

SPEC NOTE: This guide specification is intended for use when specifying a waterproof roofing system with a vegetated roof assembly. Make any required selections, such as soil depths, types of vegetation, stormwater drainage depth, insulation thickness, etc. Where selection is indicated with an [OR] statement, select the appropriate paragraph and delete the inappropriate statement. Delete all SPEC NOTES and [AND / OR], [OR] statements prior to final printing.

1 General

1.1 SECTION INCLUDES

- .1 Vegetated Protected Membrane Roofing: Installed waterproof membrane with a vegetated roof assembly, possessing lightweight engineered growing medium, stormwater retention capacity, root barrier, geotextile filter fabric and appropriate vegetation.

SPEC NOTE: Edit to suit project requirements.

1.2 RELATED SECTIONS

- .1 Section 03 31 00 - Structural Concrete: Structural concrete deck.

[OR]

- .1 Section 03 41 13 - Precast Concrete Hollow Core Planks: Structural precast concrete deck.

[OR]

- .1 Section 05 31 00 - Steel Decking: Structural metal roof deck.
- .2 Section 06 10 00 - Rough Carpentry: Structural wood deck, cants, blocking and curbs.
- .3 Section 07 22 00 - Roof and Deck Insulation: Roof insulation.
- .4 Section 07 27 00 - Air Barriers: Connection of wall air barrier system to roofing system.
- .5 Section 07 62 00 - Sheet Metal Flashing and Trim.
- .6 [Section 07 65 00 - Flexible Flashing.]
- .7 Section 07 71 00 - Roof Specialties: Manufactured gravel stops, fascias, expansion joints, reglets and scuppers.
- .8 Section 07 72 00 - Roof Accessories: Manufactured vents, hatches, and walkways.
- .9 [Section 07 76 00 - Roof Pavers: Roof [ballast] [decking] pavers.]
- .10 Section 07 92 00 - Joint Sealants.
- .11 Section [_____] - [_____]: Roof anchors.
- .12 Section 22 14 26 - Facility Storm Drains: Roof drains.

1.3 PERFORMANCE REQUIREMENTS

- .1 Vegetated Roof: Appropriate vegetation suitable for site climatic conditions incorporating root barrier, geotextile filter fabric, engineered growing medium, stormwater retention, vegetation-free zones and warranties.
- .2 Provide Products that are compatible with one another under field conditions.

1.4 SUBMITTALS

- .1 Submit Product data as specified in Section [01 00 00] [01 33 00][_____].

[OR]

- .1 Product Data: The manufacturer shall provide a cross section of green roof system detailing the components comprising the DELTA®-GARDEN ROOF system.

SPEC NOTE: Optional. Preferable to specify Automatic Drip Irrigation System as specified in Section [02 80 00]. A manual irrigation system with access to a hose bib, hose and sprinkler maybe all that is required. Design Authority responsible for providing an outside, cold weather hose bib and electrical source, located to assist in irrigation of vegetation.

- .5 Automatic Drip Irrigation: Provide irrigation for the entire system. [Submitted for approval to [Landscape Contractor] [Roofing Contractor] [Architect] [Consultant]]

1.5 CERTIFICATES

- .1 Installer Certificates: Signed by installers verifying that they have the specified qualifications as a supplier or installer having a thorough understanding of proper horticulture techniques, good taxonomy skills and able to competently identify undesired species at various growth stages, adequate equipment and skilled workers.

1.6 ENVIRONMENT ASSURANCE

- .1 Engineered Growing Medium Test Reports: Growing medium should be from recycled products. Growing medium should be obtained from sustainable and clean sources.
- .2 The entire vegetated assembly must demonstrate the ability to retain at least 35 liters of water per square meter.
- .3 Plant materials must be varieties which are not harmful to the area and demonstrate the ability to achieve at least 2°C evaporative cooling 150 mm above the roof surface.
- .4 All water retention components shall be produced from 100% post consumer recycled materials.

1.7 QUALITY ASSURANCE

- .1 Landscape installer: Having at least 5 years documented experience of a similar nature in the storage, transportation, and installation of growing media on elevated roof decks; have a certified horticulturist on staff as well as adequate training to facilitate the maintenance of the vegetated roof system over the warranty period.

- .2 All installers must have Fall Arrest Certificates on their person at all times while working on the roof top.

1.8 PRE-INSTALLATION MEETINGS

- .1 Conduct pre-installation meeting as specified in Section [01 00 00] [01 31 00][_____].

