

# BASALT SUSTAINABLE BUILDING REGULATIONS GUIDELINES

## PURPOSE

The intent of the Sustainable Building Regulations program is to encourage cost-effective sustainable building methods to create durable, energy efficient structures that conserve natural resources, promote the efficient use of building materials, and improve indoor air quality.

## APPLICABILITY

These Sustainable Building Regulations apply to all new single family, duplex, and townhouse (attached single family) construction per the currently adopted building code, additions, reconstruction of over 50% of the existing floor area; and exterior energy uses such as snowmelt, spas and pools over 64 square feet, or patio heaters. The completed Sustainable Building Regulations checklist must be submitted along with a building permit application, demonstrating compliance with the appropriate threshold level based on conditioned building area. Manufactured housing approved by Colorado Department of Housing is exempt. Exterior energy uses must be mitigated 100% on site. Commitments to construction methods and materials are binding toward issuance of a certificate of occupancy.

## DEFINITIONS

*Biomass fuel* means any plant-derived fuel available on a renewable or recurring basis, including agricultural crops and trees, wood and wood waste and residues (including wood pellets), plants (including aquatic plants), grasses, residues, and fibers.

*Conditioned building area* is the area in building, inside insulated walls, being heated or cooled, containing uninsulated ducts, or with a fixed opening directly into an adjacent conditioned space.

*Renewable energy source* is incoming solar radiation and photosynthetic processes; natural phenomenon including wind, hydropower, and lake or pond thermal differences; from decomposition of waste material; and processes that use regenerative materials, including wood and bio-based products; and from the internal heat of the earth.

## POINT REQUIREMENTS

Residential design and construction must meet the minimum thresholds below. For projects with more than one dwelling unit, *each unit* must meet the minimum threshold. Minimum point thresholds and individual project scores upon completion will be entered on the certificate of occupancy.

Methods and materials identified on a checklist, by the applicant, will be verified as part of the plan review, or on field inspections, accordingly. Threshold levels for residential buildings and residential portions of mixed-use buildings are:

- **0-2000** square feet of building area would need to meet **60 points or more**
- **2001-3000** square feet of building area would need to meet **70 points or more**



**1.1: Limit site impact to 10' beyond building footprint**

BENEFIT: Unaltered natural native vegetation outside of impacted construction area and driveway. Not applicable for sites not meeting minimum landscaping requirements or for previously impacted landscape. **Thinning required for wildfire mitigation is exempt.**

QUALIFICATION: Show detailed construction management plan with sediment fence/limits of construction no more than 10 feet around proposed building footprint. Driveway and material storage exempted. Show landscaping plan minimized to areas impacted by construction.

POINTS: 3

CONFIRMATION will be at plan review and foundation inspection.

**1.2: Ultra-low or dual-flush toilets**

BENEFIT: Toilets typically use the most water of any household fixture or appliance, on a daily basis. New and improved high-efficiency models use less water per flush.

QUALIFICATION: All toilets must be ultra-low or dual flush. A toilet using 1.4 gallons per flush (GPF) or less qualifies as an ultra-low-flush toilet.

POINTS: 2 per fixture (6 maximum)

CONFIRMATION will be at final inspection.

**1.3: Low-flow showerheads**

BENEFIT: According to the EPA, showering represents approximately 17 percent of residential indoor water use in the United States. Low-flow showerheads reduce water consumption, and the energy used to heat shower water.

QUALIFICATION: Showerheads 2.0 gallons per minute or less must be installed on all showers. Provide any documentation for on-site inspection. No more than one showerhead per 1296 square inches of shower-stall floor area, and require showerheads to be at least 36 inches apart.

POINTS: 1 per fixture (3 maximum)

CONFIRMATION will be at final inspection.

**1.4: Low-flow bathroom faucets**

BENEFIT: Faucets account for more than 15 percent of indoor household water use. Low-flow bathroom sink faucets and accessories can reduce a sink's water flow by 30 percent or more without sacrificing performance.

QUALIFICATION: Bathroom sink faucets must be WaterSense listed and labeled. Listings of approved products are available at [www.epa.gov/watersense](http://www.epa.gov/watersense).

POINTS: 1 per appliance (3 maximum)

CONFIRMATION will be at final inspection.

### **1.5: Water efficient clothes washer and/or dishwasher**

BENEFIT: Traditional washing machines average about 41 gallons of water per load, but new, energy- and water-conserving models (front-loading or top-loading, non-agitator ones) use only 16 to 20 gallons per load. Efficient dishwashers use about 1/3 less water, and 41% less energy to heat water and dry.

QUALIFICATION: Clothes washer/dishwasher must be listed on [www.aceee.org](http://www.aceee.org) or [www.energystar.gov](http://www.energystar.gov), or must be shown to have similar water usage.

POINTS: 1 per appliance

CONFIRMATION will be at final inspection.

