ADDENDA

ANSI/ASHRAE/IBPSA Addendum m to ANSI/ASHRAE Standard 209-2018

Energy Simulation Aided Design for Buildings Except Low-Rise Residential Buildings

Approved by ASHRAE and the American National Standards Institute on September 30, 2024, and by the International Building Performance Simulation Association on September 26, 2024.

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FOREWORD

Addendum m adds a new Informative Appendix I to the standard.

Informative Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum m to Standard 209-2018

Add new Informative Appendix I as shown.

(This appendix is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

INFORMATIVE APPENDIX I
LEVEL OF DETAIL FOR MODEL INPUTS

This appendix provides guidance on the appropriate level of detail (LoD) for model inputs considering different use cases, specifically the Standard 209 *modeling cycles*. The resolution or granularity of model inputs can affect both the usefulness of results and the level of effort required to complete an analysis. An optimal LoD will result in models that accurately represent the building systems of interest while avoiding unnecessary complexity and modeling time. With experience, energy modelers develop intuition regarding which model inputs require extra attention based on factors such as the analysis objective, the phase of design, and the availability of data.

For this guidance on LoD, inputs are categorized into model elements and their attributes. Table I-1 illustrates ten model elements and their key attributes along with a description of the range of potential input granularity (***Note:*** These model elements are adapted from the information-sharing workflow developed by Grinberg and Rendek[XX69]). It is important to note that the model elements listed in Table I-1 are not intended to be comprehensive but rather selected based on the applicability for most use cases and model cycles. The appropriate LoD for each attribute might vary depending on the simulation objective. For example, for Modeling Cycle #4, "HVAC System Selection Modeling," a high LoD for thermal zoning and *HVAC system* representation is likely appropriate, while a lower LoD for lighting, plug loads, and fenestration may be acceptable. In other words, for any given analysis, the optimal LoD is likely a mixture of high LoD for some inputs and lower LoD for other inputs. Guidance for the ten modeling elements and how they apply to each of the standard's seven design-phase *modeling cycles* is provided as follows.

Table I-1 Model Elements and Their Attributes

Model Element	Attributes	Description
Weather	• Weather data file • Design-day conditions • Ground temperature	Location of weather data measurement: • Nearest regional weather station • Location with similar climate • Site microclimate The type of hourly weather data: • Typical meteorological year (TMY) • Actual year • Future year [a] • Extreme year
Geometry	• Building shape (area, tilt, orientation and location of exterior surfaces and shading surfaces) • Surface boundary conditions (outdoors, ground)	Some simplification of building geometry is appropriate in almost all cases, even for detailed models, as long as the model represents a reasonable thermodynamic equivalent of the actual design.
Zoning	• Thermal zoning	Could range from a simplified approach, such as perimeter-core zoning for each floor, to actual HVAC thermal zones. In many cases, simplification relative to the actual HVAC thermal zoning, i.e., aggregation of actual zones into a smaller number of model zones, is appropriate. When actual HVAC zones comprise more than one space, modeling the zone as a single space is a common simplification. At a higher LoD, each space can be modeled, and groups of spaces can be associated with a thermal zone.
Constructions	• Material thermal properties • Thermal bridges • Surface properties	Typical options for representing materials include (a) a simple massless R-value or (b) material properties that represent thermal conductance and thermal mass. The second approach is appropriate for most cases and will result in more accurate heating and cooling load calculations. Thermal bridges exist in most constructions, and models should account for their impact. Important surface properties include solar reflectance and thermal emittance. Interior constructions used to represent partition walls and interior floors affect space load calculations and should, in most cases, be modeled with a method that accounts for thermal mass.
Fenestration	• Window dimensions and position • Glazing properties • Frame properties • Shading devices	Simplifications to fenestration dimensions and position are generally appropriate as long as window area, orientation, and tilt are correct for each thermal zone. If the model includes daylighting controls, then accurate window placement within the space is more important. For glazing properties, simplified methods allow direct input of U-factor, solar heat gain coefficient, and visible light transmittance. Detailed methods will account for the thermal and optical properties of each glazing and gap layer. Window frames may be modeled using whole-window performance inputs that represent the combined performance of glazing and frame, or frames may be modeled explicitly and separate from the glazing. Shading devices, such as overhangs and sidefins, are generally represented explicitly in the model. Some simplifications may be appropriate to represent the configuration of complex shades.

a. See Informative Appendix F for information about future climate analysis.

