# Table of Contents

**January 2010**

## Part I – General

1.01 Description .................................................................................................................. 3
1.02 Roof Garden Definitions ................................................................................................ 3
1.03 Design Guidelines .......................................................................................................... 3
1.04 Quality Assurance ........................................................................................................ 4
1.05 Submittals ...................................................................................................................... 4
1.06 Warranty ....................................................................................................................... 4
1.07 Job Conditions ............................................................................................................. 5
1.08 Product Delivery, Storage and Handling ...................................................................... 5

## Part II – Products

2.01 General ....................................................................................................................... 6
2.02 Membrane .................................................................................................................. 6
2.03 Related Carlisle Materials .......................................................................................... 6
2.04 Carlisle Roof Garden Components ............................................................................. 6
2.05 Other Non-Carlisle Products ..................................................................................... 8

## Part III – Execution

3.01 General ....................................................................................................................... 9
3.02 Roof Deck Criteria ....................................................................................................... 9
3.03 Substrate Requirements .............................................................................................. 9
3.04 Waterproofing Installation .......................................................................................... 9
3.05 Roof Garden Installation ............................................................................................ 11
   A. Prior to Installation of Roof Garden Components .................................................... 10
   B. Shallow (Ultra-Extensive) Roof Garden Installation .................................................. 11
   C. Medium (Extensive) Roof Garden Installation ......................................................... 12
   D. Deep (Intensive) Roof Garden Installation ............................................................... 13
   E. After Installation of Roof Garden Components ....................................................... 13

## Attachments

- “Attachment I” – Roof Garden Assembly Options ......................................................... 14
- “Attachment II” – Carlisle Engineered Growth Media .................................................... 17
- “Attachment III” – Carlisle Plugs & Cuttings ................................................................. 18
- “Attachment IV” – Vegetated Sedum Tiles ..................................................................... 23
- “Attachment V” – Vegetated Sedum Mats ...................................................................... 25
- “Attachment VI” – Roof Garden Maintenance Schedule ............................................ 26

## Installation Details ........................................................................................................ 27
PART I - GENERAL

1.01 DESCRIPTION

The Carlisle Roof Garden System incorporates an adhered membrane waterproofing system with one of three types of Roof Garden Assemblies installed above.

The waterproofing system utilizes one of Carlisle’s adhered roofing assemblies; EPDM, TPO, PVC, FleeceBACK or AFX products installed over a structural deck or tapered insulation and cover board.

Above the waterproofing system is one of three types of Roof Garden Assemblies utilizing various components including Root Barrier, Polystyrene Insulation, MiraDRAIN G4 Drainage Composite, Carlisle Engineered Growth Media and Carlisle Vegetation. These components are installed above the membrane dependant on desired planting schedule, allowable loads and the climatic region of the project.

As an alternative to the traditional, planted-in-place Roof Garden system, Carlisle offers the modular Green Grid tray system, which incorporates a protection fabric and pre-planted modules over the adhered waterproofing system.

1.02 Roof Garden Definitions

A. Shallow (Ultra-Extensive) Roof Garden System

Shallow Roof Garden System (growth media depth 2.5" to 4") is ideally suited for areas likely to receive little maintenance. Recommended plants include sedums, herbs and grasses. The anticipated weight above the membrane assembly is generally between 4.8 and 6 pounds per square foot, per inch of system depth, in a saturated state.

B. Medium Depth (Extensive) Roof Garden System

Medium Depth Roof Garden System (growth media depth of 5" to 8") includes plants such as sedums, herbs, grasses and other vegetation, which can grow in this depth of media. Un-irrigated systems can be provided without difficulty; however, drip, mist or spray irrigation systems may be required to support more diverse plant types or for installations in semi-arid climates. The anticipated saturated weight above the membrane assembly is less than 50 pounds per square foot.

C. Deep (Intensive) Roof Garden System

Deep Roof Gardens typically incorporate a planting system requiring greater growth media depth (exceeding 8") that requires regular maintenance, such as watering, fertilizing and mowing/weeding. A variety of plants are available including turf grass, annual or perennial flowers, shrubs and even small trees. This system typically requires a structural concrete roof deck to support the larger dead load. An irrigation system should be utilized in these assemblies. The anticipated weight above the membrane assembly is generally greater than 50 pounds per square foot.

1.03 DESIGN GUIDELINES

The Roof Garden Waterproofing assemblies will incorporate a minimum 60-mil thick Sure-Seal EPDM, Sure-Flex PVC or Sure-Weld TPO membrane, 115 FleeceBACK (EPDM or TPO) membrane, Sure-Seal AFX-Plus EPDM or 135 Sure-Weld AFX TPO membranes. Membrane will be adhered with appropriate adhesive to either a slope structural concrete deck or tapered insulation with an acceptable cover board. To facilitate drainage, a minimum roof slope of 1/4" in 12" must be provided at the waterproofing membrane level. Refer to Garden Roof (GR) Details included at the end of this specification for the various assembly options available.

Refer to Roof Garden Attachment I for Roof Garden options based on depth of engineered growth media, membrane type, and possible warranties.
1.04 QUALITY ASSURANCE

A. This Roof Garden Waterproofing System must be installed by a Carlisle Authorized Roofing Applicator in compliance with shop drawings as approved by Carlisle. There must be no deviations made from Carlisle’s specifications or the approved shop drawings without the PRIOR APPROVAL of Carlisle.

B. A pre-installation meeting should be coordinated by the specifier and attended by the roofing applicator, membrane manufacturer’s representative and other trades working on the roof system both before and after membrane installation. The purpose of this meeting is to discuss the necessity of ensuring proper membrane protection during all phases of installation and to review other applicable requirements or unusual field conditions.

C. Upon request by the Authorized Applicator, an inspection will be conducted by a Field Service Representative of Carlisle to ascertain that the membrane roofing system has been installed according to Carlisle’s specifications and details. This inspection shall be coordinated prior to installing the “above membrane roof garden components” so access to the membrane is not impaired.

D. Flood testing, electronic testing or other leak detection means is required to check the waterproof integrity of the membrane prior to installing any above membrane components.

E. An in-progress inspection may be scheduled after the initial inspection (after the membrane installation is completed) to ensure proper protection procedures are being followed to prevent possible damage to the membrane during the installation of Roof Garden components.

Note: The roofing applicator must notify Carlisle at least 3 weeks in advance of the applicable inspection dates for coordination purposes.

1.05 SUBMITTALS

A. To ensure compliance with Carlisle’s warranty requirements, all projects should be forwarded to Carlisle for review prior to installation.

B. A dimensioned layout of all field splices shall be included along with the project submittals (shop drawing and Request for Warranty).

C. For all projects, prior to project inspection by Carlisle, a final shop drawing must be approved by Carlisle.

1.06 WARRANTY

A. 10, 15 or 20-year System Warranty is available for a charge on commercial buildings and applies only to products manufactured or marketed by Carlisle SynTec Incorporated. The membrane system is defined as membrane, flashings, adhesives, sealants and other Carlisle brand products utilized in this installation. For a complete description of these products, refer to the “Products Section” or the applicable “Attachment” in the Carlisle specifications.

When Carlisle Roof Garden components are specified and installed, for a nominal charge, a 10, 15 or 20-year Overburden Warranty can be added. The warranty covers all Carlisle Roof Garden components above the membrane limited to the protection fabric, polystyrene, drainage products, moisture retention mat, growth media, and Carlisle Roof Garden Plants. In the event of a leak, Carlisle is responsible for overburden removal, roof repair, and replacement of the overburden.

If a 20-year No Dollar Limit warranty including overburden is desired, a Sustainable Roofing Alliance Consultant must be utilized on the project during the design and construction phases. The SRA consultant shall be on site to monitor the installation.

B. Access for warranty service

If a 10, 15 or 20-year Overburden Warranty is not obtained or if the owner chooses to use overburden by others, it shall be the owner's responsibility to expose the waterproofing membrane assembly in the event warranty service or investigation is necessary.
C. The formation or presence of mold or fungi in a building is dependent upon a broad range of factors including, but not limited to, the presence of spores and nutrient sources, moisture, temperatures, climatic conditions, relative humidity, and heating/ventilating systems and their maintenance and operating capabilities. These factors are beyond the control of Carlisle and Carlisle shall not be responsible for any claims, repairs, restoration or damages relating to the presence of any irritants, contaminants, vapors, fumes, molds, fungi, bacteria, spores, mycotoxins, or the like in any building or in the air, land, or water serving the building.

1.07 JOB CONDITIONS

Material Safety Data Sheets (MSDS) must be on location at all times during transportation, storage, and application of materials. The applicator shall follow all safety regulation as recommended by OSHA and other agencies having jurisdiction.

A. Coordination between various trades is essential to avoid unnecessary rooftop traffic over sections of the roof and to prevent damage to the membrane. Heavily traveled areas must be protected by placing temporary protection courses to prevent damage to the membrane.

B. The use of a vapor retarder to protect insulation and reduce moisture accumulation within an insulated roofing assembly should be investigated by the specifier. Consult the latest publications by ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.) and NRCA (National Roofing Contractors Association) for specific information.

1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the job site in the original, unopened containers labeled with the manufacturer's name, brand name and installation instructions.

B. Job site storage temperatures in excess of 90° F (32° C) may affect shelf life of curable materials (i.e., sealants, cleaners, primers, adhesives, SecurTAPE, Pourable Sealer, Pressure-Sensitive Flashing and uncured flashing).

C. When liquid adhesives and sealants are exposed to lower temperatures, restore to a minimum of 60° F (16° C) before use. Do not store containers with opened lids due to loss of solvent that will occur from flash off.

D. Sure-Seal and Sure-Weld FleeceBACK and AFX Membrane, when specified, should be stored in its original plastic wrap or be covered to protect from moisture. Any moisture absorbed by the fleece backing must be removed by using a wet-vac system, prior to membrane application.

E. Store Sure-Weld TPO or Sure-Flex PVC membranes (when applicable) in the original undisturbed plastic wrap in a cool, shaded area and cover with light-colored breathable tarpaulins.

F. Membranes that have been exposed to the elements for approximately 7 days must be prepared with Weathered Membrane Cleaner prior to hot air welding. Refer to Carlisle’s Sure-Weld Specifications, Part II, Application, for applicable requirements.

G. Insulation, Dens Deck Prime, Securock, and base sheets, when specified, must be stored so they are kept dry and are protected from the elements. Store insulation, Dens Deck Prime, and Securock on a skid and completely cover with a breathable material such as tarp or canvas. If the insulation is lightweight, it should be weighted to prevent possible wind damage.

H. Carlisle Engineered Growth Media should be stored under cover whenever possible to avoid direct sunlight exposure to the SuperSacks in which the material is delivered and excessive moisture absorption. Care should be taken not to damage the packaging to avoid leakage when hoisted to the rooftop.

I. Carlisle Roof Garden Plants, when specified, should be planted promptly after delivery to the jobsite. Sedum cuttings should be used within 12 hours of arrival. Plugs should be unpacked immediately upon arrival and planted within three (3) days. Vegetated Sedum Tiles and Mats should be unpacked and installed within 36 hours. Unused plugs and tiles should be stored in an outdoor location with access to at least four (4) hours per day of direct sunlight.
PART II - PRODUCTS

2.01 GENERAL

The components of this roofing system are to be products of Carlisle. The installation, performance or integrity of products by others is not the responsibility of Carlisle and is expressly disclaimed by the Carlisle Warranty.

