

APPENDIX J

ENERGY CONSERVATION FOR NEW CONSTRUCTION  
LOW-RISE RESIDENTIAL BUILDINGS  
(780 CMR Appendix J is based upon the Council of American Building Officials  
Model Energy Code 1995 Edition.)

780 CMR J1.0 ADMINISTRATION AND  
ENFORCEMENT

be designed and constructed to comply with the requirements of 780 CMR 13.

J1.1 Scope and General Requirements:

**J1.1.1 Title:** Appendix J reflects the technical requirements of the Model Energy Code 1995 Edition, but also contains material which reflects the unique requirements of Massachusetts.

**J1.1.2 Scope:** 780 CMR Appendix J sets forth minimum requirements for the design and construction of new residential occupancy buildings and additions to existing residential occupancy buildings three stories or less in height by regulating the design and construction of building envelopes for adequate thermal resistance and low air leakage, and by the design, selection, and installation of mechanical, electrical, and service water heating systems and equipment to enable efficient use of energy. It is intended that these provisions provide flexibility to permit the use of innovative approaches and techniques to achieve effective utilization of energy. 780 CMR Appendix J is not intended to abridge safety, health, or environmental requirements under other applicable code sections or ordinances.

**Note:** For alterations to existing buildings, see 780 CMR J1.1.2.3 and Chapter 34.

J1.1.2.1 Building Types:

**J1.1.2.1.1 Group R residential buildings:** New construction buildings, or new portions thereof, that must comply with the requirements of Appendix J are:

- 1. Detached one- and two-family dwellings (Use Groups R-4 or R-5 in 780 CMR 310); and,
- 2. All other residential buildings, three stories or less in height (Use Groups R-2, R-3, or R-5 in 780 CMR 310). Note that Use Group R-1 buildings are to be treated as *commercial buildings*.

**J1.1.2.1.2 Other Buildings:** New construction buildings and structures not included in 780 CMR J1.1.2.1.1. shall be classified as Commercial/High-Rise Buildings and shall

**J1.1.2.2 Exempt buildings:** The following buildings or structures shall be exempt from the requirements of 780 CMR Appendix J:

- 1. Buildings and structures or portions thereof whose peak design rate of energy usage is less than 3.4 Btu/h per square foot (10.7 W/m<sup>2</sup>) or 1.0 watt per square foot (10.7 W/m<sup>2</sup>) of floor area for all purposes;
- 2. Greenhouses that are free-standing, or attached to a building and separated by a wall having the same thermal value as an exterior wall, and provided with a separate temperature control system;
- 3. Buildings with less than 100 square feet of gross floor area, and;
- 4. Buildings and structures or portions thereof which are neither heated nor cooled.

J1.1.2.3 Application to existing buildings:

**J1.1.2.3.1 Additions to existing buildings:** Additions to existing buildings or structures shall comply with one of the applicable criteria below:

- 1. The new addition, by itself, shall conform to the applicable provisions of Appendix J, **or**;
- 2. The new addition plus the existing building/dwelling unit may be considered together to ensure compliance with all applicable provisions of Appendix J, **or**;
- 3. Additions that are open to or separated by an exterior wall from the existing house/dwelling unit shall meet the prescriptive envelope component criteria of Table J1.1.2.3.1. The total area (rough opening or unit dimensions) of glazed fenestration products (windows, skylights, and glazed portion of doors) shall not exceed 40% of the gross wall and gross ceiling area of the addition combined. If any individual fenestration component exceeds the maximum U-value listed in Table J1.1.2.3.1, then the area-weighted average U-value for all fenestration components must be less than or equal to the listed value. The R-value requirements for opaque thermal envelope

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components indicate insulation products (cavity and/or insulating sheathing), and shall be equal to or exceed the applicable listed values found in Table J1.1.2.3.1. If such additions are separated from the main house by a wall and are conditioned, then a readily accessible manual or automatic means shall be provided to partially restrict or shut off the heating and/or cooling input to the addition space. That portion of a wall that separates the addition from the existing building/dwelling unit, if an existing exterior wall, shall be allowed to remain and neither that portion of said wall or any fenestration within said portion of wall common to the addition need comply with the thermal envelope requirements of Appendix J.

