

BUILT GREEN COLORADO™ CHECKLIST 2004



Built Green™ Checklist 2004 Effective January 1, 2004		Point Value	Builder's Selected Options	Documents Required at Time of Random Rating
<p>Builders are required to choose one of the three methods of meeting the Energy Efficiency Minimum Requirement (shown below as items 1, 2 and 3) and then reach a cumulative point total of 70 from anywhere in the Checklist. It is not required to select points from each category. The 3 points for an E-Star Rating count toward the cumulative total. Builders will be required to provide the corresponding verification documents where noted in the far right column at the time of random inspection.</p>				
I. ENERGY EFFICIENCY: MINIMUM REQUIREMENT				
1	E-Star Rating of at least 82 points (systems analysis option of Chapter 4 of the International Energy Conservation Code 2000) Homes must commit to this compliance method and test homes on a 15% or higher basis in order to take these points or	3		Rating Certificate
2	Chapter 5 of the IECC. See attached Appendix A.	0		Trade off worksheet
3	Chapter 11 of the International Residential Code 2000	0		Builder spec sheet
II. ENERGY EFFICIENCY: ENVELOPE				
4	House meets ENERGY STAR® criteria (86 points on HERS scale)	9		Rating Certificate
5	Home designed for passive solar heating (>20%)	8		Solar heat calculations
6	Home orientation allows solar heating (long dimension is w/in 30 degrees of solar south) and reduces overheating potential of west-facing glass	7		
7	Two foot overhang, between one and two feet above south windows	6		
8	R-3.5 or better insulated exterior wall sheathing on 75% or more exterior wall area	6		Builder spec sheet
9	R-2.0 or better insulated exterior wall sheathing on 75% or more exterior wall area	4		
10	South glass area is between 5-7% of total finished floor area	5		
11	Raised heels of 6" or more on trusses to provide for full-height insulation over top wall plate	5		Builder spec sheet
12	Insulated headers, minimum R-10	5		Builder letter or spec sheet
13	Advanced sealing package in addition to basic sealing practices (advanced package adds sealing at top and bottom plates, attic penetrations, corners and between cavities at penetrations)	4		Field verification
14	Attic sealing package completed after installation of drywall and including sealing the drywall to top plate connection, fan and light housing, and the use of a weather-stripped attic hatch made of a heavier material such as MDF.	4		
15	Blower door test verifies 0.35 ACH or less (house-specific: see Guide for mechanical ventilation requirements at 0.35 ACH or less)	4		Infiltration test report
16	House is wrapped with an exterior air infiltration barrier to manufacturer's specifications	4		Builder spec sheet
17	Sill plate sealed with foam sill gasket	3		
18	Advanced sill-sealing package includes moisture barrier above and below sill in addition to standard foam air barrier	3		
19	Provide south roof area designed for future solar collector use (20° of south)	1		
III. ENERGY EFFICIENCY: MECHANICAL SYSTEMS				
20	Active solar heating system (solar fraction >20%)	12		Solar heat calculations
21	90% or higher energy efficiency furnace with sealed combustion air and modulating gas valve	11		
22	In-floor heating system installed per requirements listed in Guide to the Built Green Checklist	11		
23	90% or higher energy efficiency furnace with sealed combustion air	10		

