Energy-Conscious Blueprint

Energy Efficient Heating and Envelope Design

The United Illuminating Company (UI)

Prescriptive Criteria for an Efficient Building Envelope

A building's envelope, or shell, has a major impact on the energy profile of the entire building. Using energy-efficient envelope and glazing materials lowers that profile by reducing the energy needed for heating and cooling. These materials also improve zone temperature control for greater comfort.

Compliance levels are based on ASHRAE 90.1 -2004, standards representing energy efficient design/construction practices. Otherwise, the building/envelope must be modeled with approved software such as Comcheck, ASHRAE EnvStd or equivalent. Projects exceeding the envelope compliance criteria may be eligible for additional incentives.

Table 5.5-5
BUILDING ENVELOPE REQUIREMENTS
(HDD65: 5401-7200, CDD50: 1801-3600)

OPAQUE ELEMENTS	NONRESIDENTIAL	
	ASSEMBLY MAXIMUM	MINIMUM INSULATION R-VALUE
Roofs		
Insulation entirely above deck	U-0.063	R-15.0 ci
Metal Building	U-0.065	R-19.0
Attic and other	U-0.034	R-30.0
Walls, Above Grade		
Mass	U-0.123	R-7.6 ci
Metal Building	U-0.113	R-13.0
Steel Framed	U-0.084	R-13.0 + R-3.8 ci
Wood Framed and other	U-0.089	R-13.0
Walls, Below Grade		
Below Grade Walls	C-1.140	NR
Floors		
Mass	U-0.087	R-8.3 ci
Steel Joist	U-0.052	R-19.0
Wood Framed and other	U-0.033	R-30.0
Slab-on-Grade Floors		
Unheated	F-0.730	NR
Heated	F-0.840	R-10 for 36 Inches
Opaque Floors		
Swinging	U-0.700	
Non-swinging	U-1.450	

Table 5.5-5
BUILDING ENVELOPE REQUIREMENTS
(HDD65: 5401-7200, CDD50: 1801-3600)

FENESTRATION	NONRESIDENTIAL	
	ASSEMBLY MAXIMUM U-VALUE (FIXED/OPERABLE)	ASSEMBLY SHGC (ALL ORIENTATIONS/ NORTH-ORIENTED)
Vertical Glazing, % of Wall		
0 – 10.0%	$U_{fixed}^{-0.57}$ $U_{oper}^{-0.67}$	$SHGC_{all}^{-0.49}$ $SHGC_{north}^{-0.49}$
0 – 10.0%	$U_{fixed}^{-0.57}$ $U_{oper}^{-0.67}$	$SHGC_{all}^{-0.39}$ $SHGC_{north}^{-0.49}$
20.1 – 30.0%	$U_{fixed}^{-0.57}$ $U_{oper}^{-0.67}$	$SHGC_{all}^{-0.39}$ $SHGC_{north}^{-0.49}$
30.1 – 40.0%	$U_{fixed}^{-0.57}$ $U_{oper}^{-0.67}$	$SHGC_{all}^{-0.39}$ $SHGC_{north}^{-0.49}$
40.1 – 50.0%	$U_{fixed}^{-0.46}$ $U_{oper}^{-0.47}$	$SHGC_{all}^{-0.26}$ $SHGC_{north}^{-0.36}$
Skylight with curb, Glass, % of Roof		
0 – 2.0%	$U_{all}^{-1.17}$	$SHGC_{all}^{-0.49}$
2.1 – 5.0%	$U_{all}^{-1.17}$	$SHGC_{all}^{-0.39}$
Skylight with curb, Plastic, % of Roof		
0 – 2.0%	$U_{all}^{-1.10}$	$SHGC_{all}^{-0.77}$
2.1 – 5.0%	$U_{all}^{-1.10}$	$SHGC_{all}^{-0.62}$
Skylight with curb, All, % of Roof		
0 – 2.0%	$U_{all}^{-0.69}$	$SHGC_{all}^{-0.49}$
2.1 – 5.0%	$U_{all}^{-0.69}$	$SHGC_{all}^{-0.39}$

AHRAE/ESNA Standards 90.1-2004
This chart is reprinted with permission from ASHRAE.

