

**ORDINANCE NO. 12
SERIES OF 2007**

**AN ORDINANCE OF THE BOARD OF TRUSTEES
OF THE TOWN OF CARBONDALE, COLORADO, ADDING PROVISIONS TO
THE MUNICIPAL CODE FOR THE ADDITION OF THE CARBONDALE
EFFICIENT BUILDING PROGRAM, CONCERNING THE CONSTRUCTION
OF RESIDENTIAL UNITS WITH EFFICIENT BUILDING PRACTICES
INCLUDING ENERGY COMPLIANCE FOR CHAPTER 15.09 OF THE
INTERNATIONAL ENERGY CONSERVATION CODE.**

BE IT ORDAINED BY THE BOARD OF TRUSTEES OF THE TOWN OF
CARBONDALE, COLORADO:

WHEREAS, the Carbondale Energy Plan outlines the desire of the community to
construct buildings in a more environmentally responsible and energy efficient manner;
and

WHEREAS, the Board of Trustees of the Town has determined the addition of
Carbondale Efficient Building Program to the municipal code will provide for education
of the community, promote the use of environmentally friendly construction methods
and renewable energy technologies, and foster economic development of “green”
businesses; and

WHEREAS, the Board of Trustees finds and determines that additional energy
efficiency enhancements are in the interest of public health, safety and welfare;

NOW THEREFORE, BE IT ORDAINED BY THE BOARD OF TRUSTEES OF
THE TOWN OF CARBONDALE, COLORADO, that the following additions to the
Town of Carbondale Municipal Code are hereby approved and adopted.

SECTION 1: A new Chapter 15.30 of the Carbondale Municipal Code, entitled
“Efficient Building Program—Residential” is added, to read as follows:

Chapter 15.30

Efficient Building Program--Residential

15.30.010	Purpose
15.30.020	Applicability
15.30.030	Exemptions
15.30.040	Point Requirements, Alternative Points, On-site Requirements
15.30.050	Renewable and Efficiency Fund – Fees and Spending
15.30.060	Inspection and Compliance

- 15.30.070** **Definitions**
- 15.30.080** **Section 1: Site/Water Conservation**
- 15.30.090** **Section 2: Recycling and Reuse**
- 15.30.100** **Section 3: Framing and Materials**
- 15.30.110** **Section 4: Indoor Air Quality**
- 15.30.120** **Section 5: Energy Compliance and Efficiency Improvements**
- 15.30.130** **Section 6: Solar Energy**
- 15.30.140** **Section 7: Innovation**
- 15.30.150** **Section 8: Alternative - Cash in lieu Points**
- 15.30.160** **Section 9: On-site renewable energy and exterior energy requirements**
- 15.30.170** **Carbondale Efficient Building Checklist**

15.30.010 PURPOSE

The intent of the Carbondale Efficient Building Program is to encourage cost-effective and 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. Depending on the house size and use of exterior energy, there are requirements for on site renewable energy mitigation in order to promote a local self-sufficient energy economy as per the Carbondale Energy Plan.

15.30.020 APPLICABILITY

Carbondale Efficient Building Program applies to all new residential (single family, duplex, townhouse, accessory dwelling unit) construction per the currently adopted building codes, as well as multifamily and residential sections of multi- use projects, and additions/reconstruction (remodel) projects as defined by the International Building Code or as specified in definitions.

The Carbondale Efficient Building Program Checklist (CEB Checklist) and this code document are used for code enforcement. A resource guide will be provided for additional guidance and background references.

15.30.030 EXEMPTIONS

Houses or mixed use structures applying for historical designation may request the Community Development Department to exempt the structure from any requirements set forth in this Chapter 15.30. The Community Development Department shall refer any such request to the Community Office for Resources Efficiency (CORE) and/or the Building Department for comments before processing any such exemption request.

Mobile home units that are approved by Colorado Department of Housing are exempt.

In the event of any conflict between this Chapter 15.30 and any provision set forth in Title 18 of this Code (Zoning), Title 18 shall govern.

15.30.040 POINT REQUIREMENTS

A. General description

The points to be scored or minimum required points are based on total square footage or total square footage per unit (or an “average”) for multifamily and residential portions of multi-use projects. *See* Definitions for appropriate total square footage calculations. In multi-use and mixed use residential projects, points that are common to all units are gained for each unit and can be scored in each CEB checklist, *i.e.* recycled content siding, roof insulation.