Table I-1 Model Elements and Their Attributes *(Continued)*

Model Element	Attributes	Description
Lighting	• Lighting power • Operation schedule • Fraction of light heat to space	At the simplest LoD, a single lighting power density and operation schedule is applied to all zones. At a higher LoD, lighting power is entered for each space based on occupancy type or an actual lighting design, and operating schedules reflect anticipated space usage and impact of automatic controls. The split between the lighting heat gain that goes to a space and the heat gain to a separate location such as a return air plenum depends on the type of lighting fixture. Default values are commonly used when fixture types are unknown. Otherwise, appropriate inputs based on lighting fixture type will provide more accurate space heat gain calculations.
Plug and *process loads*	• Power • Operation schedule	Power inputs could range from default plug load density based on building type to client- specified or measured equipment power densities. At a simple level, operation is represented by a single schedule applied to all zones. At a detailed level, schedules are unique to each zone based on expected usage or measured operation.
HVAC	• *HVAC system* configuration • Capacities • Efficiencies • Flows • Ventilation rate • Operating schedule • Controls	There are several dimensions to LoD for *HVAC system* inputs. Individual air distribution systems may be combined into one or more larger systems in the model, or they each may be modeled explicitly. Chilled-water systems and hot-water systems may be represented by simple loops with typical chiller and boiler types, or may be configured based on actual loop design and equipment type. Capacities and flows for HVAC equipment may be autosized, or actual values may be entered. Efficiency and off-design performance of components (i.e., performance curves) may be based on typical equipment or may be specified for specific equipment. Ventilation rates may follow typical standards or actual design. Efficiency strategies, such as demand control ventilation, heat recovery, or a dedicated outdoor air system, may be represented at varying LoD. Controls (static pressure reset, supply temperature reset, chiller staging, etc.) may be based on minimum requirements or typical practice or may be based on specific design strategies.
Service water heating (SWH)	• Hot-water flow and profile • Make-up and fixture water temperatures • Equipment capacity, efficiency, and controls	At a lower LoD, SWH loads may be estimated based on building type and number of occupants. At a higher LoD, SWH loads may be based on selected fixtures and number of fixture uses per day. In some cases, SWH is not included in the model if it does not affect the analysis objective.
Occupants	• Occupant count • Metabolic rate • Schedule	Occupant types and their characteristics (such as schedules, metabolic rate) may be homogeneous or heterogeneous. Occupant count could range from default occupant density based on building type to client-specified. Occupant schedules may range from simpler representation at the whole-building level through default static occupancy profiles to detailed zone-level dynamic occupancy profiles.

a. See Informative Appendix F for information about future climate analysis.

XX1 MODELING CYCLE #1— SIMPLE BOX MODELING

For Modeling Cycle #1, the *energy modeling* use case is to evaluate basic alternatives for building form, window area, window shading, and envelope constructions. Key considerations are as follows:

- Quick turnaround is necessary to provide timely design feedback.
- Information available about the project may be limited to location, occupancy type(s), and approximate floor area.

