

SECTION 07 33 64

SKYSCAPE™ PREGROWN MODULAR VEGETATIVE ROOF SYSTEM ELEVATE™ ROOFING, WALL, AND LINING SYSTEMS

This specification is provided as a courtesy on an as-is basis, and is not intended to substitute for specific design services provided by an architect, engineer, consultant, or other design professional. It is in the building owner's interest to consult with these professionals prior to executing the specified project. The building owner will ultimately assume the entire risk as to results, quality and performance of the roofing system specified.

EDITOR NOTE: Text underlined and/or red in color must be addressed to complete a final specification document. It is the sole responsibility of the editor to exercise appropriate care and sound professional judgment in the execution of this task.

PART 1 GENERAL

The project, Project Name located in City, ST, includes the provision of a complete Elevate roofing, wall, and lining systems SkyScape™ TPO Pregrown Vegetative Roof System.

1.01 SUMMARY

- A. Furnish and install vegetative roof system, including:
 - 1. System manufacturer's requirements for the specified warranty.
 - 2. Preparation of roofing substrates (by reference).
 - 3. Pregrown modules.
 - 4. Drain inspection chambers.
 - 5. Edge flashing.
 - 6. Irrigation.
 - 7. Piping.
 - 8. Wiring.
 - 9. Other roofing-related items specified or indicated on the drawings or otherwise necessary to provide a complete modular vegetative roof system.
- B. Disposal of demolition debris and construction waste is the responsibility of Contractor. Perform disposal in manner complying with all applicable federal, state, and local regulations.
- C. Comply with the published recommendations and instructions of the roofing membrane manufacturer, at www.holcimelevate.com.
- D. Commencement of work by the Contractor shall constitute acknowledgement by the Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing membrane manufacturer. **No modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.**

1.02 RELATED SECTIONS **[Additional requirements may be specified in other sections. Edit to suit project needs.]**

- A. Section 07 07 00 – Building Integrated Photovoltaic Systems.
- B. Section 07 50 00 – Membrane Roofing.
- C. Section 07 72 00 – Roof Accessories: Roof hatches, vents, and manufactured curbs.
- D. Section 08 62 00 – Unit Skylights.
- E. Section 11 01 00 – Fall Arrest Systems.
- F. Section 22 10 00 – Plumbing Piping and Roof Drains.

1.03 REFERENCES

- A. Referenced Standards: These standards form part of this specification only to the extent they are referenced as specification requirements.
1. ASTM C578-04a, Rigid Cellular Polystyrene Thermal Insulation.
 2. ASTM E2399-05, Standard Test Method for Maximum Media Density for Dead Load Analysis of Green Roof Systems.
 3. ASTM E2397-05, Standard Practice for determination of Dead Loads and Live Loads associated with Green Roof Systems.
 4. ASTM E2400-06 Standard Guide for Selection, Installation, and Maintenance of Plants for Green Roof Systems
 5. ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
 6. ASTM D7003-03, Standard Test Method for Strip Tensile Properties of Reinforced Geomembranes.
 7. ASTM D7004-03, Standard Test Method for Grab Tensile Properties of Reinforced Geomembranes.
 8. ASTM D4533-11, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 9. ASTM D4533-11, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 10. ASTM D751-06, Standard Test Methods for Coated Fabrics.
 11. ASTM C518-10, Standard Test Method for Steady State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 12. ASTM D1621-10, Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
 13. ASTM C272-01, Standard Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions.
 14. ASTM D4632-08, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
 15. ASTM D4533-11, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 16. ASTM D4833-07, Standard Test Method for Index Puncture Resistance of Geo-membranes and Related Products.
 17. ASTM D6241-04(2009), Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile Related Products Using a 50 mm Probe.
 18. ASTM D3786/D3786M-09, Standard Test Method for Bursting Strength of Textile Fabrics Diaphragm Bursting Strength Tester Method.
 19. ASTM D4355-99, Standard Test Method for Deterioration of Geotextiles by Exposure to Ultraviolet Light and Water (Xenon Arc Type Apparatus).
 20. ASTM D4491-99a, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 21. ASTM D4751-04, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
 22. ASTM D5261-10, Standard Test Method for Measuring Mass per Unit Area of Geotextiles.
 23. ASTM D5199-12, Standard Test Method for Measuring the Nominal Thickness of Geosynthetics.
 24. ASTM D5035-11, Standard Test Method for Breaking Force and Elongation of Textile Fabric (Strip Method).
- B. German Landscape Research, Development and Construction Society (Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau, FLL).
1. 2002 German FLL Guidelines for the Planning, Development, and Maintenance of Green Roofs.
- C. Occupational Safety and Health Administration (OSHA). Safety Data Sheets (SDS) (where applicable; not required for articles).

