

THE GEORGIA ENERGY CODE: 2009 IECC + AMENDMENTS

For the Georgia Association of Home Inspectors
Bourke Reeve



ABOUT SOUTHFACE



EARTHCRAFT



Regional Green Building Program



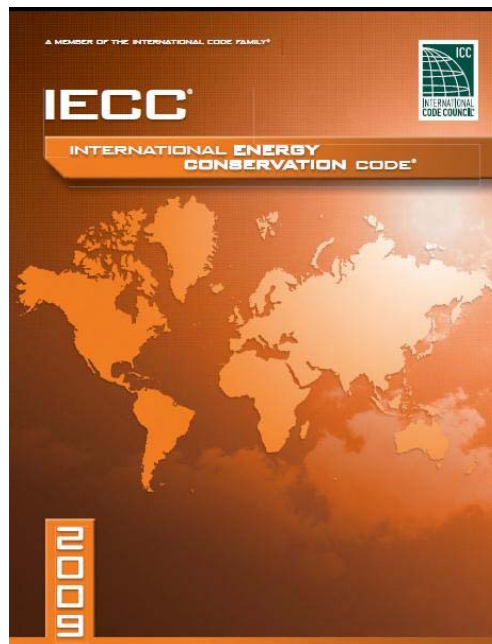
HISTORY OF ENERGY CODES

- MEC 1992, '93, 95 – “Early” energy codes, complicated, DP windows required
- IECC 98, 2000, '03 – “Strengthening”, SHGC of 0.4 required where < 3500 HDD
- IECC 2004, '06 – “Simplification”, Fewer CZ’s, eliminate % glazing, certificate required
- IECC 2009 – (GA Code) duct + envelope testing, efficient lighting required
- The code keeps pushing the bar! ('09 Code is ~15% more stringent than '06 version)



IMPORTANCE OF ENERGY CODES

- **Saves energy** - Buildings consume 40% of energy in U.S.; energy codes reduce dependence on foreign energy sources
- **Saves money**- energy costs continue to escalate and energy codes help keep money within local economy
- **Additional benefits:**
 - Increases comfort
 - Protects health
 - Enhances durability of homes



OVERVIEW OF RESIDENTIAL CODE REQUIREMENTS

Focus is on building envelope

- Ceilings, walls, windows, floors, foundations
- Sets insulation levels, window U-factors and SHGC
- Infiltration control
 - Caulk and seal to prevent air leaks
 - Verify tight envelope with blower door



Limited Heating, Air Conditioning, and Water Heating requirements

Ducts

- No cavities as ducts
- Seal with mastic and insulate
- Verify tight with duct pressurization test

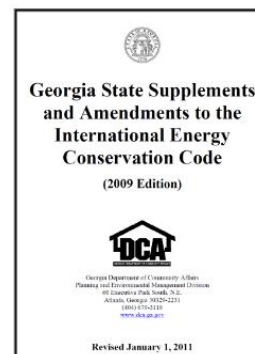
Lighting equipment

- 50% of lamps to be high-efficacy lamps
- Lighting control options

No appliance requirements

GEORGIA AMENDMENTS

1. Improved Kneewalls
2. Consistent Windows
3. Air Sealing Graphics
4. Minimum Insulation Thresholds
5. Better Ducts - Require Mastic
6. No Electric Furnaces
7. No Powered Attic Ventilators (except solar powered)
8. Mandatory Blower Door and Duct Blaster test
9. Qualifications of Verifiers– (who can do testing)



STRUCTURE OF 2009 IECC

Ch. 1 - Administration

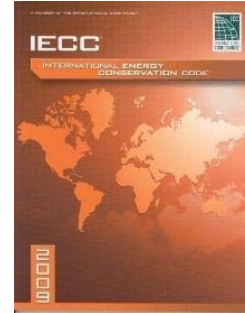
Ch. 2 - Definitions

Ch. 3 - Climate Zones

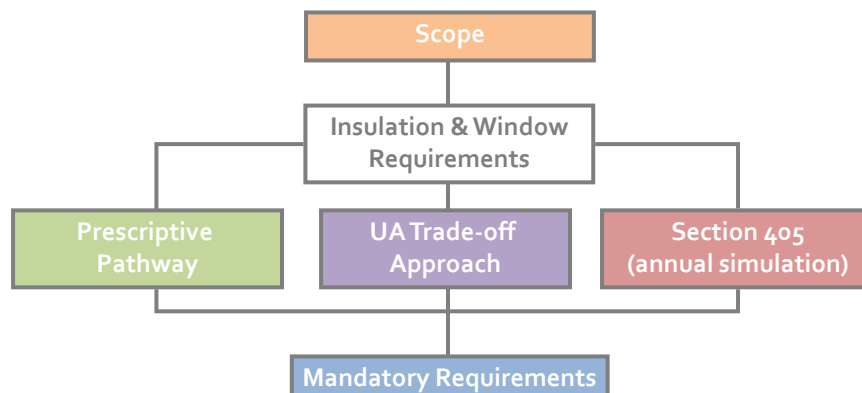
Ch. 4 - Residential Code

- 401 General
- 402 Building Thermal Envelope
- 403 Fenestration
- 404 Lighting
- 405 Performance Alternative

Ch. 5 - Commercial Buildings
(references ASHRAE 90.1)



ENERGY CODE COMPLIANCE PATHWAYS



RESIDENTIAL BUILDINGS



- New construction
- 1 and 2 family (R3)
- Multi-family, 3 stories and less (R2 and R4)
- Additions, Alterations, Repairs

Exempt Buildings

- No conditioning
- Historical
- Low peak energy for space conditioning
 - < 3.4 Btu/hr/ft² of floor area
 - < 1.0 W/ft² of floor area



ADDITIONS, ALTERATIONS, RENOVATIONS OR REPAIRS

101.4.3 Additions, alterations, renovations or repairs.

Additions, alterations, renovations or repairs to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion(s) of the existing building or building system to comply with this code. Additions, alterations, renovations or repairs shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building.

Exception: The following need not comply provided the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Glass only replacements in an existing sash and frame.
3. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.
4. Construction where the existing roof, wall or floor cavity is not exposed.
5. Reroofing for roofs where neither the sheathing nor the insulation is exposed. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.



SPACE. An enclosed space within a building.

(a) **Conditioned space:** a cooled space, heated space, or indirectly conditioned space is defined as follows:

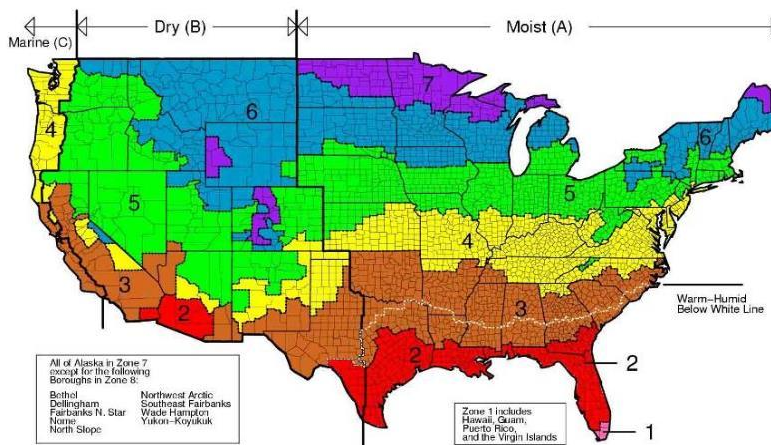
(2) **Heated space:** an enclosed space that is heated by a heating system whose output capacity is $> 5 \text{ Btu/h}\cdot\text{ft}^2$.

