



ROOFTOP GREEN, LLC

Tray System Specifications and Installation Guidelines

Tray Description:

Our tray is made from non-woven, porous PET fiber that is thermoformed into a 12-cell container with a perforated top scrim. Seeds are embedded in a retention layer below the scrim.

Tray Composition:

Our tray is 100% post-consumer recycled polyethylene terephthalate. Post-consumer materials have been removed and reused from waste streams.

Material Colors:

Base white is standard. Bluish White can be used for specific project designations. The naturally white reflective nature of the tray helps materials maintain longevity while maximizing albedo on exposed portions of the tray.

Tray Dimensions:

14.67" width X 26.45" length X 3.75" depth. Tray dimensions may change slightly over time as media shifts and plants develop. Roughly 2.70 square feet.

0.65" lip around entire tray allows for folding and overlapping as needed. Product is semi-rigid, allowing for optimal roof space coverage without the use of hard or sharp footers.

Tray Weight (Dry): 25lbs +/- 4lbs.

Tray Weight (Saturated): 46lbs +/-5lbs.

Media Composition:

Our trays contain a proprietary blend of media, which includes expanded Haydite clay aggregates and sand. A very small portion of organics, composed of compost and mulch. The blend is designed for fast draining, high water retention, and low compression. The media meets both ASTM and FLL standards for extensive rooftop medias.

Tray Weight (Per Square Foot):

Dry Delivery 12.50 lbs. +/- 2lbs

Field Weight 14.00 - 17.50 lbs.

Saturated 17.50 – 18.90 Lbs.

Max Vegetated Saturated Weight: 52.15 lbs. per tray

Water Absorption and Dispersal Rates:

Retention rate 6.88 – 7.10 lbs. of water per tray, or 3.44 – 3.55 lbs per square foot of water retention.

Drainage rate ≈ 12 gallons per minute per linear foot.

Integrated Irrigation Systems:

If species are provided from a separate or third party source, they first should be approved of by a certified GRP specialist or the tray manufacturer. If plugs or flats are used in place of the Rooftop Green seed sheet, refer to a Rooftop Green, LLC specialist.

All rooftop vegetation requires spot irrigation during prolonged periods of heat. The Rooftop Green product requires a minimum of two months irrigation after installation for optimal germination of seed. The product is designed to work with species mixes tested by the company. Temporary irrigation systems are strongly

recommended for the first growing season of the green roof application. For watering schedule and install dates, please refer to the **Installation Guidelines**.

Slip Sheet/Root Barrier:

An industry approved 40mil minimum thickness protection layer should be installed directly under tray modules (see below for details). Pooling areas and compromised roof spaces should be addressed before green roof installation. Check with materials manufacturers and/or a roof specialist to see how green roof products impact warranties pertaining to existing roofing materials. Barrier layer should be inspected and approved by installer for watertight seams before tray installation. Standard tray module does not require a capillary, or anti-crush layer. If any type of irrigation system is installed, it should be used in conjunction with an approved drainage layer for Standard tray modules. Approved materials include:

- HDPE
- PP
- High mil Urethane
- TPO
- FTPO
- CSPE
- PVC
- EPDM

Flashing/Containment:

Standard and Ecosystem Impact Trays do not require additional edging or flashing for optimum functionality. Edging and flashing may be applied to increase the aesthetic appeal of a modular green roof system. If edging or flashing is desired, edger should not impede drainage of vegetative roof area. For a list of compatible flashing systems please contact your Rooftop Green specialist or refer to manufacturer information.

Species Selection:

Depending of the Rooftop Green model chosen, the tray media will be pre-seeded at a rate of 90% coverage for established growth. [Patrick will send general list]

Delivery and Installation:

Our products ship by mail or courier. Pick up arrangements can be made for large orders. Determine the most cost effective and efficient method for your project by contacting certified Rooftop Green LLC personnel before your purchase. Estimated work-loads and do-it-yourself recommendations should be discussed in pre-purchasing period to determine feasibility for the project. Modules can be conveyed on the work scene by hand, boom, lifts, or even cranes. Rooftop Green LLC is not responsible for the method of conveyance determined by the owner, but is available for consultation and advice. See **Installation Guidelines** section for more detailed information.

