HVAC Mandatory Provisions

Part II, 1 of 3

Project Name:			
Project Address:			Date:
HVAC System Designer of Record:			Telephone:
Contact Person:			Telephone:
City:	Climate Zone:		
Zip:	Cooling Design DB Temp:	Cooling Design WB Temp:	Heating Design Temp:

Mandatory Equipment Efficiency Worksheet (Section 6.4.1.1)

System Tag	Equipment Type (Tables 6.8.1-1 through 6.8.1-20 and F1-F5)	Size Category (Tables 6.8.1-1 through 6.8.1-20 and F1-F5)	Subcategory or Rating Condition (Tables 6.8.1-1 through 6.8.1-20 and F1-F5)	Units of Efficiency (Tables 6.8.1-1 through 6.8.1-20 and F1-F5)	Minimum Efficiency (Tables 6.8.1-1 through 6.8.1-20 and F1-F5) Rated ≥ Required
					≥
					≥
					≥
					≥
					≥
					≥

Mandatory Nonstandard Centrifugal Chiller Worksheet (Section 6.4.1.1)

Chiller Tag	Leaving Evaporator Temp. (°F or °C)	Entering Condenser Temp. (°F or °C)	Centrifugal Chiller K_{adj} Factor (Section 6.4.1.2) A/B	Type and Size Category (Table 6.8.1-3)	Path (A or B)	Table 6.8.1-3 Minimum Efficiency and Adjusted Efficiency* Table 6.8.1-3 Value/Adjusted Value	Actual Efficiency Rated ≥ Required
			/			/	≥
			/			/	≥
			/			/	≥
			/			/	≥

* Adjustment applies only to water-cooled centrifugal chillers.

General Mandatory Requirements

❑ Yes ❑ N/A All heating and cooling equipment meet minimum efficiencies as required in Tables 6.8.1-1 through 6.8.1-20.

❑ Yes ❑ N/A Load calculations are provided for selection of all equipment and systems (Section 6.4.2.1).

❑ Yes ❑ N/A Pump head calculations are provided for selection of all pumps (Section 6.4.2.2).

❑ Yes ❑ N/A Zone control complies with the requirements of Section 6.4.3.1.

❑ Yes ❑ N/A Off hour controls comply with the requirements of Section 6.4.3.3.

❑ Yes ❑ N/A Stair and elevator shaft vents are provided with motorized dampers (Section 6.4.3.4.1)

❑ Yes ❑ N/A Ventilation fans with motors greater than 0.75 hp (0.56 kW) have automatic controls complying with Section 6.4.3.4.4.

❑ Yes ❑ N/A Enclosed parking garage ventilation systems meet the requirements of Section 6.4.3.4.5.

❑ Yes ❑ N/A Direct digital controls (DDC) are installed to comply with the requirements of Section 6.4.3.10.

❑ Yes ❑ N/A Air-cooled DX units with economizers have fault detection and diagnostic (FDD) systems which comply with Section 6.4.3.12.

❑ Yes ❑ N/A Piping insulation meets or exceeds the requirements of Section 6.4.4.1.3.

❑ Yes ❑ N/A Construction documents require record documents, manuals and system balancing (Sections 6.7.3.1, 6.7.3.2 and 6.7.3.3).

❑ Yes ❑ N/A Verification and testing performed and documented (Section 6.9.1).

❑ Yes ❑ N/A Commissioning performed and documented (Section 6.9.2).

Special Mandatory Requirements

❑ Yes ❑ N/A Freeze protection or snow/ice-melting systems (if any) have controls to prevent operation in warm weather (Section 6.4.3.7).

❑ Yes ❑ N/A High occupancy density areas are equipped with demand control ventilation (Section 6.4.3.8).

❑ Yes ❑ N/A HVAC systems serving vestibules have thermostats limiting heating and cooling (Section 6.4.3.9).

❑ Yes ❑ N/A Independent perimeter heating systems (if any) comply with the control requirements of Section 6.4.3.1.1.

❑ Yes ❑ N/A Independent heating and cooling thermostatic controls (if any) are interlocked to prevent crossover of setpoints (Section 6.4.3.2).

