

GardenScapes™
Hassle-Free Garden Roofing
Training Manual for Certified Contractors

Information Sheet

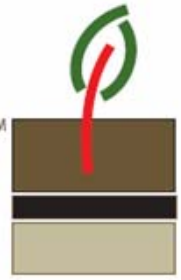
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*Quality You Can Trust Since 1886...
From North America's Largest Roofing Manufacturer™*



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Hassle-Free Garden Roofing



Training Manual For Certified Contractors

GAF MATERIALS CORPORATION

2008

GardenScapes™ Garden Roof System

Accessibility and Safety

All green roofs require some form of access to the roof for maintenance purposes and/or for use by occupants. Vegetative free zones should be created in areas that require high levels of maintenance.

Key Concepts	Requirements
Installation	Structural Loading Capacity <ul style="list-style-type: none">• Loads during construction and during repairs can be much greater than once the roof is complete and in service... this is due to stockpiled materials and construction equipment that may be on the roof.• Take care to not overload the roof structure – and be sure to follow the designer’s requirements for how the roof must accommodate the additional weight. Primary accessibility concerns during installation include the safety of workers and how you’re going to get the green roof materials to the site and the roof. Consider... <ul style="list-style-type: none">• Cranes• Elevators• Conveyance machines• Hoists

Drainage, Slope, & Vegetation-Free Zones

Garden roof systems should be installed with positive slope so that there is not standing water on the roof membrane. In addition, drains are a particular concern because they need to work properly and be accessible after the garden roof is installed.

Key Concepts	Requirements
<p>Drains</p>	<p>Drains on a GardenScapes™ Garden Roof must perform to remove water from the roof and they must also meet a number of other criteria.</p> <ul style="list-style-type: none"> • Must be made of corrosion resistant materials... i.e., plastic, brass, stainless steel – and they must use corrosion resistant accessories (i.e. bolts and strainers) • Have underside slotted clamping rings and debris collection basins to prevent clogging • Have inspection chambers with removable lids • Be set below the field of the membrane in sumps • Be easily accessible for maintenance
<p>Sloped Roofs</p>	<p>GardenScapes™ Garden Roofs should not be installed on slopes greater than 2:12... unless an engineered slope stability analysis is completed.</p>
<p>Vegetation-Free Zones</p>	<p>Vegetation-free zones are just that... areas of the roof where there is no growing medium or plants – instead, the membrane is protected by stone ballast or pavers.</p> <ul style="list-style-type: none"> • All borders, perimeters, and corners should be vegetative-free zones • Be sure to provide a minimum 1 foot wide continuous vegetative free zone around all rooftop equipment , penetrations, skylights, solar panels, antenna supports, expansion joints, and interior parapet walls. • Consider a vegetative-free zone where HVAC intake or exhaust could be effected by plants or harm plants. • Be sure to provide a minimum 3 foot wide continuous vegetative-free zone around roof top structures such as mechanical rooms, penthouses, and adjacent walls. • Be sure to provide a minimum 3 foot wide vegetative-free zone to partition the roof into sections no wider or longer than 125 feet. Incorporate these breaks in the vegetation into expansion joints or roof area dividers wherever possible. • Must comply with local building and fire code requirements.

Delivery, Storage, and Weather Considerations

Be sure to follow good roofing installation practices when installing a GardenScapes™ Garden Roof System. The first rules to follow are the ones that GAF has published for protection of materials during jobsite storage prior to and during installation.

Key Concepts	Requirements
<p>Storage and Protection</p>	<ul style="list-style-type: none"> • Materials should be received in their original containers/wrappers with seals unbroken. Do not accept damaged materials on the jobsite. • Protect materials stored on the roof from precipitation and moisture. Be sure to store materials off of the roof surface on pallets and covered with a tarp or other waterproof material. Factory plastic wrapping is not adequate to protect roofing materials on the jobsite. • Do not install wet or damaged materials into the roof system. All insulation that has become wet is considered damaged and must be removed from the jobsite. • Do not allow any water-based adhesives or coatings to freeze – this will damage the material. Damaged materials must be destroyed and replaced with new material. • Plants should be unpacked immediately upon arrival and watered as needed. Be sure to inspect the plants and do not accept them if they are not in good condition. • Plant care... if the plants arrive before the GardenScapes™ Roof Garden is ready for planting, the plants should be laid out and cared for until installation is complete.
<p>Weather Considerations</p>	<p>Do not install materials during inclement or threatening weather because this will result in a poor installation... including high or gusting winds, or a fine mist or light drizzle.</p> <p>Other considerations...</p> <ul style="list-style-type: none"> • Do not install more material than can be covered up/weatherproofed during the same day if the material cannot be exposed to water or sun damage. • Material installation when the outside temperature is over 90F can result in condensation on the membrane and excessively fast adhesive drying rates. • Material installation when the outside temperature is below 40F can result in poor installation quality due to material stiffness and vulnerability to damage and excessively slow adhesive drying rates. Do not install fully adhered membranes