### **1.6: Storm water reuse plan**

BENEFIT: Recycling storm water from building for landscape irrigation reduces water usage, and restores ground water. 1" of water on 1,000sq/ft of roof = 265 gal.of fresh water. **Collection and storage of natural precipitation is prohibited by State law.**

QUALIFICATION: Provide a grading plan which illustrates the principle and construct swales to maximize distribution of surface drainage to planted areas on site, or direct surface drainage to a larger, neighborhood eco-system. Subsurface "deep-root" irrigation for individual plantings also qualifies.

POINTS: 4

CONFIRMATION will be at plan review and final inspection.

## **SECTION 2 RECYCLING AND REUSE**

### **2.1: Use of pine beetle salvage wood**

BENEFIT: Pine beetle affected lumber harvested in Colorado can be utilized as dimensional framing material, as well as siding, flooring, trim, etc.

QUALIFICATION: Material must be used for over 50% of structure.

POINTS: 3 per application

CONFIRMATION will be at framing and final inspection.

**2.2: Surplus/deconstructed materials donated to building materials exchange**

BENEFIT: Extra onsite materials, either new or deconstructed, can be donated to a local materials exchange yard. Currently, the RECON yard in Wolcott, the Habitat for Humanity ReStore in Glenwood Springs, and Pitkin County Landfill accept most dimensional lumber and new or used building products. Site pick-up is available.

POINTS: 1 per trailer load

CONFIRMATION: Receipts of donated materials must be on job site with field set of plans at final inspection.

**2.3: Wood, scrap metal, cardboard recycled on site**

BENEFIT: Reduced impact on landfill from construction materials. The landfill offers a 50% reduced tipping fee for separated wood waste.

QUALIFICATION: Show on construction management plan. Labeled containers located on site with evidence of use and service.

POINTS: 2 per material type recycled. For example, if cardboard and wood scrap were being recycled in containers on site, 2 points would be given.

CONFIRMATION will be at framing inspection.

**2.4: Reclaimed and/or recycle-content materials**

BENEFIT: Use of construction materials reclaimed from another structure and/or any materials with recycle-content in them.

QUALIFICATION: Provide material info with building permit. Materials that are architectural salvage, purchased from a reclaimed materials distributor, deconstructed by the owner/applicant from another structure, or that are purchased from a used building materials exchange (RECON yard in Wolcott, Habitat for Humanity ReStore in Glenwood Springs, etc.) all qualify as reclaimed materials. Some common recycle-content materials include fly-ash concrete, steel studs/I-beams, composite decking, recycle-content faux shake/slate roofing, cellulose or shredded cotton batt-insulation, recycle-content carpets, counter tops, tile, etc. Material must be used for over 50% of structure.

POINTS: 2 per material used.

CONFIRMATION: Material information/documentation must be on job site with field set of plans at final inspection.

**2.5 Built-in Recycling Center**

**BENEFIT:** A conveniently located recycling center in the home will encourage the process. Up to 30 square feet of space dedicated to recycling will be exempted from FAR calculations.

**QUALIFICATION:** Design and build a recycling center, in or adjacent to kitchen, with at least two bins for glass, cans, plastic, paper and other common recycling items.

**POINTS:** 3

**CONFIRMATION** will be at plan review and final inspection.

### **SECTION 3 MATERIALS AND FRAMING**

#### **3.1: Materials manufactured within Colorado**

**BENEFIT:** Limit transportation and reduce the environmental effects.

**QUALIFICATION:** Provide documentation on-site for any materials used that are manufactured in state. Concrete does not qualify.

**POINTS:** 2 per material used

**CONFIRMATION** will be at plan review and framing inspection.

#### **3.2: Insulated Concrete Forms (ICFs) for foundation**

**BENEFIT:** Insulated Concrete Forms (ICFs) are expanded-polystyrene foam blocks which are stacked with concrete poured into the internal void. ICFs provide improved insulation and reduced moisture transport over conventional foundation walls.

**QUALIFICATION:** ICFs shown on structural drawings.

**POINTS:** 5

**CONFIRMATION** will be at plan review and framing inspection.

#### **Insulated Concrete Forms (ICFs) for basement/foundation walls plus above grade walls.**

**QUALIFICATION:** ICFs shown on structural drawings must be used for >75% of exterior walls.

**POINTS:** 10

**CONFIRMATION** will be at plan review and framing inspection.

#### **3.3: Structural/framing dimensions in 2' increments**

**BENEFIT:** Even dimensions reduce material waste and labor.

QUALIFICATION: Show exterior dimensions on site/floor plans. Exterior dimensions in 2' increments must be incorporated in 75% or more of the building footprint.

POINTS: 2

CONFIRMATION will be at plan review.

**3.4: Optimum value engineering techniques used**

BENEFIT: Conserve building materials

QUALIFICATION: Use 24-inch on center studs for over 50% of the structure.  
Use 2-stud corners for over 50% of framing.  
Use efficient headers in over 50% of framing. "Efficient headers" refers to insulated headers on exterior walls (minimum R-10) or eliminating headers in non-load bearing walls.

