

Green Roof Media Test Standards

Currently, the most widely recognized standards for testing green roof media are those developed in Germany by the Landscaping and Landscape Development Research Society (FLL) and published in the *Guideline for the Planning, Execution and Upkeep of Green-Roof Sites*. These standards designate specific test protocol to follow as well as criteria to meet based on green roof type. More recently, a U.S. task force has been established to develop green roof test methods and standards through the American Standard Testing Methods (ASTM) organization. Penn State's Agricultural Analytical Services Laboratory employs the FLL test procedures on a routine basis and ASTM methods as they are available.

Submitting a Green Roof Media Sample for Testing

Take the following steps to submit a green roof sample to the Penn State Agricultural Analytical Services Laboratory:

- Obtain a Green Roof Media Sample Submission form from the laboratory or print the submission form from the laboratory Web site (www.aasl.psu.edu).
- Complete the sample submission form, designating the green roof media type and test(s) requested.
- Submit your green roof media sample with sample submission form to the laboratory.
- Analyses are generally completed and a report mailed within 10 working days of sample receipt.

Contact Information

Information on green roofs is also available at Penn State's Center for Green Roof Research Web site, hortweb.cas.psu.edu/research/greenroofcenter/index.html. For any additional questions on green roof media testing, contact the lab:

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Green Roof Media Testing Program



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College of Agricultural Sciences
Agricultural Research and
Cooperative Extension

About Green Roofs

Green roofs, also known as “living roofs,” are roofs that are covered with vegetation and a plant growth medium. Green roofs offer numerous benefits over traditional roofs, including reduced stormwater runoff, improved runoff water quality, lowered air-conditioning costs, longer roof membrane life, and an aesthetically pleasing roof. Green roof technology is not new—Germany and other European countries have been using it extensively for decades. Green roofs are increasing in popularity in the United States because of the significant benefits they provide.

Green Roof Types

In general, green roofs can be characterized as intensive or extensive systems. Intensive green roof systems are high-maintenance green roof sites with sufficiently deep-growing media to support large plants such as shrubs and trees. Extensive green roof systems are low-maintenance green roof sites with growing media less than 6 inches deep and on which drought-tolerant species such as sedums are often grown. The following are different forms of extensive systems:

- Multicourse extensive system: uses two or more distinct types of media, one of which is optimized for drainage
- Multilayer extensive system: single-medium extensive green roof system with a high-efficiency synthetic drainage layer instead of a separate drainage course
- Single-layer extensive system: single-medium extensive green roof system without a high-efficiency drainage layer
- Drainage course: an aggregate material used for drainage course in a multicourse extensive green roof system

Testing Green Roof Media

Testing green roof media is essential for characterizing their physical and chemical properties to ensure they meet the requirements of their intended use. In general, green roof media are long-lasting, lightweight, custom-blended substrates with sufficient water-holding capacity, aeration, and drainage to adequately support plant growth. Commonly, tests performed on green roof media include those for density, air-filled porosity, water-holding capacity, hydraulic conductivity, particle size (grain size) distribution, organic matter, pH, soluble salts, and other chemical parameters.

Green Roof Media Test Packages

Package*	Recommended Green Roof Type	Description	Fee
GR01A	Intensive Multilayer extensive Multicourse extensive	Particle size distribution (< 0.002 to > 12.5 mm) with graphical display of results relative to FLL limits, dry-weight density, density at maximum water-holding capacity, total porosity, air-filled porosity at maximum water-holding capacity, water-permeability factor (hydraulic conductivity), pH, total soluble salts, organic matter, phosphorus, potassium, calcium, magnesium, nitrate, and ammonium	\$260.00
GR01B	Intensive Multilayer extensive Multicourse extensive Single-layer extensive	Same as GR01A but provides results for pH, total soluble salts, phosphorus, potassium, calcium, magnesium, nitrate-nitrogen, and ammonium-nitrogen using the saturated media test procedure instead of FLL test methods (boron, copper, iron, manganese, sodium, and zinc also provided)	\$235.00
GR02	Intensive Multilayer extensive Multicourse extensive Single-layer extensive	Same as GR01 but without phosphorus, potassium, calcium, magnesium, nitrate, and ammonium	\$210.00
GR03	Drainage course	Percentage of silt-sized (< 0.05 mm) particles, dry-weight density, density at maximum water-holding capacity, total porosity, water-permeability factor (hydraulic conductivity), pH, total soluble salts, and organic matter	\$175.00



*Required sample size: approximately 5 gallons (20 liters)

Optional Tests

Package	Description	Fee
Saturated Paste pH, Salts, and Nutrients	pH, nitrate-nitrogen, ammonium-nitrogen, total soluble salts, phosphorus, potassium, calcium, magnesium, sodium, boron, copper, iron, manganese, and zinc using the saturated media extract method with DTPA	\$30.00
Saturated Water Permeability for Drainage Media (ASTM Method E2396)	Water permeability of coarse granular materials used in the drainage layers of green roof systems [requires additional 1 gallon (4 liters) to sample size]	\$85.00
Calcium Carbonate Equivalence (ASTM Method C-25)	Material's neutralizing value expressed as calcium carbonate equivalence	\$20.00
EPA 503 Contaminants	Total sorbed arsenic, cadmium, copper, mercury, molybdenum, nickel, lead, selenium, and zinc following EPA SW-846 methods	\$130.00
Mehlich 3 Nutrients	Extractable phosphorus, potassium, calcium, and magnesium by the Mehlich 3 method	\$20.00

