

Maintenance Guideline



Maintenance Schedule

	Water	Mowing	Fertilizer
Weeks 0-2	2x/week	No	No
Weeks 2-4	1x/week	If desired - no shorter than 3"	No
Weeks 4-6	Every other week	Project- specific	No
Long Term	Once/month (dependent on rainfall) - Aim for 1" water/week including rain.	Project-specific	2.5 g nitrogen/m ² in Spring, and 5g nitrogen/m ² in Fall

Notes:

Mowing: Mow if desired, or leave un-mowed for a 'naturalized' appearance

Fertilizer: Use up to 10g nitrogen/m² per application for higher traffic areas. If leaving the grass un-mowed, fertilize only once/year in Fall (5g nitrogen/m²). Slow release fertilizer is recommended.

Maintenance needs are project specific and based on the client's expectation, e.g. visible or publicly accessible green roofs often have higher aesthetic expectation and thus require more maintenance. Maintenance schedule should be tailored according to project needs and climatic conditions.

1. Rooftop Safety

Rooftops present fall hazards. Maintenance crew must be trained in fall arrest protection and their work must comply with local labour code. All crew personnel shall be equipped with safety gear and tied off when working on rooftops. The crew must be properly trained to install and

maintain Next Level™ green roof systems. Contact a Next Level™ Stormwater Management representative for details.

2. Plant Performance

Check coverage, health and diversity of vegetation. Note problematic areas and identify causes if possible. Some common problems and solutions are as follows:

- *Rotting:* Our plants are selected to thrive in hot and dry environment. They may rot and die in standing water. Check for ponding, roof drainage and reduce irrigation frequency as needed.
- *Wilting:* Grass will wilt and turn yellow during prolonged heat and drought. Irrigate until saturation. Repeat in a few days as necessary until conditions improve.
- *Vegetation color change:* Pay attention to the color of your grass – Green is good; blue-green indicates that it is too dry; yellow-brown means it is stressed from heat or too much moisture. Adjust watering schedule as needed. Eco-Grass varieties can be left to go dormant during the summer if desired. Keep in mind that even dormant grass requires some water, but watering can be reduced without permanent damage.
- *Dryness:* Check for causes such as fan exhaust and reflected surfaces (e.g. glass and metal sidings) on the roofs. Correct these conditions if possible and provide irrigation. If conditions do not improve, replace affected area with hard landscape such as pebbles and concrete pavers.
- *Disease:* Fungus growth is rare and usually an indication of excessive dampness. Check for ponding, reduce irrigation frequency and if necessary, apply an organic fungicide to control.
- *Pests:* Pest such as caterpillars and garden snails eat vegetation. Grubs will eat the roots of grass. If their population becomes too high and cause excessive damage to the green roof, apply an organic pesticide to control.
- *Nutrient Deficiencies:*

Soil Nutrients Needed	Grass Deficiency Symptoms
Nitrogen	Older leaves turn yellow green and little new growth is noticed.
Potassium	Leaf tips and edges looked burned.
Phosphorus	Foliage will change from dark green to reddish in hue.
Magnesium	Foliage will appear yellowish green with red tinted edges.
Calcium	New leaves will be small and grass will be rust colored.
Sulfur	Fully grown leaves turn yellow.
Iron	The new grass will turn yellow.
Manganese	The new grass turns yellow.
Zinc	Leaves will appear to be shriveling, narrow bladed and smaller than usual.
Boron	Yellowed grass and immature growth.
Molybdenum	Fully grown and mature grass appears gray-green.

Act at first sight of problem to minimize potential damage to the green roof. When in doubt, please consult a Next Level™ Stormwater Management representative.

3. Fertilizing

A soil test is the only way to know for sure how much of each nutrient is required, but the following information can be used as a general guideline. It is recommended to use a controlled release fertilizer. Irrigate thoroughly to allow the fertilizer to settle.

Apply 2.5 g nitrogen/m² in Spring, and 5g nitrogen/m² in Fall. Use up to 10g nitrogen/m² per application for higher traffic areas. If leaving the grass un-mowed, fertilize only once/year in Fall (5g nitrogen/m²).

Use the following formula to calculate the application rate of fertilizer. This example is using NPK 17-7-10, supplying nitrogen (N) at a rate of 5g/m²:

Nitrogen requirement, divided by the percentage of nitrogen in the formula, multiplied by 100.
(I.e.: $5g/m^2 \div 17 \times 100 = 29.4 g/m^2$ application rate.)

4. Weeding

Remove unwanted vegetation (e.g. weeds and grasses) before they flower, form seeds and multiply on the green roof. Remove any woody plants and tree seedlings as soon as possible. Remove overgrown vegetation in non-vegetated borders. Remove vegetation by hand; use of herbicide is not recommended.

