

Installation Guide



The following guidelines are intended to familiarize GreenGrid installation contractors with the basic approach, resources and methodology for a successful GreenGrid® green roof installation. The guidelines may require modification for customized projects. Weston Solutions, Inc. (WESTON) will provide construction oversight and/or technical consultation, on request, for complicated installations.

GreenGrid is a fully modular green roof system and easy to install. Numerous projects have been successfully installed by General Contractors, Roofing Subcontractors and Landscape Contractors. Installation crews should plan for:

- Unloading the GreenGrid® modules from the delivery truck.
- Hoisting the pallets or racks to the roof surface.
- Furnishing and placing a slip sheet or other protective material in the areas where the GreenGrid® modules will be installed.
- Layout and installation of the modules according to the design plan, and in accordance with local, state and federal regulations.
- Watering and transition of the newly installed green roof.

OVERVIEW - EQUIPMENT AND LABOR REQUIREMENTS

The installation contractor shall furnish all labor, materials, tools and equipment to unload, hoist and install the GreenGrid green roof system. Most GreenGrid systems are pre-grown at a nursery and shipped to the installation location as a complete living green roof system. Special care and attention is required upon delivery to protect the plants and prepare for installation of the modules. The following crew labor and equipment are typical for commercial GreenGrid projects ranging in size between 5,000 sf and 50,000 sf.

- **Crew size:** Six to ten trained laborers on the roof. Even numbered teams are encouraged since typically two people carry each module. One to three Riggers and Spotters, as needed, to coordinate unloading and hoisting (ground and roof). A Foreman to direct installation layout and coordinate module installation.
- **Equipment:** A forklift or other equipment to unload the delivery truck (note, in many instances cranes can direct pick pallets from an open-top, flatbed trailer.) Hoisting equipment will depend on site-specific logistics and building height, and may include:
 - For roofs of ~30' or less, with good side access, a lull, skid-steer or dynalift is an efficient and cost effective way to simultaneously unload and hoist.
 - For roofs >30', a boom truck or crane is more common.
 - Installation via elevator in high rise applications may require modifications to the standard delivery method to accommodate narrow openings or weight restrictions, as a result, please notify Weston in advance and what limitations exist. Also anticipate a slower installation rate. Delivery charges may increase.
- **Material Staging:** A small, flat area should be allocated for off-loading the GreenGrid system on pallets or within racks. The installation contractor should plan for a secure staging for empty pallets, racks and/or spacers that must be returned to the nursery.

Most installations are scheduled during favorable, seasonal weather conditions. This is generally mid-April through mid-October in Northern climates and can be extended in Southern states. The lead time for pre-growing the GreenGrid system was detailed on the Quote and contract and based on the project-specific requirements.

ESTIMATED INSTALLATION RATES:

- Standard Extensive Modules: 3,000-6,500 sf per day (1-2 trucks). Maximum of 10,000 sf per day using 3 trucks and shipping modules on pallets, or 1,200 – 4,000 sf using nursery racks.
- Standard Intensive Modules: 1,240-2,480 sf per day (1-2 trucks). Receiving more than 2,480 sf requires rack rotation which may limit 2nd day deliveries (and beyond) to 1,240 sf per day or require alternate day delivery.

PACKAGING FOR DELIVERY

Standard G4 extensive modules (2' x 2' x 4.25") will typically be shipped by securely stacking modules on pallets using wood spacers between modules, and shrink wrapped and banded. Semi-intensive (6-inch) and intensive (8-inch) modules will ship on racks. Semi-intensive modules can be packaged on pallets if using standard sedums or sedum mats only.

The following delivery estimates and equipment are used:

Standard Extensive G4 projects < 2,500 sf

A 34-foot nursery box truck with lift gate. A full pallet will include approximately eighteen 2' x 4' extensive modules or approximately thirty-six 2' x 2' modules.

Standard Extensive G4 Projects > 2,500 sf

A 53-foot flat-bed tractor trailer, with up to 20 pallets per truck (max capacity of 3,200 sf). The total number of pallets per truck will depend on module weights at the time of packing.

Semi-Intensive or Intensive G4 Projects < 1,200 sf

A 34-foot nursery box truck with lift gate, containing up to 15 nursery racks (50"w x 30"d x 84" h). Each rack may hold five 2' x 4' or ten 2' x 2' intensive modules. Maximum capacity of 600 sf per truck.