POINTS: 2 per feature; maximum of 6

CONFIRMATION will be at plan review and framing inspection.

**3.5: Engineered structural lumber used in floors, walls and/or roofs**

BENEFIT: Smaller, fast-growing, tree species are used in engineered lumber, and there is little or no waste involved in the production and end use of the products. Engineered lumber products are an innovative alternative to the solid sawn lumber materials that have to be harvested in diminishing old growth forests.

QUALIFICATION: Must be in place for over 50% of the structure.

POINTS: 1 for floors only; 2 for floors, roof and/or walls

CONFIRMATION will be at plan review and framing inspection.

**3.6: Pre-cut studs, trusses, walls, and/or sections.**

BENEFIT: Pre-cut or off-site construction of structures reduces material waste.

QUALIFICATION: Use pre-cut studs AND trusses for over 75% of the structure. (2 points)  
Use panelized or pre-fabricated walls. (2 additional points)  
Use prefabricated sections or modular construction for over 75% or more of the building. (2 additional points)

POINTS: 2 to 6

CONFIRMATION will be at plan review and framing inspection.

### **3.7: FSC or SFI certified materials used**

**BENEFIT:** Preserve old-growth forests by promoting sustainably-harvested wood products.

**QUALIFICATION:** Wood certified by either the Forest Stewardship Council (FSC) or Sustainable Forestry Initiative (SFI). Greenspot, in Glenwood Springs and Valley Lumber, in Basalt, are certified by both organizations for chain of custody. Material must be used in over 50% of building.

**POINTS:** 2 points per material used

**CONFIRMATION** will be at plan review and framing inspection.

### **3.8: Structural Insulated Panels (SIPs) or Straw Bale used for exterior walls**

**BENEFIT:** SIPs (a foam core laminated to oriented strand board) and straw bale construction provide superior R-values and reduced air-infiltration to conventional 2x6" wall construction.

**QUALIFICATION:** Must be used for >75% of exterior walls.

**POINTS:** 10

**CONFIRMATION** will be at plan review and framing inspection.

## **SECTION 4 ENERGY**

### **4.1: HERS rated house**

**BENEFIT:** The overall energy efficiency of Home Energy Rating System (HERS)-rated homes is usually higher than minimum building-code standards. E-Star is an accredited (HERS) provider, and the major trainer and certifier of Home Energy Raters in Colorado. An E-Star Energy Rating gives each home a score expressed on a scale from 0 to one 100, with 100 as the (2003 IECC) baseline. The goal is to be "better than code", and ultimately "net zero". Complete information, including local rating professionals is available at [www.e-star.com](http://www.e-star.com).

**QUALIFICATION:** Submit documentation with plans from an (HERS) professional showing calculations showing an index of 80 or less and, at completion of the project, an As-Built Energy Rating Report with a rating of 80 or less. 5 points additional for an index rating of 75 or less; and 5 points additional for an index rating of 70 or less; and 5 points additional for net zero.

**POINTS:** 5 to 20

**CONFIRMATION** will be upon presentation of the qualifying As-Built Energy Rating Report.

#### **4.2: Blower Door Test Only**

**BENEFIT:** Promotes tighter construction and pinpoints areas of air infiltration.

**QUALIFICATION:** Complete a blower door test by a certified professional that accurately shows air changes per hour (ACH). Test results must show ACH of 0.40 or less.

**POINTS:** 5

**CONFIRMATION** will be upon presentation of the qualifying test results.

#### **4.3: Roof/ceiling insulation**

**BENEFIT:** Increased insulation levels reduce heat loss. This is the most effective use of insulation to reduce overall heat loss.

**QUALIFICATION:** Show roof/ceiling insulation plan. Install per plan. Post completed Insulation Certificate in mechanical room.

**POINTS:** 1 to 15 - One point for each R value over 38, up to 15 points maximum. For example, if an R-50 roof is installed, 12 points would be given.

**CONFIRMATION** will be at insulation inspection.

#### **4.4: Reflective radiant barrier**

**BENEFIT:** A reflective radiant barrier installed in a vented attic space reduces ceiling heat gains and cooling loads in summer.

**QUALIFICATION:** Show and specify a reflective radiant barrier on roof/ceiling insulation plan. Install a reflective radiant barrier on the “ceiling” or “floor” of the attic, or under the roof sheathing of a vaulted ceiling.

**POINTS:** 2

**CONFIRMATION** will be at framing if installed on or under roof sheathing; or insulation inspection if laid over insulation

#### **4.5: Wall insulation**

**BENEFIT:** Increased insulation levels reduce heat loss.

**QUALIFICATION:** Show wall insulation in construction plans. Install per plan. Post completed Insulation Certificate in mechanical room.

**POINTS:** 1 to 8 - One point given for each R value over 19, up to 15 points maximum. For example, if an R-30 wall is installed, 11 points would be given.