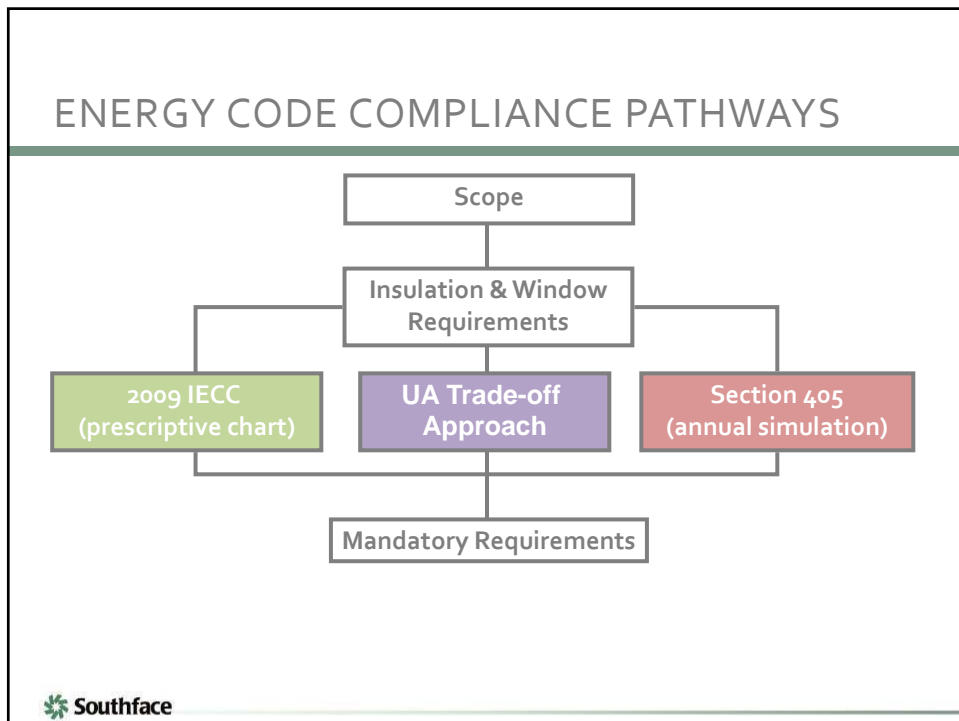
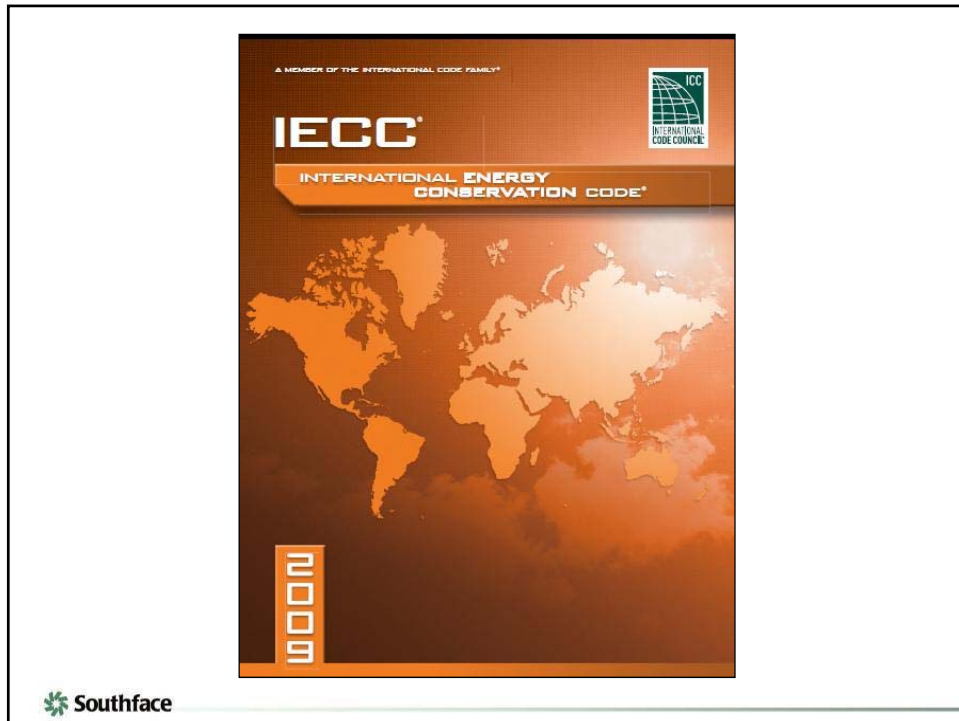
(3) **Indirectly conditioned space:** an enclosed space within a building that is not a heated or cooled space, containing un-insulated ducts, or containing the heating equipment or which is heated or cooled indirectly by being connected to adjacent space(s), provided that air from heated or cooled spaces is transferred (naturally or mechanically) into the space. Unvented Attic Assemblies meeting the requirements of the IRC are an approved indirectly conditioned space.

~~**CONDITIONED SPACE.** An area or room within a building being heated or cooled, containing uninsulated ducts, or with a fixed opening directly into an adjacent conditioned space.~~



Note: GA is in Climate Zone (CZ) 2, 3 and 4

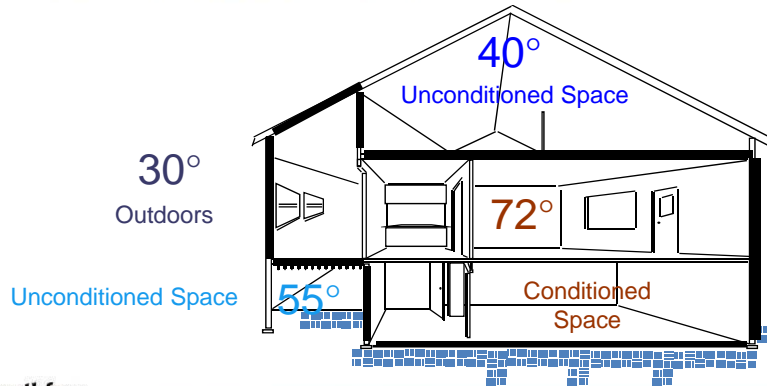




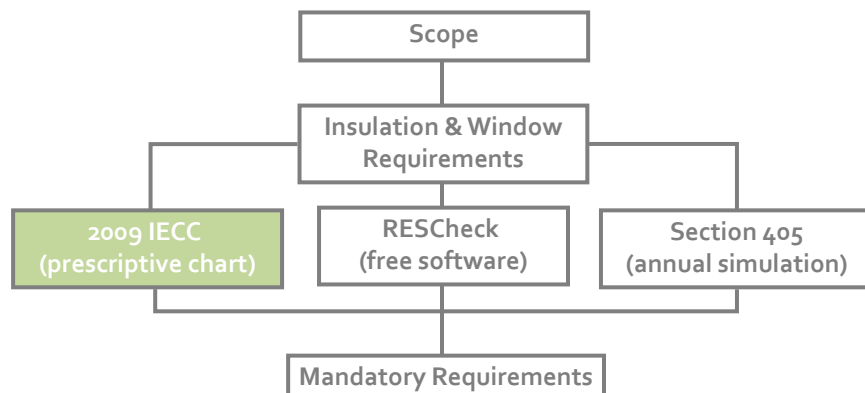
402-BUILDING THERMAL ENVELOPE

Building Thermal Envelope — The basement walls, exterior walls, floor, roof, and any other building element that enclose conditioned space. This boundary also includes the boundary between conditioned space and any exempt or unconditioned space. —2009 IECC

The *building thermal envelope* is the barrier that separates the conditioned space from the outside or unconditioned spaces. The building envelope consists of two parts - an air barrier and a thermal barrier that must be both continuous and contiguous (touching each other). In a typical residence, the building envelope consists of the roof, walls, windows, doors, and foundation. Examples of unconditioned spaces include attics, vented crawlspaces, garages, and basements with ceiling insulation and no HVAC supply registers.



