

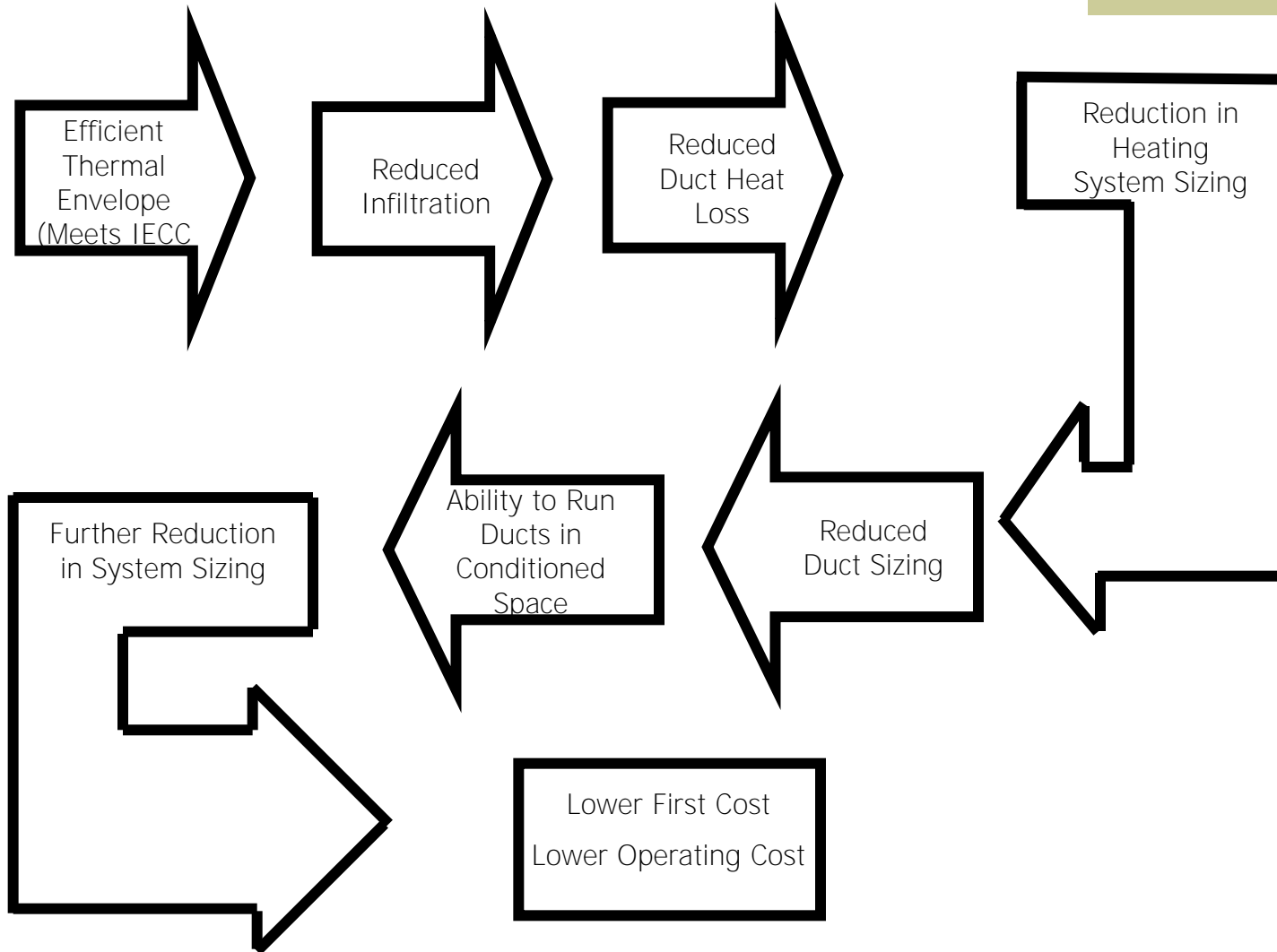
Above Code Residential Building Programs

Eric Makela, Britt/Makela Group

Residential Programs

- Create more Comfortable Homes
- Reduce Operating and Maintenance Costs
- Contribute to a *More Vibrant/Active Community*
 - Live
 - Walk
 - Work and Shop
- Reduce Carbon Emissions through
 - Community Energy Conservation
 - Building Energy Conservation
 - Waste Reduction

Complying with the IECC at the Lowest First Cost



Reduced Framing Case Study

- Pulte Homes, Tracy, California

- Home Specification

- Conditioned Floor Area: 2,495 ft²

- Total Floor Area: 2,910 ft²

- Length of Exterior Wall: 252 lf

- Length of Interior Wall: 340 lf

- Source: *“Using Wood Efficiently: From Optimizing Design to Minimizing the Dumpster”* Building Science Corporation, 2002.

Reduced Framing Case Study

■ Estimated Framing Savings

WOOD FRAME WALL SUMMARY			
Assembly	2" x 4"	2" x 6"	Reduced by
8' Studs	1,403	665	-735 (52%)
Board Feet	5,186	3,082	-2,104 (40%)
Cost	\$2,749	\$1,632	-\$1,117 (40%)

Reduced Framing Case Study

■ Other Benefits for Reduced Framing

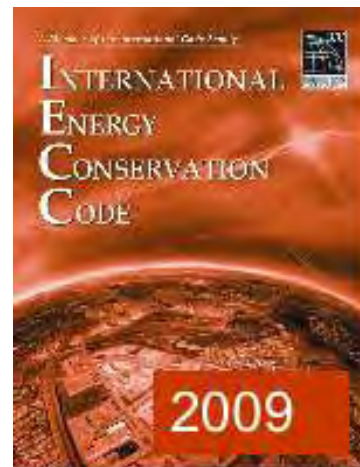
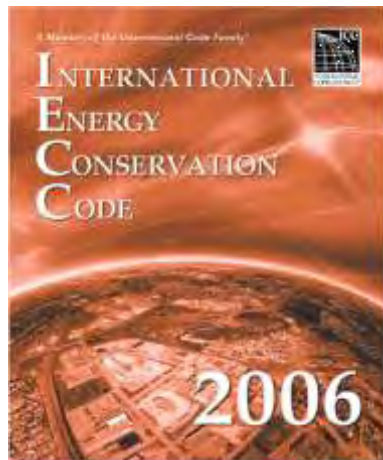
ENERGY COST REDUCTION						
Energy Loads	2" x 4"		2" x 6"		Savings	
	Loads (kBtuh)	Estimated Cost (\$/Year)	Loads (kBtuh)	Estimated Cost (\$/Month)	Loads (kBtuh)	Estimated Cost (\$/Year)
Heating	45.2	\$332.00	28.0	\$231	17.2(38%)	\$101.00
Cooling	45.6	\$671.00	26.0	\$479	19.6(43%)	\$192.00
Total Savings						\$293.00