Semi-Intensive and Intensive G4 Projects > 1,200 sf

A 53-foot enclosed trailer truck, containing up to thirty racks (50"w x 30"d x 84" h). Each rack will contain five 2'x4' size or ten 2'x2' size modules. Maximum capacity of 1,240 sf per truck.



Standard full pallet on box truck



Standard half pallet on box truck

Any shrink wrap must be removed within 4 hours of delivery, and modules are not to remain stacked on pallets for more than 24 hours after delivery. Racks must be unloaded and returned to the delivery truck each day for return to the nursery. Note that for large intensive projects, a constant rotation of racks or alternate day delivery of two trucks per day may be necessary as the number of racks available at this time is limited to two full 53' loads.

DO NOT THROW PALLETS AND SPACERS AWAY. A nursery truck will pick up the empty pallets and spacers for reuse when unloading is complete. Please call to coordinate a pick-up time. The installation contractor does not need to be present IF the pallets and spacers are neatly stacked on a flat paved surface and movable by pallet jack. If a forklift or if special access is required, the installation contractor will need to be present for pick up and loading of empty pallets and spacers.

IF MORE THAN 5% OF PALLETS ARE NOT RETURNED A \$10 PER PALLET REPLACEMENT FEE WILL APPLY. LOST OR DAMAGED RACKS WILL INCUR A REPLACEMENT FEE OF \$950 EACH.



Standard flatbed trailer on arrival



Standard flatbed trailer ready for unloading

ROOF SURFACE PREPARATION

Before installing GreenGrid modules, the waterproofing surface shall be inspected by a technical representative of the waterproofing manufacturer or designated building Owner's Representative. All testing and certification of the waterproofing and verification of cleanliness will be done by others.

- Sweep the areas to be greened as well as the hoisting area clean of any debris.
- Place a slip sheet or protection fabric (as specified by waterproofing manufacturer) on the waterproofing surface in the areas to receive the green roof. To increase installation efficiency, place slip sheet the day before module installation.
- Set your starting point according to the green roof layout along a hard edge (i.e., parapet wall, building wall, etc.).
- Snap a string line(s) and prepare grid layout and "work-arounds" for roof penetration or other obstructions.

HOISTING AND UNLOADING

All hoisting, lifting and heavy equipment operation should be done by qualified, trained and licensed professionals using recently inspected and equipment in good condition.

- Provide hoisting equipment, pallets or racks, as appropriate.
- Use industry-specific safety signage, fall protection and barriers per OSHA regulations.
- Confirm the structural capacity to stage materials on the roof, or staging areas.
- Consider using temporary surface protection (plywood or tarps) for the 'landing zone' where pallets or racks are hoisted to.
- Unload and handle modules individually or temporarily stacked on buggies or carts.
- **Do not drag modules when unloading pallets – lift to avoid damaging plants below.**
- Store pallets and spacers for pickup by nursery.



Standard intensive modules ready for installation



When hoisting by crane a lift pan should be used, especially with racks. NEVER hoist racks by their frames

HOISTING AND UNLOADING

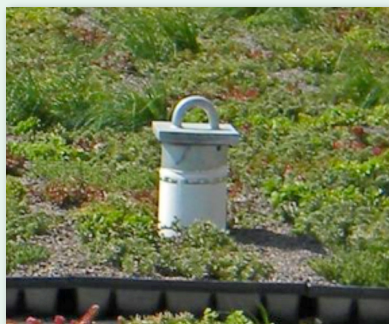
- Assign personnel for moving and placing modules based on the type and weight of module and place according to the roof layout plan. A roof cart can increase installation speed, if available.
- **Handle the modules with care.** Do not drop modules, or twist, drag, deform the contents.
- Set your first row of modules along the hard edge/string line and build-out grid.
- When placing modules, align them square and tight, push them against one another to avoid "creep" and eliminate any space between modules.
- **If any plants become dislodged during installation, immediately replant them.**
- Sweep or remove any spilled media or debris before placing modules to avoid damaging waterproofing. If media is not evenly distributed within the module(s), smooth media by hand to create an even surface.
- The modules do not attach to the roof surface.