ENERGY CODE COMPLIANCE PATHWAYS



2009 IECC- SECTION 402.1

One prescriptive “answer” for how to build in each climate zone
(CZ: 2a, 3a and 4a)

Includes lots of footnotes

TABLE 402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT*

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT U-FACTOR ^b	GLAZED FENESTRATION SHGC ^c	CEILING ^e	WOOD FRAME WALL ^d	ATTIC KNEEWALL ^e
2	0.50 ^f	0.75	0.30	R-30 or U-0.030	R-13 or U-0.082	R-18 or U-0.065
3	0.50 ^f	0.65	0.30	R-30 or U-0.030	R-13 or U-0.082	R-18 or U-0.065
4	0.35	0.60	0.30 ^g	R-38 or U-0.025	R-13 or U-0.082	R-18 or U-0.065

CLIMATE ZONE	MASS WALL ^f	FLOOR ^g	BASEMENT WALL ^{h,i}	SLAB ^j	CRAWL SPACE WALL ^k
2	R-4/6 or U-0.165	R-13 or U-0.064	R-0	R-0	R-0
3	R-5/8 or U-0.141	R-19 or U-0.047	R-5/13 or U-0.136	R-0	R-5/13 or U-0.136
4	R-5/10 or U-0.141	R-19 or U-0.047	R-10/13 or U-0.059	R-0	R-10/13 or U-0.059

* This requirement will take effect on July 1, 2011.



SECTION 402.2: INSULATION REQUIREMENTS



Details for insulating various aspects of the building envelope

- Ceilings with Attic – 402.2.1
- Ceilings w/out Attic – 402.2.2
- Access hatches and doors – 402.2.3
- Mass Walls – 402.2.4
- Steel Framing – 402.2.5
- Floors – 402.2.6
- Basement Walls – 402.2.7
- Slab-on-grade – 402.2.8
- Crawlspace Walls – 402.2.9
- Masonry Veneer – 402.2.10
- Sunrooms – 402.2.11



402.2.1 - CEILINGS WITH ATTICS

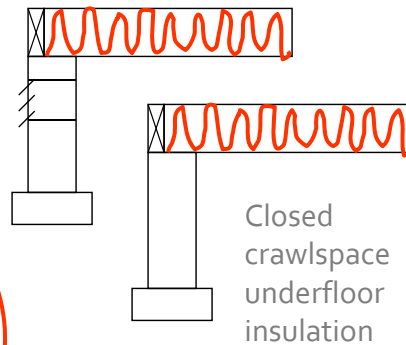
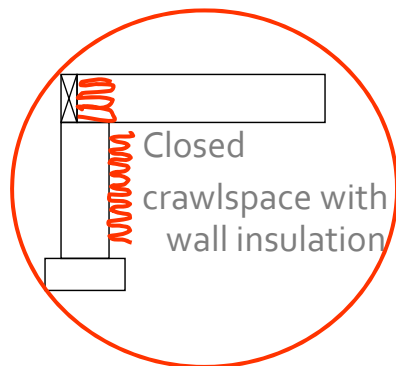
- R-30 (CZ2 & 3) or R-38 (CZ4) are prescriptive requirements
- GA: R-19 acceptable under HVAC attic platforms (32 s.f./platform + 32" walkway)
- Rulers required every 300 s.f.



 Southface

402.2.9 CRAWLSPACE WALLS - 3 OPTIONS

Standard vented
crawlspace - underfloor
insulation



Note: all crawlspaces must meet vapor retarder requirements, as per IRC

 Southface

CLOSED CRAWLSPACES

Seal ground with plastic (6" up walls, 6" overlaps)
Insulate interior of walls to satisfy code
(R-10 in CZ4, R-5 in CZ3, R-0 in CZ2)
Eliminate all vents and leaks (access doors)
Satisfy IRC exception to vent requirement (2006 IRC section R408.3)

Venting Exceptions:

- Continuous exhaust (radon)
- Direct condition crawlspace (supply)
- Direct condition (dehumidifier)



Critical Details:

- No drainage problems
- Use a sealed combustion / direct vent furnace or install a Heat Pump
- Pest Control and Code Official awareness



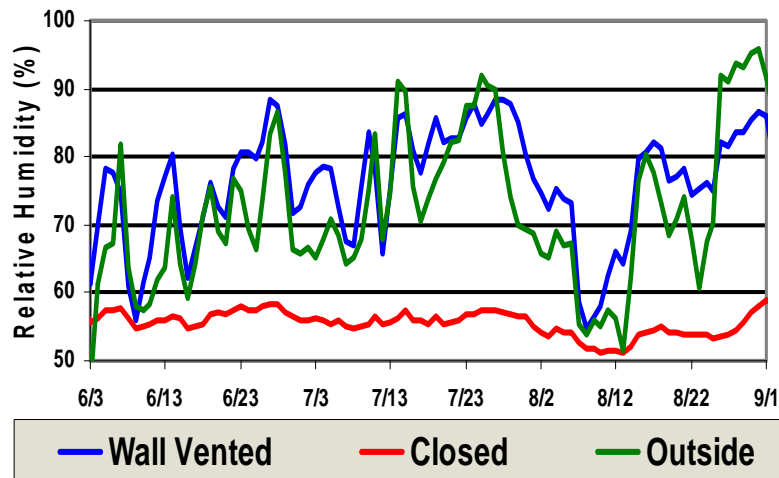
CLOSED CRAWL SPACE STUDY



www.crawlspaces.org
www.crawlspacesproducts.com



Crawlspace Moisture Levels Summer 2002



Southface

402.2.9 – CRAWLSPACE WALLS

402.2.9 Crawl space walls. As an alternative to insulating floors over crawl spaces, crawl space walls shall be permitted to be insulated when the crawl space is not vented to the outside. Crawl space wall insulation shall be permanently fastened to the wall and extend downward from the floor to within 9 inches (229 mm) of the finished interior grade adjacent to the foundation wall. A 3-inch (76 mm) inspection/view strip immediately below the floor joists shall be provided to permit inspections for termites. Exposed earth in unvented crawl space foundations shall be covered with a continuous Class 1 vapor retarder in accordance with the *International Building Code*. All joints of the vapor retarder shall overlap by 6 inches (152 mm) and be sealed or taped. The edges of the vapor retarder shall extend at least 6 inches (228 mm) up the stem wall and shall be attached and sealed to the stem wall. (Effective January 1, 2011)



- Insulate band joist area
- 3-inch view strip (removable)
- Crawl space wall insulation to extend within 9 inches of finished interior grade
- Complete plastic sealed to walls at least 6 inches up the stem wall

Southface

REALITY OF UNDERFLOOR INSULATION



 Southface

402.3 FENESTRATION REQUIREMENTS

Low-e effectively required!