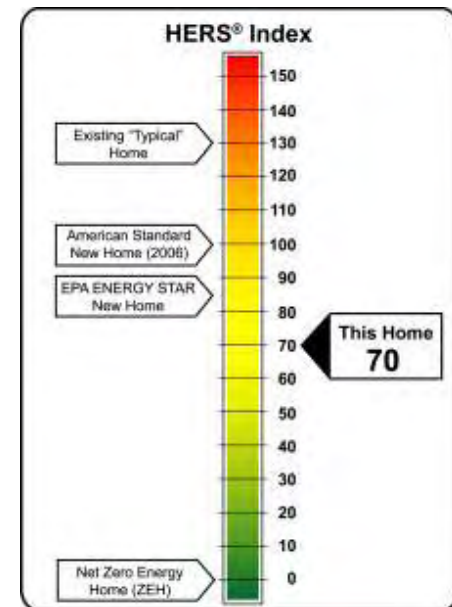
Program Elements

- Building Size
- Site Selection
- Landscaping
- Water Conservation
- Energy Conservation
- Materials and Resources
- Indoor Environmental Quality
- Operation, Maintenance and Owner Education

Energy Conservation – Building Structure



- Percent above the IECC
- Energy Star
- HERS Index



Size

Site

Lndscp

Water

Energy

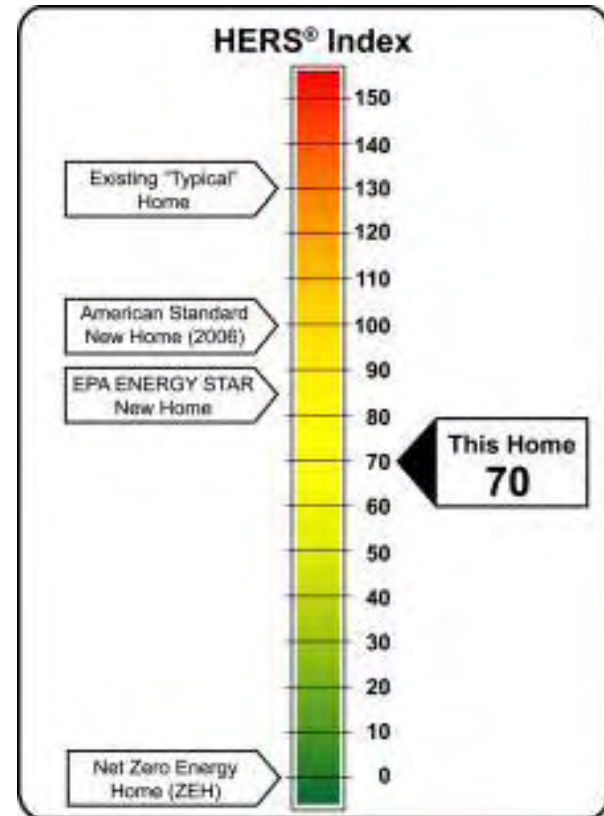
MatRes

EQ

OM

Energy Conservation – Building Structure

- Benefits of a HERS Index
 - Comprehensive
 - Verifiable
 - Flexible by House Size
 - Tied to the IECC



Size

Site

Lndscp

Water

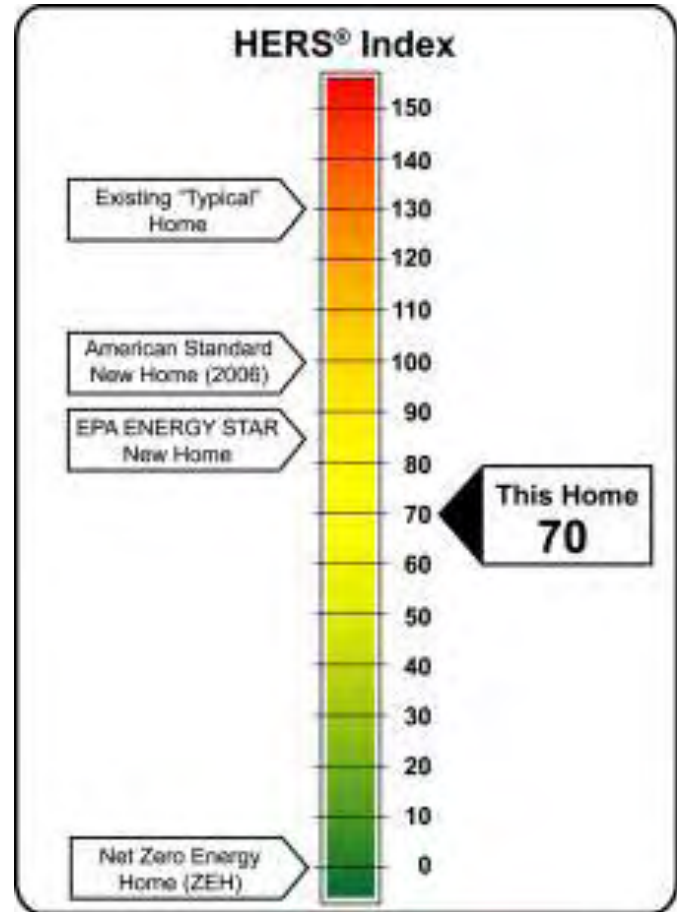
Energy

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EQ

OM

HERS Index – Adjust for house size



Size

Site

Lndscp

Water

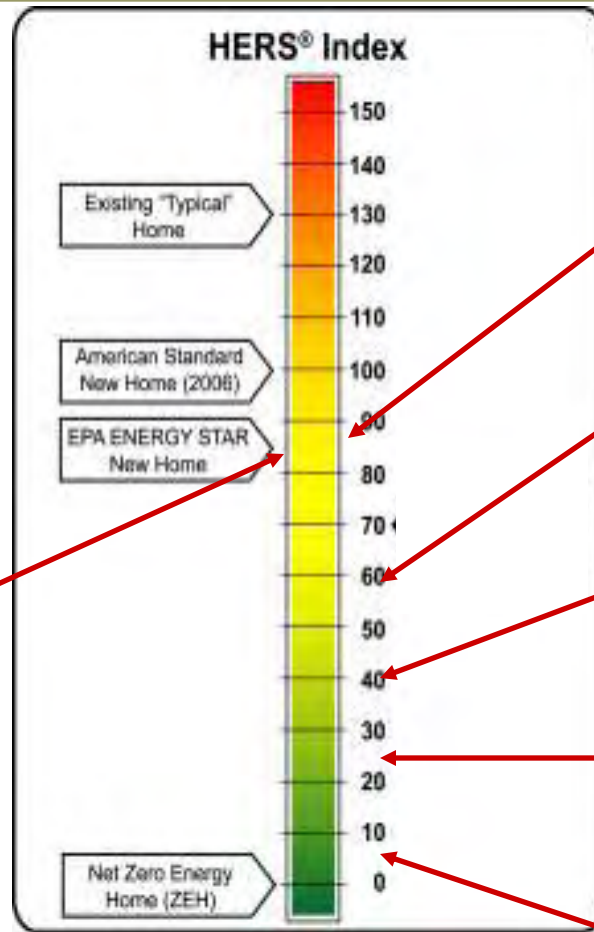
Energy

MatRes

EQ

OM

HERS Index – Energy Star



Boulder County, Co

- <1000 ft² HERS index of 85
- 1001- 3000 ft² HERS index of 60
- 3001-4000 ft² HERS index of 40
- 4001-5000 ft² HERS index of 25
- >5001 ft² HERS index of <10

