ROOF GARDEN
Roofing Systems

Traditional

"Attachment I"
Roof Garden Care & Maintenance Requirements

July 2020

Introduction

Carlisle Roof Gardens can be a low maintenance feature of a building. Budget and time allowances for Roof Gardens vary dependent on design, e.g., growth media and plant selection. As with any biological system, Carlisle Roof Gardens require proper care and maintenance to thrive and perform as designed.

This attachment outlines Carlisle's requirements for maintenance on Roof Garden systems in American Horticultural Society (AHS) Plant Heat–Zones 3-8 when a Vegetation Warranty is purchased as part of a Carlisle Total Systems Warranty. Roof Garden systems installed outside of Zones 3-8 will be addressed on a case-by-case basis. Carlisle's Vegetation Warranty will only remain valid and affective if there is a maintenance plan and/or contract in place for the duration of the warranty period. Maintenance may be accomplished by contracting a landscaping or nursery professional. However, the Owner may elect to self-perform the required maintenance assuming there are adequate and competent personnel able to understand, follow and document the requirements and guidelines set forth in this attachment. Failure to perform and document maintenance as outlined in this attachment may be grounds for termination of the Vegetation Warranty. Any claim made under Carlisle's Vegetation Warranty is contingent upon the Owner's proof and documentation of strict compliance with the maintenance requirements in this attachment.

Warranty and maintenance requirements of non-standard Carlisle planting options are project specific and will be addressed on case-by-case basis.

Immediately After Planting

1. Fully saturate the entire Roof Garden system to the point of runoff by soaking with conventional overhead sprinklers that are supplied by a ¾" hose.

2. Inspect drains for any foreign debris that may hinder their performance and clear the drains of any such debris.

Irrigation Requirements

1. Document all 1st Year Maintenance in TABLE 4.

2. Permanent irrigation may not be needed dependent upon the Roof Garden design, geographic region and microclimate where the Roof Garden is to be installed, but it is strongly recommended. **However, access to water via hose bibs at the roof level is always a requirement.**

3. Recommended water pressure is 35 psi at a volume flow of 9 gpm. Duration of irrigation events should be 30-45 minutes. Actual water pressure and volume flow will determine irrigation duration during the establishment period. Once runoff is observed, the Roof Garden system is considered to be thoroughly saturated.

4. Commercial overhead sprinklers such as spider stands (PICTURE 1) should be used to provide temporary overhead irrigation.

PICTURE 1: Spider Sprinkler Stand

5. Irrigation should be performed early to mid-morning or late afternoon. Never irrigate during evening hours.

6. Temporary overhead irrigation of Carlisle Sedum Mats or Sedum Tiles during the establishment period to follow recommendations listed in Table 1.

TABLE 1. Frequency of temporary irrigation for Sedum Mats and Tiles*

	Spring Install	Early Summer Install	Late Summer Install	Fall Install	Winter Install
Number of Weeks after installation	April-May	June-July 15th	July 15th-Sept 15th	Sept 15th-Oct	Nov-Dec
	Number of 30-45 minute irrigation events per week				
1-2	1-2	2	1-2	1	1
3-4	1	1	1	1	1
5-6	0-1	0-1	0-1	0-1	0-1

*Frequency and duration of irrigation events should be adjusted to account for precipitation

7. Temporary overhead irrigation of Carlisle Sedum Plugs during the establishment period to follow recommendations listed in Table 2.

8. Sedum Plugs are not recommended for planting during the winter months.

TABLE 2. Frequency of temporary irrigation for Sedum Plugs*

	Spring Install	Early Summer Install	Late Summer Install	Fall Install	Winter Install
Number of Weeks after installation	April-May	June-July 15th	July 15th-Sept 15th	Sept 15th-Oct	Nov-Dec
	Number of 30-45 minute irrigation events per week				
1-2	1-2	2	1-2	1	Plugs not recommended
3-4	1	1	1	1	
5-6	0-1	0-1	0-1	0-1	

*Frequency and duration of irrigation events should be adjusted to account for precipitation

9. It is imperative to closely monitor your Roof Garden system for signs of stress during drought conditions. Drought is defined as prolonged periods of extreme ambient temperatures (>90° F) with no precipitation (2-3 weeks). *Sedum album* (PICTURE 2) is a great indicator plant. If it shows signs of shrinkage, die back, or red/brown discoloration, you

must irrigate the system to the point of runoff. Frequency of irrigation will depend on the depth of growth media. Extensive systems (≤4") will most likely need to be supplemented twice (2X's) as much during drought conditions.