Maximum fenestration

U-factor = 0.50 in CZ 2&3
= **0.35** in CZ4

- Area weighted average of fenestration

Maximum

SHGC = 0.30 for all glazing

- Area weighted average of fenestration
 1. Show compliance by having all glazing be ≤ 0.30
 2. Perform REScheck weighted average trade-off

	World's Best Window Co.	
National Fenestration Rating Council	Millennium 2000+ Vinyl-Clad Wood Frame Double Glazing • Argon Fill • Low E Product Type: Vertical Slider	
CERTIFIED		
ENERGY PERFORMANCE RATINGS		
U-Factor (U.S./I-P)	Solar Heat Gain Coefficient	
0.30	0.30	
ADDITIONAL PERFORMANCE RATINGS		
Visible Transmittance	Air Leakage (U.S./I-P)	
0.51	0.2	
<small>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information. www.nfrc.org</small>		

 Southface

303.1.3 FENESTRATION

If not NFRC labeled, must use tables 302.1.3 to assign a default SHGC and U-Factor

TABLE 303.1.3(1)
DEFAULT GLAZED FENESTRATION U-FACTOR

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

TABLE 303.1.3(3)
DEFAULT GLAZED FENESTRATION SHGC

SINGLE GLAZED		DOUBLE GLAZED		GLAZED BLOCK
Clear	Tinted	Clear	Tinted	
0.8	0.7	0.7	0.6	0.6

Window Label "Catch-22"

NFRC label effectively required



Example: vinyl-clad wood window

If NFRC label present:

Values on label apply. (in this example: U-factor 0.30 SHGC 0.30)

If no NFRC label present:

Default U-factor: 0.55

Default SHGC: 0.70

 World's Best Window Co. Millennium 2000® Vinyl-Clad Wood Frame Double Glazing, Argon Gas, Low-E Product Type: Vertical Slider	
ENERGY PERFORMANCE RATINGS U-Factor (U.S.A-F) 0.30	Solar Heat Gain Coefficient 0.30
ADDITIONAL PERFORMANCE RATINGS Visible Transmittance 0.51	Air Leakage (U.S.A-F) 0.2

402.3 FENESTRATION REQUIREMENTS

15 square feet exemption for decorative glazing

- Permits modest amount of stained glass, transom windows, etc.

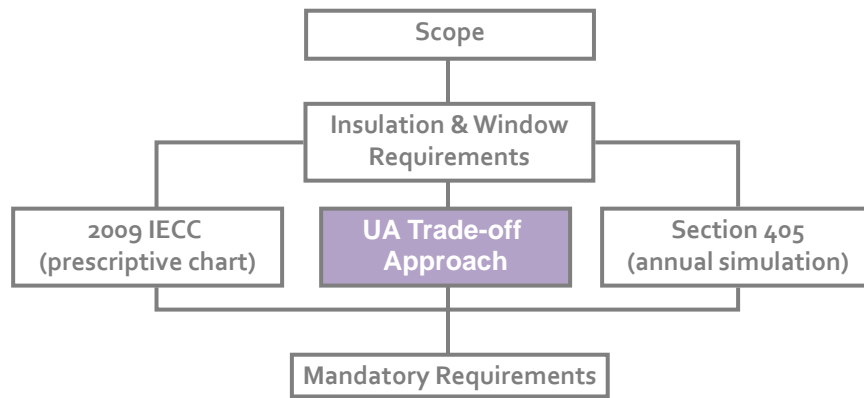
Opaque door exemption

- One opaque door is exempt from U-factor requirements
- GA Specific - exemption is not applicable to attic-access doors

Replacement fenestration – must meet code



ENERGY CODE COMPLIANCE PATHWAYS



402.1.4 – TOTAL UA ALTERNATIVE

Equivalency using UA approach
Allows for simple trade-offs with prescriptive chart



TABLE 402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT*

CLIMATE ZONE	FENESTRATION U-FACTOR ^a	SKYLIGHT U-FACTOR ^b	GLAZED FENESTRATION SHGC ^c	CEILING ^e	WOOD FRAME WALL ^d	ATTIC KNEEWALL ^f
2	0.50 ^g	0.75	0.30	R-30 or U-0.030	R-13 or U-0.082	R-18 or U-0.065
3	0.50 ^g	0.65	0.30	R-30 or U-0.030	R-13 or U-0.082	R-18 or U-0.065
4	0.35	0.60	0.30 ^h	R-38 or U-0.025	R-13 or U-0.082	R-18 or U-0.065

CLIMATE ZONE	MASS WALL ⁱ	FLOOR ^g	BASEMENT WALL ^{3k}	SLAB ^j	CRAWL SPACE WALL ^{3k}
2	R-4/6 or U-0.165	R-13 or U-0.064	R-0 U-0.36	R-0	R-0 U-0.477
3	R-5/8 or U-0.141	R-19 or U-0.047	R-5/13 U-0.136	R-0	R-5/13 U-0.136
4	R-5/10 or U-0.141	R-19 or U-0.047	R-10/13 U-0.059	R-0	R-10/13 U-0.059

* This requirement will take effect on July 1, 2011.



402.1.4 – GA: CANNOT TRADE TO ZERO

TABLE 402.1.4 SUMMARY OF MINIMUM INSULATION R-VALUES AND MAXIMUM U-FACTORS FOR ENVELOPE COMPONENTS WHEN TRADE-OFFS ARE USED		
ELEMENT ¹	Minimum R-value or Maximum U-factor	
Walls (Stud)	R-13	
Mass Walls ²	Climate Zone: 2 R-4	Climate Zone: 3 & 4 R-5
Basement Walls	Climate Zone: 2 R-0	Climate Zone: 3 & 4 R-5
Attic Knee Walls ³	R-18	
Ceilings with Attic Spaces	R-30	
Air-permeable Roofline Installed Insulation ⁴	Climate Zone: 2&3 R-19 air-permeable +R-5 air-impermeable	Climate Zone: 4 R-19 air-permeable +R-15 air-impermeable
Air-impermeable Roofline Installed Insulation ⁴	R-19	
Floor over unheated spaces	R-13	
Windows	U- 0.50 with max. SHGC 0.30*	



RESCHECK™ SOFTWARE

www.energycodes.gov

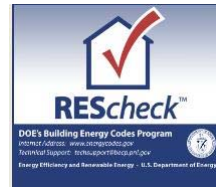
Software evaluates specific designs quickly

Demonstrates SHGC compliance

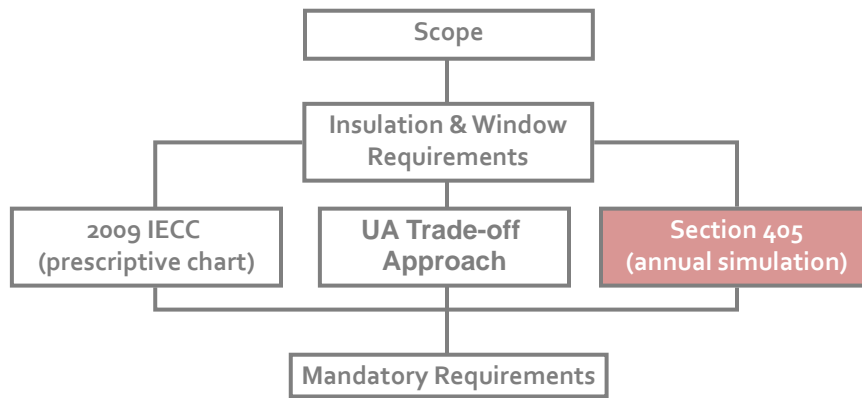
Allows trade-offs

- Building envelope components
- No longer for heating & cooling equipment efficiencies

GA specific version
(coming soon)



ENERGY CODE COMPLIANCE PATHWAYS



2009 IECC – SECTION 405

Simulated Performance Alternative

- Annual energy usage simulation demonstrates that the proposed building's energy costs are < "standard code" building
- Likely to involve a HERS rater
- REMrate & Energy Gauge are acceptable



www.resnet.us



REM/RATE SAMPLE REPORT

Total annual energy costs, duct insulation, window U-factor and SHGC, envelope and duct testing compared between 2009 IECC and home