2.02 MEMBRANE

Sure-Seal® (black) EPDM, Sure-Seal® AFX-Plus, FleeceBACK® EPDM or Sure-Weld® TPO membrane can be used with this system. Refer to Paragraph 1.03, Design Guidelines for required membrane thickness that is dependent upon the type of Roof Garden and warranty selected. For membrane physical properties, refer to the appropriate Carlisle Technical Data Bulletins or Product Data Sheets.

2.03 RELATED CARLISLE MATERIALS FOR WATERPROOFING

A. Sure-Seal Products


B. Sure-Weld Products


C. Sure-Flex Products

Sure-Flex PVC Bonding Adhesive, Sure-Flex PVC non-reinforced Flashing, Sure-Flex PVC “T” Joint Cover, Sure-Flex PVC Cut-Edge Sealant, Water Cut-Off Mastic, Universal Single-Ply Sealant, PVC One-Part Pourable Sealer, Foil Grip Aluminum Tape, PVC Membrane Cleaner, Sure-Flex PVC Coated Metal, Sure-Flex PVC Heat Weldable Walkway Rolls, Sure-Flex PVC Inside/Outside Corners and Sure-Flex Pre-Molded accessories are used depending on the waterproofing assembly.

D. Other Carlisle products, such as insulation and edgings/copings, are also required when such components are to be included as part of the System Warranty.

2.04 CARLISLE ROOF GARDEN COMPONENTS

A. MiradRAIN G4 Drainage Composite consists of a high impact polystyrene core with “cups” and high-flow overflow drains. A non-woven 100% post-consumer recycled polyester combination filter fabric and green moisture retention mat is bonded to the retention side of the molded core to prevent passage of particles into the water reservoirs. Designed to filter and retain water in all Roof Gardens while allowing excess water to quickly reach the drainage system. Drainage composite is 1.21” thick and holds up to 0.32” of rainfall (0.2 Gallons) per square foot. Packaged in 4’ x 50’ rolls weighing 70 pounds.

B. Carlisle Engineered Growth Media – A lightweight FLL-approved growth media used for roof garden applications. Applied at the specified depth on Carlisle Roof Garden assemblies. Refer to Roof Garden Attachment II.

C. Carlisle Roof Garden Plants

1. Plugs – Carlisle plant plugs are available in 10” X 20” flats/trays containing either twenty-four (24) 2.5” diameter plugs or seventy-two (72) 1.5” diameter plugs. Plugs come in a wide selection that is specifically chosen for rooftop environments are available from Carlisle. Refer to Roof Garden Attachment III for more information.
2. **Cuttings** – Carlisle sedum cuttings are available in bulk and are sold by the pound. More than 12 different varieties of sedum cuttings can be used to propagate Carlisle Roof Gardens. Carlisle sedum cuttings must be planted with Carlisle Moisture Retention Gel to ensure that cuttings have adequate moisture to successfully root in a rooftop environment. Refer to **Roof Garden Attachment III** for more information.

3. **Vegetated Sedum Tiles** – Carlisle’s Vegetated Sedum Tiles are available in 2.08 square foot pieces. Designed to enable rapid installation and ensure full (95 %+) vegetated coverage on the day of installation. Each tile weighs approximately 4.5 pounds (3.2 pounds per square foot) and is planted with multiple varieties of sedum. Four different varieties of Sedum Tiles are available that cover nearly every environmental condition. Refer to **Roof Garden Attachment IV** for more information.

4. **Vegetated Sedum Mats** – Carlisle’s Vegetated Sedum Mats are available in 21.25 or 25 square foot rolls. Mats enable full vegetative coverage on the day of installation with the fastest possible installation time. Carlisle’s Vegetated Sedum Mats weigh approximately 5.5 pounds per square foot in a saturated state and are planted with seven to nine varieties of sedum. Refer to **Roof Garden Attachment V** for more information.

D. **Polystyrene Insulation** (available from Carlisle)

1. **Insulfoam DB** is a minimum 40 psi compressive strength, moisture resistant, closed cell expanded polystyrene with ¼” x ¼” drainage channels every 2” O.C. Installed directly over the roof membrane in Intensive (deep) garden assemblies. Available in 4”x 4’ and 4” x 8’ board sizes with a thickness of 1” to 40”. Readily available in custom lengths and widths.

2. **Dow Roofmate or Foamular 404/604** is a minimum 40/60 psi compressive strength, moisture resistant, closed cell polystyrene foam insulation with drainage channels along board edges to promote drainage at the membrane level. Installed directly over the roof membrane in Intensive (deep) garden assemblies. Available in 2’ x 8’ board sizes with a thickness of 1” to 4”.

E. **Protection Fabric** – Carlisle CCW 300HV (16 oz/yd²) is a polypropylene non-woven needle-punched fabric that is stabilized to resist soil chemicals, mildew, and insects and is non-biodegradable. Designed to prevent abrasion to the membrane when a root barrier is used in Intensive and Extensive Roof Garden assemblies. Available in 12.5’ x 200’ and 40” x 200’ rolls.

F. **Root Barriers**


2. **Biobarrier** – In certain Deep (Intensive) Roof Garden applications, Biobarrier synthetic hormone root barrier is used in selective areas. Biobarrier releases a root-thwarting compound at a few parts per billion, preventing particularly invasive roots from damaging the waterproofing membranes. Biobarrier is available in 12” x 100’ rolls and 58.5” x 100’ rolls. Contact Carlisle when considering special planting choices.

G. **Carlisle Aluminum Roof Garden Edge** – a 0.080” thick extruded aluminum edge used to separate roof garden assemblies from adjacent walkways or perimeter stone ballast. The edging comes in 10’ lengths and 4” high with a 3” flange or 8” high with a 6” flange. Additional heights are available from Carlisle.

H. **Carlisle Aluminum Roof Garden Drain Box** – a 0.125” thick extruded aluminum drain box that is 12” x 12” with a welded 4-1/2” flange to keep the drain areas clear of stone ballast or growth media. The drain box is available in 4” or 8” heights. Drainage holes are pre-punched around the sides. Access to the drain is provided by a removable lid. Custom sized Drain Boxes are available from Carlisle.

I. **Carlisle Modified Base Sheet** – A tough, glass fiber, reinforced, SBS-modified asphalt, base sheet (nominal 39” wide by 50’ long) that meets or exceeds the requirements for ASTM D 6163 Type I, Grade S for SBS-modified bituminous sheet materials. The Carlisle Modified Base Sheet is used directly under AFX-Plus Membrane.
J. **Hanover Architectural Products (available through Carlisle)**

1. **Carlisle Prest Pavers** - 2’ x 2’ x 2” thick precast concrete pavers weighing 25 psf with a compressive strength of 8500 psi. Absorption is less than 5% and Flexural is 1,100 psi. Additional standard and custom made sizes available.

2. **Carlisle Pedestal Paver** - 2’x2’x2.25” thick precast concrete pavers weighing 22 psf and an elevated clearance of 1/2” from incorporated footing.

3. **Carlisle Guardian Paver** - Developed for high wind and special conditions. The paver is 2’x2’x2” or 3” thick and weighs 25 psf to 38 psf.

4. **Carlisle RockCurb** - transition component between paver system/hard caped areas and adjoining roof garden assembly. Rock Curb comes in three standard heights (8”, 12”, and 16”) and is manufactured either straight or with a radius.

5. **Carlisle Paver Accessories** - High Tab Pedestal with shims, EPDM Pedestal with shims, Compensator, Elevator Coupler, and Elevator Pedestal.

K. **Carlisle Stained Glass Stone** – Stained Glass Stone is 100% post-consumer recycled & tumbled glass in a 1”- 2” particle size used as a special effects accessory for Roof Gardens and Plazas. Available in 12 different colors, Stained Glass Stone can be utilized around perimeters, penetrations or even to create colorful logos in any size or shape. Stained Glass Stone is applied at a minimum rate of 10 pounds per square foot over a minimum 1” thick drainage composite such as Carlisle MiraDRAIN G4.

### 2.05 OTHER NON-CARLISLE PRODUCTS

A. **“Hardscaped” Items:**

1. **Individual concrete plaza pavers** – 2’ x 2’ x 2” thick precast concrete pavers weighing a minimum of 18 psf with a minimum compressive strength of 6500 psi.

2. **Paver Pedestals** – Rubber paver pedestals to elevate the surface of the pavers above the roof membrane and promote positive drainage and protection from freeze/thaw.

3. **Stone Ballast** – Nominal 1-1/2” diameter rounded water worn gravel which conforms to ASTM D448, gradation size #4, applied at a minimum of 10 pounds per square foot.

4. **Other** – Products such as concrete curbs, landscape lumber (wood timbers, etc.) or other desired landscape products suitable for this application. Used to transition between roof garden and hardscaped areas to act as a “growth media stop.”

B. **Asphalt** (ASTM D 312): Type III or IV Hot Asphalt used for mopping AFX-Plus FleeceBACK membrane to structural concrete or approved base sheets. As an option, Modified SBS or SEBS Asphalt may be used. Application rate is 18-22 pounds per square (100 square feet) for membrane mopping (28-32 pounds per square for insulation attachment, if applicable).

<table>
<thead>
<tr>
<th>Property/ASTM</th>
<th>Type III</th>
<th>Type IV</th>
<th>Modified Asphalt</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-36 Softening Point (° F)</td>
<td>Min. – 195</td>
<td>Min. – 210</td>
<td>Min. – 215</td>
</tr>
<tr>
<td>Max. – 205</td>
<td>Max. – 225</td>
<td>Max. – 235</td>
<td></td>
</tr>
<tr>
<td>D 92 Flash Point (° F)</td>
<td>Min. – 525</td>
<td>Min. – 525</td>
<td>Min. – 525</td>
</tr>
<tr>
<td>Max. – 600</td>
<td>Max. – 600</td>
<td>Max. – 600</td>
<td></td>
</tr>
<tr>
<td>D 5 Penetrations Units</td>
<td>@ 32° F = 6</td>
<td>@ 32° F = 6</td>
<td>@ 32° F = 7</td>
</tr>
<tr>
<td>@ 77° F = 16-24</td>
<td>@ 77° F = 13-22</td>
<td>@ 77° F = 18</td>
<td></td>
</tr>
<tr>
<td>D 113 Ductility @ 77° F, cm</td>
<td>3.0</td>
<td>2.0</td>
<td>7.0</td>
</tr>
<tr>
<td>D 2042 Solubility in Trichloroethylene %</td>
<td>99.8</td>
<td>99.8</td>
<td>97.5</td>
</tr>
</tbody>
</table>

C. **“Cut Back” Asphalt Primer** – Meets ASTM D 41 – Used to prime structural concrete decks prior to mopping AFX-Plus FleeceBACK membrane or associated base sheets. Coverage rate is 1 to 2 gallons per 100 square feet depending on surface porosity.
PART III     EXECUTION

3.01 GENERAL

When feasible, begin the application at the highest point of the highest roof level and work to the lowest point to prevent moisture infiltration and minimize construction traffic on completed sections. This will include completion of all flashings and terminations.

3.02 ROOF DECK CRITERIA

Proper decking shall be provided by the building owner. The building owner or its designated representative must ensure that the building structure is investigated by a registered engineer to assure its ability to withstand the total weight of the specified roofing system, as well as construction loads and live loads, in accordance with all applicable codes. The specifier must also designate the maximum allowable weight and location for material loading and storage on the roof.

A. For Shallow (Ultra-Extensive) Roof Garden Systems, any roof deck capable of withstanding the roof loading may be accepted.

B. For Medium Depth (Extensive) and Deep (Intensive) Roof Garden Systems, structural concrete roof decks are recommended due to the increased weight of the roof assembly when the system is at its maximum water capacity

C. Defects in the roof deck must be reported and documented to the specifier, general contractor and building owner for assessment. The Carlisle Authorized Roofing Applicator shall not proceed unless the defects are corrected.