1.04 SYSTEM DESCRIPTION

- A. Vegetative Roof System: (omit components that do not apply)
1. Root barrier, (Not required when Elevate UltraPly™ TPO (any thickness) or Elevate RubberGard™ EPDM is used as the roofing membrane. RubberGard EPDM seams must be stripped under the vegetative area using a bead of Elevate Pourable Sealer S-10, 1.5" o.c.

- 2. Drain inspection chambers,
 - 3. Pregrown Modules
 - 4. Edge Flashing,
 - 5. **Module-integrated Irrigation (optional).**
- B. The Vegetative Roof System shall be composed of a single-media system of fully integrated living and manufactured components which form a continuous cover over the designated roofing area.
- C. All components of the vegetative roof system must be provided by the roofing system manufacturer under a single, sole-sourced warranty for both roofing system and vegetative roof system.

1.05 ACTION AND INFORMATIONAL SUBMITTALS

- A. Submittals in accordance with Division 01 Submittal Procedures.
- B. Submit samples, Technical Information Sheets and SDS sheets of each product specified.
- C. Submit testing data from Penn State University Agricultural Analytical Services Laboratory. Testing should be no more than one (1) year from the date of submission.
- D. Submit testing data from a certified laboratory of the growing media as per ASTM E2399-05. Testing should be no more than three (3) months from the date of submission.
- E. Submit OSHA Safety Data Sheets in accordance with Division 01 for any articles for which SDS are required by OSHA.15 – Sustainable Requirements: Construction and Hazardous Materials.
- F. Coordinate submittal requirements and provide submittals required by Division 01 Sustainable Requirements: Construction.
- G. Product Data: provide Technical Information Sheets for each product specified in the green roof assembly.
- H. Samples: Submit two (2) samples of each component in the vegetative roof system.
- I. Manufacturer's Certificate: signed by the Vegetative Roof System Manufacturer verifying that the Installer is approved, authorized, or licensed by Manufacturer to install specified products.
- J. Installer's Certificate: a letter, on company letterhead, signed by Installer verifying they have the specified qualifications described.
- K. Division 01 Quality Control: maintenance reports.
 - 1. Reports: must be submitted quarterly, must be signed by an approved representation of Contractor/Subcontractor, and must outline actions carried out as per maintenance requirements.

1.06 QUALITY ASSURANCE

- A. Contractor/Subcontractor must have proven experience installing vegetative roof systems of a similar nature.
- B. Contractor/Subcontractor must have trained staff to facilitate maintenance of vegetative roof/system. **(Omit when maintenance is not included in project specification)**
- C. Contractor/Subcontractor must be certified by manufacturer of vegetated roof system.
- D. All employees of Contractor/Subcontractor must maintain Fall Arrest Certificates on their person at all times while working on roof top.

1.07 QUALIFICATIONS

- A. Manufacturer: company specializing in supplying of vegetative roof systems with 5 years of experience.

- B. Preference will be given to those system providers which produce their products from local sources.
- C. Installer: company approved by membrane and vegetative roof system manufacturer.

