

increase factor = AFUE (HSPF) home – AFUE (or HSPF) NAECA divided by AFUE (HSPF) NAECA.

Cooling efficiency increase factor = the increase factor in the cooling equipment efficiency measured by the Seasonal Energy Efficiency Ratio (SEER) above that required by NAECA.

The formula being cooling equipment = SEER home—SEER NAECA divided by SEER NAECA.

The cooling multiplier for the Uo Zone is from the following table:

Uo zone	Cooling multiplier (Cm)
1	0.60 (Florida only).
1	0.20 (All other locations).
2	0.07.
3	0.03.

(e) U values for any glazing (e.g., windows, skylights, and the glazed portions of any door) must be based on tests using AAMA 1503.1–1988, Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections, or the National Fenestration Rating Council 100, 1997 Edition, Procedure for Determining Fenestration Product U-factors. In the absence of tests, manufacturers are to use the residential window U values contained in Chapter 29, Table 5 of the 1997 ASHRAE Handbook of Fundamentals, Inch-Pound Edition. In the event that the classification of the window type is indeterminate, the manufacturer must use the classification that gives the higher U value. Where a composite of materials from two different product types is used, the product is to be assigned the higher U value. For the purpose of calculating U_o values, storm windows are treated as an additional pane.

(f) *Annual energy used based compliance.* As an alternative, homes may demonstrate compliance with the annual energy used implicit in the coefficient of heat transmission (U_o) requirement. The annual energy use determination must be based on generally accepted engineering practices. The general requirement is to demonstrate that the home seeking compliance approval has a projected annual energy use, including both heating and cooling, less than or equal to a similar “base case” home that meets the

standard. The energy use for both homes must be calculated based on the same assumptions; including assuming the same dimensions for all boundaries between conditioned and unconditioned spaces, site characteristics, usage patterns and climate.

[58 FR 55011, Oct. 25, 1993, as amended at 70 FR 72047, Nov. 30, 2005]

§ 3280.509 Criteria in absence of specific data.

In the absence of specific data, for purposes of heat-loss/gain calculation, the following criteria shall be used:

(a) *Infiltration heat loss.* In the absence of measured infiltration heat loss data, the following formula shall be used to calculate heat loss due to infiltration and intermittently operated fans exhausting to the outdoors. The perimeter calculation shall be based on the dimensions of the pressure envelope.

Infiltration Heat-Loss = 0.7 (T) (ft. of perimeter), BTU/hr.

where: T = 70 minus the heating system capacity certification temperature stipulated in the Heating Certificate, in F.

(b) Framing areas.

Wall 15 percent of wall area less windows and doors.
Floor and Ceiling 10 percent of the area.

(c) *Insulation compression.* Insulation compressed to less than nominal thickness and loose-fill insulation in sloping cavities must have its nominal R-values reduced in compressed areas in accordance with the following table:

TABLE TO PARAGRAPH (C)—EFFECT OF INSULATION COMPRESSION AND RESTRICTION ON R-VALUES

Original thickness (%)	Non-uniform (a) restriction		Uniform (b) compression batt (%)
	Batt (%)	Blown (%)	
0	20	15	0
1	26	21	1
2	32	25	2
3	36	28	4
4	38	30	5
5	41	32	7
6	43	33	8
7	45	35	10
8	46	36	11
9	48	38	13
10	49	39	14
11	51	40	15
12	52	42	17

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TABLE TO PARAGRAPH (C)—EFFECT OF INSULATION COMPRESSION AND RESTRICTION ON *R*-VALUES—Continued

Original thickness (%)	Non-uniform (a) restriction		Uniform (b) compression batt (%)
	Batt (%)	Blown (%)	
13	53	43	18
14	54	44	20
15	55	45	21
16	57	46	22
17	58	47	24
18	59	48	25
19	59	49	26
20	60	50	28
21	61	51	29
22	62	52	30
23	63	52	31
24	64	53	33
25	65	54	34
26	65	55	35
27	66	56	36
28	67	57	37
29	68	57	39
30	68	58	40
31	69	59	41
32	70	60	42
33	70	60	43
34	71	61	44
35	72	62	45
36	72	63	47
37	73	63	48
38	74	64	49
39	74	65	50
40	75	65	51
41	75	66	52
42	76	67	53
43	76	68	54
44	77	68	55
45	78	69	56
46	78	70	57
47	79	70	58
48	79	71	59
49	80	71	60
50	80	72	61
51	81	73	62
52	81	73	63
53	82	74	64
54	82	75	65
55	83	75	65
56	83	76	66
57	84	76	67
58	84	77	68
59	84	78	69
60	85	78	70
61	85	79	71
62	86	79	72
63	86	80	73
64	87	81	74
65	87	81	74
66	88	82	75
67	88	82	76
68	88	83	77
69	89	84	78
70	89	84	78
71	90	85	79
72	90	85	80
73	90	86	81
74	91	86	82
75	91	87	82
76	92	87	83
77	92	88	84
78	92	89	85

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TABLE TO PARAGRAPH (C)—EFFECT OF INSULATION COMPRESSION AND RESTRICTION ON *R*-VALUES—Continued

Original thickness (%)	Non-uniform (a) restriction		Uniform (b) compression batt (%)
	Batt (%)	Blown (%)	
79	93	89	85
80	93	90	86
81	93	90	87
82	94	91	88
83	94	91	88
84	95	92	89
85	95	92	90
86	95	93	91
87	96	93	91
88	96	94	92
89	96	94	93
90	97	95	93
91	97	95	94
92	97	96	95
93	98	96	95
94	98	97	96
95	98	97	97
96	99	98	97
97	99	98	98
98	99	99	99
99	100	99	99
100	100	100	100

