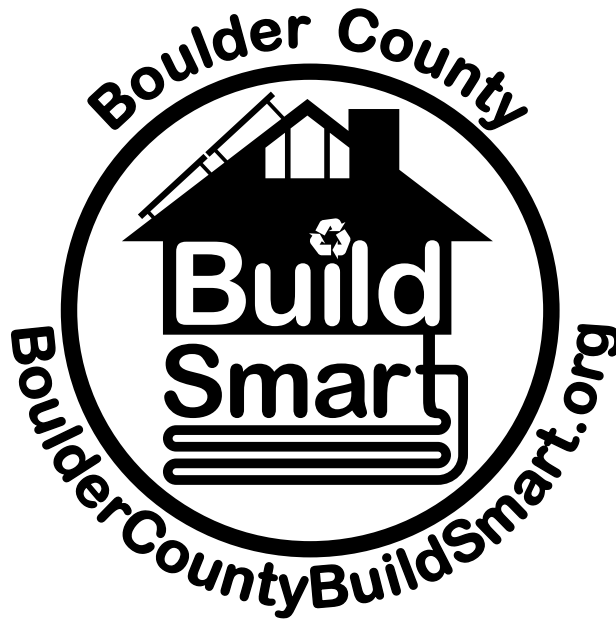


Boulder County

Boulder County BuildSmart Code



Boulder County BuildSmart (2015 IRC Chapter 11)
Effective January 1, 2016 | Updated October 10, 2017



Land Use Department:

Courthouse Annex Building • 2045 13th Street • PO Box 471 • Boulder, CO 80302

Building Safety & Inspection Services:

Phone: 303-441-3925 • Fax: 303-441-4856 • Email: building_official@bouldercounty.org • www.bouldercounty.org/lu

Office Hours: Monday – Monday, Wednesday, Thursday, Friday 8 a.m. to 4:30 p.m. | Tuesday 10 a.m. to 4:30 p.m.

Building Permits can be applied for and issued until 4 p.m. Plan review services by the Building Safety and Inspection Services Team are unavailable on Tuesdays. Building permits that require a plan review and counter questions will not be accepted on Tuesdays. Over the counter EZBP building permits are available on Tuesdays from 10 a.m.-4:30 p.m.

Part IV—Energy Conservation

IRC CHAPTER 11 ENERGY EFFICIENCY

Note: IRC Chapter 11 is amended to contain the requirements of the Boulder County BuildSmart program for residential energy efficiency and sustainability. Amended as such, the provisions are not interchangeable with the residential energy [RE] provisions of the International Energy Conservation Code.

SECTION N1101 GENERAL

N1101.1 Scope. This chapter regulates the energy efficiency for the design and construction of buildings regulated by this code.

Exception: Federally-certified manufactured dwellings and state-certified factory-built dwellings.

N1101.2 Intent. This chapter shall regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each *building*. This chapter is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This chapter is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances. This chapter implements the provisions of the “Boulder County BuildSmart” program. BuildSmart serves the County’s stated goals of promoting and encouraging high performing, sustainable residential development and redevelopment in the unincorporated areas of Boulder County by: promoting development that will create energy efficient structures that reduce both the production of greenhouse gases from residential buildings and the amount of material sent to landfills; conserving water and other natural resources in the homebuilding process; and insuring proper indoor air quality. BuildSmart also furthers the goals and measures outlined in the Colorado Climate Action Plan and the county’s Sustainable Energy Plan. The production and efficient use of energy will continue to play a central role in the future of Colorado and the nation as a whole. The development, production, and efficient use of renewable energy will advance the security, economic well-being, and public and environmental health of Colorado, as well as contributing to the energy independence of our nation. The 2015 revision to BuildSmart continues to include both performance and a prescriptive options for compliance, providing additional flexibility in selection of the most cost-effective design for each project.

N1101.3 Compliance materials. The *building official* shall be permitted to approve specific computer software, worksheets, compliance manuals and other similar materials that meet the intent of this code.

N1101.4 Above code programs. The *building official* or other authority having jurisdiction shall be permitted to deem a national, state or local energy-efficiency program to exceed the energy efficiency required by this code. Buildings *approved* in writing by such an energy-efficiency program shall be considered in compliance with this code. The requirements identified as “mandatory” in this chapter, as applicable, shall be met.

N1101.5 Information on construction documents. Construction documents shall be drawn to scale upon suitable material. Electronic media documents are permitted to be submitted when *approved* by the *building official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building, systems and equipment as herein governed. Details shall include, but are not limited to, as applicable:

1. Insulation materials and their *R*-values.
2. Fenestration *U*-factors and SHGCs.
3. Area-weighted *U*-factor and SHGC calculations.
4. Mechanical system design criteria
5. Mechanical and service water heating system and equipment types, sizes and efficiencies.
6. Equipment and system controls.
7. Duct sealing, duct and pipe insulation and location.
8. Air sealing details.
9. Area of Floor to area of Glass Ratio

N1101.5.1 Thermal envelope depiction. The building’s thermal envelope shall be represented on the construction drawings.

N1101.6 Defined terms. The following words and terms shall, for the purposes of this chapter, have the meanings shown herein.

ABOVE-GRADE WALL. A wall more than 50 percent above grade and enclosing *conditioned space*. This includes between-floor spandrels, peripheral edges of floors, roof and basement knee walls, dormer walls, gable end walls, walls enclosing a mansard roof and skylight shafts.

ACCESSIBLE. Admitting close approach as a result of not being guarded by locked doors, elevation or other effective means (see “Readily *accessible*”).

ADDITION. An extension or increase in the *conditioned space* floor area or height of a building or structure.

AIR BARRIER. Material(s) assembled and joined together to provide a barrier to air leakage through the building envelope. An air barrier may be a single material or a combination of materials.

ALTERATION. Any construction, retrofit or renovation to an existing structure other than repair or addition that requires a permit. Also, a change in a building, electrical, gas, mechanical or plumbing system that involves an extension, addition or change to the arrangement, type or purpose of the original installation that requires a permit.

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. A wall 50 percent or more below grade and enclosing *conditioned space*.

BUILDING. Any structure used or intended for supporting or sheltering any use or occupancy, including any mechanical systems, service water heating systems and electric power and lighting systems located on the building site and supporting the building.

BUILDING SITE. A contiguous area of land that is under the ownership or control of one entity.

BUILDING THERMAL ENVELOPE. The basement walls, exterior walls, floor, roof and any other building elements that enclose *conditioned space* or provide a boundary between *conditioned space* and exempt or unconditioned space.

C-FACTOR (THERMAL CONDUCTANCE). The coefficient of heat transmission (surface to surface) through a

building component or assembly, equal to the time rate of heat flow per unit area and the unit temperature difference between the warm side and cold side surfaces ($\text{Btu/h} \cdot \text{ft}^2 \cdot ^\circ\text{F}$) [$\text{W}/(\text{m}^2 \cdot \text{K})$].

CIRCULATING HOT WATER SYSTEM. A specifically designed water distribution system where one or more pumps are operated in the service hot water piping to circulate heated water from the water-heating equipment to fixtures and back to the water-heating equipment.

CLIMATE ZONE. A geographical region based on climatic criteria as specified in this code.

CONDITIONED FLOOR AREA. The horizontal projection of the floors associated with the *conditioned space*. For the purposes of this chapter, the *conditioned floor area* shall be measured as the floor area within the inside face of the interior *air barrier*.

CONDITIONED SPACE. An area, room or space that is enclosed within the building thermal envelope and that is directly heated or cooled or indirectly heated or cooled. Spaces are indirectly heated or cooled where they communicate through openings with conditioned spaces, where they are separated from conditioned spaces by uninsulated walls, floors or ceilings, or where they contain uninsulated ducts, piping or other sources of heating or cooling.

CONTINUOUS AIR BARRIER. A combination of materials and assemblies that restrict or prevent the passage of air through the building thermal envelope.

CONTINUOUS INSULATION (ci). Insulating material that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior or exterior, or is integral to any opaque surface, of the building envelope.

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

CURTAIN WALL. Fenestration products used to create an external nonload-bearing wall that is designed to separate the exterior and interior environments.

DECONSTRUCTION. The dismantling of an existing building or portion thereof without the use of heavy machinery or the destruction of the materials. Deconstruction includes the salvage of materials from the existing structure for recycling, resale, or reuse as an alternative to sending them to a landfill. There are two types of deconstruction,

structural and non-structural deconstruction.

DECONSTRUCTION, NON-STRUCTURAL. Non-Structural deconstruction (also referred to as soft-stripping) is the removal and reclaiming of the reusable non-structural components such as appliances, cabinets, doors, windows, flooring, fixtures, and finish materials.

DECONSTRUCTION, STRUCTURAL. Structural deconstruction is the removal and reclaiming of the reusable structural components of a building, such as walls, floors, and roofs.

DECONSTRUCTION PROFESSIONAL. A professional engaged in the deconstruction field.

DEMOLITION. The tearing down of an existing structure and the disposal of its components or materials without the implementation of deconstruction techniques.

DEMAND RECIRCULATION WATER SYSTEM. A water distribution system where pump(s) prime the service hot water piping with heated water upon demand for hot water.

DUCT. A tube or conduit utilized for conveying air. The air passages of self-contained systems are not to be construed as air ducts.

DUCT SYSTEM. A continuous passageway for the transmission of air that, in addition to ducts, includes duct fittings, dampers, plenums, fans and accessory air-handling equipment and appliances.

ENERGY ANALYSIS. A method for estimating the annual energy use of the *proposed design* and *standard reference design* based on estimates of energy use.

ENERGY COST. The total estimated annual cost for purchased energy for the building functions regulated by this code, including applicable demand charges.

ENERGY SIMULATION TOOL. An *approved* software program or calculation-based methodology that projects the annual energy use of a building.

ENERGYSMART. A Boulder County service that partners with local municipalities, non-profits, and utilities to assist county residents and businesses with improving a wide variety of sustainability related aspects of their living and work places, with particular emphasis on its energy usage. This program is principally funded by Boulder County with additional contributions from the City of Boulder, and is designed to stimulate local economic growth, increase en-

ergy efficiency and renewable energy investment in Boulder County, and reduce the climate affected impacts of the human environment (www.energysmartyes.com).

ENERGYSMART ASSESSMENT. An assessment analyzing your home's energy related attributes, provides the foundation for making cost-effective home improvements that will result in lower energy costs, increased occupant comfort, and a safer and healthier living environment (www.energysmartyes.com).

ENERGYSMART ADVISING. A one-on-one, personalized free service that is available to all EnergySmart participating homes and businesses. The Energy Advisor can help answer questions, aid in the prioritization of projects, connect customers with qualified contractors, find and apply for incentives and low-cost financing, and make upgrade process as smooth and hassle free as possible (www.energysmartyes.com).

ENERGY STAR (for homes). A national program from the U.S. Environmental Protection Agency (EPA) that certifies new homes for features related to energy efficiency, durability, and indoor air quality (www.energystar.gov).

ERI REFERENCE DESIGN. A version of the rated design that meets the minimum requirements of the 2006 *International Energy Conservation Code*.

EXTERIOR WALL. Walls including both above-grade walls and basement walls.

FENESTRATION. Products classified as either *vertical fenestration* or *skylights*.

FENESTRATION PRODUCT, SITE-BUILT. A fenestration designed to be made up of field-glazed or field-assembled units using specific factory cut or otherwise factory-formed framing and glazing units. Examples of site-built fenestration include storefront systems, curtain walls, and atrium roof systems.

FENESTRATION, VERTICAL. Windows (fixed or moveable), opaque doors, glazed doors, glazed block and combination opaque/glazed doors composed of glass or other transparent or translucent glazing materials and installed at a slope of a least 60 degrees (1.05 rad) from horizontal.

HEATED SLAB. Slab-on-grade construction in which the heating elements, hydronic tubing, or hot air distribution system is in contact with, or placed within or under, the slab.

HIGH-EFFICACY LAMPS. Compact fluorescent lamps, T-8 or smaller diameter linear fluorescent lamps, or lamps

with a minimum efficacy of:

1. 60 lumens per watt for lamps over 40 watts;
2. 50 lumens per watt for lamps over 15 watts to 40 watts; and
3. 40 lumens per watt for lamps 15 watts or less.

HISTORIC BUILDING. Buildings that are listed in or eligible for listing in the National Register of Historic Places, or designated as historic under an appropriate state or local law.

INFILTRATION. The uncontrolled inward air leakage into a building caused by the pressure effects of wind or the effect of differences in the indoor and outdoor air density or both.

INSULATED SIDING. A type of continuous insulation with manufacturer-installed insulating material as an integral part of the cladding product having a minimum *R*-value of R-2 and is installed in a manner that places the insulation in direct contact with the surface that it is intended to insulate without gaps or voids.