3.03 SUBSTRATE REQUIREMENTS

The substrate must be dry, relatively smooth and free of protrusions, debris, sharp edges or foreign materials and must be free of accumulated water, ice and snow. Cracks or voids in the substrate greater than 1/4" (6 mm) must be filled with a suitable material.

3.04 WATERPROOFING INSTALLATION

Before beginning installation, refer to the applicable Material Safety Data Sheets, OSHA safety requirements, and Technical or Product Data Bulletins for cautions and warnings.

A. Insulation Attachment

1. Base layer of insulation can be mechanically attached with acceptable Carlisle Fasteners and Insulation Plates. Refer to applicable Adhered Application section for acceptable decks and the Carlisle Fasteners.

2. Fastening density is determined from insulation type and thickness. Refer to appropriate insulation attachment details in Sure-Seal/Sure-White Adhered Application Details, Sure-Weld Adhered Application Details or the Sure-Flex Specification.

3. As an alternate to mechanically attaching the base layer of insulation, Carlisle FAST Adhesive can be used. Refer to Sure-Seal/Sure-White Adhered Application – Attachment III, Sure-Weld Adhered Application – Attachment IV, or the Sure-Flex Adhered Specification Section 602116, paragraph 3.04.

4. Top layer of insulation must be an acceptable cover board adhered with FAST Adhesive. Refer to Sure-Seal/Sure-White Adhered Application – Attachment III or Sure-Weld Adhered Application – Attachment IV for application procedure. Cover boards shall be minimum ½-inch thick Dens-Deck Prime or Securock.
B. Membrane Installation

1. FleeceBACK Membranes either Sure-Seal EPDM or Sure-Weld TPO may be adhered with the appropriate adhesive directly over sloped structural concrete or wood roof decks. Direct application over cellular or perlite lightweight insulating concrete substrate may also be specified (contact Carlisle for acceptable lightweight insulating concretes).

2. Follow Carlisle’s applicable Adhered Roofing System Specifications for insulation types, surface preparation procedures, membrane positioning, and adhesive application requirements.

C. Membrane Splicing

1. Refer to appropriate splicing procedures published in Sure-Seal EPDM or Sure-Weld TPO Adhered Application Specification.

2. In addition to the standard splice procedure all field splices shall be overlaid with the appropriate 6” EPDM or TPO Pressure-Sensitive Cover Strip. For PVC membranes use 6” welded Cover Strip.

3. Prior to Pressure-Sensitive Cover Strip application, the splice area must be primed with Sure-Seal HP-250 or Low VOC EPDM or Low VOC TPO Primer.

D. Flashing

1. Walls, curbs, skylights and all other penetrations through the membrane must be flashed in accordance with Carlisle’s published specifications/details for the applicable membrane specified. Refer to Roof Garden Details RG7, RG8 and RG12.

2. Flashing heights shall be greater in height than the specified depth of the Roof Garden assembly (Drainage composite, growth media, etc.).

3. Vertical field splices at walls, curbs, etc., must be overlaid in the same fashion as the field splices.

E. Roof Drains

1. Roof garden drains should be covered with Carlisle Aluminum Drain Box or a perforated drain box by others with removable lid (at the growth media surface height) for inspection purposes. 1-1/2” nominal diameter rounded river washed gravel is applied around the drain box a minimum 18” to promote drainage. Refer to Roof Garden Details RG10 and RG11.

2. In Shallow (Ultra-Extensive) and Medium Depth (Extensive) Roof Garden Waterproofing assemblies, standard cast iron compression ring clamping drains may be able to be used with 1-1/2” nominal diameter rounded river washed gravel applied around the drain sump area (minimum 18” in width) for drainage.

3.05 ROOF GARDEN INSTALLATION

Refer to Roof Garden Attachment I – Carlisle Roof Garden Assembly Options

A. Prior to installation of Roof Garden Components

1. Limit foot traffic over completed waterproofing system. Heavily traveled areas (staging areas, corridors used to transport roof garden components) must be protected using ½” thick plywood or other sheathing.

2. Perform a Flood Test or Electronic Test (TPO Membrane only) to ensure the watertight integrity of the waterproofing system. Testing should take place after the membrane and flashings have been in place a minimum of 24 hours. Plug drains and provide necessary barriers to contain water.

3. “Flood Test” the membrane surface with water for 48 hours at a minimum depth of 2”. Inspect for leaks and repair membrane if damage to waterproofing assembly is found. Retest after repairs have been made.

Note: On Sure-Weld TPO System, electronic testing such as Electric Field Vector Mapping (EFVM) may be used to test membrane for defects. Contact the appropriate testing agency for procedures
4. Sweep the surface of the membrane to remove all debris and loose or foreign material.

B. Shallow (Ultra-Extensive) Roof Garden Installation

1. MiraDrain G4 Drainage Composite
   a. Unroll the drainage composite and flip over so green or white moisture retention mat is facing upwards.
   b. Place drainage composite directly over the waterproofing membrane with the built-in overlapping flap facing the direction of the slope.
   c. Position additional drainage composite rolls next to each other with green moisture retention mat butted against the long side. Once in place, flip 6” retention mat flap over the first drainage composite. For runs of MiraDRAIN G4 exceeding 50 feet in length, peel back both fabrics approximately 3” on the adjacent ends of the rolls and insert two rows of the MiraDRAIN “cups” into the cups of the abutting roll. This locks the MiraDRAIN rolls together and does not allow for passage of growth media directly onto the waterproofing membrane.
   d. Continue with placement of drainage component until the designated roof garden area is covered.

2. Carlisle Engineered Growth Media (Refer to Roof Garden Attachment II for growth media types based on building location and depth of growth media.)
   a. Hoist growth media in SuperSacks by crane to the roof area that is receiving the Roof Garden.
   b. Distribution of the Carlisle Engineered Growth Media shall be directly over the MiraDRAIN G4 Drainage Composite from SuperSacks that are lowered by crane 2’ to 4’ above the drainage composite.
   c. Slit the bottom of the sack with a knife or other cutting device to dispense the growth media directly over the drainage composite or into wheelbarrows for transportation to hard to access areas.
      Caution: Location points for distribution of growth media must not overload the structural capacity of building.
   d. Coverage rate per sack for a shallow assembly is approximately 150 square feet for a 4” depth.
      Caution: Care must be taken when distribution of Carlisle Growth Media is during windy conditions to limit potential scouring of media. If growth media is not used on the day of arrival, product should be stored under a trap or other opaque cover to prevent direct exposure to sunlight and moisture.
      Note: As an alternative to super sacks, growth media may be purchased in bulk and blown to the roof using a blower truck. For information please contact Carlisle.

3. Carlisle Roof Garden Plants (Refer to Roof Garden Attachment III for specific plants based on types and hardening zone.)

Vegetative Plugs
Place plug trays in the vicinity of where planting has been specified.
   a. If 2.5” diameter plugs are planted, spacing is recommended 8” to 9” on center (1.78 to 2.25 plugs per square foot).
   b. If 1.5” diameter plugs are planted, spacing is recommended 6” to 8” on center (2.25 to 4 plugs per square foot).
   c. Make a 2” deep indentation into the growth media and insert plug.
   d. Tamp the growth media around the base of the plug by hand to ensure that plug is securely buried.
Sedum Cuttings
a. Prior to installation of the sedum cuttings apply Carlisle Retention Gel over the growth media at rate of 1 pound per 200 square feet either through manual / hand broadcasting or a rotary seed / fertilizer spreader.

b. Broadcast sedum cuttings by hand with a coverage rate of 1 pound per 10 square feet.

c. Immediately water the assembly until the system is saturated and the Retention Gel is fully expanded.

d. Irrigate the Roof Garden for a minimum of 60 days following installation according to Carlisle’s Roof Garden Maintenance guidelines. (Refer to Roof Garden Attachment III & V).

Vegetated Tiles
a. Remove tile from container with care and lay directly onto the growth media.

b. Place additional vegetated tiles with edges butted together to within ¼”.

c. Continue with placement of vegetated tiles until the designated roof garden area is covered.

d. Water the Roof Garden assembly by hand or sprinkler(s) until the system is saturated.

Vegetated Mats
a. Lift the 48” x 75” mats from the pallets and unroll the mats directly over the growth media.

b. Unroll Vegetated Mats adjacent to each other with edges butted together to within ¼”.

c. Continue with placement of vegetated mats until the designated roof garden area is covered.

d. Water the Roof Garden assembly by hand or sprinkler(s) until the system is saturated.

C. Medium (Extensive) Roof Garden Installation

1. CCW 300HV Protection Fabric
   a. Unroll protection fabric directly over the waterproofing membrane.

   b. Position the next roll of protection fabric to overlap the first a minimum of 2”.

   c. Additional rolls shall follow the above procedure.

2. Geomembrane Root Barrier
   a. Unroll root barrier over the protection fabric.

   b. Position the next roll of root barrier to overlap the first a minimum of 3”.

   c. Clean splicing area with Carlisle Weather Membrane Cleaner to remove any dirt / contaminates.

      i. Root barrier sheets shall be spliced together by heat welder.

      ii. Seaming root barrier with a heat welder refer to Thermoplastic Specification, Section 3.06 Heat Welding Procedures.

   d. Extend root barrier up walls, curbs, etc. to the height of the top of the growth media depth.

      Caution: Placement of root barrier must not impede drainage for the roof area.
3. **MiraDrain G4 Drainage Composite** (Refer to article 3.05-B1 for installation instructions).

4. **Carlisle Engineered Growth Media**  
   Refer to **Roof Garden Attachment II** for installation instructions of growth media with the following exception: Coverage rate per SuperSack for Medium Roof Garden is approximately 75 square feet for a depth of 8”.

5. **Carlisle Roof Garden Plants**  
   a. Refer to **Roof Garden Attachment III** for specific plants based on types and hardening zones and options for planting of plugs, sedum cuttings, vegetated tiles and vegetated mats.
   
   b. If building owner requires special planting needs, contact Carlisle for assistance.

D. **Deep (Intensive) Roof Garden Installation**

1. **Carlisle Expanded or Extruded Polystyrene** (minimum 2” thick with drainage channels)  
   a. Loose lay insulation board directly over the waterproofing membrane with channeled side facing down.
   
   b. Insulation boards shall be butted with no gaps greater than ¼”.
   
   c. **Note**: As an alternate to the referenced insulation boards, CCW 300HV Protection Fabric may be used. Refer to article 3.05-C1 for installation instructions.

2. **Geomembrane Root Barrier**  
   Refer to article 3.05-C2 for installation and seaming instructions with the following addition: Geomembrane Root Barrier shall be loose laid over the protection fabric or polystyrene insulation.

3. **MiraDrain G4 Drainage Composite**  
   Refer to article 3.05-B1 for installation of the drainage composite with the following addition: When drainage composite is installed over polystyrene insulation joints in drainage composite and insulation shall be stagger a minimum of 6”.

4. **Carlisle Engineered Growth Media**  
   (Refer to **Roof Garden Attachment II** for growth media types based on building location and depth of media). Refer to article 3.05-B2 for installation instruction of growth media with the following exception: Coverage rate per SuperSack for Deep Assemblies are determined based on total depth required for special plants.

5. **Carlisle Roof Garden Plants** (Refer to **Roof Garden Attachment I**)  
   Because of unique design nature of Deep Roof Garden Assemblies, contact Carlisle for assistance on design and choices of plants.

E. **After installation of Roof Garden Components**

1. Irrigate the Roof Garden with a lawn sprinkler, hand sprayer, or with a designed irrigation system until saturation to the point of runoff.

