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| https://media.licdn.com/mpr/mpr/shrink_100_100/p/3/005/0a9/1de/3fbdb4e.png | Hydrotech Membrane Corporation  10,951 Parkway Boulevard  Anjou, Quebec, H1J 1S1  Web: [www.hydrotechmembrane.ca](http://www.hydrotechmembrane.ca) |

**Hydrotech Spec Note:** In order to maintain a fair and impartial bidding process, add the following paragraph to the INSTRUCTIONS TO BIDDERS (section 00 21 13 of the National Master Specification (NMS)):

**REQUESTS FOR SUBSTITUTIONS**

When products are mentioned by their trade name or by the manufacturer’s name, those shall form the basis of substitution requests. Requests for substitutions shall only be considered if they are forwarded in writing to the offices of the Consultant no later than ten (10) working days prior to the bid closing date. Such requests must be complete with descriptive data and samples in order to allow proper evaluation and comparison between the proposed substitutions and the specified products.

Where applicable, approval of such substitution requests shall be through the issuance of an addendum amending the bid documents.

Only materials, equipment or products accepted through addenda will be considered as equivalents.

The contractor shall not, at any time, base its bid price on equivalent products that have not been accepted in accordance with the procedures described above.

**Hydrotech Spec Note:** This section is only provided as a guide to assist a knowledgeable specifier in writing a suitable specification for an extensive vegetative roof over a hot-applied rubberized asphalt roofing system on concrete decks. The specifier may choose applicable paragraphs among the ones provided or add new ones in accordance with the specific requirements of the project.

**Hydrotech Spec Note:** Detail drawing section 07 55 63 may be consulted on the Web to help write the specifications. Also, technical data for each material and product shown on the Drawings and specified in this Section may also be found on the Web of Hydrotech Membrane Corporation.

# General

## SUMMARY

**Hydrotech Spec Note:** The “SUMMARY” Article is a brief summary of the contents covered in this section and is not intended to describe the entire scope of the work.

### Preparation of substrate

### Hot-applied rubberized asphalt membrane

### Polyester fabric reinforcing

### Elastomeric reinforcing

### Protection sheet

### Pitch pocket at membrane penetration

### Plastic cement

### Root barrier protection

### Thermal insulation

### Drainage board

### Water retention mat

### Drainage/water retention component

### Edge restraint

### Geotextile membrane

### Inspection chamber for roof drain

### Vegetative roof growing media

### Related material for vegetative roof

## PRODUCTS INSTALLED, BUT NOT SUPPLIED BY THIS SECTION

**Hydrotech Spec Note:** In the following article, list sections which specify products required to be installed by this section. For example, plants can be supplied by landscaping sections (see Division 32) to be coordinated with the plants indicated to be installed in Part 3 of this Section).

Also, when products or special equipment is indicated to be installed "by others" or their installation is termed as “Not In Contract”, it is to be understood that such work will be performed by the Owner.

### Section []

## RELATED SECTIONS

**Hydrotech Spec Note:** The “RELATED SECTIONS” Article informs the reader (General Contractor or other) that there may be other sections whose scope may directly affect the work of this section.

Its aim is not to identify specific work specified elsewhere in the project manual excluded from this section but which would "normally" form part of it. Such coordination and division of labour is the responsibility of the General Contractor and not that of the Specifier. Indicate below, the number and the title of each applicable section.

### Section [32 93 10 - Trees, Shrubs and Ground Cover Planting].

### Section [03 30 00 - Cast-In-Place Concrete].

### Section [04 22 00 - Concrete Unit Masonry].

### Section [06 08 99 - Rough Carpentry for Minor Works].

### Section [07 14 13 - Hot Fluid-Applied Rubberized Asphalt Waterproofing].

### Section [07 21 13 - Board Insulation].

### Section [07 26 00 - Vapour Retarders].

### Section [07 27 00 - Air Barriers].

### Section [07 55 63 - Vegetated Protected Membrane Roofing].

### Section [07 62 00 - Sheet Metal Flashing and Trim].

### Section [07 92 00 - Joint Sealants].

### [Section [\_\_\_\_\_\_\_\_\_\_ - Roof drains].

### Section [\_\_\_\_\_\_\_\_\_\_].

## REFERENCE STANDARDS

**Hydrotech Spec Note:** Indicate below the applicable reference standards that are used in this section. Identify each standard using the name of the standard agency, the standard number and its title. Indicate the publication and revision dates of each standard in accordance with those provided by Hydrotech Membrane Corp.

### CGSB-37-GP-9Ma Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing.

### CAN/CGSB-37.50-M89 Hot Applied, Rubberized Asphalt for Roofing and Waterproofing.

### CAN/CGSB-37.51-M90 Application for Hot-Applied Rubberized Asphalt, for Roofing and Waterproofing.

### CGSB-37-GP-52M Roofing and Waterproofing Membrane, Sheet Applied, Elastomeric.

### CAN/ULC-S701-11 Thermal Insulation, Polystyrene, Boards and Pipe Covering.

### CSA A231.1:19/CSA A231.2:19 Precast concrete paving slabs/Precast concrete pavers.

### CSC TEK-AID 07120 Hot Rubberized Asphalt Waterproofing and Roofing.

### Canadian Roofing Contractors’ Association (CRCA).

### FM (Factory Mutual Engineering Corporation) Roof Assembly Classifications.

### ULC (Underwriters Laboratories of Canada) Fire Hazard Classifications.

### BBA (British Board of Agreement) Agreement Certificate No. 90/2432.

### A- LOHTA Ontario Landscape Standard-edition 2004/Landscape guideline.

### B- BCLNA/BCSLA The British Columbia Landscape Standard 7th edition.

### C- Respective Landscape Provincial Standards.

### D- CAN/BNQ 0413-200/2016 Organic Soil Conditioners-Composts.

### CNLA Canadian Standards for Nursery Stock 8th edition.

### ASTM E2396M-19 Standard Test Method for Saturated Water Permeability of Granular Drainage Media [Falling-Head Method] for Vegetative (Green) Roof Systems.

### ASTM E2397M-19 Standard Practice for Determination of Dead Loads and Live Loads Associated with Vegetative (Green) Roof Systems.

### ASTM E2398M-19 Standard Test Method for Water Capture and Media Retention of Geocomposite Drain Layers for Vegetative (Green) Roof Systems.

### ASTM E2399M-19 Standard Test Method for Maximum Media Density for Dead Load Analysis of Vegetative (Green) Roof Systems.

### ASTM E2400M-19 Standard Guide for Selection, Installation, and Maintenance of Plants for Vegetative (Green) Roof Systems.

### ANSI/SPRI VF-1 2017 External Fire Design Standard for Vegetative Roofs.

### ANSI/SPRI VR1 2018 Procedure for Investigating Resistance to Root or Rhizome Penetration on Vegetative Roofs.

### Tech Solutions 508.3 Ballast Design Guide for PMR Systems.

**Hydrotech Spec Note:** Insert the following standard only for vegetation in sedum mats.

### CSA A123.24-15 Standard test method for wind resistance of modular vegetated roof assembly.

## SYSTEM DESCRIPTION

**Hydrotech Spec Note:** Use this Article to set the parameters and requirements for the design or performance criteria of the roofing system installation.

### Complete Garden Roof® Assembly on cast-in-place concrete deck including a hot-applied, reinforced, flexible, rubberized asphalt membrane. The membrane shall be protected against the following:

#### Damage resulting from installation and adhesion of the insulation to the membrane, by means of a protection sheet,

#### Root intrusions by a root barrier membrane,

#### Ultraviolet light, temperature changes or damages due to pedestrian traffic, by means of Type IV rigid polystyrene insulation,

#### Covered by a drainage/water retention component on which a geotextile membrane is unrolled to impede fine particles from the growing media and the obstruction of the aeration and drainage system of the drainage/water retention component,

#### Covered by a thickness of 150 mm or less of growing media which is designed for minimal maintenance vegetative roofs or for buildings with low bearing capacity,

#### Covered by an erosion control mat fastened with disk anchors to provide wind and water surface erosion protection and vegetation reinforcement when installed,

#### Covered by plants having a good tolerance to drought, wind uplift forces or fire hazards [in accordance with the requirements of regulatory bodies such as ASTM E2397, [ULC], [Factory Mutual (FM)] [..] and others, vegetative roof system shall have a dead load of ( ) kg/m².

