

EXECUTIVE SUMMARY

The purpose of this report is to provide a summary of the existing design of the Unified Science Center, propose alternative design solutions based on the design criteria and objectives established by the owner, and perform in-depth studies of these designs to determine their viability. Updated information from each of the three previous technical reports is included, followed by descriptions of the alternatives to be considered, project methods and research, three mechanical depth studies and four breadth studies.

The Unified Science Center is a 200,000 ft² teaching facility on the University of Scranton Campus in Scranton, Pennsylvania. It is intended to achieve LEED Silver certification, and accordingly, its integrated design is geared toward that goal.

After researching many different techniques for laboratory space conditioning and ventilation, three methods were identified as appropriate for this project: a sensible heat recovery wheel to be used in conjunction with the enthalpy wheel already designed; an active chilled beam system to help reduce costs and emissions; and a standard VAV system with terminal reheat to provide a reference for the current design.

After researching and performing analysis on each of these three systems, the following results were determined:

- The addition of heat recovery wheels to the current mechanical system provides a good way to save energy, with a payback period of about 8 years.
- Active chilled beams are also a viable option; though they have some significant drawbacks, they potentially have a payback period of 3-5 years.
- The current design of the HVAC systems outperforms a traditional VAV system not only in terms of annual energy cost, but possibly also initial cost.

In addition to these studies of the building's mechanical systems, breadth studies of the building's architecture/sustainability include light shelf analysis, a solar array study, and an investigation of the feasibility of rainwater harvesting. Solar panels and rainwater harvesting methods are prohibited by unacceptable payback periods, while the use of light shelves is limited by the plenum space required by mechanical systems.

This report concludes that the mechanical systems of the Unified Science Center are extremely well designed and suited to the requirements of the project; still, the redesigns proposed in this report have the potential to save even more energy over the lifetime of the building given the willingness to accept a higher initial cost.