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24	90% or higher efficiency boiler with sealed combustion air	8		
25	Air conditioner is SEER 12 or higher with R410A or other non-HCFC refrigerant	8		Field verification
26	No panned joist space or cavities used as return air; i.e. hard ducted return system is required	8		Spec sheet or field verification
27	Ground-source heat pump system, either radiant or air-ducted, for space heating and cooling	15		
28	House-specific verification of HVAC system commissioning including: review of heat load calculations, field inspection, duct leakage testing, combustion safety inspection, CAZ pressure test, AC charge, and HVAC flow inspection	7		Report
29	All ductwork joints and penetrations sealed with low toxic mastic or aerosolized sealant system	7		Spec sheet
30	Duct leakage is demonstrated to not exceed 10% of total system flow	8		Test results
31	Baseboard hot water heating installed per Manual J	7		Calculations
32	Ducts sized and installed in accordance with room-by-room loads calculations for sizing ductwork using manual D	6		Calculations
33	Electronically commutated motor on air handler/furnace	6		Field verification
34	HVAC equipment sizing calculations using Manual J or equivalent sizing method	6		Calculations
35	Furnace and/or boiler centrally located	5		
36	Whole house fan installed with seasonal cover and instructions provided to homeowner (see Guide to the Built Green Checklist for additional usage guidelines)	5		
37	Zoning utilizing two or more thermostats controlling separate heating and/or cooling zones from a single system, or zoning using two or more separate systems	5		
38	Transfer air grills or insulated jump-ducts in lieu of return-air ducts in every bedroom	4		
39	Multi-stage condensing unit if A/C is installed	4		Spec sheet
40	Any ducts outside conditioned space must be sealed with mastic and insulated to a minimum of R-8 (supply) or R-4 (return)	2		Field verification
41	Two properly supported ceiling fan pre-wires	1		
42	Programmable thermostat with "fan-only" switch	1		
IV. ENERGY EFFICIENCY: WATER HEATING				
43	Solar water heating system provides 50% or more of the home's hot water heating needs	12		Solar heating calcs.
44	Drain-line waste-water heat exchanger installed to capture heat from gray water	3		
45	Ground-source and waste heat recovery water heating	10		
46	Side arm water heater off of boiler	4		
47	Sealed-combustion tankless water heater with .82 EF or greater. Minimum flow of 6 GPM with 50-degree temperature rise	10		
48	Gas water heater with energy factor of 0.60 or greater	3		
49	Insulate hot water pipes to R-6 in unconditioned spaces	3		
50	Water heater within 20 pipe feet of dishwasher and clothes washer	3		

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51	Insulate all hot water lines to all locations with standard flexible pipe insulation or better	3		Spec sheet
52	Rough-in for future solar hot water heating	3		
53	Gas water heater with insulating blanket installed to manufacturer's specifications	2		
54	Insulate hot and cold water pipes 3 feet from the water heater	2		
V. ENERGY EFFICIENCY: APPLIANCES				
55	Solar electric system provides 20% or more of the home's electricity	15		Solar electric calculations
56	Dishwasher is an ENERGY STAR [®] labeled product	4		Label
57	Refrigerator is an ENERGY STAR [®] labeled product	4		Label
58	Gas clothes dryer with electronic ignition	3		
59	Gas cook top with electronic ignition	3		
60	Provide gas rough-in for clothes dryer and/or cook top when appliances not included	3		
61	If appliances are not included, a list of energy efficient appliances is provided to homebuyer	1		Copy of list
VI. ENERGY EFFICIENCY: LIGHTING				
62	Solar-powered walkway or outdoor area lighting	4		
63	10% of light fixtures are fluorescent or have compact fluorescent light bulbs installed	3		
64	Advanced Lighting and Automation Control System capable of unified automation control of lighting loads.	3		
65	No can lights in insulated ceiling	3		
66	Air tight, insulation contact-rated can lights are used	2		Product lit., invoice or field verification
67	Provide buyer the first year enrollment costs of 100% of electric power provided by WindSource	2		Builder letter
68	Light-colored interior walls, ceiling and soffits	1		
69	Light-colored carpet	1		
VII. MATERIALS: FOUNDATION				
70	Foam insulated reinforced structural concrete slab	7		Subcontractor letter
71	Rigid insulation forms that provide permanent insulation to the foundation (ICFs)	6		
72	Frost-protected shallow foundation	5		Spec sheet
73	Insulated foundation with rigid R-10 foam insulation from footer to top of wall	5		
74	Full height interior basement wall insulation, R-11 or higher	3		
75	Western coal fly ash concrete (minimum 15%, seasonal application)	2		Supplier letter
76	Recycled concrete or glass cullet for aggregate	2		Product data
77	Non-solvent based damp proofing	1		Product data
78	Aluminum foundation forms used	1		