**Hydrotech Spec Note:** CONTACT Hydrotech for specific requirements.

### DEFINITIONS

#### Vegetative Roof – An area of planting/ landscaping, built up on a waterproofed substrate at any level that is separated from the natural ground by a man-made structure.

#### Extensive Vegetative Roof – Low maintenance landscaping consisting of shallow growing media depths (<150mm) with plant varieties restricted to primarily mosses, herbs and succulents capable of withstanding harsh growing conditions.

#### Intensive Vegetative Roof – Landscaping requiring regular maintenance, consisting of deeper growing media depths (>150mm) with a wider variety of plant species possible including shrubs and trees.

#### Semi-Intensive Vegetative Roof – Lawn oriented landscaping requiring at-grade lawn oriented maintenance. Can include sodded or seeded turf grasses or naturalized grasses with growing media depths (>200mm).

#### Garden Roof® Assembly – Patented system of drainage, water retention and root barrier components utilized in the construction of vegetative roofs over Hydrotech's MM6125® membrane.

#### Steep Slope Vegetative Roof – Defined as a slope exceeding 14° or 25% (3:12) pitch.

#### “C” Factor – The runoff coefficient used in the Rational Method, “C” represents the portion of the storm rainfall that becomes runoff.

#### Curve Number (CN) – A number that is used with Natural Resource Conservation Service (SCS) methods to convert rainfall depth into runoff volume. The Curve Number takes into account a site’s soil type, plant cover, impervious cover, interception and surface storage.

## SUBMITTALS

**Hydrotech Spec Note:** Use this article only if the roofing system includes specific details such as flashings, insulation or expansion joints or if interfaces with other elements must be clearly illustrated to properly identify the responsibility of each trade.

**Hydrotech Spec Note:** Indicate the appropriate section reference and edit its number and title.

### Submit shop drawings in accordance with section [01 33 00 - Submittal Procedures].

### Show details and locations for [expansion joints] [plane changes] [and] [penetrations] [roof plans showing layout of pavers serving as ballast and/or walkways].

### Submit product data sheets for primer, membrane, fabric reinforcing, elastomeric reinforcing sheet, protection sheet, root barrier protection, insulation, [precast concrete paver], water retention panel, growing media, erosion control mat, disk anchors and vegetative products.

**Hydrotech Spec Note:** Include the following paragraph to highlight the importance of interfacing between the work of this section and the existing or new building.

### Clearly indicate specific sealing and tie-in procedures that will be undertaken to ensure the integrity of the building envelope at connections between the hot-applied rubberized asphalt membrane and the walls, decks, air barriers and vapour barriers.

### Vegetative roof system manufacturer shall provide a maintenance program for future Owner.

### Show certification that all components of the extensive vegetative roof assembly are being supplied and warranted by a single-source manufacturer.

### Provide ballasting requirements for the specified loose laid extruded polystyrene insulation, as **referenced in part [1.9.3] - REGULATORY REQUIREMENTS**, to include the following:

#### A written ballast review on membrane manufacturer’s letterhead outlining specific roof level ballasting requirements required to satisfy limited wind resistance warranty conditions.

#### Each roof level shall be individually evaluated and prepared during the design and pre-bid process.

#### A final ballast review shall be submitted that reflects the designed conditions at the time of the project bid.

### Provide storm water performance of the specific vegetative roof system for the project and include:

**Hydrotech Spec Note:** Insert [ ] specific to given project.

#### Composite Curve Number (CN) shall be [ ].

#### Composite C factor shall be [ ].

#### Total volume of water stored in the growing media shall be a minimum of [ ] m3.

#### Total volume of water stored in the water retention/drainage element shall be [ ] m3.

#### Hydrograph of vegetative roof system showing stormwater release delay and stormwater volume reduction.

### Show evidence indicating that water is available at the roof level to ensure that the vegetation can receive sufficient moisture through proper maintenance of the vegetative roof.

### Show evidence that a contract is in place to maintain the vegetation to Hydrotech requirements once installed and throughout the warranty period.

**Hydrotech Spec Note:** Insert the following standard only for vegetation in sedum mats.

### Show certification from an approved independent testing laboratory that the pre-vegetated modular tray assembly for use on the roof has been tested in accordance with CSA A123.24-15 to a minimum wind speed of not less than 177 km/ h (110 mph) without failure of the assembly.

## TESTING AND QUALITY CONTROL CERTIFICATES

### Submit a certificate issued by an independent laboratory competent and demonstrating that the membrane contains 40% post-consumer recycled content.

### Submit a certificate issued by a competent independent testing laboratory demonstrating that the membrane meets the requirements of CAN/CGSB-37.50.

### Provide an environmental product declaration issued by a recognized program operator.

### Provide a product health declaration issued by the membrane manufacturer.

**Hydrotech Spec Note:** Due to its resistance to acids, Hydrotech Membrane Corp.’s rubberized asphalt membrane distinguishes itself from some other asphaltic materials on the market. Include the following paragraph if the Owner requires acid-resistant characteristics for the membrane.

### Rubberized asphalt membrane shall contain filler agents and rubber screenings in order to provide acid-resistant properties (fertilizers, cleaning products, etc.).

**Hydrotech Spec Note:** Use the following paragraph in accordance with the requirements of governmental and regulatory agencies.

### Provide a certificate issued and signed by the insulation manufacturer certifying that the extruded polystyrene insulation is CFC-free.

### Upon request from the Consultant, submit satisfactory assurance that, for the duration of their lifetime, all materials used in the waterproofing system will remain compatible with each other and with the products with which they come into contact.

### In order to ensure full compatibility, all products specified in this section must come from a single manufacturer.

## QUALIFICATIONS

**Hydrotech Spec Note:** Use this article if pre-qualification is required for the manufacturer or installer.

### The membrane manufacturer shall have at least fifteen (15) years’ successful business experience in the field of hot-applied rubberized asphalt roofing membranes.

### The membrane manufacturer must be ISO 9001-2015 approved and provide a copy of the official certificate.

### Installer shall be approved by the manufacturer as a Garden Roof® Assembly installer and submit proof that it has a successful record of field applications for the past five (5) years to the satisfaction of the Consultant.

### The installer shall submit a list of at least three (3) successful projects of similar nature and complexity to this project, successfully completed within the past five (5) years. Previous experience submittals must match the specific membrane system proposed by the installer.

### The site foreman shall have a minimum of five (5) years of experience and at least one field worker on the team shall also have a minimum of five (5) years of experience.

### The manufacturer shall have a qualified technician to assist the contractor, if necessary, in the application of products and the inspection of the roofing system.

### The landscaping sub-contractor must be approved by the membrane manufacturer and submit proof that he have a successful record of horticultural experience for the past five (5) years to the satisfaction of the Consultant. He must be fully informed of horticultural techniques, be familiar with the CNLA Canadian Landscape Standard and have a good taxonomical knowledge. He must be able to identify undesirable species at their different growing stages. Furthermore, he must understand the basic components of an irrigation system.

### The vegetative roof system installer is responsible for the maintenance of the vegetative roof for a period of at least two years. At project close-out, he must ensure that plants are well developed, healthy and free of adventitious species and their development completed.

### **Refer to part [1.5.1] - SYSTEM DESCRIPTION**. Include single-source for all components from the manufacturer.

### Vegetative roof supplier shall show evidence that the specified vegetative roof system has been developed, marketed, supported and installed for a minimum of fifteen (15) years on projects of similar complexity.

### Vegetative roof supplier shall provide data and calculations, specific to the products being submitted, that verify that the vegetative roof system specified meets the project criteria for storm water runoff volume and rate control.