INSULATING SHEATHING. An insulating board with a core material having a minimum *R*-value of R-2.

LEED. Leadership in Energy & Environmental Design is a green building certification program that encourages green building strategies and practices. To receive LEED certification, building projects satisfy prerequisites and earn points to achieve different levels of certification. LEED is a program of the US Green Building Council (USGBC) (<http://www.usgbc.org/leed>).

LIVING BUILDING CHALLENGE. A green building certification program administered by the International Living Future Institute. To be certified under this program, projects must meet a series of ambitious performance requirements (<http://living-future.org>).

LOW-VOLTAGE LIGHTING. Lighting equipment powered through a transformer such as a cable conductor, a rail conductor and track lighting.

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

PASSIVE HOUSE. The term Passive House (Passivhaus in German) refers to a rigorous standard for energy efficiency in buildings. It results in buildings that require little energy for space heating or cooling. The certification program is administered by PHIUS, which is a 501(c)3 organization

that provides research, technical standards, training, certification and design tools (www.phius.org)

PROPOSED DESIGN. A description of the proposed building used to estimate annual energy use for determining compliance based on total building performance.

RATED DESIGN. A description of the proposed *building* used to determine the energy rating index.

READILY ACCESSIBLE. Capable of being reached quickly for operation, renewal or inspection 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*”).

RENEWABLE ENERGY SYSTEMS. Any renewable energy systems which meet the intent of the required on-site renewable energy offset required by other sections of this code, including solar thermal systems, solar photovoltaic electric systems, geothermal heating systems, wood- and pellet-burning stoves, boilers, or furnaces; small scale wind generation systems, and other similar systems.

REPAIR. The reconstruction or renewal of any part of an existing building for the purpose of its maintenance or to correct damage. For definitions applicable in Chapter 11, see Section N1101.9.

REROOFING. The process of recovering or replacing an existing *roof covering*. See “Roof recover” and “Roof replacement.”

RESIDENTIAL BUILDING. For this chapter, includes detached one- and two-family dwellings and multiple single-family dwellings (townhouses) as well as Group R-2, R-3 and R-4 buildings three stories or less in height above grade plane.

ROOF RECOVER. The process of installing an additional *roof covering* over a prepared existing *roof covering* without removing the existing *roof covering*.

ROOF REPAIR. Reconstruction or renewal of any part of an existing roof for the purposes of its maintenance.

ROOF REPLACEMENT. The process of removing the existing *roof covering*, repairing any damaged substrate and installing a new *roof covering*.

R-VALUE (THERMAL RESISTANCE). The inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces, under steady state conditions, per unit area ($h \cdot \text{ft}^2 \cdot ^\circ\text{F}/\text{Btu}$) [$(\text{m}^2 \cdot \text{K})/\text{W}$].

SERVICE WATER HEATING. Supply of hot water for purposes other than comfort heating.

SKYLIGHT. Glass or other transparent or translucent glazing material installed at a slope of less than 60 degrees (1.05 rad) from horizontal. Glazing material in skylights, including unit skylights, solariums, sunrooms, roofs and sloped walls is included in this definition.

SOLAR HEAT GAIN COEFFICIENT (SHGC). The ratio of the solar heat gain entering the space through the fenestration assembly to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation that is then reradiated, conducted or convected into the space.

STANDARD REFERENCE DESIGN. A version of the *proposed design* that meets the minimum requirements of this code and is used to determine the maximum annual energy use requirement for compliance based on total building performance.

SUNROOM. A one-story structure attached to a dwelling with a glazing area in excess of 40 percent of the gross area of the structure's exterior walls and roof.

THERMAL ISOLATION. Physical and space conditioning separation from *conditioned space(s)*. The *conditioned space(s)* shall be controlled as separate zones for heating and cooling or conditioned by separate equipment.

THERMOSTAT. An automatic control device used to maintain temperature at a fixed or adjustable set point.

U-FACTOR (THERMAL TRANSMITTANCE). The coefficient of heat transmission (air to air) through a building component or assembly, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films ($\text{Btu/h} \cdot \text{ft}^2 \cdot ^\circ\text{F}$) [$\text{W}/(\text{m}^2 \cdot \text{K})$].

VENTILATION AIR. That portion of supply air that comes from outside (outdoors) plus any recirculated air that has been treated to maintain the desired quality of air within a designated space.

VISIBLE TRANSMITTANCE [VT]. The ratio of visible light entering the space through the fenestration product assembly to the incident visible light, Visible Transmittance, includes the effects of glazing material and frame and is expressed as a number between 0 and 1.

WHOLE HOUSE MECHANICAL VENTILATION SYSTEM. An exhaust system, supply system, or combination thereof that is designed to mechanically exchange indoor air with outdoor air when operating continuously or through a programmed intermittent schedule to satisfy the whole house ventilation rates.

ZERO ENERGY READY HOMES (ZERH). This national certification program from the U.S. Department of Energy (DOE) was previously known as the "Challenge Home" program. This program incorporates the basics of the Energy Star for Homes program, and adds additional requirements for water conservation, indoor air quality, and energy efficiency (<http://energy.gov/eere/buildings/zero-energy-ready-home>).

ZONE. A space or group of spaces within a building with heating or cooling requirements that are sufficiently similar so that desired conditions can be maintained throughout using a single controlling device.

N1101.7 Climate zone. All of unincorporated Boulder County shall be considered Climate Zone 5. For buildings located on sites that are above 5500 feet in elevation, alternate, more specific weather data may be accepted.

Tables N1101.7 (R301.1), "CLIMATE ZONES, MOISTURE REGIMES AND WARM-HUMID DESIGNATIONS BY STATE, COUNTY AND TERRITORY," and N1101.7.2, "INTERNATIONAL CLIMATE ZONE DEFINITIONS," are deleted. Sections N1101.7.1, "Warm humid counties," and Section N1101.7.2, "International climate zones," are also deleted.

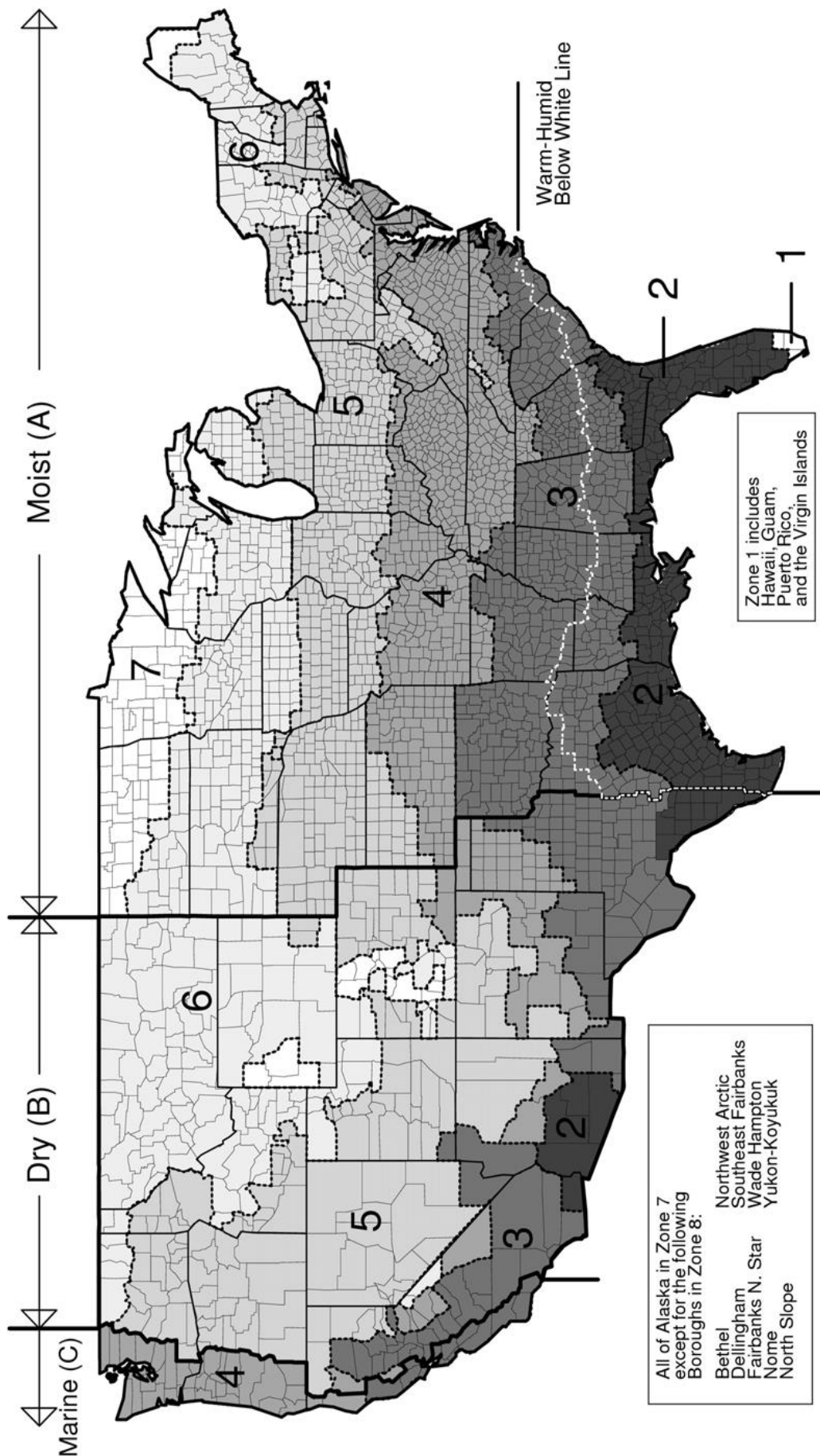


FIGURE N1101.7 CLIMATE ZONES

N1101.8 (R301.4) Tropical climate zone. This section is deleted.

N1101.9 Interior design conditions. The interior design temperatures used for heating and cooling load calculations shall be a maximum of 72°F (22°C) for heating and minimum of 75°F (24°C) for cooling.

N1101.10 Identification. Materials, systems and equipment shall be identified in a manner that will allow a determination of compliance with the applicable provisions of this code.

N1101.10.1 Building thermal envelope insulation.

An *R*-value identification mark shall be applied by the manufacturer to each piece of *building thermal envelope* insulation 12 inches (305 mm) or greater in width. Alternately, the insulation installers shall provide a certification listing the type, manufacturer and *R*-value of insulation installed in each element of the *building thermal envelope*. For blown or sprayed insulation (fiberglass and cellulose), the initial installed thickness, settled thickness, settled *R*-value, installed density, coverage area and number of bags installed shall be *listed* on the certification. For insulated siding, the *R*-value shall be labeled on the product's package and shall be *listed* on the certification. The insulation installer shall sign, date and post the certification in a conspicuous location on the job site.

N1101.10.1.1 Blown or sprayed roof/ceiling insulation. The thickness of blown-in or sprayed roof/ceiling insulation (fiberglass or cellulose) shall be written in inches (mm) on markers that are installed at least one for every 300 square feet (28 m²) throughout the attic space. The markers shall be affixed to the trusses or joists and marked with the minimum initial installed thickness with numbers not less than 1 inch (25 mm) in height. Each marker shall face the attic access opening. Spray polyurethane foam thickness and installed *R*-value shall be *listed* on certification provided by the insulation installer.

N1101.10.2 Insulation mark installation.

Insulating materials shall be installed such that the manufacturer's *R*-value mark is readily observable upon inspection.

N1101.10.3 Fenestration product rating. *U*-factors of fenestration products (windows, doors and skylights) shall be determined in accordance with NFRC 100.

Exception: Where required, garage door *U*-factors shall be determined in accordance with either NFRC 100 or ANSI/DASMA 105.

U-factors shall be determined by an accredited, independent laboratory, and labeled and certified by the manufacturer. Products lacking such a labeled *U*-factor shall be assigned a default *U*-factor from Table N1101.10.3(1) or N1101.10.3(2). The solar heat gain coefficient (SHGC) and visible transmittance (VT) of glazed fenestration products (windows, glazed doors and skylights) shall be determined in accordance with NFRC 200 by an accredited, independent laboratory, and labeled and certified by the manufacturer. Products lacking such a labeled SHGC or VT shall be assigned a default SHGC or VT from Table N1101.10.3(3).