B. Examples - Point Requirements

The number of points required is on a graduated scale and can be calculated directly in the CEB Checklist. Examples of points required for various new residential housing or other residential type construction are included below:

Size – Square footage:

- **2000** square feet or less **110 points or more**
- **3000** square feet **120 points or more**
- **4000** square feet **130 points or more**
- **5000** square feet **150 points or more**
- **6000** square feet **170 points or more**
- **7000** square feet **200 points or more**
- **8000** square feet **230 points or more**

For remodels or additions less than 2000 square feet:

- **500 square feet** **40 points**
- **1000 square feet** **60 points**
- **1500 square feet** **80 points**
- **2000 square feet** **110 points**
- **over 2000 square feet** **as per above**

If the construction permit is only for a detached garage, the point requirements shall follow the remodel and addition point schedule above.

Residential units in the multi-family and multi-use categories calculate total square footage as an “average” unit size as per the definitions. The points required are based on

5.46 Efficient lighting

2 Points

Efficient lighting must be installed in 10% of fixtures. Install lighting that uses 20% or less wattage as incandescent lighting for equivalent lumens. Hard wired T8s, T5s, LEDs or equivalent comply.

Compliance: Inspected (5: Final).

5.47 CFL – Compact Fluorescents

1-2 Points

Install CFLs in lighting fixtures, 1 point for every 4 bulbs installed, maximum of 2 points.

Compliance: Inspected (5: Final).

5.48 Airtight J Boxes

2 Points

Reduce air infiltration through electrical boxes; use air tight boxes on all exterior walls for improved energy efficiency.

Compliance: Inspected (4: Rough -in).

5.49 Interior lighting

1 Point

Consider ways to reduce bright light spilling from inside your home into the outside environment to be a good neighbor. Curtains, shades, proper placement of fixtures and low light levels at night can help reduce light pollution.

Compliance: Provide a letter stating applicant will meet the intent of this item. .

15.30.130 Solar Energy (Section 6)

6.0 General Description:

Section 6 should be reviewed with Section 9.1 On site requirements for houses over 3000 square feet.

6.1 Prerequisite:

Site should have reasonably unobstructed solar access from the south from 10 AM to 2 PM. Site plan must show accurate North Arrow.

6.2 Rough-in for future solar hot water preheat and solar electric REQUIRED

Solar hot water- Rough In Only

REQUIRED

Two runs of copper plumbing pipe minimum 3/4", insulated, minimum R-6, must be installed in an interior wall and start in the mechanical room or near the area that will

house the storage tank/heat exchanger. The plumbing 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 shall end after penetrating the roof that will support the collectors. In the mechanical room, identify 10 sq.ft. for future preheat tank.

Solar Electric Rough- In Only

REQUIRED

Install minimum 3/4 inch conduit from future site for solar electric to service panel or room for utilities.

Compliance: Inspected. (4: Rough in)

6.3 Sun tempered Design:

5 Points

In our climate 10-15% of a homes heating energy can be obtained by moving some of the home's windows to the south side of the house. Install south-facing (at least within 30 degrees of true south) glass, equivalent to 6-7% of total above grade heated floor area. On plans show calculation of area of south glass divided by total heated floor area.

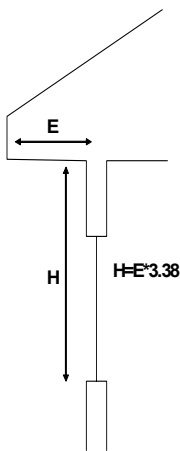
Compliance: Inspected at plan review.

6.4 Passive solar design

5-10 Points available

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.