#### Calculations shall be based on actual testing of suppliers vegetative roof components to be used for the project including but not limited to the regionally specific growing media formulation and water retention/ drainage materials.

#### Calculations shall account for vegetated and un-vegetated portions of the roof as well as local climatic conditions including rainfall depth, intensity, duration, and timing.

### Vegetative roof supplier shall provide data demonstrating that the composite C-factor and Curve Number parameters for the specified vegetative roof system are less than or equal to those factors used in the engineering design and analysis for the projects drainage and storm water systems analysis.

### The manufacturer shall meet with the necessary parties at the jobsite to review and discuss project conditions as it relates to the integrity of the roofing assembly.

## REGULATORY REQUIREMENTS

**Hydrotech Spec Note:** A ULC-compliant roofing assembly is required to withstand exposure to a fire from a source located outside of the building. The classification is established depending on whether the degree of fire exposure is severe (class A), medium (class B) or light (class C). This classification is established in accordance with CAN/ULC-S107M, Methods of Fire Tests of Roof Coverings.

### The roofing system provided by this section shall be ULC class A, in accordance with test result no. 360 O18, conducted in accordance to CAN/ULC-S107M and CAN/ULC-S126-M86 test methods.

**Hydrotech Spec Note:** The following paragraph refers to the requirements of the Factory Mutual (FM) insurance body. Verify if the Owner is insured with this organization before requiring the contractor to comply with these requirements.

### The roofing system provided by this section shall be FM - class [1] [2]

**Hydrotech Spec Note:** In order to resist wind uplift pressures on the roof, FM data and associate performance criteria can be used to anchor the roof covering system or one of its parts to the structure (even if the Owner is not insured by FM). See for example "Data Sheet I-28" on insulated steel decks covered with lightweight concrete toppings or other approved materials.

### Ballasting requirements vary depending on height of roof deck, parapet height, and design wind speed based upon location of building. Vegetative roofs also require proper ballasting and the possible use of wind erosion mats. Ballast design shall be in accordance with DuPont and Hydrotech Membrane Corp.’s requirements and other applicable codes or wind design guides. CONTACT Hydrotech for all ballasting recommendations.

## MOCK-UPS

**Hydrotech Spec Note:** Use this article to build a portion of the roofing system on site and over a specific area. Such a mock-up will permit review of the membrane installation procedures, coordination with the work of several sections, testing to be conducted on site, training of various trades in specific applications techniques, and monitoring of the installation.

**Hydrotech Spec Note:** Indicate the appropriate section reference and edit its number and title.

### Build mock-ups in accordance with section [01 33 00 - Submittal Procedures].

### Install the roofing system over an area of at least [10] square meters; include a typical lap joint, [an expansion joint], [an outside corner] [and] [an inside corner]. The waterproofed surface resulting from the construction of the mock-up may become part of the finished work, provided it is approved by the Consultant.

### Wait [24] hours prior to undertaking [roofing] work to allow the Consultant to examine the mock-ups and approve them.

## PREINSTALLATION MEETINGS

**Hydrotech Spec Note:** Use this section if the Owner intends to include these meetings in its administration of the construction process; define the detailed requirements (for the entire of the project if possible) to which this article refers in the appropriate section of Division 1.

### Hold a pre-installation site meeting [one] [---] week(s) prior to the start of the work of this section, in accordance with the requirements of section [01 31 19 - Project Meetings].

### Request the attendance of representatives from testing and inspection companies, manufacturer’s representatives, installers and other parties directly affected by the work of this section.

### Review installation conditions and procedures and coordinate with the work of related sections. Adhere to the manufacturer’s requirements and ensure approval of the substrate.

## DELIVERY, STORAGE AND HANDLING

### Deliver materials unopened and in their original packaging, properly labelled with the manufacturer’s name, installation instructions, UL labels and any other identification numbers.

### Store materials in a clean and safe manner without exceeding the structural capacity of the storage substrates.

### Store absorbent materials off-ground, in a dry place and protected from inclement weather.

### Store rolls upright.

### Only remove from storage area material quantities that can be installed in a day’s work.

### Store insulation away from [sunlight], [inclement weather] and any deleterious substances.

### Store materials in accordance with manufacturer's written instructions.

### Handle and store vegetation in accordance with the Hydrotech Garden Roof® Assembly Installation Instructions and Maintenance Plan.

## SITE CONDITIONS

**Hydrotech Spec Note:** For the “SITE CONDITIONS” article, refer to the workplace hazardous materials information system (WHMIS) specified in section [02 81 00 - Hazardous Materials]. Specify below any additional requirements.

### Do not install hot-applied rubberized asphalt membranes when the ambient temperature or the substrate temperature is below -18°C. The cooling factor due to the wind is not applicable.

### Ensure substrates are dry and free from snow and ice. Use only dry materials, and apply materials only when weather conditions will not promote moisture infiltration into waterproofing layers.

### Perform membrane preparation and application in a well ventilated area.

### Ensure membranes and accessories are installed such that they are not exposed to temperatures exceeding 82°C (i.e. warm ducts, vents and exhaust stacks) throughout their lifetime.

### Note that primers contain petroleum distillates and are extremely flammable; do not breathe these vapors, do not use near open flames or in poorly ventilated areas. Read the container labels and material safety data sheets for additional information.

### Avoid contact between materials such as petroleum, grease, solvents, mineral oil, vegetable oil, animal fat etc. and roofing membrane. If appropriate, inform membrane manufacturer of anticipated exposure to foreign matter or chemical fumes. Manufacturer shall assess the impact of these items on the performance of the roofing system.

### Surfaces with a slope greater than 14° or 25% (3:12) have special installation considerations. CONTACT Hydrotech for more details.

**Hydrotech Spec Note:** The weight of the ballast required to keep the insulation in place varies according to the height of the finished roof surface, the height of the parapets, the wind uplift design and the location of the building. For water detention roofs, the weight of the ballast necessary to avoid the negative buoyancy of the insulation varies depending on the thickness of the insulation.

### The weight and design of the ballast system shall meet the requirements of "Tech Solutions 508.3 - Ballast Design Guide for PMR Systems" by DuPont or other applicable codes.

### In order to protect the work, the general contractor shall ensure that adequate measures are taken to protect the membrane and plants.

## SCHEDULING AND CRITICAL PATH MANAGEMENT

**Hydrotech Spec Note:** Use this article when a critical path is required for the work of this section to enable partial occupation of the building or the work of another section to proceed.

### Submit a [schedule] [and] [critical path] in accordance with the requirements of section [01 31 19 - Project Meetings].

### Coordinate with work of related sections to allow the installation of materials and work that must precede the application of the roofing membrane.

## WARRANTY

**Hydrotech Spec Note:** Retain the following paragraph for Federal Government projects. Verify references to General Conditions “C” and edit accordingly.

### Upon completion of the work, the contractor shall supply the owner with a single-source warranty direct from the manufacturer.

### For work of this section, the 12 month warranty period indicated in the General Conditions “C” is extended to [24] [60] months.

**Hydrotech Spec Note:** Retain the following paragraph for private sector projects. Verify and modify references to article GC - 12.3 as necessary.

### Submit a written warranty, signed by the manufacturer and installer and naming the Owner as beneficiary, certifying that the hot-applied rubberized asphalt roofing system will remain in place and will retain its waterproofing properties, in accordance with the requirements of article GC - 12.3 of the General conditions, except the warranty shall be for a period of [24] [60] months.

**Hydrotech Spec Note:** Use the following paragraph when the owner requires a manufacturer's warranty. Contact the manufacturer to confirm the availability of the guarantees offered.

### The Contractor must provide a written, signed and issued warranty on behalf of the owner, certifying that the hot-applied rubberized asphalt roofing system will remain in place and will retain its waterproofing properties.

