in accordance with manufacturer's recommendations and architectural layout.

N. Drainage/Water Retention Component:
   1. Drainage/water retention component shall be installed with holes up, over the root barrier protection, or insulation (if used). Adjacent panels shall be butt together. Drainage/water retention component shall be cut to fit around penetrations with a heavy-duty utility knife or small toothed saw.
   2. 2. The cups of the drainage/water retention component shall be filled with lightweight aggregate level with the top surface of the panels where required due to loading conditions.

**O.** Filter Fabric: A layer of filter fabric shall be laid over the drainage/water retention component, lapping adjacent rolls a minimum of 12 inches. Enough material shall be left to be drawn up above the anticipated growing media level. Any excess shall be trimmed down to the level of the growing media.

P. Growing media shall be placed carefully to avoid damage or displacement of other materials such as walls, paving, drainage components, filter fabric, and waterproofing membrane.
   1. Growing media shall be placed to within 1 inch greater than final grade or to a depth of no greater than 8 inches and compacted as described in manufacturer’s written instructions. below. For final grades less than 8 inches only one round of compaction shall be performed and remaining growing media loosely placed such that top of growing media exceeds final grade by 1 inch. For final grades greater than 8 inches, place growing media at no greater than 6 inches and repeat procedure until growing media has been compacted within 1 inch of final grade.

3.4 FIELD QUALITY CONTROL

A. Engage a full-time site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions; surface preparation; and application of the membrane, flashings, protection, and drainage components; furnish daily reports to Architect.

B. Flood Testing: Flood test each deck area for leaks, according to recommendations in ASTM D 5957, after completing and protecting waterproofing but before overlaying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
   1. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of sheet flashings.
   2. Flood each area for 72 hours.
   3. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight.

C. Engage an independent testing agency to observe flood testing and examine underside of decks and terminations for evidence of leaks during flood testing.

3.5 CLEANING AND PROTECTION

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

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

END OF SECTION