Table I-2 Level of Detail for Cycle #1—Simple Box Modeling

Model Element and Attribute	Guidance on Level of Detail
Weather	A TMY weather file for the closest available location is typically appropriate.
Zoning	A simplified perimeter-core thermal zoning pattern is generally appropriate to minimize model complexity and development time.
Geometry	One objective of Modeling Cycle #1 is to provide designers with information about the impact of building form and orientation before any design concepts are developed. A common approach is to model simple rectangular geometries that provide the same floor area but have varying aspect ratio, number of floors, and orientation.
Constructions	Another objective of this *modeling cycle* is to evaluate the sensitivity of energy consumption to changes in opaque envelope construction. A reasonable approach is to evaluate high, medium, and low levels of insulation for walls, roofs, and floors. Consider also evaluating constructions with high and low thermal mass. Avoid modeling exterior surfaces as massless or quick constructions so that the heating and cooling load results include the effect of thermal mass of envelope components. Default assumptions for interior constructions are generally appropriate.
Fenestration	The evaluation will typically include the impact of window area, window performance, and perhaps also window shading. Simple window geometries are appropriate, typically one window per orientation in each zone, to represent a given window-wall ratio. Simple window performance input methods—U-factor, solar heat gain coefficient, and visible light transmittance—are also appropriate at this stage. The evaluation might include models with high, medium, and low values for each.
Lighting	Default values for lighting power and lighting schedules based on the building type from standards are generally appropriate. Modeling of daylighting control in perimeter zones should be considered in order to reflect the effect that window area and light transmittance have on the availability of daylight.
Plug and *process loads*	Default values for plug-load power and schedules based on building type are generally appropriate.[a]
HVAC	A typical *HVAC system* with default specifications, perhaps based on energy code requirements, and typical hours of operation is appropriate. A few considerations: • Choose a system with an appropriate type of heating system. If for example, one goal is an all-electric project, then choose a system type with heat-pump heating. • Carefully consider inputs that significantly impact heating and cooling loads and consumption. For example, air-side economizers provide free cooling when outdoor conditions are favorable, which can have a significant impact on cooling energy consumption. Exhaust air energy recovery can significantly reduce heating energy consumption in buildings with high minimum outdoor-air ventilation requirements. • Review any system autosizing results to ensure that changes in system sizing between models seem reasonable.
Service water heating (SWH)	Default values for SWH load based on occupancy type are typically appropriate. Default equipment performance, may be based on energy code requirements, with attention to choosing an appropriate water-heater type, e.g., electric resistance, gas, or heat-pump.
Occupants	Default values for number of occupants and the occupancy schedule are typically appropriate.[a]

a. Refer to Informative Appendix C for more information on data sources for model inputs.

XX2 MODELING CYCLE #2— CONCEPTUAL DESIGN MODELING

For Modeling Cycle #2, the *energy modeling* use case is to evaluate alternatives for the form and architecture of the building. Key considerations are as follows:

- Quick turnaround is necessary to provide timely design feedback.
- Little to no project-specific information is available about envelope components, lighting systems, and *HVAC systems*.

Table I-3 Level of Detail for Cycle #2—Conceptual Design

Model Element and Attribute	Guidance on Level of Detail
Weather	A TMY weather file for the closest available location is typically appropriate, with consideration for similarity in elevation or potential microclimate issues.
Zoning	The goal is a model that accurately reflects the heating and cooling load impacts of different architectural designs. For this purpose, a simplified perimeter-core thermal zoning pattern is generally appropriate to minimize model complexity and development time. Additional zones might be appropriate to approximately represent areas with significantly different characteristics, such as fenestration area, internal loads, or operating schedules.
Geometry	A primary objective of Modeling Cycle #2 is to evaluate the impact of different building geometry alternatives. Therefore, models should reflect the significant differences between alternatives while avoiding unnecessary detail. The most important characteristics are surface area and orientation. While some judgment is necessary, simplifications that ignore small features or details of the opaque envelope are unlikely to significantly impact the analysis.
Constructions	The appropriate LoD for opaque envelope constructions will depend on the conceptual design alternatives being evaluated. In some cases, the focus of the study is on building form alone, and project-specific information about opaque envelope constructions is not yet available. In this case, choice of typical constructions, perhaps based on energy codes, is appropriate. In other cases, the type of opaque envelope construction may be a subject of the study. For example, alternatives might include different structural systems such as steel, concrete, and wood. In those cases, attention to the details of constructions and their thermal properties is appropriate. In all cases, avoid modeling exterior surfaces as massless or “quick” constructions so that the heating and cooling load results include the effect of thermal mass of envelope components. Also ensure that model inputs reflect approximate impact of thermal bridging. Pay attention to modeling of interior constructions such as interior floors and partitions, especially in cases where conceptual design alternatives include different levels of thermal mass.
Fenestration	Ensure that window area and orientation are represented accurately for each alternative. If alternatives include differences in window shading, then ensure that the approximate dimensions of window shading devices are correct. Otherwise, it is generally appropriate to simplify the window inputs with, for example, a single window instead of a set of punched windows. The exact location and dimension of the window relative to the zone is not critical except in cases where automatic daylighting controls are modeled. When the simulation tool offers different methods to represent window thermal and optical performance, a simple approach is reasonable at this stage because the actual glazing selection is typically not yet available. These simplified methods allow direct input of U-factor, solar heat gain coefficient, and visible light transmittance. Ensure that the U-factor represents overall window performance, including framing.
Lighting	Default values for lighting power based on the building type from standards and codes are generally appropriate. Default lighting schedules based on building type are also appropriate, though adjustments may be appropriate if the anticipated building operation schedule is atypical. Modeling of daylighting control in perimeter zones should be considered in order to reflect the effect that architectural design alternatives have on the availability of daylight.
Plug and *process loads*	Default values for plug-load power and schedules based on building type are generally appropriate.[a] Extra time to identify project-specific plug load inputs may be appropriate if one of the goals of the analysis is to provide an initial estimate of likely building energy consumption.
HVAC	See guidance for Modeling Cycle #1 in Section I1.
Service water heating	See guidance for Modeling Cycle #1 in Section I1.
Occupants	Default values for number of occupants and the occupancy schedule are typically appropriate.[a]