CONFIRMATION will be at insulation inspection.

#### **4.6: Exterior insulation**

**BENEFIT:** The so-called Residential Exterior Membrane Outside-insulation Technique (REMOTE) eliminates thermal bridging thereby increasing the effective R-value of the insulation. A REMOTE shell provides a very tight air envelope.

**QUALIFICATION:** Detail a REMOTE system on plans. Specify a minimum 3” rigid (EPS or XPS) exterior insulation. Requires effective mechanical ventilation system and sealed combustion appliances. Visit [www.cchrc.org/remote.aspx](http://www.cchrc.org/remote.aspx) for more information.

**POINTS:** For 3” minimum exterior rigid insulation, 5 points; for 6” minimum insulation, 10 points.

CONFIRMATION will be at insulation inspection.

#### **4.7: Slab insulation**

**BENEFIT:** Increased insulation levels reduce heat loss.

**QUALIFICATION:** For slab-on-grade and basement floor, show compression-resistant insulation under the slab on construction plans. Install per plan.

**POINTS:** 1 to 3 - For R-5 minimum insulation, 1 point; for R-8 minimum insulation, 2 points; for R-10 minimum insulation, 3 points; for R-16 minimum insulation; for R-20 minimum insulation

CONFIRMATION will be prior to slab pour.

#### **4.8: Crawl space/basement wall insulation**

**BENEFIT:** Increased insulation levels reduce heat loss.

**QUALIFICATION:** For crawl space and/or basement walls, show insulation of wall in construction plans. Install per plan. Insulation must be continuous for entire wall area below main floor.

**POINTS:** 1 to 3 - For minimum R-10, 1 point; for minimum R-15, 2 points; for R-19 or higher, 3 points.

CONFIRMATION will be at insulation or final inspection.

#### **4.9: Blown or sprayed insulation**

**BENEFIT:** Blown or sprayed insulation reduces air infiltration and offers higher effective R values than batt insulation.

**QUALIFICATION:** Specify blown fiberglass or cellulose, or spray-foam insulation on plans. Blown insulation installed in attics/ceilings, walls, and basements/crawlspaces

POINTS: 1 per Quantity Level - One point given for each quantity level of blown or sprayed insulation installed. For example, if 80% of the insulation in a structure is blown-in, then quantity level 4 (76-100%) or 4 points would be given.

CONFIRMATION will be at insulation inspection.

#### **4.10: Insulate all hot water pipes at all locations**

BENEFIT: Insulating hot-water pipes reduces heat loss through the plumbing system. Hot water is delivered to point of use faster, reducing water waste.

QUALIFICATION: Closed cell foam or fiberglass pipe insulation with a minimum 2.5 R-value must be installed on all hot water pipes.

POINTS: 1

CONFIRMATION will be at plumbing rough-in inspection.

#### **4.11: Energy-efficient windows**

BENEFIT: High-performance windows significantly increase a wall's thermal resistance, helping keep the interior warmer in the winter and cooler in the summer.

QUALIFICATION: Provide window manufacturer specifications with window schedule as part of construction plans. Leave window labels in place until inspected.

POINTS: 2 points for each U-.05 below U-.35 (for example, U-.30 = 2 pts)

CONFIRMATION will be at framing inspection.

#### **4.12: Insulating window coverings installed**

BENEFIT: Windows, even high performance models, are still typically the largest point of heat loss in walls. By utilizing insulating window coverings, a window's thermal performance can be doubled or tripled.

QUALIFICATION: Window coverings must be installed on 75%, or more, of the windows and have a minimum R-3 to qualify. Some common options are duet/cellular shades, or quilted shades.

POINTS: 3

CONFIRMATION will be at final inspection.

#### **4.13: Radiant floor/hydronic baseboard heating system**

BENEFIT: Buildings with hydronic heating systems have consistently shown lower heating energy use than equivalent structures with forced-air heating systems. Occupants are warmed at lower air temperatures with radiant heat. Hydronic systems can be zoned,

which provides the potential for unoccupied rooms to be kept at lower temperatures, which lowers heat loss and reduces fuel consumption.

QUALIFICATION: Either in-floor radiant heat or baseboard hydronic heat qualifies provided over 50% of the heating needs of the structure are met by hydronic means.

POINTS: 2

CONFIRMATION will be at mechanical rough-in and final inspection.

#### **4.14: Efficient Boiler or Furnace**

BENEFIT: Efficient operation reduces energy consumption and emissions .

QUALIFICATION: Specify and install a heating appliance with an AFUE rating of at least 88%

POINTS: 1 to 7 - If a boiler and/or furnace with a (combined) AFUE rating of 88% is installed, then one point is given. For each point of efficiency above 88% up to 94%, an additional point is given. For example, if a boiler has an AFUE rating of 94%, then 7 points would be given.

CONFIRMATION will be at heating inspection.

#### **4.15: Ductwork in conditioned spaces**

BENEFIT: Whenever possible, running ductwork through unconditioned space, especially attics, should be avoided. It creates a potential for heat loss and moisture problems.