❑ Yes ❑ N/A Sensible heating panels are insulated per Section 6.4.4.1.4.

❑ Yes ❑ N/A Radiant floor heating is insulated per Section 6.4.4.1.5.

❑ Yes ❑ N/A Walk-in coolers and walk-in freezers comply with 6.4.5.

HVAC Mandatory Provisions

Part II, 2 of 3

Project Name:	
Contact Person:	Telephone:

Walk-In Coolers and Freezers Worksheet (Section 6.4.5)

Walk-in Freezer/Cooler Tag						
Doors are provided with closers (Section 6.4.5(a))						
Doorways have a means to reduce infiltration when door is open (Section 6.4.5(b))						
Walk-in cooler wall, ceiling, and door insulation is R-25 (R-4.4) or greater (Section 6.4.5(c))						
Walk-in freezer wall, ceiling, and door insulation is R-32 (R-5.6) or greater (Section 6.4.5(c))						
Walk-in freezer floor insulation is R-28 (R-4.9) or greater (Section 6.4.5(d))						
Evaporator fan motors are electronically commutated or three-phase (Section 6.4.5(e))						
Lights meet the minimum efficacy requirement (Section 6.4.5(f))						
Minimum insulation properties for windows and transparent reach-in door in freezers are met (Section 6.4.5(g))						
Minimum insulation properties for windows and transparent reach-in door in coolers are met (Section 6.4.5(h))						
Antisweat heaters meet the maximum power limitation or the controls requirement (Section 6.4.5(i) and Section 6.4.5(j))						
Condenser fan motors are electronically commutated, permanent split capacitor, or three-phase (Section 6.4.5(k))						
Freezer includes temperature-based defrost termination control (Section 6.4.5(l))						

Refrigerated Display Case Worksheet (Section 6.4.6)

Refrigerated Display Case Tag						
Meets the requirements of Section 6.4.1.1 and the performance requirements of Table 6.8.1-11 (Section 6.4.6(a))						
The lighting is automatically controlled by time clock or motion (Section 6.4.6(b))						
Low-temperature display cases include temperature-based defrost termination control (Section 6.4.6(c))						
Antisweat heater power is reduced in response to %RH outside the case (Section 6.4.6(d))						

HVAC Mandatory Provisions

Part II, 3 of 3

Project Name:	
Contact Person:	Telephone:

Systems Worksheet (Section 6.4)

System Tag						
Supply Airflow						
Direct-Expansion Cooling Capacity						
Supply Motor Power						
Outdoor Airflow						
Deadband (Section 6.4.3.1.2)						
Automatic Shutdown (Section 6.4.3.3.1)						
Setback Controls (Section 6.4.3.3.2)						
Setup Controls (Section 6.4.3.3.2)						
Optimum Start (Section 6.4.3.3.3)						
Zone Isolation (Section 6.4.3.3.4)						
Hotel/Motel Guest Room Controls (Section 6.4.3.3.5)						
Outdoor Air Shutoff Dampers (Section 6.4.3.4.2)						
Exhaust/Relief Shutoff Dampers (Section 6.4.3.4.2)						
Damper Leakage (Section 6.4.3.4.3)						
Heat Pump Auxiliary Heat (Section 6.4.3.5)						
Humidification/Dehumidification Deadband (Section 6.4.3.6)						
Ventilation Control for High Occupancy Areas (Section						
Duct/Plenum Insulation (Section 6.4.4.1.2)						
Duct Sealing Levels Supply/Return (Section 6.4.4.2.1)						
Duct Leakage Test (Section 6.4.4.2.2)						

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

Deadband (Section 6.4.3.1.2)

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

Automatic Shutdown (Section 6.4.3.3.1)

- *C1 Complying seven-day time clock with override*
- *C2 Complying occupant sensor*
- *C3 Complying manually operated time switch*
- *C4 Complying security system interlock*
- *C5 Complying residential system with two-day time clock*
- *N1 N/A continuous operation*
- *N2 N/A heating and cooling ≤ 15 kBtu/h (4.4 kW) and manual on/off*

Setback Controls (Section 6.4.3.3.2)