**TABLE N1101.10.3(1)
DEFAULT GLAZED FENESTRATION U-FACTORS**

FRAME TYPE	SINGLE PANE	DOUBLE PANE	SKYLIGHT	
			Single	Double
Metal	1.20	0.80	2.00	1.30
Metal with Thermal Break	1.10	0.65	1.90	1.10
Nonmetal or Metal Clad	0.95	0.55	1.75	1.05
Glazed Block	0.60			

**TABLE N1101.10.3(2)
DEFAULT DOOR U-FACTORS**

DOOR TYPE	U-FACTOR
Uninsulated Metal	1.20
Insulated Metal	0.60
Wood	0.50
Insulated, nonmetal edge, max 45% glazing, any glazing double pane	0.35

**TABLE N1101.10.3(3)
DEFAULT GLAZED FENESTRATION SHGC AND VT**

	SINGLE GLAZED		DOUBLE GLAZED		GLAZED BLOCK
	Clear	Tinted	Clear	Tinted	
SHGC	0.8	0.7	0.7	0.6	0.6
VT	0.6	0.3	0.6	0.3	0.6

N1101.10.4 Insulation product rating. The thermal resistance (*R*-value) of insulation shall be determined in accordance with the U.S. Federal Trade Commission *R*-value rule (CFR Title 16, Part 460) in units of h × ft² × °F/Btu at a mean temperature of 75°F (24°C).

N1101.10.4.1 Insulated siding. The thermal resistance (*R*-value) of insulated siding shall be determined in accordance with ASTM C 1363.

Installation for testing shall be in accordance with the manufacturer's installation instructions.

N1101.11 Installation. All materials, systems and equipment shall be installed in accordance with the manufacturer's instructions and this code.

N1101.11.1 Protection of exposed foundation insulation. Insulation applied to the exterior of basement walls, crawlspace walls and the perimeter of slab-on-grade floors shall have a rigid, opaque and weather-resistant protective covering to prevent the degradation of the insulation's thermal performance. The protective covering shall cover the exposed exterior insulation and extend not less than 6 inches (153 mm) below grade.

N1101.12 Maintenance information. Maintenance instructions shall be furnished for equipment and systems that require preventive maintenance. Required regular maintenance actions shall be clearly stated and incorporated on a readily accessible label. The label shall include the title or publication number for the operation and maintenance manual for that particular model and type of product.

Note: N1101.13.1 Tropical zone. This section is deleted and relaxed as follows:

N1101.13 Compliance. Projects shall comply with one of the following:

1. **N1101.13.1 New Buildings.** New buildings shall comply with the requirements of Figure N1101.13.1, "Options for New Buildings".
2. **N1101.13.2 Additions.** Additions shall comply with the requirements of Figure N1101.13.2, "Options for Additions."
3. **N1101.13.3 Alterations, Remodels, and Repairs.** Alterations, Remodels, and Repairs shall comply with the requirements of Figure N1101.13.3 "Options for Alterations, Remodels, and Repairs."

N1101.14 Certificate (Mandatory). A permanent certificate shall be completed by the builder or registered design professional and posted on a wall in the space where the furnace is located, a utility room or an approved location inside the building. Where located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. The certificate shall list the predominant *R*-values of insulation installed in or on ceiling/roof, walls, foundation (slab, *basement wall*, crawl space wall and/or floor) and ducts outside conditioned spaces; *U*-factors for fenestration and the solar heat gain coefficient (SHGC) of

fenestration, and the results from any required duct system and building envelope air leakage testing done on the building. Where there is more than one value for each component, the certificate shall list the value covering the largest area. The certificate shall list the types and efficiencies of heating, cooling and service water heating equipment. Where a gas-fired unvented room heater, electric furnace, or baseboard electric heater is installed in the residence, the certificate shall list "gas-fired unvented room heater," "electric furnace" or "baseboard electric heater," as appropriate. An efficiency shall not be *listed* for gas-fired unvented room heaters, electric furnaces or electric baseboard heaters. Where photovoltaic systems are present, the certificate shall indicate the number of panels, the nameplate rating of the system (kW), and the anticipated average annual output (kWh) of the system.

N1101.15 Deconstruction (Mandatory)

N1101.15.1 Deconstruction. All existing buildings and portions thereof requiring removal of building materials must be deconstructed as defined in this chapter. Demolition is not permitted.

N1101.15.2 Penalty. Buildings that are demolished or partially demolished rather than deconstructed will, at the discretion of the Building Official, be issued a stop work notice for a period not exceeding 30 days.

1101.15.3 Documentation of Intent to Deconstruct. Documentation of intent to deconstruct consisting of a deconstruction plan, a written description of deconstruction work, or the County Deconstruction Checklist must be provided at building permit application. The documentation of intent to deconstruct must include: the name of the Deconstruction Contractor, a list of the materials to be recovered, donated, or reused, and the destination of the materials. The documentation must include both Nonstructural Deconstruction and Structural Deconstruction. Items which must be donated, sold, or re-used include: cabinets, dimensional lumber, flooring, and solid core doors.

N1101.15.4 Verification of deconstruction of a structure. The completion of deconstruction as approved on the deconstruction plan must be verified by the Building Division. The owner or deconstruction contractor shall provide written verification of deconstruction by means of receipts or a written log, maintained by the homeowner or general contractor, which includes the volume or weight of materials and the destination where they were transported to the Building Division office. Verification must be received prior to scheduling the rough inspections.

N1101.16 Construction jobsite waste reduction and recycling (Mandatory). All construction jobsite waste must be recycled including wood, scrap metal, cardboard, and concrete. Labeled containers must be provided at the construction-site for use in capturing recyclable material. A mixed load container may be used if that container is being sent to a waste/recycling center that will verify the weight of recycled material recovered from that mixed load.

N1101.16.1 Documentation of intent to recycle. Documentation of intent to recycle which consists of a recycling plan, a written description of recycling activity, or the submittal of the County Recycling Checklist must be provided at building permit application. The documentation must clearly show how the requirements of Section 1101.15 will be met and must specify the locations of recycling containers and the destination where material will be recycled.

N1101.16.2 Verification. Field inspection will be made by the Boulder County Building Division during the construction process to assure that recycling containers have been placed on-site. Prior to the final inspection, documentation must be provided to the Building Division office by the owner or waste/recycling contractor indicating the weight or volume of materials diverted from the waste stream. Materials that must be recycled include: appliances, concrete, metals, cardboard, and wood (except pressure treated or painted wood), and thermostats and other devices containing mercury. Other materials which are accepted by the waste/recycling contractor must also be recycled.

N1101.17 Indoor water conservation (Mandatory). New and replacement bathroom sink faucets, shower heads, toilets, and urinals must be labeled as meeting EPA Water Sense (www.epa.gov/WaterSense/) criteria.

Exceptions:

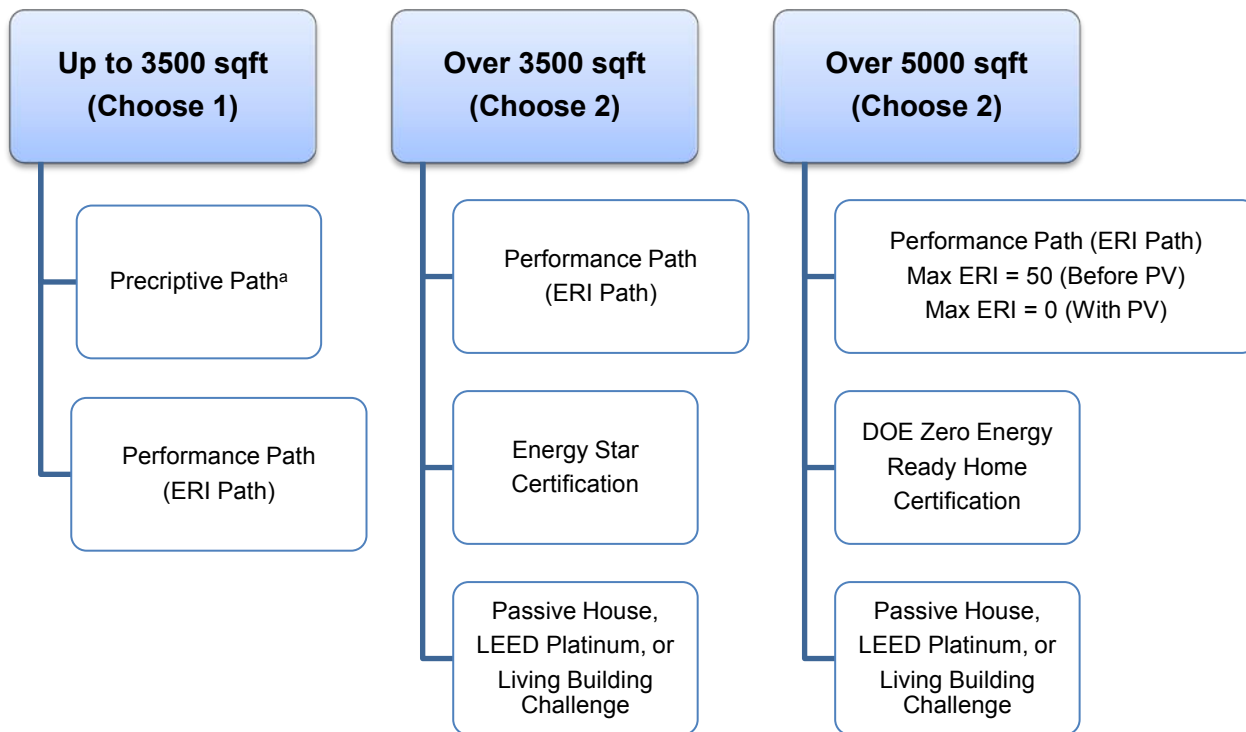
1. Showerheads with a maximum flow of 2.0 gallons per minute (gpm).
2. Urinals with a maximum flush rate of 0.5

gallons per flush (gpf).

N1101.18 Renewable energy requirements. Whenever renewable energy systems are required by this chapter, those systems must be constructed on-site.

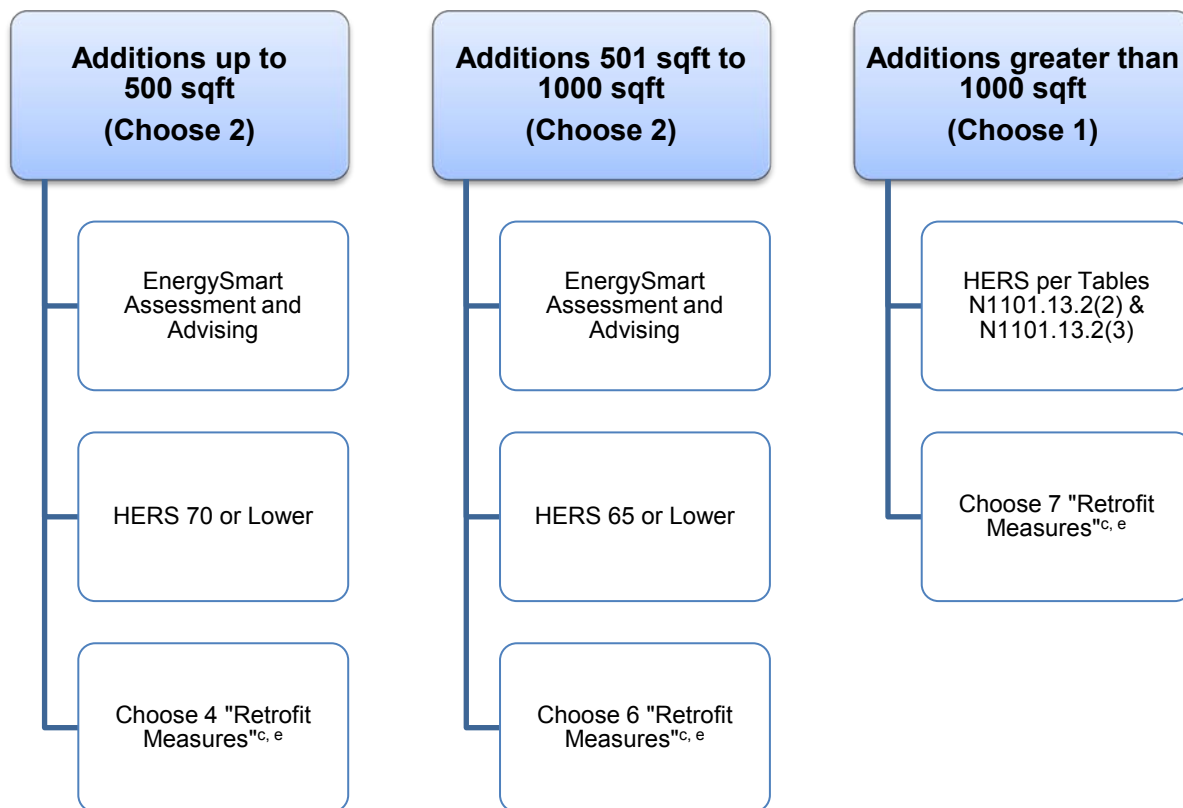
Exception: If an applicant's property is situated in a part of the county where state law permits local utility companies to operate "solar gardens," "solar farms," or similar community renewable energy facilities, the renewable energy requirements of this chapter may be satisfied off-site through the purchase of an adequate share in a community facility, at the discretion of the building official. At a minimum, an "adequate" share in a community facility must (1) enable the production of an equivalent amount of power compared to what the applicant would otherwise be required to produce on-site; (2) be purchased from a facility located within Boulder County or a county contiguous to Boulder County; and (3) given that such shares do not automatically run with the applicant's land, include a mechanism that ensures the share cannot be sold or modified in any way without the consent of Boulder County, with the exception of legal transfer to the applicant's successors-in-interest for use on the same property. Written proof that these requirements are met must be filed with the Building Safety and Inspection Services Division prior to the final inspection approval or the issuance of a certificate of occupancy.