5. Roof Servicing

Wind-blown garbage and dead plant biomass can accumulate on the green roof. Accumulation of debris in and around the drainage channels and roof outlets can hinder drainage, which can lead to ponding and excessive loading on the roof. Clear the roof drains of debris regularly, especially after major storm or rain events. Remove debris from vegetated areas, non-vegetated borders and access paths. Visually inspect exposed roof membrane and flashing for any sign of damage and leak.

6. Irrigation

An irrigation system is highly recommended for hot and dry climates.

Irrigation can be done manually with a garden hose or using automated systems such as drip lines or overhead spray. Drip system loses less water through evaporation and it is not affected by high wind compared to overhead spray however spray system may provide more even coverage. Drip lines should be installed above the Eco-Grass blanket for ease of inspection and troubleshooting.

Check to ensure that the irrigation coverage is uniform. Adjust the irrigation system/regime as necessary, e.g. amount, time and frequency of irrigation zones. Avoid over- or under-watering. Routinely clean out dirt traps in the system to avoid blockage. Check often to ensure that the automated system is in working order. When lengthy repair is expected, make arrangement for a temporary sprinkler system or water manually with a garden hose until repair is completed.

It is recommended to irrigate early in the morning which reduces the amount of water lost to evaporation due to heat and wind. Grass watered in the evening can become susceptible to diseases such as mildew and fungus.

Irrigation Frequency

At Installation: Immediately after installation water the Eco-Grass blanket thoroughly and deeply. It should be slightly spongy to the step. This is the only time the green roof should be 'spongy-wet'. Unroll and install the Eco-Grass blankets immediately after delivery to avoid damage.

Weeks 0 - 2: For the first 2 weeks after installation, watering must be thorough and must be done twice per week (once/week if installed in cooler weather). The growing medium underneath should be moist after watering. Lift a corner of the Eco-Grass blanket to ensure that water has reached the growing medium underneath. Make sure to pay close attention to corners and perimeters so no spots are missed.

Weeks 2-4: Two weeks after the sod is laid, reduce watering to once/week. Although watering is reduced to once/week, the duration should increase slightly in order for moisture to reach deeper into the soil below. This encourages deeper root growth.

Weeks 4-6: Water every other week.

Long Term Care: Water monthly. The green roof should get at least 1" of water per week. Check local rainfall amounts and adjust schedule accordingly.

Irrigation regime (amount and frequency) depends on many factors such as the weather conditions, the water retention capacity of the green roof system and the slope of the roof. Keep an eye on the health of the vegetation and it will indicate whether more or less irrigation is needed.

7. Mowing

Do not mow during the first 2 weeks. Do not water the day before mowing – this allows the soil to dry out slightly before the mowing. When the weather is particularly dry, do not cut the grass shorter than 3". Cutting higher creates conditions for deeper, healthier roots, and helps the growing medium hold water more efficiently. Do not mow if the grass is under drought or heat stress.

Grass clippings can be left on the green roof, as nitrogen and other nutrients contained in the clippings are recycled to the lawn as they decompose. This does not contribute to thatch accumulation.

8. Thatch

Thatch is a tight, brown, spongy, organic layer of both living and dead grass roots and stems that accumulates over time above the soil surface. If there is an accumulation of more than 3/4", consider decreasing both fertilization and watering. In fact, as the green roof matures, you should be able to decrease fertilization and watering slightly without any negative effect. Take note of the health of the vegetation during this period and adjust as needed.

9. Water Quality

Irrigation water can come from sustainable sources such as rain water capture and grey water reuse on site, or natural streams and ponds nearby. However, it is important that the irrigation water is free from chemicals and pollutants that might be harmful to the plants on the green roof. When in doubt, the irrigation water should be tested to confirm its quality.

10. Extreme Weather Events

Prolonged heat/drought: The plants will go dormant and if the situation does not improve, they will eventually die. A rule of thumb is to compensate the evapotranspiration with irrigation.

Wind Storm: Hurricanes may displace vegetation, especially on newly installed roof where the plants have not had a chance to root in. Check for displacement and re-secure. Check for missing growing medium and plants from wind erosion and replace as needed. Clear wind-blown debris from the roof, especially in and around the drainage channels and roof outlets. Check for displacement of pebbles in the non-vegetated borders, redistribute pebbles as needed. Ensure irrigation system remains in working order.

Heavy Rain: Heavy rain can wash off debris and dislodge growing medium from the green roof. Check and clear dirt and debris from drainage channels, roof outlets and non-vegetated borders. Replenish growing medium and add seed as needed.

