ENERGY STAR Multifamily High Rise
ASHRAE 90.1-2007 Compliance Forms

To earn the ENERGY STAR using either Path, a building must meet certain requirements, including those described in the Mandatory Provisions of ASHRAE 90.1-2007.

ENERGY STAR MFHR Performance Path:

- The envelope components must comply with ASHRAE 90.1-2007, Section 5.4.
- The heating and cooling systems must comply with ASHRAE 90.1-2007, Sections 6.4.
- Domestic water heating systems must comply with ASHRAE 90.1-2007, Sections 7.4.
- Lighting must comply with ASHRAE 90.1-2007, Section 9.4.

ENERGY STAR MFHR Prescriptive Path:

- The envelope components must comply with ASHRAE 90.1-2007, Section 5.4.
- The heating and cooling systems must comply with ASHRAE 90.1-2007, Sections 6.4 and 6.5.
- Domestic water heating systems must comply with ASHRAE 90.1-2007, Sections 7.4 and 7.5.
- Lighting must comply with ASHRAE 90.1-2007, Section 9.4.

To document compliance with those requirements, ASHRAE 90.1-2007 Compliance Forms may be used, but are not required to be submitted to EPA. The following pages provide instructions on how to use the forms and the forms relevant to the sections above. For all ASHRAE 90.1-2007 forms, visit https://www.ashrae.org/standards-research--technology/standards-forms--procedures

Compliance Forms

Instructions

Compliance forms are provided in the User's Manual to assist in understanding and documenting compliance with the building envelope requirements. Copies of the forms are provided both in printed and electronic form. Modifiable electronic versions are included on the CD distributed with the Manual, and also available for download from the ASHRAE website.

The building envelope forms are organized in two parts and on three pages. Part I should be used with all methods of compliance. Part II should be used only with the Prescriptive Building Envelope Option and should be completed separately for each space-conditioning category in the building.

- Part I has header information and a Mandatory Provisions checklist. This page should be filled out for all compliance methods, since the mandatory features apply to all compliance methods.
- Part II, Page 1 has header information that must be completed for each space-conditioning category and a schedule of constructions for opaque surfaces. The schedule is a simple listing of each unique construction type in the building. For each item in the list, you indicate the class of construction, the source of U-factor data, the proposed and criteria U-factor or R-value. Optionally, you may enter the surface area of the building for this construction type.
- Part II, Page 2 of the documentation is a schedule of fenestration construction types. This table contains an item for each unique fenestration construction type. For each item in the table, you indicate the class of construction, the source of data, proposed fenestration data and the performance criteria.

Part I: Header Information

Project Name: Enter the name of the project. This should agree with the name that is used on the plans and specifications or the common name used to refer to the project.

Project Address: Enter the street address of the project, for instance "142 Minna Street."

Date: Enter the date when the compliance documentation was completed.

Designer of Record/Telephone: Enter the name and the telephone number of the designer of record for the project. This will generally be an architecture firm.

Contact Person/Telephone: Enter the name and telephone number of the person who should be contacted if there are questions about the compliance documentation.

City: The name of the city where the project is located.

Climate Zone: The climate zone of this project.

Criteria Table: Enter the number of the criteria table used for the project (for example, 5.5-4). Look in Table 5.5-1 through Table 5.5-8 for the criteria tables for all climate locations. If your county or city is listed in the Standard's Appendix B, the appropriate criteria table will be shown next to your city.

Part I: Mandatory Provisions Checklist

This section of the compliance form summarizes the mandatory requirements for the design of the building envelope. The mandatory measures are organized on this form in the same order as they are in the Standard: Insulation, Fenestration and Doors and Air Leakage. Checking a box indicates that the mandatory requirement applies to the building and that the building complies with the requirement. If the requirement is not applicable, leave the box unchecked.

Part II: Header Information

Part II is used with the Prescriptive Building Envelope Option. A separate Part II form should be completed for each space-conditioning category in the building. The Project Name, Contact Person and Telephone should be carried over from Part I. The following additional information is required.

Space Category: Check one of the option buttons to indicate the space-conditioning category for the opaque constructions and fenestration constructions that follow.

5.3.2.3 Exceptions: This section has checkboxes for you to indicate which fenestration exceptions you are using. Three exceptions are available:

- *Overhangs*: When this exception is taken, the shading effect of overhangs can be used to adjust the proposed building's SHGC. This exception can be taken on a window-by-window basis. This box should be checked if an overhang credit is taken for any window.
- *Street Level Windows:* When this exception is taken, street level windows are exempt from the SHGC criteria, provided they do not exceed 75% of the gross wall area, the street level floor-to-floor height does not exceed 20 ft, and the street level fenestration is shaded by an

Building Envelope Compliance Documentation — Part I

Project Name:		
Project Address:		Date:
Designer of Record:		Telephone:
Contact Person:		Telephone:
City:	Climate Zone:	Criteria Table:

Mandatory Provisions Checklist

Insulation (§ 5.4.1)

- ☐ Insulation Materials are installed in accordance with manufacturer's recommendations and in such a manner as to achieve rated R-value of insulation
  - ☐ Exception: for metal building roofs or metal building walls.
- ☐ Loose-fill insulation is not used in attic roof spaces when the slope of the ceiling is more than three in twelve.
- ☐ Attic eave vents have baffling to deflect the incoming air above the surface of the insulation.
- ☐ Insulation is installed in a permanent manner in substantial contact with the inside surface.
- ☐ Batt insulation installed in floor cavities is supported in a permanent manner by supports no greater than 24 in. o.c.
- ☐ Lighting fixtures, HVAC, and other equipment are not be recessed in ceilings in such a manner to affect the insulation thickness unless.

Exceptions:

- ☐ The recessed area is less than one percent.
- ☐ The entire roof, wall, or floor is covered with insulation to the full depth required.
- ☐ The effects of reduced insulation are included in calculations using an area weighted averages.

- ☐ Roof insulation is not installed over suspended ceiling with removable ceiling panels.
- ☐ Exterior insulation is covered with a protective material to prevent damage. Insulation is protected in attics and mechanical rooms where access is needed.
- ☐ Foundation vents do not interfere with the insulation.
- ☐ Insulation materials in ground contact have a water absorption rate no greater than 0.3 percent.