**TABLE J1.1.2.3.1**  
**Prescriptive Envelope Component Criteria**  
**Additions to Existing Low-Rise Residential**  
**Buildings**

MAXIMUM	MINIMUM				
Fenestration U-value	Ceiling R-Value	Wall R-Value	Floor R-Value	Basement Wall R-Value	Slab Perimeter R-Value and Depth
0.39	R-37 <sup>1</sup>	R-13	R-19	R-10	R-10, 4 ft

<sup>1</sup> R-30 ceiling insulation may be used in place of R-37 if the insulation achieves the full R-value over the entire ceiling area (i.e. - not compressed over exterior walls, and including any access openings.)

**Exception: Sunroom Additions / Consumer Notification:** *Sunrooms*, as defined in 780 CMR Appendix J2.0 DEFINITIONS, shall be exempt from the compliance requirements set forth in 780 CMR J1.1.2.3.1 and J1.1.3 provided that the actual property owner (not the owner’s agent or representative) of the structure onto which the *sunroom* addition is being made, provides a signed copy of the Sunroom “CONSUMER INFORMATION FORM” (found in 780 CMR, Appendix B) to the Building Department. This signed “CONSUMER INFORMATION FORM” shall be submitted to the building official as a requirement of building permit issuance, and shall remain as part of the construction documents. If such *sunroom* additions are separated from the main house by a wall and are conditioned spaces, then a readily accessible manual or automatic means shall be provided to partially restrict or shut off the heating and/or cooling input to the *sunroom* addition space. That portion of a wall that separates the *sunroom* addition from the existing building/dwelling unit, if an existing exterior wall, shall be allowed to remain and neither that portion of said wall or any fenestration within said portion and common to

the *sunroom* addition, need comply with the thermal envelope requirements of Appendix J.

**J1.1.2.3.2 Historic buildings:** Historic buildings, as defined in 780 CMR 3409, are exempt from Appendix J.

**J1.1.2.3.3 Change of occupancy:** A change in the occupancy or change in use of an existing building or structure shall be permitted, subject to the provisions of 780 CMR 3407.

**J1.1.2.4 Mixed occupancy:** When a building houses more than one occupancy, each portion of the building shall conform to the requirements for the occupancy housed therein. Where minor accessory uses do not occupy more than 10% of the area of any floor of a building, the major use shall be considered the building occupancy.

**J1.1.3 Compliance:** Compliance with Appendix J shall be determined by one of the following alternatives:

1. 780 CMR J5.0, Residential Building Design by Prescriptive Practice (or Default Package Approach) in which the U and R values are given for the thermal envelope. Additional requirements are stated in 780 CMR J4.0, or;
2. 780 CMR J6.0, Residential Building Design by Component Performance (or Manual Trade-off Approach) which allows trade-offs between building envelope components and heating and cooling equipment efficiencies to minimize cost. Additional requirements are stated in 780 CMR J4.0, or;
3. 780 CMR J7.0, Residential Building Design by MAScheck Software which achieves similar results as the Manual Trade-off Approach. Additional requirements are stated in 780 CMR J4.0, or;
4. 780 CMR J8.0, the Systems Approach or Total Energy Analysis for the entire building and its energy using sub-systems, or;
5. 780 CMR J9.0, Buildings Utilizing Renewable Energy Resources.
6. 780 CMR J11.0, a Home Energy Rating issued for the home with a score of 83.0 or more points

**J1.2 Construction Documents:**

**J1.2.1 General:** Construction documents including necessary computations shall be submitted to the building official as part of the building permit application process. Such construction documents shall indicate conformance with 780 CMR J1.2 and other applicable sections of 780 CMR, and in accordance with 780 CMR 110.

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**J1.2.2 Details:** The construction documents shall show in sufficient detail pertinent data and features of the building project and the equipment and systems as herein governed, including, but not limited to, design criteria, exterior envelope component materials, *U*-values of the envelope systems, *R*-values of insulating materials, size and type of apparatus and equipment, equipment and systems controls, energy calculations if applicable, and other pertinent data to indicate conformance with the requirements of the Building Code.

When HVAC equipment sizing information is not available at the time of initial building permit application, such information shall be submitted prior to the installation of said equipment, and supporting calculations shall demonstrate compliance with 780 CMR J4.4. Installed equipment must meet or exceed the efficiency rating listed in the submitted construction documents.

### J1.3 Inspections

**J1.3.1 General:** Construction or work for which a permit is required shall be subject to 780 CMR 111 and 115.

**J1.4 Precedence:** When provisions of 780 CMR Appendix J and a section of a referenced standard specify different materials, methods of construction, or other requirements, the explicit provisions of 780 CMR shall govern.