2. Refer to **Roof Garden Attachment VI** for maintenance schedule.
Shallow (Ultra-Extensive) Roof Garden Assembly

A shallow planting system (2.5" to 4" in depth) ideally suited for areas that will receive little maintenance. Recommended plants include sedums, herbs and grasses. The anticipated weight of the assembly above the membrane is generally between 4.8 and 6 pounds per square foot, per inch of growth media depth, in a saturated state.

A. Vegetative Components – Carlisle vegetated components are installed directly above the waterproofing components.

1. CCW MiraDRAIN G4 Drainage Composite
2. 2.5” – 4” Carlisle Engineered Growth Media
   a. Saturated Weight of 4” deep: Approx. 27-lbs per square foot
   b. Dry Weight of 4” deep: Approx. 16-lbs per square foot
3. Carlisle Vegetated Sedum Tiles, Carlisle Vegetated Sedum Mats, Carlisle Sedum Plugs, or Sedum Cuttings & Carlisle Moisture Retention Gel

B. Waterproofing Components

<table>
<thead>
<tr>
<th>Membrane Options for 10 or 15 Year Warranty</th>
<th>Membrane Options for 20-Year Warranty</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-mil Sure-Seal EPDM(1)(2)</td>
<td>75-mil Sure-Tough EPDM(1)(2)</td>
</tr>
<tr>
<td>60-mil Sure-Weld TPO or 60-mil Sure-Flex PVC(1)(3)(4)</td>
<td>72-mil Sure-Weld EXTRA TPO or 80-mil Sure-Flex PVC(1)(3)(4)</td>
</tr>
<tr>
<td>105 AFX-Plus FleeceBACK(1)(2) or 135 AFX TPO(1)(3) hot mopped directly over structural concrete.</td>
<td>105 AFX-Plus FleeceBACK(1)(2) or 135 AFX TPO(1)(3) hot mopped with two plies of base sheets directly over structural concrete.</td>
</tr>
<tr>
<td>115-mil Sure-Weld TPO(3) or Sure-Seal FleeceBACK(2) adhered with FAST Adhesive directly over structural sloped concrete.</td>
<td>115-mil Sure-Weld TPO(3) or Sure-Seal FleeceBACK(2) adhered with FAST Adhesive directly over structural sloped concrete.</td>
</tr>
</tbody>
</table>

(1) When positive slope is incorporated by tapered insulation, non-FleeceBACK or AFX membranes may be adhered to a coverboard (DensDeck Prime or SecuRock) which has been adhered to the insulation with Carlisle Insulation Adhesive.
(2) Sure-Seal and Sure-Tough EPDM Membranes shall be seamed with 3” Factory Applied Tape and overlaid with 6” Pressure-Sensitive Cured Cover Strip
(3) Sure-Weld TPO membrane seams shall be heat-welded and overlaid with 6” TPO Pressure-Sensitive Cover Strip
(4) Sure-Flex PVC Membrane seams shall be heat-welded and overlaid with a 6” PVC welded cover strip

Medium (Extensive) Roof Garden Assembly

A medium depth planting system (growth media depth of 5" to 8") where recommended plants include sedums, herbs, grasses and other vegetation which can grow in this depth of media. In temperate climates, un-irrigated systems can be provided without difficulty; however, drip, mist or spray irrigation systems may be required to support more diverse plant types or for installations in semi-arid climates. The anticipated weight above the membrane assembly is generally less than 50 pounds per square foot.
A. Vegetative Components – Carlisle vegetated components are installed directly above the waterproofing components.

1. CCW 300HV Protection Fabric
2. 40-mil non-reinforced Geomembrane Root Barrier
3. CCW MiraDRAIN G4 Drainage Composite
4. 5” – 8” Carlisle Engineered Growth Media
   a. Saturated Weight: 27-lbs to 50-lbs per square foot
   b. Dry Weight: 14.5-lbs to 31-lbs per square foot
5. Carlisle Vegetated Sedum Tiles, Carlisle Vegetated Sedum Mats, Carlisle Sedum Plugs, Perennial Plugs, Grasses, or Sedum Cuttings & Carlisle Moisture Retention Gel

B. Waterproofing Components

<table>
<thead>
<tr>
<th>Membrane Options for 10 or 15 Year Warranty</th>
<th>Membrane Options for 20-Year Warranty</th>
</tr>
</thead>
<tbody>
<tr>
<td>75-mil Sure-Tough EPDM(1)(2)</td>
<td>90-mil Sure-Seal EPDM(1)(2)</td>
</tr>
<tr>
<td>72-mil Sure-Weld EXTRA TPO or 80-mil Sure-Flex PVC(1)(3)(4)</td>
<td>80-mil Sure-Weld EXTRA TPO or 80-mil Sure-Flex PVC(1)(3)(4)</td>
</tr>
<tr>
<td>105 AFX-Plus FleeceBACK(1)(2) or 135 AFX TPO(1)(3) hot mopped with two plies of base sheets directly over structural concrete.</td>
<td>105 AFX-Plus FleeceBACK(1)(2) or 135 AFX TPO(1)(3) hot mopped with two plies of base sheets directly over structural concrete.</td>
</tr>
<tr>
<td>115-mil Sure-Weld TPO(3) or Sure-Seal FleeceBACK(2) adhered with FAST Adhesive directly over structural slope concrete.</td>
<td>115-mil Sure-Weld TPO(3) or Sure-Seal FleeceBACK(2) adhered with FAST Adhesive directly over structural slope concrete.</td>
</tr>
</tbody>
</table>

(1) When positive slope is incorporated by tapered insulation, non-FleeceBACK or AFX membranes may be adhered to a coverboard (DensDeck Prime or SecuRock) which has been adhered to the insulation with Carlisle Insulation Adhesive. (2) Sure-Seal and Sure-Tough EPDM Membranes shall be seamed with 3” Factory Applied Tape and overlaid with 6” Pressure-Sensitive Cured Cover Strip. (3) Sure-Weld TPO membrane seams shall be heat-welded and overlaid with 6” TPO Pressure-Sensitive Cover Strip. (4) Sure-Flex PVC Membrane seams shall be heat-welded and overlaid with a 6” PVC welded cover strip.

Deep (Intensive) Roof Garden Assembly

A deep planting system (growth media depth greater than 8”) where recommended plants available include turf grass, annual or perennial flowers, shrubs and even small trees. In most climates, deep systems require regular maintenance such as watering, fertilizing and mowing/weeding. This system typically requires a structural concrete roof deck to support the larger dead load. An irrigation system may be utilized in these assemblies, as required. The anticipated weight above the membrane assembly is generally greater than 50 pounds per square foot.

A. Vegetative Components – Carlisle vegetated components are installed directly above the waterproofing components.

1. Min 2” polystyrene (Carlisle Insulfoam, Foamular, or Dow) with drainage channels or CCW 300HV Protection Fabric
2. 40-mil non-reinforced Geomembrane Root Barrier
3. CCW MiraDRAIN G4 Drainage Composite
4. Greater than 8” Carlisle Engineered Growth Media
   a. Saturated Weight: Greater than 50-lbs per square foot
   b. Dry Weight: Greater than 23-lbs per square foot
5. Carlisle Vegetated Sedum Tiles, Carlisle Vegetated Sedum Mats, Carlisle Sedum Plugs, Perennial Plugs, Grasses, Shrubs, or Sedum Cuttings & Carlisle Moisture Retention Gel
### B. Waterproofing Components

<table>
<thead>
<tr>
<th>Membrane Options for 10 or 15 Year Warranty</th>
<th>Membrane Options for 20-Year Warranty</th>
</tr>
</thead>
<tbody>
<tr>
<td>90-mil Sure-Seal EPDM&lt;sup&gt;(1)(2)&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>80-mil Sure-Weld EXTRA TPO or 80-mil Sure-Flex PVC&lt;sup&gt;(1)(3)(4)&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>105 AFX-Plus FleeceBACK&lt;sup&gt;(1)(2)&lt;/sup&gt; or 135 AFX TPO&lt;sup&gt;(1)(3)&lt;/sup&gt; hot mopped with two plies of base sheets directly over structural concrete.</td>
<td></td>
</tr>
<tr>
<td>115-mil Sure-Weld TPO&lt;sup&gt;(3)&lt;/sup&gt; or Sure-Seal FleeceBACK&lt;sup&gt;(2)&lt;/sup&gt; adhered with FAST Adhesive directly over structural sloped concrete.</td>
<td>145-mil Sure-Seal FleeceBACK&lt;sup&gt;(2)&lt;/sup&gt; adhered with FAST Adhesive directly over structural concrete.</td>
</tr>
</tbody>
</table>

<sup>(1)</sup> When positive slope is incorporated by tapered insulation, non-FleeceBACK or AFX membranes may be adhered to a coverboard (DensDeck Prime or SecuRock) which has been adhered to the insulation with Carlisle Insulation Adhesive.

<sup>(2)</sup>Sure-Seal and Sure-Tough EPDM Membranes shall be seamed with 3” Factory Applied Tape and overlaid with 6” Pressure-Sensitive Cured Cover Strip.

<sup>(3)</sup>Sure-Weld TPO membrane seams shall be heat-welded and overlaid with 6” TPO Pressure-Sensitive Cover Strip.

<sup>(4)</sup>Sure-Flex PVC Membrane seams shall be heat-welded and overlaid with a 6” PVC welded cover strip.
Carlisle Engineered Growth Media (CEGM) is available in five different blends based on geography and depth requirements for plant growth. These blends are engineered specifically for roof gardens to be lightweight, resistant to decomposition, and high water holding capacity while maintaining air porosity within the growth media. Carlisle Engineered Growth Media is blended to strict FLL-compliant standards. Each Carlisle Blend is packaged in 1.35 to 2.0 cubic yard SuperSacks weighing 1,450 to 3,000 pounds.

1. **Intensive** blends are for growth media depths 6-inches and greater
2. **Extensive** blends are for growth media depths less than 6-inches.
3. **Lightweight** blend can be used anywhere the Extensive blend is used and is 27% lighter in lbs per cubic foot.
4. **Pacific Northwest** blends are limited to WA, OR, ID, MT and WY

Below is a chart showing the physical properties of each blend:

<table>
<thead>
<tr>
<th>Depths</th>
<th>FLL Standards 6-inches or greater</th>
<th>2.5-inches to 5.9-inches</th>
<th>6-inches or greater</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth Media Blends(1)</td>
<td>Extensive</td>
<td>Intensive</td>
<td>Lightweight (2)</td>
</tr>
<tr>
<td>Bulk Density (dry weight)</td>
<td>lbs/ft³</td>
<td>45.7</td>
<td>34.0</td>
</tr>
<tr>
<td>Bulk Density (saturated weight)</td>
<td>lbs/ft³</td>
<td>72.5</td>
<td>69.3</td>
</tr>
<tr>
<td>Total Pore Volume</td>
<td>Vol %</td>
<td>71.9</td>
<td>73.4</td>
</tr>
<tr>
<td>Maximum Water Holding Capacity</td>
<td>Vol %</td>
<td>&gt;35</td>
<td>&gt;45</td>
</tr>
<tr>
<td>Air-Filled Porosity (at max. WHC)</td>
<td>Vol %</td>
<td>&gt;10</td>
<td>&gt;10</td>
</tr>
<tr>
<td>Water Permeability</td>
<td>cm/s</td>
<td>&gt;0.001</td>
<td>0.03</td>
</tr>
<tr>
<td>Water Permeability</td>
<td>in/min.</td>
<td>&gt;0.0236</td>
<td>0.731</td>
</tr>
<tr>
<td>pH</td>
<td>6.5 - 8.0</td>
<td>6.6</td>
<td>6.7</td>
</tr>
<tr>
<td>Soluble Salts (water, 1:10, m:v)</td>
<td>mmhos/cm</td>
<td>0.1</td>
<td>0.23</td>
</tr>
<tr>
<td>Soluble Salts (water, 1:10, m:v)</td>
<td>g (KC1)/L</td>
<td>&lt;3.5</td>
<td>0.47</td>
</tr>
<tr>
<td>Organic Matter Content</td>
<td>mass %</td>
<td>&lt;8</td>
<td>5.2</td>
</tr>
</tbody>
</table>

(1) Saturated weight of growth media is approximately 6 lbs/ft²/in unless otherwise noted.
(2) Saturated weight of growth media is approximately 4.8 lbs/ft²/in.