- Occasionally (although not required on most projects), the modules can be connected to one another using zip ties or cabling. When required, connecting the outside perimeter rows typically will suffice in order to mitigate wind or uplift concerns.
- Thoroughly water (until system is draining or at least 1" applied) immediately after installation (each day if installation is multiple days). Oscillating sprinklers can be used.
- Coordinate irrigation system installation (if applicable) during or after module placement. Some irrigation systems may require simultaneous installation as modules are placed.
 - Typical irrigation systems used with the intensive modules:
 - Drip (with surface or below-module main lines)
 - Microsprinkler (generally for establishment or temporary use 2 yrs or less)
 - Pop-up spray heads with below-module main lines
- Do not install modules on pedestals. The modules must be completely supported from beneath. If shimming is required, use foam insulation rated for exposure to water.

ROOF OBSTRUCTIONS

GreenGrid modules can be cut to size and shape necessary to fit odd dimensions, angles or shaped corners. Certain customized shapes may be available for pre-ordering.

- For drains, vent pipes, or window washing anchors
 - Do not place a module where it doesn't fit, and fill the area with river rock or stone.
 - Cut a circular hole or notch in an empty module (must be requested in advance), place over the penetration, line with fabric, and move media and plants from a full module.
- For mechanical units, exhaust vents, or heat producing equipment
 - Leave a minimum 2' buffer zone without modules (4' for direct exhaust onto the roof).
 - Include an access path for maintenance personnel to minimize trip hazards.
- For miscellaneous obstructions
 - Do not place a module where it doesn't fit, and fill the area with stone.
 - Modules can be custom cut to fit – please request empty modules in advance for cutting purposes (NOTE: cut GreenGrid modules do not have valid plastic materials warranty).



Anchor through module bottom



Modules cut and flashed to fit



Full module-sized void space left around penetration and filled

ACCESSORIES

Many GreenGrid system installations involve using decorative edging, wood or rubber pavers, irrigation systems and other accessories

- Edge treatment can be installed along exposed edges, but is not required for a fully functional GreenGrid system. Several types of metal and wood edge treatments are available. A coated aluminum edge treatment is most common and available in a variety of colors and finishes. Edging shall not block or interfere with water flowing beneath the GreenGrid system.
- Recycled rubber (100% post-consumer) and “Ipe” Brazilian hardwood pavers are available in a standard 2'x2' dimension. Concrete pavers on pedestals can also be used.
- Irrigation requirements depend on the project location, plant selection and type of green roof. Typically the extensive GreenGrid system does not require irrigation except in arid or dry climates. Semi-intensive and intensive GreenGrid systems often do utilize drip irrigation.



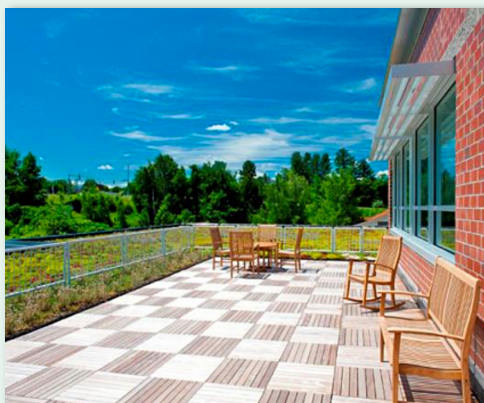
Painted steel and gravel trim



Painted steel trim with Ipe and concrete pavers on pedestals



Flexible edge for curved shapes



Weston's Regional Office with Ipe wood pavers and G3 modules without edge treatment



Intensive GreenGrid with concrete curb and concrete pavers on pedestals

If you have questions or need additional assistance related to installation of the GreenGrid[®] green roof system, please contact GreenGrid via the contact numbers on our website.

This guidance document is not to be considered an all-inclusive manual. It has been provided solely to assist in preparing for installation of the GreenGrid green roof system, and Weston makes no warranties as to its completeness or appropriateness for any given project.



GreenGrid is a registered trademark of Weston Solutions, Inc. (WESTON). The GreenGrid[®] system is a proprietary technology of WESTON in the U.S. and Canada.
U.S. patents 7,900,397 / 7,997,027 / 8,555,545
Canadian patents 2,416,457 / 2,416,463 / 2,418,262