Rooftop Green LLC is not liable for damages to the product or owners properties before, during, or after the green roof installation. Such notes should be made between owner and contractor to avoid warranty voiding, safety hazards, or property damages.

Installation Guidelines

1. Installer Spec. Checklist:

The following section should be read thoroughly by installer and roof owner prior to installation.

1.1 Complete a Comprehensive Plan

A comprehensive installation plan covering ALL of the installation and maintenance requirements associated with a living vegetative system should be drafted and approved by the owner/building facilities manager prior to beginning any green roof project. The installer should agree to provide the necessary equipment and labor for the installation, in accordance with all of the safety standards necessary, to unload tray system units from delivery vehicle, transport trays to roof with a previously approved plan at the project/building owner's consent, and installation of the roof, including preliminary materials such as slip sheets or drainage.

A comprehensive plan will include preliminary roof work to be done (slip sheet, drainage, roof repair, structural approval for weight-bearing capacity of roof, warranty verifications for extant roofing materials, etc.), overall vegetative roof design, tray and species specifications including care over time, a plan for irrigation and maintenance, and timeframe from order date to estimated completion.

Complete and save manufacture warranty information for project plan and owner's record.

1.2 Follow Installer Guidelines

Green roof vegetative project should follow the specifications and guidelines on this document without infraction. All guideline work should be completed and approved of by a Rooftop Green, LLC endorsed installer or green roofing specialist. Owner or project leader should meet with Rooftop Green, LLC specialist to cover maintenance requirements available in the owner's manual and ***Installer Guidelines***.

1.3 Preliminary Work

Installer, owner, architect, or engineer shall appoint a qualified individual to determine the structural weight-bearing load of the roof, and approve it for planned weight loads. Preliminary installation of waterproofing or roof repairs should be done at this time and inspected by the building owner, slip sheet manufacturer, and installation contractor.

Steps 1.1 and 1.3 should be completed before installation of any Rooftop Green modules.

1.4 Consult with an Endorsed Contractor

For a list of contractors endorsed by Rooftop Green, LLC please contact a Rooftop Green, LLC specialist.

1.5 Oversight

Prior to the delivery of the first tray, the installer, whether it is the owner or contractor, will be in charge of reviewing and discussing the ***Installation Guidelines*** with labor force, Rooftop Green, LLC, and owner. If deemed necessary by owner or Rooftop Green, LLC, coordinate with a qualified green roof installer or Rooftop Green, LLC specialist to oversee the installation process. Ensure that debris and non-essential matter is removed from roof surface before the install begins.

2.0 Tray Selections

The Standard Tray includes low growing and hardy succulent species, which keep maintenance and watering to a minimum. This is the most common green roof utilized in the industry, offering resilient species with a carpet style aesthetic.

The Impact Tray utilizes several species at varying heights and widths providing a “wild flower” look to the green roof. This mix incorporates a sedum base with several naturalized and native species for a higher aesthetic impact.

The Perennial Herb Tray requires more maintenance than other trays, but provides a culinary bonus. Hardy perennial herbs provide familiar scents and sights while offering the utility of an edible herb garden.

2.1 Specifications

All specifications, green roof advice, warranties, and procedures are dependent upon proper use of the modular tray system. These standardized procedures are for the Rooftop Green, LLC green roof modular tray system only. The trays are high density non-woven PET fiber polymers of base white color and roughly 3/16 (.1875) inches thick. The tray top dimensions at the media surface level are 25.2 inches X 13.4 inches at a depth of 3.23 inches to 4.00 inches. Depth will vary slightly over time with a pillowing effect toward the center. Drainage clearance is composed of 3 ridges running the length of the tray and two running the width, with a clearance of .667 inches from the slip sheet to tray.