**Installation** – Carlisle growth media shall be applied over an approved Carlisle Roof Garden Waterproofing Assembly and protection courses. Sacks may be lowered to 2’ – 4’ above the rooftop by crane where the bags are slit with a knife or other cutting device and then dispensed directly from the sack to the roof or into wheelbarrows to be transported to hard to reach areas. Approx. coverage rate per sack: 4” depth approximately 150 square feet and 8” depth 75 square feet per sack.

Caution must be exercised when Carlisle Growth Media is applied during windy conditions to limit potential scouring of media and if not used on the day of arrival, product should be stored under a tarp or other non-clear cover to prevent direct exposure to sunlight and moisture.
A. **Sedums** – A low growing groundcover plant that is very resilient and drought tolerant. There are over 500 varieties from annual and creeping herbs to shrubs. These succulents can be found throughout the northern hemisphere, but location is important; some varieties are able to handle a cold-hardy condition while others are more heat tolerant. Carlisle has specifically chosen the listed sedums for rooftop environments. Selection assistance is available through Carlisle SynTec Incorporated.

1. **Sedum Plugs** – Carlisle sedum plugs are available in 10”x 20” flats/trays weighting approximately 4 pounds each containing either twenty-four 2.5” diameter plugs or seventy-two 1.5” diameter plugs.

   a. **Installation** – 2.5” diameter plugs are recommend to be spaced 8” to 9” on center (1.78 to 2.25 plugs per square foot). 1.5” diameter plugs are recommended to be spaced 6” to 8” on center (2.25 to 4 plugs per square foot). After spacing has been determined, a 2” deep indentation is made into the growth media, the plug is inserted, vegetation facing upwards, and the growth media is tamped by hand around the submerged plug base. Once planting is complete, irrigate the Roof Garden to the point of runoff.

2. **Carlisle Moisture Retention Gel and Sedum Cuttings**

   a. **Carlisle Moisture Retention Gel** – Used in conjunction with Carlisle’s Sedum Cuttings to ensure rapid rooting and growth of vegetated rooftops. Designed to hold large quantities of water at the surface of the growth media so that cuttings have immediate access to hydration as the plants’ roots form and grow. Available in sealed 50 lb. bags, with a coverage rate of 1 lb per 200 ft$^2$.

      i. **Installation** – Apply via a handheld rotary spreader or by hand broadcast. Most rotary spreaders should be operated at a rate of roughly 1 pound per 200 square feet. Once Carlisle Moisture Gel is applied, apply sedum cuttings and water the surface of the growth media until the gel expands to roughly four times its applied size.

   b. **Sedum Cuttings** – Carlisle sedum cuttings are available in bulk and are sold by the pound. More than 12 different varieties of sedum cuttings can be used to propagate Carlisle Roof Gardens. Carlisle sedum cuttings must be planted with Carlisle Moisture Retention Gel to ensure that cuttings have adequate moisture to successfully root in a rooftop environment. Available in insulated boxes containing between 20 to 35 lbs. of single-variety or mixed cuttings.

      i. **Installation** – Once Carlisle Retention Gel is distribute across the entire surface of the growth media, cuttings may be applied manually or by hand broadcasting. Recommended rate of cuttings application is 1 pound per 10 square feet for rapid vegetative coverage. After cuttings are applied, the Roof Garden must be immediately irrigated to the point of runoff and the Moisture Retention Gel becomes expanded and saturated. When cuttings are used to propagate the Roof Garden, it is absolutely mandatory that an irrigation system be used for a minimum of 60 days to ensure proper establishment of the cuttings. Refer to Roof Garden Attachment VI for irrigation and maintenance.
3. Available Plant Varieties from Carlisle by Hardening Zones

United States Hardening Zones 2 through 10

**Zone 2**
- Arenaria Montana
- Cerastium tomentosum
- Saponaria ocymoides
- Thymus praecox ‘Purple Carpet’
- Veronica liwanensis

**Zone 3**
- Achillea ‘Appleblossom’
- Achillea millefolium ‘Summer Pastels’
- Achillea millefolium ‘Summer Wine’
- Achillea ‘Moonshine’
- Achillea ‘Paprika’
- Achillea ‘Terra Cotta’
- Arenaria montana
- Armeria maritima ‘Alba’
- Artemisia stelleriana ‘Silver Brocade’
- Aurinia saxatilis ‘Gold Dust’
- Cerastium tomentosum
- Phlox subulata ‘Candystripe’
- Phlox subulata ‘Crimson Beauty’
- Phlox subulata ‘Drummons Pink’
- Phlox subulata ‘Emerald Blue’
- Phlox subulata ‘Fort Hill’
- Phlox subulata ‘Red Wing’
- Phlox subulata ‘White Delight’
- Saponaria ocymoides
- Scabiosa columbaria ‘Pink Mist’
- Sedum acre ‘Gold Moss’
- Sedum album ‘Coral Carpet’
- Sedum hispanicum ‘Purple Form’
- Sedum kamtschaticum
- Sedum kamtschaticum ‘W. Gold’
- Sedum sieboldii
- Sedum spurium ‘Fuldaglut’
- Sedum spurium ‘John Creech’
- Sedum spurium ‘Red Carpet’
- Sedum spurium ‘Tricolor’
- Thymus praecox ‘Purple Carpet’
- Thymus pseudolusiganus ‘Wooly Thyme’
- Veronica liwanensis

**Zone 4**
- Achillea ‘Appleblossom’
- Achillea millefolium ‘Summer Pastels’
- Achillea millefolium ‘Summer Wine’
- Achillea ‘Moonshine’
- Achillea ‘Paprika’
- Achillea ‘Terra Cotta’
Plant Varieties Cont.

- Achillea x lewisii 'King Edward'
- Arenaria montana
- Armeria maritima 'Alba'
- Armeria maritima 'Splendens'
- Artemisia stelleriana 'Silver Brocade'
- Aurinia saxatilis 'Gold Dust'
- Aurinia saxatilis 'Summit'
- Cerastium tomentosum
- Dianthus deltoides 'Brilliant'
- Dianthus 'Spangled Star'
- Phlox subulata 'Candystripe'
- Phlox subulata 'Crimson Beauty'
- Phlox subulata 'Drummons Pink'
- Phlox subulata 'Emerald Blue'
- Phlox subulata 'Fort Hill'
- Phlox subulata 'Red Wing'
- Phlox subulata 'White Delight'
- Potentilla nepalensis 'Miss Wilmot'
- Saponaria ocymoides
- Scabiosa columbaria 'Pink Mist'
- Sedum acre 'Gold Moss'

Zone 5

- Achillea 'Appleblossom'
- Achillea x lewisii 'King Edward'
- Achillea millefolium 'Summer Pastels'
- Achillea millefolium 'Summer Wine'
- Achillea 'Moonshine'
- Achillea 'Paprika'
- Achillea 'Terra Cotta'
- Arenaria montana
- Armeria maritima 'Alba'
- Armeria maritima 'Dusseldorfer Stolz'
- Artemisia stelleriana 'Silver Brocade'
- Aurinia saxatilis 'Gold Dust'
- Aurinia saxatilis 'Summit'
- Cerastium tomentosum
- Delosperma nubigenum
- Dianthus deltoides 'Brilliant'
- Dianthus 'Spangled Star'
- Lavandula angustifolia 'Hidcote'
- Phlox subulata 'Candystripe'
- Phlox subulata 'Crimson Beauty'
- Phlox subulata 'Drummons Pink'
- Phlox subulata 'Emerald Blue'
- Phlox subulata 'Fort Hill'
- Phlox subulata 'Red Wing'
- Phlox subulata 'White Delight'
- Potentilla nepalensis 'Miss Wilmot'
- Saponaria ocymoides
- Scabiosa columbaria 'Pink Mist'
- Sedum acre 'Gold Moss'
- Sedum album 'Coral Carpet'
- Sedum hispanicum 'Purple Form'
- Sedum kamtschaticum
- Sedum kamtschaticum 'W. Gold'
- Sedum kamtschaticum k. varigatum
- Sedum rupestris 'Angelina'
- Sedum sexangular
- Sedum sieboldii
- Sedum spurium 'Fuldaglut'
- Sedum spurium 'John Creech'
- Sedum spurium 'Red Carpet'
- Sedum spurium 'Tricolor'
- Sempervivum 'Black'
- Sempervivum 'Cobweb Buttons'
- Thymus praecox 'Bressingham'
- Thymus praecox 'Purple Carpet'
- Thymus pseudolanuginosus 'Wooly Thyme'
- Thymus serpyllum 'Albus' ('Album')
- Thymus serpyllum 'Coccineum'
- Thymus serpyllum 'Elfin'
- Veronica liwanensis
Plant Varieties Cont.

Zone 6

- Achillea 'Appleblossom'
- Achillea x lewisi 'King Edward'
- Achillea millefolium 'Summer Pastels'
- Achillea millefolium 'Summer Wine'
- Achillea 'Moonshine'
- Achillea 'Paprika'
- Achillea 'Terra Cotta'
- Agastache 'Blue Fortune'
- Arenaria montana
- Armeria maritima 'Alba'
- Armeria maritima 'Dusseldorfer Stolz'
- Armeria maritima 'Splendens'
- Artemisia stelleriana 'Silver Brocade'
- Aurinia saxatilis 'Gold Dust'
- Aurinia saxatilis 'Summit'
- Cerastium tomentosum
- Delosperma cooperi
- Delosperma nubigenum
- Dianthus deltoides 'Brilliant'
- Dianthus 'Spangled Star'
- Lavandula angustifolia 'Hidcote'
- Phlox subulata 'Candystripe'
- Phlox subulata 'Crimson Beauty'
- Phlox subulata 'Drummons Pink'
- Phlox subulata 'Emerald Blue'
- Phlox subulata 'Fort Hill'
- Phlox subulata 'Red Wing'
- Phlox subulata 'White Delight'
- Potentilla nepalensis 'Miss Wilmot'
- Saponaria ocymoides
- Scabiosa columbaria 'Pink Mist'
- Sedum acre 'Gold Moss'
- Sedum album 'Coral Carpet'
- Sedum hispanicum 'Purple Form'
- Sedum kamtschaticum
- Sedum kamtschaticum k. varigatum
- Sedum kamtschaticum 'W. Gold'
- Sedum reflexum 'Blue Spruce'
- Sedum rupestre 'Angelina'
- Sedum sexangulare
- Sedum sieboldii
- Sedum spurium 'Fuldaglut'
- Sedum spurium 'John Creech'
- Sedum spurium 'Red Carpet'
- Sedum spurium 'Tricolor'
- Sempervivum 'Black'
- Sempervivum 'Cobweb Buttons'
- Thymus praecox 'Bressingham'
- Thymus praecox 'Purple Carpet'
- Thymus pseudolanuginosus 'Wooly Thyme'
- Thymus serpyllum 'Albus' ('Album')
- Thymus serpyllum 'Coccineum'
- Thymus serpyllum 'Elfín'
- Veronica liwanensis

Zone 7

- Achillea 'Appleblossom'
- Achillea x lewisi 'King Edward'
- Achillea millefolium 'Summer Pastels'
- Achillea millefolium 'Summer Wine'
- Achillea 'Moonshine'
- Achillea 'Paprika'
- Achillea 'Terra Cotta'
- Agastache 'Blue Fortune'
- Arenaria montana
- Armeria maritima 'Alba'
- Armeria maritima 'Dusseldorfer Stolz'
- Armeria maritima 'Splendens'
- Artemisia stelleriana 'Silver Brocade'
- Aurinia saxatilis 'Gold Dust'
- Aurinia saxatilis 'Summit'
- Cerastium tomentosum
- Delosperma cooperi
- Delosperma nubigenum
- Dianthus deltoides 'Brilliant'
- Dianthus 'Spangled Star'
- Lavandula angustifolia 'Hidcote'
- Phlox subulata 'Candystripe'
- Phlox subulata 'Crimson Beauty'
- Phlox subulata 'Drummons Pink'
- Phlox subulata 'Emerald Blue'
- Phlox subulata 'Fort Hill'
- Phlox subulata 'Red Wing'
- Phlox subulata 'White Delight'
- Potentilla nepalensis 'Miss Wilmot'
- Saponaria ocymoides
- Scabiosa columbaria 'Pink Mist'
- Sedum acre 'Gold Moss'
- Sedum album 'Coral Carpet'
- Sedum hispanicum 'Purple Form'
- Sedum kamtschaticum
- Sedum kamtschaticum k. varigatum
- Sedum kamtschaticum 'W. Gold'
- Sedum reflexum 'Blue Spruce'
Plant Varieties Cont.

