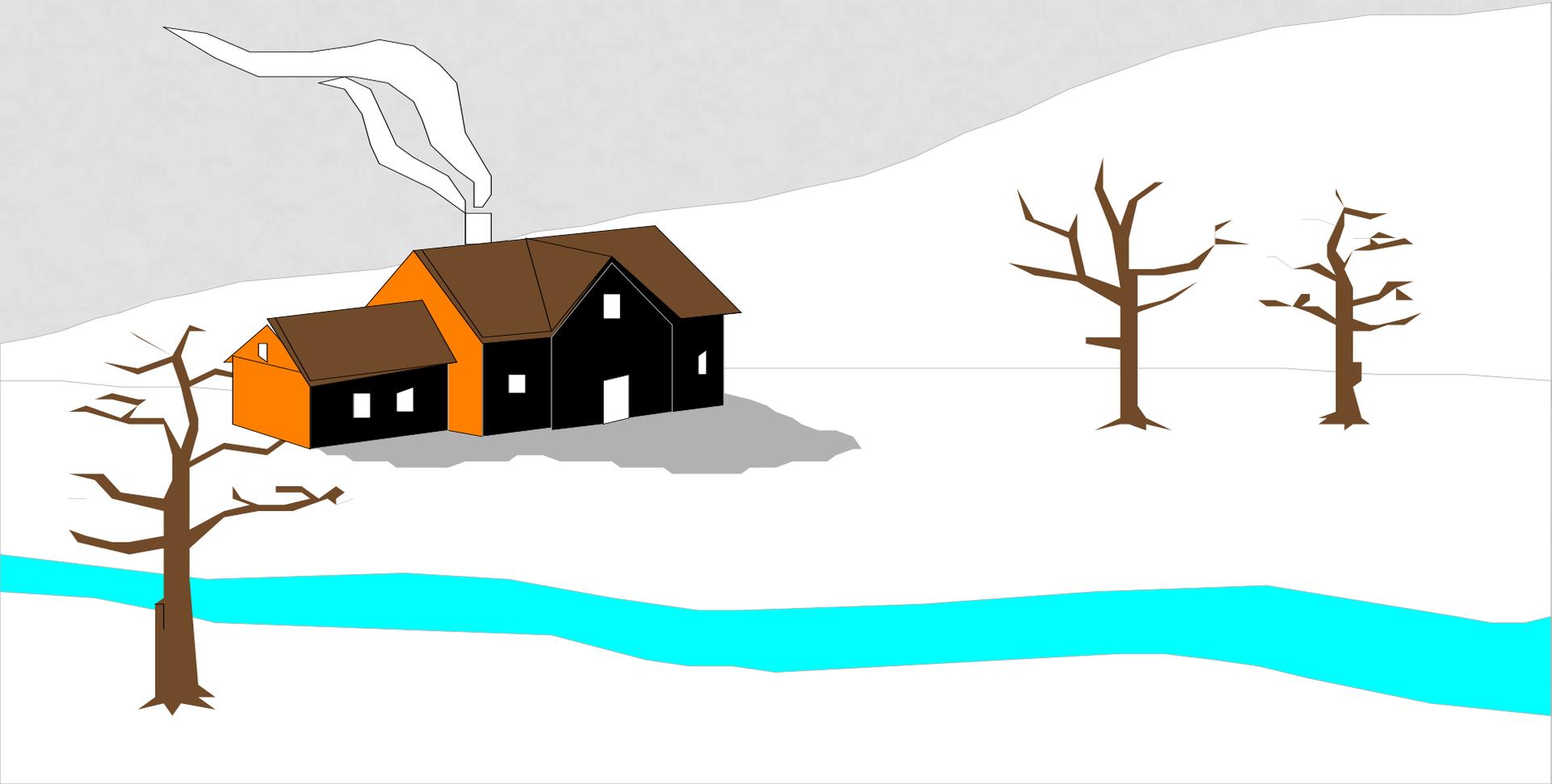


THE VERMONT RESIDENTIAL ENERGY CODE 2015



WORKSHOP CONTENT

- The Energy Code
 - Background / Overview
 - Which buildings, when?
 - Obligations of the builder
- What's Required?
 - Basic Requirements
 - Performance Requirements
 - Filing the Paperwork