Fenestration and Doors (§ 5.4.2)

- ☐ U-factors are determined in accordance with NFRC 100. U-factors for skylights shall be determined for a slope of 20° above the horizontal.

Exceptions:

- ☐ U-factors are taken from A.8.1 for skylights.
- ☐ U-factors are taken from A.8.2 other fenestration products.
- ☐ U-factors are taken from A.7 for opaque doors.
- ☐ U-factors are derived from DASMA 105 for garage doors.

- ☐ Solar heat gain coefficient (SHGC) is determined in accordance with NFRC 200.

Exceptions:

- ☐ SHGC is determined by multiplying the shading coefficient (SC) by 0.86. Shading coefficient is determined using a spectral data file determined in accordance with NFRC 300.
- ☐ SHGC for the center of glass is used. SHGC is determined using a spectral data file determined in accordance with NFRC 300.
- ☐ SHGC is taken from § A8.1 for skylights.
- ☐ SHGC is taken from § A8.2 for vertical fenestration.

- ☐ Visible light transmittance is determined in accordance with NFRC 200.

Air Leakage (§ 5.4.3)

- ☐ The *building envelope* is sealed, caulked, gasketed, and/or weather-stripped to minimize air leakage.
- ☐ Air leakage through fenestration and doors is less than 0.4 cfm/ft² (1.0 cfm/ft² for glazed swinging entrance doors and for revolving doors) when tested in accordance with NFRC 400.

Exceptions:

- ☐ Field fabricated fenestration and doors.
- ☐ For garage *doors* tested in accordance with DASMA 105.

- ☐ Cargo doors and loading dock doors are equipped with weatherseals in climates zones 3 through 8.
- ☐ Entrance doors have vestibules.

Exceptions:

- ☐ Climate zone 1 or 2
- ☐ Building is less than four stories.
- ☐ Doors not intended as building entrance.
- ☐ Doors open from dwelling unit(s).
- ☐ Doors open from spaces smaller than 3,000 ft².
- ☐ Building has revolving doors.
- ☐ Doors for vehicular movement or material handling.

Compliance Forms

Compliance forms are provided in the User's Manual to assist in understanding and documenting compliance with the HVAC requirements. Copies of the forms are provided both in printed and electronic form. Modifiable electronic forms are included on the CD distributed with the Manual, as well as available for download from the ASHRAE website. The HVAC system forms are organized in three parts and on five pages.

- Part I is used with the Simplified Approach Option (§ 6.3). This is the only form required with this compliance option.
- Part II, the Mandatory Provisions, consists of two pages and should be used with either the Prescriptive Path (§ 6.5) or Energy Cost Budget (§ 11) compliance methods. The first page contains header information, tables for entering equipment efficiencies for heating and cooling equipment, and checklists of general and special mandatory requirements. The second page contains the HVAC System Worksheet. Multiple copies of each page may be required to list all central heating and cooling equipment and all HVAC systems.
- Part III should only be used for the Prescriptive Path (§ 6.5) compliance method. Page one is a checklist of the prescriptive requirements and needs to be completed only once for each building. Page two addresses the fan power requirements.

Part I: Simplified Approach

This compliance approach may be used for small buildings with two or fewer floors and single, zone systems.

Header Information

Project Name. Enter the name of the project. This should agree with the name that is used on the plans and specifications or the common name used to refer to the project.

Project Address. Enter the street address of the project, for instance "142 Minna Street."

Date: Enter the date when the compliance documentation was completed.

City: The name of the city where the project is located.

Zip/Postal Code: Enter the zip or postal code of the project site.

HVAC Designer of Record/Telephone: Enter the name and the telephone number of the designer of record for the project. This will generally be the mechanical engineer or contractor.

Contact Person/Telephone: Enter the name and telephone number of the person who should be contacted if there are questions about the compliance documentation.

Checklist Qualification

Only small buildings less than 25,000 ft² and with two or fewer stories may use the Simplified Approach.

Requirements

This section of the form summarizes the Simplified Approach requirements. Each form is separated into two sections.

The upper part of the form contains a list of the requirements. Check each box to indicate that the requirement applies to the HVAC system and that the system complies with the requirement. If the requirement is not applicable, then leave the box unchecked.

The lower part of the form contains a table for entering heating and cooling capacities and efficiencies for comparison against the Standard. The rated capacity and efficiency for heating and cooling should be taken from manufacturers specifications.

The Minimum Efficiency columns should include values taken from Tables 6.8.1 and 6.3.2. The last column "Econ. Min. Efficiency" need only be completed if an exception to the economizer requirement is being taken, based on greater equipment efficiency (See Table 6.3.2).

Part II: Mandatory Provisions

This section of the compliance documentation summarizes the Mandatory Provisions. These apply with either the Prescriptive Path or Energy Cost Budget Method of compliance. The two pages of mandatory requirements are organized into three sections:

- The efficiency tables on Page 1 document that heating and cooling equipment meets or exceeds the efficiency requirements.
- The check boxes in the lower part of Page 1 demonstrate compliance with the general and special provisions of the Mandatory Provisions.
- The Systems Worksheet on Page 2 summarizes the requirements specific to air-handling systems.

Equipment Efficiency Tables

Enter the requested data for each piece of mechanical heating or cooling equipment using one entry per row. Identical pieces of equipment can be entered as a group on a single line. For each row, enter data from the mechanical equipment schedules and Tables 6.8.1 (A through G). For each row, enter data from the mechanical equipment schedules and Tables 6.2.1 (H through J).

Non-standard chillers are water-cooled centrifugal chillers that cannot operate at the ARI Standard 550/590 test conditions of 44°F chilled water supply and 85°F condenser water supply. Use the lower worksheet for these chillers (if any exist in the building).

General and Specific Mandatory Provisions
The lower part of the Page 1 form contains the general and special system requirements. Check the box to indicate that the requirement applies to the HVAC system and that the system complies with the requirement. If the requirement is not applicable, then leave the box unchecked.