Passive solar design for enhanced performance:



Install south-facing glass equivalent to 7- 12% or more of total above grade heated floor area, and provide proper shading according to the figure to the left, where E= eave width, H=height of bottom of window from the eave, and $H=E*3.38$, or conversely, $E=H/3.38$. Show calculations on the plan. **Compliance:** Inspected. (PC)

Additional 5 points

For each square foot of south-facing glass, provide at least thermal mass in interior walls and/or floor reached by the solar gain. Types of thermal mass which qualify include concrete floors, double-layered sheetrock, gypcrete, tile, masonry, CMUs, adobe, stone. **Compliance:** Inspected (5: Final). **Additional 5 points**

6.5 Solar hot water system for domestic hot water

only 8 Points

Solar hot water system also serves for heating

4 addition Points

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 true south, and between 30 and 60 degrees from horizontal. See Section 9 for On-site requirements. System size is dependent on number of bedrooms:

1 bedroom – 40 square feet of collectors, 50 gallons storage

2 bedrooms – 48 square feet of collectors, 60 gallons storage

3 bedrooms – 64 square feet of collectors, 80 gallons storage

4+ bedrooms – 96 square feet of collectors, 120 gallons storage

Integrated solar hot water system that supplements both radiant floor heat and domestic hot water

Total 12 points

Install a solar hot water system sized as previous that provides heat for radiant floor heating as well as domestic hot water. Show system in construction plans and schematics. Distribute solar heat to a heat exchanger and/ or insulated storage tank in order to meet part of the winter heating load. Area of solar collectors shall be 5-7% of total heated floor area. No more than 320 square feet of collector shall be installed on a house. The collectors for the solar system must be mounted with a minimum slope from the horizontal of 40 degrees.

Compliance: Inspected (5: Final).

6.6 On-site solar electric or photovoltaic

5- 50 Points

Solar electric system

Obtain 5 points for every 0.5 Kilowatt (KW) installed up to 50 Points (5 kW). For example: 2 kW= 20 points, 4 KW = 40 points. Partial points offered for systems not reaching the .5KW increments. For example: 3.1 KW equals 31 points.

Photovoltaic panels should be mounted within 30 degrees of true south and between 20 and 50 degrees from horizontal to receive full credit for KW capacity. System must have unobstructed solar access. Applicant must submit plans from a qualified architect, engineer, or COSEIA certified designer, certifying the KW capacity, and proper system design. Proper protection as per code and prevention of electric islanding must be in place in the event on a power outage.

Systems with designs that are not within the orientation parameters must show efficiency of system more than 70% as per the “solar orientation chart”. Solar orientation chart is in the appropriate section in the Resource Guide. These systems can receive partial credit but the KW capacity must be adjusted for efficiency. For example: nameplate 4KW times 75% efficiency= 3 KW.

Compliance: Inspected (5: Final).

15.30.140 Innovation Points (Section 7)

7.1 Innovation Points

1-20 Points

Innovative product use and/or design will be given points on a case by case basis. The item must specifically meet the intent of the CEB code as stated at the beginning of this document, and points will be scaled as the item would apply to similar comparable sections in the code. Criteria for points granted will be made available.

Some options eligible for Innovation Points may include but are not limited to:

Energy 10 Analysis, American Lung Association-certified home, modulating or sequential staged boilers, sun rooms, net-zero energy home, pervious materials in hardscape areas, trombe wall/interior thermal massing systems, evapo-transpiration watering system.

7.2 Ground source heat pump (geothermal) system

20 Points

Ground source heat pumps utilize glycol loop systems drilled into the ground to heat or cool a structure. Also provides heat and hot water for your home. Minimum COP as per ARI guidelines must be minimum 3.3. System design must cover the heat load of the residence.

Compliance: Inspected at 4: **Rough In-** ARI Certificate required documentation.

7.3 Deconstruction/Reuse of Materials

1 to 10 Points

In cases of scrape offs or remodels, deconstruction of structures should be considered. Materials can be donated to organizations such as Habitat for Humanity for reuse or sale. The number of points is dependent on the amount of deconstruction material donated. Donated/reused value of \$5000 equals 10 points.

Compliance: Documentation required: donated value receipt from non-profit organization. (Inspection for receipt 4: **Rough-In**)

7.4 Deconstruction/Grinding

5 Points

NOTE!