TODAY'S PRESENTATION

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Delivered by Efficiency Vermont

MAJOR CHANGES FOR 2015

- Compliance with Stretch code required for Act 250 projects
- New insulation requirements and packages
- ASHRAE 62.2 option for ventilation
- Makeup air requirements for exhaust hoods
- Air tightness reduced from 5 to 3 ACH50
- 75% of lights must be high efficacy

THE LEGISLATION -- ACT 20 OF 1997 “RESIDENTIAL BUILDING ENERGY STANDARDS”

- Based on International Energy Conservation Code
 - Performance-based standard
 - Some Vermont-specific additions/exemptions
- Self-certification by builder
- Three-year revision cycle
 - Public review process
- 2015 code applies to all projects that start construction on or after March 1, 2015



WHICH BUILDINGS MUST COMPLY?

- New construction, low-rise residential
 - One and two family dwellings
 - Multifamily housing three stories or less
 - Does *not* include commercial buildings
 - But *does* include residential part of mixed-use
- Existing low-rise residential buildings
 - Additions
 - Only the addition needs to conform
 - Renovations, window & equipment replacement

ALTERATIONS & RENOVATIONS

- Applies to additions, alterations, renovations or repairs to an existing building, building system or portion thereof (unaltered portions need not comply)
- Applies to change of unconditioned to conditioned space
- Applies to insulation projects
- Replacement windows must comply
- Storm windows and glass replacement exempt

ALTERATIONS & RENOVATIONS

- Walls exempt if cavities are not exposed or if they are already full of insulation
- Reroofing exempt unless sheathing or insulation is exposed and cavity is empty
- Replacement of less than 50% of light fixtures and replacement of bulb & ballast in existing fixtures is exempt

LOG HOMES

- Vermont code distinguishes between log homes and everything else
- In general, log homes are allowed to be less efficient
 - But there are more stringent requirements for other parts of the building to partially make up for the difference

EXEMPTIONS

- Extreme low energy use
 - less than 1 watt per square foot peak load
- Mobile homes
 - Title VI, National Manufactured Housing Construction & Safety Standards Act of 1974
 - Site-constructed components still must comply
- Buildings (or areas) not heated or cooled
- Hunting Camps

- Historic buildings can apply for exemption

OWNER/BUILDER PROJECTS

- Specifically exempted from meeting the technical requirements of the code
- Owner must direct the details of construction, including energy items, must live in the building
- Must do calculations, complete and file the Owner/Builder Disclosure Statement
- Must disclose in writing to potential buyers before purchase and sale agreement

LIABILITY

- Homeowner may take civil action against person certifying building
- Damages may include increased energy costs and costs to bring the building into compliance (as well as court, attorneys' fees)
- Claims must be filed within six years

THERMAL REQUIREMENTS

- The next few slides outline the thermal requirements of the new code
- For average houses, installing these levels will meet the code
- But the code requires overall performance, and there are many ways to get there
- So you can install assemblies less efficient than this, but you have to make up for it somewhere else in the building, and you have to use a method that accommodates that trade-off

WINDOWS

- Fenestration (except skylights)
 - Maximum 0.32 U-value (0.30 for log homes)
- Skylights
 - Maximum 0.55 U-value
- Glazing area
 - Maximum 20%
- Up to 15 sq ft of glazing and one door is exempt

INSULATION

- Ceilings
 - Minimum R-49
 - For flat ceilings, R-38 deemed to meet R-49 if full height uncompressed over top wall plate
 - Sloped ceilings OK @ R-30 if not more than 500 sq ft or 20% of ceiling area, whichever is less
 - Installer must certify details, sign, post in conspicuous location. Depth markers required for blown attics