Size

Site

Lndscp

Water

Energy

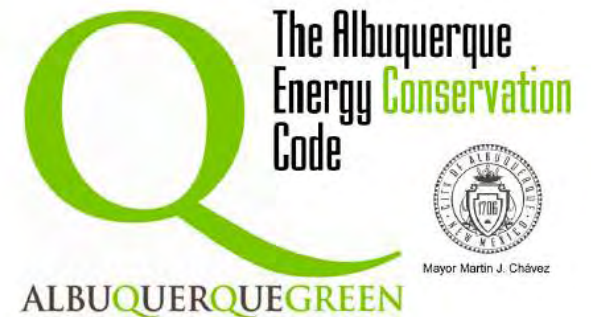
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EQ

OM

Albuquerque, NM – Two Programs

- Mandatory Energy Conservation Code
- Voluntary Green Path



VOLUME II
ONE - AND TWO - FAMILY
DETACHED DWELLINGS
AND TOWNHOUSES

Size

Site

Lndscp

Water

Energy

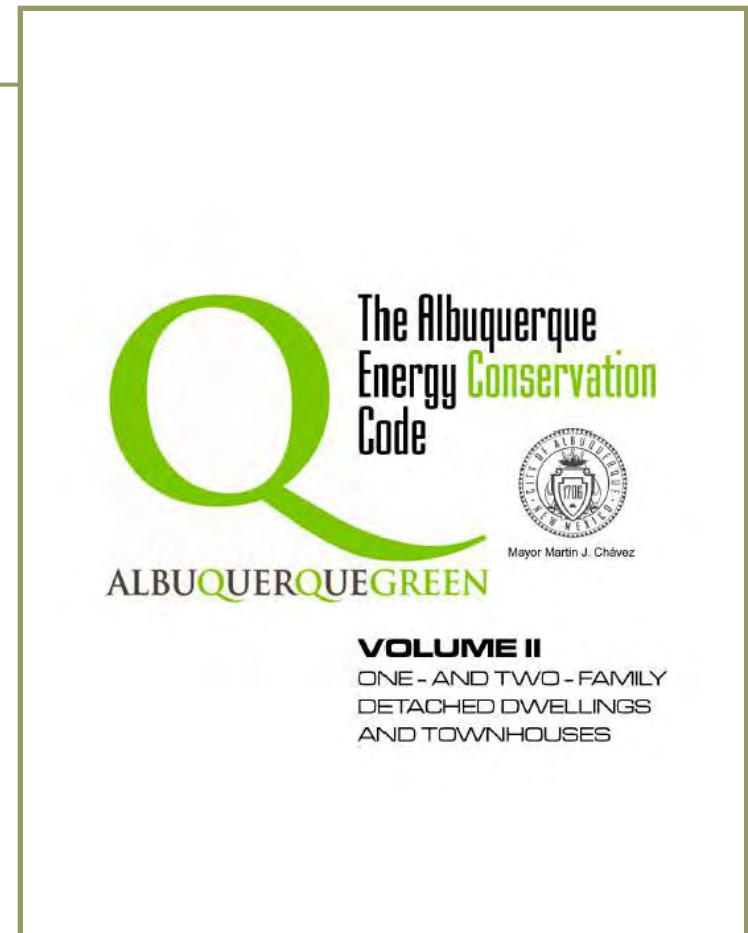
MatRes

EQ

OM

Albuquerque Mandatory (On-Hold)

- Compliance with the 2006 IECC with the following amendments:
 - Cool roofs required
 - Low-E required on North, East and West facing fenestration
 - R-19 required in walls
 - R-21 required in raised floors
 - Reduced slab-edge insulation to R-5 for unheated slabs but requires R-10 insulation to be installed under heated slab
 - Minimum 90% gas furnace efficiency
 - Minimum 15 SEER A/C efficiency
 - Minimum 8.2 HSPF Heat Pump efficiency
 - Ventilating fans required to be Energy Star Labeled
 - HVAC piping to be insulated to an R-4 \leq 2" and R-6 $>$ 2" in diameter
 - Limits use of electric resistant space and water heat
 - Increases EF requirement for water heating from current NAECA minimum
 - Energy Star labeled light fixtures for 70% of interior lighting
 - Energy Star labeled appliances when provided.
 - Thermal By-pass Checklist required



Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

National Appliance Energy Conservation Act (NAECA)



- Preempts Requiring Higher Efficiency Levels than the Federal Minimum for:
 - Heating systems
 - Cooling systems
 - Domestic water heaters
 - Several appliances
- Santa Fe and Albuquerque

Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

National Appliance Energy Conservation Act (NAECA)



- Options for Circumventing NAECA
 - Only require for voluntary programs
 - Provide optional compliance packages
 - Provide trade-off approaches

Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

Albuquerque, NM – Based on LEED

■ Voluntary

- Achieve Gold, or
- Achieve Silver with 21.5 points in Energy, or
- Build Green New Mexico Gold



Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

LEED for Homes

2006 IECC ANNUAL ENERGY COST COMPLIANCE			
Building Name:	Sample	Date:	January 18, 2008
Owner's Name:		Builder's Name:	
Property Address:		Weather Site:	Bole, ID
		File Name:	Sample 2 story 2700 sf.rtg
		Annual Energy Cost	
		2006 IECC	As Designed
Heating:		358	368
Cooling:		138	130
Water Heating:		131	124
Lights & Appliances:		524	524
Photovoltaic:		-0	-0
Service Charge:		-120	-120
Total:		1273	1266 *
Duct Insulation R-Value Check (per Section 403.2.1*)			
Minimum Duct Insulation (Design must be higher)		8.0	8.0
Window U-Value Check (per Section 403.6)			
Window U-Value (Design must be less)		0.480	0.340
<p>This home MEETS the annual energy cost requirements in accordance with Section 403 of the 2006 International Energy Conservation Code based on a climate zone of 5B.</p> <p>* Design energy cost is based on the following systems: Heating: Fuel-fired at distribution, 45.0 AFUE, 52.0 AFUE Cooling: Air conditioner, 36.0 SEER, 13.0 EER Water Heating: Conventional, Class 0.83 EF Windows: NFRC Area Ratio 0.10 Blower door test: 11q, 0.0004 Cf; 0.0004 SLA</p>			