- *C1 Setback provided*
- *N1 N/A continuous operation*
- *N2 N/A heating and cooling ≤ 15 kBtu/h (4.4 kW) and manual on/off*
- *N3 N/A radiant heating*

Setup Controls (Section 6.4.3.3.2)

- *C1 Setup provided*
- *N1 N/A continuous operation*
- *N2 N/A heating and cooling ≤ 15 kBtu/h (4.4 kW) and manual on/off*

Optimum Start (Section 6.4.3.3.3)

- *C1 Optimum start provided*
- *N1 N/A continuous operation*
- *N2 N/A heating and cooling ≤ 15 kBtu/h (4.4 kW) and manual on/off*

Zone Isolation (Section 6.4.3.3.4)

- *C1 Isolation areas provided*
- *N1 N/A Continuous operation*
- *N2 N/A ≤ 15 kBtu/h (4.4 kW) or ≤ 3/4 hp (0.56 kW)*
- *N3 N/A All zones on same schedule*
- *N4 N/A Outdoor air/exhaust air ≤5,000 cfm (2,400 L/s)*
- *N5 N/A Exhaust flow < 10%*

Hotel/Motel Guest Room Controls (Section 6.4.3.3.5)

- *C1 Setpoint control provided*
- *C2 Ventilation control provided*
- *N1 N/A Continuous operation*
- *N2 N/A heating and cooling ≤ 15 kBtu/h (4.4 kW) and manual on/off*
- *N3 N/A 50 guest rooms or less*

OSA Shutoff Dampers (Section 6.4.3.4.2)

- *C1 Motorized shutoff dampers*
- *C2 Gravity shutoff dampers on outdoor air and building in Climate Zone 0, 1, 2, or 3*
- *N1 N/A Outdoor air ≤300 cfm (140 L/s)*

Exhaust/Relief Shutoff Dampers (Section 6.4.3.4.2)

- *C1 Motorized shutoff dampers on exhaust and relief*
- *C2 Gravity shutoff dampers on exhaust and relief and the building is less than three stories in height*

Damper Leakage (Section 6.4.3.4.3)

- *C1 Outdoor air, exhaust, and relief dampers comply with Table 6.4.3.4.3*

Heat Pump Auxiliary Heat (Section 6.4.3.5)

- *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*

Humidification/Dehumidification Deadband (Section 6.4.3.6)

- *C1 Complying controls provided*
- *N1 N/A no humidification and/or dehumidification*
- *N2 N/A Desiccant with direct evap. cooling*
- *N3 N/A Specific humidity levels or precision control required*

Ventilation Control for High-Occupancy Areas (Section 6.4.3.8)

- *C1 All zones comply with Section 6.4.3.8*
- *N1 N/A Space ≤ 500 ft² (50 m²) or < 25 people/1000 ft² (25 people/10m²)*
- *N2 N/A System does not qualify*
- *N3 N/A exhaust air energy recovery complies with Section 6.5.6.1*
- *N4 N/A system is multiple zone and has pneumatic controls*
- *N5 N/A design outdoor air <750 cfm (375 L/s)*
- *N6 N/A Transfer (or makeup air) > 75% of design outdoor air*

Duct/Plenum Insulation (Section 6.4.4.1.2)

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

Duct Sealing (Section 6.4.4.2.1)

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

Duct Leakage Test (Section 6.4.4.2.2)

- *Y Ducts will be tested for leakage*
- *N Ducts will not be tested for leakage*

HVAC Prescriptive Requirements

Part III, 1 of 3

Project Name:	
Contact Person:	Telephone:

Prescriptive Checklist

Prescriptive Air-System Requirements

❑ Yes ❑ N/A All systems comply with simultaneous heating and cooling limitations (Section 6.5.2).

Prescriptive Hydronic System Requirements

❑ Yes ❑ N/A Boiler plant is capable of the minimum turndown specified in Table 6.5.4.1 (Section 6.5.4.1).

❑ Yes ❑ N/A Hydronic systems meet the variable flow requirements of Section 6.5.4.2.

❑ Yes ❑ N/A Chillers and boilers in parallel have isolation controls per Section 6.5.4.3.