Hail: Hail stones can damage plants on green roof through crushing and freezing. Fortunately, the damage is usually temporary. Do not walk on frozen plants as this can cause further damage. The green roof should recover in a few months.

11. Foot Traffic

Foot traffic should be restricted for the first 2 weeks. Use designated access path or walk on stones in the non-vegetated borders whenever possible. When absolutely necessary, occasional foot traffic is permitted no more than once every 2 weeks. Avoid walking on the same path to minimize plant damage. Install designated access path to rooftop units that require frequent access.

Avoid putting heavy loads on the green roof as this will crush the plants. Should this be absolutely necessary, lay plywood over the vegetation for no more than 4 hours to spread the load and protect the plants. Remove plywood to allow the plants to recover overnight. Any damage to vegetation must be repaired immediately.

12. Membrane Repair

For a small area, cut and remove a section of Eco-Grass blankets, growing medium, water retention layers (if applicable), drainage layer and root barrier, layer by layer, to expose the roof membrane. Take care not to damage the roof membrane when cutting. After membrane repair is completed, cut a new piece of root barrier, with at least 30cm larger on all sides than the original cutout for overlap, place over the opening left by the existing root barrier. Replace all layers one by one into their original spots. Spread some growing medium along edge of the cut-out Eco-Grass blankets to promote plant growth across the seam. Keep the area moist until the plants have rooted in again, about 4 weeks.

For a larger area, roll back and remove Eco-Grass Blanket. Store rolled up blankets in a cool, shady spot for no more than 24 hours. Otherwise, unroll on non-vegetated section of the roof or on the ground for longer storage. Roll back and remove sub-layers, one layer after another, to expose the membrane. Do not cut but roll the root barrier to one side. After membrane repair is completed, roll root barrier back into position, taking care to maintain the 30cm overlap between sheets. Replace all other layers. Spread some growing medium between the Eco-Grass blankets to promote plant growth across the seam. Keep moist until the plants have rooted in again, about 2-4 weeks.

13. Roof Membrane Replacement or Relocation of the Green Roof System

Roll up Eco-Grass blankets. Unroll them on the ground or in a nursery with proper care. Remove growing medium and unroll the rest of the sub-layers such as water retention layers, drainage layer and root barrier, layer by layer. Store sub-layers indoors or cover to protect from rain. Remove all pebbles around the non-vegetated border. After replacement of the roof membrane, re-install all layers as a new installation. Keep green roof moist until the plants have rooted in again, about 2-4 weeks.

14. Routine Inspection

The owner or his/her representative is encouraged to conduct routine visual checks to help decide what maintenance measures and schedule to follow, e.g. irrigation regime and weeding frequency. Report any sign of problem (e.g. wilting or pest damage) immediately to a Next Level™ Stormwater Management representative for remedial actions to minimize potential damage to the green roof.

15. Third Party Materials

All our components have been tested for quality and compatibility according to the German FLL Green Roof Guidelines. To maintain the high performance of the green roof system, only approved components may be used for maintenance. This includes but not limited to Eco-Grass blankets, growing media, water retention layers, drainage/filter layer, root barrier, fertilizer, metal edging and retention grid. Please contact a Next Level™ Stormwater Management representative for details.

16. Disclaimer

This guideline serves as general recommendation only and does not preclude owner responsibility for routine green roof care and oversight. Specific projects may require special maintenance actions and schedule. Should there be any queries, please contact a Next Level™ Stormwater Management representative.

Eco-Grass Green Roof System – Maintenance Check List

Project Name: _____ System Buildup: _____ Completion Date: _____	Last Inspection Date: _____ Inspection Date: _____ Inspected by: _____
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	Observations	Actions
1. Plant Performance		
a. Coverage		
b. Health - disease and pest damage		
c. Diversity		
2. General Maintenance		
a. Remove foreign and overgrown vegetation		
b. Remove vegetation in non-vegetated borders		
c. Replenish missing growing medium		
d. Repeat seeding to bare areas		
e. Repair/replace Eco-Grass blankets		
f. Fertilize		
g. Irrigate		
3. Roof Servicing		
a. Clear debris from drainage channels, outlets and borders		
b. Ensure working order of drainage channels and outlets		
c. Inspect exposed roof membrane		
4. For Sloped Roof Only		
a. Check anti-sliding/anti-shearing elements		
b. Replace missing soil and plants from erosion		
c. Check for uniform irrigation coverage		
5. For Irrigation System Only		
a. Uniform irrigation coverage		
b. Over or under watering		
c. Clean out dirt traps		
d. Functioning of automated system		
6. Comments and Recommendations		