INSULATION

- Wood frame walls
 - Minimum R-25
 - R-13 cavity insulation plus R-10 insulated sheathing deemed to comply.
- Mass walls
 - Minimum R-15
 - R-20 required if more than half of the insulation is on the interior
 - (Log homes exempt from wall R-value requirement)

INSULATION

- Floors
 - Minimum R-30 (R-38 for log homes)
 - Minimum R-20 OK if it fills the whole cavity
 - Must maintain permanent contact with underside of subfloor

INSULATION

- Basement walls
 - Minimum R-15 continuous or R-20 cavity
 - From top of wall to 10 ft below grade or to basement floor, whichever is less
 - Exterior insulation must have protective covering

INSULATION

- Unvented crawl space:
 - Minimum R-15 continuous or R-20 interior cavity
 - Permanently fastened to wall down to floor and then vertically and/or horizontally for at least an additional 24 inches
 - Must have Class I vapor barrier on floor, attached to wall, seams taped
 - No vents to outside
- Vented crawl space
 - Insulate floor above

INSULATION

- Slab edge
 - Minimum R-15 perimeter
 - Four feet high or high + wide total
- Heated slab
 - Minimum R-15 underneath continuous
- Exposed exterior insulation must have a protective covering

WHAT'S REQUIRED?

- Basic Requirements
- Performance Requirements -- Three Methods
 - ☎ "Fast Track" method
 - 💻 REScheck Software
 - ★ Home Energy Rating
- Certification

WHEN TO DO THE ANALYSIS



- Not required until after, but...
- Should determine where you stand before committing to a design
 - Or especially, before framing & backfilling

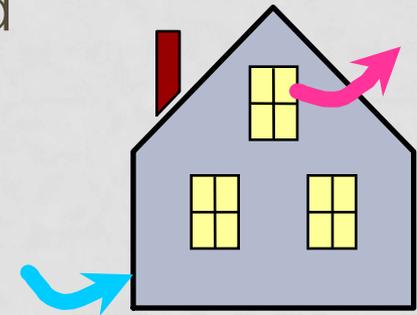
BASIC REQUIREMENTS

Vermont Residential Building Energy Code		
Basic Requirements ~ Summary		
<i>Note: This is an overview of key points. See Appendix C for complete details.</i>		
1	Air Leakage	Seal all joints, access holes and other such openings in the building envelope, as well as connections between building assemblies. Air barrier installation must follow criteria established in (insert section here).
2	Vapor Retarder	For non-vented framed ceilings, wall and floors, install a vapor retarder (i.e., 6 mil. plastic or vapor-barrier paint) on the warm-in-winter side of the insulation.
3	Duct Insulation	In unconditioned basements, crawlspaces and attics, insulate supply and return ducts for heating and cooling systems to R-5. Insulate ducts outside the building to R-8.
4	Duct Sealing	In unconditioned spaces, seal ducts using mastic with fibrous backing tape. (Pressure-sensitive tape maybe used only for duct-board systems, in accordance with NAIMA standards.) Duct tape is not permitted.
5	Programmable Thermostat	Where the primary heating system is a forced-air furnace, forced air split system heat pump, packaged unit heat pump, water boiler, or steam boiler, at least one programmable thermostat per home must be installed.
6	Solid Fuel-Burning Appliances and Fireplaces	All solid fuel-burning appliances and fireplaces must have tight-fitting, gasketed metal, glass or ceramic doors with compression closure or compression latch system.
7	Exhaust Fans	Exhaust dampers are required for kitchen, bath and dryer fans.
8	Ventilation & Combustion Air	All homes must have an automatically controlled ventilation system. Chimney-vented combustion devices must have combustion air. See Chapter 2 for details.
9	Maximum Fenestration U-Factor	The area-weighted average maximum fenestration U-factor permitted using trade-offs is 0.32 for windows and 0.55 for skylights.
10	Mechanical System Piping Insulation	Mechanical system piping capable of carrying fluids above 105°F (41°C) or below 55°F (13°C) must be insulated to a minimum of R-3.
11	Lighting	A minimum of 50 percent of the lamps in permanently installed lighting fixtures must be high-efficacy lamps.
12	Circulating Hot Water Systems	All circulating service hot water piping must be insulated to at least R-3. Circulating hot water systems must also include an automatic or readily accessible manual switch that can turn off the hot water circulating pump when the system is not in use.
13	Equipment Sizing	Heating and cooling equipment must be sized in accordance with ACCA Manual S based on building loads calculated in accordance with ACCA Manual J or other approved heating and cooling calculation methodologies. In addition, heating and cooling equipment must be sized in accordance with (insert section here).
14	Certification	Complete a Vermont Residential Building Energy Standards Certificate for each dwelling. Send one copy to the Vermont Department of Public Service and one copy to the town clerk of the town in which the property is located, and affix the original on or near the home's electrical panel or heating equipment.
<i>For details about any of these requirements, see Appendix C.</i>		