[OR]

- .1 Meetings: Prior to commencement of deck installation, review and document methods and procedures related to roof deck, engineered growing medium and vegetation, including the following:
 - .1 Participants: authorized representatives of the [Contractor,] and [Construction Manager,] [Owner,] [Landscape Architect,] [Consultant,] [Roofing Subcontractor,] [Roofing Manufacturer,] [Garden Roof System Manufacturer,] [Landscape Subcontractor.]
 - .2 Review methods and procedures related to vegetated roof installation, including roofing manufacturer's and garden roof system manufacturer's written installation instructions.
 - .3 Review construction schedule and confirm availability of products, subcontractor personnel, equipment and facilities.
 - .4 Review deck installation criteria and finishes for conformance with vegetated roof system criteria. [including issues of slope and fastening]
 - .5 Review structural loading conditions and limitations of roof deck both before, during and after roofing application.
 - .6 Review flashing details, special vegetated roofing details, roof drainage, roof penetrations, equipment curbs, and other conditions affecting vegetated roofing installation.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Deliver and store products undamaged in original containers with manufacturer's labels and seals intact.
- .2 Store products in designated areas elevated off the ground and protected from ultra-violet radiation, inclement weather and construction activities.
- .3 Store products on roof deck in a manner to prevent overloading the structure and properly secured to prevent movement due to wind or other forces. [Prevent permanent deformation of deck.]

1.10 ENVIRONMENTAL REQUIREMENTS

- .1 Do not apply any vegetated roofing materials during inclement weather.

- .2 Comply with recommendations for minimum and maximum temperatures and humidity during application.

1.11 MAINTENANCE

- .1 Vegetated Maintenance Program: Maintain the nutrient levels and storm water retention properties of the growing medium, bi-monthly from May thru October. The entire vegetated roof shall be maintained for the warranty period as per the following:
 - .1 First year maintenance schedule:
 - .1 Weekly inspection of the entire vegetated roof area for the first six weeks. Provide irrigation if needed to ensure a complete green cover of the whole surface of the vegetated roof by the specified plant mix.
 - .2 Bi-weekly inspection for further six weeks, including irrigation if needed and operation of re-planting if necessary in certain areas, weeding of undesired aggressive tall species and woody seeding.
 - .3 One early fall visit for weeding of undesired aggressive tall species and woody seeding, inspection and cleaning of the roof drains.
 - .2 Second year maintenance schedule:
 - .1 Four visits during the second year.
 - .2 Included in this schedule shall be: removal of unintended species, replacement of dead plantings, plant-appropriate pruning, cleaning of drains and maintenance-free areas, programming and opening/closing of irrigation system, watering, repairing of components due to normal wear and tear, as required.
 - .3 Maintenance Reports:
 - .1 The subcontractor will, during the first year, submit a maintenance report at the end of each inspection.
 - .2 The reports will include: inspection dates, maintenance personnel at each visit, activities performed, notes on growing condition, notes on adjustments made during visit.
 - .3 Report to be signed by the maintenance subcontractor, maintenance personnel and verified by a representative of the building owner.
 - .4 Copies to be submitted to the building owner and membrane manufacturer.
 - .5 A subcontractor not conforming to this schedule will be replaced but will be deemed to be responsible and will bear all costs of the new subcontractor.

- .6 Record noted deficiencies and arrange for their proper repair under warranty.

1.12 WARRANTY

- .1 Submit a TWO year contractor warranty in accordance with the General Conditions of the Contract.

[OR]

- .1 Vegetation Warranty: A written warranty that the landscape/roofing contractor, at no charge, replaces vegetation that is dead or unhealthy, engineered growing medium that has eroded, for a period of TWO growing seasons, at no charge to the owner. Make replacements in same manner as specified for original plantings.

2 Products

2.1 MANUFACTURERS

- .1 Manufacturers of vegetation suitable for site climatic conditions engineered growing medium, stormwater retention layer, root barrier, geotextile filter fabric, and materials for vegetation-free zones having FIVE years experience.
- .2 Manufacturers of vegetation suitable for site climatic conditions, engineered growing medium, stormwater retention layer, root barrier, geotextile filter fabric, and materials for vegetation-free zones having products considered acceptable for use:
- .1 Cosella-Dörken Products Inc.
- .2 Johns- Manville

2.2 MATERIALS

- .1 Root Barrier: Heavy duty polyethylene film, 15 mil thick, UV protected, green, possessing no chemical residue, protected from oxidation; DELTA®-ROOT BARRIER by Cosella-Dörken Products Inc.
- .2 Stormwater Retention Layer: Minimum allowable water retention 8 L/m². 100% recycled polyethylene, molded into a three dimensional dimple sheet, having an octagonal re-enforced rib structure for enhanced compressive strength. Designed specifically for stormwater retention, aeration, drainage of excessive precipitation and engineered to promote irrigation through capillary action into the soils.
- Compressive strength: 200 kN/m² (4,160 psf)
 - Dimensions 6.6' x 65.6' (2 x 20 m); dimple height 0.79 in (20 mm)
 - Drain capacity between dimples 0.81 gal / (s ft) (10 l/(s m))
 - Drainage rate through perforations 3.86 fl. oz / ft² (1.23 l/s x m²)
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- Volume of air between dimples 43.98 fl. oz / ft² (14 l/m²)

Product: DELTA®-FLORAXX by Cosella-Dörken Products Inc.

