

Executive Summary

The Francis Michael Performing Arts Academy Auditorium renovation is the focus of research for this thesis report. The report seeks to investigate strategies that could benefit the building design in terms of energy conservation, first cost savings and renovation construction time. When evaluating the options to improve the Auditorium's systems, several considerations came to mind:

- How could the building benefit holistically from a change in design?
- What systems are affected by this change?
- What are the costs and benefits of the design change?

The owner's goal for the Auditorium is to revitalize the building and create to a world-class performing arts facility. While economic feasibility is a large constraint the owner also wanted innovative mechanical systems, that are conscious of energy consumption. Another goal is to correct the acoustics properties of the theater space within the Auditorium.

The depth of this report focuses on investigating alternative mechanical systems for the support spaces surrounding the theater. Active chilled beams and a demand based ventilation system were investigated for energy, cost and operational impact. Additionally, two breadth studies in construction and acoustics were explored. The construction study analyzed the first cost and schedule impacts of implementing a chilled beam system. The second breadth examines the acoustical properties of the support spaces and further studies the impact of the rooftop mechanical units on the theater audience.

Throughout a year of investigation into all of these areas of study the analysis yielded the following results:

<i>Chilled Beam Analysis</i>		[Mechanical Depth & Construction Breadth]
Option A - 42 added Active Chilled Beams	Option B - 98 added Active Chilled Beams	
○ Annual Energy Savings: \$15,348 (5%)	○ Annual Energy Savings: \$18,805 (7%)	
○ Added First Cost: \$121,606 (10.5 yrs)	○ Added First Cost: \$488,620 (N/A)	
○ TCO Savings (20 yrs): \$97,596	○ TCO Savings (20 yrs): - \$214,529	
<i>Demand Controlled Ventilation Analysis</i>		[Mechanical Depth]
Office Spaces	Performance Spaces	
○ Potential Energy Savings: 45%	○ Potential Energy Savings: 20%	
<i>Acoustic Analysis</i>		[Acoustic Breadth]
Room Acoustic Study (Original/Proposed)	Theater Acoustic Analysis	
○ Open Office: NC - 29/NC - 24	○ Reverberation Time T(30): ~ 3.3 sec	
○ Private Office : NC - 21/NC - 25	○ Background Noise Level: ~ NC - 35	