Systems Worksheet
Page 2 contains the mandatory requirements for HVAC systems. Data for each system or group of identical systems should be entered in the columns. The first five rows are data that can be obtained from the mechanical equipment schedules (system tag, supply airflow, supply external static pressure, supply fan motor rated horsepower, and outdoor air airflow). The remaining 11 rows contain the mandatory requirements. For each requirement enter the appropriate code from the notes below the table. For example, for the Automatic Shutdown requirement (§ 6.4.3.2.1), if a complying time switch with manual override is provided on the system the user should enter the code "C1."

Part III: Prescriptive Requirements

This section of the compliance documentation summarizes the prescriptive requirements. The first page has a checklist of the prescriptive requirements.

Prescriptive Economizer Requirements
Check all of the boxes that apply for HVAC systems in this project. Note: if systems are exempt from the economizer requirement, mark the basis for the exception in the space provided. If a requirement is not applicable, then leave the box unchecked.

Prescriptive Air-System Requirements
The next section contains the air-system requirements. Check all of the boxes that apply to HVAC systems in this project. If a requirement is not applicable, then leave the box unchecked.

Prescriptive Water-System Requirements
The next section contains the water-system requirements. Check all of the boxes that apply to HVAC systems in this project. If a requirement is not applicable, then leave the box unchecked.

Prescriptive Special System Requirements
Check all of the boxes that apply to HVAC systems in this project. If a requirement is not applicable, then leave the box unchecked. If none of the requirements are applicable, the form may be omitted.

Fan Power Limitations
Fill out the worksheet on Page 2 for each fan system with greater than 5 nameplate-rated horsepower. Identical fan systems may be combined into a single worksheet.

There are two options for showing compliance with the fan power limitation. Option 1 is shown at the top of the page. Option 2 is shown at the bottom. For each fan system only the top or the bottom part of the table will be completed.

Option 1 – Nameplate Horsepower
With this option, each of the fans in the system are listed in the table on the left. The option buttons are used to indicate the type of fan. The Tag is a reference to a schedule on the mechanical drawings. For each, the nameplate horsepower is listed in the last column and summed at the bottom of the table.

This value shall be less than the allowed nameplate horsepower calculated in the table on the right. The allowed nameplate horsepower is calculated by multiplying Design Supply Airflow Rate (CFM_S) times the allowance from Table 6.5.3.1.1A. A value of 0.0011 is used for constant volume systems and 0.0015 for variable volume systems.

Option 2 – Brake Horsepower
With Option 2, the allowed brake horsepower for the fan system is calculated in the top two tables of this section. The base allowance is calculated by multiplying the Design Supply Airflow Rate (CFM_S) times the Option 2 allowance from Table 6.5.3.1.1A. A value of 0.00094 is used for constant volume systems and 0.0013 for variable volume systems.

Additional brake horsepower is allowed for devices listed in Table 6.5.3.1.1B and described earlier in this chapter. Each device is listed along with the CFM through the device and the pressure drop allowance from Table 6.5.3.1.1B. The additional brake horsepower is calculated using the equation below. The additional allowances are summed and added to the base brake horsepower allowance in the left side table.

$$bhp_{Addition} = \frac{CFM_i \times PD_i}{4131} \quad (6\text{-L})$$

With Option 2, it is necessary to calculate the installed brake horsepower for the fan system. The Installed Brake Horsepower table at the bottom of the form provides a means for making this calculation.

Each fan in the system is listed along with the Tag, which keys the fan to the mechanical schedules. A brief description of each fan is provided and the type of fan is indicated by choosing one of the option boxes.

HVAC Mandatory Provisions

Project Name:			
Project Address:			Date:
HVAC System Designer of Record:			Telephone:
Contact Person:			Telephone:
City:	Climate Zone:		
Zip:	1% Summer DB Temp:	1% Summer WB Temp:	99.6% Winter Temp:

Mandatory Equipment Efficiency Worksheet (§ 6.4.1.1)

System Tag	Equipment Type (Tables 6.8.1A through G)	Size Category (Tables 6.8.1A through G)	Sub-Category or Rating Condition (Tables 6.8.1A through G)	Units of Efficiency (Tables 6.8.1A through G)	Minimum Efficiency (Tables 6.8.1A through G) Rated ≥ Required
					≥
					≥
					≥
					≥
					≥
					≥
					≥

Mandatory Non-Standard Centrifugal Chiller Worksheet (§ 6.4.1.1)

System Tag	Leaving CHW Temperature (°F)	Entering CW Temperature (°F)	Condenser Flow Rate (gpm/ton)	Size Category (Tables 6.8.1H through J)	Minimum Efficiency (Tables 6.8.1H through J) Rated ≥ Required
					≥
					≥
					≥
					≥

General Mandatory Requirements

- ☐ Load calculations are provided for selection of all equipment and systems (§ 6.4.2).
- ☐ Stair vents, elevator shaft vents, gravity hoods, gravity vents and gravity ventilations are provided with motorized dampers.
  - ☐ Exception: Gravity dampers are used since the building is less than 3 stories or in climate zones 1–3.
  - ☐ Exception: No vents are required as these systems ventilate unconditioned zones.
- ☐ Piping insulation meets or exceeds the requirements of the Standard (§ 6.4.4.1.3).
- ☐ Construction documents require record drawings (§ 6.7.2.1), manuals (§ 6.7.2.2), system balancing (§ 6.7.2.3) and system commissioning (§ 6.7.2.4).

Special Mandatory Requirements

- ☐ Freeze protection or snow/ice melting systems (if any) have controls to prevent operation in warm weather (§ 6.4.3.7).
- ☐ Independent perimeter heating systems (if any) comply with the control requirements of § 6.4.3.1.1 and § 6.4.3.2.
- ☐ Independent heating and cooling thermostatic controls (if any) are interlocked to prevent crossover of set points (§ 6.4.3.2).