	<p>unless the temperature is above 40F and rising. Steps to avoid problems include:</p> <ul style="list-style-type: none"> ○ Store materials in a warm area or warming box and use as soon as possible after removing ○ Allow adhesives to properly cure ○ Use a weighted lawn roller over the membrane ○ Adjust welder settings to insure proper welds
<p>Seasonal Constraints</p>	<p>There is an optimal vegetation planting period that will maximize the plants' survival rate. Many plants that work well in one area may have a more difficult time in a harsher, drier environment.</p> <ul style="list-style-type: none"> ● Install green roof vegetation in cool seasons to ensure a higher survival rate, using natural rainfall to help plants get established. ● If installed in hot, dry periods, plants must be watered routinely to avoid damage. ● Planting should coincide with installation of the growing medium to avoid erosion of medium. If immediate planting cannot be done, the growing medium should be covered with an erosion blanket/mat.

GardenScapes™ Garden Roof System Components

The GardenScapes™ Garden Roof System is made of several different components, engineered to provide a roofing system that will waterproof the building and provide a vegetative garden roof.

Key Component	Options
Membrane	<ul style="list-style-type: none"> • EverGuard™ TPO thermoplastic polyolefin membrane, smooth, reinforced • EverGuard™ TPO Fleece Back thermoplastic polyolefin membrane
Flashing & Accessories	<ul style="list-style-type: none"> • EverGuard™ TPO membrane flashings of the same type, thickness, and color as the roofing membrane except where smooth reinforced membrane is used as flashing with a Fleece Back membrane • EverGuard™ TPO Fleece Back membranes are optional flashing membranes with any EverGuard™ TPO roof system • EverGuard™ pre-formed TPO flashing accessories • DRILL TEC™ membrane and insulation fasteners and plates • EverGuard™ TPO bonding adhesives, sealants, caulking, and primers • Full line of GardenScapes™ stainless steel edging, corners, attachment plates and heavy duty plastic module drain boxes
Insulation Fire Barriers	<ul style="list-style-type: none"> • EnergyGuard™ polyisocyanurate insulations– note: minimum 1” thick, minimum 25 psi compressive strength • EnergyGuard™ perlite insulation, minimum ½” thick • High Density Wood Fiber insulation, minimum ½” thick • Dens-Deck®, Dens-Deck® Prime, or SecureRock®, by Georgia Pacific and USG respectively
Drainage Foundation System	<ul style="list-style-type: none"> • DuraGro™ 4-in-1 Drainage Foundation System: includes separation mat, water retention mat, drainage core, and filter fabric
Growing Medium	<ul style="list-style-type: none"> • Start-Rite™ Growing Medium, regionally blended and includes activated carbon and growth agent
Vegetation	<ul style="list-style-type: none"> • Sedum: regional vegetation suited for project location and climate

Site Conditions... Before Starting

Before you start installation of a GardenScapes™ Garden Roof System, preparation is key to avoid problems during the installation.