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79	Recycled-content expansion joint filler	1		Product data
VIII. MATERIALS: STRUCTURAL FRAME				
80	Reinforced cementitious foam-formed walls (ICFs, or insulated concrete forms)	13		
81	Utilize fly ash concrete when temperature permits	2		
82	Structural insulated panels used for 75% or more of walls (spray-in polyurethane foam in framed walls meets this criteria as well when filling entire cavity)	7		
83	Structural insulated panels used for 75% or more of roof (spray-in polyurethane foam insulation system meets this criteria as well when filling entire cavity)	7		
84	Outdoor structures, decking and or landscaping materials with 50% or greater recycled content	7		
85	Engineered alternative wall systems as approved by local code	5		
86	Outdoor structures, decking and landscaping materials made from non-CCA pressure-treated engineered lumber or non-CCA (chromated copper arsenate) dimensional lumber	4		Product lit.
87	Outdoor structures, decking and or landscaping materials with 80% or greater recycled content	8		
88	Outdoor structures, decking and or landscaping materials with 90% or greater recycled content	9		
89	Dimensional or engineered lumber from third-party certified sustainably harvested sources used for floor framing	3		Certificate
90	Dimensional or engineered lumber from third-party certified sustainably harvested sources used for wall framing	3		Certificate
91	Dimensional or engineered lumber from third-party certified sustainably harvested sources used for roof framing	3		Certificate
92	Engineered alternative replaces large dimension solid lumber (2x10 or greater) in 90% or more of floor area (i.e. trusses, joists)	3		Spec sheet or field verification
93	Reduced framing package (i.e., 24" O.C. studs at interior non-bearing walls and 3-stud corners)	3		Builder letter or field verification
94	Engineered lumber products for beams	3		Spec sheet or field verification
95	Engineered alternative replaces large dimension solid lumber (2x10 or greater) in 90% or more of roof structure area (i.e. trusses, joists)	2		Spec sheet or field verification
96	Engineered lumber products for window or door headers	2		Spec sheet or field verification
97	Finger-jointed plate material	2		Spec sheet or field verification
98	Engineered plate material	2		Spec sheet or field verification
99	Finger-jointed studs for 90% of stud wall framing	2		Spec sheet or field verification
100	Engineered stud material for 10% of stud wall framing	2		Spec sheet or field verification
101	Recycled and/or recovered content gypsum wallboard	2		Invoice
102	Outdoor structures, decking and landscaping materials made from third-party certified sustainably harvested lumber	1		Certificate

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103	Recycled content sheathing (minimum 50% pre or post consumer)	1		Product data
IX. MATERIALS: SUB-FLOOR				
104	Zero formaldehyde OSB (PMDI binder only) used in subfloor	4		Product data
105	Natural cork or 100% recycled or recovered content underlayment (no Lauan)	3		Product data
106	No Lauan underlayment used	2		Supplier letter
107	Oriented strand board (OSB) made from fast growth material	1		
X. MATERIALS: WINDOWS				
108	Low-e windows NFRC rated at u=0.37 or lower comprise 75% or more of total window area	6		NFRC certificate/label
109	Window frames made from third-party certified sustainably harvested wood	2		
110	Strategies to reduce heat gain and/or heat loss, such as exterior-mounted sunscreens, operable insulated window coverings, operable awnings, or other architectural elements to reduce heat gain	5		
111	No metal-frame windows in house, including basements	2		
XI. MATERIALS: DOORS				
112	Exterior doors (includes door to garage) insulated to R-5, or greater	3		
113	No Lauan doors (tropical hardwood)	2		Supplier letter
114	Recycled and/or recovered content doors	2		Product data
115	Doors made from third-party certified sustainably harvested wood	1		Certificate
XII. MATERIALS: INSULATION				
116	Home has blown wall insulation such as cellulose, fiberglass, non-toxic spray foam or rock wool.	6		Spec Sheet
117	Recycled-content (minimum 75%) insulation	2		Product data
118	Insulation is certified by a third party to contain at least 25% recycled content	1		Product data
119	HCFC-free rigid foam insulation	1		Product data
XIII. MATERIALS: EXTERIOR WALL FINISHES				
120	Indigenous stone on 50% or more of exterior wall area	8		
121	Brick on 50% or more of exterior wall area	7		
122	Natural or synthetic stucco (EIFS), with drainage plane, on 50% or more of exterior wall area	4		Installation spec sheet
123	Fiber cement fascia and soffits	2		
124	Molded cementitious "stone" on 50% or more of exterior wall area	3		
125	Wood siding is 100% from third-party certified sustainably harvested sources, 50% or more of exterior wall area	2		Certificate
126	Fiber cement siding on 50% or more of exterior wall area	3		
127	Install window and door flashing per diagrams in the Guide	2		Spec sheet
128	Recycled and/or recovered-content siding (minimum 50% pre- or post-consumer) on 50% or more of exterior wall area	1		Product data