FIGURE N1101.13.1
OPTIONS FOR NEW BUILDINGS^{a, b, c, d}



- a. Buildings with glazing to floor area ratios that exceed 18% may not use the prescriptive path.
Exception: Passive solar designs in which 50% or more of the total glazing faces south.
- b. The energy efficiency requirements of BuildSmart are deemed to be met by buildings with an annual space conditioning requirement of less than 5kBtu/sqft/year.
- c. When unconditioned floor area is being converted to *conditioned floor area* (except for basement finishes), the project is to meet the requirements for an addition.
- d. All “sqft” numbers refer to *conditioned floor area* (“CFA”) in square feet as defined in Section N1101.6.

FIGURE N1101.13.2(1)
OPTIONS FOR ADDITIONS^{a, b, c, d, e}



a. All new building components must meet the requirements of Section N1102.

Exception: Homes using the ERI (HERS) pathway.

b. For additions greater than 200 square feet of floor area resulting in dwellings with greater than 3,500 square feet of *conditioned floor area*, existing plus proposed, Figures N1101.13.2(2) and table N1101.13.2 must be used.

c. “Retrofit Measures” are listed in Table N1101.13.3(2).

d. All “sqft” numbers refer to *conditioned floor area* (“CFA”) in square feet as defined in Section N1101.6.

e. Buildings with glazing to floor area ratios that exceed 18% may not use the prescriptive path.

Exception: Passive solar designs in which 50% or more of the total glazing faces south.

FIGURE N1101.13.2(2)
OPTIONS FOR ADDITIONS---continued

ERI (HERS) REQUIREMENTS FOR ADDITIONS

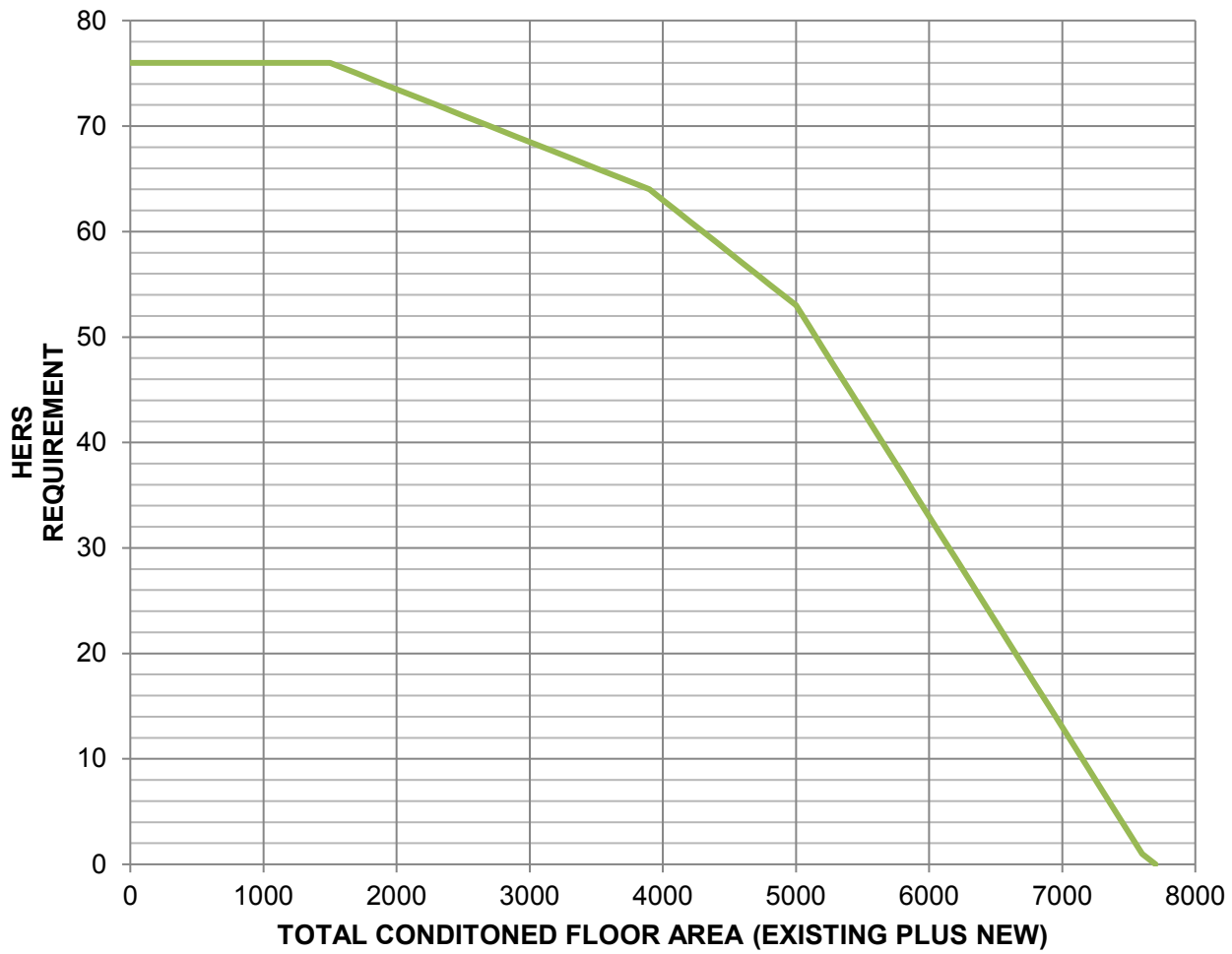
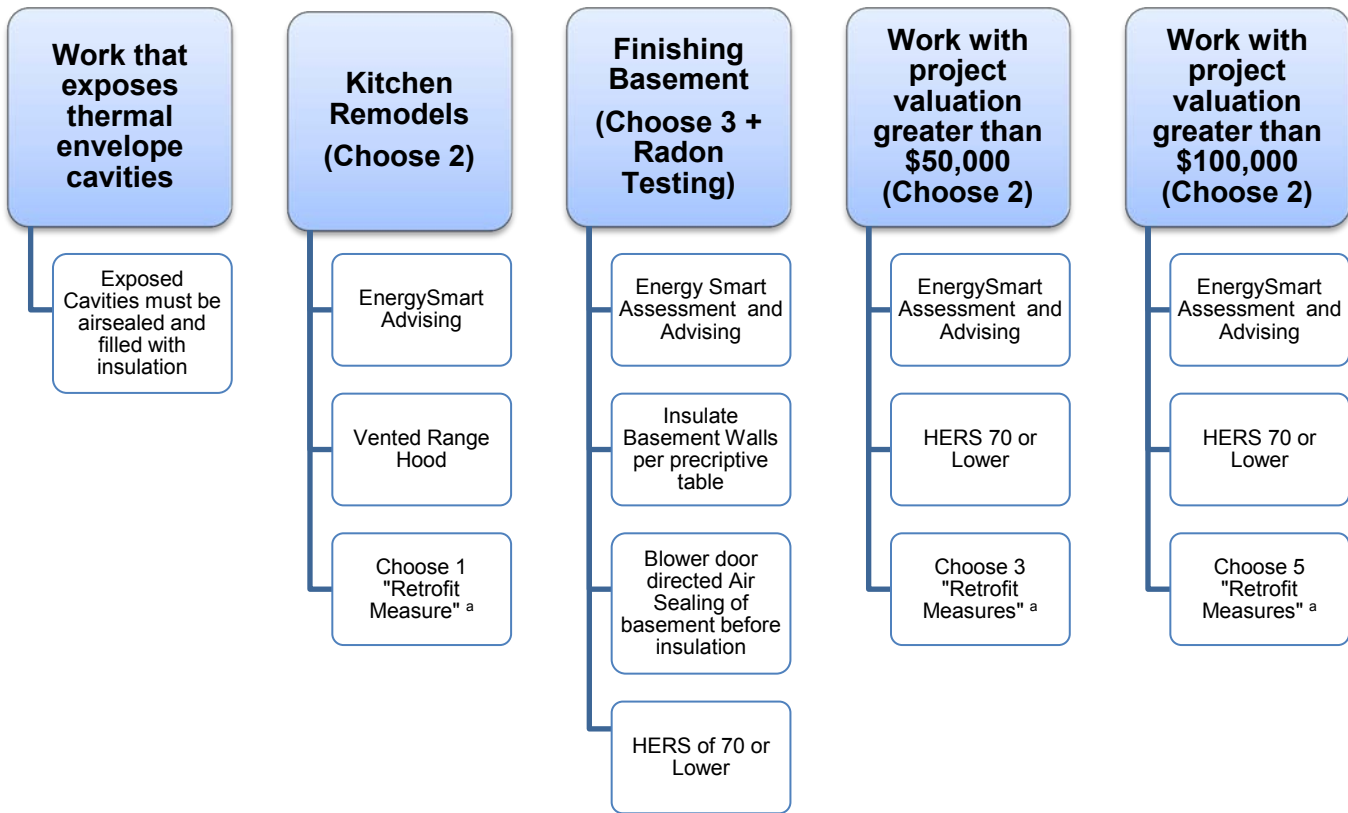


TABLE N1101.13.2(3)
OPTIONS FOR ADDITIONS---continued:
ERI (HERS) REQUIREMENTS FOR ADDITIONS

CFA, SQ FT*	MAXIMUM ERI	CFA, SQ FT*	MAXIMUM ERI	CFA, SQ FT*	MAXIMUM ERI
0	76	3500	66	5600	41
1500	76	3600	66	5700	39
1600	76	3700	65	5800	37
1700	75	3800	65	5900	35
1800	75	3900	64	6000	33
1900	74	4000	63	6100	31
2000	74	4100	62	6200	29
2100	73	4200	61	6300	27
2200	73	4300	60	6400	25
2300	72	4400	59	6500	23
2400	72	4500	58	6600	21
2500	71	4600	57	6700	19
2600	71	4700	56	6800	17
2700	70	4800	55	6900	15
2800	70	4900	54	7000	13
2900	69	5000	53	7100	11
3000	69	5100	51	7200	9
3100	68	5200	49	7300	7
3200	68	5300	47	7400	5
3300	67	5400	45	7500	3
3400	67	5500	43	7600	1
				7700 or greater	0

