

Executive Summary

(Photos Provided by Burt Hill)



The Delaware County Community College Science, Technology, Engineering, and Mathematics (STEM) Center is a new addition to their Marple Campus, and is part of the two-building STEM Complex. At 105,000 square feet and four stories it is a focal point for the campus, and stands out with both architectural and sustainable features.

With a sophisticated existing design of the mechanical systems, alternative solutions were analyzed for the core of the building, excluding the classroom and office spaces. This report outlines the mechanical redesign through a radiant floor heating and cooling system with a supplemental dedicated outdoor system, as well as an investigation into the potential use of natural ventilation.

The analysis shows that a radiant floor design has the means to completely handle the sensible heating and cooling capacity for the spaces selected for redesign. Additionally, it is specified that the ventilation and necessary latent load be accounted for by an outdoor air system that means in increase in air handling equipment, but overall reduction in ductwork and terminal units. By using this system, and significantly decreasing the airside energy usage, a yearly cost savings is calculated.

The construction management breadth implications for the use of these alternate systems includes a higher calculated upfront cost and increase in construction time necessary through the special construction required for a radiant floor slab.

Positive implications of the radiant system exist for the acoustical breadth analysis include a lower overall sound pressure level and room criterion for the spaces of concern. Addition analysis proves that the necessary floor finish alteration to correspond with the radiant slab design has minimal effect on the acoustical reverberation characteristics.

Finally, investigation of the use of natural ventilation, including full computational fluid dynamics simulation, determines this as a feasible alternative design to further aid the reduction of operating cost achieved by the radiant floor system. Altogether it is determined that these proposed alternative systems would improve the overall mechanical design of the STEM Center on the Delaware County Community College campus.