CAMPBELL SCIENTIFIC
WHEN MEASUREMENTS MATTER

Green Projects: University of Toronto Green Roof Research

Monitoring weather and conditions for different soil and plant types

Weather stations collecting data on raised planter beds at the University of Toronto's GRIT Lab.

Case Study Summary

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

Location:
Toronto ON Canada

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Contracting Agency:
University of Toronto, John H Daniels Faculty of Architecture, Landscape & Design

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

Communication Link:
Ethernet

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

Website:
http://grit.daniels.utoronto.ca

Live Camera:
http://roof-cam.daniels.utoronto.ca/

The Problem – How to optimize green roof performance

The University of Toronto's (U of T) Green Roof Innovation Testing Laboratory (GRIT Lab) was established to investigate and optimize performance of a green roof. The experiment consists of a weather station and thirty-three 4 ft x 8 ft raised beds 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) storm water management, 2) evaporative cooling, 3) biodiversity, 4) life cycle costs.

The Solution – Data collection from thirty-three test beds

This application uses one CR3000 datalogger and two CR1000 dataloggers along with several AM16/32B multiplexers to measure the almost three hundred 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 heights above the soil. These instruments should allow for heat flux through the different soil media to be determined. An infrared radiometer also allows for the average temperature of the vegetation to be determined.

Storm water 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 are also used to track how much moisture the soil retains. A climate station measures general weather conditions along with rainfall and a flow meter installed on a pressurized irrigation system allows for amounts of water entering each bed to be approximated 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 monitor thirty-three 4ft x 8ft raised beds with different soil media, amounts of soil, vegetation types, and irrigation regimes.