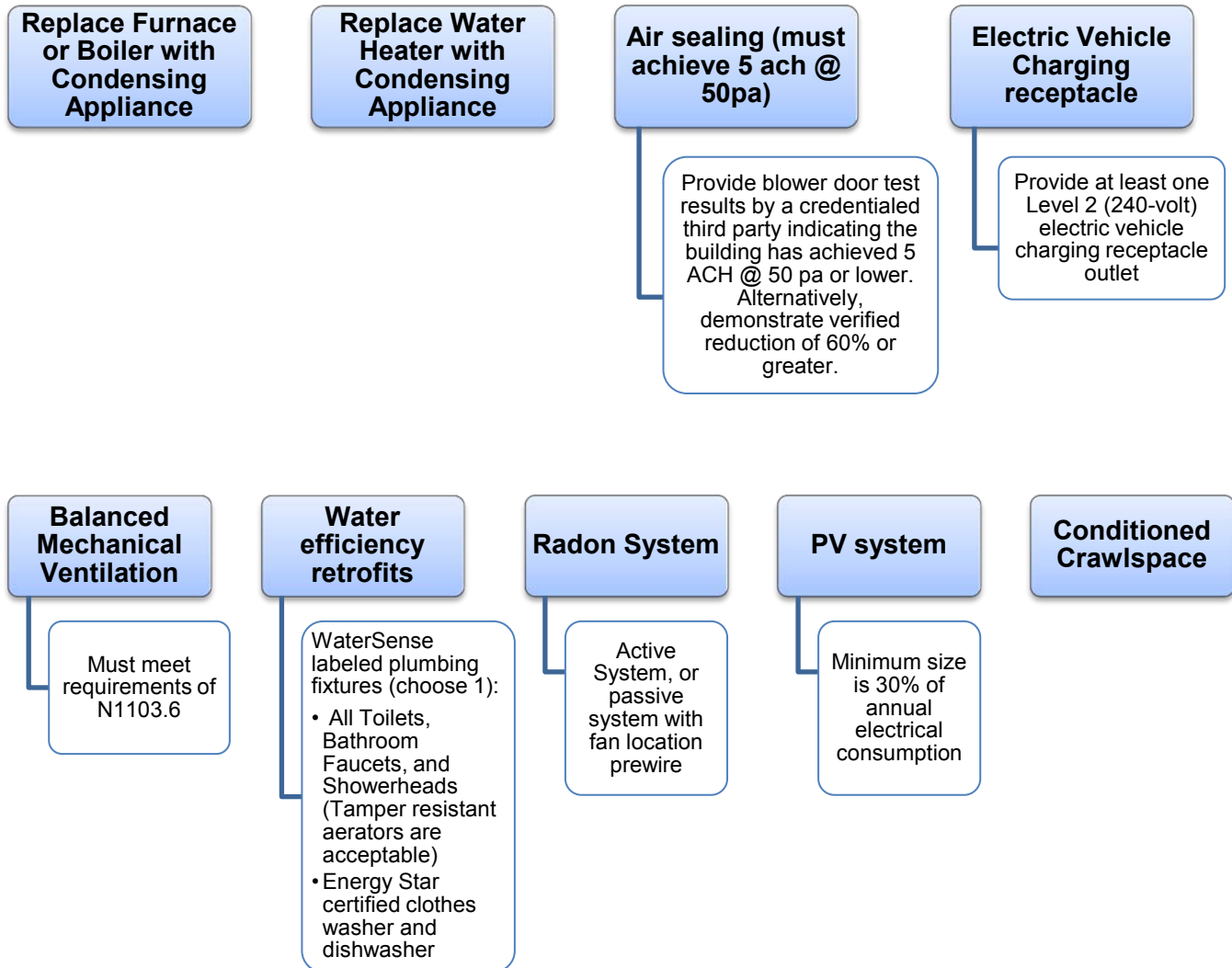
**Conditioned floor area ("CFA") is to be rounded to the nearest 100 square feet.*

FIGURE N1101.13.3(1)
OPTIONS FOR ALTERATIONS, REMODELS, AND REPAIRS



^a "Retrofit measures" are listed in Figure N1101.13.3(2).

FIGURE N1101.13.3(2)
OPTIONS FOR ADDITIONS, ALTERATIONS, REMODELS,
AND REPAIRS RETROFIT MEASURES



SECTION N1102 BUILDING THERMAL ENVELOPE

N1102.1 General (Prescriptive). The *building thermal envelope* shall meet the requirements of Sections N1102.1.1 through N1102.1.4.

Exception: The following low energy buildings, or portions thereof, separated from the remainder of the building by *building thermal envelope* assemblies complying with this section shall be exempt from the *building thermal envelope* provisions of Section N1102.

1. Those with a peak design rate of energy usage

less than 3.4 Btu/h · ft² (10.7 W/m²) or 1.0 watt/ft² of floor area for space conditioning purposes.

2. Those that do not contain *conditioned space*.

N1102.1.1 Vapor retarder. Wall assemblies in the *building thermal envelope* shall comply with the vapor retarder requirements of Section R702.7.

N1102.1.2 Insulation and fenestration criteria. The *building thermal envelope* shall meet the requirements of Table N1102.1.2 based on the climate zone specified in Section N1101.7.

**TABLE N1102.1.2
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^{a, l, m}**

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b, i, e}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ^{i, j}	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^e WALL R-VALUE
Boulder County (modified 5 & Marine 4)	0.30	0.43	NR	54	19 + 5 ^{h, k}	18/24	42 ^g	15/20	15, 3 ft	15/20

For SI: 1 foot = 304.8 mm.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. When insulation is installed in a cavity which is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall not be less than the *R*-value specified in the table.

Exception: An *R*-19 batt installed in a 2 X 6 stud cavity shall be deemed to meet the requirements of this code.

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception: Skylights may be excluded from glazed fenestration SHGC requirements in Climate Zones 1 through 3 where the SHGC for such skylights does not exceed 0.30.

c. “15/20” means *R*-15 continuous insulation on the interior or exterior of the home or *R*-20 cavity insulation at the interior of the basement wall. “15/20” shall be permitted to be met with *R*-13 cavity insulation on the interior of the basement wall plus *R*-5 continuous insulation on the interior or exterior of the home.

d. *R*-10 shall be added to the required slab edge *R*-values for heated slabs.

e. Not Used.

f. Not Used.

g. Floors over conditioned space are exempt from this requirement.

h. The first value is cavity insulation, the second value is continuous insulation, so “19+5” means *R*-19 cavity insulation plus *R*-5 continuous insulation.

i. The second *R*-value applies when more than half the insulation is on the interior of the mass wall.

j. For strawbale construction, see Section AS108.

k. To reduce the potential for condensation within the wall assembly, it is recommended that exterior continuous insulation be a minimum of *R*-7.5. See also Table R702.7.1.

l. Overhead doors for garages and shops that contain conditioned floor area must have fully weather stripped overhead doors with a minimum *R*-value of 13. Such doors must be weather stripped at the top, sides and bottom and between the panels.

m. Buildings with glazing to floor area ratios that exceed 18% may not use the prescriptive path.

Exception: Passive solar designs in which 50% or more of the total glazing faces south.

N1102.1.3 R-value computation. Insulation material used in layers, such as framing cavity insulation, or continuous insulation shall be summed to compute the corresponding component *R*-value. The manufacturer's settled *R*-value shall be used for blown insulation. Computed *R*-values shall not include an *R*-value for other building materials or air films. Where insulated siding is used for the purpose of complying with the continuous insulation requirements of Table N1102.1.2, the manufacturer's labeled *R*-value for insulated siding shall be re-

duced by *R*-0.6 unless typical installation includes air gaps between siding and substrate. If such gaps exist, *R*-value shall be reduced by 60% or *R*-0.6 (whichever is greater).

N1102.1.4 U-factor alternative. An assembly with a *U*-factor equal to or less than that specified in Table N1102.1.4 shall be permitted as an alternative to the *R*-value in Table N1102.1.2.

TABLE N1102.1.4
EQUIVALENT U-FACTORS^{a, c}

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	CEILING U-FACTOR	FRAME WALL U-FACTOR	MASS WALL U-FACTOR ^b	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR	CRAWL SPACE WALL U-FACTOR
Boulder County (modified 5 & Marine 4)	0.30	0.43	0.020	0.045	0.056	0.026	0.067/0.05	0.05

- a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.
- b. When more than half the insulation is on the interior, the mass wall *U*-factors shall be a maximum of 0.065.
- c. Buildings with glazing to floor area ratios that exceed 18% may not use the prescriptive path.

Exception: Passive solar designs in which 50% or more of the total glazing faces south.

N1102.1.5 Total UA alternative. If the total *building thermal envelope* UA (sum of *U*-factor times assembly area) is less than or equal to the total UA resulting from using the *U*-factors in Table N1102.1.4 (multiplied by the same assembly area as in the proposed building), the building shall be considered in compliance with Table N1102.1.2. The UA calculation shall be done using a method consistent with the ASHRAE *Handbook of Fundamentals* and shall include the thermal bridging effects of framing materials.

vent. The baffle shall extend over the top of the attic insulation. The baffle shall be permitted to be any solid material.

N1102.2.4 Access hatches and doors. Access doors from conditioned spaces to unconditioned spaces such as attics and crawl spaces shall be weather-stripped and insulated to a level equivalent to the insulation on the surrounding surfaces. Access shall be provided to all equipment that prevents damaging or compressing the insulation. A wood-framed or equivalent baffle or retainer is required to be provided when loose-fill insulation is installed, the purpose of which is to prevent the loose-fill insulation from spilling into the living space when the attic access is opened, and to provide a permanent means of maintaining the installed *R*-value of the loose-fill insulation.

Exception: Vertical doors that provide access from conditioned to unconditioned spaces shall be permitted to meet the fenestration requirements of Table R1102.1.2 based on the applicable climate zone specified in Chapter 3.

N1102.2 Specific insulation requirements (Prescriptive). In addition to the requirements of Section N1102.1, insulation shall meet the specific requirements of Sections N1102.2.1 through N1102.2.13.

N1102.2.1 Ceilings with attic spaces. This section is deleted.

N1102.2.2 Ceilings without attic spaces. This section is deleted.

N1102.2.3 Eave baffle. For air-permeable insulations in vented attics, a baffle shall be installed adjacent to soffit and eave vents. Baffles shall maintain an opening equal or greater than the size of the

N1102.2.5 Mass walls. Mass walls for the purposes of this chapter shall be considered above-grade walls of concrete block, concrete, insulated concrete form (ICF), masonry cavity, brick (other than brick veneer), earth (adobe, compressed earth block, rammed earth) and solid timber/logs, or any other walls having a heat capacity greater than or equal to $6 \text{ Btu/ft}^2 \times ^\circ\text{F}$ ($123 \text{ kJ/m}^2 \times \text{K}$).

N1102.2.6 Steel-frame ceilings, walls, and floors. Steel-frame ceilings, walls, and floors shall meet the insulation requirements of Table N1102.2.6 or shall meet the *U*-factor requirements of Table N1102.1.4. The calculation of the *U*-factor for a steel-frame envelope assembly shall use a series-parallel path calculation method.

**TABLE N1102.2.6
STEEL-FRAME CEILING, WALL
AND FLOOR INSULATION
(R-VALUE)**

Note: Table N1102.2.6 is deleted.

N1102.2.7 Walls with partial structural sheathing. This section has been deleted.

N1102.2.8 Floors. Floor framing-cavity insulation shall be installed to maintain permanent contact with the underside of the subfloor decking.

Exception: The floor framing-cavity insulation shall be permitted to be in contact with the topside of sheathing or continuous insulation installed on the bottom side of floor framing where combined with insulation that meets or exceeds the minimum wood frame wall *R*-value in Table 1102.1.2 and that extends from the bottom to the top of all perimeter floor framing members.

N1102.2.9 Basement walls. Walls associated with conditioned basements shall be insulated from the top of the *basement wall* down to 10 feet (3048 mm) below grade or to the basement floor, whichever is less. Walls associated with unconditioned basements shall meet this requirement unless the floor overhead is insulated in accordance with Sections N1102.1.2 and N1102.2.8.

N1102.2.10 Slab-on-grade floors. Slab-on-grade floors with a floor surface less than 12 inches (305 mm) below grade shall be insulated in accordance with Table N1102.1.2. The insulation shall extend downward from the top of the slab on the outside or inside of the foundation wall. Insulation located below grade shall be extended the distance provided in Table N1102.1.2 by any combination of vertical insulation, insulation extending under the slab or insulation extending out from the building. Insulation extending away from the building shall be protected by pavement or by not less than 10 inches (254 mm) of soil. The top edge of the insulation installed between the *exterior wall* and the edge of the interior slab shall be permitted to be cut at a 45-degree (0.79 rad) angle away from the *exterior wall*. Slab-edge insulation is not required in jurisdictions designated by the *building official* as having a very heavy termite infestation.

N1102.2.11 Crawl space walls. As an alternative to insulating floors over crawl spaces, crawl space walls shall be permitted to be insulated when the crawl space is not vented to the outside. Crawl space wall insulation shall be permanently fastened to the wall and extend downward from the floor to the finished grade level and then vertically and/or horizontally for at least an additional 24 inches (610 mm). Exposed earth in unvented crawl space foundations shall be covered with a continuous Class I vapor retarder in accordance with this code. All joints of the vapor retarder shall overlap by 6 inches (153 mm) and be sealed or taped. The edges of the vapor retarder shall extend not less than 6 inches (153 mm) up the stem wall and shall be attached to the stem wall.

N1102.2.12 Masonry veneer. Insulation shall not be required on the horizontal portion of the foundation that supports a masonry veneer.

N1102.2.13 Sunroom insulation. *Sunrooms* enclosing conditioned spaces shall meet the insulation requirements of this code.

N1102.3 Fenestration (Prescriptive). In addition to the requirements of Section N1102, fenestration shall comply with Sections N1102.3.1 and N1102.3.5.

N1102.3.1 U-factor. An area-weighted average of fenestration products shall be permitted to satisfy the *U*-factor requirements.

N1102.3.2 Glazed fenestration SHGC. An area-weighted average of fenestration products more than 50-percent glazed shall be permitted to satisfy the SHGC requirements.

Dynamic glazing shall be permitted to satisfy the SHGC requirements of Table R1102.1.2 provided the ratio of the higher to lower labeled SHGC is greater than or equal to 2.4, and the *dynamic glazing* is automatically controlled to modulate the amount of solar gain into the space in multiple steps. *Dynamic glazing* shall be considered separately from other fenestration, and area-weighted averaging with other fenestration that is not dynamic glazing shall not be permitted.