- Sedum rupestre ‘Angelina’
- Sedum sexangular
- Sedum sieboldii
- Sedum spurium ‘Fuldaglut’
- Sedum spurium ‘John Creech’
- Sedum spurium ‘Red Carpet’
- Sedum spurium ‘Tricolor’
- Sempervivum ‘Black’
- Sempervivum ‘Cobweb Buttons’
- Thymus praecox ‘Bressingham’
- Thymus praecox ‘Purple Carpet’
- Thymus pseudolanuginosus ‘Wooly Thyme’
- Thymus serpyllum ‘Albus’ (‘Album’)
- Thymus serpyllum ‘Coccineum’
- Thymus serpyllum ‘Elfin’
- Veronica liwanensis

Zone 8

- Achillea ‘Appleblossom’
- Achillea x lewisii ‘King Edward’
- Achillea millefolium ‘Summer Pastels’
- Achillea millefolium ‘Summer Wine’
- Achillea ‘Moonshine’
- Achillea ‘Paprika’
- Achillea ‘Terra Cotta’
- Agastache ‘Blue Fortune’
- Armeria maritima ‘Alba’
- Armeria maritima ‘Dusseldorfer Stolz’
- Armeria maritima ‘Splendens’
- Artemisia stelleriana ‘Silver Brocade’
- Aurinia saxatilis ‘Gold Dust’
- Aurinia saxatilis ‘Summit’
- Delosperma cooperi
- Delosperma nubigenum
- Dianthus deltoides ‘Brilliant’
- Dianthus ‘Spangled Star’
- Lavandula angustifolia ‘Hidcote’
- Sedum acre ‘Gold Moss’
- Sedum album ‘Coral Carpet’
- Sedum hispanicum ‘Purple Form’
- Sedum kamtschaticum
- Sedum kamtschaticum k. varigatum
- Sedum reflexum ‘Blue Spruce’
- Sedum rupestre ‘Angelina’
- Sedum sexangular
- Sedum sieboldii
- Sedum spurium ‘Fuldaglut’
- Sedum spurium ‘John Creech’
- Sedum spurium ‘Red Carpet’
- Sedum spurium ‘Tricolor’
- Sempervivum ‘Black’
- Sempervivum ‘Cobweb Buttons’
- Thymus praecox ‘Bressingham’
- Thymus praecox ‘Purple Carpet’
- Thymus pseudolanuginosus ‘Wooly Thyme’
- Thymus serpyllum ‘Albus’ (‘Album’)
- Thymus serpyllum ‘Coccineum’
- Thymus serpyllum ‘Elfin’
- Veronica liwanensis

Zone 9

- Achillea millefolium ‘Summer Pastels’
- Achillea millefolium ‘Summer Wine’
- Achillea ‘Moonshine’
- Achillea ‘Paprika’
- Achillea ‘Terra Cotta’
- Agastache ‘Blue Fortune’
- Armeria maritima ‘Dusseldorfer Stolz’
- Armeria maritima ‘Splendens’
- Artemisia stelleriana ‘Silver Brocade’
- Delosperma cooperi
- Delosperma nubigenum
- Dianthus deltoides ‘Brilliant’
- Dianthus ‘Spangled Star’
- Sedum kamtschaticum k. varigatum
- Sedum reflexum ‘Blue Spruce’
- Sedum sieboldii
- Sempervivum ‘Black’

Zone 10 – Please contact Carlisle for plants suitable to Zone 10.
Roof Garden
"Attachment IV"
Carlisle Vegetated Tiles
June 2010

A. Vegetated Sedum Tiles – Carlisle’s Vegetated Sedum Tiles are well suited for high slope applications and are pre-grown in four different mixes of 6 to 8 sedum varieties. Each tile is available in 2.08 square foot trays weighing approximately 4.5 pounds (~3.2 pounds per square foot). Vegetated coverage after installation is approximately 95% or greater. Vegetated Sedum Tiles can be specified for US Hardening Zones 3 through 8. For Hardening Zones 9 and 10, please contact Carlisle for guidance. For US Hardening Zone Map refer to Roof Garden Attachment III.

B. Sedum Tiles Mixes

1. All Season Mix – This mix provides flowers throughout the whole growing season. Winter interest and seasonal foliage color changes are also found in this group. This is a good, general-purpose mix that provides year-round beauty.

   Sedum varieties:
   - Sedum album ‘Coral Carpet’
   - Sedum h. ‘Immergrunchen’
   - Sedum floriferum ‘Weihenstephaner Gold’
   - Sedum middendorffianum diffusum
   - Sedum reflexum ‘Green Spruce’
   - Sedum spurius ‘Coccineum’
   - Sedum spurius ‘Fuldaglut’
   - Sedum spurius ‘John Creech’
   - Sedum spurius ‘Green Mantle’
   - Sedum spurius ‘Red Carpet’
   - Sedum stefco
   - Sedum takesimensis ‘Golden Carpet’
   - Sedum tetractinum ‘Coral Reef’

2. Color Max Mix – Color Max includes a bed of sedums for use when maximum color is desired. This comes in the form of brightly colored foliage, flowers in abundance, and colors that blend together well.

   Sedum varieties:
   - Sedum acre ‘Aurea’
   - Sedum album ‘Coral Carpet’
   - Sedum album ‘Orange Ice’
   - Sedum floriferum ‘Weihenstephaner Gold’
   - Sedum kamtschaticum ‘Variegatum’
   - Sedum reflexum ‘Blue Spruce’
   - Sedum rupestre ‘Angelina’
   - Sedum spurius ‘Green Mantle’
   - Sedum spurius ‘John Creech’
   - Sedum spurius ‘Red Carpet’
   - Sedum spurius ‘Summer Glory’
   - Sedum spurius ‘Tricolor’
3. **Shade Mix** – The plants in Shade Mix are those that have demonstrated abilities to withstand shaded areas. Most sedums do best in higher light, but this group excels when the rooftop receives less than 4 hours of direct sunlight per day.

**Sedum varieties:**

- Sedum acre ‘Aurea’
- Sedum h. ‘Immergrunchen’
- Sedum pachyclados
- Sedum sexangulare
- Sedum spurium ‘Album Superbum’
- Sedum spurium ‘Eco Mt. Emei’
- Sedum spurium ‘Fuldaglut’
- Sedum spurium ‘Green Mantle’
- Sedum spurium ‘John Creech’
- Sedum ternatum

4. **Tuff Stuff Mix** – The sedums in Tuff Stuff are the toughest, most durable, most drought resistant choices available. They have proven ability to survive wind, cold, heat, drought, and tough environments that limit plant choices.

**Sedum varieties:**

- Sedum album ‘Coral Carpet’
- Sedum cauticolum
- Sedum ellacombianum
- Sedum hybridum ‘Czar’s Gold’
- Sedum kamtschaticum
- Sedum middendorffianum diffusum
- Sedum rupestre
- Sedum sexangulare
- Sedum spurium sp.
- Sedum spurium ‘Roseum’
- Sedum spurium ‘Voodoo’
- Sedum stefco

C. **Installation** - Remove the tiles from the cardboard stacking containers with care. Simply place the Sedum Tiles over a minimum 2.5” of Carlisle Growth Media, leaving 1/8”-1/4” gap between the Tiles. Water the Roof Garden assembly to the point of system saturation and water begins to leave the assembly.
Roof Garden
"Attachment V"
Carlisle Vegetated Sedum Mats

June 2010

A. Vegetated Sedum Mats – Carlisle’s Vegetated Sedum Mats are well suited for high slope applications and are pre-grown with a large variety of sedums. Each mat is available in 21.25 – 25 square foot rolls weighing approximately 80 pounds. Vegetated coverage after installation is 85% or greater. Vegetated Sedum Mats can be specified for US Hardening Zones 3 through 8. For Hardening Zones 9 and 10, please contact Carlisle for guidance. For US Hardening Zone Map refer to Roof Garden Attachment III.

B. Sedum Mat Varieties

Carlisle’s Vegetated Sedum Mats are planted with a minimum of 7 different varieties of sedum to achieve a mix of colors and textures. Sedum varieties consist of:

- Sedum Acre
- Sedum Album
- Sedum Ellacombianum
- Sedum Kamtschaticum
- Sedum Pulchellum
- Sedum Reflexum ‘Blue Spruce’
- Sedum Spurium ‘Fuldaglut’
- Sedum Spurium ‘Dragons Blood’
- Sedum Spurium ‘John Creech’
- Sedum Spurium ‘Red Carpet’
- Sedum Spurium ‘Tricolor’
- Sedum Sexangular

C. Installation - Remove the Sedum Mats from the pallets with care. Simply place the Sedum Mats over a minimum 2.5" of Carlisle Growth Media, leaving 1/8"-1/4" gap between the Mats. Water the Roof Garden assembly to the point of system saturation and water begins to leave the assembly.
Roof Garden
"Attachment VI"
Roof Garden Maintenance

November 2011

Immediately After Planting
1. Water/irrigate the roof to the point of run-off.
2. Inspect drains for any foreign debris that may hinder their performance.

Irrigation Requirements
1. If Carlisle’s Sedum Tiles or Mats are used, water the system two to three times a week in the mid-morning for at least the first month.
2. If planting was accomplished by use of hydrated cuttings, the Roof Garden must be irrigated for a minimum of 60 days. The initial two weeks irrigation should occur twice a day, morning and early afternoon, tapering to once per day in the mid-morning for the remainder of the 60-day establishment period.
3. If planting was accomplished by the use of plugs, the Roof Garden must be irrigated for a minimum of 30 days. Watering events should occur once per day in the mid-morning during this period.
4. During extremely hot, dry, drought type conditions, regularly check your Roof Garden system for signs of stress. If the plants seem to be thirsty where they are wilted, you must irrigate the system. During these times, irrigation should be done twice a week in the morning or evenings.
5. If permanent irrigation is an option, Roof Garden plants will thrive and the overall system will be healthier. Permanent irrigation should be set to water twice a week during the mid-morning. During extremely hot, dry, drought type conditions, irrigation may need to be increased to ensure the survival of the Roof Garden plants.
6. If the Roof Garden was installed in an area that receives less than 35 inches of rainfall per year, a permanent irrigation system is required.