1.08 INSPECTION AND TESTING

- A. Product test reports: based on evaluation of comprehensive tests conducted by an independent testing agency of the specified products.
- B. Manufacturer field inspection reports: Manufacturer's written acceptance of vegetative roof system installation based on manufacturer's standard inspections.
- C. **Electronic testing (Optional; also, leak detection may not be compatible with all roofing system types): perform leak testing by an electronic detection process administered by a qualified testing agency. Flood testing is unacceptable as a testing procedure. (Omit when leak detection is not part of project specification)**

1.09 PERFORMANCE REQUIREMENTS

- A. Growing media must meet FLL Guidelines for extensive media.
- B. Bulk density of growing media must be less than 32 lb/ft². Calculations must be based on maximum media density at saturation of growing media per ASTM E2399-05.
- C. Minimum dry weight of the growing media must be more than 18 lb/ft². Calculations must be based on dry weight of growing media per ASTM E2399-05.
- D. Entire vegetative roof system must retain at least 1.1 US gallons/ft² of water. Calculations must include volume of water represented by difference in weight between dry and saturated weight of the growing media per ASTM E2399-05.
- E. Growing media must have a Saturated Hydraulic Conductivity of greater than 15 inch/hour per ASTM E2399-05.
- F. All growing media must be produced within a 500-mile radius of project site.
- G. All materials involved in the making of the growing media must be from recycled products.
- H. All vegetation must be verified for compatibility by the Growing Media Manufacturer prior to acceptance.

1.10 MOCK-UP

- A. Provide mock-up of modular vegetated roof membrane assembly and associated components and accessories to Section **[Division 01 – Quality Control]**.
- B. Mock-up Size: **[3 units wide x 3 units long]** root barrier, drain inspection chambers, pre-vegetated modules, edging, irrigation, roof pavers; at location designated.
- C. Mock-up may remain as part of the Work.

1.11 PRE-INSTALLATION MEETINGS

- A. Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations in accordance with Division 01 – Construction Progress Schedule – Critical Path Method (CPM).
 - 1. Meeting: prior to commencement of roof installation, review and document methods and procedures related to roof deck and roofing system construction, including:
 - 2. Participants: authorized representatives of Contractor, Construction Manager, Owner, Consultant, Roofing Subcontractor, Roofing System/Vegetative Roof System Manufacturer, and Vegetative Roof System Installer.
 - a. Review methods and procedures relating to vegetated roofing assembly, including Manufacturer's written installation instructions.
 - b. Review construction schedule and confirm availability of products,

- Subcontractor personnel, equipment, and facilities.
- c. Review roofing membrane type and system for conformance with vegetated assembly criteria.
- d. Review structural loading limitations of roof deck and identify temporary loading areas for storage.
- e. Review flashing details, roofing details, drains, penetrations, equipment curbs, and other conditions affecting vegetated system assembly.
- f. Review governing regulations, insurance and/or certificates where required.
- g. Review safety requirements, including fall arrest measures.
- h. Review field quality control procedures and review no-smoking policy.
- i. Prior to commencement of work obtain from the EFVM Contractor a report certifying the roof is watertight.
- j. Prior to commencement of work obtain a structural report from Consultant certifying dead load weight restrictions for the entire assembly.
- k. Prior to commencement of work, ensure coordination with related work specified in other Sections.
 - l. Minutes of each meeting must be taken by a representative of Consultant and distributed to all parties within 24 hours of the meeting date.
- m. Review limits of traffic by other trades on vegetated assembly and outline procedures for compensation due to damage.
- n. Review procedure for Manufacturer's inspection visit to assess compatibility with warranty requirements.
- o. Contractor must complete a photographic record of site prior to commencement.

1.12 HEALTH AND SAFETY

- A. Follow all procedures and practices listed in Division 01 – Health and Safety Requirements.

1.13 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store Products in original packaging with Manufacturer's labels and materials list intact and signed off.
- B. Store Products in designated weather protected areas, elevated from ground, and protected from environmental damage.
- C. Avoid storage of modules on site to prevent contamination. Install modules immediately upon delivery to site.