❑ Yes ❑ N/A Chilled-water and hot-water systems meet the temperature reset requirements of Section 6.5.4.4.

❑ Yes ❑ N/A Hydronic heat pump systems and water-cooled air-conditioning units comply with the hydronic isolation requirements of Section 6.5.4.5.

❑ Yes ❑ N/A Chilled-water and condenser-water piping systems are sized in compliance with Section 6.5.4.6.

Prescriptive Special System Requirements

❑ Yes ❑ N/A Heat rejection systems comply with Section 6.5.5.

❑ Yes ❑ N/A 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 (1,800 kW), and have a design service water heating load exceeding 1,000,000 Btu/h (293 kW). The heat recovery system (if any) complies with Section 6.5.6.2.

❑ Yes ❑ N/A Kitchen exhaust systems comply with Section 6.5.7.2.

❑ Yes ❑ N/A Laboratory exhaust systems comply with Section 6.5.7.3.

❑ Yes ❑ N/A Radiant heating systems comply with Section 6.5.8.

❑ Yes ❑ N/A The cooling equipment with hot-gas bypass controls (if any) meets the unloading requirements of Section 6.5.9.

❑ Yes ❑ N/A Conditioned spaces with a door to the outdoors (including doors that are more than one-half glass) must have door switches per Section 6.5.10.

Commercial Refrigeration Equipment Requirements

❑ Yes ❑ N/A Fan-powered condensers serving walk-in coolers, walk-in freezers, or refrigerated display cases must meet the design and performance requirements of Section 6.5.11.1.

❑ Yes ❑ N/A Walk-in coolers, walk-in freezers, and refrigerated display cases include control logic that resets the suction pressure setpoint per Section 6.5.11.2.

HVAC Prescriptive Requirements

Part III, 2 of 3

Project Name:	
Contact Person:	Telephone:

Systems Worksheet (Section 6.5)

System Tag						
Supply Airflow						
Cooling Capacity						
Heating Capacity						
Outdoor Airflow						
Economizer (Section 6.5.1)						
Humidification (Section 6.5.1.6)						
Dehumidification (Section 6.5.2.3)						
VAV Fan Control (Section 6.5.3.2.1)						
VAV Fan Static Pressure Control (Sections 6.5.3.2.2 and						
Multiple-Zone VAV System Ventilation Control (Section 6.5.3.3)						
Supply Air Temperature Reset Control (Section 6.5.3.4)						
Exhaust Air Energy Recovery (Section 6.5.6.1)						

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

Economizer (Section 6.5.1)

- *C1 System employs air economizer complying with Sections 6.5.1.1, 6.5.1.3,6.5.1.4, and 6.5.1.5*
- *C2 System employs fluid economizer complying with Sections 6.5.1.2, 6.5.1.3, 6.5.1.4, and 6.5.1.5*
- *N1 N/A size exception from Table 6.5.1-1*
- *N2 N/A nonparticulate air treatment per Section 6.2.1 of Standard 62.1*
- *N3 N/A per Exception 4 to Section 6.5.1*
- *N4 N/A system employs heat recovery complying with Section 6.5.6.2.2*
- *N5 N/A system serves residential spaces with a system capacity less than five times that in Table 6.5.1-1*
- *N6 N/A per Exception 7 to Section 6.5.1*
- *N7 N/A system expected to operate < 20 h/wk*
- *N8 N/A system serves space with open refrigerated casework systems*
- *N9 N/A cooling efficiency exceeds the requirements of Table 6.5.1-2*
- *N10 N/A serves computer rooms and meets Exception 11 to Section 6.5.1*
- *N11 N/A serves computer rooms and meets Exception 12 to Section 6.5.1*

Humidification (Section 6.5.1.6)

- *C1 System humidifies and has a water-side economizer*
- *N1 N/A System humidifies to a dew point <35°F (<2°C)*
- *N2 N/A System humidifies and an economizer is not required per Section 6.5.1*
- *N3 N/A System does not have hydronic cooling*
- *N4 N/A System does not have humidifier controls*

Dehumidification (Section 6.5.2.3)