- .3 Filter Fabric: Heat-bonded polyolefin fabric, 100% polypropylene, UV stabilized, water permeable. DELTA®-BIO GREEN by Cosella-Dörken Products Inc.
- .4 Engineered Growing Medium: A lightweight, biologically populated, soil-less mix of organic and inorganic material that will support succulent and desert plantings meeting the following performance requirements:
 - .1 Organic content ≤ 8% by weight
 - .2 Volume dry weight– approx. 0.7 kg/ l
 - .3 Volume weight saturated- approx. 0.9 kg/ l
 - .4 Air content ≥ 25% by volume
 - .5 Water storage capacity ≥ 20% by volume
 - .6 Water permeability ≥ 0.1 cm/s
 - .7 pH – 6.9-9.5
 - .8 Compression factor-approx 1.2
 - .9 Particle size distribution ≤ 15%
- .6 Vegetation: Selected for its appropriate resistance to site climatic conditions and aesthetic suitability as recommended by landscape architect.

2.3 ACCESSORIES

SPEC NOTE: Edit to suit project requirements.

1. Ballast: Round washed river stone of diameter between 2 cm (3/4") and 4 cm (1 1/2").

3.1 EXAMINATION

- .1 Prior to installing the DELTA®-GARDEN ROOF system, examine surfaces and report and remediate any adverse conditions which may have a negative impact on the appearance or performance of the garden roof system.

3.2 INSTALLATION

- .1 Underlying roof components (deck, vapor barrier, insulation, waterproofing membrane, etc.) shall be installed, tested, and approved according to manufacturer's guidelines.
- .2 Ensure the roof structure is approved to support the water-saturated weight of the garden roof.

- .3 The surface of the roofing shall be cleaned and be free of debris prior to installing any garden roof components.
- .4 Loose lay DELTA®-ROOT BARRIER onto the roof surface. Begin installation at drains. Work outward from the drains, ensuring any overlaps shingle downward to facilitate water flow towards the drains and to minimize water seepage under DELTA®-ROOT BARRIER. Cut DELTA®-ROOT BARRIER as tightly as possible around drains and protrusions. the number of overlaps should be minimized. Where overlaps cannot be avoided, they shall be a minimum of 1 m (39"). End laps also shall be overlapped a minimum of 1 m (39"). Wide overlaps help prevent roots from damaging the waterproofing. Terminate DELTA®-ROOT BARRIER up the parapets or garden roof edge to the anticipated finished level of the growing medium.
- .5 Beginning at one side of the roof, roll out DELTA®-FLORAXX dimple side down, cup side up. Always place the DELTA®-FLORAXX tightly to the perimeter parapet or garden roof edge. End laps and side laps shall be placed tightly to the adjacent roll of DELTA®-FLORAXX. Do not interlock the dimples. Cut DELTA®-FLORAXX as tightly as possible around drains and protrusions.
- .6 Beginning at one side of the roof, loose lay DELTA®-BIO GREEN geotextile over top of DELTA®-FLORAXX. Terminate DELTA®-BIO GREEN up the parapets or garden roof edge to the anticipated finished level of the growing medium. To prevent fine particles from being washed out of the growing medium, end laps and side laps of DELTA®-BIO GREEN shall be overlapped a minimum of 30 cm (12"). Cut DELTA®-BIO GREEN as tightly as possible around drains and protrusions.
- .7 Place ballast (by others), such as round washed river stone of diameter between 2 cm (3/4") and 4 cm (1 1/2"), at perimeter parapets or garden roof edges, and around drains to a minimum width of 30 cm (12"). The minimum thickness of the ballast shall meet or exceed the anticipated thickness of the growing medium. Ensure the ballast completely covers the DELTA®-BIO GREEN at the perimeter parapets or garden roof edges.
- .8 Place specified growing medium according to manufacturer's recommendations.
- .9 Thoroughly water garden roof to fill water retention cups and fully saturate the growing medium.

3.3 VEGETATION

- .1 Plant specified vegetation where designated on the drawings. Fertilize, irrigate and maintain in accordance with landscape/roofing contractor's requirements.
- .2 Vegetation shall be installed from spring thaw up to 12 weeks prior to the start of winter.
- .3 All other components and growing medium may be installed at any time provided adequate protection is provided to prevent damage and erosion.

- .4 Traffic is prohibited on the vegetated assembly during the establishment period.

3.4 CLEANING

- .1 Refer to Section [01 74 00][_____].
- .2 Clean drains, gutters and downspouts of debris, ensuring free drainage.
- .3 Clean adjacent roof surfaces, levels and ground level areas of debris and excess products.

END OF SECTION