



Senior Thesis Program
The Department of Architectural Engineering
The Pennsylvania State University
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Breadth Analysis – Mechanical

Ideas and suggestions for breadth analysis in Building Mechanical Systems

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Design Considerations – Building Mechanical Systems

- Accessibility for regular maintenance – more accessible means better and more frequent upkeep.
- Coordination with other trades – physical coordination and sequential coordination.
- Effect on acoustical performance of the spaces
- Return Air Plenums – impact on air temperature/flow rate
- Return Air Plenum – fire resistive construction (Plenum rated cables or in conduits)
- Return air windows.
- HVAC equipment load (weight) on the structural design. How is this issue addressed? Can we make some generalized prediction?
- Raised floor – under floor air distribution. Impacted on comfort, energy usage, structural framing and construction coordination.
- Type of structural system – physical space requirement, fire protection requirements.
- Construction sequencing – how to get the large equipment to its designated location,
- Replacement access – how to get the replacement unit into the existing location.
- Back-up/Stand-by equipment – How crucial is down time? How long does it take to get equipment replaced? Is down time crucial?
- Emergency power – How critical is it to maintain operation during power outages? How quickly must the emergency power come on? How long should the emergency power be available for? What is in the building now? Assess the risks that the current system poses and how can the risks be reduced?
- What architectural changes can be made to reduce energy use and/or improve building or system performance?

Impact on Building Mechanical Systems - when changes to structural electrical design are considered.

- Effect on heating and cooling loads when electrical usage is altered.
- Consider heating and cooling needs with added equipment, such as UPS systems and indoor transformers.
- Effect on spatial requirements. Steel structure is typically deeper than concrete.
- Impact of exposing the mechanical system. What are you going to see? How do you organize the stuff?
- Long term impact – will the construction stand up over time?

Energy Conservation and Energy Cost Reduction Considerations

- Time of day usage – ice or chilled water storage (Not necessarily energy savings, but only energy cost savings.) Look the energy rate structure.
- Energy recovery – Air-to-Air heat exchanger, sensible only or enthalpy recovery
- Alternate energy sources