

Executive Summary

The Lutheran Theological Seminary at Philadelphia, The New Learning Center is located in the code district of Philadelphia, Pennsylvania. ASHRAE 90.1 has requirements for building envelope, HVAC systems and equipment, and electrical systems that must be met. ASHRAE also specifies the design conditions for the modeling and simulation of the building before construction. Analysis was performed of the building and its systems to compare with the ASHRAE 90.1 codes. The results are shown in the following table.

Category	System or Design Compliance
Exterior Walls	Yes
Roof	Yes
Glass Area	Yes
Glass U-Value	Yes
Glass Shading Coefficient	No
Chiller COP	Yes
Boiler COP	Yes
Service Water Heating	Yes
Power	Yes
Lighting	No
Motor Efficiency	Yes

LEED-NC Certification was also performed on the Lutheran Theological Seminary at Philadelphia. Although this building was not initially designed for LEED purposes, it was designed well enough that 15 points were still attained. If the design and construction were up to date with the most recent building strategies and codes it would be above that level. With slight variation to the process and design another 15 points would be attainable. That would make the building LEED Certified, and almost LEED Silver.

The Lutheran Theological Seminary at Philadelphia was designed with a mechanical system with a chiller, two boilers, three air handling units, and fan coils for heating and cooling. With these pieces of equipment, and all the supporting mechanical equipment that allows the system to operate properly, the total initial HVAC cost was \$1,468,000. That breaks down to approximately \$26.22 per square foot. There is also an overall 3.57% of the building area that in lost rentable space due to the mechanical room, mechanical closets for fan coils units, and vertical shafts for ductwork.

Trane Trace was used to model the building and run load, energy, and cost estimations. All of the zones and equipment were input into the program and run. The analysis showed that all portions of the system, including the boilers, chiller, air handling units, and fan coils, were all

sized properly for heating and cooling. Some of the air handling unit ventilation values were slightly low, but they were quite close to the calculated values. The simulation estimated the annual cost of operation of the mechanical and electrical systems to be \$77,168, approximately \$1.38 per square foot.