- Energy and Atmosphere Option 1 (Performance)
- Optimize Energy Performance
 - Water Heating
 - Residential Refrigerant Management

Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

LEED for Homes

- Energy and Atmosphere Option 2 (Prescriptive)
 - Insulation Quality
 - Air Infiltration
 - Windows
 - Space Heating and Cooling Equipment
 - Water Heating
 - Lighting
 - Appliances
 - Renewable Energy
 - Residential Refrigerant Management



Size

Site

Lndscp

Water

Energy

MatRes

EQ

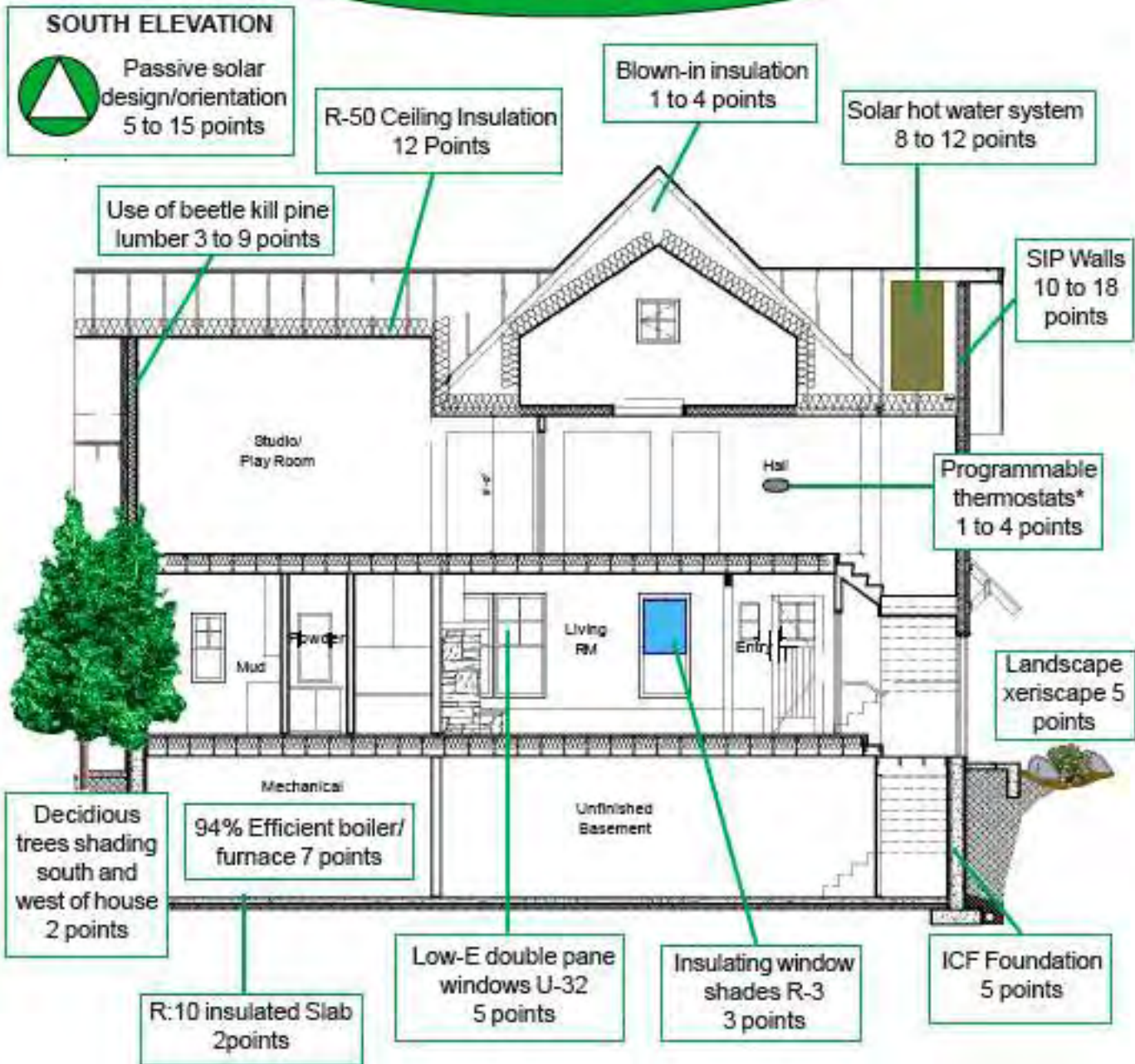
OM

Sample Residential Programs



Size	Site	Lndscp	Water	Energy	MatRes	EQ	OM
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Example of Earned Points in an ECObuild Home



Size

OM

ECOBUILD Checklist

			4.0	ENERGY
5		1-4	4.1	Programmable thermostats (1 pt per quantity level)
5		2	4.2	Thermostats in each habitable room (excluding bathrooms, utility rooms, etc.)
5		5	4.3	HERS rated house with a score of 80 or less
5		2	4.4	Blower door test only—must show ACH 0.40 or less
5		1-7	4.5	88% efficient boiler and/or furnace: 1 pt plus 1 pt for each add'l % AFUE rating
5		3	4.6	Tankless on-demand water heater(s)
5		1-4	4.7	Energy Star® appliances (1 pt for each appliance)
5		2	4.8	Exterior lighting minimized (5500 lumens or less)
5		2	4.9	Efficient interior lighting (CFLs, T8/T5, LED or equivalent for over 50% of structure)
5		1-4	4.10	Motion detecting light switches (1 pt for each installed interior or exterior, up to 4 pts)
5		1	4.11	Ceiling fans/air de-stratification system in common rooms
5		4	4.12	No mechanical air conditioning
5		2	4.13	Installation of whole-house fan natural cooling/ventilation system
5		2	4.14	Radiant floor and/or hydronic baseboard heat (≥ 50% of heating system)
5		2	4.15	Air to air heat exchanger
3		1-15	4.16	Roof/ceiling insulation: 1 pt for each R value over 38
3		1-8	4.17	Wall insulation: 1 pt for each R value over 19 up to 8 pts
3		1-3	4.18	Slab insulation: R-5: 1 pt R-8: 2 pts R-12: 3 pts
3		1-3	4.19	Crawl Space/basement insulation: R-10: 1 pt R-15: 2 pts R-19+: 3 pts
3		1-4	4.20	Blown or sprayed insulation (1 pt per QL)
3		1	4.21	Insulate all hot water pipes at all locations R-2.5 or higher
5		1	4.22	Water heater(s) wrapped with R-5 or above
5		2-8	4.23	Double-pane windows with low-e glaze, 2 pts plus 1 pt for each .05 below U-.50 (U-.30 = 6 pts)
5		3	4.24	Insulating window shades installed (≥ 75% of all exterior windows R-3 or higher)
3		1-2	4.25	No ductwork in unconditioned space (2 points) or insulated to R-5 in unconditioned space (1pt)
		94		Subtotal

Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

ECOBUILD

5.0 RENEWABLE ENERGY			
PC	5-15	5.1	Passive solar design (see guidelines)
5	8-12	5.2	Solar hot water system for domestic hot water (8 pts) plus space heat (4 additional pts)
5	2	5.3	Solar hot water plumbing rough-in only
5	3-50	5.4	Solar PV, wind, and/or micro-hydro system on-site 3 pts for every .5 kW supplied
5	5-20	5.5	Ground source heat pump system (5 pts per quantity level)
5	2	5.6	Pellet stove (rated for 2.0 grams per hour of particulate or less)
5	2-8	5.7	5-year commitment of wind energy from Holy Cross Energy or Xcel Energy, 2 pts/QL
	109		Subtotal

Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

Albuquerque, NM – Based on LEED

- Voluntary
 - Achieve Gold, or
 - Achieve Silver with 21.5 points in Energy, or
 - Build Green New Mexico Gold



Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

Program Element – Building Size



Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

Program Element – Building Size

Boulder, County: House size adjusts minimum energy efficiency

■ New Construction

- <1000 ft² HERS index of 85
- 1001-3000 ft² HERS index of 60
- 3001-4000 ft² HERS index of 40
- 4001-5000 ft² HERS index of 25

Size

Site

Lndscp

Water

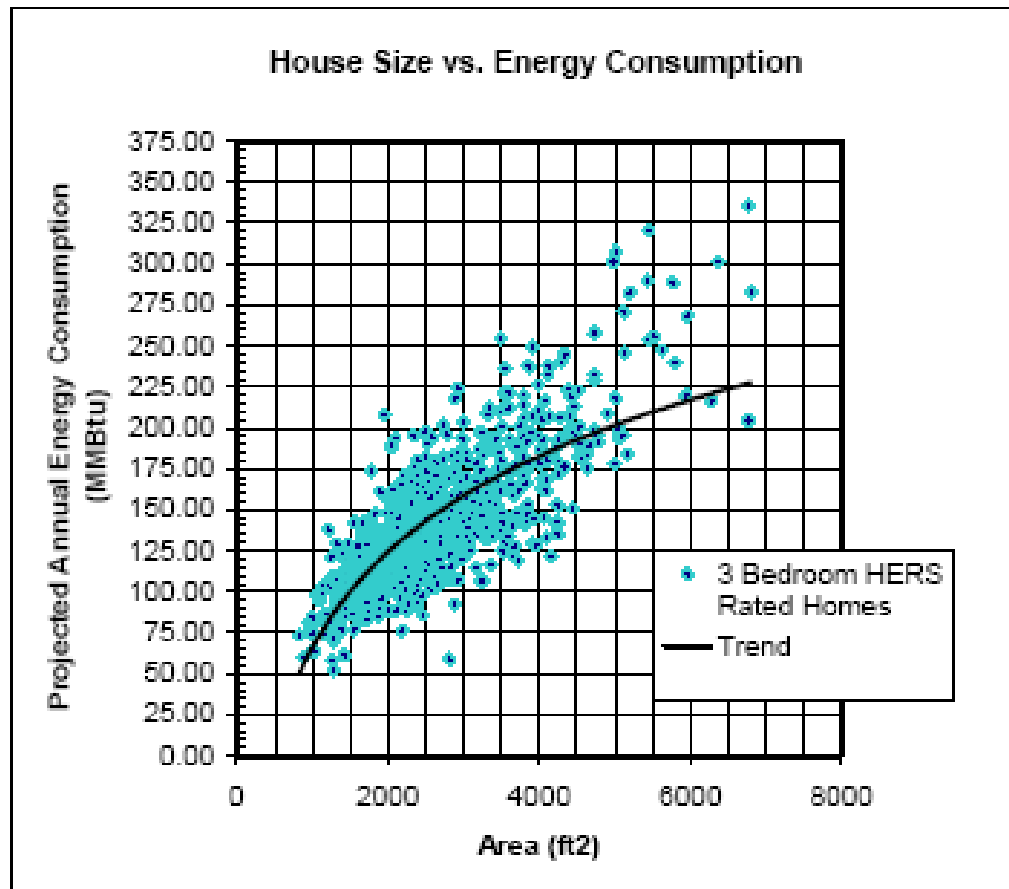
Energy

MatRes

EQ

OM

Size Matters, A lot



Michael Horowitz, *Size Matters*, 007

Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

Size Matter, A lot

Component	Pittsburgh PA					Charleston SC				
	House Size					House Size				
	912 sf	1537 sf	1922 sf	4060 sf	5564 sf	912 sf	1537 sf	1922 sf	4060 sf	5564 sf
Walls	R-19 +R-5	R-19 +R-5	R-19+R-5	R-13+R-4	R-13	R-19 +R-0	R-19 +R-0	R-19 +R-0	R-19 +R-0	R-19 +R-0
Ceilings	R-38	R-38	R-38	R-38	R-30	R-38	R-38	R-38	R-38	R-38
Windows & Glass	U - 0.32	U - 0.32	U - 0.32	U - 0.38	U - 0.41	U - 0.38	U - 0.38	U - 0.38	U - 0.55	U - 0.71
Doors	SHGC 0.34	SHGC 0.34	SHGC 0.34	SHGC 0.34	SHGC 0.55	SHGC 0.39	SHGC 0.39	SHGC 0.39	SHGC 0.61	SHGC 0.88
Doors	R-2.2	R-2.2	R-2.2	R-2.2	R-2.2	2.2	2.2	2.2	2.2	2.2
Basement walls above grade	R-11	R-11	R-11	R-11	R-11	R-11	R-11	R-11	R-11	R-11
Basement walls below grade	R-11	R-11	R-14	R-11	R-11	R-11	R-11	R-11	R-11	R-11
Duct location	Inside envelope	Inside envelope	Inside envelope	Inside envelope	Inside envelope	Inside envelope	Inside envelope	Inside envelope	Inside envelope	Inside envelope
Heating efficiency (AFUE)	93%	96%	93%	80%	80%	80%	80%	80%	80%	80%
Domestic water heating efficiency	40 gal, 0.56 EF	40 gal, 0.56 EF	40 gal, 0.56 EF	40 gal, 0.56 EF	40 gal, 0.56 EF	40 gal, 0.56 EF	40 gal, 0.56 EF	40 gal, 0.56 EF	40 gal, 0.56 EF	40 gal, 0.56 EF
Air tightness	.2 ACH Nat	.2 ACH Nat	.2 ACH Nat	.2 ACH Nat	.2 ACH Nat	0.28	0.28	0.28	0.28	0.43
Air conditioning SEER	10	12	10	10	10	10	10	10	10	10
Floors over unconditioned space	N/A	N/A	N/A	19	N/A	N/A	N/A	N/A	19	N/A
HERS Score	85.7	85.7	85.9	85.9	86.0	85.8	85.5	86.0	86.1	86.0

Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

ECOBUILD

POINT REQUIREMENTS			
Dwelling units:			
0-2000	square feet of floor area would need to meet		40 points or more
2001-3000	square feet of floor area would need to meet		45 points or more
3001-4000	square feet of floor area would need to meet		50 points or more
4001-5000	square feet of floor area would need to meet		60 points or more
5001-6000	square feet of floor area would need to meet		70 points or more
6001-7000	square feet of floor area would need to meet		80 points or more
7001-8000	square feet of floor area would need to meet		90 points or more
8001+	square feet of floor area would need to meet		100 points or more
OR, pay cash-in-lieu of points short x floor area x \$10 divided by required points.			
Dwelling units meeting the following points will receive a 25% building permit rebate, not to exceed \$5000:			
0-2000	square feet of floor area would need to meet		60 points or more
2001-3000	square feet of floor area would need to meet		70 points or more
3001-4000	square feet of floor area would need to meet		80 points or more
4001-5000	square feet of floor area would need to meet		90 points or more
5001-6000	square feet of floor area would need to meet		100 points or more
6001-7000	square feet of floor area would need to meet		110 points or more
7001-8000	square feet of floor area would need to meet		120 points or more
8001+	square feet of floor area would need to meet		130 points or more
Exterior uses of energy (fees based on energy consumption calculations):			
Snowmelt over 200 ft ² :	\$16 per ft ²	<i>Exterior fees exempted if on-site renewable energy installed to meet 50% or more of energy for exterior item(s).</i>	
Spa/Hot Tub over 64 ft ² :	\$176 per ft ²		
Year-round exterior pool:	\$136 per ft ²	<i>Any rebates from building permits can be credited accordingly.</i>	
= TOTAL FEES/CREDITS			

Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

Site Selection

- Options include
 - Avoid environmentally sensitive areas
 - Select infill site
 - Select greyfield site
 - Select brownfield site
 - Select site with access to public transportation and bike paths



Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

LEED for Homes



Location and Linkages

- Site Selection
- Preferred Locations
- Infrastructure
- Community Resources
- Access to Open Space

Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

Site Development and Landscaping

From Buckeye, AZ - Both
Mandatory Requirements and
Options to Select

- Mandatory

- Protect east, west and southern entrances from southern sun
- 80% landscaping is xeriscaping

- Options include

- Permeable hardscape
- Solar orientation
- Shaded outdoor living area



Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

Site Selection and Landscaping

Eagle County adds other options:

- Residential option include
 - Minimize area of impact
 - Reuse fill
 - Reduce irrigated turf, use drip where appropriate
 - Water efficient landscaping
 - Deciduous trees shading

Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

LEED for Homes



Sustainable Sites

- Site Stewardship
- Landscaping
- Local Heat Island Effects
- Surface Water Management
- Nontoxic Pest Control
- Compact Development

Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

ECOBUILD

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Size	Site	Lndscp	Water	Energy	MatRes	EQ	OM
------	------	--------	--------------	--------	--------	----	----

LEED for Homes



- Water Efficiency
 - Water Reuse
 - Irrigation
 - Indoor Water Use

Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

Water Conservation - Indoors

- National Program, or Home Grown?



Size

Site

Lndscp

Water

Energy

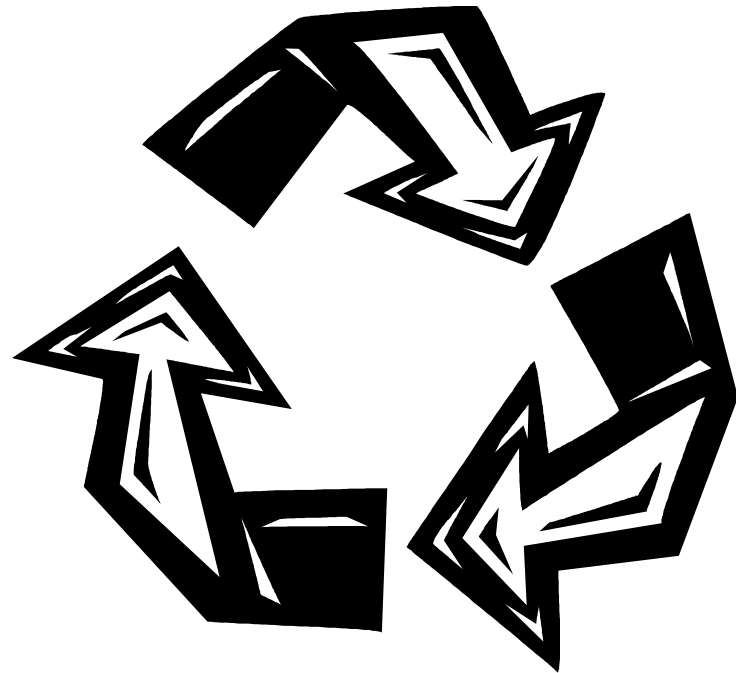
MatRes

EQ

OM

Materials and Resources.

- Reduce
- Reuse
- Recycle



Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

ECOBUILD

		AV	Subtotal
			2.0 RECYCLING AND REUSE
		3-9	2.1 Use of beetle kill pine salvaged wood
5		1-6	2.2 Surplus building materials donated (1 pt per trailer load) to RECON, Habitat Outlet, etc.
4		2-6	2.3 Wood, metal scrap, cardboard recycled (2 points per material recycled)
4		2-8	2.4 Reclaimed a/o recycled content materials used (2 pts per material used in over 50% of building)
		20	Subtotal
			3.0 FRAMING & MATERIALS
PC		2	3.1 Structural/framing dimensions in 2' increments (≥75% of footprint)
2		2-6	3.2 Optimum Value Engineering techniques used (see guidelines) 2-6 points
2		1-2	3.3 Engineered I-joists used in floors (1 pt) roofs and/or I-studs in walls (1 additional pt)
2		2-4	3.4 Pre-cut studs and pre-fabricated trusses (2 pts), panelized walls (3 pts), and/or sections (4 pts)
2		2-8	3.5 FSC or SFI certified materials (2 pts per material used in over 50% of building)
PC		1-8	3.6 Materials manufactured within Colorado and/or rapidly renewable materials (1 pt per material)
2		10	3.7 Straw Bale or Structural Insulated Panels (SIP's) used for exterior walls
2		5-10	3.8 Insulated Concrete Forms (ICF's) for crawlspace/basement (5 pts) plus exterior walls (10 pts)
		59	Subtotal

Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

LEED for Homes



- Materials and Resources
 - Material Efficient Framing
 - Environmentally Preferable Products
 - Waste Management
 -

Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

Indoor Air Quality – Minimize Pollutants - ECOBUILD

6.0 INDOOR AIR QUALITY		
3	REQUIRED	6.1 Formaldehyde-free or low-toxic insulation
5	REQUIRED	6.2 Low- or zero-VOC and/or low-toxic interior paint, stain/finishes, and adhesives
5	2	6.3 Vapor retarder or wall system that allows moisture permeability above 50% RH
5	2	6.4 High efficiency pleated air (HEPA) filter in HVAC system
5	1-4	6.5 Low- or non-toxic floor coverings (1 pt per Quantity Level)
5	1	6.6 Carbon monoxide detectors
5	2	6.7 All gas furnaces, fireplaces, boilers, hot water heaters sealed combustion/direct vented.
5	2	6.8 No attached garage or automatic exhaust fan in attached garage
4	1-2	6.9 Elimination of all particleboard inside building envelope (2 pts) or all particleboard sealed (1 pt)
3	3	6.10 Radon mitigation system installed
	16	Subtotal

Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

LEED for Homes



- Indoor Environmental Quality
 - Energy Star with IAP
 - Combustion Venting
 - Moisture Control
 - Outdoor Air Ventilation
 - Local Exhaust
 - Distribution of Space Heating and Cooling
 - Air Filtering
 - Containment Control
 - Radon Protection
 - Garage Pollutant Protection

Owners Manual

1.6 Owner's Manual

What good are energy efficient appliances and good windows if you don't know how to operate them? An Owner's Manual can consist of a simple binder with the operation instructions for all major systems installed in the house. For examples of Owner's Manuals, please contact the High Country Conservation Center at (970) 668-5703.

An owner's manual, which includes the operation instructions of all mechanical systems and energy saving systems installed in the house, shall be provided to the homeowner; many mechanical systems require professional service and this should be indicated in the owner's manual. *Not required for Multi-Family.*

Compliance: Inspected (Final)



Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

LEED for Homes

SCOTTSDALE
GREEN BUILDING PROGRAM
City of Scottsdale
Green Building Lecture Series
Exploring a systems approach to design & construction, including energy / resource efficiency, healthy & environmentally responsible building practices and much more.
Presented By:
City of Scottsdale Green Building Program
on Thursday each Month
7-9 PM
Location:
Granite Reef Senior Center
1700 N. Granite Reef Rd.
Scottsdale, AZ
Information:
Scottsdale Green Building Program
(480) 312-2245
Website:
www.scottsdaleaz.gov/greenbuilding
Subscribe to:
Green Building Events
Go to
www.scottsdaleaz.gov/listserve

Green Building Lecture Series Schedule
FALL / WINTER 2007-2008
Free Monthly Lecture Series

Date	Topic
September 6	Intro To Green Home Building Standards An overview of the green building standards including incentives, benefits, strategies, and materials compatible with our Sonoran Desert Environment
October 5 & 6	Green Building Expo (Location Change: Scottsdale Center for the Performing Arts) Please visit the website for lecture schedules and details. www.greenbuildingaz.com
November 1	Natural & Reclaimed Building Materials Regional materials that are compatible with our harsh desert environment, abundant, rapidly renewable, and support the local economy. Learn about opportunities to reuse quality materials and divert waste from our landfills.
December 6	Alternative Materials: Green Pioneers New building products and techniques for Green Building showing innovative entrepreneurial pioneers making Green a reality. "Includes a Building Materials Showcase" Presented by Rick Johnson, inventor of IMB Reinforced Insulated Masonry
January 3	Home Improvements & Green Remodeling Green is everywhere. We will discuss how you make practical and healthy decisions for your home in the current state of green. The presentation includes examples and an opportunity to get professional feedback on your specific questions and concerns. Presented by Anne Boffino of Bohner-Baserman Design Group and Mick Delany of a.k.a. Green.
February 7	Building Science: The Systems Approach to Energy Efficiency Learn about the principles of heat flow to create an energy efficient, safe, comfortable and healthy home. Hear about diagnostic tests used to evaluate energy performance problems and their possible solutions.
March 6	Interior & Indoor Environmental Quality Indoor air pollutants can be six times higher than outdoor air. This lecture will address strategies for minimizing indoor pollutants including material selection, ventilation and filtration.
April 3	Water Efficiency in the Sonoran Desert An overview of water conservation practices, including indoor plumbing fixtures, xeriscape, gray water & rainwater harvesting
May 1	Innovative Green Built Projects (in the Phoenix/Scottsdale Area) See innovative local projects that excel from the synergistic benefits of energy efficiency, renewable resources, water efficiency, and climate responsive design.
June 5	Green Feng Shui This lecture will highlight new design strategies blending the eastern practice of Feng Shui and the basics of green design for greater harmony & health.

- Awareness and Education
 - Education of the Homeowner or Tenant
 - Education of the Building Manager

Size

Site

Lndscp

Water

Energy

MatRes

EQ

OM

Significant Residential Changes 2009 IECC



Reduce Air Leakage in the Building Envelope



- Requires Blower Door Test on Each Residence, or

Comply with Air Barrier and Insulation Inspection Checklist

**TABLE 402.4.2
AIR BARRIER AND INSULATION INSPECTION**

COMPONENT	CRITERIA
<u>Air barrier and thermal barrier</u>	Exterior thermal insulation is installed in substantial contact and continuous alignment with building envelope air barrier. Breaks or joints in the air barrier are filled or repaired. Air permeable insulation is not used as a sealing material. Air permeable insulation is inside of an air barrier.
<u>Ceiling / attic</u>	Air barrier in any dropped ceiling / soffit is substantially aligned with insulation and any gaps are sealed. Attic access (except unvented attic), knee wall door, or drop down stair is sealed.
<u>Walls</u>	Corners and headers are insulated. Junction of foundation and sill plate is sealed.
<u>Windows and doors</u>	Space between window/door jambs and framing is sealed.
<u>Rim joists</u>	Rim joists are insulated and include an air barrier.
<u>Floors (including above garage and cantilevered floors)</u>	Insulation is installed to maintain permanent contact with underside of subfloor decking. Air barrier is installed at any exposed edge of insulation.
<u>Crawspace walls</u>	Insulation is permanently attached to walls. Exposed earth in unvented crawlspaces is covered with class I vapor retarder with overlapping joints taped.
<u>Shafts, penetrations</u>	Duct shafts, utility penetrations, knee walls, and flue shafts opening to exterior or unconditioned space are sealed.
<u>Narrow cavities</u>	Batts in narrow cavities are cut to fit, or narrow cavities are filled by sprayed/blown insulation.
<u>Garage separation</u>	Air sealing is provided between the garage and conditioned spaces.
<u>Recessed lighting</u>	Recessed light fixtures are airtight, IC rated, and sealed to drywall. Exception—fixtures in conditioned space.
<u>Plumbing and Wiring</u>	Insulation is placed between outside and pipes. Batt insulation is cut to fit around wiring and plumbing, or sprayed/blown insulation extends behind piping and wiring.
<u>Shower / tub on exterior wall</u>	Showers and tubs on exterior walls have insulation and an air barrier separating them from the exterior wall.
<u>Electrical / phone box on exterior walls</u>	Air barrier extends behind boxes or an air sealed type boxes are installed.
<u>Common wall</u>	Air barrier is installed in common wall between dwelling units.
<u>HVAC register boots</u>	HVAC register boots that penetrate building envelope are sealed to subfloor or drywall.
<u>Fireplace</u>	Fireplace walls include an air barrier.