#### Materials Warranty (excluding workmanship):

##### Duration: [5] [10] [15] [20] years.

#### Waterproofing warranty (including materials and workmanship):

##### Duration: [5] [10] [15] [20] years.

#### Insulation warranty covering:

##### 90% retention of the original thermal value.

##### (OPTIONAL) Remain on the deck to a maximum 110 km/h gust wind speed.

**Hydrotech Spec Note:** Requires pre-bid, written ballast review prepared by the insulation and/ or membrane material supplier and resulting information incorporated into bidding and contract documents. Also requires written verification from insulation and/ or membrane material supplier that the completed installation meets the criteria established in the final ballast review submitted at the time of the project bid.

##### Duration: [5] [10] [15] [20] years.

#### Total System Warranty; covers components of the vegetative roof system, including membrane, flashing, insulation, Garden Roof® components, Checker Block® ballast units and vegetation. Includes removal and replacement of the Garden Roof® components, Checker Block® ballast units, vegetation and growing media (<600 mm deep) when supplied by, installed, and maintained to Hydrotech's current requirements.

##### Duration of Membrane/Flashing and replacement of Hydrotech supplied roof substrate board from date of installation: [5] [10] [15] [20] years (watertight condition).

##### Duration of insulation from date of purchase: [5] [10] [15] [20] years:

###### 90% retention of the original thermal value.

###### (OPTIONAL) Remain on the deck to a maximum 110 km/h gust wind speed.

**Hydrotech Spec Note:** Requires pre-bid, written ballast review prepared by the insulation and/ or membrane material supplier and resulting information incorporated into bidding and contract documents. Also requires written verification from insulation and/ or membrane material supplier that the completed installation meets the criteria established in the final ballast review submitted at the time of the project bid.

##### Material Integrity of Garden Roof® Components from date of purchase: [5] [10] [15] [20] years.

##### Extensive Vegetation: 2-year thrive and coverage from date of installation:

###### Sedum Plugs: minimum 50% coverage end of year 1; 80% coverage end of year 2.

###### Sedum Carpet and Sedum Tile: minimum 90% coverage end of year 2.

###### Perennial Plugs: 2-year thrive from date of installation.

##### Duration of Checker Block® ballast units from date of purchase: [5] [10] [15] years (will not crack, split or disintegrate due to freeze-thaw).

##### \*\*CONTACT HYDROTECH FOR EXACT WARRANTY TERMS AND CONDITIONS\*\*

# Products

## GENERAL

### **Refer to section [1.5.1] - SYSTEM DESCRIPTION**. All components shall be obtained as a single-source from the membrane/ vegetative roof manufacturer to ensure total system compatibility and integrity.

## Manufacturer:

#### Hydrotech Membrane Corp.

#### 10 951 Parkway Boulevard

#### Montreal, Quebec

#### 800-361-8924 or 514-353-6000

#### Web Site: www.hydrotechmembrane.ca

**Hydrotech Spec Note:** Below is a list of all potential materials that could be used in the installation of a hot-applied rubberized asphalt roofing system. Make sure that only materials necessary for the completion of the current project are specified in this section.

## PRIMER

### Surface conditioner:

#### Acceptable product: QUICK-SET by Hydrotech Membrane Corp.

#### Acceptable product: 56170 by Hydrotech Membrane Corp.

## RUBBERIZED ASPHALT

### Hot-applied rubberized asphalt: Conforming to CAN/CGSB-37.50.

#### Acceptable product: Flexible and monolithic waterproof membrane having 40% post-consumer recycled content, MM6125® by Hydrotech Membrane Corp.

## FABRIC REINFORCING

### Non-woven polyester fabric reinforcing suitable for use with hot-applied rubberized asphalt membrane.

#### Acceptable product: Flex-Flash® FH-16 by Hydrotech Membrane Corp.

## ELASTOMERIC REINFORCING

### Reinforcing synthetic rubber sheet manufactured from uncured neoprene having a minimum thickness of 1.6 mm.

#### Acceptable product: Flex-Flash® UN by Hydrotech Membrane Corp.

## PROTECTION SHEET

### 2 mm thick, elastomeric SBS bitumen protection sheet with sanded/ sanded finish and reinforced with a 95 g/m² fibreglass sheet.

#### Acceptable product: Hydroflex® 30 by Hydrotech Membrane Corp.

## PITCH POCKET

### Pitch pocket for plastic cement: [453 g (16 oz) copper] [0.8 mm thick, galvanized steel] in accordance with requirements of section [07 62 00 - Sheet Metal Flashing and Trim].

## PLASTIC CEMENT

### Use membrane specified in s**ection [2.3] - RUBBERIZED ASPHALT** - of this specification.

## ROOT BARRIER

### Polyethylene sheet specially formulated and tested electronically against pinholes meeting ANSI/SPRI VR-1 and a pressure-sensitive polyethylene tape.

#### Acceptable product: Standard Root Stop by Hydrotech Membrane Corp.

#### Acceptable product: Root Stop Tape as supplied by Hydrotech Membrane Corp.

## RIGID INSULATION

**Hydrotech Spec Note:** Class A roofs in accordance with ULC require a type IV rigid insulation having a minimum thickness of 57 mm.

### Rigid extruded polystyrene insulation for use over the waterproofing membrane.

#### Type IV Insulation, STYROFOAM ™ brand as manufactured by DuPont, distributed by Hydrotech Membrane Corp.

#### Insulation to meet CAN / ULC-S701-11 with minimum R-5 LTTR (RSI-0.86) thermal resistance per inch (25 mm) thickness.

#### Minimum compressive strength (ASTM D 1621): 240, 276, 414 or 690 kPa (35, 40, 60 or 100 psi).

#### Maximum water absorption by volume (ASTM D2842): 0.7%.

#### Water vapour permeance for 25 mm (1") thickness (ASTM E96): 35-45 ng /(Pa\*s\*m²) (0.6-0.8 Perm) (max.).

#### The insulation shall have an RSI (R) value per 25.4 mm (1") thickness of RSI 0.88 m2 \* K/W (R 5.0°F \* ft² \* h/Btu) when tested at 23.9 °C (75°F) temperature average according to ASTM C518 and ASTM C177.

#### The insulation shall be CFC and HCFC free.

#### Acceptable products: STYROFOAM™, ROOFMATE™, HiLoad 40, HiLoad 60 and HiLoad 100. Contact Hydrotech for recommended products.

## COMPOSITE DRAINAGE GEONET *(Hydrotech Spec Note: if required, consult Hydrotech)*

### Composite drainage system consisting of a three-dimensional, crush-proof, drainage core and a filter fabric, to be installed over thermal insulation.

#### Acceptable product: Hydrodrain® 300 by Hydrotech Membrane Corp.

## MOISTURE RETENTION MAT *(Hydrotech Spec Note: if required, consult Hydrotech)*

### Non-woven, synthetic fiber mat capable of retaining additional moisture for potential use by vegetation.

#### Acceptable product: Moisture Retention Mat as supplied by Hydrotech Membrane Corp.

## DRAINAGE/WATER RETENTION COMPONENT

### Embossed panel of recycled polypropylene, laminated with a filter cloth on its upper face and a non-woven geotextile fabric on its underside.

#### Acceptable product: for extensive vegetative roof, Gardendrain® GR10 by Hydrotech Membrane Corp.

##### Drainage/water retention component shall meet ASTM E2398.

#### Acceptable product: for extensive, semi-intensive and intensive vegetative roof, Gardendrain® GR25 by Hydrotech Membrane Corp.

##### Drainage/water retention component shall meet ASTM E2398.

## GEOTEXTILE

### Non-woven polypropylene geotextile.

#### Acceptable product: LiteTop® Filter by Hydrotech Membrane Corp.

## INSPECTION CHAMBER FOR ROOF DRAIN

### Aluminium overdrain inspection box, with perforated sides and removable lid.

#### Acceptable product: GardenHatch® by Hydrotech Membrane Corp.

#### Acceptable product: extensions, models 25, 75 or 215 mm, by Hydrotech Membrane Corp.

## METAL EDGE RESTRAINT

### Metal edge restraint, dimensions to suit, fabricated of 2.54 mm thick aluminium bent to a 90° angle, slotted vertically to permit drainage.

#### Acceptable product: GardenEdge® by Hydrotech Membrane Corp.

#### Acceptable product: connector piece, right angled or straight, fabricated of 2.54 mm thick aluminium, with openings to fasten retaining curbs one to each other.