2009 IECC ANNUAL ENERGY COST COMPLIANCE			
Date:	August 04, 2010	Rating No.:	
Building Name:	ACME House	Rating Org.:	Southface Energy Rated Homes
Owner's Name:	Mike Bork	Phone No.:	
Property:	Willie B. Croyle Road	Ratee's Name:	Diana Bork
Address:	Atlanta, GA 30308	Ratee's No.:	
Inspector's Name:		Rating Type:	Based On Plans
Weather Site:	Atlanta, GA	Rating Date:	7/16/10
File Name:	Home_Insul_C/MJ_WL_C/M_3003.rtg		

	Annual Energy Cost	
	2009 IECC	As Designed
Heating:	530	514
Cooling:	214	220
Water Heating:	271	256
Lights & Appliances:	555	555
Photovoltaics:	-6	-6
Service Charge:	120	120
Total:	1659	1666
Duct Insulation R-Value Check (per Section 405.2):		
Minimum Duct Insulation (Design must be higher):	6.0	6.0
Window SHGC Check (per Section 402.5):		
Window SHGC Value (Design must be lower):	0.500	0.310
Home Infiltration (per Section 402.4.2):		PASSES
Duct Leakage (per Section 403.2.2):		PASSES

This home **MEETS** the annual energy cost requirements in accordance with Section 405 of the 2009 International Energy Conservation Code based on a climate zone of 3A.

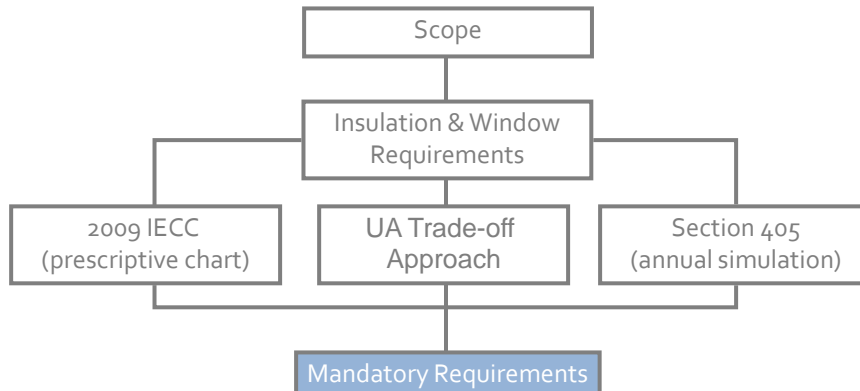
Name: Diana Bork Signature: _____
 Organization: Southface Energy Rated Homes Date: August 04, 2010

* Design energy cost is based on the following systems:
 ARI-P: Htg: 75.1 kWh, 7.7 mBtu; Ctg: 50.0 kWh, 13.0 SEER.
 Water Heating: Conventional Elec: 0.90 EF.
 ASHP: Htg: 6.1 kWh, 0.0 mBtu; Ctg: 30.0 kWh, 13.0 SEER.
 Window In-solar Area Ratio is 1.1.
 Code default: Htg: 0.35 Ctg: 0.35 ACH50.

In accordance with IECC, building inputs, such as setpoints, infiltration rates, and window shading may have been



ENERGY CODE COMPLIANCE PATHWAYS



2009 IECC- SECTION 401.3

Mandatory Requirement:

- Certificate on panel box or air handler shows
- Major Component R-values
- U-factor, SHGC of Windows
- Equipment Efficiencies
- GA Specific: Load Calculations
- GA Specific: Envelope and Duct Testing Results



Go to southface.org to download fillable pdf of this form!

Blower Door Results go here:

Load Calc Results go here:

Duct testing Results go here:



Georgia Residential Energy Code Compliance Certificate*

Builder/Design Professional: _____ Phone: _____

Envelope Summary:

- List the R-value for the following components:

Flat ceiling/roof: _____	Sloped/ vault ceiling: _____
Exterior wall: _____	Above grade mass wall: _____
Attic kneewall: _____	Attic kneewall sheathing: _____
Basement stud wall: _____	Basement continuous: _____
Crawlspace stud wall: _____	Crawlspace continuous: _____
Foundation slab: _____	Floors over unconditioned space: _____
Cantilevered Floor: _____	Other insulation: _____
- Fenestration Components:

Window U-factor: _____	Window SHGC: _____
Skylight U-factor: _____	Skylight SHGC: _____
Glazed Door U-factor: _____	Opaque Door U-factor: _____
	(<50% glazed)
- Building Envelope Tightness (BET):

BET test conducted by: _____ Phone: _____

Fan Flow at 50 Pascals = _____ CFM₅₀ Total Conditioned Volume = _____ ft³

ACH₅₀ = CFM₅₀ x 60 / Volume = _____ ACH₅₀ (must be less than 7 ACH₅₀)

Low Rise Multifamily Visual Inspection Option
(The visual inspection option may be conducted by a thirdparty instead of the RFT test for R-2 buildings only.)

Visual inspection conducted by: _____ Phone: _____

Mechanical Summary:

Water Heater Energy Factor: _____ EF Fuel type: ☐ Gas ☐ Electric ☐ Other

Number of Heating and Cooling Systems: _____

Heating System Type (choose one): _____

☐ Gas: _____ AFUE ☐ Air-Source Heat Pump: _____ HSFP

☐ Other: _____ Efficiency: _____

Cooling System Type (Standard DX, Heat Pump, Geothermal, etc.): _____

Cooling System Efficiency: _____ SEER ☐ EER ☐ Other

Heating/Cooling Load Calculations Performed by: _____ Phone: _____

Total Heating Load (based on ACCA Plan, 2 or other approved methodology): _____ Btu/h

Total Cooling Load (based on ACCA Plan, 2 or other approved methodology): _____ Btu/h

Cooling Sensible Load: _____ Btu/h Cooling Latent Load: _____ Btu/h

Total Air Handler CFM (based on design calculations): _____ CFM

Duct Tightness Test Conducted by: _____ Phone: _____

CFM₁₀₀ per 100 ft² of conditioned floor area = CFM₁₀₀ x 100 / Conditioned floor area served

If all ducts are not located within conditioned space, builder must verify that either the post-construction duct leakage to outdoors (PDO) is ≤ 8 ft³/100 ft², the post construction total duct leakage (PCTL) is ≤ 12 ft³/100 ft², or the rough-in test (RIT) with an handler installed is ≤ 6 ft³/100 ft². State which method was used to conduct the duct tightness test: _____

System	Method (DR, MBRS, AMBS)	Test (PCT, PCT, RIT)	CFM ₁₀₀	Area served (ft ²)	Test Result
1					
2					
3					

*Note: This permanent certificate shall be posted on or in the electrical distribution panel. Certificate shall be completed by the builder or registered design professional. Where there is more than one value for each component, certificate shall list the value covering the largest area.

Go to southface.org to download fillable pdf of this form!