- Air Tightness
- Vapor Retarder
- Ducts
- Thermostats
- Solid Fuel Appliances
- Ventilation & Combustion Air
- Window U-value
- Pipe Insulation
- Lighting
- Equipment Sizing

AIR LEAKAGE

- Air leakage locations must be sealed
- Applies to leakage points between:
 - Conditioned space and outside
 - Conditioned and unconditioned spaces
- Testing option
 - Less than 3 ACH @ 50 Pa
 - Everything open except chimney dampers, continuously operating vent system, adjustable passive vents
- Visual inspection option



VISUAL AIR BARRIER INSPECTION

- Continuous, durable air barrier
- Breaks or joints in the air barrier sealed
- Space between fenestration jambs and framing sealed with minimum expanding foam
- All plumbing and wiring penetrations shall be sealed to the air barrier

VISUAL AIR BARRIER INSPECTION

- Junctions of the foundation and sill plate, sill plate and rim-band, and rim band and subfloor, and tops of walls sealed
- When air permeable insulation is installed at the rim joist, a durable, rigid interior air barrier shall be installed
- Air barrier shall be installed at any exposed edge of floor insulation.

VISUAL AIR BARRIER INSPECTION

- Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be air sealed
- Air sealing shall be provided between the garage and conditioned spaces
- Exterior walls adjacent to showers and tubs shall have a durable, rigid air barrier separating the exterior wall from the shower and tubs

VISUAL AIR BARRIER INSPECTION

- Air barrier extends behind electrical or communication boxes or air sealed type boxes shall be installed or created
- Air barrier shall be installed in common wall between dwelling units. Common walls shall be sealed at junctions with outside walls and at the top pressure plane of the house
- HVAC register boots that penetrate building thermal envelope shall be sealed to subfloor or drywall
- Log homes have their own criteria (ICC-400)

RECESSED LIGHTS

- Must be IC (Insulation Contact) rated
- Must be air tight or low leakage fixtures
 - No penetrations between the inside of the recessed fixture and ceiling cavity; sealed or gasketed to prevent air leakage

ACCESS HATCHES

- Access doors must be weatherstripped and insulated to a level equivalent to the insulation on the surrounding surfaces.
- Access must be provided to all equipment that prevents damaging or compressing the insulation.
- A wood framed or equivalent baffle or retainer is required when loose fill insulation is installed.