## BALLAST/ HARDSCAPE

**Hydrotech Spec Note:** Edit to suit project’s specific requirements.

### Stone: Crushed, sieved, opaque, non-porous stone washed free of fines, long fragments of ice and snow and meeting standard ASTM D-448. Nominal size of 2, 4 or 5 (as per Tech Solutions 508.3 (Ballast Design Guide for PMR Systems by DuPont).

### Paver

**Hydrotech Spec Note:** Retain paragraph below when it is necessary to increase the weight of the ballast around the perimeter of the roof and/or install a walkway.

Ensure that the concrete pavers (or granite pavers or other types of pavers) scheduled to be installed do not form part of the products supplied by landscaping (see Division 32), are appropriately listed in the article of Part 1 “PRODUCTS INSTALLED, BUT NOT SUPPLIED BY THIS SECTION”. List the physical properties of the product according to the chosen manufacturer.

#### Concrete pavers meeting the following physical characteristics in accordance with CSA standard A231.2-06:

|  |  |
| --- | --- |
| **Property** | **Results** |
| Compressive strength | [ ] |
| Flexural Modulus | [ ] |
| Water absorption | [ ] |
| Freeze/thaw resistance | [ ] |

### Concrete Grid Unit

### Acceptable product: “Checker Block®” by Hydrotech Membrane Corp.

### Acceptable product: stainless steel zip-tie as supplied by Hydrotech Membrane Corp.

### Acceptable product: Disk Anchor as supplied by Hydrotech Membrane Corp.

## GROWING MEDIA *(Hydrotech Spec Note: select required LiteTop® media)*

### Custom growing media mix capable of supporting vigorous growth of the specified vegetation. Must meet requirements described in part [ ] of [refer to 1.4.12] standard, and complying with the following specifications:

|  |  |  |  |
| --- | --- | --- | --- |
| **Property** | **Extensive\*** | **Semi-Intensive\*** | **Intensive\*** |
| **Density (moist)** | 0.88-1.28 g/cm3 | 0.93-1.27 g/cm3 | 0.88-1.20 g/cm3 |
| **Density (saturated)** | 1.12-1.44 g/cm3 | 1.17-1.57 g/cm3 | 1.22-1.49 g/cm3 |
| **Water retention capacity** | > 30% | > 40% | > 40% |
| **Air capacity** | > 10% | > 15% | > 10% |
| **Hydraulic conductivity** | > 30 cm/h | > 70 cm/h | > 25 cm/h |
| **Passing 9.5 mm sieve** | 95 – 100 % | 95 – 100% | 95 – 100 % |
| **Passing 6.3 mm sieve** | 45 – 95% | 65 – 95% | 60 – 95% |
| **Passing 3.3 mm sieve** | 30 – 75 % | 40 – 80% | 35 – 70 % |
| **Passing 2.0 mm sieve** | 25 – 60% | 30 – 65% | 30 – 60% |
| **Passing 1.0 mm sieve** | 15 – 45 % | 25 – 45% | 20 – 50 % |
| **Passing 0.25 mm sieve** | 5 – 25 % | 10 – 30% | 5 – 25 % |
| **Passing 0.075 mm sieve** | <10 % | < 12% | <15 % |
| **Silt < 0.075-0.002 mm** | < 8 % | < 8% | < 12 % |
| **Clay < 0.002 mm** | <2% | < 4% | <3% |
| **pH** | 6.0 – 8.0 | 6.0 – 8.0 | 6.0 – 8.0 |
| **Carbonate Content** | < 25 g/L | < 25 g/L | < 25 g/L |
| **Electrical Conductivity** | < 2.5 mmhos/cm | < 3.0 mmhos/cm | < 3.0 mmhos/cm |
| **Organic matter** | 3% – 8% | 4% – 9% | 6% – 12% |
| **C/N ratio** | < 20 | < 20 | < 20 |
| **Phosphorus\*\*** | 65 – 180 ppm | 65 – 180 ppm | 65 – 180 ppm |
| **Potassium\*\*** | 135 – 270 ppm | 135 – 270 ppm | 135 – 270 ppm |
| **Calcium\*\*** | 1,700 – 3,200 ppm | 1,700 – 3,200 ppm | 1,700 – 3,200 ppm |
| **Magnesium\*\*** | 135 – 315 ppm | 135 – 315 ppm | 135 – 315 ppm |
| **Aluminium\*\*** | 1,100 – 1,600 ppm | 1,100 – 1,600 ppm | 1,100 – 1,600 ppm |
| **CEC** | > 20 cmol/kg | > 20 cmol/kg | > 20 cmol/kg |

\* Values may be adjusted due to availability of local materials or special project conditions related to plant selection and/ or environmental conditions.

\*\*: Mehlich III extraction.

#### Acceptable product: for extensive vegetative roof, Extensive LiteTop® growing media by Hydrotech Membrane Corp.

#### Acceptable product: for semi-intensive vegetative roof, Semi-intensive LiteTop® growing media by Hydrotech Membrane Corp.

#### Acceptable product: for intensive vegetative roof, Intensive LiteTop® growing media by Hydrotech Membrane Corp.

### Growing media complying to CAN/BNQ 0413-200/2016 (Organic Soil Conditioners-Composts) for the organic content.

## EROSION CONTROL MATERIAL

**Hydrotech Spec Note:** Edit according to project requirements. Consult Hydrotech.

### Biodegradable erosion control matting, composed of straw and/ or coconut fiber stitched together with biodegradable thread forming top and bottom netting.

#### Acceptable product: GardMat® LT by Hydrotech Membrane Corp.

### Long term erosion control mat, composed of polypropylene netting.

#### Acceptable product: GardMat® N by Hydrotech Membrane Corp.

### Heavy-duty plastic anchor disk with connected plastic stem and friction-fit plastic top disk used to fasten GardMat® erosion control mat or Instagreen™ Sedum Carpet/ Tile.

#### Acceptable product: Disk Anchor as supplied by Hydrotech Membrane Corp.

### Hydro-mulch

#### Wood fibre and polymer based hydro-mulch, 100% biodegradable and having nutritive properties promoting rooting for use in securing the Seedlings on the roof. Where hydro-mulching equipment is available and has access to the roof, hydro-mulch shall be mixed with tackifier and applied as wet slurry to seedling installations.

### Dry hydro-mulch

#### Wood fibre and polymer based hydro-mulch, 100% biodegradable and having nutritive properties promoting rooting for use in securing the Seedlings on the roof. Where hydro-mulching equipment and access are not possible, dry hydro-mulch shall be applied in accordance with the Hydrotech Garden Roof® Assembly Installation Instructions and Maintenance Plan.

## VEGETATION/ PLANTING

**Hydrotech Spec Note:** Intensive plant material and lawn plant material (specified elsewhere) shall be as shown on plan.

### **Option « A » Plant in multicellular tray**

### A selection of 8 to 10 plant varieties perfectly adapted for extensive vegetative roofs in [Eastern] [Central] [Western] Canada.

#### Acceptable product: extensive Garden Roof® [Eastern] [Central] [Western] Canada for plants in cellular trays.

#### List of selected plants must take into account not only their hardyness zone and growing characteristics but also the degree and daily hours of sunlight, predisposition to desiccation as well as all other physical characteristics of the plantation site.

#### All plants must be supplied by a nursery that meets requirements described in part [ ] of CNLA Canadian Landscape Standard 1st edition.

#### Unless the CNLA standard has special handling requirements (container, bare roots or loose), all plants shall be delivered on 24 unit multicellular trays of at least 190 cm³ (ex. 5 cm deep by 6 cm diameter).

#### All plants must be clearly identified by type, species and variety. They must arrive on the plantation site saturated with water to avoid desiccation during transport.

#### Plants shall be vigorous and with a well-developed root system. They must be free of phytopathogens and phytophagous organisms. Growing media must be composed mainly of mineral matter and be free of adventitious species.