1.14 SUSTAINABLE REQUIREMENTS (Edit according to needs of project)

- A. **Concept Design Strategy:**
 - 1. **Concept Design strategy requirements detailed in Section 01 47 13 – Sustainable Requirements: Concept Design form an integral part of this project including materials and products of this Section. Sustainable design concepts include:**
 - a. **Holistic green design framework.**
 - b. **Descriptions of design criteria.**
 - c. **Setting sustainable goals based on projects design decisions.**
- B. **Sustainability goals are delineated with measurable performance targets.**
- C. **Operational requirements are specified to transform design requirements into physical (site and building) requirements.**
- D. **Construction:**
 - 1. **Construction requirements detailed in Section 01 – Sustainable Requirements: Construction form an integral part of this project including materials and products of this Section. Sustainable construction requirements include:**
 - a. **Specific construction requirements for project.**
 - b. **Administrative, temporary, and procedural requirements for the use of materials and methods of construction.**

- E. Verification:
 - 1. Contractor's verification established in Section 01 47 17 – Sustainable Requirements: Contractor's Verification form an integral part of this project. Verification requirements include:
 - a. Verification of performance requirements and expected results included in Concept Design and specified in Section 01 47 15 – Sustainable Requirements: Construction.
 - b. Compliance with sustainable requirements specific to this technical section.
- F. Operation:
 - 1. Operation requirements specified in Section 01 47 19 – Sustainable Requirements: Operation form an integral part of this project. Operation requirements include:
 - a. Products, materials, services, and methods used in operation and maintenance of building consistent with procurement policy of eco- purchasing that reduces volume of wastes, material costs, toxicity of products and supports recycling.

1.15 ENVIRONMENTAL REQUIREMENTS

- A. Pregrown modules must be installed according to optimal conditions, conducive to plant establishment and survival.
- B. Traffic is prohibited on vegetative roof system during the establishment period.

1.16 MAINTENANCE

- A. Maintenance: conducted annually in accordance with this specification for entire warranty period.
- B. Initial maintenance: include weekly inspection of entire green roof for the first eight (8) weeks, providing irrigation as required to ensure survival of new plantings. Conduct biweekly inspection for further eight (8) visits, including irrigation, re-planting and weeding out of non-intended plantings as required.
- C. Regular maintenance: commence following initial maintenance period. Visit site month during each active growing season. This schedule includes: 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,
 - 1. Repair or replacement of components due to normal wear and tear as required.
- D. All products in the maintenance of the green roof must be certified organic and approved by Vegetative Roof System Manufacturer. Use of chemical fertilizers or pesticides is strictly prohibited.

1.17 SUBSTITUTION PROCEDURES

- A. Submit requests for alternates to this specification a minimum of fifteen (15) working days prior to bid closing for evaluation in accordance with Division 01.
 - 1. Submit evidence that alternate materials meet or exceed performance characteristics as set out in this specification.
 - 2. Submit documentation from an approved independent testing laboratory certifying the performance of vegetated roof system and its components in accordance with testing methods cited in Part 1.8 Inspection and Testing of this section.
 - 3. Submit references clearly indicating that Vegetative Roof Installer has successfully completed projects on an annual basis of similar scope and nature for a minimum of five (5) years.
 - 4. Submit Manufacturer's complete set of standard details for extensive vegetative roof system.
 - 5. Submit a list of five (5) projects executed over the past twelve months and any related case studies.

1.18 WARRANTY

- A. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.