QUALIFICATION: Keep all ductwork within thermal envelope. Or, ducts in unconditioned space should be sealed with mastic at all joints and insulated to a minimum R-6; R-8 minimum in attics.

POINTS: 2, for all ductwork within conditioned space; or, 1 for properly sealed and insulated ductwork in unconditioned space

CONFIRMATION will be at HVAC rough-in inspection.

#### **4.16: No mechanical air conditioning**

BENEFIT: Eliminating the need for air conditioning offers an immediate initial cost savings as well as reduced operational costs for the life of the structure.

QUALIFICATION: Proper design of building aspect, window sizing and placement, overhang shading, and insulation, can eliminate the need for air conditioning systems in our climate. No components for a roughed-in system should be installed.

POINTS: 4

CONFIRMATION will be at final inspection.

**4.17: Programmable thermostats**

BENEFIT: Allows occupants to set heating and cooling needs to their lifestyle.

QUALIFICATION: Thermostats that automatically change programmed temperature settings must be installed and be functional. If a programmable thermostat controls 15% of the habitable space, then 1 point would be applied. If programmable thermostats control 100% of the habitable space, then 4 points would be applied.

POINTS: 1 per (25%) Quantity Level

CONFIRMATION will be at final inspection.

**4.18: Thermostats for each room**

BENEFIT: A zoned system allows heating and cooling to be isolated to occupied rooms only.

QUALIFICATION: Each enclosed room must have a separate thermostat, not including storage areas, closets, bathrooms, mechanical rooms, or non-habitable space.

POINTS: 2

CONFIRMATION will be at final inspection.

**4.19: Tankless on-demand water heater(s) or efficient gas water heater**

BENEFIT: Efficient operation reduces energy consumption and emissions.

QUALIFICATION: Gas or electric tankless models qualify, and must meet over 50% of total domestic hot water needs. Boiler side-arms (water heaters), off of a modulating, condensing boiler 90% efficiency or above; a combined (space and water heating) appliance efficiency rating (CAE) of 0.85 or higher; or a condensing water heater with a thermal efficiency rating of 90% or higher, also qualify. Units must have an intermittent ignition device (IID) instead of a standing pilot light.

POINTS: 3; or gas water-heaters with 88% efficiency or above, receive 2 points.

CONFIRMATION will be at final inspection.

**4.20: Energy Star appliances**

BENEFIT: Energy Star appliances are designed and tested for energy efficiency as well as water conservation.

QUALIFICATION: Any appliances, other than those credited for water conservation (Sec. 1.5), with the EPA's Energy Star logo on them and/or listed on

[www.energystar.gov](http://www.energystar.gov) website qualify. Clothes dryers are not Energy Star rated, however, an outdoor clothes line will qualify.

POINTS: 1 to 4 (graduated scale)

CONFIRMATION will be at final inspection, with appliances installed and operable.

#### **4.21: Ceiling fans/air destratification system in common rooms**

BENEFIT: Ceiling fans and air-handling systems help to reduce the accumulation and of warm air at ceiling level and exfiltration through the ceiling during the winter; and they circulate air in the summer, making a room feel cooler.

QUALIFICATION: Show units/systems in construction plans.

POINTS: 1 per fan to a maximum of 4

CONFIRMATION will be at final inspection.

#### **4.22: Installation of whole-house fan natural cooling/ventilation system**

BENEFIT: help cool a structure by flushing warm air from inside living space as well as the attic. Such ventilation systems can help reduce or eliminate air-conditioning cooling loads.

QUALIFICATION: Whole-house fan natural cooling/ventilation systems installed in the ceilings and attic. Systems must operable manually and by automated thermostat. Fans should be sized to produce between 4-5 air changes per hour (ACH) at maximum speed. For design purposes, use the following formula:

*Minimum fan CFMs = Volume of house x 4-5 ACH /60, where Volume = square footage of house interior x average ceiling height.*

POINTS: 2

CONFIRMATION will be at final inspection.

#### **4.23: Centralized heat recovery ventilation (HRV)**

BENEFIT: An HRV unit integrated with a forced-air heating system increases heating efficiency. It can be operated independent of the furnace to circulate and freshen indoor air winter and summer.

QUALIFICATION: Majority of total mechanical ventilation must go through an HRV unit for points.

POINTS: 8

CONFIRMATION will be at heating inspection.

#### **4.24: Exterior lighting minimized**

**BENEFIT:** Reduces nighttime light pollution, glaring and offensive light sources, and conserves energy.

**QUALIFICATION:** Exterior lighting plan to be submitted with construction plans. Total exterior lighting must be less than 5500 lumens for points. (100-Watt incandescent or 23-watt CFL light bulbs produce around 1600 lumens; 60-Watt incandescent or 13-Watt CFL bulbs produce around 800 lumens; and 40-Watt incandescent or 9-Watt CFL bulbs produce around 450 lumens, according to Energy Star).

