YOUR TRUSTED DESIGN PARTNER

- GENERAL GEOMETRY
- INTERNAL LOADS & SCHEDULES
- BUILDING ENVELOPE
- HVAC SYSTEMS & SCHEDULES

BUILDING ENERGY MODELING CHECKLIST

BEM is a physics-based software simulation of building energy use. A BEM program takes as input a description of a building, including the parameters shown in this article. The program combines these inputs with information **about local weather and uses physics equations to calculate thermal loads**, the system's response to those loads, resulting energy use, and related metrics such as occupant comfort and energy costs. BEM programs perform calculations for a full year on an hourly or shorter basis. They also account for system interactions, such as those between lighting and heating/cooling.

THE USES OF BEM

- **Architectural Design**: Architects utilize BEM to design energy-efficient buildings, specifically to make informed decisions about the quantitative trade-offs between up-front construction costs and operational energy costs.
- **HVAC Design and Operation**: BEM assists mechanical engineers in designing HVAC systems that efficiently meet the building's thermal loads. It also aids in the design and testing of control strategies for these systems.
- **Building Performance Rating**: BEM can be employed to assess the inherent performance of a building while accounting for specific use and operation factors.
- **Building Stock Analysis**: BEM analysis conducted on prototype models, supports the development of energy codes and standards. It also assists organizations such as utilities and local governments in planning large-scale energy-efficiency programs.

ENERGY CODES TO CHECK

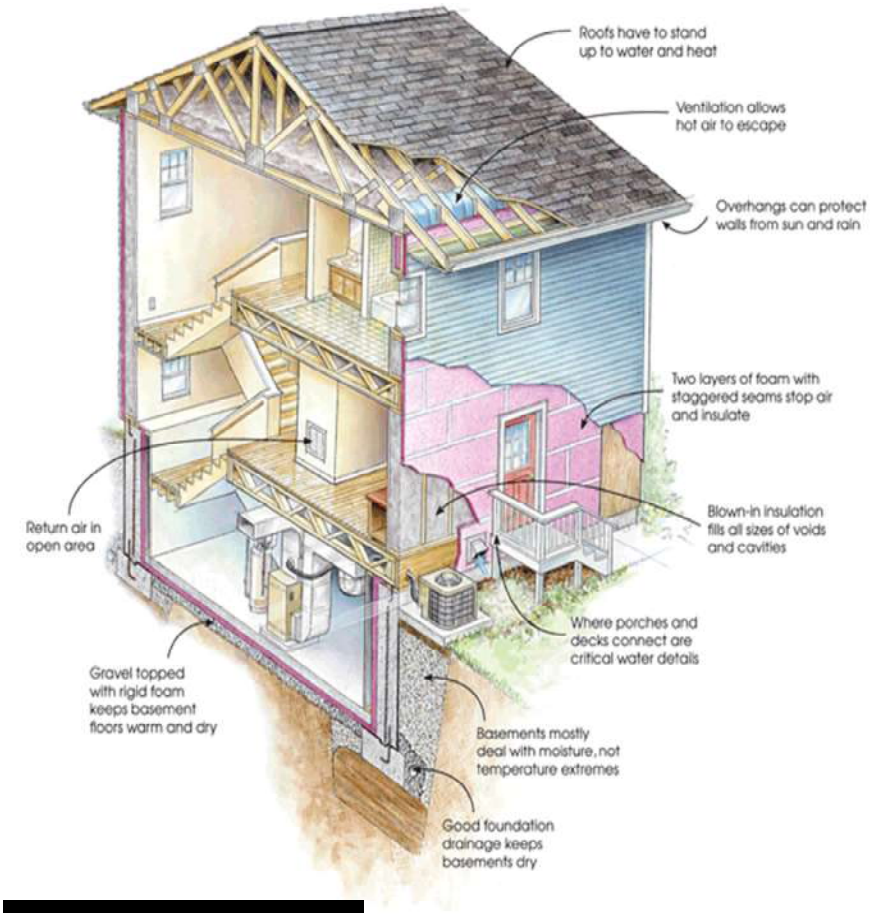
- IECC minimum-compliant baseline building using the Performance Rating Method (PRM) outlined in section 407 of the referenced standard.
- Appendix G from ASHRAE 90.1
- LEED CERTIFICATION REQUIREMENT
- GREEN GLOBE CERTIFICATION REQUIREMENT

GENERAL GEOMETRY

- Building shape and orientation
- Program – principal building function (e.g., small office, large office, hospital/medical, hotel,etc.)
- Total floor area
- Number of floors
- Thermal zoning of floors (Perimeters and Core)
- Floor to Floor height
- Floor to Ceiling height

INTERNAL LOADS

- Anticipated Occupancy (average no. of people)
- Lighting power density (average W/ft^2)
- Daylighting sensors, Occupancy sensors.
- Plug load power density (average W/ft^2)
- Exterior lighting peak power
- Elevator (Type, peak motor power, schedule of use)
- Occupancy schedule (summer/winter; weekday, weekend, holiday hours of use)
- Lighting schedule (summer/winter; weekday, weekend, holiday hours of use)
- Plug-load use schedule (summer/winter; weekday, weekend, holiday hours of use)
- Exterior lighting schedule (summer/winter; weekday, weekend, holiday hours of use)