2.2 Tray Weight

Fully saturated weight, including vegetative maturity is 46.15 Lbs. per tray. This number is erring on the side of 0% media loss and 100% vegetation maturity. Expected field weight ≈ 40.00 – 45.00 Lbs. Rooftop Green, LLC tray system is designed to be installed with the appropriate structural support in respect to overall saturated weights. Owner/Installer is responsible for determining the roofs weight-bearing load via the use of a certified engineer/roofing contractor or other means.

2.3 Species Selection

Seed listed under **Species Selection** heading as provided by tray manufacturer should be germinated and maintained to reach suggested soil coverage of ≥ 90% soil surface area. Rooftop Green, LLC is not liable or responsible for the longevity and performance of species outside of the provided product. The species provided are meant to establish a hardy, long-lived, series of plants. Rooftop Green, LLC is not liable for plant death and vegetative loss as a result of the actions or lack thereof by the owner or their representative in maintaining the plants during the product’s germination, or established maturity.

2.3 Media

Module media has been tested and sourced to meet the required industry standard of German FLL growing media, while providing the necessary organic matter for sustained ecological support. Nutrient and mineral base of the aforementioned media is indicative of healthy green roof systems and requires no supplements for early product life cycle. Project location, height, solar exposure, and number of precipitation events will play a role in nutrient base over time. Please consult your Rooftop Green, LLC specialist or GRP for supplemental nutrient needs or inquiries.

Media changes slightly from tray to tray to optimize growth of selected species. These changes include higher amounts of organic composition, finer granulation of media component and increased water retention aggregates.

2.4 Root Barrier Layers

Green roof installation and maintenance can take place on certain pre-existing rooftops without additional layers such as water proofing or drainage layers. However, Rooftop Green, LLC strongly suggests the use of a dense root

barrier layer to prevent the damage caused by any woody species that accidentally establish within the system. It is strongly recommended that all layers of the typical green roof system be considered during the planning stage of the project.

It is suggested that the system be used with an approved 40mil minimum thickness protection layer. This layer should be installed on roof surface directly beneath tray modules. Pooling areas and compromised roof space should be fixed as per standard practice before green roof installation. Check with materials manufacturers and modular roof specialist for warranty and compatibility of products.

Accepted underlying membranes (for root barrier layer) include but are not limited to ≥ 40 mil thickness of the following :

- HDPE
- PP
- High mil Urethane
- TPO
- FTPO
- CSPE
- PVC
- EPDM

2.5 Seamed Membranes

For any roofing membranes, there is a method for adhering one section to the next. All HDPE, TPO, PVC, and Polypropylene seams must be heat welded. All underlying EPDM or like materials requiring glued seams must do so with the appropriate moisture resistant adhesives. Both PSAs and glues should be cleared or recommended by the membrane manufacturer. Consult with a Rooftop Green representative or a roofing contractor for more detailed information.

3.0 Accessories and amenities to be used in conjunction with the green roof trays

If pavers are used, they must allow for free flowing drainage and not obstruct sunlight from reaching the tray's surface. Pavers should be at least 2.75" but no greater than 5" in height. Pavers can be placed directly adjacent to trays but should not overlap or deform tray edges (more than .25").

Edging of green roof not required on flat roof applications. However, edging is required on gabled rooftops at a 40° pitch or greater. Edgers should be no less than 2" high but no higher than 5" from the underlying layer of the green roof. Edging may be pushed snug, allowing for no more than .25" deformation of the tray walls. Edging should be approved for rooftop use. Edging must come with fabricated 90° angled corners from manufacture or have malleable/bendable characteristics up to a 90° degree angle, without structural failure. Custom-made edging should be approved of by a Rooftop Green, LLC specialist prior to installation.

Partial edging is not recommended on green roof applications.