### J1.5 Materials and Equipment

#### J1.5.1 Identification:

**J1.5.1.1 General:** Materials and equipment shall be identified in a manner that will allow a determination of their compliance with the applicable provisions of Appendix J.

**J1.5.1.2 Building envelope insulation:** A thermal resistance (*R*) identification mark shall be required on each piece of building envelope insulation 12 inches (305 mm) or greater in width.

Alternatively, the insulation installer shall provide a signed and dated certification for the insulation installed in each element of the building envelope, listing the type of insulation, the manufacturer and the *R*-value. For blown-in or sprayed insulation, the installer shall also provide the initial installed thickness, the settled thickness, the coverage area and number of bags installed. The installer shall post the certification in a conspicuous place on the job site.

**J1.5.1.3 Insulation installation:** Roof-ceiling, floor and wall cavity insulation shall be installed in accordance with manufacturer's instructions, and in a manner which will permit

inspection of the manufacturer's *R*-value identification mark.

Alternatively, the thickness of roof-ceiling insulation that is either blown or sprayed shall be identified by thickness markers that are labeled in inches installed at least one for every 300 square feet (28 m<sup>2</sup>) through the attic space.

The markers shall be affixed to the trusses or joists, and marked with the minimum initial installed thickness and the minimum settled thickness with numbers at least 1.0 inch (25 mm) in height. Each marker shall face the attic access. The thickness of installed insulation shall meet or exceed the minimum initial installed thickness shown by the marker.

**J1.5.2 Maintenance information:** Required regular maintenance actions shall be clearly stated and incorporated on a readily accessible label on the equipment or made otherwise available for permanent reference. Such label may be limited to identifying, by title or publication number, the operation and maintenance manual for that particular model and type of product. Maintenance instructions shall be furnished for equipment which requires preventive maintenance for efficient operation.


**J1.5.3 Fenestration product rating, certification and labeling:** *U*-values of fenestration products (windows, doors and skylights) shall be determined in accordance with the NFRC 100, as listed in Appendix A, and labeled (see Figure J1.5.3 below) and certified by the manufacturer. Such certified and labeled values shall be accepted for purposes of determining compliance with the building envelope requirements of Appendix J.

**Note 1:** NFRC certification and labeling requirements take effect January 1, 1999. Prior to January 1, 1999, window, door, and skylight *U*-values may be assigned using manufacturers' calculations or the default values in Tables J1.5.3a and J1.5.3b.

**Note 2:** After January 1, 1999, when a manufacturer of windows, glazed and unglazed doors or skylights has not determined product *U*-value in accordance with J1.5.3 for a particular product line, compliance with the building envelope requirements of Appendix J shall be determined only by assigning such products a default *U*-value in accordance with Tables J1.5.3a and J1.5.3b. Product features must be verifiable for the product to qualify for the default value associated with those features. Where the existence of a particular feature cannot be determined with reasonable certainty, the product shall not receive credit for that feature. Where a composite of materials from two different

product types are used, the product shall be assigned the higher U-value.

FIGURE J1.5.3



National Fenestration  
Rating Council

**NWDA**  
NATIONAL WOOD WINDOW  
AND DOOR ASSOCIATION

Accredited  
Certification  
Program

Manufacturer stipulates that these ratings were determined  
in accordance with NFRC 100-91<sup>SM</sup>

U-value	AA	36" x 60"	0.33	With 5/8" HP 5-Argon Filled Low-E Glazing
U-value	BB	48" x 72"	0.31	

*NFRC ratings are determined for a fixed set of environmental conditions and may not be appropriate for determining seasonal energy performance. For additional information contact: NWDA 1400 East Touhy Avenue, Suite G-54 Des Plaines, Illinois 60018; Phone (708) 299-5200, Fax; (708) 299-1286*

Meets or exceeds C.E.C. Air Infiltration Standards

Table J1.5.3a  
U-value Default Table for Windows, Glazed Doors, and Skylights

	Single Glazed	Double Glazed and Single Glazed with Storm
<b>Metal Without Thermal Break</b>		
Operable	1.30	0.87
Fixed	1.17	0.69
Door	1.26	0.80
Skylight	1.92	1.30
<b>Metal with Thermal Break</b>		
Operable	1.07	0.67
Fixed	1.11	0.63
Door	1.10	0.66
Skylight	1.93	1.13
<b>Metal-Clad Wood</b>		
Operable	0.98	0.60
Fixed	1.05	0.58
Door	0.99	0.57
Skylight	1.50	0.88
<b>Wood/Vinyl</b>		
Operable	0.94	0.56
Fixed	1.04	0.57
Door	0.98	0.56
Skylight	1.47	0.85

For SI: 1 inch = 25.4 mm.  
Glass block assemblies shall have a U-value of 0.60.