- B. Warranty: Provide Elevate SkyScape Limited Warranty Rider to Elevate Red Shield™ Warranty, plants, irrigation system (if applicable), and other manufacturer provided system accessories.
 - 1. Materials: Filter layer, retention layer, drainage layer, root barrier, and/or slip sheet, will not deteriorate to the point of failure due to weathering. Plants properly installed in Elevate-provided engineered growth medium will cover no less than 80% of their original installed coverage area for a period of thirty (30) days from the date of installation.
 - 2. Overburden: Provide for the removal and replacement of System components as necessary to expose the system for inspection and/or repair of leaks in a roofing system.
 - 3. 24-Month Plant Coverage: If the system vegetation does not cover at least 50% of the garden roof area twelve (12) months from the date of installation, and at least 80% of the garden roof area twenty-four (24) months from the date of installation, manufacturer will take such steps to restore plant coverage to the stated percentages.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Manufacturer of vegetated roof system having systems and/or products approved for use:
 - 1. SkyScape Pregrown Modular System by Elevate roofing, wall, and lining systems, www.holcimelevate.com.

2.02 MATERIALS

- A. Root Barrier: (optional, see note in Part 1.4.1.A)
 - 1. Material: Heavy duty reinforced polymer film, 10 mil thick, three-ply laminate with high strength cord grid, flame-retardant.
 - 2. Flame Spread Index-Class A ASTM E84: 5.
 - 3. 1" Tensile Strength ASTM D7003: 50 lb/ft.
 - 4. Elongation at break ASTM D7003: 600%.
 - 5. Grab Tensile Strength ASTM D7004: 78 lb/ft.
 - 6. Trapezoid Tear ASTM D4533: 52 lb/ft.
 - 7. Hydrostatic Resistance ASTM D751: 74 psi.
 - 8. Mullen Burst ASTM D751: 169 psi.
 - 9. Product approved for use: SkyScape Root Barrier by Elevate.
 - 10. Accessory: SkyScape Root Barrier Tape by Elevate.
- B. Pregrown Modules:
 - 1. Modular unit must include a permanent drainage/water retention layer, above which is situated an integrated filter cloth barrier.
 - 2. Module must include a built-in positive locking mechanism to attach the modules together along all four sides, without creating overlapping at the top of adjacent modules (passive lap joints to connect modules are unacceptable).
 - 3. Modules must utilize perforated sidewalls for soil-to-soil contact for the entire depth of the growth media.
 - 4. Growing media: meets FLL Guidelines for extensive media as tested by Penn State University Agricultural Analytical Services Laboratory.
 - 5. Pregrown with sedums including: Sedum spurium Fuldaglut, Sedum spurium John Creech, Sedum spurium Red Carpet, Sedum spurium Tricolor, Phedimus kamtschaticum, Phedimus takesimensis Golden Carpet, Sedum acre Gold Moss, Sedum album Coral Carpet, Sedum album Murale, Sedum Floriferum Weihenstephaner Gold, Sedum reflexum Blue Spruce, Sedum rupestre Angelina, Sedum sexangulare, Sedum Immergrunchen
 - 6. Module exterior dimensions: 15.0 in x 20.0 in x 5.75 in.
 - 7. Depth of growing media: 4 in.
 - 8. (optional) Integrated in-module irrigation: Sprinkler bodies and lateral line hookups must be pre-plumbed into modular unit prior to nursery growing operations.
 - 9. Base spacing of plumbed units at one unit per 165 modules based on 275 kPa (40 psi) or 11 modules (length) x 15 modules (width)
 - 10. Product approved for use: SkyScape Pregrown Modular System by Elevate.