a. Refer to Informative Appendix C for more information on data sources for model inputs.

XX3 MODELING CYCLE #3— LOAD REDUCTION MODELING

For Modeling Cycle #3, the *energy modeling* use case is to evaluate load reduction strategies prior to final *HVAC system* selection. Key considerations are as follows:

- Schematic design moves quickly, and prompt analysis is required for the results to be useful.
- The architectural design may be evolving in parallel with the *energy modeling* analysis.
- The analysis is performed prior to final *HVAC system* selection, which means that little to no project-specific information will be available for HVAC model inputs.

Table I-4 Level of Detail for Cycle #3—Load Reduction Modeling

Model Element and Attribute	Guidance on Level of Detail
Weather	A TMY weather file for the closest available location is typically appropriate, with consideration for similarity in elevation or potential microclimate issues. Consider also using a future-weather or extreme-weather file to evaluate the sensitivity of loads to changes in climate. See Informative Appendix F. Pay attention to choice of design-day inputs.
Zoning	The floor-plan design may be evolving as the analysis is performed, so simplifications to thermal zoning in the model are usually appropriate to reduce complexity and modeling time. It is usually more valuable to provide early results based on an approximate floor plan than to wait for the architectural design to be finalized before creating an *energy model*. Include enough detail in thermal zoning to represent the range of expected space usages, considering differences in internal loads and usage schedules.
Geometry	As with zoning, simplifying assumptions for the building form are appropriate in the interest of timely results. Shading devices and shading from adjacent structures should be included.
Constructions	The appropriate level of detail depends on whether alternatives for opaque envelope constructions are a subject of the analysis. See also guidance for Modeling Cycle #2 in Section I2.
Fenestration	See guidance for Modeling Cycle #2 in Section I2.
Lighting	Since lighting heat gain is a significant contributor to space loads, it is generally appropriate to use lighting power density inputs for each zone that are appropriate for the space occupancy type. Default lighting schedules based on building type are often appropriate, though adjustments may be warranted if the anticipated building operation schedule is atypical. Modeling of daylighting control in perimeter zones should be considered to reflect the effect that lighting controls have on cooling and heating loads.
Plug and *process loads*	Because one of the goals of Modeling Cycle #3 is to estimate end-use energy consumption, pay attention when choosing appropriate plug-load inputs for each space occupancy type. Use realistic plug load schedules for an accurate reflection of plug loads on energy consumption and thermal load. Nighttime and weekend plug loads may be higher than values in default schedules.[XX70]
HVAC	Use the likely proposed system type if that information is available along with any other *HVAC system* performance information that is available at the time of analysis. However, it is generally more valuable to proceed with the load reduction analysis as early as possible rather than waiting for details of *HVAC system* design. Otherwise, see guidance for Modeling Cycle #2 in Section I2.
Service water heating	See guidance for Modeling Cycle #1 in Section I1.
Occupants	Choose appropriate values for the number of occupants and occupancy schedule for each type of space usage.

