

# Executive Summary

The following report serves to provide an alternative design proposal for the New Science and Technology Center at the Chestnut Hill Academy. The alternative design includes three parts: an acoustical study, a daylight study, and the main HVAC design which consisted of switching the VAV system to a dedicated outdoor air system with active chilled beams. An ice thermal storage system was also included to help recover part of the electric costs.

The acoustical and daylight studies both served to evaluate the building outside of its HVAC performance. The acoustic breadth focused on the reverberation time of the classrooms and corridors, but included sound transmission ratings as well. The results showed that each of the spaces met the target reverberation time range of 0.4 - 0.6 seconds at almost all frequencies. Each exterior and interior wall type, with one exception, met the recommended STC rating as well.

The daylight breadth served two purposes. The first was to justify the cost of including a daylight harvesting system in the original design. The second was to try and either improve the current design in order to maximize the daylight potential. The results showed that a daylight harvesting system was justified. Several attempts, such as new glazing layouts and building re-orientation, were compared to the original design to see if the interior daylight levels could be increased. Of all the trials, the original design proved to provide the best conditions for daylight harvesting.

The main HVAC alternative, as stated above, included both ACB and TES. Each space was supplied with dehumidified air which was conditioned and mixed locally. Simulations showed a significant increase in energy use, as expected with a DOA system. In an attempt to decrease the resulting increase in annual operating costs an ice storage system was included. The ice storage system was intended to create ice using electricity during off-peak hours and then supplying cold water to the chiller during the on-peak hours. While the system did lower the operating costs, it was not significant enough to justify the alternative design. The alternative design saved roughly 4% in capital costs, while the annual operating costs were 27% higher than the original design. In comparison the original design for the Science & Technology Center's HVAC system is the better choice.