Exception: *Dynamic glazing* is not required to comply with this section when both the lower and higher labeled SHGC already comply with the requirements of Table N1102.1.2.

N1102.3.3 Glazed fenestration exemption. Up to 15 square feet (1.4 m²) of glazed fenestration per dwelling unit shall be permitted to be exempt from *U*-factor and SHGC requirements in Section N1102.1.2. This exemption shall not apply to the *U*-factor alternative approach in Section N1102.1.4 and the total UA alternative in Section N1102.1.5.

N1102.3.4 Opaque door exemption. One side-hinged opaque door assembly up to 24 square feet (2.22 m²) in area is exempted from the *U*-factor requirement in Section N1102.1.2. This exemption shall not apply to the *U*-factor alternative approach in Section N1102.1.4 and the total UA alternative in Section N1102.1.5.

N1102.3.5 Sunroom fenestration. *Sunrooms* enclosing *conditioned space* shall meet the fenestration requirements of this code.

applicable to the method of construction. Where required by the *building official*, an *approved* third party shall inspect all components and verify compliance.

(See **TABLE N1102.4.1.1 AIR BARRIER AND INSULATION INSTALLATION** on next page)

N1102.4 Air leakage (Mandatory). The *building thermal envelope* shall be constructed to limit air leakage in accordance with the requirements of Sections N1102.4.1 through N1102.4.5.

N1102.4.1 Building thermal envelope. The *building thermal envelope* shall comply with Sections N1102.4.1.1 and N1102.4.1.2. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

N1102.4.1.1 Installation. The components of the *building thermal envelope* as listed in Table N1102.4.1.1 shall be installed in accordance with the manufacturer's instructions and the criteria listed in Table N1102.4.1.1, as

**TABLE N1102.4.1.1
AIR BARRIER AND INSULATION INSTALLATION**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling/soffit shall be aligned with the insulation and any gaps in the air barrier sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance of R-3 per inch minimum. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between window/door jambs and framing, and skylights and framing shall be sealed.	
Rim joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors (including above garage and cantilevered floors)	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking, or floor framing cavity insulation shall be permitted to be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and extends from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Where provided instead of floor insulation, insulation shall be permanently attached to the crawl space walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	
Narrow cavities		Batts in narrow cavities shall be cut to fit, or narrow cavities shall be filled by insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the drywall.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.
Plumbing and wiring		Batt insulation shall be cut neatly to fit around wiring and plumbing in exterior walls, or insulation that on installation readily conforms to available space shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate them from the showers and tubs.	Exterior walls adjacent to showers and tubs shall be insulated.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical or communication boxes or air-sealed boxes shall be installed.	
HVAC register boots	HVAC register boots that penetrate building thermal envelope shall be sealed to the subfloor or drywall.	
Concealed sprinklers	When required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	

a. In addition, inspection of log walls shall be in accordance with the provisions of ICC 400.

N1102.4.1.2 Testing. The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding five air changes per hour in Climate Zones 1 and 2, and three air changes per hour in Climate Zones 3 through 8. Testing shall be conducted in accordance with ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inches w.g. (50 Pascals). Where required by the *code official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weather-stripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, if installed at the time of the test, shall be open.
4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed.
5. Heating and cooling systems, if installed at the time of the test, shall be turned off.
6. Supply and return registers, if installed at the time of the test, shall be fully open.

N1102.4.2 Fireplaces. Open hearth fireplaces shall not be permitted indoors. New wood-burning fireplaces shall have tight-fitting flue dampers or doors, and outdoor combustion air. Where using tight-fitting doors on factory-built fireplaces listed and labeled in accordance with UL 127, the doors shall be tested and listed for the fireplace. Where using tight-fitting doors on masonry fireplaces, the doors shall be listed and labeled in accordance with UL 907.

N1102.4.3 Fenestration air leakage. Windows, skylights and sliding glass doors shall have an air infiltration rate of no more than 0.3 cfm per square foot (1.5 L/s/m²), and swinging doors no more than 0.5 cfm per square foot (2.6 L/s/m²), when tested according to NFRC 400 or AAMA/WDMA/CSA 101/I.S.2/A440 by an accredited,

independent laboratory and *listed* and *labeled* by the manufacturer.

Exception: Site-built windows, skylights and doors.

N1102.4.4 Rooms containing fuel-burning appliances. Where open combustion air ducts provide combustion air to open combustion fuel-burning appliances, the appliances and combustion air opening shall be located outside the building thermal envelope or enclosed in a room, isolated from inside the thermal envelope. Such rooms shall be sealed and insulated in accordance with the envelope requirements of Table N1102.1.2, where the walls, floors and ceilings shall meet a minimum of the basement wall *R*-value requirement. The door into the room shall be fully gasketed and any water lines and ducts in the room insulated in accordance with Section N1103. The combustion air duct shall be insulated where it passes through conditioned space to a minimum of *R*-8.

Exceptions:

1. Direct vent appliances with both intake and exhaust pipes installed continuous to the outside.
2. Fireplaces and stoves complying with Sections N1102.4.2 and R1006.

N1102.4.5 Recessed lighting. Recessed luminaires installed in the *building thermal envelope* shall be sealed to limit air leakage between conditioned and unconditioned spaces. All recessed luminaires shall be IC-rated and *labeled* as having an air leakage rate not more than 2.0 cfm (0.944 L/s) when tested in accordance with ASTM E 283 at a 1.57 psf (75 Pa) pressure differential. All recessed luminaires shall be sealed with a gasket or caulk between the housing and the interior wall or ceiling covering.

N1102.5 Maximum fenestration *U*-factor and SHGC (Mandatory). The area-weighted average maximum fenestration *U*-factor permitted using tradeoffs from Section N1102.1.5 or N1105 shall be 0.48 in Climate zones 4 and 5 and 0.40 in Climate Zones 6 through 8 for vertical fenestration, and 0.75 in Climate Zones 4 through 8 for skylights. The area-weighted average maximum fenestration SHGC permitted using tradeoffs from Section N1105 in Climate Zones 1 through 3 shall be 0.50.

SECTION N1103 SYSTEMS

N1103.1 Controls (Mandatory). At least one thermostat shall be provided for each separate heating and cooling system.

N1103.1.1 Programmable thermostat. The thermostat controlling the primary heating or cooling system of the dwelling unit shall be capable of controlling the heating and cooling system on a daily schedule to maintain different temperature set points at different times of the day. This thermostat shall include the capability to set back or temporarily operate the system to maintain *zone* temperatures down to 55°F (13°C) or up to 85°F (29°C). The thermostat shall initially be programmed by the manufacturer with a heating temperature set point no higher than 70°F (21°C) and a cooling temperature set point no lower than 78°F (26°C).

N1103.1.2 Heat pump supplementary heat (Mandatory). Heat pumps having supplementary electric-resistance heat shall have controls that, except during defrost, prevent supplemental heat operation when the heat pump compressor can meet the heating load.

N1103.2 Hot water boiler outdoor temperature setback. Hot water boilers that supply heat to the building through one- or two-pipe heating systems shall have an outdoor setback control that lowers the boiler water temperature based on the outdoor temperature.

N1103.3 Ducts. Ducts and air handlers shall be in accordance with Sections N1103.3.1 through N1103.3.5.

N1103.3.1 Insulation (Prescriptive). Supply and return ducts in attics shall be insulated to a minimum of R-8 where 3 inches (76.2 mm) in diameter and greater and R-6 where less than 3 inches (76.2 mm) in diameter. Supply and return ducts in other portions of the building shall be insulated to a minimum of R-6 where 3 inches (76.2 mm) in diameter or greater and R-4.2 where less than 3 inches (76.2 mm) in diameter.

Exception: Ducts or portions thereof located completely inside the *building thermal envelope*.

N1103.3.2 Sealing (Mandatory). Ducts, air handlers and filter boxes shall be sealed. Joints and seams shall comply with either the *International Mechanical Code* or Section M1601.4.1 of this code, as applicable.

Exceptions:

1. Air-impermeable spray foam products shall be permitted to be applied without additional joint seals.
2. For ducts having a static pressure classification of less than 2 inches of water column (500 Pa), additional closure systems shall not be required for continuously welded joints and seams, and locking-type joints and seams of other than the snap-lock and button-lock types.

N1103.3.2.1 Sealed air handler. Air handlers shall have a manufacturer's designation for an air leakage of no more than 2 percent of the design air flow rate when tested in accordance with ASHRAE 193.

N1103.3.3 Duct testing (Mandatory). Ducts shall be pressure tested to determine air leakage by one of the following methods:

1. Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure if installed at the time of the test. All registers shall be taped or otherwise sealed during the test.
2. Post-construction test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Registers shall be taped or otherwise sealed during the test.

Exception: A duct air leakage test shall not be required where the ducts and air handlers are located entirely within the building thermal envelope.

A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*.

N1103.3.4 Duct leakage (Prescriptive). The total leakage of the ducts, where measured in accordance with Section R403.3.3, shall be as follows:

1. Rough-in test: The total leakage shall be less than or equal to 4 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area where the air handler is installed at the time of the test. Where the air handler is not installed at the time of the test, the total leakage shall be less than or equal to 3 cubic feet per minute (85 L/min) per 100 square

feet (9.29 m²) of conditioned floor area.

2. Post-construction test: Total leakage shall be less than or equal to 4 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area.

N1103.3.5 Building cavities (Mandatory). Building framing cavities shall not be used as ducts or plenums.

N1103.4 Mechanical system piping insulation (Mandatory). Mechanical system piping capable of carrying fluids above 105°F (41°C) or below 55°F (13°C) shall be insulated to a minimum of R-3.

N1103.4.1 Protection of piping insulation. Piping insulation exposed to weather shall be protected from damage, including that caused by sunlight, moisture, equipment maintenance and wind, and shall provide shielding from solar radiation that can cause degradation of the material. Adhesive tape shall not be permitted.

N1103.5 Service hot water systems. Energy conservation measures for service hot water systems shall be in accordance with Sections N1103.5.1 and N1103.5.4.

N1103.5.1 Heated water circulation and temperature maintenance systems (Mandatory).

Heated water circulation systems shall be in accordance with Section R1103.5.1.1. Heat trace temperature maintenance systems shall be in accordance with Section R1103.5.1.2. Automatic controls, temperature sensors and pumps shall be accessible. Manual controls shall be readily *accessible*.

N1103.5.1.1 Circulation systems. Heated water circulation systems shall be provided with a circulation pump. The system return pipe shall be a dedicated return pipe or a cold water supply pipe. Gravity and thermo-siphon circulation systems shall be prohibited. Controls for circulating hot water system pumps shall start the pump based on the identification of a demand for hot water within the occupancy. The controls shall automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is no demand for hot water.

N1103.5.1.2 Heat trace systems. Electric heat trace systems shall comply with IEEE 515.1 or UL 515. Controls for such systems shall automatically adjust the energy input to the heat tracing to maintain the desired water temperature in the piping in accordance with

the times when heated water is used in the occupancy.

N1103.5.2 Demand recirculation systems. A water distribution system having one or more recirculation pumps that pump water from a heated water supply pipe back to the heated water source through a cold water supply pipe shall be a *demand recirculation water system*. Pumps shall have controls that comply with both of the following:

1. The control shall start the pump upon receiving a signal from the action of a user of a fixture or appliance sensing the presence of a user of a fixture or sensing the flow of hot or tempered water to a fixture fitting or appliance.
2. The control shall limit the temperature of the water entering the cold water piping to 104°F (40°C).

N1103.5.3 Hot water pipe insulation (Prescriptive). Insulation for hot water pipe with a minimum thermal resistance (*R*-value) of R-3 shall be applied to the following:

1. Piping $\frac{3}{4}$ inch (19 mm) and larger in nominal diameter.
2. Piping serving more than one dwelling unit.
3. Piping located outside the conditioned space.
4. Piping from the water heater to a distribution manifold.
5. Piping located under a floor slab.
6. Buried piping.
7. Supply and return piping in recirculation systems other than demand recirculation systems.

N1103.5.4 Drain water heat recovery units. Drain water heat recovery units shall comply with CSA 55.2. Drain water heat recovery units shall be tested in accordance with CSA 55.1. Potable water-side pressure loss of drain water heat recovery units shall be less than 3 psi (20.7 kPa) for individual units connected to one or two showers. Potable water-side pressure loss of drain water heat recovery units shall be less than 2 psi (13.8 kPa) for individual units connected to three or more showers.