**POINTS:** 2

**CONFIRMATION** will be at plan review and final inspection.

#### **4.25: Efficient lighting**

**BENEFIT:** Alternatives to incandescent bulbs use 20% or less wattage for equivalent lumens.

**QUALIFICATION:** Compact Fluorescent Lamps (CFLs), T8s, T5s, LEDs or equivalent comply. Over 50% of the bulbs installed must be alternatives to incandescent.

**POINTS:** 2; 4 points for 50% LEDs (considering the expense)

**CONFIRMATION** will be at final inspection.

#### **4.26: Motion detecting light switches**

**BENEFIT:** Lighting operated by motion detection saves energy while increasing safety and security.

**QUALIFICATION:** Install motion-detection-controlled lighting as an integrated unit or by a remote motion sensor for closets, basements, etc.

**POINTS:** 1 to 4 - One point is given for each motion detection switch installed, up to 4 points.

**CONFIRMATION** will be at final inspection.

### **SECTION 5 RENEWABLE ENERGY**

#### **5.1: Passive solar design**

**BENEFIT:** Effective passive solar design allows for south-facing solar heat gain and heat storage in thermal mass of the interior during the winter, while properly shading south-facing windows to prevent unwanted heat gain during the summer.

QUALIFICATION: Site must have reasonably unobstructed solar access. Deciduous trees are allowable to the south, and desirable to the east and west, for summer shading. Site plan must show a Sun Angles Dial along with the North Arrow, showing at minimum angles of sunrise, angles of the sun at noon, and angles of sunset; for summer solstice, equinox, and winter solstice respectively. In Basalt, the angles of the noon sun are 68, 47, and 25 degrees for summer solstice, equinox, and winter solstice, respectively.

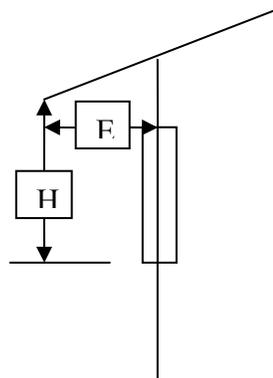
### 5.1.1: Optimize Glazing

Install south-facing (within at least 20 degrees east of due south) glass equivalent to 7% or more of total heated floor area. Effective south-facing windows require a high Solar Heat Gain Coefficient (SHGC) – typically 0.60 or higher — to maximize heat gain.

POINTS: 10

### 5.1.2: Shading

Install south facing glass equivalent to 12% or less of total heated floor area, and provide proper shading according to the formula  $E = H / 3.38$ , or conversely,  $H = E \times 3.38$ , where E = eave depth, and H = height of bottom of window from the eave.



POINTS: 10

### 5.1.3: Thermal Mass

For each square foot of south-facing glass, provide at minimum an equivalent square footage of thermal mass interior walls and/or floor reached by the solar gain. Examples of thermal mass include concrete, gypcrete, tile, masonry or stone floors; double-layered sheetrock, masonry, stone, adobe walls.

POINTS: 5

CONFIRMATION will be at plan review and final inspection.

### **5.2: Solar hot water system for domestic hot water**

**BENEFIT:** Supply or supplement hot water for domestic use with little or no energy consumption.

**QUALIFICATION:** Install a solar hot water system, which includes rooftop or ground-mounted panel collectors connected to a heat exchanger and/or insulated storage tank for domestic hot- water supply. System must have unobstructed solar access. Systems may be active, using solar or electric pumps, or they may utilize a thermal siphon. Collectors must be facing within 20 degrees of due south, and between 30 and 50 degrees from horizontal. System size is dependent on number of bedrooms. Evacuated-tube collectors are typically 25% more efficient than flat plate collectors. Parenthesized areas are minimum requirements for evacuated-tube collectors.

1 bedroom – 40 square feet of collectors (30 square feet), 50 gallons storage  
2 bedrooms – 48 square feet of collectors (36 square feet), 60 gallons storage  
3 bedrooms – 64 square feet of collectors (48 square feet), 80 gallons storage  
4+ bedrooms – 96 square feet of collectors (72 square feet), 120 gallons storage

**POINTS:** 8

**CONFIRMATION** will be at plan review and final inspection.

### **5.3: Integrated solar hot water system that supplements both radiant floor heat and domestic hot water**

**BENEFIT:** Supply or supplement hot water for domestic use and space heating with little or no energy consumption.

**QUALIFICATION:** Install a solar hot water system sized as previous (bedroom based) that provides heat for radiant floor heating as well as domestic hot water. Show system in construction plans and schematics.