BUILDING ENVELOPE

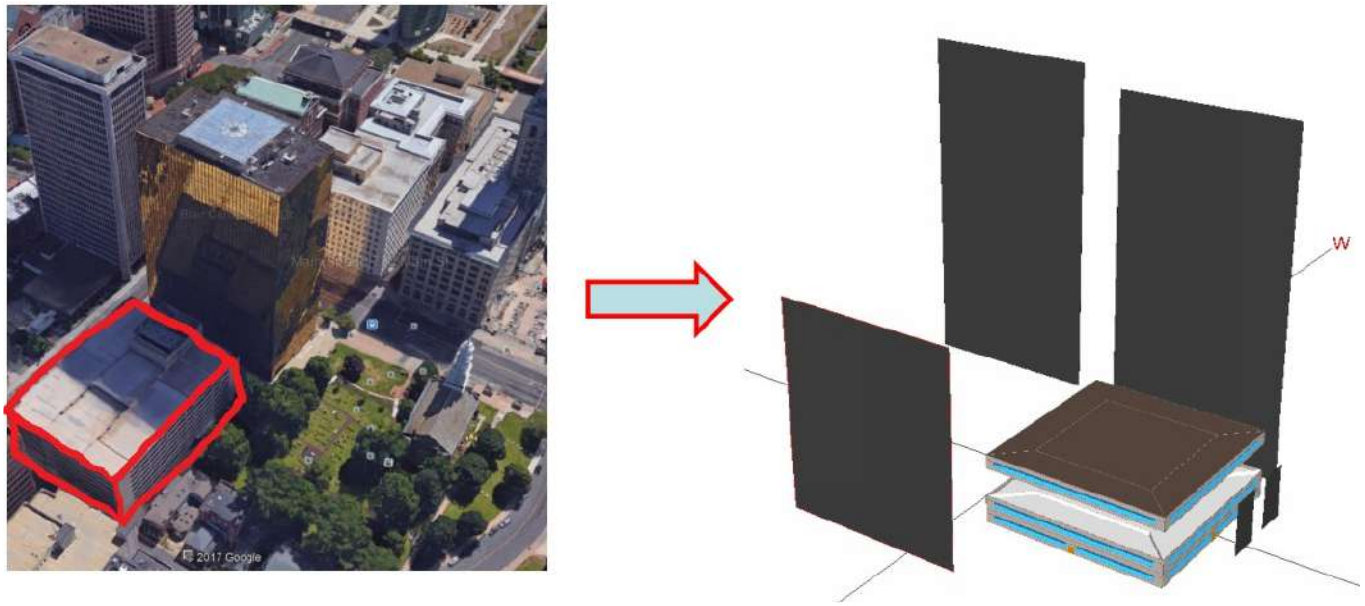
- Window dimensions (each orientation, if different, lower vs upper floors)
- Glazing sill and head height (above the floor, each window type)
- Window-to-wall ratio (each orientation, if different, lower vs upper floors)
- Shading Geometry (for each orientation, if different)
- Windows + Skylights (SHGC, U-value + visible light transmission, frame-type)
- Wall, Roof + Foundation construction/ makeup
- Interior Partitions, Internal Mass (furniture), Infiltration assumptions
- Infiltration schedule (weekday, weekend, holiday)

HVAC SYSTEMS

- System-type (heating + cooling)
- Sizes (capacity + efficiency) or ‘auto size to design day’.
- Distribution type (e.g., VAV terminal boxes with electric reheat, underfloor plenum, etc.).
- Thermostat set-point and set-back (heating + cooling).
- Ventilation / Outdoor-air requirements.
- Economizers, Energy recovery.
- HVAC fan operation schedule (summer/winter; weekday, weekend, holiday hours of use).
- Heating schedule of operation (summer- weekday, weekend, holiday hours of use).
- Cooling schedule of operation (winter- weekday, weekend, holiday hours of use).
- Minimum Outdoor-air schedule (weekday, weekend, holiday hours of use).
- Fan efficiency, Pump type/efficiency.
- Cooling-tower type/efficiency.
- Service water type/efficiency/volume/T-setpoint and service hot-water schedule of use.

SITE SHADING

- Shading by adjacent structures and terrain must be modeled the same as in the proposed design.
- Shading from canopies, overhangs, etc.



APPROVED ENERGY MODELING SOFTWARE

- EnergyPlus building.
- Carrier hourly analysis program (HAP).
- Trane TRACE 700
- eQUEST
- DesignBuilder

CONCLUSION

The building energy modeling checklist serves as a valuable tool for ensuring comprehensive and accurate energy analysis and optimization of building designs. By following the checklist, we can systematically evaluate various aspects of a building's energy performance, including insulation, HVAC systems, lighting, and renewable energy options. The checklist promotes a holistic approach to energy modeling, considering both passive and active design strategies to achieve optimal energy efficiency, occupant comfort, and environmental sustainability.