Project Name:	
Contact Person:	Telephone:

Systems Worksheet (§ 6.4)

System Tag						
Supply CFM						
Supply ESP (in. w.c.)						
Fan System HP						
OA CFM (i.e. Outdoor Air CFM)						
Automatic Shutdown (§ 6.4.3.2.1)						
Deadband (§ 6.4.3.1.2)						
Setback Controls (§ 6.4.3.2.2)						
Setup Controls (§ 6.4.3.2.2)						
Optimum Start (§ 6.4.3.1.3)						
Zone Isolation (§ 6.4.3.1.4)						
Shutoff Dampers (§ 6.4.3.3.3)						
Heat Pump Aux Heat (§ 6.4.3.4)						
Humidifier Preheat (§ 6.4.3.5)						
Humidification/Dehumidification Deadband (§ 6.4.3.6)						
Ventilation Control (§ 6.4.3.8)						
Duct/Plenum Insulation (§ 6.4.4.2.1)						
Duct Sealing Levels (§ 6.4.4.2.1) Supply/Return						
Duct Leakage Test (§ 6.4.4.2.2)						

In the table above, enter the appropriate codes from this list:

Shutdown
- *C1 Complying nonresidential time switch with override*
- *C2 Complying residential time switch with override*
- *N1 N/A continuous operation*
- *N2 N/A ≤15 kbtu/h or ≤3/4 hp*
- *N3 N/A hotel/motel guestroom*

Dead Band
- *C1 Dual setpoint control*
- *C2 Manual change over control*
- *N1 N/A special occupancy (requires approval)*
- *N2 N/A heating or cooling only*

Setback Controls
- *C1 Setback provided (down to 55F)*
- *N1 N/A continuous operation*
- *N2 N/A ≤15 kbtu/h or ≤3/4 hp*
- *N3 N/A 99.6% Win DB>40F*
- *N4 N/A radiant heating*
- *N5 N/A no heating*

Setup Controls
- *C1 Setup provided (up to 90F)*
- *N1 N/A continuous operation*
- *N2 N/A ≤15 kbtu/h or ≤3/4 hp*
- *N3 N/A 1% Sum DB<=100F*
- *N4 N/A no cooling*

Optimum Start
- *C1 Optimum start provided*
- *N1 N/A continuous operation*
- *N2 N/A ≤15 kbtu/h or ≤3/4 hp*
- *N3 N/A supply<=10,000 cfm*

Shutoff Dampers
- *C1 Motorized shutoff dampers on OA and Exh*
- *C2 Gravity shutoff dampers on OA and Exh*
- *N1 N/A continuous operation*
- *N2 N/A ≤15 kbtu/h or ≤3/4 hp*
- *N3 N/A OA/EA <=300 cfm*

Zone Isolation
- *C1 Isolation zones provided*
- *N1 N/A continuous operation*
- *N2 N/A ≤15 kbtu/h or ≤3/4 hp*
- *N3 N/A all zones on same schedule*
- *N4 N/A OA/EA <=5,000 cfm*

Heat Pump Aux Heat
- *C1 Complying controls provided*
- *N1 N/A system is not a heat pump*
- *N2 N/A auxiliary is not electric or is not provided*
- *N3 N/A heat pump covered by NAECA*

Humidifier Preheat
- *C1 Complying controls provided*
- *N1 N/A no humidifier*

Humidification/Dehumidification Dead Band
- *C1 Complying controls provided*
- *N1 N/A no humidification and/or dehumidification*

Duct/Plenum Insulation
- *C1 Complying insulation provided*
- *N1 N/A all ducts located in conditioned space*

Duct Sealing
- *Enter highest seal level (A, B or C) for supply and return*

Duct Leakage Test
- *Y Ducts will be tested for leakage*
- *N Ducts will not be tested for leakage*

HVAC Prescriptive Requirements

Project Name:	
Contact Person:	Telephone:

Prescriptive Checklist

Prescriptive Economizers (§ 6.5.1)

- ☐ Systems employ airside economizers (§ 6.5.1.1).
- ☐ Economizer provides up to 100% design airflow in outdoor air (§ 6.5.1.1.1).
- ☐ Economizer is integrated with the mechanical cooling system (§ 6.5.1.1.2 and § 6.5.1.3).
- ☐ Economizer high limit shutoff complies with § 6.5.1.1.3.
- ☐ Economizer dampers meet or exceed leakage requirements (§ 6.5.1.1.4).
- ☐ System provides relief for up to 100% design airflow in outdoor air (§ 6.5.1.1.5).
- ☐ Economizer complies with the heating system impact requirements (§ 6.5.1.4).
- ☐ Systems employ waterside economizers.
- ☐ Economizer can provide 100% of the load at either the outdoor conditions of 50°F db/45°F wb or 45°F db/40°F wb where required for dehumidification purposes (§ 6.5.1.2.1).
- ☐ Precooling coils and heat exchangers have either a ≤ 15 ft of WC pressure drop or are bypassed when economizer is not in use (§ 6.5.1.2.2).
- ☐ Economizer is integrated with the mechanical cooling system (§ 6.5.1.3).
- ☐ Economizer complies with the heating system impact requirements (§ 6.5.1.4).
- ☐ Systems are exempt from the economizer requirements.

Specify economizer exemptions:_____

_____

_____

_____

_____

Prescriptive Air-System Requirements

- ☐ Simultaneous Heating and Cooling (§ 6.5.2.3).
- ☐ Zone minimums were set to meet the requirements of *Standard 62*.
- ☐ Zone minimums were set to ≤0.4 cfm/ft^2 of zone conditioned floor area.
- ☐ Zone minimums are less than 300 cfm.
- ☐ Other (requires special documentation and approval).
- ☐ Humidity controls (if any) comply with the requirements of § 6.5.2.3.
- ☐ Systems that employ hydronic cooling and have humidification (if any) use a waterside economizer that complies with § 6.5.1.
- ☐ Variable air volume fan controls comply with the requirements of § 6.5.3.2.

Prescriptive Water-System Requirements

- ☐ Three-pipe systems are not used (§ 6.5.2.2.1).
- ☐ Two-pipe changeover heating/cooling systems (if any) comply with the requirements of § 6.5.2.2.2.
- ☐ Hydronic (ground- or water-loop) heat pump systems that have equipment for both loop heat addition and loop heat rejection (if any) comply with the requirements of § 6.5.2.2.3.
- ☐ System pumps greater than 10 hp employ variable flow controls (§ 6.5.4.1), pump isolation (§ 6.5.4.2) and temperature reset (§ 6.5.4.3).