VAPOR RETARDER

- Class I or II (aluminum foil, poly, kraft facing) required on frame walls
 - Except basement walls & below grade walls
- Class III (paint) allowed if:
 - Vented cladding over fiberboard or gypsum
 - Insulated sheathing R-7.5 on 2x4 wall
 - Insulated sheathing R-11.25 on 2x6 wall

DUCTS

- Ducts outside thermal envelope must be insulated to the same R-value as required for immediately adjacent surfaces
- All ducts must be air sealed
- Can't use building cavities as supply ducts. May be used as return ducts, but only interior cavities

DUCTS

- If air handler or any ductwork is located outside conditioned space, ducts must be tested and have:
 - Less than 4 CFM@25 Pa leakage to outdoors per 100 sq ft of conditioned floor area (postconstruction), or
 - Less than 3 CFM@25 Pa total leakage per 100 sq ft of conditioned floor area (rough-in)

HEATING CONTROLS

- Programmable thermostat required if furnace, heat pump or boiler
- Not required for solid fuel or spaces served by radiant floors

COMBUSTION AIR FOR GAS & OIL

- All chimney-vented gas and oil appliances (Category I or Category II) must have combustion air as specified in the gas and oil codes (NFPA 54 & 31), even if those codes have not been adopted in the local area.
- All new homes are “unusually tight construction” as defined in the gas & oil codes, so air must be supplied, regardless of the volume of the space
- Also, taking combustion and dilution air from attics or crawl spaces is specifically prohibited

CHIMNEYS

- All chimney-vented equipment must establish spill-free draft within 2 minutes under worst-case conditions

SOLID FUEL COMBUSTION

- Must have gasketed doors with compression closure or compression latch system
- Solid fuel combustion air must be delivered directly to the firebox (except older stoves where not possible)
- Site-built exterior air inlet must meet detailed installation requirements

MECHANICAL VENTILATION

- Whole house ventilation
 - Including local exhaust
- Automatic controls
- Minimum flow rates
- Installation requirements

HOW MUCH AIR?

- Two ways to comply with code
 - Prescriptive
 - Install required minimum rated capacity
 - Performance
 - Have system tested

MINIMUM RATED CAPACITIES

Number of Bedrooms	Minimum Rated Capacity (CFM)	Minimum Number of Fans (if not central system)
1	50	1
2	75	1
3	100	1
4	125	2
5	150	2
> 3000 sq ft	0.05 x sq ft	2

PERFORMANCE TESTING

- Measured flow must be at least 15 CFM plus 15 per bedroom
- 2 bedroom – 45 CFM
- 3 bedroom – 60 CFM
- 4 bedroom – 75 CFM
- 5 bedroom – 90 CFM



LOCAL VENTILATION

- Bathrooms must have exhaust
 - 50 CFM capacity for intermittent
 - 20 for continuous
 - Can use the whole-house system or a separate fan
- Kitchen exhausts over 400 CFM must have make-up air

NOISE

- Quiet is important
 - Or occupants will turn it off
- Equipment within 4 feet of louvers, grills or openings must be rated no more than 1.5 sones
- Remotely-mounted equipment must be acoustically isolated from framing and isolated from ducting by short (1-2 ft) runs of insulated flex duct

CONTROLS

- Code requires continuous operation or automatic control (no reliance on humans)
- Continuous operation
 - Must have labeled, remotely-mounted switch
 - No local way of turning off
- Automatic Control
 - Must have timer or other fully automatic control
 - Crank timers, dehumidistats, switches not allowed

VENTILATION DUCTWORK

- Fan housings and inlet grills must be sealed to ceiling or wall
- Duct runs over 8 feet must be a smooth wall material
- Ducts in unheated locations must be insulated
- Fans must be connected to ducts with mechanical fasteners
- Joints & connections must be air sealed

BATH FAN SELECTION

- Must be rated for “continuous duty”
- Must not exceed 50 watts
 - As listed by manufacturer
 - Fan power only, not lights, heater, etc
 - Fans under 20 watts available
- Must be no more than 1.5 sones
 - Fans under 1 sone available

WINDOW EFFICIENCY

- The average area-weighted U-value of windows may not exceed 0.32
- Skylights may not exceed U-0.55

