CASE STUDY

ST. PATRICK'S CATHEDRAL
New York City

In 2006, the design team was charged by the Trustees of St. Patrick's Cathedral to evaluate the existing mechanical systems as part of a comprehensive needs and conditions assessment of the Cathedral campus. It was clear that the air conditioning system, operating on a "shoestring" with 1960s-era machinery, was well beyond its useful life and insufficiently cooled the Cathedral.

Early in the design process, geothermal technology was assessed as a potential means to meet the Trustees' sustainable objectives. The system comprises 10 wells in terraces flanking the north and south sides of the Cathedral; beneath these wells, nine-inch-diameter boreholes were drilled through dense Manhattan schist at a depth averaging 1,650 ft.—and up to a maximum of 2,250 ft.—through bedrock.

Design team leader Murphy Burnham & Buttrick Architects and its consultants, including geothermal plant designers Landmark Facilities Group, well drilling consultants PW Grosser, structural engineers Silman, and geotechnical engineers Langan Engineering, collaborated with Zubatkin Owner Representation and construction manager, Structure Tone Inc. to conceptualize and design the geothermal system.

Scientific Labs Get Smarter

Scientific research labs represent a huge portion of the energy demand of a university campus, says Dan Diehl, Aircuity. In many cases, as much as two-thirds of a campus' energy use can be attributed to research labs. While it may seem clear that labs would be a great place to start when looking to go greener and reduce energy demand, the difficulty of doing so without sacrificing safety can often pose a roadblock. Faced with this challenge, and looking to support their mission to be a leader in research and to attract and retain the best talent, a group of engineers at UC Irvine (UCI) came up with the concept of Smart Labs: a design that can reduce energy consumption by up to 50% in research labs.

Smart Labs is an efficient recipe implemented by UCI to reduce energy use and provide better Indoor Environmental Quality (IEQ) in labs. This recipe can be easily implemented in other universities and research lab settings, and can dramatically reduce energy consumption by up to 50% or more. All the while, intelligent ventilation platforms keep lab personnel safe by ensuring that air quality adheres to strict safety standards.

HEAT RECOVERY METHODS THROUGH A DISTRICT APPROACH FOR HEATING AND COOLING ARE NOW MORE COMMONPLACE.

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Yet, to make this all come to fruition, collaboration among all disciplines was necessary. "The project also embodies international best practices in district heating and cooling, with engineers, manufacturers and constructors collaborating to transform the plant into one of the most efficient district energy systems in the world," says Joe Collins, partner in charge, ZGF Architects.

What was once possibly considered unattainable in larger square footage projects, heat recovery methods through campus-wide or district approaches for heating and cooling are now becoming commonplace, highlighted in the Amazon and Stanford University examples.

▼ **GEOTHERMAL WHERE ONCE THOUGHT NOT POSSIBLE**
Designed into the system is significant redundancy in the form of gas-fired boilers and an evaporative fluid cooler that ensure heating and air conditioning loads are met in times of peak demand. The system comprises 10, 9-in.-wide geothermal wells that average 1,650 ft. in depth.

▲ **TONS OF AC**
The geothermal plant in St. Patrick's Cathedral produces 240 tons of air conditioning and the necessary heating to fully service the entire cathedral campus.