Blower Door Results go here:

Load Calc Results go here:

Duct testing Results go here:



Georgia Residential Energy Code Compliance Certificate*

Builder/Design Professional: ABC Builder Phone: 404-123-4567

Envelope Summary:

- List the R-value for the following components:

Flat ceiling/roof: <u>R-30</u>	Sloped/vault ceiling: <u>N/A</u>
Exterior wall: <u>R-13</u>	Above grade mass wall: <u>N/A</u>
Attic kneewall: <u>N/A</u>	Attic kneewall sheathing: <u>R16</u>
Basement stud wall: <u>N/A</u>	Basement continuous: <u>N/A</u>
Crawlspace stud wall: <u>N/A</u>	Crawlspace continuous: <u>N/A</u>
Foundation slab: <u>R-0</u>	Floors over unconditioned space: <u>R19</u>
Cantilevered floor: <u>N/A</u>	Other insulation: <u>N/A</u>
- Fenestration Components:

Window U-factor: <u>0.32</u>	Window SHGC: <u>0.29</u>
Skylight U-factor: <u>N/A</u>	Skylight SHGC: <u>N/A</u>
Glazed Door U-factor: <u>N/A</u>	Opaque Door U-factor: <u>0.35</u>
	(≤50% glazed)
- Building Envelope Tightness (BET):

BET test conducted by: Home Performance South Phone: 404-123-4567

Fan Flow at 50 Pascals: 2,000 CFM₅₀ Total Conditioned Volume = 20,000 ft³

ACH₅₀ = CFM₅₀ x 60 / Volume = 6 ACH₅₀ (must be less than 7 ACH₅₀)

Low Rise Multifamily Visual Inspection Option
 (The visual inspection option may be conducted by a third party instead of the BET test for 1, 2 buildings only.)
 Visual inspection conducted by: N/A Phone: N/A

Mechanical Summary:

Water Heater Energy Factor: 0.61 EF Fuel type: ☒ Gas ☐ Electric ☐ Other

Number of Heating and Cooling Systems: 1

Heating System Type (choose one):
☒ Gas: 90% AFUE ☐ Air-Source Heat Pump: HSPF
☐ Other: Efficiency:

Cooling System Type (Standard DX, Heat Pump, Geothermal, etc.): Standard DX
 Cooling System Efficiency: 1.1 SEER ☐ EER ☐ Other

Heating/Cooling Load Calculations Performed by: HVAC South Phone: 770-424-1047

Total Heating Load (based on ACCA Man. 3 or other approved methodology): 39,800 Btu/h

Total Cooling Load (based on ACCA Man. 3 or other approved methodology): 39,800 Btu/h

Cooling Sensible Load: 20.8 Btu/h Cooling Latent Load: 8.0 Btu/h

Total Air Handler CFM (based on design calculations): 2,600 CFM

Duct Tightness Test Conducted by: HVAC South Phone: 404-123-4567

CFM₁₀₀ per 100 ft² of conditioned floor area = CFM₁₀₀ x 100 / Conditioned floor area served

If all ducts are not located within conditioned space, builder must verify that either the post-construction duct leakage to outdoors (PCL) is ≤ 8 cfm/100 ft², the post-construction total duct leakage (PCLT) is ≤ 12 cfm/100 ft², or the results in test (M1) with air handler installed is ≤ 6 cfm/100 ft². State which method was used to conduct the duct tightness test:

duct blower (DB), modified blower door subtraction method (MBDS), or automated multipoint blower door (AMBD):

System	Method (DB, MBDS, or MBT)	Test (PCL, PCLT, or M1)	CFM ₁₀₀	Area served (ft ²)	Test Result
1	DB	PCLT	2,000	2,000	5
2					
3					

*Note: This permanent certificate shall be posted on or in the electrical distribution panel. Certificate shall be completed by the builder or registered design professional. Where there is more than one value for each component, certificate shall list the value covering the largest area.

402.4 AIR LEAKAGE

Mandatory Requirement: Air Sealing

- Detailed list
- Fenestration
- Fireplaces
- Recessed light fixtures: airtight, IC-rated

Details on techniques for air sealing – in flip book format



402.4 Air leakage (Mandatory).

402.4.1 Building thermal envelope. The *building thermal envelope* shall be durably sealed to limit infiltration. The sealing methods between dissimilar materials shall allow for differential expansion and contraction. The following shall be caulked, gasketed, weatherstripped or otherwise sealed with an air barrier material, suitable film or solid material:

- All joints, seams and penetrations.
- Site-built windows, doors and skylights.
- Openings between window and door assemblies and their respective jambs and framing.
- Utility penetrations.
- Dropped ceilings or chases adjacent to the thermal envelope.
- Knee walls.
- Walls and ceilings separating a garage from conditioned spaces.
- Behind tubs and showers on exterior walls.
- Common walls between dwelling units.
- Attic access openings.
- Rim joist junction.
- Other sources of infiltration.



402.4.3 WOOD BURNING FIREPLACES

New *wood-burning fireplaces shall have gasketed doors and outdoor combustion air



 Southface



402.4.5 RECESSED LIGHTS

Standard Can Light



Air-tight and IC Rated



402.4.5 Recessed lighting. Recessed luminaires installed in the *building thermal envelope* shall be sealed to limit air leakage between conditioned and unconditioned spaces. All recessed luminaires shall be IC-rated and *labeled* as meeting ASTM E 283 when tested at 1.57 psf (75 Pa) pressure differential with no more than 2.0 cfm (0.944 L/s) of air movement from the *conditioned space* to the ceiling cavity. All recessed luminaires shall be sealed with a gasket or caulk between the housing and the interior wall or ceiling covering.

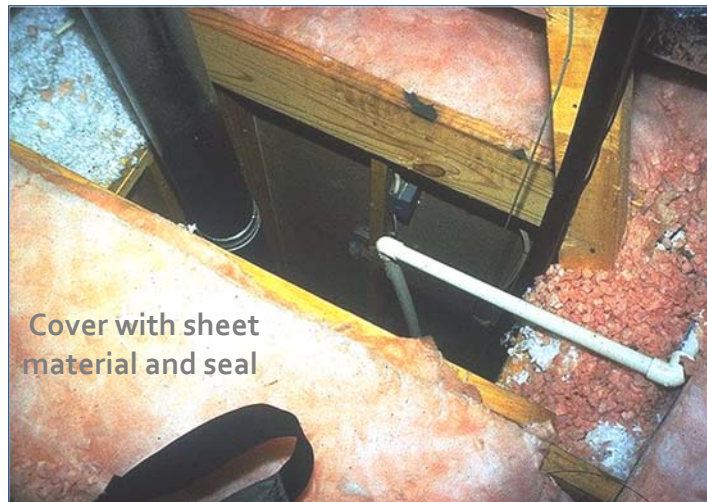
 Southface

402.4.2 AIR BARRIER AND INSULATION INSPECTION

NUMBER	COMPONENT	CRITERIA
1	Air barrier and thermal barrier	Exterior thermal envelope insulation for framed walls 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.
2	Ceiling/attic	Air barrier in any dropped ceiling/coffers is substantially aligned with insulation and any gaps are sealed. Attic access (except unvented attic), knee wall door, or drop down stair is sealed.
3	Walls	Corners and headers are insulated. Junction of foundation and sill plate is sealed.
4	Windows and doors	Space between window/door joints and framing is sealed.
5	Rim joists	Rim joists are insulated and include an air barrier.
6	Floors (including above-garage and cantilevered floors)	Insulation is installed to maintain permanent contact with underside of outdoor decking. Air barrier is installed at any exposed edge of insulation.
7	Crawl space walls	Insulation is permanently attached to walls. Exposed earth in unvented crawl spaces is covered with Class I vapor retarder with overlapping joints taped.
8	Shafts, penetrations	Duct shafts, utility penetrations, knee walls and flue shafts opening to exterior or unconditioned space are sealed.
9	Narrow cavities	Gaps in narrow cavities are cut to fit, or narrow cavities are filled by sprayed/blown insulation.
10	Garage separation	Air sealing is provided between the garage and conditioned spaces.
11	Recessed lighting	Recessed light fixtures are air tight, IC rated, and sealed to drywall. Exception—fixtures in conditioned space.
12	Plumbing and wiring	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.
13	Shower/tub on exterior wall	Showers and tubs on exterior walls have insulation and an air barrier separating them from the exterior wall.
14	Electrical/phone box on exterior walls	Air barrier extends behind boxes or air sealed-type boxes are installed.
15	Common wall	Air barrier is installed in common wall between dwelling units.
16	HVAC register boots	HVAC register boots that penetrate building envelope are sealed to subfloor or drywall.
17	Fireplace	Fireplace walls include an air barrier.