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129	Recycled and/or recovered-content fascia, soffits or trim (minimum 50% pre- or post-consumer)	1		Product data
130	Brick is regionally produced	1		
XIV. MATERIALS: ROOF				
131	Minimum 30-year roofing material, including concrete, slate, clay or metal	8		Spec Sheet
132	Recycled-content roofing material	3		Spec Sheet
133	Self-adhering roof underlayment on eaves, valleys, and roof penetrations	4		
134	Self-adhering roof underlayment on entire roof	6		
135	Minimum 30-year roofing material including composition or fiberglass	3		Spec Sheet
XV. MATERIALS: FINISH FLOOR				
136	Natural fiber carpet made with natural latex rather than SB latex backing	6		Spec Sheet
137	Domestic wood flooring from reused/recovered or re-milled sources	6		Spec Sheet
138	Natural linoleum in place of any vinyl sheet flooring or vinyl composition tile, with low toxic adhesives or backing	4		
139	Wood flooring made from third-party certified sustainably harvested sources	3		Certificate
140	Ceramic tile installed with low toxic adhesives and plasticizer-free grout	3		MSDS
141	Bamboo or cork flooring in place of hardwood	3		
142	Natural or recycled-content carpet pad made from textile, carpet, carpet cushion or tire waste (rebond still qualifies)	2		
143	25% - 100% recycled-content carpet, tacked not glued	2		Product data
144	Ceramic tile is 50% or more recycled-content	2		Product data
XVI. MATERIALS: CABINETS AND TRIM				
145	100% agricultural waste or 100% recycled wood particleboard/MDF for cabinets	6		Product data
146	100% agricultural waste or 100% recycled wood particleboard/MDF for shelving/countertops	5		Product data
147	Solid hardwood trim from third-party certified sustainably harvested sources	2		Certificate
148	Cabinet fronts made from 100% reclaimed wood or 100% re-milled wood	6		
149	Finger-jointed and/or MDF trim	1		
XVII. HEALTH AND SAFETY: INDOOR AIR QUALITY				
150	House meets American Lung Association Health House standards	13		Certificate
151	Heat/Energy recovery ventilator or air-to-air heat exchanger	9		Spec sheet
152	Power-direct vent/draft-induced domestic water heater	6		
153	Install a whole house HEPA filter	6		
154	Sealed-combustion solid fuel burning stove with outside combustion air	5		