#### A controlled release coated fertilizer may be necessary to activate plant rooting.

### **Option « B » Sedum cutting**

### This product is used for extensive Garden Roof®. It is composed of a selection of varieties of sedum cultivated from mature sedum plants. The selection is adapted to [Eastern] [Central] [Western] Canada’s climate and is delivered as cuttings without roots in boxed plastic bags.

#### Acceptable product: Extensive Garden Roof® [Eastern] [Central] [Western] Canada for Sedum Cuttings.

#### This product is fixed to the growing media using a wood fibre and polymer based hydro-mulch, 100% biodegradable and having nutritive properties promoting rooting. This option must be realized at a particular time of the season.

**Hydrotech Spec Note:** Select/specify cutting density

##### 8 lb /100 sq. ft.

##### 10 lb / 100 sq. ft.

##### 12 lb / 100 sq. ft.

##### 15 lb / 100 sq. ft.

##### Other

### **Option « C » Sedum carpet**

### This product is used for extensive Garden Roof®. It is composed of coconut coir, a layer of growing media and a plant mix of varieties of sedums adapted to [Eastern] [Central] [Western] Canada’s climate.

#### Acceptable product: Instagreen™ Carpet by Hydrotech Membrane Corp.

### **Option « D » Sedum tile**

### This product is used for extensive Garden Roof®. It is composed of coconut coir, a layer of growing media and a plant mix of varieties of sedums adapted to [Eastern] [Central] [Western] Canada’s climate.

#### Acceptable product: Instagreen™ Tile by Hydrotech Membrane Corp.

**Hydrotech Spec Note:** Select one or more of the following sedum tile blend.

##### Four Season

##### Full Color

##### Shade Tolerant

##### Rugged

##### Custom Sedum Tile

**Hydrotech Spec Note:** Indicate species and varieties below; contact Hydrotech for assistance and expand list as needed.

|  |
| --- |
|  |
|  |
|  |
|  |

### **Option « E » Seedling (grass and wild flowers)**

### A selection of seed varieties indigenous and adapted for semi-intensive vegetative roofs in [Eastern] [Central] [Western] Canada. Selected by the landscape architect/ designer in keeping with the overall plan intended.

#### Product: Certified Canada Grade No.1

#### Plant mix list must take into account not only their hardiness zone and growing characteristics but also the degree and daily hours of sunlight, predisposition to desiccation as well as all other physical characteristics of the plantation site.

#### This mix is fixed to the growing media using a wood fibre and polymer based hydro-mulch, 100% biodegradable and having nutritive properties promoting rooting. This option must be realized at a particular time of the season.

#### The installation of an automatic programmed irrigation system is recommended during the first year for plants establishment and for future needs during drought periods.

# Execution

## PROTECTION

### Protect walls and areas adjacent to the staging or installation areas.

### Post warning signs and install safety barriers around the place of the work. Keep them in good condition until completion of the work.

### Promptly remove asphalt stains from adjacent work.

### Take necessary means to evacuate rain water as far as possible from the building surfaces, until the drains or similar systems are installed and connected.

### Prevent traffic on substrates and protect work of this Section until completion of the Work. Promptly implement protection measures deemed necessary and specified by the Consultant.

### Provide walkways by placing plywood over the membrane to allow traffic of people and equipment without damaging the membrane.

### At the end of each day’s work or when work is interrupted due to inclement weather, protect materials that have been removed from the storage area.

### Provide protection around the roof’s edges and provide ballast.

## SUBSTRATE EXAMINATION

### Examine substrates and immediately inform the Consultant of any defects in writing.

### Before starting work, ensure the following conditions are in place:

#### Substrate is solid, level, uniform, dry and free of snow, ice, frost and any other contaminants; remove dust and debris;

#### Parapet walls are already built;

#### Drains have been installed at the appropriate elevations relative to the finished surface;

#### Sleeves, vents, pipes and other items penetrating the substrate and intended to receive the work of this section are installed correctly and securely;

#### Plywood or lumber nailers have been installed on the walls and parapets in accordance with specified requirements.

### The roofing contractor shall not proceed with the installation of the roof membrane system until any deficiencies have been corrected.

**Hydrotech Spec Note:** Select from the following articles, the appropriate PREPARATION procedures for the types of SUBSTRATES that apply to the project.

## PREPARATION - CONCRETE SUBSTRATES

### Concrete surface to be waterproofed must be at least be wood trowel-finished, preferably 3 to 5 CSP grade, to ensure proper adhesion.

### Plug formwork holes, gaps and superficial cracks with a latex filling product compatible with the waterproofing membrane.

### Ensure concrete has cured for a minimum of 14 days prior to applying the base coat.

### Grind all sharp edges of joints or plane changes and remove any loose aggregate; substrates shall be completely free of all preformed mastic sealing compounds or similar materials for a depth equal to not less than twice the width of the joint. Chamfered edges are preferred for expansion joints.

## PREPARATION - GENERAL REQUIREMENTS

**Hydrotech Spec Note:** Sand blasting of the substrate may be required to remove existing curing compounds present on the substrate. Coordinate between the finishes applied to concrete surfaces and section [03 30 00 - Cast-In-Place Concrete]. All concrete surfaces must be finished to wood trowel requirements at the minimum, and must have cured for at least 14 days. If applicable, notify the general contractor or the construction manager.

### Prior to starting any work, remove from substrates any materials that may adversely affect the bond between the substrate and the roofing membrane. Remove materials including but not limited to the following: Curing products, dust, paint, ice, stripping agents and loose particles.

### Apply the surface conditioner on dry substrates, in accordance with CAN/CGSB - 37.51 at a rate of 1 litre per 4 to 6 m² of area.

### Heat the rubberized asphalt, using a double-walled, indirect-heat melter fuelled by heat transfer oil having a flashpoint of 315°C (max). The melter must be equipped with thermometers and a direct-drive mechanical agitator. It is strictly forbidden to heat the membrane in a direct-fired heat melter. The temperature of the membrane in the melter must be between 180°C (minimum) and 190ºC (maximum). Never exceed the maximum temperature.

### Bridging cracks and construction joints more than 1.5 mm and less than 6 mm in width: Apply a 300 mm wide and 3 mm thick layer of rubberized asphalt centred on the axis of the crack and embed 150 mm wide elastomeric reinforcing sheet in it; ensure the ends of the elastomeric reinforcing sheet overlap and are fully adhered for a length of 150 mm. Avoid air pockets.

### Apply another 3 mm thick layer of rubberized asphalt on the reinforcing sheet so that it is perfectly embedded into the membrane.

**Hydrotech Spec Note:** Consult manufacturer’s web site for technical information regarding the expansion joints.

### Expansion joint sizes and elastomeric reinforcing sheet types:

#### Joints 25 mm and less, with total movement of 50%: 1.6 mm thick elastomeric reinforcing.

#### Joints between 25 mm and 50 mm, with total movement of 50%: 1.6 mm thick double elastomeric reinforcement, complete with filler rod

#### [Joints 50 mm or more and/ or greater than 50% movement: Use RedLine® prefabricated expansion joints].

### Elastomeric expansion joints:

#### Bridge joint by spreading a 2 mm thick and 300 mm wide layer of rubberized asphalt over joint.

#### Slip first elastomeric reinforcing sheet folded into a loop into the joint to a depth equal to one and a half the width of the joint; ensure the edges of the sheet extend at least 150 mm past each side of the joint. Insert the backer rod inside the loop formed by the sheet.

#### Coat the elastomeric sheet with a 2 mm thick layer of rubberized asphalt. Extend the coating for at least 150 mm beyond the sheet. Embed a second sheet of elastomeric reinforcing and overlap the first sheet by 75 mm at the edges. Provide a loop above the backer rod.

#### Prepare the expansion joint with a single length of elastomeric sheet; if this is not feasible, the overlap must be at least 150 mm long.

#### Affix the upper edges of the reinforcing sheet to vertical surfaces with a tie bar.

### Metal flashing for mechanical vents and pipes: Provide an elastomeric reinforcing sheet and install it around vents and membrane penetrations. Position sheet in location and seal with rubberized asphalt and waterproofing clamp. For substrate penetrations, use prefabricated metal flashing.