N1103.6 Mechanical ventilation (Mandatory). The building shall be provided with ventilation that meets the requirements of Section M1507 of this code or the *International Mechanical Code*, as applicable, or with other approved means of ventilation. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ven-

tilation system is not operating. The ventilation system must be a balanced system that provides both outside air intake and stale air exhaust. The construction documents must include a description or drawings of the fresh air distribution strategy.

N1103.6.1 Whole-house mechanical ventilation system fan efficacy. Mechanical ventilation system fans shall meet the efficacy requirements of Table N1103.6.1.

Exception: Where mechanical ventilation fans are integral to tested and listed HVAC equipment, they shall be powered by an electronically commutated motor.

**TABLE N1103.6.1 (R403.6.1)
MECHANICAL VENTILATION SYSTEM FAN EFFICACY**

FAN LOCATION	AIR FLOW RATE MINIMUM (CFM)	MINIMUM EFFICACY (CFM/WATT)	AIR FLOW RATE MAXIMUM (CFM)
Range hoods	Any	2.8 cfm/watt	Any
In-line fan	Any	2.8 cfm/watt	Any
Bathroom, utility room	10	1.4 cfm/watt	< 90
Bathroom, utility room	90	2.8 cfm/watt	Any

For SI: 1 cubic foot per minute = 28.3 L/min.

N1103.7 Equipment sizing and efficiency rating (Mandatory). Heating and cooling equipment shall be sized in accordance with ACCA Manual S based on building loads calculated in accordance with ACCA Manual J or other *approved* heating and cooling calculation methodologies. New or replacement heating and cooling equipment shall have an efficiency rating equal to or greater than the minimum required by federal law for the geographic location where the equipment is installed.

N1103.8 Systems serving multiple dwelling units (Mandatory). Systems serving multiple dwelling units shall comply with Sections C403 and C404 of the IECC—Commercial Provisions in lieu of Section N1103.

N1103.9 Snow melt system controls (Mandatory). Snow- and ice-melting systems, supplied through energy service to the building, shall include automatic controls capable of shutting off the system when the pavement temperature is above 50°F (10°C), and no precipitation is falling and an automatic or manual control that will allow shutoff when the outdoor temperature is above 40°F (4.8°C).

N1103.9.1 Design (Mandatory). Energy use by snow and ice melt systems must be offset by on-site renewable energy

generation equivalent to the energy used by the snow and ice melting equipment. Plans must be submitted that detail the type, size and location of the on-site renewable energy generation equipment. Note: A separate building permit is required for on-site renewable energy generation equipment.

N1103.9.2 Design criteria for supporting on-site renewable energy equipment (Mandatory). On-site renewable energy generation equipment installed to offset the energy used by snow and ice melt systems must be designed to provide 34,425 BTUs per square foot per year.

N1103.10 Pools energy consumption (Mandatory). Swimming pools must be provided with energy conservation measures in accordance with Section N1103.10.1 through N1103.10.6, or be unheated. Heated pools must be heated by solar thermal or other equipment that does not rely directly or indirectly on the burning of fossil fuels or they must have their energy use offset by on-site renewable energy generation equipment equivalent to the energy use by the swimming pool.

Exception: Swimming pools having less than 200 sq. ft. of water surface area are exempt from the requirements to provide renewable energy.

N1103.10.1 Heaters. The electric power to heaters shall be controlled by a readily *accessible* on-off switch that is an integral part of the heater mounted on the exterior of the heater, or external to and within 3 feet (914mm) of the heater. Operation of such switch shall not change the setting of the heater thermostat. Such switches shall be in addition to a circuit breaker for the power to the heater. Gas-fired heaters shall not be equipped with continuously burning ignition pilots.

N1103.10.2 Time switches. Time switches or other control methods that can automatically turn off and on according to a preset schedule shall be installed for heaters and pump motors. Heaters and pump motors that have built-in time switches shall be in compliance with this section.

Exceptions:

1. Where public health standards require 24-hour pump operation.
2. Pumps that operate solar- and waste-heat-recovery pool heating systems.

N1103.10.3 Covers. Outdoor heated pools and outdoor permanent spas shall be provided with a vapor retardant cover or other *approved* vapor-retardant means. Pools heated to more than 90°F (32°C) shall have a pool cover with a minimum

insulation value of *R*-12.

N1103.10.4 (R403.10.4) Filters. Swimming pool filters must be cartridge-type filters.

N1103.10.5 (R403.10.4) Pumps. Swimming pool pumps must be multi-speed pumps.

N1103.10.6 Energy conservation design standards for swimming pools. For the purpose of calculating the energy use of swimming pools, the following are assumed:

Swimming Pool Season:

Outdoor Pools: 3 months

Indoor Pools: 12 months

Pool Heating Temperature: 82°F (28°C) or less

On-Site Renewable Energy Requirements:
29,000 BTUs per square foot of pool surface area per year.

Note: This Section is not intended to limit the season or temperature of swimming pools.

N1103.11 Portable spas (Mandatory). The energy consumption of electric-powered portable spas shall be controlled by the requirements of APSP-15.

N1103.12 Residential pools and permanent residential spas. Residential swimming pools and permanent residential spas that are accessory to detached one- and two-family dwellings and townhouses 3 stories or less in height above grade plane and that are available only to the household and its guests shall be in accordance with APSP-15.

N1103.13 Spas (Mandatory). Any energy use by indoor or outdoor spas must be offset by on-site renewable energy generation equivalent to the energy use by the spa. Plans must show the annual energy use of the spa, the calculation method used to determine the expected energy use, and the on-site renewable energy system(s) which will be used to offset the energy used by the spa. All spas must be equipped with an insulated cover that is listed to provide a minimum *R*-value of at least 12.

Exception: Spas and hot tubs which have been tested and listed for compliance with the requirements of the California Energy Commission (CEC) Title 20 (Standby power for portable electric spas shall not be greater than $5[V^2/3]$ watts where *V*=the total volume of the spa in gallons), and are less than 64 square feet in surface area shall be exempted from the requirement to offset their energy usage by on-site renewable energy generation. Spas larger than 64 sq. ft. in surface area that are certified to meet the requirements of the CEC shall offset their

requirements at the rate of 140,000 BTUs per square foot per year.

N1103.13.1 Design criteria for spas. The requirements of this Section apply to spas that do not meet the exception in Section N1103.13.

Spa Season: 12 months

On-Site Renewable Energy Requirements:
430,000 BTUs per square foot per year.

N1103.14 Other exterior energy uses. Exterior energy uses, with the exception of cooking appliances, must be offset with on-site renewable energy production. For purposes of calculating renewable energy offset requirements, the minimum usage of exterior, fossil-fuel-consuming, fireplaces and firepits shall be considered to be 50 hours per year, and exterior space heating devices shall be assumed to operate a minimum of 150 hours per year.

N1103.15 Minimum Equipment Efficiency. Dwellings or accessory buildings with conditioned space using the prescriptive path must comply with the minimum equipment efficiency values of Table N1103.15.1.

Exceptions:

1. Permits for the replacement of existing equipment where a venting upgrade is not readily achievable.
2. Additions and remodels where existing systems are not being modified or replaced.

**TABLE N1103.15.1
MINIMUM EQUIPMENT EFFICIENCY VALUES**

ITEM	REQUIREMENT
Appliances (new or replaced)	Energy Star Certified
Furnaces, Boilers	92% AFUE with ECM Blower Motors
Water Heaters	0.82 Energy Factor
Heat Pumps	Energy Star Certified
Unit Heaters	92% Thermal Efficiency

SECTION N1104
ELECTRICAL POWER AND LIGHTING SYSTEMS
(MANDATORY)

N1104.1 Lighting equipment (Mandatory). Not less than 75 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps or not less than 75 percent of the permanently installed lighting fixtures shall contain only high-efficacy lamps.

Exception: Low-voltage lighting.

N1104.1.1 Lighting equipment (Mandatory). Fuel gas lighting systems shall not have continuously burning pilot lights.

SECTION N1105
SIMULATED PERFORMANCE ALTERNATIVE
(PERFORMANCE)

Note: Section N1105 is deleted.

SECTION N1106
ENERGY RATING INDEX
COMPLIANCE ALTERNATIVE

N1106.1 Scope. This section establishes criteria for compliance using an Energy Rating Index (ERI) analysis.

N1106.2 Mandatory requirements. Compliance with this section requires that the mandatory provisions identified in Sections N1101.13 through N1104 identified as “mandatory” and Section N1103.5.3 be met. The building thermal envelope shall be greater than or equal to levels of efficiency and Solar Heat Gain Coefficient in Table 402.1.1 or 402.1.4.3 of the 2009 *International Energy Conservation Code*.

Exception: Supply and return ducts not completely inside the building thermal envelope shall be insulated to a minimum of R-6.

N1106.3 Energy rating index. The Energy Rating Index (ERI) shall be a numerical integer value that is based on a linear scale constructed such that the *ERI reference design* has an Index value of 100 and a *residential building* that uses no net purchased energy has an Index value of 0. Each integer value on the scale shall represent a 1 percent change in the total energy use of the rated design relative to the total energy use of the *ERI reference design*. The ERI shall consider all energy used in the *residential building*.

N1106.3.1 ERI reference design. The *ERI reference design* shall be configured such that it meets the minimum requirements of the 2006 *International Energy Conservation Code* prescriptive requirements. The proposed *residential building* shall be shown to have an annual total normalized modified load less than or equal to the annual total loads of the *ERI*

reference design.

N1106.4 ERI-based compliance. Compliance based on an ERI analysis requires that the *rated design* be shown to have an ERI less than or equal to the appropriate value shown graphically in Figure N1106.4 or listed numerically in Table N1106.4 when compared to the *ERI reference design*.

N1106.5 Verification by approved agency. Verification of compliance with Section N1106 shall be completed by an *approved* third party.

N1106.6 Documentation. Documentation of the software used to determine the ERI and the parameters for the residential building shall be in accordance with Sections N1106.6.1 through N1106.6.3.

N1106.6.1 Compliance software tools.

Documentation verifying that the methods and accuracy of the compliance software tools conform to the provisions of this section shall be provided to the *code official*.

N1106.6.2 Compliance report. Compliance software tools shall generate a report that documents that the ERI of the *rated design* complies with Sections N1106.3 and N1106.4. The compliance documentation shall include the following information:

1. Address or other identification of the residential building.
2. An inspection checklist documenting the building component characteristics of the *rated design*. The inspection checklist shall show results for both the *ERI reference design* and the *rated design*, and shall document all inputs entered by the user necessary to reproduce the results.
3. Name of individual completing the compliance report.
4. Name and version of the compliance software tool.

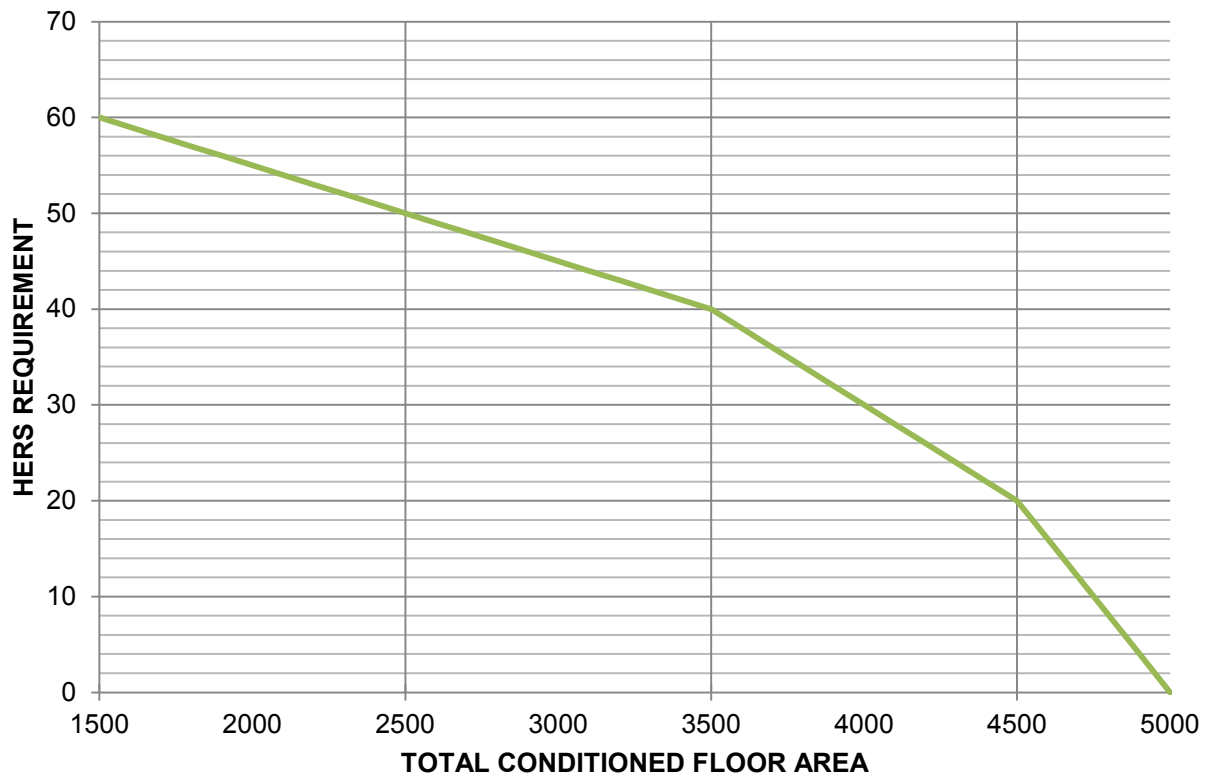
Exception: Multiple orientations. Where an otherwise identical building model is offered in multiple orientations, compliance for any orientation shall be permitted by documenting that the building meets the performance requirements in each of the four (north, east, south and west) cardinal orientations.