Table J1.5.3b  
U-value Default Table for Non-glazed Doors

	With Foam Core	Without Foam Core
Steel Doors (1-¾ Inches Thick)	0.35	0.60
	Without Storm Door	With Storm Door
Wood Doors (1-¾ Inches Thick)		
Panel with 7/16-inch panels	0.54	0.36
Hollow core flush	0.46	0.32
Panel with 1- _ -inch panels	0.39	0.28
Solid core flush	0.30	0.26

For SI: 1 inch = 25.4 mm.

**J1.6 Alternate Materials — Method of Construction, Design Or Insulating Systems:** The provisions of Appendix J are not intended to prevent the use of any material, method of construction, design or insulating system not specifically prescribed herein, provided that such construction, design or insulating system has been approved, if necessary, by the BBRs as meeting the intent of Appendix J.

780 CMR J2.0 DEFINITIONS

780 CMR J2.1 General Definitions

**J2.2 Meaning:** Unless otherwise expressly stated, the following terms shall, for the purpose of 780 CMR Appendix J, have the meaning indicated in 780 CMR J2.0.

**J2.3 Tense, gender and number:** Words used in the present tense include the future; words used in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural the singular.

**J2.4 Terms not defined:** Where terms are not defined, they shall have their ordinarily accepted meanings or such as the context may imply. Any terms relating to plumbing and electrical wiring shall have their terms as defined by the Regulations of the Commonwealth of Massachusetts pertaining to plumbing and electrical wiring.

**ACCESSIBLE (AS APPLIED TO EQUIPMENT):** Admitting close approach because not guarded by locked doors, elevation or other effective means (see “Readily accessible”).

**AIR CONDITIONING, COMFORT:** The process of treating air so as to control simultaneously its temperature, humidity, cleanliness, and distribution to meet requirements of the conditioned space.

**AIR TRANSPORT FACTOR:** The ratio of the rate of useful sensible heat removal from the conditioned space to the energy input to the supply and return fan motor(s), expressed in consistent units and under the designated operating conditions.

**ANNUAL FUEL UTILIZATION EFFICIENCY (AFUE):** The ratio of annual output energy to annual input energy which includes any non-heating season pilot input loss, and for gas or oil-fired furnaces or boilers, does not include electrical energy.

**AUTOMATIC:** Self-acting, operating by its own mechanism when actuated by some impersonal influence, as, for example, a change in current strength, pressure, temperature or mechanical configuration (see “Manual”).

**BASEMENT WALL:** The opaque portion of a wall which encloses one side of a basement and is partially or totally below grade.

**BOILER CAPACITY:** The rate of heat output in Btu/h (W) measured at the boiler outlet, at the design inlet and outlet conditions and rated fuel/energy input.

**BUILDING ENVELOPE:** The elements of a building which enclose conditioned spaces through which thermal energy may be transferred to or from the exterior or to or from spaces exempted by the provisions of 780 CMR J1.1.2.2.

**BUILDING PROJECT:** A building or group of buildings, including on-site energy conversion or electric-generating facilities, which utilize a single submittal for a construction permit or are within the boundary of a contiguous area under one ownership.

**COEFFICIENT OF PERFORMANCE (COP)—COOLING:** The ratio of the rate of heat removal to the rate of energy input in consistent units, for a complete cooling system or factory assembled equipment, as tested under a nationally recognized standard or designated operating conditions.

**COEFFICIENT OF PERFORMANCE (COP)—HEAT PUMP—HEATING:** The ratio of the rate of heat delivered to the rate of energy input, in consistent units, for a complete heat pump system under designated operating conditions. Supplemental heat shall not be considered when checking compliance with the heat pump equipment (COPs listed in the tables in 780 CMR J4.4).