### Pitch pockets: Position pitch pockets over the membrane. Adhere a sheet of elastomeric reinforcing to the membrane and cover the flange of the pitch pockets. Fill the pitch pockets with rubberized asphalt or putty mastic in order to ensure water drainage.

### Flashing drains: Extend the membrane and elastomeric sheet reinforcing (600 mm x 600 mm) on the upper side of the drain flange and provide a sealed and waterproof assembly between the membrane and the drain. Install clamp and tighten it enough around the membrane to get a watertight connection with the latter. Seal all drains during installation of ballast [and precast concrete pavers] or installation of any other materials that may clog them. Remove sealing materials when work is interrupted or upon completion of the work.

## MEMBRANE

### Hot-apply the rubberized asphalt and form flashings with fabric reinforcement or a reinforced elastomeric sheet as appropriate, in accordance with the minimum requirements of CAN/CGSB - 37.51 and the manufacturer’s instructions. The more stringent requirements shall prevail.

### Apply a base layer of rubberized asphalt continuously over the concrete substrate to an average thickness of 3 mm.

### Completely cover the base layer with 1000 mm wide reinforcing fabric. Be careful to overlap each joint at least 50 mm. Cover the fabric with a 3 mm thick top layer.

### The thickness of the two layers should have an average of 5 mm without readings less than 4 mm.

### Maintain the continuity of the building envelope’s [air] [and] [vapour] barrier with the roof membrane.

## PROTECTION SHEET

### Install the applicable protection sheet while the rubberized asphalt is still tacky.

### Overlap sheets 50 mm to ensure they completely cover the membrane.

### Bring up protection sheet and adhere against the walls while the rubberized asphalt is still hot.

## TESTING

**Hydrotech Spec Note:** Several types of tests may be required to ensure that the waterproofing system meets the requirements of the specifications. Specify in the “TESTING” article below, the appropriate test methods as well as the required results.

### Flood test

**Hydrotech Spec Note:** Regarding the Article "FLOOD TEST", a field test is generally specified to control the performance of the waterproofing coatings applied on horizontal surfaces where hydrostatic pressure is present and considered an important factor. Ensure substrates can support the dead loads applied by the amount of water required to perform the test and specify the height of the hydraulic head needed to obtain the required hydrostatic pressure.

#### Do not conceal the roofing installation until inspection and testing have been successfully completed to the satisfaction of the Consultant.

#### Clog drains and build a temporary dam around the horizontal waterproofing test area for the duration of the test. Flood the test area in order to obtain a water head of at least [ ] mm.

#### Maintain water at the specified level for [24] [48] hours.

#### If required, repair leaks and repeat the flood test as necessary.

#### Drain water after test is completed.

### Electric field vector mapping (EFVM)

#### Membrane quality control shall be performed using the EFVM (Electric Field Vector Mapping) method and shall be paid by the Owner.

## ROOT BARRIER MEMBRANE

### Completely unroll the root barrier on the waterproofing system and carefully unfold to avoid pleats.

### Overlap root barrier sheets 1500 mm. A 750 mm overlap is acceptable when the Root Stop Tape is used to continuously seal the lap edges.

### Bring root barrier membrane up 25 mm above anticipated final soil level at roof perimeter and at openings. Membrane shall be cut back to soil level at work’s end.

### Place temporary ballast on the root barrier until installation of following roofing component.

## RIGID INSULATION

### Promptly install insulation boards. Butt insulation boards in order to obtain tight joints in parallel rows, and such that end joints are staggered. Cut the panels and fit them properly to corners and around the perimeter.

### Adhere insulation boards to vertical or inclined surfaces using approved construction adhesive so that insulation boards do not move during subsequent work.

## COMPOSITE DRAINAGE GEONET *(Hydrotech Spec Note: if required, consult Hydrotech)*

### Install a continuous composite drainage Geonet on the insulation and overlap joints 100 mm.

## MOISTURE RETENTION MAT *(Hydrotech Spec Note: if required, consult Hydrotech)*

### Install a continuous moisture retention mat on the composite drainage Geonet.

### Overlap joints 100 mm.

### Bring retention mat up 100 mm above anticipated final soil level at roof perimeter and at openings. Membrane shall be cut at soil level at work’s end.

### Temporary ballast is required until installation of the remaining assembly components.

## DRAINAGE/ WATER RETENTION COMPONENT

### Lay the panel continuously, white fleece side up, directly on the insulation.

### Cut and shape panels to fit openings and parapets.

### Overlap joints by 75 mm on the adjacent panel using the selvage edge on one top side of the panel.

## GEOTEXTILE

### Install strips of geotextile at horizontal to vertical transitions at edgings, curbs and penetrations to contain engineered growing media. Overlap adjacent strips of geotextile a minimum of 300 mm and secure with tape during the installation process.

### Install geotextile to a height above the finished growing media elevation and trim down any excess to the level of the plant materials.

## ROOF DRAIN INSPECTION CHAMBER

### Lay roof drain inspection chambers directly over drainage/ water retention component.

### Use river gravel ballast around chambers so it remains free of vegetation.

### Use extensions to reach appropriate level when growing media is deeper.

## METAL EDGE RESTRAINT

### To ensure a continuous barrier between growing media and clean strips, install retaining curbs directly onto the drainage/ water retention panels where indicated.

### Butt and fasten retaining curbs one to the other using connector pieces.

## BALLAST/ HARDSCAPE

**Hydrotech Spec Note:** Please refer to Tech Solution 508.3 "Ballast Design Guide for PMR System.

### The ballast design must conform to the requirements of DuPont and Hydrotech Membrane Corp. **CONTACT Hydrotech for ballast recommendations**.

### Stone ballast should be installed around the entire perimeter of the roof, building walls, penetrations, escape hatches and where clean edging is required for wind design, fire areas and paths access to maintenance.

### The concrete grid units shall be installed per Hydrotech requirements and as shown on Hydrotech details.

#### The concrete grid units shall be installed where indicated on plans and to pattern required per ballasting requirements established by Hydrotech Membrane Corp.

#### The disk anchors shall be installed in concrete grid units and elsewhere in Garden Roof® to the pattern required per the ballasting requirements established by Hydrotech Membrane Corp.

#### The stainless steel zip ties shall be used to connect the concrete grid units together as required by Hydrotech Membrane Corp.

**Hydrotech Spec Note:** Ensure tradesmen executing work described in the following articles have the necessary knowledge of planting and maintenance of plants and are members of their provincial landscape association. Furthermore, tradesmen qualified to install vegetative roofs is a great advantage to the success of the project.

## GROWING MEDIA

### Maintain site well drained. Ensure roof drains are free of debris or materials that may block them.

### Spread a uniform [ ] mm thickness of growing media for intensive vegetative roof on the geotextile, on all surfaces to be planted. Verify thickness at multiple locations in order to obtain a maximum difference of 10 mm at any point on the surface.

### Fill depressions and rake surface level. Compact growing media with a 135 kg water-filled roller at every 75-100 mm of thickness. Refer to the supplier for the compaction factor.

### Water for 24 hours prior to planting to saturate the soil. Minimum thickness of growing media after compaction shall be [ ] mm. Review final growing media thickness after watering, correct thickness if required and re-water.

### Remove growing media on a width of [ ] mm from roof periphery, roof drains, penetrations and mechanical equipment. Use river gravel ballast retained and separated from growing media with a prefabricated curb.

### Immediately remove growing media as well as debris from non-planted areas and dispose of noxious substances off site.

### Have level and thickness of growing media approved prior to planting.

## EROSION CONTROL MAT

**Hydrotech Spec Note:** The erosion control mat is not required when sedum carpet/ tile is installed; however the sedum carpet/ tile shall be anchored in place as required.

### The erosion control mat shall be installed directly over the growing media and properly staked into place.

#### Stake fastening pattern is based on local wind speed, building height and roof slope. CONTACT Hydrotech for specific guidelines.