Prescriptive Criteria for an Efficient Heating System

Efficient heating equipment assures you of reduced energy costs over the entire life of your building. Your projects may be eligible for additional incentives if, along with all other applicable standard measures, you exceed the heating efficiency standards based on current manufacturers' performance data and minimize over-sizing.

The prescriptive compliance levels are based on ASHRAE 90.1 -2004 standards representing energy efficient equipment.

Please contact your Utility Representative for more details.

GAS AND OIL FIRED BOILERS – MINIMUM EFFICIENCY REQUIREMENTS

TABLE 6.8.1F

Equipment Type	Size Category (Input)	Subcategory or Rating Condition	Minimum Efficiency[b]	Test Procedure[c]
Boiler Gas-Fired	<300,000 Btu/h	Hot Water	80% AFUE	DOE 10 CFR Part 430
		Steam	75% AFUE	
	≥300,000 Btu/h and ≤2,500,000 Btu/h	Maximum Capacity[d]	75% E_t[b]	H.I. Htg Boiler Std.
	>2,500,000 Btu/h[a]	Hot Water	80% E_c	
	>2,500,000 Btu/h[a]	Steam	80% E_c	
Boiler Oil-Fired	<300,000 Btu/h		80% AFUE	DOE 10 CFR Part 430
	≥300,000 Btu/h and ≤2,500,000 Btu/h	Maximum Capacity[d]	78% E_t[b]	H.I. Htg Boiler Std.
	>2,500,000 Btu/h[a]	Hot Water	83% E_c	
	>2,500,000 Btu/h[a]	Steam	83% E_c	
Oil-Fired (Residual)	≥300,000 Btu/h and ≤2,500,000 Btu/h	Maximum Capacity[d]	78% E_t[b]	H.I. Htg Boiler Std.
	>2,500,000 Btu/h[a]	Hot Water	83% E_c	
	>2,500,000 Btu/h[a]	Steam	83% E_c	

NOTES:

a. These requirements apply to boilers with rated input of 8,000,000 Btu/h or less that are not packaged boilers, and to all packaged boilers. Minimum efficiency requirements for boilers cover all capacities of packaged boilers.

b. Et = thermal efficiency. See reference document for detailed information.

c. Section 12 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

d. Minimum and maximum ratings as provided for an allowed by the unit's controls.

WARM AIR FURNACES AND COMBINATION WARM AIR FURNACES/AIR-CONDITIONING UNITS, WARM AIR DUCT FURNACES AND UNIT HEATERS

TABLE 6.8.1E

Equipment Type	Size Category (Input)	Subcategory or Rating Condition	Minimum Efficiency[a]	Test Procedure[b]
Warm Air Furnace, Gas-Fired	<225,000 Btu/h		78% AFUE or 80% E_t[d]	DOE 10 CFR Part 430 or ANSI Z21.47
	≥225,000 Btu/h	Maximum Capacity[d]	80% E_c[c]	ANSI Z21.47
Warm Air Furnace, Oil-Fired	<225,000 Btu/h		78% AFUE or 80% E_t[d]	DOE 10 CFR Part 430 or UL 727
	≥225,000 Btu/h	Maximum Capacity[e]	81% E_t[F]	UL 727
Warm Air Duct Furnaces, Gas-Fired	All Capacities	Maximum Capacity[e]	or 80% E_c[g]	ANSI Z83.9
Warm Air Unit Heater, Gas-Fired	All Capacities	Maximum Capacity[e]	or 80% E_c[g]	ANSI Z83.8
Warm Air Unit Heaters, Oil-Fired	All Capacities	Maximum Capacity[e]	or 80% E_c[g]	UL 731

NOTES:

a. Et = thermal efficiency. See test procedure for detailed discussion.

b. Section 12 contains a complete specification for the reference test procedure, including the reference year version of the test procedure.

c. Ec = combustion efficiency. Units must also include and IID, have jacket losses not exceeding 0.75% of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.

d. Combination units not covered by NAECA 9 3-phase power or cooling capacity greater than or equal to 65,000 Btu/h) may comply with either rating.

e. Minimum and maximum ratings as provided for an allowed by the unit's controls.

f. Et = thermal efficiency. Units must also include and IID, have jacket losses not exceeding 0.75% of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.