Note: To use this table, first compute the restricted insulation thickness as a fraction of the uncompressed (full) insulation thickness. Then look up the *R*-value remaining from the appropriate column (Non-uniform Restriction, Batt Non-uniform Restriction, Blown or Uniform Compression, Batt). Example: Assume a section of loose-fill ceiling insulation went from *R*-25 insulation at a height of 10 inches to a minimum height of 2 inches at the edge of the ceiling. The ratio of minimum to full thickness is 0.20 (2 divided by 10). Look up 0.20 (20 percent), read across to column 3 (Non-uniform Restriction, Blown), and read 50 percent. Therefore, the *R*-value of the loose-fill insulation over the restricted area would be *R*-12.5 (50 percent of 25).

(a) Non-uniform restriction is that which occurs between non-parallel planes, such as in the ceiling near the eaves.

(b) Uniform compression is compression between parallel planes, such as that which occurs in a wall.

(d) *Air supply ducts within floor cavity.* Air supply ducts located within a floor cavity shall be assumed to be heating or cooling the floor cavity to living space temperatures unless the duct is structurally isolated by the framing system or thermally insulated from the rest of the floor cavity with a thermal insulation at least equal to *R*-4.

(e) *Air supply ducts within ceiling cavity.* Where supply ducts are located in ceiling cavities, the influence of the duct on cavity temperatures shall be considered in calculating envelope heat loss or heat gain.

(f) The supply duct loss (and/or heat gain where applicable—See §3280.511) shall be calculated using the actual duct surface area and the actual thickness of insulation between the duct and outside of the manufactured home. If there is an air space of at least ½ inch

between the duct and the insulation, heat loss/gain need not be calculated if the cavity in which the duct is located is assumed to be at living space temperature. The average temperature inside the supply duct, including ducts installed outside the manufactured home, shall be assumed to be 130 F for purposes of calculation of heat loss and 60 F for heat gain.

(g) *Return air cavities.* Cavities used as return air plenums shall be considered to be at living space temperature.

[40 FR 58752, Dec. 18, 1975. Redesignated at 44 FR 20679, Apr. 6, 1979, as amended at 78 FR 73984, Dec. 9, 2013]

§ 3280.510 Heat loss certificate.

The manufactured home manufacturer shall permanently affix the following "Certificate" to an interior surface of the home that is readily visible to the homeowner. The "Certificate" shall specify the following:

(a) *Heating zone certification.* The design zone at which the manufactured home heat loss complies with § 3280.506(a).

(b) *Outdoor certification temperature.* The lowest outdoor temperature at which the installed heating equipment will maintain a 70 °F temperature inside the home without storm sash or insulating glass for Zones 1 and 2, and with storm sash or insulating glass for Zone 3 and complying with § 3280.508 and § 3280.509.

(c) *Operating economy certification temperature.* The temperature to be specified for operating economy and energy conservation shall be 20 °F or 30% of the design temperature difference, whichever is greater, added to the temperature specified as the heating system capacity certification temperature without storm windows or insulating glass in Zones 1 and 2 and with storm windows or insulating glass in Zone 3. Design temperature difference is 70° minus the heating system capacity certification temperature in degrees Fahrenheit.

HEATING CERTIFICATE

Home Manufacturer _____
Plant Location _____
Home Model _____

(Include Uo Value Zone Map)

This manufactured home has been thermally insulated to conform with the requirements of the Federal Manufactured Home Construction and Safety Standards for all locations within Uo Value Zone ____.

Heating Equipment Manufacturer _____
Heating Equipment Model _____

The above heating equipment has the capacity to maintain an average 70F temperature in this home at outdoor temperatures of [see paragraph (b) of this section] F. To maximize furnace operating economy and to conserve energy, it is recommended that this home be installed where the outdoor winter design temperature (97 1/2%) is not higher than [see paragraph (c) of this section] F degrees Fahrenheit.

The above information has been calculated assuming a maximum wind velocity of 15 MPH at standard atmospheric pressure.

(d) The following additional statement must be provided on the heating certificate and data plate required by § 3280.5 when the home is built with a vapor retarder of not greater than one perm (dry cup method) on the exterior side of the insulation: "This home is designed and constructed to be sited only in humid or fringe climate regions as shown on the Humid and Fringe Climate Map." A reproduction of the Humid and Fringe Climate Map in § 3280.504 is to be provided on the heating certificate and data plate. The map must be not less than 3½ inch × 2¼ inch in size and may be combined with the Uo Value Zone Map for Manufactured Housing in § 3280.506.

[40 FR 58752, Dec. 18, 1975. Redesignated at 44 FR 20679, Apr. 6, 1979, as amended at 58 FR 55011, Oct. 25, 1993; 70 FR 72048, Nov. 30, 2005]

§ 3280.511 Comfort cooling certificate and information.

(a) The manufactured home manufacturer shall permanently affix a "Comfort Cooling Certificate" to an interior surface of the home that is readily visible to the home owner. This certificate may be combined with the heating certificate required in § 3280.510. The manufacturer shall comply with one of the following three alternatives in providing the certificate and additional information concerning the cooling of the manufactured home:

(1) *Alternative 1.* If a central air conditioning system is provided by the home