## PLANTING

### **Option « A » Plant in tray, container and root ball**

### Refer to part [ ] of [refer to 1.4.12] standard, when applicable to planting work. Plant the specified vegetation in accordance with the landscape architect/ designer’s instructions and plans.

### Planting shall be performed only during plant growing season, and avoiding dry and intensely hot periods. Do not plant when growing media is frozen. Contact Hydrotech for fall and spring frost dates specific to the Project and plant material type.

### Keep growing media moist and plants in a shaded area, away from the wind, from moment of delivery until planting.

**Hydrotech Spec Note:** Use the following article only if selection of plants requires it. Refer to section [2.23]

### Spread the fertilizer on surface of growing media at rate specified by manufacturer. Incorporate into top of growing media with a rake for a better absorption during rooting. For receptive plants, a bio-stimulant may be added.

### Where no specific design is required, plant in a random way to obtain a homogenous mix. Plant in an equilateral triangle to maximize the plantable area. Always verify each type of plant’s typical spacing requirements and rectify as required. Suggested spacing is around 200 mm centre on centre (the distance between each line of plantation should be 200 mm and the distance between each plant row should be 175 mm).

### Plant following all steps listed in article [ ] of part [ ] of [refer to 1.4.12] standard.

### Once planting is completed, water growing media with sufficient water to saturate deep in the growing media.

### **Option « B » Sedum cutting and** s**eedling (grass and wild flowers)**

### Refer to part [ ] of [refer to 1.4.12] standard, when applicable to seeding work. Seed the specified vegetation in accordance with the landscape architect/ designer’s instructions and plans **(OR)** [Grow sedum cuttings in accordance with article [ ] of part [ ] of [refer to 1.4.12] equivalent standard, and adapted to sedum when applicable].

### All components of the vegetative roof system must be adequately installed prior to scattering of seeds [sedum cuttings] to avoid trampling and storage of materials on the plants.

### Seeding [Sedum propagation] period shall be between end of thaw and mid-June and between early August and mid-September. Seeding [Sedum propagation] is prohibited during dry and intensely hot periods. Do not seed [disperse] when growing media is frozen.

### Keep seeds [sedum cuttings] and hydro-mulch containers in a cool, dark and dry area immediately upon arrival on the job site until planting.

### Sow or hydro-seed the mix on the growing media at a sowing rate recommended by the seed supplier and as recommended practices **(OR)** [Manually spread sedum cuttings mix on the growing media at a suggested rate of dispersion of [ ] kg per 10 m² [refer to 2.23]]. Spread when there is no wind to prevent desiccation of the seeds [cuttings].

### The hydro-mulch mix must include a fertilizer and fixing agent, calibrated to the recommended dose by the manufacturer; it is imperative that the hydro-mulch mix be prepared on site. Apply uniformly, only on seeded areas **(OR)** [Immediately fix the cuttings to the growing media using the hydro-mulch].

### Once the hydro-mulch is in place, water entire plantation area with sufficient water to saturate deep into the growing media.

### **Option « C » Sedum carpet and sedum tile**

### Proceed with sedum carpet [tile] placement using methods inspired by articles [ ] of part [ ] of [refer to 1.4.12] standard, by adapting them to sedum when applicable.

### All components of the vegetative roof system must be installed prior to receiving sedum carpets [tiles] to avoid trampling and storage of materials on the plants.

### Planting shall be performed only during plant growing season, and avoiding dry and intensely hot periods. Do not plant when growing media is frozen. Contact Hydrotech for fall and spring frost dates specific to the Project and plant material type.

### Ensure carpet roll’s [tile’s] growing media is moist at time of delivery and correct if required with an oscillating sprinkler prior to hoisting onto roof. Store out of direct sunlight and keep rolls [tiles] damp until unrolled [placed].

### If sedum carpets [tiles] cannot be placed within one day of their delivery, they must be unrolled [unpacked] on plywood or cardboard in a cool and shady location.

### Moisten an area of approximately 10 m2 where the first rolls [tiles] of sedum are placed to help alleviate stress on the root system. Each roll [tile] must be placed on pre-moistened growing media. Repeat process for every 10 m2 of installation area.

### Set the rolls down gently with the end (‘’the flap’’) on the bottom of the roll. Place this leading edge exactly and firmly against the starting edge. Unroll it, avoid moving the carpet due to the stress and tearing action this will have on the root system. Avoid exposing bottom of roll edges. If necessary, fold edges towards the interior **(OR)** [Put tiles down in place gently. Place this leading edge firmly against the starting edge].

### From the starter roll, lay sedum carpet roll with staggered joints. Joints between rolls shall touch but not overlap. Fill gaps over 25 mm with growing media. For gaps wider than 75 mm, patch with a piece of sedum carpet **(OR)** [From the starter tile, place sedum tiles with staggered joints. Joints between tiles shall touch but not overlap. Fill gaps with growing media].

### When a 10 m2 area has been laid, commence watering this area for at least one hour using an oscillating sprinkler. Repeat the process for each following area of 10 m2. At day’s end, the entire planted area must be watered until saturation of the carpets [tiles] and growing media’s components is achieved.

## MAINTENANCE DURING ESTABLISHMENT PERIOD

**Hydrotech Spec Note:** Vegetative roof maintenance varies according to planting type. Adapt the following paragraphs to suit project’s specific requirements.

### Ensure maintenance of planted areas for a period of two (2) years and report and photo-document progress of vegetation during maintenance and warranty period.

### Perform maintenance described below between date of planting and date of acceptance by Architect. Proceed with maintenance using methods of articles [ ] of part [ ] of [refer to 1.4.12] standard.

### Inspect weekly for the first ten weeks to take note of installation and maintenance defects and to correct such immediately. Afterwards, monthly inspections between late spring and early fall shall be performed as part of the scheduled two (2) year maintenance program. Fill-out and submit appended maintenance control forms to vegetative roof system supplier for each inspection visit.

### Saturate growing media during the critical establishment period, which is the first four weeks after planting; for the first week, water daily; second week, water every two days, third week, water every three days and, for the fourth week, water at least once during the week. A 25 mm rainfall replaces a watering.

### Planted areas and clean strips shall be kept clean of debris and dead plant matter. If necessary, remove accumulated leaves and dead flowers and water the plant material and growing media if they are exposed to salt spray.

### In the case of plants suffering from mineral deficiencies uniformly spread a fertilizer or soil amendment after having informed the vegetative roof system supplier and the Owner. Spread half the required dosage in one direction then spread the other half perpendicularly. A controlled release coated fertilizer is recommended to respect the growing stages of plants.

### During the first year, saturate the growing media to avoid plant fading and water stress at all times. Carefully watch prolonged dry spells where a considerable amount of water is required. Except in emergency situations, avoid watering in full sunlight or hot temperatures.

### During inspection visits, manually weed planted areas (aerial and roots) of all undesirable adventitious plants. Weeding is much more frequent during the first year of establishment (at least four times) and diminishes the second year until complete coverage by the desired vegetation is achieved. In all cases, adventitious plants must be destroyed prior to their seeds maturing.

### Unless indicated otherwise by the vegetative roof system supplier and the Owner, it is forbidden to use any pesticide (herbicide, fungicide, insecticide) or anti-parasitic product on the vegetative roof.

### Inspect and clean roof drains two to three times a year, especially at beginning and end of the growing season.

### Replant areas where plants are dead or where areas are denuded after having informed the vegetative roof system supplier and the Owner, and this, until the end of warranty period.

## FIELD QUALITY CONTROL

**Hydrotech Spec Note:** The inspection company must have sufficient experience in testing waterproofing and installation methods applicable to the membranes specified in this section.

### The inspection and testing of hot-applied rubberized asphalt membranes shall be performed by the testing laboratory designated by the [Consultant] [the Owner], in accordance with the requirements of section [01 45 00 - Quality Control].

## CLEANING

### Clean the work in accordance with the requirements of sections [01 74 00 - Cleaning] and [01 74 19 - Waste Management and Disposal].

END OF SECTION