Prescriptive Special System Requirements

- ☐ All heat rejection equipment with motors ≥ 7.5 hp employ controls that comply with § 6.5.5.
- ☐ Exhaust Air Energy Recovery: all fan systems that have both a design supply capacity of ≥ 5,000 cfm and a minimum outdoor air supply of ≥ 70% of the design supply air employ an energy recovery system that complies with § 6.5.6.1.
- ☐ Heat recovery for service water heating is provided for facilities that operate continuously, have a total water-cooled heat rejection capacity exceeding 6,000,000 btu/h, and have a design service water heating load exceeding 1,000,000 btu/h. The heat recovery system (if any) complies with § 6.5.6.2.
- ☐ Kitchen hoods with exhaust flows > 5000 cfm comply with the requirements of § 6.5.7.1.
- ☐ Fume hoods with a total exhaust system flow > 15,000 cfm comply with the requirements of § 6.5.7.2.
- ☐ Radiant heaters complying with § 6.5.8.1 are used to heat unenclosed spaces (if any).
- ☐ The cooling equipment with hot-gas bypass controls (if any) meets the unloading requirements of § 6.5.9.

Project Name:	
Contact Person:	Telephone:

Option 1 – Nameplate Horsepower

Installed Nameplate Horsepower

Tag	Description	Supply	Return	Exhaust	Series FPB	Other	Nameplate Horsepower
		○	○	○	○	○	
		○	○	○	○	○	
		○	○	○	○	○	
		○	○	○	○	○	
		○	○	○	○	○	

Allowed Nameplate Horsepower

Design Supply Airflow Rate (CFM_S)	
Fan Nameplate Horsepower Allowance from Table 6.5.3.1.1A	
Total Allowed Nameplate Horsepower	

Option 2 – Brake Horsepower

Allowed Fan Brake Horsepower

Design Supply Airflow Rate (CFM_S)	
Fan Brake Horsepower Allowance from Table 6.5.3.1.1A	
Base Allowance (Line1 x Line 2)	
Additional Brake Horsepower Allowance	
Total Allowed Brake Horsepower	

Pressure Drop Adjustments for Qualifying Devices

Tag	Device Description	Pressure Drop from Table 6.5.3.1.1B	CFM through Device	Additional Brake Horsepower Allowance

Installed Brake Horsepower

Tag	Description	Supply	Return	Exhaust	Series FPB	Other	CFM	Pressure Drop (PD)	η_{Fan}	η_{Drive}	η_{Motor}	Brake Horsepower
		○	○	○	○	○						
		○	○	○	○	○						
		○	○	○	○	○						
		○	○	○	○	○						
		○	○	○	○	○						

Compliance Forms

Compliance forms are provided in the User's Manual to assist in understanding and documenting compliance with the service water heating requirements. Copies of the compliance forms are provided both in printed and electronic form. Modifiable electronic versions are provided on the CD accompanying this Manual, and are also posted on the ASHRAE website for free download.

The service water heating form is organized on one page and in four sections, beginning with header information and mandatory measures and concluding with worksheets for equipment efficiency and combined space and water heaters.

Header Information

Project Name: Enter the name of the project. This should agree with the name that is used on the plans and specifications or the common name used to refer to the project.

Project Address: Enter the street address of the project, for instance "345 Jefferson Street."

Date: Enter the date when the compliance documentation was completed.

Designer of Record/Telephone: Enter the name and the telephone number of the designer of record for the project. This will generally be an architecture firm.

Contact Person/Telephone: Enter the name and telephone number of the person who should be contacted if there are questions about the compliance documentation.

City: The name of the city where the project is located.

Mandatory Provisions Checklist

This section of the compliance form summarizes the Mandatory Provisions for the design of the service water heating system. The mandatory measures are organized on this form in the same order as they are in the Standard. Check the box to indicate that the mandatory requirement applies to the building and that the building complies with the requirement. If the requirement is not applicable, then leave the box unchecked.

Equipment Efficiency Worksheet

Complete a row in this table for each water heater that is to be installed in the building. This list should have the same number of items as the water heater schedule on the plans. For each water heater, enter the system tag. This is the code that is used to identify the equipment on the plans and specifications.

In the second column, enter the equipment type; this should be a choice from Table 7.8 of the Standard. In the third column, enter the subcategory or rating condition from Table 7.8. In the fourth column, enter the input rating for the equipment. Enter the tank volume in the fifth column.

Column six compares the rated efficiency of the equipment with the requirement from the Standard. For small water heaters (those covered by NAECA), the energy factor (*EF*) will be entered. Otherwise, the thermal efficiency (*Et*) should be entered. The efficiency of the equipment must be greater than or equal to the required efficiency in order to comply. The required energy factor or thermal efficiency is taken from Table 7.8 of the Standard.

Column seven compares the standby loss of the equipment to its requirement. This is used only for large water heaters that are not covered by NAECA. The required standby loss is taken from Table 7.8 of the Standard. The proposed standby loss is taken from test data for the water heater.

Combination Space and Water Heating Worksheet

This section only needs to be completed if the project is complying through the Prescriptive Method.

Complete a row in this table for each combination space and water heating system that is to be installed in the building. This list should be a subset of the boilers that are scheduled on the plans. For each combination system, enter the boiler tag. This is the code that is used to identify the equipment on the plans and specifications. For each system the user must demonstrate compliance by filling in the data for either column two, three, or four.

Column two compares the rated stand-by loss of the equipment with the requirement from the Standard. The required stand-by loss must be computed from the probable mean demand (*pmd*) and the fraction of the year when the outdoor daily mean temperature is greater than 64.9°F using the formula in § 7.5.2 of the Standard.

Column three compares the annual energy usage of the combined equipment to the annual energy usage of separate space and water heaters. For each entry in this column, the user must provide supporting calculations demonstrating how the annual energy usage numbers were derived.

Column four demonstrates the input rating of the space heating boiler is less than 150,000 Btu/h. The input rating entered here should match the input rating specified for that boiler in the mechanical schedules.