- *C1 System dehumidifies without employing reheating or recooling*
- *N1 N/A system does not have humidistatic controls*
- *N2 N/A system meets Exception 1 to Section 6.5.2.3*
- *N3 N/A system meets Exception 2 to Section 6.5.2.3*
- *N4 N/A system meets Exception 3 to Section 6.5.2.3*
- *N5 N/A system meets Exception 4 to Section 6.5.2.3*
- *N6 N/A system meets Exception 5 to Section 6.5.2.3*
- *N7 N/A system meets Exception 6 to Section 6.5.2.3*

VAV Fan Control (Section 6.5.3.2.1)

- *C1 System has a two-speed motor and control compliant with Sections 6.5.3.2.1(a) and 5.6.3.2.1(c).*
- *C2 System has a variable-speed motor and control compliant with Sections 6.5.3.2.1(b) and 5.6.3.2.1(c).*
- *N1 N/A system is constant volume*

VAV Fan Static Pressure Control (Sections 6.5.3.2.2 and 6.5.3.2.3)

- *C1 Static pressure setpoint is <1.2 in. w.c.(300 pa) (note installation of multiple pressure sensors)*
- *C2 Static pressure setpoint is reset by zone demand per Section 6.5.3.2.3.*
- *N1 N/A system is constant volume and is below the Table 6.5.3.2.1 threshold*

Multiple-Zone VAV System Ventilation Control (Section 6.5.3.3)

- *C1 System complies with Section 6.5.3.3*
- *N1 N/A system has zonal transfer fans that recirculate air directly from other zones.*
- *N2 N/A system design exhaust rate is more than 70% of the design ventilation rate*

Supply Air Temperature Reset Control (Section 6.5.3.5)

- *C1 System employs supply air temperature reset per Section 6.5.3.5*
- *N2 N/A system is located in Climate Zone 0A, 1A, 2A, or 3A*
- *N3 N/A system has no reheating, recooling, or mixing of heated and cooled supply air*
- *N4 N/A system has >75% of the energy for reheat from site-recovered or site solar energy sources*

Exhaust Air Energy Recovery (Section 6.5.6.1)

- *C1 System employs an exhaust air energy recovery device that exceeds 50% enthalpy recovery ratio*
- *N1 N/A system operates less than 8,000 h/yr and is exempt per Table 6.5.6.1-1*
- *N2 N/A system operates 8,000 h/yr or more and is exempt per Table 6.5.6.1-2*
- *N3 N/A system serves a laboratory meeting Section 6.5.7.3*
- *N4 N/A system is heating only and the spaces are heated to <60°F (<16°C)*
- *N5 N/A >60% of the heating energy is from site-recovered or site solar energy*
- *N6 N/A heating energy recovery is exempt in Climate Zones 0, 1 and 2*
- *N7 N/A cooling energy recovery is exempt in Climate Zones 3C, 4C, 5B, 5C, 6B, 7, and 8*
- *N8 N/A Exhaust air is used for another energy recovery system*
- *N8 N/A Exhaust air is Class 4 per Std. 62.1 or not allowed by Std. 170 for use in energy recovery systems with leakage potential*
- *N9 N/A where the sum of airflow rates exhausted and relieved within 20 ft. (6m) of each other is less than 75% of the ventilation rate*
- *N10 N/A dehumidifying systems with energy recovery in series with the cooling coil*
- *N11 N/A system operates less than 20 h/wk above the Table 6.5.6.1-1 threshold*

HVAC Prescriptive Requirements

Part III, 3 of 3

Fan System Option 1 – Nameplate Power

Installed Nameplate Power

Tag	Description	Supply	Return	Exhaust	Series FPB	Other	Nameplate Power (hp [kW])
		❍	❍	❍	❍	❍	
		❍	❍	❍	❍	❍	
		❍	❍	❍	❍	❍	
		❍	❍	❍	❍	❍	
		❍	❍	❍	❍	❍	

Allowed Nameplate Power

Design Supply Airflow Rate (CFM_S [L/s_s])	
Fan Nameplate Power Allowance from Table 6.5.3.1-1	
Total Allowed Nameplate Power	