HOT WATER PIPES

- Mechanical system piping in unconditioned spaces capable of carrying fluids above 105 degrees F must be insulated to a minimum R-3
- Applies to space heating pipes only, not domestic hot water

LIGHTING EFFICIENCY

- At least 75% of lighting fixtures must be high-efficiency lamps
 - CFL or equivalent

SYSTEM SIZING

- Heat load calculation must be done
 - Manual J or other approved methodology
- Air conditioners and heat pumps must not be oversized by more than 15%
- Fuel-fired appliances must not be oversized by more than 40%
- Or use smallest available unit

Wanna Short Break?

COMPLIANCE METHODS

“Fast Track” Method

Software Method

Home Energy Rating



FAST TRACK METHOD

- Advantages
 - Simplest method
 - Minimal calculations
 - Low cost (do it yourself)





FAST TRACK METHOD

Drawbacks

- Least flexible, limited types of homes
- Glazing area cannot exceed 20% of wall area
- Cannot use for metal framing in exterior walls
- Must comply with conditions
 - Attic hatch insulated equal to attic floor
 - Basement wall insulation full-height
 - Specified depth for slab, crawl space insulation



FAST TRACK: PROCESS

Table 4-1

Performance Requirements Single-Family and Multi-Family Homes ~ <i>Fast-Track Method</i>		
Component	Base Package	Sloped Ceiling Alternative
1. Ceiling R-Value	R-49	R-38
2. Above-Grade Wall R-value	R-20 or R-13+5	R-20+5
3. Floor R-value	R-30	R-30
4. Basement/Crawl Space Wall R-value	R-15/20	R-15/20
5. Slab Edge R-value	R-15, 4 ft.	R-15, 4 ft.
6. Heated Slab R-value	R-15	R-15
7. Window and Door U-value	0.32	0.32
8. Skylight U-value	0.55	0.55
9. Maximum Glazing Area	20%	20%

Note: R-values and AFUE must be equal to or greater than the values shown. U-values and glazing percentage must be equal to or less than the values shown.

Table Qualifiers

These guidelines apply to all "Performance Requirements" tables in this handbook.

- A Thermal Values:** Use the nominal thermal values listed by the manufacturer. If the home's design specifies a component that has two different thermal values (i.e., R-38 ceiling and R-49 ceiling), an average R-value must be calculated for comparison. (See Section 3.5a.)
- B Wall R-Values:** "13+5" means R-13 cavity insulation plus R-5 insulated sheathing. If structural sheathing covers 25 percent or less of the exterior, insulating sheathing is not required where structural sheathing is used. If structural sheathing covers more than 25 percent of exterior, structural sheathing shall be supplemented with insulated sheathing of at least R-2.
- C Window U-Values:** Window U-value is the average U-value for all glazing, including windows, skylights, and sliding and patio doors. (See Section 3.5b to calculate average U-values.)
- D Window and Door Exemptions:** You can exclude up to 15 square feet of glazed fenestration area from the calculation of average U-value for windows, and one door (up to 24 square feet) from the calculation of average U-value for doors.
- E Default Thermal Values:** See Appendix B. Flat and sloped ceiling R-values assume standard truss. However, if a raised truss is used, as shown in Figure B-1 (Appendix B), R-value may be reduced to R-38.
- F Ceilings Without Attics:** For ceilings without attic spaces (vaulted ceilings), R-30 is allowed for up to 500 square feet or 20% of the total insulated ceiling area, whichever is less.
- G Ceilings With Attics:** For ceilings with attic spaces, R-38 is allowed to satisfy the requirement for R-49 wherever the full height of uncompressed R-38 insulation extends over the wall top plate at the eaves.
- H Slab Edge Insulation:** Slab edge insulation must extend 4' or a combination of depth and width that equals 4'.
- I Basement/Crawlspace R-Values:** "15/20" means R-15 continuous insulated sheathing on the interior or exterior of the home or R-20 cavity insulation at the interior of the basement wall. "15/20" is allowed to be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulated sheathing on the interior or exterior of the home. Crawlspace wall insulation must cover the full height of the wall and extend to a depth 12" below grade and basement wall insulation must cover the full height of the basement wall.
- J Hatches:** Access hatches and doors must be insulated to the same level as the surrounding surface.
- K Unconditioned Spaces:** Components that enclose unconditioned spaces do not need to be considered.
- L Heated Slabs:** R-15 insulation is required beneath the entire slab for heated slabs.
- M Thermal Values That Do Not Apply:** Ignore the values in the table if the building component is not part of the home (i.e., if there are no sloped ceilings, ignore the values).