2.03 ACCESSORIES

- A. Drain Inspection Chambers (Optional):
1. Material: aluminum, form bent from solid sheet.
 - a. Must be perforated at the drainage course level to allow for free drainage and solid at the growing layer to prevent rooting and plant growth through the edging.
 2. Height: 1" higher than the finished growing medium height.
 3. Shape: box-shaped, with a solid lid fitted with locking mechanisms.
 4. Total exterior dimensions: 15" x 15" x 6"
 5. Product approved for use: SkyScape Aluminum Drainage Inspection Chamber by Elevate.
- A. Edge Flashing:
1. Material: extruded aluminum edging.
 2. Must be perforated at the drainage course level to allow for free drainage and solid at the growing layer to prevent rooting and plant growth through the edging.
 3. Shape: L-Shaped
 4. Drainage hole radius: $\frac{3}{4}$ ".
 5. Dimensions: 4" x 5.97", 3/8" lip.
 6. Product approved for use: SkyScape Edge Flashing by Elevate.
- B. Irrigation (Optional):
1. Sprinklers:
 - a. Sprinkler bodies must be Schedule 80 and 4" height. Add extensions as required to accommodate plantings.
 - b. Sprinkler nozzles must be rotary-type and inserted into the sprinkler bodies of the pre-plumbed module as per system supplier's literature and instructions. Add extensions as required to accommodate plantings.
 - c. Products approved for use: Elevate SkyScape MP Sprinkler Rotator Head.
 2. Pipe:
 - a. All pipes must be continuously and permanently marked with the following information: Manufacturer's name or trademark, size, schedule and type of pipe, working pressure at 72 degrees F.
 - b. Polyethylene pipe: $\frac{3}{4}$ " or larger and be of high, medium or low density with a minimum pressure rating of 75 psi. All polyethylene pipe should be a minimum schedule 40-standard.
 - c. P.V.C. pipe: class 160, SDR 26 direct burial pipe conforming to CS –256-63 and homogeneous throughout and free from visible cracks, dents, holes, or foreign materials. All plastic pipe fittings to be installed shall be schedule 40 molded fittings manufactured for the same material as the pipe and shall be suitable for solvent weld, slip joint ring tight seal, or screwed connections. No fittings made of other material shall be used except brass saddle tees and crosses as hereinafter specified. Slip fitting socket taper shall be so sized that a dry pipe end, conforming to these special provisions, can be inserted no more than halfway into the socket. All threaded connections under pressure should be Teflon taped or an equivalent substitute. Compressive strength ASTM D1621: 40 psi.
 3. Automatic control valves:
 - a. All automatic valves: of current design and manufacturing date, and 24v electric solenoid or hydraulically controller. Material: P.V.C. plastic, or brass construction featuring slow opening and closing operation, with
 - b. a manual bleed device.
 - c. All manual and automatic valves: enclosed in thermo plastic boxes with covers, of size as required to permit "ease of access" for service purposes. The term "ease of access" means that every solenoid and manual valve should have adequate access for all types of maintenance. All valve access boxes: installed on a suitable base for stability and drainage.
 - d. Products recommended for use: Hunter PGV Series or Rainbird JTV Series.

- OR -

4. Automatic controllers:
 - a. All automatic irrigation controllers: of current design and manufacturing date by a name brand manufacturer or irrigation supplier. They may be of solid state or electro-mechanical construction, to operate from a conventional 115 v service.
 - b. Unit minimum features:
 - i. Four stations of independent duration settings,
 - ii. 24-hour clock,
 - iii. Rainy weather shutdown mode,
 - iv. Seven- or fourteen-day calendar cycle,
 - v. Master valve or pump start circuit,
 - vi. Products recommended for use: Hunter or Rainbird Automatic Controllers.
5. Wiring:
 - a. All 115-v wiring: conform to local electrical codes.
 - b. All 24-v control wire between solenoid valves and controllers: Number 14-gauge TWU-40o solid conductor, white jacket for the common wire, and colored for the power wire. For runs less than 500', and single valve operation: Number 16, Number 18, Number 20 gauge multi-colored and conductor wire may be used. If two controllers are used, each unit must have its own common wire.

PART 3 INSTALLATION

3.01 EXAMINATION

- A. Examine surfaces and report any adverse conditions which may negatively impact appearance or performance of vegetated roof system. Ensure all unacceptable conditions are corrected before proceeding.
- B. Ensure adequate provisions have been made for loading, unloading, storage, parking, and access to roof site.
- C. Execute work in accordance with the specification, drawings, and details.
- D. Report any imbedded object or obvious damage to Consultant.
- E. Ensure all equipment is in good working order. Protect all equipment which comes into contact with roofing membrane, flashings, and related work.
- F. Ensure adequate safety equipment has been obtained for all operations.