Key Concepts	Requirements
<p>Site Conditions</p>	<ul style="list-style-type: none"> • Be sure that the designer has verified that the building structure can accommodate the weight of the new roofing system. • Confirm that the structure has adequate slope – if not, eliminate areas of ponding water by adding additional drains or adding slope to the roof. • Fix any defects in the roof deck or structure and verify that it is clean, dry, sound and free of depressions, waves, or projections. • Protect building surfaces against damage and contamination from roofing work. • Where work must continue over completed roof areas, be sure to protect the finished roofing system from damage. • Follow all of GAF’s recommendations for preparation of the roofing area.
<p>Tools - In Addition to Your Regular Rooftop Tools, Don’t Forget...</p>	<ul style="list-style-type: none"> • Heavy duty scissors for cutting drainage mat • Safety knives for opening bags or totes • Metal saw or good snips for cutting the retaining edge • Shovels for spreading the growing medium • Wheel barrows or buckets for installing the drainage stone • Metal rakes for leveling out the medium surface • Hand trowels for planting

Installing Your GardenScapes™ Garden Roof System

GardenScapes™ Garden Roof Installation – Membrane & Flashings

Install your EverGuard™ TPO roofing membrane/system including insulation if present **in accordance with GAF's current EverGuard™ TPO installation guidelines.**

Flashings must follow GAF's current requirements for Ballast Applied systems – and be completed prior to the installation of any of the above membrane components.

Be sure to see the “Inspection” Section and the requirements for testing of the completed membrane prior to installation of any above membrane components.

GardenScapes™ Garden Roof Installation – Dura-Gro™ 4-in-1 Drainage Foundation System

Installation	Requirements
Dura-Gro™ 4-in-1 Drainage Foundation	<ul style="list-style-type: none">• Roll out the water retention and separation layer in full sheet widths• Lap 6” on all side and end laps• Stagger adjacent end laps a minimum of 18”• Be sure the filter fabric is face up – it's the thinner material• Be sure to extend to the perimeter of all building walls, parapet walls, curbs (it will be installed under the ballast stones or pavers in all vegetative free zones)• Cut the 4-in-1 water retention and separation layer to fit snugly around all penetrations, drains, and curbs

Note: Each roll of Dura-Gro™ 4-in1 Drainage Foundation mat covers 200 sq.ft.

GardenScapes™ Garden Roof Installation – Accessories

The accessories are installed on top of the 4-in-1 layer and prior to the installation of the growing medium – they define where the vegetation areas and vegetative-free zones are going to be on the finished roof.

Installation	Requirements
Module Drain Box	<ul style="list-style-type: none"> • Install GardenScapes™ drain boxes at all drains on the roof • Add additional side sections if more height is necessary around or over the drain
Metal Edging	<ul style="list-style-type: none"> • Install GardenScapes™ gravel guard metal edging around <ul style="list-style-type: none"> ○ The entire perimeter ○ All curbs, drains, and roof top penetrations • Be sure the larger drainage holes are on the 4-in-1 mat and are facing so that the growing medium will be installed over the holes • The metal must be properly spaced to allow for the vegetative-free zones it is defining <ul style="list-style-type: none"> ○ Minimum 1 foot wide around all rooftop equipment , penetrations, skylights, solar panels, antenna supports, expansion joints, and interior parapet walls. ○ Minimum 3 foot wide around roof top structures such as mechanical rooms, penthouses, and adjacent walls. ○ Minimum 3 foot wide to partition the roof into sections no wider or longer than 125 feet. Incorporate these breaks in the vegetation into expansion joints or roof area dividers wherever possible.
Drainage Gravel	<ul style="list-style-type: none"> • Install over 4-in-1 mat in all vegetative-free zones (except where pavers will be installed)

GardenScapes™ Garden Roof Installation – Start-Rite™ Growing Medium

This is the “soil” that the plants are planted in – and must be properly installed to support the vegetation.

Installation	Requirements
Start-Rite™ Growing Medium	<ul style="list-style-type: none"> • Install in full and uniform application to a minimum 4” depth AFTER compaction. • Compact – using a minimum 200 lbs. roller or hand compactor – must achieve <u>a minimum of 50% compaction</u> • After compacting , add additional growing medium and water thoroughly. • Fill any settled areas with growing medium and re-wet to ensure a smooth surface.

GardenScapes™ Garden Roof Installation – Vegetation

Installation	Requirements
Sedum	<ul style="list-style-type: none"> • Plant all GardenScapes™ Vegetation in accordance with the landscape architect’s/designer’s plans and instructions. • Water planted areas thoroughly.

GardenScapes™ Garden Roof Installation – Completing the Job

Walkways and vegetative-free zones are used to control the movement of users on accessible garden roofs and to allow for easy maintenance access to equipment and system components.