**Please read the CEB Guidelines prior to completing the Checklist.
The CEB Guidelines serve as the official code document for this program.**

QUANTITY / CHECK	SCORE	POSSIBLE POINTS	CODE SECTION	CODE DESCRIPTION	TIME OF VERIFICATION	VERIFICATION SIGN-OFF & DATE
5.0 ENERGY MEASURES CONTINUED						
Ducting/Air-conditioning/HVAC						
			REQUIRED	5.29 Seal all ductwork with mastic.	3	
		2	5.30	All ductwork sealed with low VOC mastic.	3	
		1-3	5.31	No ductwork in unconditioned space or duct work insulated to minimum R-8 in unconditioned spaces.	3	
			REQUIRED	5.32 If ducted system: No panned joist spaces or building spaces used for return air; fully ducted system.	4	
		5	5.33	Use of a evaporative cooling system - No air conditioning A/C.	5	
		-4	5.34	Mechanical air conditioning (A/C) installed.	5	
		2	5.35	Mechanical A/C with minimum 15 SEER submit ARI certificate; item 5.22 required.	D-5	
Cooling Strategies						
		2	5.36	Overhangs to block summer sun.	PC	
		2	5.37	Reduce solar heat gain with windows in summer.	5	
		1	5.38	Ceiling fans or air desertification system(s) in common rooms.	5	
		2	5.39	Installation of whole house fan, with R-19 seasonal cover, for ventilational cooling.	5	
Windows/Other						
		4	5.40	Window quilts or insulated window shades installed on ≥ 75% of all exterior windows.	5	
		2	5.41	Unheated Entry Airlock.	5	
Electrical						
		2-8		Energy Star® appliances. (2 point for each appliance)		
		2		Appliance:		
		2	5.42	Appliance:	5	
		2		Appliance:		
		2		Appliance:		
		1	5.43	Dimmers on fixtures - Required to have a minum of four dimmers installed.	5	
		2	5.44	House dimming system with time clock and vacation modes.	5	
		1-4	5.45	Occupancy sensing light switches for exterior and/or interior lighting.	5	
		2	5.46	Install 10% of fixtures with hard wired fluorescent fixtures.	5	
		1-2	5.47	CFL - Compact Fluorescents Lamps 1 point for every 4 bulbs installed.	5	
		2	5.48	Airtight J boxes for all exterior walls.	3	
		1	5.49	Reduce interior light spillage to exterior.	4	
6.0 SITE ORIENTATION AND RENEWABLE ENERGY						
		P	6.1	Solar access is unimpeded from 10-2 PM through-out the year for items 6.1-6.6	PC	
				Rough in for preheat on solar hot water & solar electric as follows:	4	
			REQUIRED	6.2 Solar Hydronic System - Rough in 3/4 inch return and supply and provide 10 ft. ² for future solar tank.	PC-4	
				Solar Electric - Rough in from roof to service panel & provide 6ft ² available near panel for future solar electric equipment.	PC-4	
		5	6.3	Sun tempered design.	PC	
		10	6.4	Passive solar design.	PC	
		8	6.5	Solar heating system for domestic hot water.	PC	
		4		Solar heating system for space heat.		
		5-50	6.6	Solar Electric System 5 points for each 0.5 KW installed on site.	5	
		0	77	Sub Total		
7.0 INNOVATION POINTS						
		1-20	7.1	Innovative product or design points.	PC	
		20	7.2	Ground source heat pump to cover at least 50% of heating load - COP of ≥ 3.3 ARI.	5	
		10	7.3	Deconstruction/Reuse.	PC-1	
		5	7.4	Deconstruction - Grinding and compaction for removal.	PC-1	
		5	7.5	Approved Wood Pellet or EPA certified wood stove - item 5.6 required.	5	
		0	63	Sub Total		
8.0 ALTERNATIVE POINTS						
		0-13	8.1	Cash in-lieu of points.	4	
		0-13		Sub Total		

The Carbondale Efficient Building Checklist can be downloaded from the Town of Carbondale web site with Summary page to assist in compliance with Sections 8 and Sections 9.

SECTION 2: Except as set forth above, the Board of Trustees intends that all other provisions of the Municipal Code shall remain in full force and effect. If any part, section, subsection, sentence, clause or phrase of this Ordinance is for any reason held to be invalid, such decision shall not affect the validity of the remaining portions of this ordinance and the Board of Trustees hereby declares that it would have passed this Ordinance and each such part thereof regardless of the fact that any one or more provisions were declared invalid.

INTRODUCED, READ AND PASSED this ___ day of May, 2007.

THE TOWN OF CARBONDALE

Michael Hassig, Mayor

ATTEST:

Cathy Derby, Town Clerk