**POINTS:** 16

**CONFIRMATION** will be at plan review and final inspection.

### **5.4: Solar hot-water system rough-in only**

**BENEFIT:** Simplifies solar retrofit if undertaken in the future.

**QUALIFICATIONS:** Two, well-secured runs of **copper** plumbing pipe, 3/4" minimum, insulated to an R-6, minimum, must be installed in an interior wall between the attic/roof and the mechanical room or area that could house the storage tank/heat exchanger. An 18/2 (thermostat) wire (or 1/2" conduit) must also be run at the same location for future control installations. The plumbing and wiring should terminate in an attic space under the roof that will support the solar collectors, and it shall be above the insulation for easy sighting. If there isn't an attic space, the piping and wiring shall end after penetrating the roof that will support the collectors. Ends of installed pipes and wires must be labeled

“solar”; pipes and conduit must be capped or effectively sealed; wires terminating outside must be in a sealed junction box. Provide 3’x3’ of floor space (FAR exempt) for a future storage tank.

POINTS: 2

CONFIRMATION will be at plan review and final inspection.

### **5.5: Solar photovoltaic system**

BENEFIT: Photovoltaic (PV devices) change sunlight directly into household electricity.

QUALIFICATION: Applicant must submit plans from a qualified architect, engineer, or designer certifying the kW capacity, and proper system design. Photovoltaic panels should be mounted within 20 degrees of due south and between 30 and 50 degrees from horizontal. System must have reasonably unobstructed solar access. Proper protection to prevent electric islanding must be in place in the event on a power outage.

POINTS: 10 for every 1 kW installed to a maximum of 50

CONFIRMATION will be at plan review and final inspection.

### **5.6: Solar photovoltaic system rough-in only**

BENEFIT: Simplifies solar retrofit if undertaken in the future.

QUALIFICATIONS: A 1” conduit must be installed between the attic/roof and the future inverter location, in the general vicinity of the electrical panel. Ends of the conduit shall be labeled “solar”. Conduit terminating in an attic space under the roof that will support the solar collectors shall be above the insulation for easy sighting. If there isn’t an attic space, the piping and wiring shall end on the roof that will support the collectors, in a sealed junction box. Provide 3’x3’ of wall space 30” deep (FAR exempt) for a future inverter. Reserve two slots in the main breaker panel for a 240v breaker.

POINTS: 2

CONFIRMATION will be at plan review and final inspection.

### **5.7: Ground source heat pump (geothermal) system**

BENEFIT: Ground source heat pumps utilize glycol loop systems drilled into the ground to heat or cool a structure.

QUALIFICATION: Five points are given for each quantity level of the structure’s heating/cooling needs met by the system. If utilized for a snowmelt system, total energy calculations must include exterior energy use(s) as well.

POINTS: 10 to 40 - 10 points per quantity level. For example, if the system met 60% of the structure's heating/cooling needs, quantity level 3 (51-75%), 10 points per quantity level, 30 points would be given.

CONFIRMATION will be at plan review and final inspection.

**5.8: High-efficiency wood-burning stove**

BENEFIT: Wood- and bio-mass-fuel burning technology has improved tremendously in recent years. Woodstove efficiency has increased and emissions rates have been reduced with pellet, soapstone, catalytic and non-catalytic stoves. Additional information may be found at [www.static.hpba.org/fileadmin/factsheets/product/EPACertWoodburning.pdf](http://www.static.hpba.org/fileadmin/factsheets/product/EPACertWoodburning.pdf).

QUALIFICATION: Specify stove make and model number on plans. Stove may generate no more than 2.0 grams/hour of particulate and must exceed 75% efficiency as determined by EPA (New Source Performance Standard for New Residential Wood Heaters) test methods using Low-Heat Value protocol. Provide EPA "Temporary Label", manufacturer's (IRS) certification statement, or other documentation at plan review. Installation must conform to manufacturer's recommendations at final inspection.

POINTS: 4

CONFIRMATION will be at plan review and final inspection.

**5.9: 5-year commitment of wind energy from Holy Cross Energy or XCel Energy**

BENEFIT: Wind is a clean, inexhaustible, indigenous energy resource. On-site wind power is not practical in Basalt; however, wind energy credits are available through Holy Cross Energy ([www.holycross.com](http://www.holycross.com)). For around 2.5 cents per kWh above the current rate, residents can purchase wind energy for their home use equivalent.

QUALIFICATION: Submit copy of applicable electric bill from utility showing level of wind energy commitment (if available), as well as signed document from the applicant stating a minimum 5-year commitment at given levels.

POINTS: 2 per Quantity Level - For example, if your wind energy commitment represented 100% of your average monthly use, then Quantity Level 4 (76%-100%) would apply, 2 points per quantity level, giving the applicant 8 points.

CONFIRMATION will be at plan review.

**SECTION 6 INDOOR AIR QUALITY**

**6.1: Formaldehyde-free and/or low-toxic insulation**

BENEFIT: Formaldehyde resins have been used in the manufacture of fiberglass batts.

Out gassing of formaldehyde, a probable human carcinogen, has been found to contaminate indoor air. Use of alternative insulating products reduces exposure to occupants.

QUALIFICATION: Insulation must be labeled as formaldehyde-free or Green Guard certified at [www.greenguard.org](http://www.greenguard.org).