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ELECTRICALLY OPERATED PACKAGED TERMINAL AIR CONDITIONERS. PACKAGED TERMINAL HEAT PUMPS. SINGLE PACKAGED VERTICAL HEAT PUMPS. ROOM AIR CONDITIONERS & ROOM AIR CONDITIONERS HEAT PUMP-MIN. EFFICIENCY REQUIRED

TABLE 6.8.1D

Equipment Type	Size Category (Input)	Subcategory or Rating Condition	Minimum Efficiency	Test Procedure[a]
PTAC (Cooling Mode) New Construction	All Capacities	95°F db Outdoor Air	12.5 – (0.213 x Cap/1000)[c] EER	ARI 310/380
PTAC (Cooling Mode) Replacement[b]	All Capacities	95°F db Outdoor Air	10.9 – (0.213 x Cap/1000)[c] EER	
PTHP (Cooling Mode) New Construction	All Capacities	95°F db Outdoor Air	12.3 – (0.213 x Cap/1000)[c] EER	
PTHP (Cooling Mode) Replacement[b]	All Capacities	95°F db Outdoor Air	10.8 – (0.213 x Cap/1000)[c] EER	
PTHP (Heating Mode) New Construction	All Capacities		3.2 – (0.026 x Cap/1000)[c] COP	
PTHP (Heating Mode) Replacement[b]	All Capacities		2.9 – (0.026 x Cap/1000)[c] COP	
SPVAC (Cooling Mode)	All Capacities	95°F db/75°F wb Outdoor Air	8.6 EER	ARI 390
SPVHP (Cooling Mode)	All Capacities	95°F db/75°F wb Outdoor Air	8.6 EER	ANSI/AHAM RAC-1
SPVHP (Heating Mode)	All Capacities	47°F db/43°F wb Outdoor Air	2.7 COP	
Room Air Conditioners with Louvered Sides	<6000 Btu/h		9.7 SEER	
	≥6000 Btu/h and <8000 Btu/h		9.7 EER	
	≥8000 Btu/h and <14,000 Btu/h		9.8 EER	
	≥14,000 Btu/h and <20,000 Btu/h		9.7 SEER	
	≥20,000 Btu/h		8.5 EER	
Room Air Conditioners without Louvered Sides	<8000 Btu/h		9.0 SEER	
	≥8000 Btu/h and <20,000 Btu/h		8.5 EER	
	≥20,000 Btu/h		8.5 EER	
Room Air Conditioners , Heat Pump with Louvered Sides	<20,000 Btu/h		9.0 EER	
	≥20,000 Btu/h		8.5 EER	
Room Air Conditioners , Heat Pump without Louvered Sides	<14,000 Btu/h		8.5 EER	
	≥14,000 Btu/h		8.0 EER	
Room Air Conditioners, Casement Only	All Capacities		8.7 EER	
Room Air Conditioners, Casement-Slider	All Capacities		9.5 EER	

NOTES:

a. Section 12 contains a complete specification of the reference test procedure, including the referenced year version of the test procedure

b. Replacement units must be factory labeled as follows: "MANUFACTURED FOR REPLACEMENT APPLICATION ONLY. NOT TO BE INSTALLED IN NEW CONSTRUCTION PROJECTS." Replacement efficiencies apply only to units with existing sleeves less than 16 inches high and less than 42 inches wide.

c. Cap means the rated cooling capacity of the product in Btu/h. If the unit's capacity is less than 7,000 Btu/h in the calculation, use 7,000 Btu/h in the calculation. If the unit's capacity is greater than 15,000 Btu/h, use 15,000 Btu/h in the calculation.

For the latest information, please contact the Representative at your local UI office, call 1-877-WISE USE (877.947.3873) or visit our website www.uinet.com.

Connecticut Light & Power — The Northeast Utilities System

CONNECTICUT ENERGY EFFICIENCY FUND
www.CTEnergyInfo.com

The United Illuminating Company

Connecticut's Energy Efficiency Programs are funded by the Conservation Charge on customer electric bills.
The Programs are designed to help customers manage their energy usage and cost.