

North Carolina State University

Radiant Panels Help Create a Quiet, Thermally Stable Environment for \$3 Million Microscope

Electron microscopes give researchers the ability to view materials on the order of “angstroms” – particles millions of times smaller than the width of a human hair. In 2011, North Carolina State University (NCSU) made the decision to invest in a uniquely-configured Aberration-Corrected Scanning Transmission Electron Microscope (AC-STEM). This incredibly sensitive piece of equipment is 12 feet tall, 1 foot in diameter and worth over \$3 million.

The addition of the microscope will have a huge impact on future training programs at the university, and will help the region keep relevant in research and development for many years to come.

“This sort of infrastructure is important to major corporations,” said Beth Dickey, a professor of materials science and engineering at NCSU. “If this region wants to remain at the cutting edge of research, we need to produce graduates who are at the forefront of these sorts of analytical techniques.”

Price collaborated with the project team to build a facility that could adequately house the valuable microscope. Radiant panels and displacement diffusers supplied by Price help the university maintain the strict environmental conditions necessary for working with this extremely sensitive instrument.

Project Summary

PRICE PRODUCTS

Radiant Panels
Displacement Ventilation

PROJECT HIGHLIGHTS

Location: Raleigh, North Carolina
Project Type: New Construction,
Lab for Electron Microscope
Year Completed: April 2012

DESIGN TEAM

Mechanical Engineer: Edmondson Engineers
Mechanical Contractor: Hockaday Mechanical Corporation
Price Representative: Hoffman & Hoffman

The Challenge:

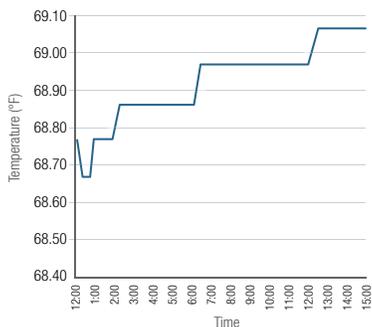
Strict Environmental Performance Criteria

The NCSU Electron Microscope requires precise environmental stability in order to function correctly. Fractional changes in temperature, small air movements, or even the acoustic vibration from voices can distort the equipment on an atomic level and cause research samples to “drift”.

Due to these environmental requirements, the microscope is housed in a specially designed room where air flow velocity is less than 5 inches per minute, and temperature change within the space is less than 0.1°C (0.18°F) every hour. These criteria ruled out mixing ventilation and laminar flow as potential methods for handling the strict temperature and air velocity requirements.

Additionally, due to construction restrictions, the mechanical side of the project had to be ordered, shipped and installed within a 90 day window.

Temperature Log (°F)



Over a 15 hour period, room temperature in the facility fluctuated by a negligible 0.4°F. This is an average thermal drift of only 0.03°F an hour.

The Solution:

Price's Hybrid Installation

Following a visit to the Price Technical Center in Atlanta where he was exposed to a number of different technologies, Tripp Martin of Edmondson Engineers selected a strategy that used radiant panels to handle the heating and cooling requirements, supplemented with displacement ventilation to handle dehumidification and airside requirements. Radiant panel installations had been used for similar applications in the past, and had been proven to meet the tight thermal requirements for electron microscope labs.

The Price Applications Engineering Team assisted Edmondson Engineers by providing project design review, drawings, and submittal paperwork. In order to meet the tight design and construction time frame, the Price team held to their goal of responding to information and design requests within 24 hours. The resulting environmental system exceeded the project performance requirements.

Once drawings and submittals were complete and approved, Price worked with Hockaday Contractors to ensure that the ordering, production, shipping and installation of the radiant panels and displacement system met the project completion deadline. The mechanical contractor had no prior experience working with radiant panels, but found them to