POINTS: **REQUIRED**

CONFIRMATION will be at plan review and insulation inspection.

**6.2: Low- or zero-VOC and/or low-toxic interior paint, stain/finishes, and adhesives**

BENEFIT: Interior paint contributes to total VOC levels.

QUALIFICATION: EPA regulations call for no more than 250 gm/L of Volatile Organic Compounds (VOCs) in Low-VOC latex paints and no more than 380 gm/L for Low-VOC oil-based paints/stains. Products must be either labeled “Low VOC”, Green Guard certified [www.greenguard.org](http://www.greenguard.org), or show that VOC levels are below EPA thresholds.

POINTS: **REQUIRED**

CONFIRMATION will be at final inspection.

**6.3: Low-or non-toxic floor coverings**

BENEFIT: Carpet and other traditional floor coverings contribute VOCs to indoor air.

QUALIFICATION: Materials either listed on [www.greenguard.org](http://www.greenguard.org) or show that coverings are below EPA thresholds for low/non-toxicity.

POINTS: 1 per Quantity Level - Quantity Level is determined by the percentage of total floor area meeting the above criteria. For example, if 80% of the total flooring was nontoxic, then quantity level 4 (76-100%) would apply, 1 point per Quantity Level, so 4 points would be given.

CONFIRMATION will be at plan review and final inspection.

**6.4: “Smart” vapor retarder in walls**

BENEFIT: Eliminating moisture from wall cavities prevents mold and decay fungi from developing. This product allows closed building envelope systems to increase their drying potential with seasonal climatic changes.

QUALIFICATION: Install a vapor-retarder system in exterior walls that allows for moisture permeability above 60% relative humidity. Specify on wall sections.

POINTS: 5

CONFIRMATION will be at plan review and insulation inspection.

**6.5: All furnaces, fireplaces, boilers, gas water-heaters, sealed combustion/direct vented.**

BENEFIT: Sealed combustion/directed-vented gas appliances reduce the risk of combustion by-products entering the indoor environment and supply combustion air from outside directly to the combustion chamber.

QUALIFICATION: Submit appliance specifications with construction plans.

POINTS: 4

CONFIRMATION will be at plan review and heating inspection.

**6.6: High-efficiency filter on HVAC system (HEPA, UV, etc.)**

BENEFIT: High-efficiency filters remove contaminants down to 0.3 microns in size from circulating air.

QUALIFICATION: Install a high efficiency filter on a forced-air distribution system. Installed filter must be rated at 99% efficiency or higher.

POINTS: 5

CONFIRMATION will be at final inspection.

**6.7: Heat recovery ventilation**

BENEFIT: An HRV system captures potentially lost warm air while ventilating interior space with fresh air. It is an energy-efficient way to remove moisture, odors, allergens and harmful gasses from indoor air while minimizing heat loss.

QUALIFICATION: Majority of total mechanical ventilation must go through an HRV unit for points.

POINTS: 5

CONFIRMATION will be at mechanical rough-in inspection.

**6.8: Range hood exhausted outside or through HRV**

BENEFIT: Removes moisture generated from cooking, as well as cooking odors and products of combustion from gas appliances.

QUALIFICATION: Install a range hood to exhaust not more than 200 CFM to the outside. Larger hoods are required to provide make-up air to prevent de-pressurization. Hoods larger than 600 CFM are not permitted in a residence. (So much make-up air is required that it will need tempering.)

POINTS: 2

CONFIRMATION will be at permit application and final inspection.

**6.9: Radon Mitigation**

BENEFIT: Radon is a natural radioactive gas that you can't see, smell or taste. The EPA has determined it is a carcinogen.

QUALIFICATION: Design and install radon mitigation system that removes radon or other soil gas from under the slab/crawlspace and vent per EPA guidelines. More information is available at <http://www.epa.gov/radon/index> and [www.buildingscience.com](http://www.buildingscience.com).

POINTS: 3

CONFIRMATION will be at final inspection.

**SECTION 7 INNOVATION POINTS**

Innovative product use and/or design points will be given points on a case by case basis. The item must specifically meet the intent of the sustainable building regulations guidelines as stated at the beginning of this guidelines document, and points will be scaled as the item would apply to similar comparable items in the guidelines, as determined by the plans examiner.

Some options eligible for Innovation Points may include but are not limited to: Energy 10 Analysis, American Lung Association-certified home, modulating or sequentially staged boilers, net-zero energy home, "Passive House", frost-protected shallow foundation, trombe wall/interior thermal massing systems, evapotranspiration watering system, on site co-generation power system, passive solar lighting, etc.

**SECTION 8 SEVERABILITY PROVISION**

Should any provision of this Sustainable Building Regulation program be declared by a court of competent jurisdiction in any final judgment to be invalid, unlawful or unenforceable for any reason, such offending provision shall be deemed deleted and the remaining provisions of such Code shall remain in full force and effect.