XX4 MODELING CYCLE #4—HVAC SYSTEM SELECTION MODELING

For Modeling Cycle #4, the *energy modeling* use case is to evaluate the impact of different *HVAC system* types on energy performance for optimal system selection. Key considerations are as follows:

- The architectural design may be evolving in parallel with the *energy modeling* analysis.
- Lighting design is likely to still be under development.
- Full details of the design are unlikely to be available for each of the *HVAC system* alternatives, so many assumptions will be necessary regarding system performance.
- Appropriate details regarding the *HVAC system* alternatives are generally more important than details of the architectural model and internal heat gains.

Table I-5 Level of Detail for Cycle #4—HVAC System Selection

Model Element and Attribute	Guidance on Level of Detail
Weather	A TMY weather file for the closest available location is typically appropriate, with consideration for similarity in elevation or potential microclimate issues. Consider also obtaining a future-weather file or extreme-weather file to evaluate the sensitivity of loads and the impact on system selection to changes in climate. See Informative Appendix F.
Zoning	Appropriate thermal zoning depends somewhat on the status of the architectural design. It is common for at least a preliminary floor plan to exist, but it is likely that the architectural design is still evolving. Some judgment is required, but the thermal zoning of the model should include a reasonable representation of the diversity of space conditions, including variations in fenestration, internal loads, and occupancy schedules. However, simplification is also appropriate by, for example, grouping spaces with similar usage into larger model zones.
Geometry	Consider using a simplified shape with shading, based on the latest concept available from the architect.
Constructions	Model actual opaque constructions if information is available; otherwise, choose typical constructions appropriate to the building type. Simplifications are generally appropriate, such as a single typical construction type for each facade, where the actual design might include more than one type of wall construction. Avoid modeling exterior surfaces as massless or quick constructions so that the heating and cooling load results include the effect of thermal mass of envelope components. Also ensure that model inputs reflect approximate impact of thermal bridging. Model interior constructions with appropriate levels of thermal mass.
Fenestration	Simplifications to window geometry are generally appropriate as long as the window area and orientation match the design for each zone. Window performance should match the proposed glass type if known; otherwise, choose typical values from sources such as energy codes. Be sure to use whole-window U-factors that account for the impact of window frames.
Lighting	If preliminary lighting design information is not available, use default lighting power values for each space type from energy codes. Default lighting schedules are generally appropriate.
Plug and *process loads*	In general, use default values appropriate to the building type, but pay attention to inputs for zones with plug loads that are likely to be different, either higher or lower, than typical spaces. These could include spaces like computer rooms, corridors, kitchens, and laboratories.

Table I-5 Level of Detail for Cycle #4—HVAC System Selection *(Continued)*

Model Element and Attribute	Guidance on Level of Detail
HVAC	The goal of this evaluation is a reasonable and fair representation of each system type. Identifying appropriate inputs will require some judgment and attention to detail. For example, it may not be appropriate to compare a high-efficiency version of one system type to a minimum-efficiency version of another system type. It is unlikely that detailed designs have been developed for each system type, and information for model inputs may be required from a number of sources. Some inputs will typically remain constant among alternatives, and reasonable default values may be appropriate. This might apply to zone thermostat set points, HVAC operating hours, and outdoor-air ventilation rates. System-specific inputs are likely appropriate for cooling efficiency and heating efficiency, and information might come from specific equipment submittals or reference sources such as energy codes. Careful attention to inputs for partial-load performance is important. Fan power can vary significantly between system types due to differences in pressure requirements and fan efficiency. Research into appropriate values can help ensure a fair comparison. Other inputs that warrant attention include ventilation, airflow, and fan control. The opportunity for and performance of efficiency features such as exhaust air heat recovery can vary between system types and deserve attention. HVAC control inputs can have a significant impact on results, so also pay attention to inputs such as supply air temperature control, air-side economizer control, and VAV box control if applicable. Sizing affects system performance, so check that sizing results for each system are appropriate.
Service water heating	See guidance for Modeling Cycle #1 in Section I1.
Occupants	Use default values for occupant density schedule for building type from standards and codes, or use actual anticipated densities and usage schedule if known.