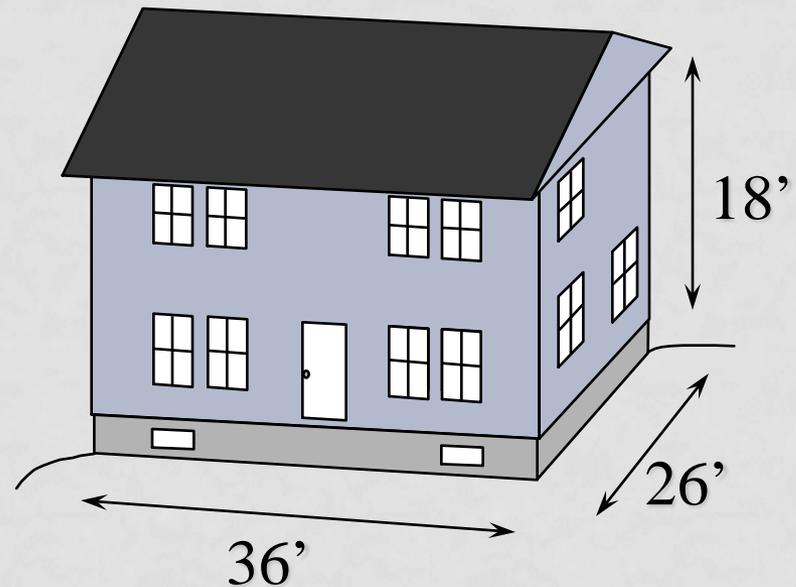
Calculate glazing percent area
 Find the right Fast Track table for your building type
 Choose desired package
 Complete and file Certificate after building is finished

GLAZING PERCENTAGE

THE ONE MAIN CALCULATION FOR THE FAST TRACK METHOD

- $124 \text{ perim} \times 18 \text{ (includes 2 band joists)} = 2232 \text{ sq ft gross wall}$
- $16 \text{ windows} \times 15 \text{ sq ft} = 240 \text{ sq ft}$
- $4 \text{ bmt windows} \times 4.5 \text{ sq ft} = 18 \text{ sq ft}$
- Total window area = 258 sq ft