402.4.3 Fireplaces. New wood-burning fireplaces shall have gasketed doors and outdoor combustion air.

Building Envelope Upgrades

Exterior Walls

TABLE 402.1.1 (Supp)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^e WALL R-VALUE
1	1.2	0.75	0.40	30	13	3	13	0	0	0
2	0.75	0.75	0.40	30	13	4	13	0	0	0
3	0.65	0.65	0.40 ^f	30	13	5	19	0	0	5/13
4 except Marine	0.40	0.60	NR	38	13	5	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.35	0.60	NR	38	21 ^g 20 or 13+7.5	13	30 f	10/13	10, 2 ft	10/13
6	0.35	0.60	NR	49	21 ^g 20 or 13+7.5	15	30 f	10/13	10, 4 ft	10/13
7 and 8	0.35	0.60	NR	49	21	19	30 f	10/13	10, 4 ft	10/13

^a Through 5. All others to current code.

Building Envelope Upgrades

Basement Walls

TABLE 402.1.1 (Supp)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ^h	FLOOR R-VALUE	BASEMENT ^g WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^e WALL R-VALUE
1	1.20	0.75	0.37	30	13	3 / 4	13	0	0	0
2	0.75	0.75	0.37	30	13	4 / 6	13	0	0	0
3	0.65	0.65	0.40 ^a	30	13	5 / 8	19	0-5/13 ⁱ	0	5/13
4 except Marine	0.40	0.60	NR	38	13	5 / 10	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.35	0.60	NR	38	19 or 13+5 ^g	13 / 17	30 ^f	10/13	10, 2 ft	10/13
6	0.35	0.60	NR	49	19 or 13+5 ^g	15 / 19	30 ^f	10/13	10, 4 ft	10/13
7 and 8	0.35	0.60	NR	49	21	19 / 21	30 ^f	10/13	10, 4 ft	10/13

Building Envelope Upgrades

Glazing U-factor

TABLE N1102.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^(a)

Climate Zone	Fenestration U-Factor	Skylight ^(b) U-Factor	Glazed Fenestration SHGC	Ceiling R-Value	Wood Frame Wall R-Value	Mass Wall R-Value	Floor R-Value	Basement ^(c) Wall R-Value	Slab ^(d) R-Value & Depth	Crawl Space ^(c) Wall R-Value
1	1.20	0.75	0.40	30	13	3	13	0	0	0
2	0.85 ^h	0.75	0.40	30	13	4	13	0	0	0
3	0.55 0.50 ^h	0.65	0.40	30	13	5	19	0	0	5/13
4 except Marine	0.40 0.35	0.60	NR	38	13	5	19	10 / 13	10, 2 ft	10 / 13
5 and Marine 4	0.35	0.60	NR	38	19 or 13+5 ^(e)	13	30 ^(f)	10 / 13	10, 2 ft	10 / 13
6	0.35	0.60	NR	49	19 or 13+5 ^(e)	15	30 ^(f)	10 / 13	10, 4 ft	10 / 13
7 and 8	0.35	0.60	NR	49	21	19	30 ^(f)	15 / 21	15, 4 ft	10 / 13

a through g (No change)

h. For impact rated resistant fenestration complying with Section R301.2.1.2, the maximum U-factor shall be 4.20 0.75 in Zone 2 and 0.79 0.65 in Zone 3.

Building Envelope Upgrades

Glazing SHGC

TABLE 402.1.1 (Supp)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ^h	FLOOR R-VALUE	BASEMENT ^o WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^e WALL R-VALUE
1	1.20	0.75	0.36 0.30	30	13	3 / 4	13	0	0	0
2	0.75	0.75	0.35 0.30	30	13	4 / 6	13	0	0	0
3	0.65	0.65	0.36 0.30	30	13	5 / 8	19	0	0	5/13
4 except Marine	0.40	0.60	NR	38	13	5 / 10	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.35	0.60	NR	38	19 or 13+5 ^g	13 / 17	30 ^f	10/13	10, 2 ft	10/13
6	0.35	0.60	NR	49	19 or 13+5 ^g	15 / 19	30 ^f	10/13	10, 4 ft	10/13
7 and 8	0.35	0.60	NR	49	21	19 / 21	30 ^f	10/13	10, 4 ft	10/13

Residential HVAC

- Perform a Duct Blaster Test on Each Duct System, or
- Locate All Ductwork in Conditioned Space
- NEEA Priority and Represents 10% Energy Savings



or



CFL Lighting Required



- Applies to permanently installed lighting fixtures
- Requires 50% to be
 - Compact Fluorescent
 - T-8 Linear Fluorescent
 - Meet minimum efficacy requirements
- Applies to interior and exterior lighting



Eliminates Equipment Efficiency Trade-offs

- Code will focus only on the building shell
 - Will result in increased insulation and glazing efficiency



REScheck Software Version 4.1.3 Compliance Certificate

Basement Wall 1 copy 1: Solid Concrete or Masonry Orientation: Right Side Wall height: 8.0' Depth below grade: 8.0' Insulation depth: 8.0'	105	0.0	10.0	5
Window 5: Vinyl Frame:Double Pane with Low-E SHGC: 0.30 Orientation: Right Side	30		0.340	10
Basement Wall 1 copy 2: Solid Concrete or Masonry Orientation: Left Side Wall height: 8.0' Depth below grade: 8.0' Insulation depth: 8.0'	105	0.0	10.0	5
Window 7: Vinyl Frame:Double Pane with Low-E SHGC: 0.30 Orientation: Left Side	30		0.340	10
Basement Wall 1 copy 3: Solid Concrete or Masonry Orientation: Front Wall height: 8.0' Depth below grade: 8.0' Insulation depth: 8.0'	320	0.0	10.0	21
Window 8: Vinyl Frame:Double Pane with Low-E SHGC: 0.30 Orientation: Front	30		0.340	10
Floor 1: All-Wood Joist/Truss:Over Unconditioned Space	418	30.0	0.0	14
Floor 2: Slab-On-Grade:Unheated Insulation depth: 0.0'	148		0.0	164
Furnace 1: Forced Hot Air 92 AFUE				
Air Conditioner 1				

~~Furnace 1: Forced Hot Air 92 AFUE~~

Questions?