Service Water Heating Compliance Documentation

Project Name:	
Project Address:	Date:
Designer of Record:	Telephone:
Contact Person:	Telephone:
City:	

Mandatory Provisions Checklist

- ☐ Load calculations have been provided for sizing of systems and equipment (§ 7.4.1).
- ☐ Equipment efficiencies meet or exceed the requirements of Table 7.8 (§ 7.4.2).
- ☐ Circulating systems are fully insulated (per Table 6.8.3) and have automatic pump controls (§ 7.4.3 and § 7.4.4.2).
- ☐ Non-circulating systems have insulated heat traps and outlet piping insulated (per Table 6.8.3) for 8 ft from the storage tank (§ 7.4.6).
- ☐ Tanks with remote heaters have circulation pump controls (§ 7.4.4.4).
- ☐ All water-heating systems have temperature controls that are adjustable down to 120°F or lower (§ 7.4.4.1).
- ☐ Systems designed with pipe heating systems such as heat trace have temperature or time controls (§ 7.4.4.2).
- ☐ Public lavatories have outlet temperature controls that limit the discharge temperature to 110°F (§ 7.4.4.3).
- ☐ Pool heaters have readily accessible controls and gas-fired heaters do not have standing pilot lights (§ 7.4.5.1).
- ☐ Heated swimming pools have vapor retardant covers (§ 7.4.5.2).
- ☐ Pool heaters and circulation pumps have time switches (§ 7.4.5.3).

Equipment Efficiency Worksheet (§ 7.4.1)

System Tag	Equipment Type (From Table 7.8)	Sub-Category or Rating Condition (From Table 7.8)	Input Rating (Btu/h or kW)	Volume (gal)	Energy Factor or Et		Standby Loss	
					Rated	≥ Required	Rated	≤ Required
						≥		≤
						≥		≤
						≥		≤
						≥		≤

Combination Space and Water Heating Worksheet (§ 7.5.1)

System Tag	Standby Loss Method			or Energy Use Exception (attach calculations			or Size Exception		
	Equipment	≤	Requirement	Equipment	<	Requirement	Equipment	<	Requirement
		≤			<			<	150,000 Btu/h
		≤			<			<	150,000 Btu/h
		≤			<			<	150,000 Btu/h
		≤			<			<	150,000 Btu/h

Compliance Forms

Instructions

Compliance forms are provided in the User's Manual to assist in understanding and documenting compliance with the lighting requirements. Copies of the compliance forms are provided both in printed and electronic form. Modifiable electronic version are included on the CD that accompanied this Manual, as well as available for download from the ASHRAE website.

The lighting forms are organized on three pages and in eight sections, beginning with header information and mandatory measures and concluding with exterior lighting requirements.

Header Information

Project Name: Enter the name of the project. This should agree with the name that is used on the plans and specifications or the common name used to refer to the project.

Project Address: Enter the street address of the project, for instance "142 Minna Street."

Date: Enter the date when the compliance documentation was completed.

Designer of Record/Telephone: Enter the name and the telephone number of the designer of record for the project. This will generally be an architecture firm.

Contact Person/Telephone: Enter the name and telephone number of the person who should be contacted if there are questions about the compliance documentation.

City: The name of the city where the project is located.

Mandatory Provisions Checklist

This section of the compliance form summarizes the Mandatory Provisions for the design of the lighting system. The mandatory measures are organized on this form in the same order as they are in the Standard. Check the box to indicate that the mandatory requirement applies to the building and that the building complies with the requirement. If the requirement is not applicable, then leave the box unchecked.

Interior Lighting Power Allowance (Building Area Method)

Complete this section of the form if the building area method is used to determine the interior lighting power allowance. Complete a row in this table for each building type in your building. For instance, if you have a three-story building with the first floor retail and the upper two floors office, you would enter two building types.

Building Type: Select a building type from the first column of Table 9.5.1 and write the name in this column.

Lighting Power Density (W/ft²): Select the lighting power density from Table 9.5.1 that corresponds to the building type entered in the first column.

Building Area (ft²): Enter the building floor area for this building type.

Lighting Power Allowance (W): Multiply the Lighting Power Density times the Building Area to get the Lighting Power Allowance and enter the product in this box. Once the Lighting Power Allowance is calculated for each Building Type, then sum the values and enter in the box labeled Total.

Interior Lighting Power Allowance (Space-by-Space Method)

Complete this section of the form if the space-by-space method is used to determine the interior lighting power allowance. Complete a row in this table for each unique space in your building.

Building Type: Select a building type from the first column of Table 9.6.1 and write the name in this column.

Common/Specific Space Type: Select the common space type from the columns in Table 9.6.1 or choose one of the Specific Space Types from the right side of Table 9.6.1.

Lighting Power Density (W/ft²): Select the lighting power density from Table 9.6.1 that corresponds to the building type and space types entered in the first two columns.

Space Area (ft²): Enter the floor area of the space.

Lighting Power Allowance (W): Multiply the Lighting Power Density times the Space Area to get the Lighting Power Allowance and enter the product in this box. Once the Lighting Power Allowance is calculated for each Space Type, then sum the values and enter in the box labeled Total.

Interior Connected Lighting Power

Use this portion of the form to calculate the connected lighting power for the interior of the building. Fill out a row in this table for each type of luminaire you have. This list will generally match the lighting fixture schedule found on the electrical drawings.

ID: Enter a code number or ID that is consistent with the lighting schedule on the plans and specifications. This identification should enable a plan checker to identify the location of luminaires of this type on the plans.

Luminaire Description: Provide a description of luminaire including information such as the number of lamps, watts per lamp, type of ballast, and type of fixture.

Type: Select one column to indicate the type of lighting source used for this luminaire. The choices are incandescent, fluorescent, HID, line-voltage track, low-voltage track, and other.

Number of Luminaires: Enter the number of luminaires of this type that are located in the building.

Watts/Luminaire: Enter the total W of power per luminaire. Be sure to include consideration of the ballast and any other factors that affect input power.

Total Watts: Calculate the total watts of power for this luminaire by multiplying

the power per luminaire times the number of luminaires.

Total: Calculate the total installed W for the building by adding the total watts for each luminaire type. In order for the building to comply, this value must be less than the Total Lighting Power Allowance calculated with either the space-by-space method or the building area method.