## ENERGY CONSERVATION FOR NEW CONSTRUCTION LOW-RISE RESIDENTIAL BUILDINGS

**COMFORT:** The physical conditions represented in the area on a psychometric chart enclosing all those conditions described in Figure 1 in **COMMERCIAL BUILDINGS:** For purposes of energy conservation, a commercial building is any building other than a *low-rise residential building*, as defined in 780 CMR J2.0.

**CONDITIONED FLOOR AREA:** The horizontal projection of that portion of interior space which is contained within exterior walls and which is conditioned directly or indirectly by an energy-using system.

**CONDITIONED SPACE:** Space within a building which is provided with positive heat supply (see definition), or which has heated and/or cooled air or surfaces, or where required, with humidification or dehumidification means so as to be capable of maintaining a space condition falling within the comfort zone set forth in ASHRAE 55, as listed in Appendix A.

**COOLED SPACE:** Space within a building which is provided with a positive cooling supply.

**CRAWL SPACE WALL:** The opaque portion of a wall which encloses a crawl space and is partially or totally below grade.

**DEADBAND:** The temperature range in which no heating or cooling is used.

**DEGREE DAY, COOLING:** A unit, based upon temperature difference and time, used in estimating cooling energy consumption. For any one day, when the mean temperature is more than 65°F (18°C), there are as many degree days as degrees Fahrenheit (Celsius) temperature difference between the mean temperature for the day and 65°F (18°C). Annual Cooling Degree Days (CDD) are the sum of the degree days over a calendar year.

**DEGREE DAY, HEATING:** A unit, based upon temperature difference and time, used in estimating fuel consumption and specifying nominal heating load of a building in winter. For any one day, when the mean temperature is less than 65°F (18°C), there exists as many degree days as there are Fahrenheit degrees difference in temperature between the mean temperature for the day and 65°F (18°C).

**DWELLING UNIT:** A single housekeeping unit comprised of one or more rooms providing complete independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking and sanitation.

**EFFICIENCY, HVAC SYSTEM:** The ratio of useful energy output (at the point of use) to the energy input in consistent units for a designated time period, expressed in percent.

ASHRAE 55, as listed in Appendix A, as being comfortable.

**ENERGY:** The capacity for doing work taking a number of forms which may be transformed from one into another, such as thermal (heat), mechanical (work), electrical and chemical in customary units, measured in kilowatt-hours (kWh) or British thermal units (Btu) (J) (see “New Energy”).

**ENERGY EFFICIENCY RATIO (EER):** The ratio of net equipment cooling capacity in Btu/h to total rate of electric input in watts (W) under designated operating conditions. If the output capacity in Btu/h is converted to watts (to create consistent units) the result is equal to the cooling COP (EER  $3.41 = \text{COP}$ .) See also Coefficient of Performance.

**ENERGY, RECOVERED:** See “Recovered energy.”

**EXISTING BUILDINGS:** For purposes of energy conservation, and existing building which has been legally occupied and/or used for a period of at least five years. (Also see 780 CMR 2.0 and 780 CMR 3400.3.1.)

**EXTERIOR ENVELOPE:** See “Building envelope.”

**FURNACE, DUCT:** A furnace normally installed in distribution ducts of air conditioning systems to supply warm air for heating and which depends on a blower not furnished as part of the duct furnace for air circulation.

**FURNACE, WARM AIR:** A self-contained, indirect-fired or electrically heated furnace that supplies heated air through ducts to spaces that require it.

**GLAZING AREA:** Interior surface area of all glazed surfaces (such as windows, sliding glass doors, skylights, etc.), sash, curbing, jambs, or other framing elements that enclose conditioned spaces.

**GROSS AREA OF EXTERIOR WALLS:** The normal projection of the building envelope wall area bounding interior space which is conditioned by an energy-using system including opaque wall, window and door area.

The gross area of exterior walls consists of all opaque wall areas, including between floor spandrels, peripheral edges of floors, roof and basement knee walls, walls enclosing a mansard roof, window areas including sash, and door areas when such surfaces are exposed to outdoor air, unconditioned spaces, or mechanically cooled space, including interstitial areas between two such spaces. For each basement wall that encloses heated space, if the average below-grade area is less than 50% of the total area for that wall, including openings, the entire wall,

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including the below-grade portion is included as part of the gross area of exterior walls. Non-opaque areas (windows, doors, etc.) of all basement walls are included in the gross area of exterior walls. (Note: if the basement is not heated space, and if the basement ceiling is insulated, then the basement walls are not included in the gross area of exterior walls.

