

ENERGY MODELING REQUIREMENTS

✓The methodology described in ASHRAE 90.1-2016, Appendix G, and California Title 24-2019 involves the generation of two energy models: one representing a baseline minimum-standard building and the other representing the proposed building with all its designed energy enhancements.

✓Next Section summarizes the three referenced standards' modeling requirements for typical projects. Since project specific information may vary, project teams should refer to the referenced standard for all applicable details and modeling requirements. LEED-CS, LEED for Schools, LEED for Commercial Interiors (CI), LEED for Retail (NC and CI), and LEED for Healthcare are identical to LEED-NC except as noted in this table. For LEED-CI projects, the simulation should use either the energy cost budget method or the Appendix G performance rating method. If served by a common building HVAC system, a LEED-CI project should include both the project space and the building segment that uses the common HVAC system.



ASHRAE 90.1.2016

California Title 24

HVAC System Selection

Baseline Case

Determine HVAC system type using actual building area, usage, number of floors, occupancy (residential or nonresidential), and heating fuel source, per Tables G3.1.1A and G3.1.1B. As per G3.1.1, use same baseline HVAC system type for entire building except for specific exceptions listed in G3.1.1:

- (a) nonpredominant conditions if they apply to more than 2,000 square feet of building area;
- (b) spaces with significant variances in process loads or occupancy schedules;
- (c) spaces with special pressurization or cross-contamination requirements that preclude use of variable air volume (VAV); or
- (d) laboratory spaces.

System types 1-4 should be modeled with one system per thermal block. System types 5-8 should be modeled with one system per floor, except that floors with identical blocks can be grouped together.

Proposed Case

Use proposed design HVAC system type and quantities. If no cooling system has been specified, model design case cooling system identical to baseline cooling system. **Exception:** Heated-only storage spaces that follow exception for modeling baseline system types 10 or 11 from ASHRAE 90.1-2016 Addendum dn or types 9 or 10 from ASHRAE 90.1-2016 should be modeled as designed, as heated-only systems.

If no heating system has been specified, assume electric heating.

For project areas without heating or cooling systems (e.g., parking garages), no air-conditioning systems should be modeled in either proposed or baseline design; any fans should be modeled identically in baseline and proposed cases as process loads unless exceptional calculation method is used.

Baseline Case

Automatically modeled in compliance mode.
Major difference from ashrae 90.1-2016
Baseline HVAC system is selected based on number of stories, occupancy type, proposed design HVAC system type (multi- or single-zone), and heating fuel. No credit or penalty for efficient duct design and low fan static pressure, unless maximum requirements are exceeded. No credit or penalty for limiting pump head.
Reporting unmet load hours is not required if EnergyPro compliance mode is used. Unmet load hour requirement is less than 10% unmet load hours (876 hours per year).

Proposed Case

Proposed design HVAC system type and quantities should reflect actual design.
Major difference from ashrae 90.1-2016
Reporting unmet load hours is not required if EnergyPro compliance mode is used. Unmet load hour requirement is less than 10% unmet load hours (876 hours per year).

ASHRAE 90.1.2016

California Title 24

HVAC System Selection +

Baseline Case

LEED - CI
If project involves no modifications to central plant or if only auxiliary components of central plant, such as pumps, have been upgraded, replace changed central plant components with mandatory and prescriptive equivalent of ASHRAE 90.1-2016, and change items within project area to mandatory and prescriptive requirements of standard. Model rest of building segment using existing conditions same as proposed case.
* Appendix G method: Determine HVAC system type following Tables G3.1.1A and G3.1.1B, based on LEED CI project area and other parameters noted above.
* Energy cost budget method: Determine HVAC system type following Figures 11.3.2 and Table 11.3.2A based on HVAC system serving project area. If extensive modifications to central plant are included in proposed case, use one of following methods:
* Appendix G method: Determine HVAC system type following Tables G3.1.1A and G3.1.1B, based on CI project area and other parameters noted above. Energy cost budget method: Determine HVAC system type following Figures 11.3.2 and Table 11.3.2A based on central HVAC system in proposed case. Alternative baseline case:
* Appendix G method: Determine HVAC system type following Tables G3.1.1A and G3.1.1B, based on entire modeled segment area and other parameters noted above.
* Energy cost budget method: Determine HVAC system type following Figures 11.3.2 and Table 11.3.2A based on HVAC system serving entire modeled segment area.