PICTURE 2. *Sedum album* 'Coral Carpet'

10. For Extensive Roof Garden systems installed in climates receiving less than 35 inches of annual rainfall, permanent irrigation will most likely be required. This decision will be heavily influenced by the Roof Garden design and microclimate conditions.

11. The decision of whether, or not, to install a permanent irrigation system is highly dependent upon the geographic region, microclimate, growth media depth, water retention layer and plant selection. All Roof Gardens will require temporary irrigation during the establishment period and during drought conditions. If the project budget allows, a permanent irrigation system can be set to easily facilitate watering during these periods through the use of timers and rain/soil moisture sensors.

    a. If a permanent irrigation system is installed, the system must be flushed prior to the first freeze to prevent the lines from bursting.

    b. Prior to re-commissioning the irrigation system in the spring, check the system for leaks and perform any repairs as needed. This is also the appropriate time to verify the functionality of timers and soil moisture sensors.

Sedum Remediation and Propagation

It is natural for bare spots to develop in a Roof Garden because plants have evolved to compete for space and resources. Should a bare spot develop and the Owner feels that action is required; remediation of these areas can be easily facilitated by harvesting your own cuttings. Cuttings are the top growth of a sedum plant and may be harvested one month after the spring growth flush. Cuttings should not be taken from plants under stress and should never be more than 50% of the existing growth.

1. Cut 35-50% off the top of the existing sedum growth (PICTURES 3 & 4)
2. Generously broadcast the cuttings across bare spots (PICTURE 5)
3. Cuttings must remain moist, water cuttings thoroughly for one month

PICTURE 3.

PICTURE 4.

PICTURE 5.

1st Year Maintenance

1. Document all 1st Year Maintenance in TABLE 4.

2. One month after planting, all weeds and non-specified plant material must be pulled from the growth media and removed from the rooftop before weeds flower and develop seed heads.

3. Carlisle does not allow the use of herbicides on its Roof Garden systems. Potential interactions between roofing membranes and herbicides, organic or nonorganic, have not been determined. The use of herbicides on a Roof Garden will void your warranty. **Weed removal and prevention is to be accomplished through hand weeding only**.

4. If the Roof Garden was planted with sedum plugs or custom plants a minimum of one weeding event should be performed every month after installation.

5. If the Roof Garden was planted with sedum mats or sedum tiles a minimum of one weeding event should be performed every two months after installation.

6. During weeding events roof drains must be inspected and cleared of any debris.

7. After the growing season and prior to the winter months, spent vegetation may be trimmed down. Cuttings and trimmings should not be removed from the roof as they will act as mulch and return nutrients to the system in preparation for the next growing season.

8. If the Roof Garden is accessed during the winter months, de-icing products must not be used in the vicinity of the vegetation. Salts or de-icing chemicals will harm the vegetation.

9. Any snow removed from pavers or walkways should be distributed evenly across the Roof Garden to prevent potentially damaging the vegetation.

10. Should it be necessary to remove snow from the Roof Garden, care will need to be exercised to ensure that the vegetation layer is not damaged or inadvertently removed.

2nd Year and Onward Maintenance

1. Document all 2nd Year Maintenance in TABLE 5.

2. The spring growth flush is the period during which plants wake up from their winter dormancy. The occurrence of this period varies by geographic location and seasonal weather conditions, but typically coincides with the appearance of bulbs such as Daffodils and Tulips. After the 12 month anniversary date of the Roof Garden installation, and annually thereafter, a soil test should be performed approximately 2-3 weeks prior to the spring growth flush. For example; if the Roof Garden was installed in October of 2012, the first annual soil test would need to be performed 2-3 weeks prior the spring growth flush of 2014. Small individual samples should be collected from across the Roof Garden to provide a broad spectrum of the media condition. 1-2 cup samples should be collected from 5-15 separate locations, depending on the area of the Roof Garden. These individual samples should be labeled and sealed in plastic bags or test kits. Carlisle recommends that the samples be sent to Pennsylvania State University's Agricultural Analytical Services Laboratory for the following tests:

    a. Saturated paste pH
    b. Salts
    c. Nutrients
    d. Percent Solids
    e. Organic content