**GROSS FLOOR AREA:** The sum of the areas of the several floors of the building, including

**GROUP R RESIDENTIAL BUILDINGS:** For the purpose of Appendix J, Group R residential buildings include:

1. Detached one and two family dwellings (Use Groups R-4 and R-5 in 780 CMR 310); and,
2. All other residential buildings, three stories or less in height (Use Groups R-1, R-2, R-3, R-5 in 780 CMR 310).

**HEAT:** The form of energy that is transferred by virtue of a temperature difference or a change in state of a material.

**HEATED SLAB:** Slab-on-grade construction in which the heating elements or hot air distribution system is in contact with or placed within the slab or the sub-grade.

**HEATED SPACE:** Space within a building which is provided with a positive heat supply. Space within a basement with registers or heating devices designed to supply heat to a basement space shall automatically define that space as heated space.

**HEATING SEASONAL PERFORMANCE FACTOR (HSPF):** The total heating output of a heat pump during its normal annual usage period for heating, in Btu, divided by the total electric energy input during the same period, in watt hours, as determined by Code of Federal Regulations, 10 CFR Part 430, Subpart B, Test procedures and based on Region 4, as listed in Appendix A.

**HUMIDISTAT:** A regulatory device, actuated by changes in humidity, used for automatic control of relative humidity.

**HVAC:** Heating, ventilating, and air conditioning.

**HVAC SYSTEM:** The equipment, distribution network, and terminals that provide either collectively or individually the processes of heating, ventilating, or air conditioning to a building.

**HVAC SYSTEM COMPONENTS:** HVAC system components provide, in one or more factory-assembled packages, means for chilling and/or heating water with controlled temperature for delivery to terminal units serving the conditioned spaces of the building. Types of HVAC system components include, but are not limited to, water

basements, cellars, mezzanine and intermediate floored tiers and penthouses of headroom height, measured from the exterior faces of exterior walls or from the center line of walls separating buildings, but excluding:

1. Covered walkways, open roofed-over areas, porches and similar spaces.
2. Pipe trenches, exterior terraces or steps, chimneys, roof overhangs and similar features.

chiller packages, reciprocating condensing units and water source (hydronic) heat pumps (see “HVAC system equipment”).

**HVAC SYSTEM EFFICIENCY:** See “Efficiency, HVAC system.”

**HVAC SYSTEM EQUIPMENT:** HVAC system equipment provides, in one (single package) or more (split system) factory-assembled packages, means for air circulation, air cleaning, air cooling with controlled temperature and dehumidification, and, optionally, either alone or in combination with a heating plant, the functions of heating and humidifying. The cooling function may be either electrically or heat operated and the refrigerant condenser may be air, water or evaporatively cooled. Where the equipment is provided in more than one package, the separate packages shall be designed by the manufacturer to be used together. The equipment may provide the heating function as a heat pump or by the use of electric or fossil-fuel-fired elements. (The word “equipment” used without modifying adjective may, in accordance with common industry usage, apply either to HVAC system equipment or HVAC system components.)

**INFILTRATION:** The uncontrolled inward air leakage through cracks and interstices in any building element and around windows and doors of a building caused by the pressure effects of wind and/or the effect of differences in the indoor and outdoor air density.

**INTEGRATED PART-LOAD VALUE (IPLV):** A single number figure of merit based on part-load EER or COP expressing part-load efficiency for air-conditioning and heat pump equipment on the basis of weighted operation at various load capacities for the equipment.

**LOW-RISE RESIDENTIAL BUILDINGS:** Residential occupancy buildings (R-2, R-3, R-4, or R-5) three stories or less in height. (Exception: For purposes of energy conservation, R-1 use group buildings shall be treated as *commercial buildings* as defined in 780 CMR J2.0.)

**MANUAL:** Capable of being operated by personal intervention (see “Automatic”).

**MULTIFAMILY DWELLING:** A building containing three or more dwelling units.



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**NET AREA OF EXTERIOR WALLS:** The gross area of exterior walls, minus the total rough opening area of all windows and doors set in the exterior walls.

**NEW ENERGY:** Energy, other than recovered energy, utilized for the purpose of heating or cooling (see “Energy”).

**PACKAGED TERMINAL AIR CONDITIONER (PTAC):** A factory-selected wall sleeve and separate unencased combination of heating and cooling components, assemblies or sections (intended for mounting through the wall to serve a single room or zone). It includes heating capability by hot water, steam, or electricity. (For the complete technical definition, see ARI Standard 310 listed in Appendix A.)