Additional Interior Lighting Power Allowance

Use this section of the form to identify additional lighting power that is permitted by § 9.6.2. This section of the Standard allows additional lighting power for decorative purposes such as wall sconces or chandeliers, for lighting installed to meet the requirements of video display terminals, and for display lighting in sales areas. These special lighting power allowances may only be used for their intended purpose. If the installed power is smaller than the allowance, the surplus power may not be allocated to another portion of the building. This type of allowance is often called a "use-it-or-lose-it" allowance.

Space ID: Enter an identification code for the space where the special allowance applies. This code should be consistent with the numbering scheme on the plans. Typically, the room number from the plans will be entered in this space.

Space Name: Enter a descriptive name for the space. This should be consistent with the name used on the room schedule on the plans. The Space ID, however, is the principal link back to the plans from the compliance form.

Type: Enter the type of special allowance that applies. Choose just one. The choices are Decorative and Display Lighting. See § 9.6.2 of the Standard for more details on these allowances.

Area (ft²): Enter the applicable area for the special allowance.

Unit Allowance (W/ft²): This allowance is fixed. Enter 1.0 W/ft² for the Decorative allowance or either 1.0, 1.7, 2.6 or 4.2 W/ft² for the Display Lighting allowance. See § 9.6.2 of the Standard for more details.

Allowance (W): Calculate the Allowance by multiplying the Area times the Unit Allowance. Enter the product in this box.

Luminaire IDs: Enter the identification numbers of the luminaires used for the intended purpose. If the allowance is for decorative lighting, the ID should reference a chandelier or wall sconce that satisfies the decorative lighting requirement. The IDs entered in this column should be consistent with those used in the lighting schedule on the plans and in the next section of the lighting compliance form labeled Additional Interior Connected Lighting Power.

Installed Power (W): Enter the lighting power actually installed in the room for the intended use. If the allowance is for decorative or display lighting, this value should represent the lighting power for the qualifying fixtures. This value must be lower than the allowance for each type of allowance and within each room. In other words, the value in the last column must be less than the value in the next to last column in every row of the table.

Additional Interior Connected Lighting Power

This table provides additional documentation on the lighting equipment installed for the additional lighting allowance. The form is essentially identical to the Interior Connected Lighting Power form discussed previously, except that entries in this table are limited to equipment permitted by § 9.6.2 of the Standard.

ID: Enter a code number or ID that is consistent with the lighting schedule on the plans and specifications. This identification should enable a plan checker to identify the location of luminaires of this type on the plans. This ID is also entered on the Additional Interior Lighting Power Allowance section of this form.

Luminaire Description: Provide a description of luminaire including information such as the number of lamps, watts per lamp, type of ballast, and type of fixture.

Type: Select one column to indicate the type of lighting source used for this luminaire. The choices are incandescent, fluorescent, HID, line-voltage track, low-voltage track, and other.

Number of Luminaires: Enter the number of luminaires of this type that are used for the special purpose.

Watts/Luminaire: Enter the total watts of power per luminaire. Be sure to include consideration of the ballast and any other factors that affect input power.

Total Watts: Calculate the total watts of power for this luminaire by multiplying the power per luminaire times the number of luminaires. This column should be summed and the total entered at the bottom of this form.

Interior Lighting Compliance Test

Each of the conditions in this table must be met for interior lighting systems to comply. The interior lighting power complies if the total interior connected lighting power plus the total additional interior connected lighting power allowance is less than or equal to the total interior lighting power allowance plus the total additional interior lighting power allowance. All or a portion (or none) of the additional interior lighting power allowance can be used to achieve compliance. However, the additional allowances calculated for both decorative and (retail) display applications cannot exceed the lighting wattage to which it would apply.

Exterior Building Lighting Power Allowance (Tradable Lighting Applications)
Use this table to calculate the lighting power allowance for exterior lighting in tradable applications. For each of the tradable lighting applications listed in Table 9.4.5 that occur in the project, enter the application type (e.g. building entrance with canopy), enter the allowance from Table 9.4.5, enter the linear feet or square feet as appropriate, multiply the allowance times the area or length, and enter that result in the Tradable Power Allowance column.

Exterior Building Lighting Power Allowance (Non-Tradable Lighting Applications)
This table is identical to the previous table except that the non-tradable lighting applications, as listed in Table 9.4.5, are to be entered here.

Additional Unrestricted Exterior Lighting Power Allowance
Enter the total power allowances from the preceding two tables, and multiply their sum by 5% to calculation the additional unrestricted exterior lighting power allowance. This value may be applied in the Exterior Lighting Compliance Test.

Exterior Connected Lighting Power (Tradable Applications)
Use this table to list the lighting equipment used for exterior lighting used for tradable applications as identified in Table 9.4.5.

ID: Enter a code number or ID that is consistent with the lighting schedule on the plans and specifications. This identification should enable a plan checker to identify the location of luminaires of this type on the plans.

Luminaire Description: Provide a description of luminaire including information such as the number of lamps, watts per lamp, type of ballast, and type of fixture.

Number of Luminaires: Enter the number of luminaires of this type that are used for the allowances listed above. For example, if the same type of luminaire is used for pathway lighting and entrance lighting, count only the luminaires that are used for entrance lighting in this table, since the Standard does not apply to pathway lighting.

Watts/Luminaire: Enter the total watts of power per luminaire. Be sure to include consideration of the ballast and any other factors that affect input power.

Total Watts: Calculate the total watts of power for this luminaire by multiplying the power per luminaire times the number of luminaires.

Exterior Connected Lighting Power (Non-Tradable Applications)
This table is similar to the preceding table except that the lighting application needs to be identified along with its corresponding luminaires because each of the non-tradable applications must comply individually.

Exterior Lighting Compliance Test
Each of the conditions in this table must be met for exterior lighting systems to comply. The tradable exterior lighting applications comply if the connected lighting power is no greater than the total allowance. All or a portion (or none) of the five percent additional allowance can be used to achieve compliance.

Connected lighting power for each of the non-tradable applications must be no greater than their corresponding allowances. Here additional allowance from the five percent pool can be applied to achieve compliance. The total of additional allowances used for both the tradable and non-tradable applications must be no greater than the total Additional Unrestricted Exterior Lighting Power Allowance.