3.02 SYSTEM INSTALLATION

- A. Root Barrier: **(when required; see note at Section 1.4.1.)**
 1. Install root barrier continually over finished membrane surface, including all vertical surfaces and projections.
 2. Overlap and seal with Manufacturer's tape all side and end laps a minimum of 4" and allow for root barrier to reach up all verticals 1" above the intended soil line and secure.
- B. Inspection Chambers:
 1. Install inspection chamber centered over drains, ensuring that the bottom inner edge of the chamber is outside of the outer edge of the drain flange.
- C. Pregrown Modules:
 1. Install modules on roof surface, working top to bottom and left to right while locking modules together. Modules should be installed according to the layout provided by the designer in the project construction drawings.
 2. **(When irrigation is used)** Insert lateral lines of irrigation system into quick-fit couplers on outside edge of pre-plumbed modules as per irrigation drawings.
 3. **(When drain inspection chambers are used)** Secure the modules to the inspection chamber using screw in accordance with Manufacturer's literature and instructions.
- D. Irrigation piping grid:

1. Install main lines, valves, valve boxes and controller wires in accordance with irrigation drawings.
- E. Edging:
1. Install edging along perimeter border between vegetation-free area and vegetated area.
 2. Remove locking tabs of pregrown module to be flush with module wall prior to securing edging.
 3. Apply Manufacturer's tape to the outside of all modular walls abutting the vegetation-free zone along the perimeter.
 4. Ensure lip of edging is over the top edge of the modular sidewall. Position edging firmly against sidewalls of pregrown modules.

3.03 FIELD QUALITY CONTROL

- A. Contractor/Subcontractor must have 5 years proven experience installing vegetative roof systems of a similar nature, or must have on-roof supervision by Manufacturer's representative.
- B. Contractor/Subcontractor must have trained staff to facilitate maintenance of vegetative roof system.
- C. Contractor/Subcontractor must be certified by manufacturer of vegetated roof system.
- D. All employees of Contractor/Subcontractor must maintain Fall Arrest Certificates on their person at all times while working on roof top.
- E. Require site attendance of roofing materials manufacturer's representative during installation of Work.
- F. Field quality control is under control of Contractor. Field quality assurance is monitored by [Departmental Representative] [Consultant] [independent inspection].
- G. Inspection and testing of roofing application through electronic field vector mapping will be carried out by [Departmental Representative] [Consultant].
- H. [Departmental Representative] [Consultant] will pay for tests as specified in Section [01 45 00 Quality Control].
- I. Correct identified defects or irregularities.

3.04 VERIFICATION

- A. Verification requirements in accordance with Section 01 Sustainable Requirements: Contractor's Verification, include:
 1. Materials and resources. Storage and collection of recyclables.
 2. Construction waste management.
 3. Resource reuse.
 4. Recycled content.
 5. Local/regional materials.
 6. Low-emitting materials.

3.05 OPERATION REQUIREMENTS

- A. Operational requirements in accordance with Section 01 47 19 – Sustainable Requirements: Operation, include:
 1. Cleaning materials and schedules.
 2. Repair and maintenance materials and instructions.

3.06 CLEANING

- A. Gather and dispose all debris upon completion of work of this section.
- B. Clean all surfaces and inspect final assembly for approval.

3.07 REPORTS

- A. Submit maintenance reports quarterly to Owner and Vegetative Roof System Manufacturer (to maintain warranty).
- B. Maintenance reports must be signed by an approved representative of Contractor and/or Subcontractor.
- C. Maintenance reports must outline actions carried out in accordance with maintenance requirements of this specification, as well as dates, personnel at each visit and notes on growing conditions.
- D. Subcontractor not conforming to the above maintenance requirements will be replaced, however, will still be held responsible for the results and costs of the replacement Subcontractor.

END OF SECTION