**PACKAGED TERMINAL HEAT PUMP:** A PTAC capable of using the refrigeration system in reverse cycle or heat pump mode to provide heat. (For complete technical definition, see ARI 380 listed in Appendix A.)

**POSITIVE COOLING SUPPLY:** Mechanical cooling deliberately supplied to a space, such as through a supply register. Also, mechanical cooling indirectly supplied to a space through uninsulated surfaces of space-cooling components, such as evaporator coil cases and cooling distribution systems which continually maintain air temperatures within the space of 85°F (29°C) or lower during normal operation. To be considered exempt from inclusion in this definition, such surfaces shall comply with the insulation requirements of Appendix J4.

**POSITIVE HEAT SUPPLY:** Heat deliberately supplied to a space by design, such as a supply register, radiator or heating element. Also, heat indirectly supplied to a space through uninsulated surfaces of service water heaters and space heating components, such as furnaces, boilers and heating and cooling distribution systems which continually maintain air temperature within the space of 50°F (10°C) or higher during normal operation. To be considered exempt from inclusion in this definition, such surfaces shall comply with the insulation requirements of Appendix J4.

**READILY ACCESSIBLE:** Capable of being reached quickly for operation, renewal or inspections, without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders or access equipment (see “Accessible”).

**RECOOLING:** The removal of heat by sensible cooling of the supply air (directly or indirectly) that has been previously heated above the temperature to which the air is to be supplied to the conditioned space for proper control of the temperature of that space.

**OPAQUE AREAS:** All exposed areas of a building envelope which enclose conditioned space, except openings for windows, skylights, doors and building service systems.

**OUTDOOR AIR:** Air taken from the outdoors, (i.e. - not previously circulated through the HVAC system.)

**RECOVERED ENERGY:** Energy utilized which would otherwise be wasted (i.e., not contribute to a desired end use) from an energy utilization system.

**REHEAT:** The application of sensible heat to supply air that has been previously cooled below the temperature of the conditioned space by either mechanical refrigeration or the introduction of outdoor air to provide cooling.

**RENEWABLE ENERGY SOURCES:** Sources of energy (excluding minerals and solid fuels) derived from incoming solar radiation, including natural daylighting and photosynthetic processes; from phenomena resulting therefrom, including wind, waves and tides, lake or pond thermal differences; and from the internal heat of the earth, including nocturnal thermal exchanges.

**RESET:** Adjustment of the set point of a control instrument to a higher or lower value automatically or manually to conserve energy.

**RESIDENTIAL BUILDINGS:** For the purposes of Appendix J, Group R residential buildings include:

1. Type I (R-4, R-5): Detached one and two family dwellings; and,
2. Type II (R-1, R-2, R-3, R-5): All other residential buildings, three stories or less in height.

**ROOF ASSEMBLY:** A roof assembly shall be considered as all components of the roof/ceiling envelope through which heat flows, thus creating a building transmission heat loss or gain, where such assembly is exposed to outdoor air and encloses a heated or mechanically cooled space.

The gross area of a roof assembly consists of the total interior surface of such assembly, including skylights exposed to the heated or mechanically cooled space.

**ROOM AIR CONDITIONER:** An encased assembly designed as a unit for mounting in a window or through a wall, or as a console. It is designed primarily to provide free delivery of conditioned air to an enclosed space, room or zone. It includes a prime source of refrigeration for cooling and dehumidification and means for circulating and cleaning air, and may also include means for ventilating and heating.

**SASH CRACK:** The sum of all perimeters of all window sashes, based on overall dimensions of such parts, expressed in linear feet. If a portion of

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one sash perimeter overlaps a portion of another sash perimeter, only count the length of the overlapping portions once.

**SEASONAL ENERGY EFFICIENCY RATIO**

**(SEER):** The total cooling output of an air conditioner during its normal annual usage period for cooling, in Btu/h (W), divided by the total electric energy input during the same period, in watt-hours, as determined by Code of Federal

Regulations, 10 CFR Part 430, Subpart B, Test procedures, as listed in Appendix A.

**SEQUENCE:** A consecutive series of operations.

**SERVICE SYSTEMS:** All energy-using systems in a building that are operated to provide services for the occupants or processes housed therein, including HVAC, service water heating, illumination, transportation, cooking or food preparation, laundering and similar functions.