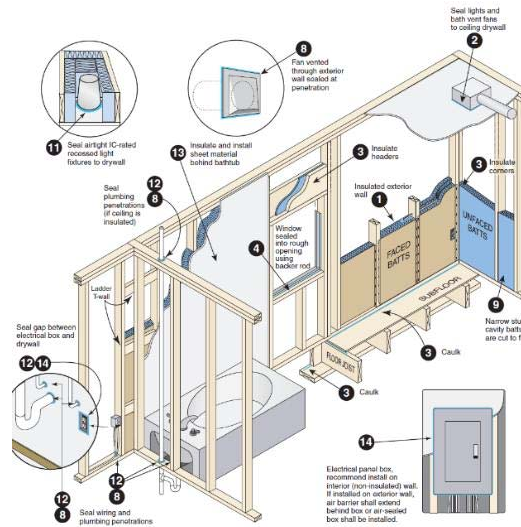
NO BIG HOLES!



APPENDIX A - AIR SEALING GENERAL (P.18)



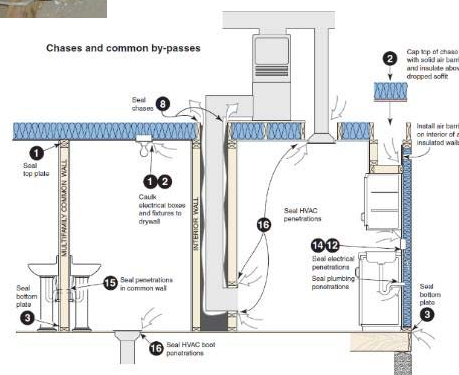
 Southface



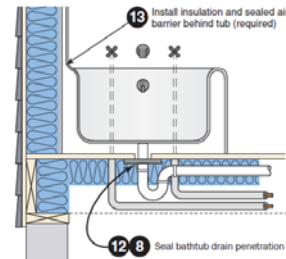
APPENDIX A - AIR SEALING CHASES (P.19)



 Southface



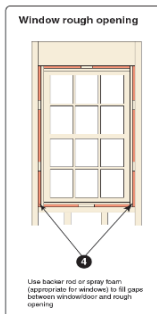
APPENDIX A - AIR SEALING BLOCKING & SHEATHING



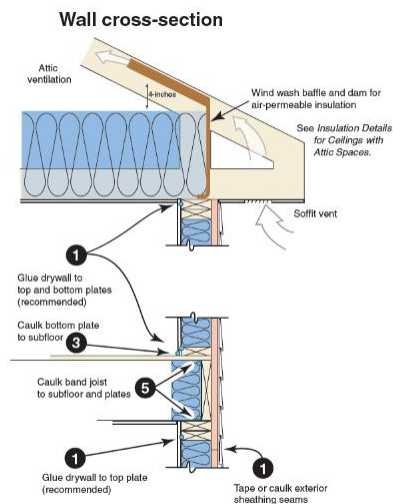
Solid sheet behind tubs
& showers on insulated walls



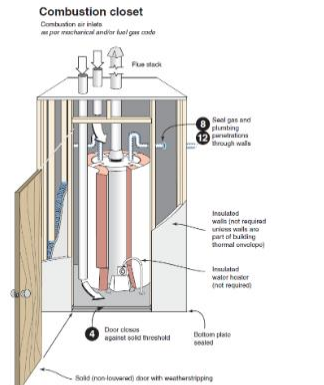
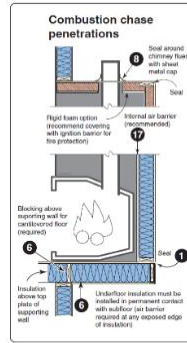
APPENDIX A - AIR SEALING WINDOWS (P. 20)



402.4.4- Windows, skylights and doors ≤ 0.3 cfm/s.f.,
Swinging doors ≤ 0.5 cfm/s.f.
Exception: site built



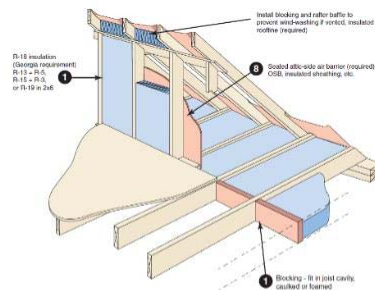
APPENDIX A - AIR SEALING COMBUSTION (P. 21)



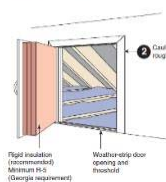
402.4.3- New wood-burning fireplaces shall have gasketed doors and outdoor combustion air

Southface

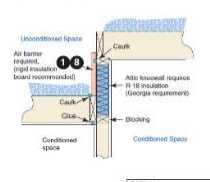
APPENDIX A - AIR SEALING KNEEWALLS (P. 22)



Attic knee-walls



Two-level attic

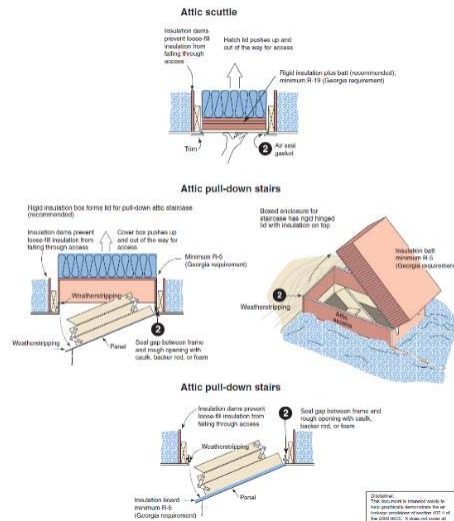


Southface

APPENDIX A - AIR SEALING ATTIC ACCESS (P. 23)



 Southface



402.4.2.1 ENVELOPE TIGHTNESS

REQUIRED Blower Door test by certified
Duct and Envelope Tightness (DET) verifier

- Test out at less than **7 ACH₅₀**

Exceptions

- Low-rise multifamily (R2 only) – 2 options
 1. Test 1 in 4 units or follow RESNET testing protocol
 2. Third-party ICC certified residential energy inspector or equivalent as approved by code official must visually inspect all units for air-sealing criteria
- Renovations that do not touch entire building envelope



$$\text{ACH}_{50} = \frac{\text{CFM}_{50} \times 60}{\text{Volume}}$$

 Southface

403.2.2. DUCT TIGHTNESS TESTING

Duct Tightness Testing REQUIRED by DET Verifier

- When tested at rough-in
 - Maximum 6% leakage with AHU installed
- When tested at final
 - Maximum 8% – Leakage to Outside
 - Maximum 12% – Total Leakage

Important: Blower Door and Duct Leakage test results

- **MUST be displayed on Certificate!**



403.2.2. DUCT TESTING EXCEPTIONS

- If all ductwork and air handler is inside the building envelope
- If less than 50% of duct system is replaced
- If Air handler, furnace or coil is *replaced*
 - Must seal all joints, seams and connections from equipment to plenum and from plenum to duct system with mastic
 - Must be verified via visual inspection by a state licensed conditioned air contractor or a Georgia DET verifier



403.2 - DUCTS

Mandatory Requirement:

Insulation:

- R-8 Insulation in Attic
- R-6 Insulation other unconditioned space
- No Insulation required when inside envelope



Sealing with Mastic required – “thick as a nickel” (GA specific)

May not use building cavities as supply or return (GA specific)



IRC REFERENCE – DUCT SEALING

M1601.3 Installation. Duct installation shall comply with Sections M1601.3.1 through M1601.3.6.