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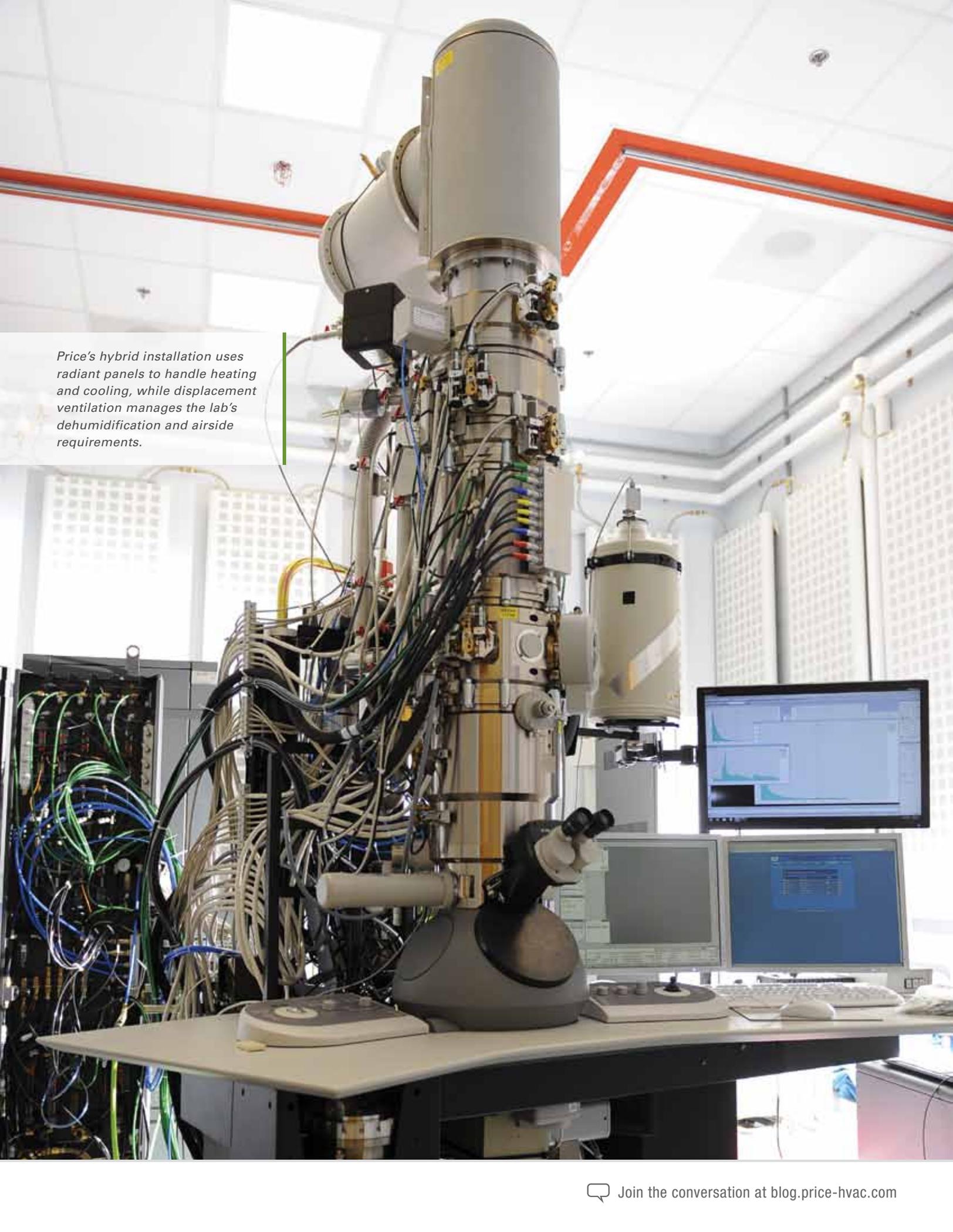
RPLA - Radiant Panel Features

- Surface mount, free hanging, or wall mount
- Integrated aluminum heat sinks
- Multiple face finish options
- 2-pipe system, 4-pipe system, inactive section, or double saddle

be quite easy to install, as Price provided hanging brackets and hose kits specifically designed and selected for the project. A single displacement diffuser – which was incorporated into the space to deal with humidity requirements and remove heat from the equipment – was also easy to install.

As anticipated by the Price team, the solution also provided exemplary acoustic performance. Traditionally, most rooms built to house sound sensitive equipment are completely covered in acoustic padding. By using the standard acoustic batting that is part of Price Radiant Panels, the NCSU facility was able to achieve exceptional sound performance without the need for additional padding. This level of acoustic performance significantly reduced the project investment.

The radiant panel system has been extremely effective in moderating temperature in the space, even “absorbing” issues from other sources to maintain environmental integrity. The facility has been up and running since April 2012 and typically goes 16 hours at a time with no measurable change in temperature, easily exceeding the room’s ambitious performance criteria.



Price's hybrid installation uses radiant panels to handle heating and cooling, while displacement ventilation manages the lab's dehumidification and airside requirements.



Wall mounted radiant panels line the perimeter of the electron microscope lab at NCSU.

Design Team Profile

Edmondson Engineers

Edmondson Engineers is a consulting engineering firm located in Research Triangle Park, North Carolina. Their HVAC system design experience includes hundreds of industrial and advanced technology installations, such as clean rooms, isolation facilities, containment facilities, differential space pressure and several special systems. They utilize state-of-the-art technology to solve project issues, and rely on their expertise and resources to consistently meet or exceed client expectations.

Hockaday Mechanical Corporation

Hockaday Mechanical Corporation is an independent mechanical contractor that can furnish the equipment best suited to their clients' needs and budget. Hockaday employees perform piping and sheet metal installation for all of their projects. They also install HVAC insulation, temperature control/energy management systems, and perform AABC and NEBB certified air and water balancing services using the best subcontractors in central North Carolina.

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