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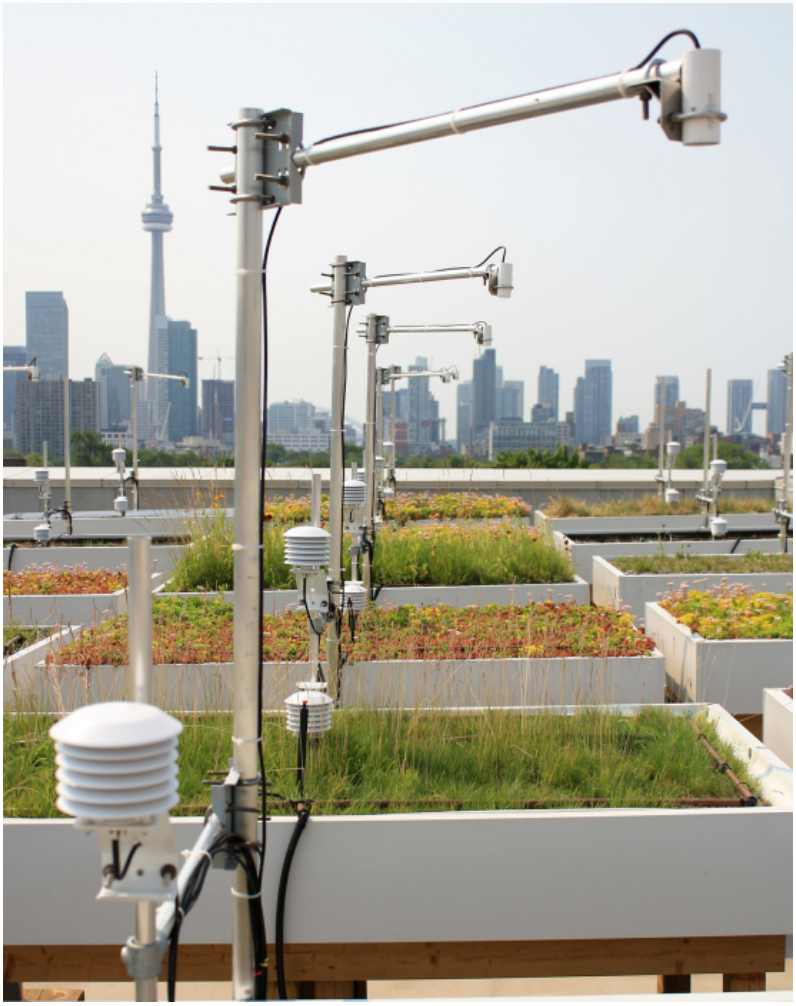
WHEN MEASUREMENTS MATTER

Ontario: Green Roofs

Campbell gear used to monitor weather and conditions for different soil and plant types



Sensors collecting data on raised planter beds at the University of Toronto's GRIT Lab

Case Study Summary

Application
Monitoring conditions to test and evaluate the construction standards of green roofs

Location
Toronto, Ontario, Canada

Products Used
CR3000, CR1000, NL120, AM16/32B, 109, SI-111, TB4-L

Contributors
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Participating Organizations
University of Toronto, John H. Daniels Faculty of Architecture, Landscape, and Design

Measured Parameters
Soil temperature, surface temperature, drainage, soil moisture

Related Website
GRIT Lab

The Problem—How to optimize green-roof performance

The University of Toronto's Green Roof Innovation Testing Laboratory (GRIT Lab) was established to investigate and optimize performance of green roofs—roofs covered with plant beds that insulate, absorb precipitation, and provide aesthetic and environmental benefits. The GRIT Lab conducts ongoing experiments at a site consisting of a weather station and 33 raised beds measuring 1.22 m by 2.44 m (4 ft by 8 ft), with different soil media, amounts of soil, vegetation types, and irrigation regimes. The goal is to evaluate four main variables for green roofs in Southern Ontario:

1. Stormwater management
2. Evaporative cooling
3. Biodiversity

4. Life-cycle costs

The Solution—Data collection from 33 test beds

This application uses one CR3000 datalogger and two CR1000 dataloggers, along with several AM16/32B multiplexers, to measure the almost 300 sensors used to compare the following four parameters:

1. Growing media type (FLL standard vs. high organic content)
2. Growing media depth (4 in. vs. 6 in.)
3. Vegetation community (sedum vs. native and biodiverse prairie-meadow mix)
4. Irrigation regimes (none, timer activated, soil-moisture-sensor activated)

Each bed is instrumented with several temperature sensors, installed at different depths in and under the soil media and at different heights above the soil. These instruments measure heat flux through the different soil media. An infrared radiometer also measures the average temperature of the vegetation.

Stormwater management and irrigation regimes are also being investigated using high-capacity tipping buckets installed beneath each raised bed to determine runoff from the different soil media. Soil-moisture sensors track how much moisture the soil retains. A climate station measures general weather conditions and rainfall, and a flow meter installed on a pressurized irrigation system approximates amounts of water entering each bed to determine runoff. Different irrigation regimes, soil media, and plant types should have a profound effect on runoff and water retention, especially between storms or watering.

Automated weather stations monitoring 33 raised beds measuring 4 ft by 8 ft, with different soil media, amounts of soil, vegetation types, and irrigation regimes

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