Lighting Compliance Documentation

Project Name:	
Project Address:	Date:
Designer of Record:	Telephone:
Contact Person:	Telephone:
City:	

Mandatory Provisions Checklist

Automatic lighting shutoff controls are provided based on either a scheduling device or an occupant sensor.

- ☐ Exception: Space is intended for 24-hour operation.
- ☐ Exception: Space is smaller than 5,000 ft².
- ☐ Exception: Space for patient care.
- ☐ Exception: Space where automatic lighting shutoff would endanger safety or security.

☐ Each space enclosed by ceiling-height partitions has an independent, accessible control that operates general lighting in the space.

- ☐ Exception: The control is located in a remote location for safety or security reasons.

☐ For spaces less than or equal to 10,000 ft², a separate space control is provided for each 2,500 ft² of area.

☐ For spaces more than 10,000 ft², a separate space control is provided for each 10,000 ft² of area.

☐ Either a photosensor or an astronomical time switch controls exterior lighting applications.

- ☐ Exception: Lights must remain on for safety, security or eye adaptation reasons.

☐ Two-lamp tandem-wired ballasts.

☐ Display lighting has a separate control.

☐ Case lighting has a separate control.

☐ Hotel/motel guest rooms have a master switch at the main entry.

☐ Task lighting has a separate control.

☐ Nonvisual lighting has a separate control.

☐ Demonstration lighting has a separate control.

☐ Exit signs do not exceed 5 W per face.

☐ Exterior building grounds luminaires greater than 100 W have lamps with minimum efficacy of 60 lumens/W.

- ☐ Exception: Luminaire is activated with a motion sensor.

Interior Lighting Power Allowance (Building Area Method)

Building Type	Lighting Power Density (W/ft²)	Building Area (ft²)	Lighting Power Allowance (W)
		Total	

Interior Lighting Power Allowance (Space-by-Space Method)

Building Type	Common/Specific Space Type	Lighting Power Density (W/ft²)	Space Area (ft²)	Lighting Power Allowance (W)
			Total	

Lighting Compliance Documentation

Project Name:	
Contact Person:	Telephone:

Interior Connected Lighting Power

ID	Luminaire Description (including number of lamps per fixture, watts per lamp, type of ballast, type of fixture)	Type: Incandescent	Fluorescent	HID	Line-Voltage Track	Low-Voltage Track	Other	Number of Luminaires	Watts/ Luminaire	Total Watts
		O	O	O	O	O	O			
		O	O	O	O	O	O			
		O	O	O	O	O	O			
		O	O	O	O	O	O			
		O	O	O	O	O	O			
		O	O	O	O	O	O			
		O	O	O	O	O	O			
		O	O	O	O	O	O			
		O	O	O	O	O	O			
		O	O	O	O	O	O			
									Total	

Additional Interior Lighting Power Allowance

Space ID	Space Name (include merchandise type for retail sales areas)	Type: Decorative	Display Lighting	Area (ft²)	Unit Allowance (W/ft²)	Allowance (W)	Luminaire ID's	Installed Power (W)
		O	O					
		O	O					
		O	O					
		O	O					
		O	O					
		O	O					
		O	O					
		O	O					
				(Add 1000 (W) if any additional retail display allowance is claimed)				
							Total	

Lighting Compliance Documentation

Project Name:	
Contact Person:	Telephone:

Additional Interior Connected Lighting Power

ID	Luminaire Description (including number of lamps per fixture, watts per lamp, type of ballast, type of fixture)	Type						Number of Luminaires	Watts/ Luminaire	Total Watts
		Incandescent	Fluorescent	HID	Line-Voltage Track	Low-Voltage Track	Other			
		○	○	○	○	○	○			
		○	○	○	○	○	○			
		○	○	○	○	○	○			
		○	○	○	○	○	○			
		○	○	○	○	○	○			
		○	○	○	○	○	○			
		○	○	○	○	○	○			
		○	○	○	○	○	○			
		○	○	○	○	○	○			
									Total	

Interior Lighting Compliance Test

Total Interior Lighting Allowance (building or space method) (Watts)		Total Additional Interior Lighting Power Allowance (Watts)		Total Interior Connected Lighting Power (Watts)		Total Additional Interior Connected Lighting Power Allowance (Watts)
	+		≥		+	

Additional Interior Lighting Power Application (decorative or display)	Total Additional Interior Lighting Power Allowance (Watts)		Total Additional Interior Connected Lighting Power Allowance (Watts)
		≤	
		≤	
		≤	
		≤	

Lighting Compliance Documentation

Exterior Building Lighting Power Allowance (Tradable Lighting Applications)

Application	Allowance	Area or Length (ft² or ft)	Tradable Power Allowance
		Tradable Power Allowance	

Exterior Building Lighting Power Allowance (Non-Tradable Lighting Applications)

ID	Application	Allowance per Unit	Area or Length or Quantity	Non-Tradable Power Allowance
			Non-Tradable Power Allowance	

Additional Unrestricted Exterior Lighting Power Allowance

Tradable Power Allowance (Watts)		Non-Tradable Power Allowance (Watts)			Additional Unrestricted Lighting Power Allowance (Watts)
(	+	)	X 0.05	=	

Exterior Connected Lighting Power (Tradable Applications)

ID	Luminaire Description (including number of lamps per fixture, watts per lamp, type of ballast, type of fixture)	Number of Luminaires	Watts/ Luminaire	Total Watts
			Total	

Exterior Connected Lighting Power (Non-Tradable Applications)

ID	Non-Tradable Application	Luminaire Description (including number of lamps per fixture, watts per lamp, type of ballast, type of fixture)	Number of Luminaires	Watts/ Luminaire	Total Watts

Exterior Lighting Compliance Test

	Tradable Power Allowance (Watts)		Additional Unrestricted Lighting Allowance to be Applied (Watts)		Tradable Connected Lighting Power (Watts)
		+		≥	

Non-Tradable Application	Non-Tradable Power Allowance (Watts)				Non-Tradable Connected Lighting Power (Watts)
		+		≥	
		+		≥	
		+		≥	

	Total Additional Allowance Applied (sum of above) (Watts)		Additional Unrestricted Lighting Power Allowance (Watts)
		≤	