3.1 Irrigation for Rooftop Green tray applications.

Irrigation is required for the first season of all Rooftop Green tray projects. Watering regimens will differ depending on location, solar exposure, building height, and roof pitch. Owner/Installer should consult the appropriate horticulture professionals in their area (as designated by growing zone and climate), or seek watering schedule information from a Rooftop Green specialist. Watering should be carried out via appropriate watering techniques including but not limited to: garden hose pressure of 40-50psi (typical residential exterior faucet, North America), watering can with diffused nozzle or “shower” apparatus, overhead sprinkler systems, or sprayer irrigation.

Situational characteristics will affect the necessity and frequency of irrigation.

1. Green roof systems installed adjacent to glass or reflective vertical surfaces are exposed to increased light and UV, requiring extra irrigation during dry periods.
2. Pitched roof applications drain faster than flat roof applications and often need to be watered during even mild dry events. Watering prevents vegetative loss and stabilizes effects of the plant growth.
3. Many pitched applications exposed to wind and sun will dry faster than typical applications and will likely require an irrigation system.
4. Size matters. Rooftop Green recommends that facilities with green roofs larger than 250 square feet should be watered by multiple personnel or utilize an automated system.

Rooftop Green recommends the use of overhead sprinkler irrigation piping that meets ASTM D1785, D2241, D2665, D2729, D2949, D3034 and F891. For potable watering for perennial herb based trays, the appropriate ASTM and materials composition should be used. Rooftop Green recommends a SCH 40 or greater UV tolerant PVC or equivalent subterranean pipe with the appropriate overhead sprinkler head system. MP Rotator overhead sprinkler systems from *Hunter, Residential and Commercial Irrigation* are readily available and easy to install.

3.2 Irrigation Lines

Irrigation lines should be placed over the underlying membrane between tray rows, underneath adjoining tray edges. Approved drainage board or drainage mesh should be cut to lengths and placed under the irrigation line at a minimum of every 2 feet to allow for free flowing drainage and prevent pooling at the line. The drainages, if placed correctly will not be exposed to direct UV or sunlight. Irrigation lines can be zip tied to drainage strips. Drainage strips should be made of 14gpm/sf or higher drainage rate material. Irrigation lines should never run between parapet edges and modules but only between modules.

Surface level irrigation must be UV resistant and heat tolerant for warmer, sunny climates. Rooftop Green recommends running overhead sprayer or MP Rotator heads to distribute water and mitigate the effects of heated irrigation lines on plant life. Consult an irrigation professional about water temperature when installing surface level drip irrigation.

Backflow prevention should be installed to mitigate pressure problems and irrigation failure near the main shut off valve. Standard house spigots should have a 2 foot install attachment (hose with adaptable threadings) to allow for speedy disconnect and drainage. If necessary, house backflow and freeze prevention apparatuses in weatherproof containers. Check for residual water in lines and backflow during mid-Fall to prevent freezing and expansion damage. To winterize, disconnect irrigation from water source. Allow for dry-out time of 10 to 15 days before freezing temperatures begin.

3.3 Electrical Wiring

All wiring should be enclosed in NEMA or UL approved waterproof containers. Check freeze protection and waterproofing every 3 months.

4.0 Installation

The installation of a Rooftop Green modular tray roof is to be conducted by the owner/owner's representative, an approved roofing contractor, Rooftop Green representative, or anyone specified as certified by Rooftop Green.

Clean and inspect the roof prior to installation. Repair and prepare surface as necessary. Place 40mil minimum root barrier slip sheet on pre-existing rooftop system. Follow all manufacturer protocols to properly seal seams in place. Slip sheet should remain clean and completely finished with sealed seams before the addition of modular units. Inspect and clear for tightness and 100% coverage of desired area (any holes or tears are to be addressed before modular install).

4.1 Delivery & Handling

Delivery of Rooftop Green LLC modules should be discussed prior to order with a Rooftop Green specialist. The availability of individual or contractor pickup from East Cleveland location, UPS delivery, LTL delivery, and vendor pick-up are all options with the modular system.