Fan System Option 2 – Input Power

Allowed Fan Input Power

Design Supply Airflow Rate (CFM_S [L/s_s])	
Fan Input Power Allowance from Table 6.5.3.1-1	
Base Allowance (Line1 x Line 2)	
Additional Input Power Allowance	
Total Allowed Input Power	

Pressure Drop Adjustments for Qualifying Devices

Tag	Device Description	Pressure Drop from Table 6.5.3.1-2	Airflow through Device	Additional Input Power Allowance

Installed Input Power

Tag	Description	Supply	Return	Exhaust	Series FPB	Other	Airflow	Pressure Drop	η_{Fan}	η_{Drive}	η_{Motor}	Input Power
		❍	❍	❍	❍	❍						
		❍	❍	❍	❍	❍						
		❍	❍	❍	❍	❍						
		❍	❍	❍	❍	❍						
		❍	❍	❍	❍	❍						

Fan Efficiency

All fans subject to the minimum efficiency requirements (primarily stand-alone building fans - see Users guide for the numerous exceptions must show compliance with the fan energy index (FEI) at system design conditions. Compliance information for the fan efficiency requirement is on Page X. For each covered fan and fan array, document the fan system design condition (fan pressure, fan air flow, and fan air density), the manufacturer-certified Fan Energy Index value, and whether or not the fan or fan array is for a variable-air-volume system that meets the requirements of Section 6.5.3.2.1.

FEI must be at least 0.95 for such variable-air-volume systems. All other fans or fan arrays in air distribution systems must meet an FEI of at least 1.00, unless an exception (1) to (10) applies.

Fan Efficiency (Section 6.5.3.1.3)

Tag	Description	Application	FEI target	Fan Pressure	Fan Air Flow	Fan Air Density *Default is 0.075*	Actual FEI
				(in. WG)	(cfm)	(lbm/ft^3)	_._ _
1	Fan or Fan Array Identification	❍ VAV	0.95				_._ _
		❍ CAV	1.00				_._ _
		❍ exempt	Exception to 6.5.3.1.3 *Select (1) to (10)*				☐
…	Fan or Fan Array Identification	❍ VAV	0.95				_._ _
		❍ CAV	1.00				_._ _
		❍ exempt	Exception to 6.5.3.1.3 *Select (1) to (10)*				☐
x	Fan or Fan Array Identification	❍ VAV	0.95				_._ _
		❍ CAV	1.00				_._ _
		❍ exempt	Exception to 6.5.3.1.3 *Select (1) to (10)*				☐

Exceptions to 6.5.3.1.3

1. Fans that are not embedded fans with a motor nameplate horsepower of less than 1.0 hp or with a fan nameplate electrical input power of less than 0.89 kW.
2. Embedded fans and fan arrays with a combined motor nameplate horsepower of 5 hp or less or with a fan system electrical input power of 4.1 kW or less.
3. Embedded fans that are part of equipment listed under Section 6.4.1.1.
4. Embedded fans included in equipment bearing a third-party-certified seal for air or energy performance of the equipment package.
5. Ceiling fans.
6. Fans used for moving gases at temperatures above 482°F.
7. Fans used for operation in explosive atmospheres.
8. Reversible fans used for tunnel ventilation.
9. Fans outside the scope of AMCA 208.
10. Fans that are intended to only operate during emergency conditions.

Ceiling Fans

Large-diameter ceiling fans (LDCFs) are defined 10 CFR 430 Appendix U as having a blade span (tip diameter) greater than seven feet. For each LDCF, document the following in the worksheet below.

- Blade span (blade tip diameter)
- Rated airflow and power consumption at the maximum speed

The data provided shall meet one of the following requirements:

- It is determined by an independent laboratory.
- It is included in a database published by USDOE.
- It is certified under a program meeting the requirements of Section 6.4.1.5.

Ceiling Fans (Section 6.4.1.3)

Large Diameter Ceiling Fan (LDCF) Identification	Blade Span (in.)	Air Flow (cfm) at maximum speed	Power consumption at maximum speed (W)	Data Source
LDCF 1	240.0	160,000	950	USDOE & AMCA CRP
LDCF 2	144	55,000	450	USDOE & AMCA CRP