N1106.6.3 Additional documentation. The *code official* shall be permitted to require the following documents:

1. Documentation of the building component characteristics of the *ERI reference design*.
2. A certification signed by the builder providing the building component characteristics of the *rated design*.
3. Documentation of the actual values used in the software calculations for the *rated design*.
4. A digital copy of the energy model file (for example, if using RemRate to create a HERS score, the .blg file).

N1106.7 Calculation software tools. Calculation software, where used, shall be in accordance with Sections N1106.7.1 through N1106.7.3.

FIGURE N1106.4 MAXIMUM ENERGY RATING INDEX (HERS INDEX), GRAPHICAL



**TABLE N1106.4
MAXIMUM ENERGY RATING INDEX, TABULAR**

CFA, SQ FT^a	MAXIMUM ERI	CFA, SQ FT^a	MAXIMUM ERI	CFA, SQ FT^a	MAXIMUM ERI
1500 or below	60	2700	48	3900	32
1600	59	2800	47	4000	30
1700	58	2900	46	4100	28
1800	57	3000	45	4200	26
1900	56	3100	44	4300	24
2000	55	3200	43	4400	22
2100	54	3300	42	4500	20
2200	53	3400	41	4600	16
2300	52	3500	40	4700	12
2400	51	3600	38	4800	8
2500	50	3700	36	4900	4
2600	49	3800	34	5000 and above	0

^a Conditioned Floor Area (“CFA”) is to be rounded to the nearest 100 square feet.

N1106.7.1 Minimum capabilities. Calculation procedures used to comply with this section shall be software tools capable of calculating the ERI as described in Section N1106.3, and shall include the following capabilities:

1. Computer generation of the *ERI reference design* using only the input for the *rated design*. The calculation procedure shall not allow the user to directly modify the building component characteristics of the *ERI reference design*.
2. Calculation of whole-building, as a single *zone*, sizing for the heating and cooling equipment in the *ERI reference design* residence in accordance with Section N1103.7.
3. Calculations that account for the effects of indoor and outdoor temperatures and part-load ratios on the performance of heating, ventilating and air-conditioning equipment based on climate and equipment sizing.
4. Printed *code official* inspection checklist listing each of the *rated design* component characteristics determined by the analysis to provide compliance, along with their respective performance ratings.

N1106.7.2 Specific approval. Performance analysis tools meeting the applicable sections of Section N1106 shall be *approved*. Tools are permitted to be *approved* based on meeting a specified threshold for a jurisdiction. The *code official* shall approve tools for a specified application or limited scope.

N1106.7.3 Input values. When calculations require input values not specified by Sections N1102, N1103, N1104 and N1105, those input values shall be taken from an approved source.

SECTION N1107 EXISTING BUILDINGS—GENERAL

N1107.1 Scope. The provisions of Sections N1107 through N1111 shall control the *alteration*, repair, addition and change of occupancy of existing buildings and structures.

N1107.1.1 Additions, alterations, or repairs:

General. Additions, alterations, or repairs to an existing building, building system or portion thereof shall comply with Section N1108, N1109 or N1110. Unaltered portions of the existing building or building supply system shall not be required to comply with this chapter, except as required by Figures N1101.13.2(1), “Options for Additions” or Figure N1101.13.3(1) “Options for Alterations, Remodels, and Repairs.”

N1107.2 Existing buildings. Except as specified in this chapter, this code shall not be used to require the removal, *alteration* or abandonment of, nor prevent the continued use and maintenance of, an existing building or building system lawfully in existence at the time of adoption of this code.

N1107.3 Maintenance. Buildings and structures, and parts thereof, shall be maintained in a safe and sanitary condition. Devices and systems that are required by this code shall be maintained in conformance with the code edition under which installed. The owner or the owner's authorized agent shall be responsible for the maintenance of buildings and structures. The requirements of this chapter shall not provide the basis for removal or abrogation of energy conservation, fire protection and safety systems and devices in existing structures.

N1107.4 Compliance. *Alterations, repairs, additions* and changes of occupancy to, or relocation of, existing buildings and structures shall comply with the provisions for *alterations, repairs, additions* and changes of occupancy or relocation, respectively, in this code and the *International Building Code, International Fire Code, International Fuel Gas Code, International Mechanical Code, International Plumbing Code, International Property Maintenance Code, International Private Sewage Disposal Code* and NFPA 70.

N1107.5 New and replacement materials. Except as otherwise required or permitted by this code, materials permitted by the applicable code for new construction shall be used. Like materials shall be permitted for repairs, provided no hazard to life, health or property is created. Hazardous materials shall not be used where the code for new construction would not permit their use in buildings of similar occupancy, purpose and location.

N1107.6 Historic buildings. No provision of this chapter relating to the construction, *repair, alteration*, restoration and movement of structures, and *change of occupancy* shall be mandatory for *historic buildings* provided a report has been submitted to the code official and signed by the owner, a registered *design professional*, or a representative of the State Historic Preservation Office or the historic preservation authority having jurisdiction, demonstrating that compliance with that provision would threaten, degrade or destroy the historic form, fabric or function of the *building*.

SECTION N1108 ADDITIONS

N1108.1 General. Additions to an existing building, building system or portion thereof shall conform to the provisions of this chapter as they relate to new construction without requiring the unaltered portion of the existing building or building system to comply with this chapter, except as

specified by Figure N1101.13.2(1) "Options for Additions" or Figure N1101.13.3(1) "Options for Alterations, Remodels, and Repairs." Additions shall not create an unsafe or hazardous condition or overload existing building systems. Additions shall be in accordance with Section N1108.1.1 or N1108.1.2.

N1108.1.1 (R502.1.1) Prescriptive compliance.

Additions shall comply with Sections N1108.1.1.1 through N1108.1.1.4.

N1108.1.1.1 Building envelope. New building envelope assemblies that are part of the addition shall comply with Sections N1102.1, N1102.2, N1102.3.1 through N1102.3.5, and N1102.4.

N1108.1.1.2 Heating and cooling systems. New heating, cooling and duct systems that are part of the addition shall comply with Sections N1103.1, N1103.2, N1103.3, N1103.5 and N1103.6.

Exception: Where ducts from an existing heating and cooling system are extended to an addition, duct systems with less than 40 linear feet (12.19 m) in unconditioned spaces shall not be required to be tested in accordance with Section N1103.3.3.

N1108.1.1.3 Service hot water systems. New service hot water systems that are part of the addition shall comply with Section N1103.4.

N1108.1.1.4 Lighting. New lighting systems that are part of the addition shall comply with Section N1104.1.

SECTION N1109 ALTERATIONS

N1109.1 General. *Alterations* to any building or structure shall comply with the requirements of the code for new construction. *Alterations* shall be such that the existing building or structure is no less conforming with the provisions of this chapter than the existing building or structure was prior to the *alteration*.

Alterations to an existing building, building system or portion thereof shall conform to the provisions of this chapter as they relate to new construction without requiring the unaltered portions of the existing building or building system to comply with this chapter. Alterations shall not create an unsafe or hazardous condition or overload existing building systems. *Alterations* shall be such that the existing building or structure uses no more energy than the existing building or structure prior to the *alteration*. Alterations to existing buildings shall comply with Sections N1109.1.1 through N1109.2.

N1109.1.1 Building envelope. Building envelope assemblies that are part of the alteration shall comply with Section N1102.1.2 or N1102.1.4, Sections N1102.2.1 through N1102.2.13, N1102.3.1, N1102.3.2, N1102.4.3 and N1102.4.5.

Exception: The following alterations need not comply with the requirements for new construction provided the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.
3. Construction where the existing roof, wall or floor cavity is not exposed.
4. Roof recover.
5. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.
6. Surface applied window film installed on existing single pane fenestration assemblies to reduce solar heat gain provided the code does not require the glazing or fenestration assembly to be replaced.

N1109.1.1.1 Replacement fenestration. Where some or all of an existing fenestration unit is replaced with a new fenestration product, including sash and glazing, the replacement fenestration unit shall meet the applicable requirements for *U*-factor and SHGC as provided in Table N1102.1.4.

N1109.1.2 Heating and cooling systems. New heating, cooling and duct systems that are part of the alteration shall comply with Sections N1103.1, N1103.2, N1103.3 and N1103.6.

Exception: Where ducts from an existing heating and cooling system are extended, duct systems with less than 40 linear feet (12.19 m) in unconditioned spaces shall not be required to be tested in accordance with Section N1103.3.3.

N1109.1.3 Service hot water systems. New service hot water systems that are part of the alteration shall comply with Section N1103.5.

N1109.1.4 Lighting. New lighting systems that are part of the alteration shall comply with Section N1104.1.

Exception: Alterations that replace less than 50 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.

N1109.2 Change in space conditioning. Any non-conditioned or low energy space that is altered to become *conditioned space* shall be required to be brought into full compliance with this chapter.

SECTION N1110 REPAIRS

N1110.1 General. Buildings, structures and parts thereof shall be repaired in compliance with Section N1107.3 and this section. Work on non-damaged components necessary for the required *repair* of damaged components shall be considered part of the *repair* and shall not be subject to the requirements for *alterations* in this chapter. Routine maintenance required by Section N1107.3, ordinary repairs exempt from *permit*, and abatement of wear due to normal service conditions shall not be subject to the requirements for *repairs* in this section.

N1110.2 Application. For the purposes of this code, the following shall be considered repairs:

1. Glass-only replacements in an existing sash and frame.
2. Roof repairs.
3. Repairs where only the bulb and/or ballast within the existing luminaires in a space are replaced provided that the replacement does not increase the installed interior lighting power.

SECTION N1111 CHANGE OF OCCUPANCY OR USE

N1111.1 General. Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with this code.

N1111.2 General. Any space that is converted to a dwelling unit or portion thereof from another use or occupancy shall comply with this code.

SECTION N1112 MODIFICATIONS

N1112.1 Modifications. The *building official* may make modifications to the requirements of this Chapter as allowed in Section 104.10 of the Boulder County Building Code if it is determined that strict application of the

requirements of this Chapter:

1. Creates practical difficulties or excessive expense in the upgrade of an existing residential structure.
2. Requires alteration to either a structure greater than 50 years in age or any structure in a historic district or site which would materially alter the historic integrity of that structure or adversely affect the historic integrity of the district or site.
3. Creates practical difficulties in meeting on-site renewable energy requirements due to topographic constraints associated with the lot or location of the structure.

In assessing whether a request for a modification should be granted, the *building official* shall, in consultation with the staff and/or a qualified professional retained by the *building official* at the applicant's expense, determine whether the strict application of this chapter creates a situation described in items 1 through 3 listed above. If it is determined that the request warrants a modification on this basis, the *building official* shall determine what appropriate mitigation measures shall be required to ensure that the structure meets the intent and spirit of this chapter. Appropriate mitigation measures may include requiring additional energy-saving or resource-efficient construction methods or materials, sustainable framing techniques, use of environmentally friendly materials, adoption of water-saving landscaping and irrigation, or similar conservation measures.



Land Use Department:

Courthouse Annex Building • 2045 13th Street • PO Box 471 • Boulder, CO 80302

Building Safety & Inspection Services:

Phone: 303-441-3925 • Fax: 303-441-4856 • Email: building_official@bouldercounty.org • www.bouldercounty.org/lu

Office Hours: Monday – Monday, Wednesday, Thursday, Friday 8 a.m. to 4:30 p.m. | Tuesday 10 a.m. to 4:30 p.m.

Building Permits can be applied for and issued until 4 p.m. Plan review services by the Building Safety and Inspection Services Team are unavailable on Tuesdays. Building permits that require a plan review and counter questions will not be accepted on Tuesdays. Over the counter EZBP building permits are available on Tuesdays from 10 a.m.-4:30 p.m.

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