First Season
1. One month after planting, all weeds and non-specified plant material must be pulled from the growth media and removed from the rooftop. A minimum of two weed removal events should occur during the first season. If Carlisle’s Sedum Tiles or Mats are used, little to no weeding should be necessary.
2. During weed removal events, all drains must be inspected. If Carlisle Roof Garden Drain Boxes are utilized, remove the four Phillips head screws on the lid and remove to visually inspect the drain internals.
3. After the local trees have dropped their leaves, a final Autumn inspection must be performed. All debris must be removed from the Roof Garden and drains must be given a final inspection for the season.

Second Season
1. If in USDA climate 7 or above, a Spring fertilizer application may be given. Granular organic fertilizer can be used at the full rate recommended on the packaging. Petrochemical-based time-release fertilizer (Osmocote, Miracle-Gro, etc.) can be used at half the rate recommended on the packaging. Organic fertilization will result in a lower water requirement for the plants. On all-sedum roofs, fertilization should not be needed.
2. A mid-Spring weed removal and drain inspection event must occur. A total of two weed removal and drain inspection events should occur during the second season.
3. If irrigation is available during the second season, it will serve to enhance the growth of your Carlisle Roof Garden. If Carlisle’s Sedum Tiles or Mats are used, neither watering nor weeding should be required.
4. After the local trees have dropped their leaves, a final Autumn inspection must be performed. All debris must be removed from the Roof Garden and drains must be given a final inspection for the season.

Third season
1. A Spring fertilizer application may be given, if needed.
2. One weed removal event must occur, in the mid-Spring
3. During the Autumn maintenance event, all foreign debris must be removed from the roof

If possible, monitor your Carlisle Roof Garden by visual examination at least once a month to make sure that the plants appear healthy. Should your roof garden experience any health-related issues, contact Carlisle SynTec Inc. for support. Once established, your Carlisle Roof Garden should provide you with decades of beautiful and trouble-free service.
**Table Footnotes**

A. **Acceptable Insulation Substrate:** A COVER-BOARD (DensDeck Prime OR SecuRock) MUST BE ADHERED TO THE INSULATION WITH FAST ADHESIVE, PRIOR TO MEMBRANE ADHESION.

B. **Acceptable Membrane on Concrete:** WHEN WATERPROOFING MEMBRANE TO BE APPLIED DIRECTLY TO STRUCTURAL OR LIGHTWEIGHT CONCRETE SUBSTRATE, FleeceBACK OR FleeceBACK AFX MEMBRANE MUST BE USED.

C. **EPDM Seams:** EPDM MEMBRANE SHALL BE SEAMED WITH MINIMUM 3" (76 mm) F.A.T. (FACTORY APPLIED TAPE) AND OVERLAID WITH 6" (152 mm) PRESSURE-SENSITIVE CURED COVER STRIP.

D. **TPO Seams:** SURE-WELD TPO MEMBRANE SEAMS SHALL BE HEAT-WELDED AND OVERLAID WITH 6" (152 mm) TPO PRESSURE-SENSITIVE COVER STRIP.

E. **PVC Seams:** SURE-FLEX PVC MEMBRANE SEAMS SHALL BE HEAT-WELDED AND OVERLAID WITH 6" (152 mm) PVC HEAT-WELDED COVER STRIP.

**Membrane Options Shallow Assembly**

<table>
<thead>
<tr>
<th>TABLE FOOTNOTES</th>
<th>10/15 - Year Warranty</th>
<th>20 - Year Warranty</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EPDM Membranes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(A) (C) 60-MIL EPDM Membrane.</td>
<td>75-MIL SURE-TOUGH EPDM.</td>
<td></td>
</tr>
<tr>
<td>(C) 115-MIL SURE-SEAL FleeceBACK, ADHERED WITH FAST ADHESIVE DIRECTLY OVER STRUCTURAL CONCRETE.</td>
<td>115-MIL SURE-SEAL FleeceBACK, ADHERED WITH FAST ADHESIVE DIRECTLY OVER STRUCTURAL CONCRETE.</td>
<td></td>
</tr>
<tr>
<td>(C) 105-MIL AFX-PLUS FleeceBACK, HOT Mopped DIRECTLY OVER STRUCTURAL CONCRETE.</td>
<td>105-MIL AFX-PLUS FleeceBACK, HOT Mopped WITH TWO PLIES OF BASE SHEETS OVER STRUCTURAL CONCRETE.</td>
<td></td>
</tr>
</tbody>
</table>

**TPO Membranes**

<table>
<thead>
<tr>
<th>TABLE FOOTNOTES</th>
<th>10/15 - Year Warranty</th>
<th>20 - Year Warranty</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) (D) 60-MIL SURE-WELD TPO.</td>
<td>72-MIL SURE-WELD EXTRA TPO.</td>
<td></td>
</tr>
<tr>
<td>(D) 115-MIL SURE-WELD FleeceBACK TPO, ADHERED WITH FAST ADHESIVE DIRECTLY OVER STRUCTURAL CONCRETE.</td>
<td>115-MIL SURE-WELD FleeceBACK TPO, ADHERED WITH FAST ADHESIVE DIRECTLY OVER STRUCTURAL CONCRETE.</td>
<td></td>
</tr>
<tr>
<td>(D) 135-MIL AFX TPO FleeceBACK, HOT Mopped DIRECTLY OVER STRUCTURAL CONCRETE.</td>
<td>135-MIL AFX TPO FleeceBACK, HOT Mopped WITH TWO PLIES OF BASE SHEETS DIRECTLY OVER STRUCTURAL CONCRETE.</td>
<td></td>
</tr>
</tbody>
</table>

**PVC Membranes**

<table>
<thead>
<tr>
<th>TABLE FOOTNOTES</th>
<th>10/15 - Year Warranty</th>
<th>20 - Year Warranty</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) (E) 60-MIL SURE-FLEX PVC.</td>
<td>80-MIL SURE-FLEX PVC.</td>
<td></td>
</tr>
<tr>
<td>(E) 115-MIL SURE-FLEX FleeceBACK PVC, ADHERED WITH FAST ADHESIVE DIRECTLY OVER STRUCTURAL CONCRETE.</td>
<td>115-MIL SURE-FLEX FleeceBACK PVC, ADHERED WITH FAST ADHESIVE DIRECTLY OVER STRUCTURAL CONCRETE.</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
- POSITIVE SLOPE MUST BE PROVIDED AT MEMBRANE SURFACE LEVEL, EITHER BY SLOPING THE STRUCTURAL DECK OR BY ADDING TAPERED INSULATION BOARD ON FLAT STRUCTURAL DECK. FOR ADDITIONAL INFORMATION, SEE SHEET 4A.
### Table Footnotes

#### A. Acceptable Insulation Substrate:
- **Cover-Board** (DensDeck Prime OR SecuRock) must be adhered to the insulation with fast adhesive, prior to membrane adhesion.

#### B. Acceptable Membrane on Concrete:
- When waterproofing membrane to be applied directly to structural or lightweight concrete substrate, FleeceBack or FleeceBack AFX membrane must be used.

#### C. EPDM Seams:
- EPDM membrane shall be seamed with minimum 3" (76 mm) F.A.T. (Factory Applied Tape) and overlaid with 6" (152 mm) pressure-sensitive cured cover strip.

#### D. TPO Seams:
- SURE-WELD TPO membrane seams shall be heat-welded and overlaid with 6" (152 mm) TPO pressure-sensitive cover strip.

#### E. PVC Seams:
- SURE-FLEX PVC membrane seams shall be heat-welded and overlaid with 6" (152 mm) PVC heat-welded cover strip.

---

### Membrane Options

#### Medium Assembly

<table>
<thead>
<tr>
<th>TABLE FOOTNOTES</th>
<th>10/15 - Year Warranty</th>
<th>20 - Year Warranty</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EPDM Membranes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(A) (C) 75-MIL EPDM Membrane</td>
<td>90-MIL SURE-TOUGH EPDM</td>
<td></td>
</tr>
<tr>
<td>(C) 115-MIL SURE-SEAL FleeceBack, adhered with fast adhesive directly over structural concrete</td>
<td>115-MIL SURE-SEAL FleeceBack, adhered with fast adhesive directly over structural concrete</td>
<td></td>
</tr>
<tr>
<td>(C) 105-MIL AFX-PLUS FleeceBack, hot mopped directly over structural concrete</td>
<td>105-MIL AFX-PLUS FleeceBack, hot mopped with two pieces of base sheets over structural concrete</td>
<td></td>
</tr>
<tr>
<td><strong>TPO Membranes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(A) (D) 72-MIL SURE-WELD TPO</td>
<td>90-MIL SURE-WELD EXTRA TPO</td>
<td></td>
</tr>
<tr>
<td>(D) 115-MIL SURE-WELD FleeceBack TPO, adhered with fast adhesive directly over structural concrete</td>
<td>115-MIL SURE-WELD FleeceBack TPO, adhered with fast adhesive directly over structural concrete</td>
<td></td>
</tr>
<tr>
<td>(D) 135-MIL AFX TPO FleeceBack, hot mopped with two pieces of base sheets directly over structural concrete</td>
<td>135-MIL AFX TPO FleeceBack, hot mopped with two pieces of base sheets directly over structural concrete</td>
<td></td>
</tr>
<tr>
<td><strong>PVC Membranes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(A) (E) 80-MIL SURE-FLEX PVC</td>
<td>80-MIL SURE-FLEX PVC</td>
<td></td>
</tr>
<tr>
<td>(E) 115-MIL SURE-FLEX FleeceBack PVC, adhered with fast adhesive directly over structural concrete</td>
<td>115-MIL SURE-FLEX FleeceBack PVC, adhered with fast adhesive directly over structural concrete</td>
<td></td>
</tr>
</tbody>
</table>

---

### Notes:
- **Positive slope must be provided at membrane surface level, either by sloping the structural deck or by adding tapered insulation board on flat structural deck.** For additional information, see Sheet 4A.
DEEP (GREATER THAN 8"
GOVENMENT ASSEMBLY

10/15 - YEAR WARRANTY
20 - YEAR WARRANTY

TABLE FOOT-NOTES

A. ACCEPTABLE INSULATION SUBSTRATE: A COVER-BOARD (DensDeck Prime OR SecuRock) MUST BE ADHERED TO THE INSULATION WITH FAST ADHESIVE, PRIOR TO MEMBRANE ADHESION.

B. ACCEPTABLE MEMBRANE ON CONCRETE: WHEN WATERPROOFING MEMBRANE TO BE APPLIED DIRECTLY TO STRUCTURAL OR LIGHTWEIGHT CONCRETE SUBSTRATE, FleeceBACK OR FleeceBACK AFX MEMBRANE MUST BE USED.

C. EPDM SEAMS: EPDM MEMBRANE SHALL BE SEAMED WITH MINIMUM 3" (76 mm) F.A.T. (FACTORY APPLIED TAPE) AND OVERLAID WITH 6" (152 mm) PRESSURE-SENSITIVE CURED COVER STRIP.

D. TPO SEAMS: SURE-WELD TPO MEMBRANE SEAMS SHALL BE HEAT-WELDED AND OVERLAID WITH 6" (152 mm) TPO PRESSURE-SENSITIVE COVER STRIP.

E. PVC SEAMS: SURE-FLEX PVC MEMBRANE SEAMS SHALL BE HEAT-WELDED AND OVERLAID WITH 6" (152 mm) PVC HEAT-WELDED COVER STRIP.