Modules are individually boxed with corrugated cardboard housings that include handles and product support. Use two hands when possible and safe while carrying the modular tray. Handles are primarily for use on rooftop environments and climbing ladders. Boxes and trays must remain dry until project installation begins. If storage is required, keep the boxes out of direct sun and rain, inside a garage, barn, or other roofed structures.

Modules should be installed same day as delivery and are not meant to be moved frequently. Modules may be sent from standing storage from Rooftop Green LLC and all seed is pre-stratified.

For projects over 200 square feet, the use of a scissor lift, boom, miniature crane, shingle ladder, or automated lift ladder is strongly recommended. In order to move all product to the rooftop environment in a timely fashion without damaging your roof or self, please rent or contract the appropriate equipment for your project size.

4.2

For flat roofs, follow straight lines (the use of chalk lines is recommended) and run modules parallel to parapet or rooftop edges. Be sure to maintain a straight line while placing rooftop modules and always overlap the tray edges for complete coverage.

On slightly pitched applications, trays should run horizontal across the roof, with the longer edge of the tray running parallel to the lowest and highest rooftop edges. Begin placing modules at the highest point on the roof and only after edging has been installed. Be sure to maintain a straight line while placing rooftop modules and always overlap the tray edges.

NOTE: Trays should not be placed on pitches of 16 degrees or steeper.

On rooftop applications where Rooftop Green or the owner/contractor deem it necessary, riveted holes on modular tray lips can be connected to create a large monolithic structure and increase green roof stability. This rivet feature, used in combination with high friction apparatus on the tray bottom, will hold modules at certain degree pitches without the fear of migration or sliding. Please inquire about these features if your project is on a 20 degree or steeper pitched roof.

4.3 Water Modules to Saturation Immediately

Rooftop Green Modules should be watered immediately after the installation. This watering process will help the media settle and start the germination process of your roof. Expect slight discoloration of run-off with the first one or two watering or precipitation events from the green roof. The particulate in these initial watering events are extremely small and will not cause complications in drainage. These are soluble media materials and a result of the trays being moved about during transportation. Buckets or watering cans without dispersed shower style nozzles should never be used to water Rooftop Green modules. This is to prevent seed from leaving the module or become buried within the media layers of the tray.

To saturate trays during the initial watering, each tray will take approximately a half-gallon of water. This initial watering will be the most intense water demand of the green roof. Keep watering until trays are saturated and water is flowing to pre-determined drainage.

4.4 Germination

Seed germination is generally the most difficult stage of any horticultural endeavor. It is important to install and monitor the project carefully at the outset. A newly installed Rooftop Green roof will require approximately 1 hour of care per 100 sq feet of green roof each week for the first month of the project. This time will be spent primarily keeping the germinating seeds moist by watering two to three times per week. Full saturation is not necessary at this time. If there is an irrigation system, plan on dedicating 15 minutes per 100 square feet for the first month.

4.5 Avoid Frost

Installation of Rooftop Green modular systems must take place after the last frost of the season and early enough to allow for an entire seasons growth in the modules. Projects can be started from March 12th and run through July. This timeframe changes based on location and general climate. A comprehensive installation plan will help to avoid frost damage to germinating seeds.

4.6 Documentation and Records

All Rooftop Green paperwork, warranties, guidelines, and maintenance recommendations should be kept together. Record maintenance work, including date, and activity.

Be sure to keep any soil test results, fertilizer information (recording the level of usage), pest control, and weed control measures. Track irrigation schedules and levels. Monitor all foot traffic (if any) across the green roof, keeping track of damage or loose modules. Reduce maintenance foot traffic via the use of plywood boards to displace weight over plants and trays. Refer to Rooftop Green's maintenance specifications for your project for more information on traffic, grip metal, and rivet systems.



Rooftop Green, LLC.

CIIC (Cleveland Industrial Innovation Center) Research & Development

17000 Saint Clair Ave, Cleveland, OH 44110