XX5 CYCLE #5—DESIGN REFINEMENT

The use case for Modeling Cycle #5 is to refine and develop the design of at least one building system after the design direction for that system has already been defined. Key considerations are as follows:

- A design direction has already been defined for building form and orientation, space programming, *HVAC system*, and service water heating system, but the level of design may vary.
- Judgment is required when defining the appropriate level of detail for the model elements that represent systems that are not subjects of the design refinement analysis.
- More time may be available for analysis compared to the earlier *modeling cycles*, allowing more time to gather project-specific input information and add model detail as appropriate for the system being studied.

Table I-6 Level of Detail for Cycle #5—Design Refinement

Model Element and Attribute	Guidance on Level of Detail
Weather	A TMY weather file for the closest available location is typically appropriate. A weather file representing the building location's microclimate may be appropriate when evaluating systems sensitive to weather, such as fenestration or heat recovery. Consider also obtaining a future-weather file or extreme-weather file to evaluate the sensitivity of the evaluation results to changes in climate. See Informative Appendix F.
Zoning	See guidance for Modeling Cycle #4 in Section I4. Some studies may warrant greater detail. For example, an analysis to refine *HVAC system* control strategies might require enough zoning detail to represent the likely diversity of space heating and cooling loads.
Geometry	Appropriate detail depends highly on the system being studied. Building geometry is not typically the subject of study in this *modeling cycle*.
Constructions	See guidance for Modeling Cycle #4 in Section I4. In addition, when opaque envelope constructions are the subject of the design refinement study, pay close attention to inputs for thermal properties for each material, surface properties (including solar reflectance and thermal emittance), and accurate representation of thermal bridging.
Fenestration	See guidance for Modeling Cycle #4 in Section I4. If fenestration is the analysis subject, it is generally appropriate to use detailed rather than simple glazing models. Pay attention to accurately representing the thermal impact of framing. Include exterior shading. Consider also modeling interior shading. If appropriate, include shading from adjacent buildings or landscaping.
Lighting	In most cases, use the proposed space-by-space lighting power. In addition, lighting schedules should represent the impact of automatic controls, such as occupancy sensors. If appropriate, include daylighting control, with attention to sensor locations, illuminance set points, and lighting control operation (e.g., switching or dimming). Also pay attention to model inputs representing the fraction of lighting energy that is heat gain to the space, which can vary by lighting fixture type. For example, with suspended fixtures, 100% of the energy is heat to the space, while for ceiling-recessed fixtures, a portion of heat goes to the space and a portion goes to the space above the ceiling.
Plug and *process loads*	In most cases, use plug-load power and schedule inputs that are appropriate for each zone. When plug or *process loads* are a subject of study, such as alternate elevator technologies or higher-efficiency appliances, office equipment, or refrigeration equipment, then a higher LoD may be appropriate.
HVAC	For an *HVAC system* refinement study, pay close attention to the following types of inputs. • System sizing, including indoor design conditions, design-day conditions, and sizing factors • Cooling and heating efficiency, both full load and partial load, with attention to software expectations regarding rating conditions • Supply airflow and control • Fan and pump power • Supply air and water temperature control • Outdoor airflow rate and control • Operating schedules

Table I-6 Level of Detail for Cycle #5—Design Refinement *(Continued)*

Model Element and Attribute	Guidance on Level of Detail
Service water heating (SWH)	When the SWH system is a subject of study, pay extra attention to load inputs for peak flow and hourly usage profile. Check also that appropriate values are used for makeup water temperature and fixture supply temperature. Include appropriate circulator controls and pump power. Use appropriate efficiency and standby loss inputs for water heating equipment.
Occupants	Consider whether these inputs will have a significant impact on the system being evaluated. Some buildings, such as schools and assisted living facilities, may require separate schedules for different occupant subtypes.