NOTE:
- POSITIVE SLOPE MUST BE PROVIDED AT MEMBRANE SURFACE LEVEL, EITHER BY SLOPING THE STRUCTURAL DECK OR BY ADDING TAPERED INSULATION BOARD ON FLAT STRUCTURAL DECK.
- FOR ADDITIONAL INFORMATION SEE SHEET 4A.
A  MEMBRANE DIRECT TO DECK

OPTION 1

OPTION 2

B  INSULATION BELOW MEMBRANE

OPTION 1

OPTION 2

NOTE:
TOP/BOTTOM LAYER OF CARLISLE RIGID BOARD INSULATION SHOULD BE TAPERED OR THE DECK SHALL BE STRUCTURALLY SLOPED IN BOTH OPTIONS.
DESIGN OPTIONS BASED ON DECK

NEW CONSTRUCTION

EXISTING DECKS

CARLISLE SUGGESTS POSITIVE SLOPE AT MEMBRANE LEVEL. IN RESULT, FLAT OR DEAD-LEVEL DECK IS NOT ACCEPTABLE UNLESS SLOPE IS CREATED. SEE VARIOUS OPTIONS BASED ON NEW CONSTRUCTION OR EXISTING DECKS

A

DESIGN A STRUCTURALLY SLOPED CONCRETE DECK & FULLY ADHERE FleeceBack OR FleeceBack AFX MEMBRANE. INSULATION MAY BE ADDED ABOVE MEMBRANE

OR

ADD FLAT INSULATION, BUT ENHANCE THE INSULATION SUBSTRATE BY ADDING DENS-DECK OR SECUROCK RIGHT UNDERNEATH THE MEMBRANE

B

IF ROOF DECK HAS TO BE FLAT, THEN ADD TAPERED LIGHTWEIGHT CONCRETE AND DIRECTLY ADHERE FleeceBack OR FleeceBack AFX MEMBRANE

OR

ADD TAPERED INSULATION, BUT ENHANCE THE INSULATION SUBSTRATE BY ADDING DENS-DECK OR SECUROCK UNDERNEATH THE MEMBRANE

C

FIELD VERIFY EXISTING CONCRETE DECK. IN CASE, IT IS FLAT OR SLOPE, IS NOT SUFFICIENT, THEN SIMILAR TO NEW CONSTRUCTION FIG. B, ADD TAPERED LIGHTWEIGHT CONCRETE AND DIRECTLY ADHERE FleeceBack OR FleeceBack AFX MEMBRANE OR ADD TAPERED INSULATION, BUT ENHANCE THE INSULATION SUBSTRATE BY ADDING DENS-DECK RIGHT UNDERNEATH THE MEMBRANE

D

UPON FIELD VERIFICATION, IF THE DECK IS FOUND TO HAVE SUFFICIENT SLOPE, THEN FOLLOW FIG. A ABOVE.

---

LEGEND

- STRUCTURAL CONCRETE
- LIGHTWEIGHT CONCRETE
- SLOPED
- FLAT INSULATION
- TAPERED INSULATION
- DENS-DECK OR SECUROCK BOARD
- ADHESIVE
- MEMBRANE
ROOF GARDEN TRANSITION DETAIL

1/4" (6.4mm)

3" (76mm) WIDE SecurTAPE EXTENDS 1/4" (6.4mm) TO PROTECT ROOF MEMBRANE FROM METAL BURR & CORNERS

PROVIDE 1/4" (6.4mm) SPACE BETWEEN EACH GARDEN EDGE UNIT

CARLISLE ALUMINUM ROOF GARDEN EDGE ADHERED WITH 3" (76mm) WIDE SecurTAPE. SEE ISOMETRIC ABOVE

ALTERNATE: CONCRETE PAVERS WITH PEDESTALS, SEE SHEET NO. RG9A

CCW PROTECTION FABRIC, HP-MAT OR CCW 200V OR CCW 300HV FABRIC

NOTE: USE 6" WIDE PRESSURE-SENSITIVE COVER STRIP ON SLOPES GREATER THAN 2" IN 12"

3" (76) WIDE SecurTAPE EXTENDS 1/4" (6.4mm) BEYOND ALUMINUM ROOF EDGE

CARLISLE ENGINEERED GROWTH MiraDRAIN G4 DRAINAGE COMPOSITE ROOF MEMBRANE FOR COMPONENTS BELOW MEMBRANE, REFER TO APPLICABLE DETAILS ON SHEET NO. 4

DETAILS NOT TO SCALE
APRIL 20, 2010
© 2010 Carlisle Syntec a division of Carlisle Construction Materials Incorporated

CARLISLE ROOF GARDEN DETAILS 2010 ROOF GARDEN DETAILS
PARAPET WALL TRANSITION

**SEE CARLISLE APPLICABLE UNIVERSAL DETAIL(S) UG SERIES, CORRESPONDING TO ROOF ASSEMBLY AND DESIGN OF RISING WALL**

**FOR TPO MEMBRANE, SPOT WELD AT TOP AT 3'-0" (914mm) O.C. FOR EPDM, SPOT SECURE WITH 6" (152mm) LONG PIECES OF SecurTAPE AT 3'-0" O.C.**

**USE SCRAP PIECE OF NON-FleeceBACK AS SACRIFICIAL MEMBRANE**

**SEE CARLISLE APPLICABLE UNIVERSAL DETAIL(S) U/P.S. –12 OR SW–12 SERIES, CORRESPONDING TO ROOF ASSEMBLY**

**ROOF MEMBRANE FULLY ADHERED FLASHING**

**MIN. 2'-0" (610mm)**

**CARLISLE ALUMINUM ROOF GARDEN EDGE**

**STONE BALLAST**

**3" (76mm) WIDE SecurTAPE EXTENDS 1/4" (6.4mm) TO PROTECT ROOF MEMBRANE FROM METAL BURR & CORNERS**

**NOTES:**
1. SACRIFICIAL MEMBRANE IS OPTIONAL WITH TPO ASSEMBLY.
2. FOR ALTERNATE DETAIL SEE DETAIL RG7

**NOTE: USE 6" WIDE PRESSURE-SENSITIVE COVER STRIP ON SLOPES GREATER THAN 2" IN 12"**
PARAPET WALL TRANSITION

SEE CARLISLE APPLICABLE
UNIVERSAL DETAIL(S) U/P.S. –12
OR SW–12 SERIES.
CORRESPONDING TO ROOF
ASSEMBLY.

ROOF MEMBRANE FULLY
ADHERED FLASHING

MIN. 2’–0” (610mm)

CARLISLE ALUMINUM ROOF
GARDEN EDGE

EXTEND C4 VERTICAL UP
TO PROTECT ROOF
MEMBRANE & FLASHING

STAINED GLASS STONE

3” (76mm) WIDE SecurTAPE EXTEmds
1/4” (6.4 mm) TO PROTECT ROOF
MEMBRANE FROM METAL BURR &
CORNERS

NOTES:
1. SACRIFICIAL MEMBRANE IS
OPTIONAL WITH TPO ASSEMBLY.

NOTE: USE 6” WIDE
PRESSURE-SENSITIVE COVER
STRIP ON SLOPES GREATER
THAN 2” IN 12”
PARAPET WALL TRANSITION

See Carlisle Applicable Universal Detail(s) U9 Series, Corresponding to Roof Assembly and Design of Rising Wall.

Roof Membrane Fully Adhered Flashing

Min. 2'-0" (610mm)

Carlisle Expanded Polystyrene Insulation

Concrete Pavers

HP-MAT or CCW200V Protection Fabric

Parapet Wall Transition

Approx. 4"

For Alternate Detail See Detail RGB

Use Scrap Piece of Non-FleeceBack as Sacrificial Membrane

For TPO Membrane, Spot Weld at Top at 3'-0" (914mm) O.C. For EPDM, Spot Secure with 6" (152mm) Long Pieces of SecurTAPE at 3'-0" O.C.

Per architect's/code approval

Detail(s) Not to Scale

April 20, 2010

© 2010 Carlisle SynTec a division of Carlisle Construction Materials, Incorporated

2010 Roof Garden Details

Page (Pdf) Sequence 011
CONCRETE PAVERS (WALKWAY) DETAIL

CARLISLE VEGETATION PER DETAIL RG1/RG2/RG3

CARLISLE ENGINEERED GROWTH MEDIA

MiroDRAIN G4 COMPOSITE DRAINAGE COMPOSITE

EPDM OR TPO MEMBRANE

FOR COMPONENTS BELOW MEMBRANE, REFER TO APPLICABLE DETAILS ON SHEET NO. 4

CARLISLE EXPANDED POLYSTYRENE INSULATION

CONCRETE PAVERS

HP-MAT OR CCW200V PROTECTION FABRIC

EXPANDED OR EXTRUDED POLYSTYRENE ([MIN. DENSITY OF 1.25 POUNDS/CUBIC FOOT) (20 KILOGRAMS/CUBIC METER)]

NOTE: AS AN ALTERNATE, MAY USE PEDESTALS UNDER THE PAVERS AND CARLISLE ALUMINUM ROOF GARDEN EDGE TO RETAIN THE GROWTH MEDIA. FOR RECOMMENDATIONS & ADDITIONAL INFORMATION REFER TO CARLISLE GUIDE SPECIFICATIONS FOR PLAZA WATERPROOFING.
CONCRETE PAVERS (WALKWAY) DETAIL

ALUMINUM EDGING ADHERED TO MEMBRANE WITH CARLISLE SecurTAPE

CONCRETE PAVERS

CCW200V OR CCW 300V PROTECTION FABRIC

PEDESTALS

FOR COMPONENTS BELOW MEMBRANE, REFER TO APPLICABLE DETAILS ON SHEET NO. 4

USE PEDESTALS UNDER THE PAVERS AND CARLISLE ALUMINUM ROOF GARDEN EDGE TO RETAIN THE GROWTH MEDIA. FOR RECOMMENDATIONS & ADDITIONAL INFORMATION REFER TO CARLISLE GUIDE SPECIFICATIONS FOR PLAZA WATERPROOFING.
NOTE:

1. THIS DETAIL APPLIES TO ALL 3 SYSTEMS, SHALLOW, MEDIUM & DEEP. USE 4" (100 mm) LOW PROFILE CARLISLE STRAINER BOX WITH SHALLOW AND MEDIUM SYSTEMS. USE HIGH PROFILE 8" (200 mm) CARLISLE STRAINER BOX WITH DEEP SYSTEMS.

2. COORDINATE WITH CARLISLE TECHNICAL STAFF, FOR CROSS-SECTION(S) DEEPER THAN 8" (200 mm) OR WHERE THE SPECIAL CONDITIONS EXIST.
NOTE:

1. THIS DETAIL APPLIES TO ALL 3 SYSTEMS, SHALLOW, MEDIUM & DEEP. USE 4" (100 mm) LOW PROFILE CARLISLE STRAINER BOX WITH SHALLOW AND MEDIUM SYSTEMS. USE HIGH PROFILE 8" (200 mm) CARLISLE STRAINER BOX WITH DEEP SYSTEMS.

2. COORDINATE WITH CARLISLE TECHNICAL STAFF, FOR CROSS-SECTION(S) DEEPER THAN 8" (200 mm) OR WHERE THE SPECIAL CONDITIONS EXIST.
INSTALL SACRIFICIAL PIECE OF FIELD MEMBRANE SIZED TO EXTEND BEYOND CARLISLE ALUMINUM ROOF GARDEN EDGE. CUT HOLE TO SLIDE DOWN THROUGH THE PIPE. SEE ISOMETRIC ON THIS SHEET.