Installation	Requirements
Stone Ballast	<ul style="list-style-type: none"> • Smooth and clean stone ballast with rounded edges and corners, typically referred to as river-washed stone. • ¾”- 1 ½” diameter, No. 4 conforming to ASTM D448 • 1” – 2 ½” diameter, No. 2 conforming to ASTM D448
Pavers	<ul style="list-style-type: none"> • Heavyweight non-interlocking freeze-thaw resistant concrete pavers with a smooth bottom surface. • Approximate weight: 25 lbs/sq.ft. • Typical size: 18” square to 30” square

Inspections

GAF will only inspect roofs where a guarantee is to be issued or where special inspection services have been agreed to and purchased prior to the start of the job. **In order to be eligible for a GardenScapes™ Roofing System Guarantee, several inspections must be performed. These are NOT optional.**

Inspection Requirements For a GardenScapes™ Roofing System Guarantee	
Inspection	Requirements
#1	<ul style="list-style-type: none"> • Interim inspection – at the completion of the membrane and flashings and <u>PRIOR to any installation above the EverGuard™ TPO membrane</u> • Prior to the #2 inspection, all punchlist items must be remedied
#2	<ul style="list-style-type: none"> • A 48 hour watertest must be performed and a test report sent to GAF • If any water entered the system, GAF must be notified for another inspection – and that inspection must be performed prior to installation of any components above the EverGuard™ TPO membrane
#3	<ul style="list-style-type: none"> • Final inspection of the completed GardenScapes™ Garden Roof System prior to the issuance of a GardenScapes™ Roofing System Guarantee

Flood testing is used to determine if there are any deficiencies in the roofing membrane that could allow water into the building and should follow ASTM D5957. **This testing is important for garden roof systems because of the cost of removing the 4-in-1 mat, growing medium, and vegetation once it is all in place.**

Following are cautions about flood testing.

Flood Testing For a GardenScapes™ Garden Roof System	
Take Care...	<ul style="list-style-type: none"> • Extreme caution must be taken to ensure the weight of the water that will be kept on the roof will not exceed the capacity of the deck • The higher the slope of the deck, the more water is required to perform the test • Removing drain plugs can be dangerous – take extreme care when releasing the plug • Do not start this test until confident the membrane is watertight – should the roof leak, a large amount of water can enter the building

GardenScapes™ Garden Roof System Best Practices Checklist

Best Practices for Your GardenScapes™ Garden Roof System	
<input type="checkbox"/>	Make sure the building can take the weight prior to starting your project
<input type="checkbox"/>	Be sure to not store rooftop materials improperly so that they overload the structure
<input type="checkbox"/>	Use approved EverGuard™ details to complete the roof membrane
<input type="checkbox"/>	Be sure to complete all punchlist items prior to installation of the 4-in-1 mat
<input type="checkbox"/>	Protect the EverGuard™ TPO membrane prior to installation of the 4-in-1 mat from roof traffic/damage
<input type="checkbox"/>	Review vegetative-free zone layout with designer before starting metal edge layout
<input type="checkbox"/>	Do not install metal edge layout until just prior to installation of Start-Rite™ medium
<input type="checkbox"/>	Rule of thumb: growing medium should not touch anything other than a metal edge and the 4-in-1 mat
<input type="checkbox"/>	Insure that the growing medium is not installed above the metal edge height
<input type="checkbox"/>	Protect all base flashings if using concrete pavers in vegetative-free zones with extended counterflashings
<input type="checkbox"/>	If the roof is not designed for accessibility, restrict access to the roof to minimize roof traffic
<input type="checkbox"/>	Do not allow the use of large shovels for installation of plants – use only hand trowels
<input type="checkbox"/>	Do not install electrical conduits, irrigation lines, piping, etc. on the EverGuard™ TPO membrane
<input type="checkbox"/>	Keep vegetation controlled and don't allow to overgrow
<input type="checkbox"/>	Keep plants watered prior to planting and until they have established themselves
<input type="checkbox"/>	Make sure drains are free flowing and the drain boxes are free of fallen leaves, soil, mud, and weeds
<input type="checkbox"/>	Verify that there are working overflow drains or do not perform water test if precipitation will occur