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155	Active or passive radon mitigation installed to EPA guidelines	5		Subcontractor letter
156	Cabinet finishes done with least toxic finishes	4		MSDS
157	Sealed-combustion gas fireplace or sealed wood-burning fireplace or stove with outside combustion air	4		
158	Exhaust fan in garage on timer or wired to door opener	4		
159	For other than furnace with sealed combustion air and power vented/draft induced water heater, mechanical room is enclosed, sealed, and insulated to R-11	4		
160	Install a MERV 9 or higher air filter specified for low-pressure residential use and compatible with air handler	4		Product literature
161	Zero formaldehyde particle board/MDF used for cabinets	4		MSDS
162	Zero formaldehyde particle board/MDF used for shelving/countertops	3		MSDS
163	Zero formaldehyde OSB (PMDI binder only) sheathing	3		MSDS
164	Only low toxicity, solvent free adhesives used throughout. Standard is less than 150 grams/liter of VOCs	3		MSDS
165	Water-based urethane finishes on wood floors	3		Product data
166	Water-based lacquer finishes on woodwork	3		Product data
167	Provide range hood vented to outside	3		
168	Garage detached from all living areas. As an alternative, attached garage is isolated from house by extensive air-sealing, with pressure diagnostic at 45 Pa or greater, verified by testing, house specific; see Guide	2		Field Verification or Test results
169	Install hardwired carbon monoxide detector outside main sleeping areas	2		
170	Central Vacuum installed rated at 500 air watts or greater and including an electric motor-driven floor brush	6		
171	UV Light installed in supply duct system above A/C coil	3		
172	All surfaces of any particle board is painted with water-based sealer (Guide will specify inside cabinets, underside of countertops, shelving, top and bottom of stair treads)	2		MSDS on sealer, builder letter
173	Insulation used throughout house contains no formaldehyde binders	1		MSDS
174	Paints and finishes that have minimal VOC content. Standard is less than 250 grams/liter of VOCs	1		MSDS
XVIII. HEALTH AND SAFETY: MOISTURE MANAGEMENT				
175	Drainage Plane. Full exterior drainage plane integrated with proper flashing of all windows, doors and other exterior penetrations (Requires item #121, 2 points. If drainage plane is also air barrier, #14, additional 4 points. See Guide to the Built Green Checklist for detailed information and diagrams.	2		Spec sheet or field verification
176	Downspout Extensions. Downspouts discharge at least 5 feet away from foundation, measured perpendicular to the foundation wall; landscaping edging does not interfere with discharge; tip-up hooks are removed prior to closing.	2		Field verification
177	Place a continuously sealed ground cover on all dirt floors (minimum 10-mil) in crawl spaces or below-grade under-floor spaces.	2		Field verification
IXX. RESOURCE CONSERVATION: LAND USE				
179	Trees and natural features on site protected during construction	6		

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180	Save and reuse all site topsoil where determined valuable by soil analysis	4		
XX. RESOURCE CONSERVATION: MATERIALS REDUCTION				
181	House does not exceed 2000 square feet of conditioned area (excluding crawl space)	6		
182	Add to points above if house does not exceed 1500 square feet of conditioned area (excluding crawl space)	3		
XXI. RESOURCE CONSERVATION: MATERIALS RE-USE				
183	Specify salvaged, reclaimed or refurbished materials for 10% of structural materials	5		Invoice
184	Specify salvaged, reclaimed or refurbished materials for 10% of finish materials	5		Invoice
185	Specify salvaged, reclaimed or refurbished materials for 5% of structural materials	3		Invoice
186	Specify salvaged, reclaimed or refurbished materials for 5% of finish materials	3		Invoice
187	Paints or finishes with recycled-content	1		Product data
XXII. RESOURCE CONSERVATION: WASTE REDUCTION AND RECYCLING				
188	Minimize job site waste by using materials wisely and prohibit burying construction waste; recycle job site waste (>50%)	6		Builder letter
189	Built-in recycling center with two or more bins	3		
XXIII. RESOURCE CONSERVATION: WATER				
190	Clothes washer is an ENERGY STAR [®] labeled product	7		Label
191	On-demand hot water delivery system installed at farthest location from water heater	4		
192	Bathroom faucets fitted with aerator restricting flow to 1.8 gpm	1		
193	Kitchen faucet fitted with aerator restricting flow to 2.0 gpm	1		
194	Dual-flush toilet averaging 1.1 gpf installed in one bathroom (add two additional points for each additional installed)	2		Spec sheet
195	Showerheads installed are low-flow (<2.5 gpm); alternative is a "venturi"-type valve. 1 point awarded for each unit.	1		Spec sheet
196	Installed irrigation system includes a soil moisture or rain sensor, or other irrigation efficiency device (examples in Guide to the Built Green Checklist)	3		Landscaper's Letter
197	Install at least three cubic yards of soil amendment per 1000 square feet of installed landscape area, based on soil analysis	4		Invoice
198	Installed irrigation system is zoned separately for turf and bedding areas, and meets low-volume, non-spray irrigation standards, which includes bubblers and drip emitters, drip irrigation, soaker hose and subsurface irrigation. Does not include micro-spray irrigation	3		
199	Less than 50% of installed landscape is cool season turf grass (fescue or bluegrass); remaining landscape area either dedicated to water-wise planting beds or to outdoor living environments.	3		Invoice or product data
200	Principles of Xeriscape are applied to non-turf areas of landscaping. See http://www.water.denver.co.gov/xeriscapeinfo/xeriscapeframe.html for details.	3		Product data or landscapers letter
201	Water heater is placed within 25 pipe feet of master bedroom	3		