Proposed Case

LEED - CS
Model building system as described in design documents. If HVAC system is not yet designed, use same HVAC system as baseline case.
LEED - CI
Use proposed design of project space, and use field-verified HVAC system information for any existing central plant.

Baseline Case

LEED - CS
Model building system as described in design documents. If HVAC system is not yet designed, use same HVAC system as baseline case.
LEED - CI
Use proposed design of project space, and use field-verified HVAC system information for any existing central plant.

Proposed Case

LEED - CS
Model building system as described in design documents. If HVAC system is not yet designed, use same HVAC system as baseline case.
LEED - CI
Use proposed design of project space, and use field-verified HVAC system information for any existing central plant.

ASHRAE 90.1.2016		California Title 24	
HVAC System Selection +			
Baseline Case	Proposed Case	Baseline Case	Proposed Case
HVAC equipment capacities for baseline system should be oversized 15% for cooling and 25% for heating (G3.1.2.2 and G3.1.2.2.1).	Proposed design HVAC system should reflect actual design capacities and system efficiencies.		
leed-CI - Appendix G method: Same as above. - Energy cost budget method: Size HVAC proportionally to capacities in proposed design based on sizing runs.			
Unmet load hours (occupied periods where any zone is outside its temperature setpoints) may not be exceeded by more than 500 hours. Also, unmet load hours for proposed design may not exceed unmet load hours for baseline design by more than 50 (G3.1.2.2).	Same as baseline case.		
LEED - CI - Appendix G method: Same as above. - Energy cost budget method: Unmet load hours should not differ by more than 50 hours between two cases. Outdoor ventilation rates should be identical to proposed case.	Proposed design should reflect actual outdoor		

ASHRAE 90.1.2016		California Title 24	
HVAC System Selection +			
Baseline Case	Proposed Case	Baseline Case	Proposed Case
Operate fan continuously when spaces are occupied and cycle it during unoccupied hours, except for spaces that have mandated minimum ventilation requirements, where fan must remain on during unoccupied hours for health and safety reasons (G3.1.2.4). Baseline system fan supply air volume should be based on a supply-air-to-room-air temperature difference of 20°F or required ventilation or makeup air, whichever is greater (G3.1.2.5). Use this supply air volume to calculate total fan power for baseline system design (G3.1.2.6). This value reflects form of power modeled for supply, exhaust, return, and relief fans.	Proposed HVAC design should reflect actual fan operation, fan supply rate, and fan motor horsepower.		
<div>LEED - CI -<ul style="list-style-type: none">Appendix G method: Same as above.Energy cost budget method: Fan operation is same as proposed case. Fan system blow-off should be same as proposed case or up to limit in Section 6.5.3.1, whichever is smaller.</div>			

ASHRAE 90.1.2016		California Title 24	
HVAC System Selection +			
Baseline Case	Proposed Case	Baseline Case	Proposed Case
Fan energy must be separated from cooling system. Overall efficiency rating, such as energy efficiency ratio, must be separated into component energy using coefficient of performance or other conversion (Equations G-A, G-B, and G-C, ASHRAE 90.1-2016 User's Manual, pp. G-24, G-26).	Same as baseline case.		
Note that fan power is broken out from cooling energy at AHRI conditions and does not necessarily correspond to installed fan power at design conditions.			

ASHRAE 90.1.2016		California Title 24	
HVAC System Selection +			
Baseline Case	Proposed Case	Baseline Case	Proposed Case
Model economizers and exhaust air energy recovery systems in baseline HVAC systems when required for given climate zone and system parameters (G3.1.2.6 and G3.1.2.10). Follow HVAC system-specific requirements (chillers, boilers, heat pumps) as indicated in G.3.1.3. LEED - CI • Appendix G method: Same as above. • Energy cost budget method: Follow HVAC system specific requirements indicated in notes for Table 11.3.2A.	Include economizers if indicated in actual design parameters. System-specific requirements should reflect actual conditions. LEED - CS System-specific requirements should reflect actual conditions. If system-specific requirements are not specified, model HVAC system identically to baseline case.		



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