    For more information on growth media testing see the link below:

    https://agsci.psu.edu/aasl/green-roof-media-testing

    Contact information and mailing address:

Agricultural Analytical Services Laboratory
Penn State University
University Park, PA 16802
814.863.0841
www.aasi.psu.edu
http://www.aasl.psu.edu/Greenroof.html

3. Sedums thrive in poor soils with low nutrient levels and do not require excessive fertilization. However, should the soil test indicate that the Roof Garden's growth media requires amendment; Carlisle recommends the use of granular slow release **organic** fertilizer. Fertilizer should be applied as necessary to return the growth media to original organic content. A single fertilization event should occur in the spring depending on the results of the annual soil test.

4. If the Roof Garden was planted with sedum plugs or custom plants a minimum of one weeding event should be performed every 2 months.

5. If the Roof Garden was planted with sedum mats or sedum tiles, a minimum of one weeding event should be performed every three months.

6. During weeding events roof drains must be inspected and cleared of any debris.

7. After the local trees have dropped their leaves, a final weeding event and general inspection must be performed. All debris must be removed from the Roof Garden and drains must be given a final inspection for the season.

8. If the Roof Garden is accessed during the winter months, de-icing products must not be used in the vicinity of the vegetation. Salts or de-icing chemicals will harm the vegetation.

9. Any snow removed from pavers or walkways should be distributed evenly across the Roof Garden to prevent excessive point loading on the building and potentially damaging the vegetation.

10. Should it be necessary to remove snow from the Roof Garden, care will need to be exercised to ensure that the vegetation layer is not damaged or inadvertently removed.

Photographic Documentation

If a Vegetation Warranty is purchased, Carlisle requires that photographic documentation be provided for support throughout the term of the warranty, typically for a period of twenty-four (24) months. Photographs need to be of sufficient quality and resolution to accurately depict the conditions of the Roof Garden. The number of photographs will vary by project size, but the quantity submitted should cover the majority of the Roof Garden area. Failure to provide sufficient photographic documentation may be cause for termination of the Vegetation Warranty. Photographs are to be submitted to Vegetation@CarlisleSynTec.com. The schedule for providing photographs is as follows:

1. Substantial completion of Roof Garden
2. 1 Month
3. 3 Months
4. 6 Months
5. 12 Months
6. 18 Months
7. 24 Months

Carlisle requests that pre-winter and spring growth flush photographs be provided.

TABLE 3. Temporary Irrigation & Maintenance during Establishment Period

Roof Garden Installation Date: ________________

Type of System (Tiles/Mats or Plugs): ________________

Performed By	Date	Week #	Activity	Observations/Duration
Example: ABC Green Roofing Maint. Co.	21 Aug. 2012	1	Irrigation Event	Growth media slightly moist prior to irrigation. No weeds present.
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*Add rows as necessary to provide adequate documentation.

TABLE 4. 1st Year Maintenance

Roof Garden Installation Date: _____

Performed By	Date	Activity	Observations/Duration
Example: ABC Green Roofing Maint. Co.	21 Aug. 2012	Supplemental Irrigation due to 15 days of >92° and no rain	Vegetation appears heat stressed. Red/brown foliage. Watered for 40 min. until fully saturated.
		Weeding Event 1	
		Roof Drains Inspected	
		Weeding Event 2	
		Roof Drains Inspected	
		Weeding Event 3	
		Roof Drains Inspected	
		Weeding Event 4	
		Roof Drains Inspected	
		Supplemental Irrigation During Drought Conditions (if required)	

*Add rows as necessary to provide adequate documentation.

TABLE 5. 2nd Year Maintenance

Roof Garden Installation Date: _____

Performed By	Date	Activity	Observations/Duration
		Annual Soil Test	
		Weeding Event 1	
		Roof Drains Inspected	
		Weeding Event 2	
		Roof Drains Inspected	
		Weeding Event 3	
		Roof Drains Inspected	
		Weeding Event 4	
		Roof Drains Inspected	
		Supplemental Irrigation During Drought Conditions (if required)	

*Add rows as necessary to provide adequate documentation.