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202	Areas planted with turf should not exceed a maximum slope of 25%.	3		
203	Installed bedding areas are mulched to a depth of 3"	3		
204	Permeable materials comprise 40% of areas for all walkways, patios and driveways	2		Product data
205	Recycled-content mulch or compost	1		Invoice
206	Rainwater harvested and directed toward landscaping needs where practical	1		Product data
207	Provide a list of drought tolerant plants to homebuyers, and add an additional point if builder incorporates water-wise landscaping on model	1		Copy of list & field verification
208	Provide homebuyers with at least 3 sample water-wise landscaping and irrigation sketch plans (when landscaping is not installed)	2		Copies
	70 POINTS MINIMUM REQUIRED. Enter your point total here.			



Checklist Appendix A, regarding Chapter 5 of the IECC 2000

ENVELOPE AND MECHANICAL: Requirements can be determined utilizing RESCheck software (free at <http://www.energycodes.gov/>).

Additional items included in Chapter 5 are:

ON GRADE: A **continuous vapor retarder** (1 perm or less) is required over exposed earth in crawl spaces. **Heated slabs** require an extra R-2 level of insulation.

ENVELOPE TIGHTNESS: All joints, seams, penetrations, rough openings, and other sources of air leakage through the building envelope must be caulked, gasketed, weather-stripped, wrapped or otherwise **sealed to limit uncontrolled air movement**.

Air sealing is also required around the following items where they are adjacent to or part of the insulated building shell:

- around tubs and showers;
- attic and crawl space panels;
- at recessed lights (e.g., trim gaskets); and
- around all electrical and plumbing penetrations, plus any of these openings between conditioned and unconditioned spaces (e.g., garages and crawl spaces).

WINDOWS/DOORS: **Doors** to unconditioned space or to the exterior must have a maximum U-value of 0.35. Wood doors won't qualify, except that one opaque door can be exempted from this requirement. Maximum allowable **air leakage for windows and/or slider doors** is 0.3 cfm per ft² of window area (0.5 cfm/ft² for swinging doors). Note: the air leakage factor is noted on the NFRC energy performance label found on nearly all windows today.

CAN LIGHTING: **Recessed lights in insulated ceilings** must be either a) air-tight, IC-rated cans, b) the cans must be located inside a sealed, airtight box in the attic, or c) the cans must not leak more than 2 cfm under test pressure (75 Pascals).

MECHANICAL: **HVAC equipment** must be sized according to calculations (ACCA's *Manual J*, 8th edition, is allowed). **Pipe insulation** is required on hydronic heating systems--typically 1-inch material rated at R-4/inch.

DUCTS: **Required duct insulation: R-5** when located in exterior walls, cantilevers, garage ceilings and common walls, vented crawl spaces, etc.

Duct sealing is required on all longitudinal and transverse joints, seams and connections of supply and return ducts. Ducts need to be "securely fastened": screw metal together and strap-and-mastic flex-ducts to takeoffs. All ducts must be sealed with "welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems or tapes installed in accordance with the manufacturer's instructions." The strong recommendation from equipment manufacturers, Built Green and E-Star is use of either mastic or foil-backed butyl tape.

Approved duct sealants: "Tapes and mastics used with rigid fibrous glass ducts shall be listed and labeled in accordance with UL 181A. Tapes and mastics used with flexible air ducts shall be listed and labeled in accordance with UL 181B. [Gray or other colored] 'Duct tape' is not permitted as a sealant on any ducts." For metal ducts, equipment manufacturers, Built Green and E-Star recommend mastic or foil-backed butyl tape.

WATER HEATING: **Water heaters** require some type of heat trap—either external or integral—on both the hot and cold water lines, and must have an EF of .62.

Constant recirculation hot-water systems require ½-inch pipe insulation on the circulation supply loop.