XX6 MODELING CYCLE #6—DESIGN INTEGRATION AND OPTIMIZATION

The use case for Modeling Cycle #6 is to evaluate two or more *design variables* to explore their interacting impacts and to identify an optimal design. Key considerations are as follows:

- This analysis approach may be employed at any point in the design process, so the appropriate level of detail will vary highly depending on available information.
- Higher level of detail for the systems subject to *optimization* is generally appropriate.
- Judgment is required with respect to the appropriate level of detail for systems not subject to *optimization* but which might affect results.

Guidance in Table I-6 for Modeling Cycle #5 is also generally applicable for Modeling Cycle #6.

XX7 MODELING CYCLE #7—RESPONSIVE DESIGN ALTERNATIVE MODELING

The use case for Modeling Cycle #7 is to evaluate the impact of a proposed design change or *value engineering* measure. Key considerations are as follows:

- The focus of the analysis is typically on one system, such as a proposed change to the design of an envelope construction or *HVAC system* component.
- Rapid turnaround may be required in order to provide useful design feedback.
- An *energy model* may already exist, but it may not match the current state of the design.
- If the design is at an advanced stage, such as during the construction documents phase, much of the information needed for a detailed model will be available. But due to the potential time sensitivity, some judgment may be necessary when determining the appropriate level of detail for systems that are not the direct subject of the analysis.

The level of detail guidance in Table I-6 will also be generally applicable for this *modeling cycle*, especially for the systems that are the subject of study.

Add the following informative reference.

XX69.Grinberg, M., and A. Rendek. 2013. Architecture and energy in practice: Implementing an information sharing workflow. In *Proceedings of BS2013: 13th Conference of International Building Performance Simulation Association*. Chambery, France.

XX70. Sarfraz, O., and C.K. Bach. 2018. Equipment power consumption and load factor profiles for buildings' energy simulation (ASHRAE 1742-RP). *Science and Technology for the Built Environment* 24(10):1054–63.

POLICY STATEMENT DEFINING ASHRAE'S CONCERN FOR THE ENVIRONMENTAL IMPACT OF ITS ACTIVITIES

ASHRAE is concerned with the impact of its members' activities on both the indoor and outdoor environment. ASHRAE's members will strive to minimize any possible deleterious effect on the indoor and outdoor environment of the systems and components in their responsibility while maximizing the beneficial effects these systems provide, consistent with accepted Standards and the practical state of the art.

ASHRAE's short-range goal is to ensure that the systems and components within its scope do not impact the indoor and outdoor environment to a greater extent than specified by the Standards and Guidelines as established by itself and other responsible bodies.

As an ongoing goal, ASHRAE will, through its Standards Committee and extensive Technical Committee structure, continue to generate up-to-date Standards and Guidelines where appropriate and adopt, recommend, and promote those new and revised Standards developed by other responsible organizations.

Through its *Handbook*, appropriate chapters will contain up-to-date Standards and design considerations as the material is systematically revised.

ASHRAE will take the lead with respect to dissemination of environmental information of its primary interest and will seek out and disseminate information from other responsible organizations that is pertinent, as guides to updating Standards and Guidelines.

The effects of the design and selection of equipment and systems will be considered within the scope of the system's intended use and expected misuse. The disposal of hazardous materials, if any, will also be considered.

ASHRAE's primary concern for environmental impact will be at the site where equipment within ASHRAE's scope operates. However, energy source selection and the possible environmental impact due to the energy source and energy transportation will be considered where possible. Recommendations concerning energy source selection should be made by its members.

ASHRAE · 180 Technology Parkway · Peachtree Corners, GA 30092 · www.ashrae.org

About ASHRAE

Founded in 1894, ASHRAE is a global professional society committed to serve humanity by advancing the arts and sciences of heating, ventilation, air conditioning, refrigeration, and their allied fields.

As an industry leader in research, standards writing, publishing, certification, and continuing education, ASHRAE and its members are dedicated to promoting a healthy and sustainable built environment for all, through strategic partnerships with organizations in the HVAC&R community and across related industries.

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IMPORTANT NOTICES ABOUT THIS STANDARD

To ensure that you have all of the approved addenda, errata, and interpretations for this Standard, visit www.ashrae.org/standards to download them free of charge.

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9/24