M1601.3.1 Joints and seams. Joints of duct systems shall be made substantially airtight by means of tapes, mastics, gasketing or other approved closure systems. Closure systems used with rigid fibrous glass ducts shall comply with UL 181A and shall be marked “181A-P” for pressure-sensitive tape, “181A-M” for mastic or “181A-H” for heat-sensitive tape. Closure systems used with flexible air ducts and flexible air connectors shall comply with UL 181B and shall be marked “181B-FX” for pressure-sensitive tape or “181B-M” for mastic. Duct connections to flanges of air distribution system equipment or sheet metal fittings shall be mechanically fastened. Mechanical fasteners for use with flexible nonmetallic air ducts shall comply with UL 181B and shall be marked 181B-C. Crimp joints for round metal ducts shall have a contact lap of at least 1 1/2 inches (38 mm) and shall be mechanically fastened by means of at least three sheet metal screws or rivets equally spaced around the joint.



DUCT AND ENVELOPE TIGHTNESS (DET) VERIFIER

Certified Verifier can either

Be Certified

- DET Verifier
- HERS Rater
- BPI Analyst
- Home Performance with ENERGY STAR contractor



Pass a DET Verifier Course

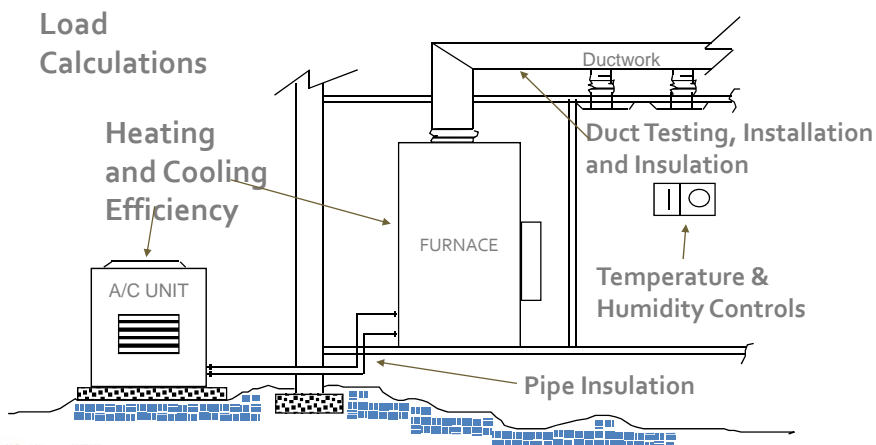
- Explain calculations for ACH50 and % duct leakage
- Discuss testing protocol (setup, safety, and accuracy)
- Field exam on tools (use blower door and duct tester)
- Pass Written Exam – 25 Questions (1 hour)

CERTIFIED DUCT AND ENVELOPE TIGHTNESS (DET) VERIFIER. A certified DET verifier shall be a certified Home Energy Rating Systems (HERS) rater, or be a certified Home Performance with ENERGY STAR contractor, or be a Building Performance Institute (BPI) Analyst, or successfully complete a certified DET verifier course that is approved by the Georgia Department of Community Affairs.
(Effective January 1, 2011)



SECTION 403 - SYSTEMS

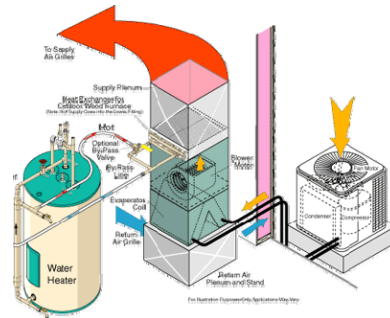
All Mandatory Requirements



SECTION 403.1 - HVAC CONTROLS

Mandatory Requirement:

- **Programmable** thermostat required for furnace
- Heat Pump requires smart thermostat or lockout feature to prevent unnecessary strip heat



403.3&4 PIPES, 403.5 VENTS

Pipe Insulation

- R-3: mechanical systems – fluids > 105 F or < 55 F
- R-2: for plumbing circulating systems (plus controls)

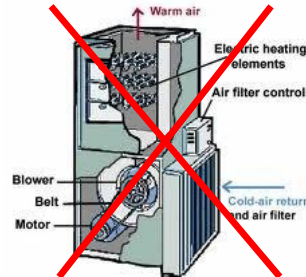
Mechanical Vents

- Require dampers



403.6.1-HEAT SOURCE, 403.10 POWER ATTIC VENTS

- GA Specific - New or replacement central HVAC systems shall not use electric-resistance heat as primary heat source for home
- GA Specific – No grid-tied power attic ventilators allowed (exception for solar powered)



Southface

403.6 SIZING

Load Calcs & Sizing

- Per Mechanical section of IRC
- ACCA Manual J or approved equivalent, i.e., ASHRAE Fundamentals
- 302.1: Interior design temp (72°F heating, 75°F cooling)
- MUST BE ACCURATE

SECTION M1401 GENERAL

M1401.1 Installation. Heating and cooling equipment and appliances shall be installed in accordance with the manufacturer's installation instructions and the requirements of this code.

M1401.2 Access. Heating and cooling equipment shall be located with respect to building construction and other equipment to permit maintenance, servicing and replacement. Clearances shall be maintained to permit cleaning of heating and cooling surfaces; replacement of filters; blowers, motors, controls and vent connectors; lubrication of moving parts; and adjustments.

M1401.3 Sizing. Heating and cooling equipment shall be sized based on building loads calculated in accordance with ACCA Manual J or other approved heating and cooling calculation procedures.

M1401.4 Exterior installations. Equipment installed outdoors shall be listed and labeled for outdoor installation. Supports and foundations shall prevent excessive vibration, settlement or movement of the equipment. Sarecons and foundations shall be installed in accordance with the requirements of this code.

Southface

2009 IECC- SECTION 401.3

Mandatory Requirement:

- Certificate on panel box or air handler shows
- Major Component R-values
- U-factor, SHGC of Windows
- Equipment Efficiencies
- GA Specific: **Load Calculations**
- GA Specific: **Envelope and Duct Testing Results**



404 - LIGHTING

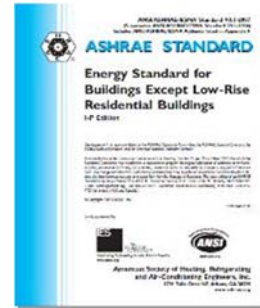
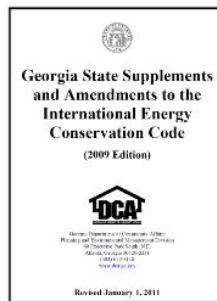
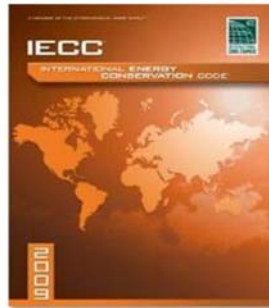
A minimum of 50 percent of bulbs in permanent fixtures must be high-efficacy **or on occupancy / vacancy sensor (GA specific)**

High efficacy =

- + CFL,
- + T8 or T5 fluorescent bulb or,
- + Meet certain lumen/W requirements (good LEDs)
- NOT incandescent/ halogen bulbs
- NOT T12 fluorescent bulbs



GEORGIA COMMERCIAL ENERGY CODE



WRAP UP AND Q&A

Thank you!

Bourke Reeve
breeve@southface.org