- $258 / 2232 = .116$, or 11.6%



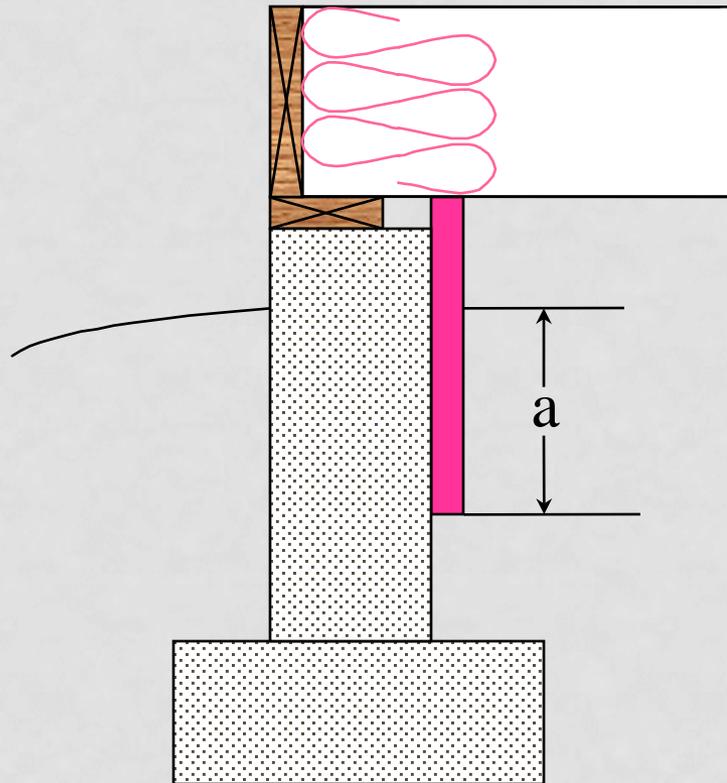
FOUNDATION INSULATION

- For tables, basement wall insulation must extend from the top of the wall to the floor

CRAWLSPACE INSULATION

- Vented crawlspace:
 - The floor above a vented crawlspace must be insulated
 - Must be separated from conditioned basement
- Unvented crawlspace w/ wall insulation:
 - Wall insulation must go from top of wall to at least 12" below grade

CRAWLSPACE WALL INSULATION

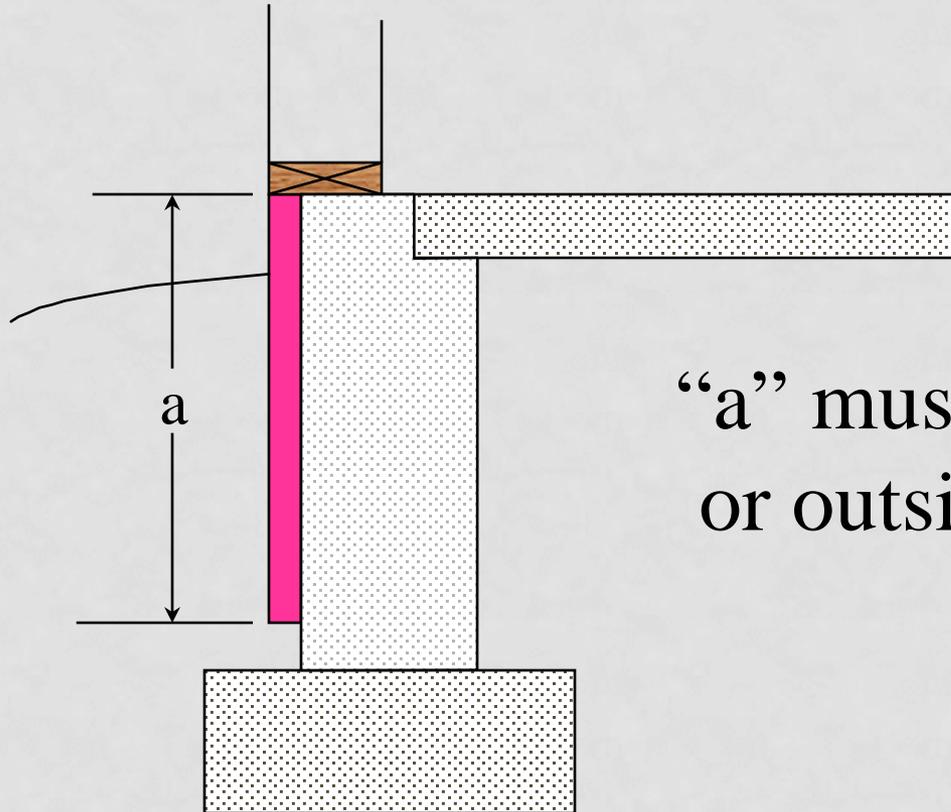


“a” must be 12”
minimum (inside or
outside frost wall)

SLAB-ON-GRADE FLOORS

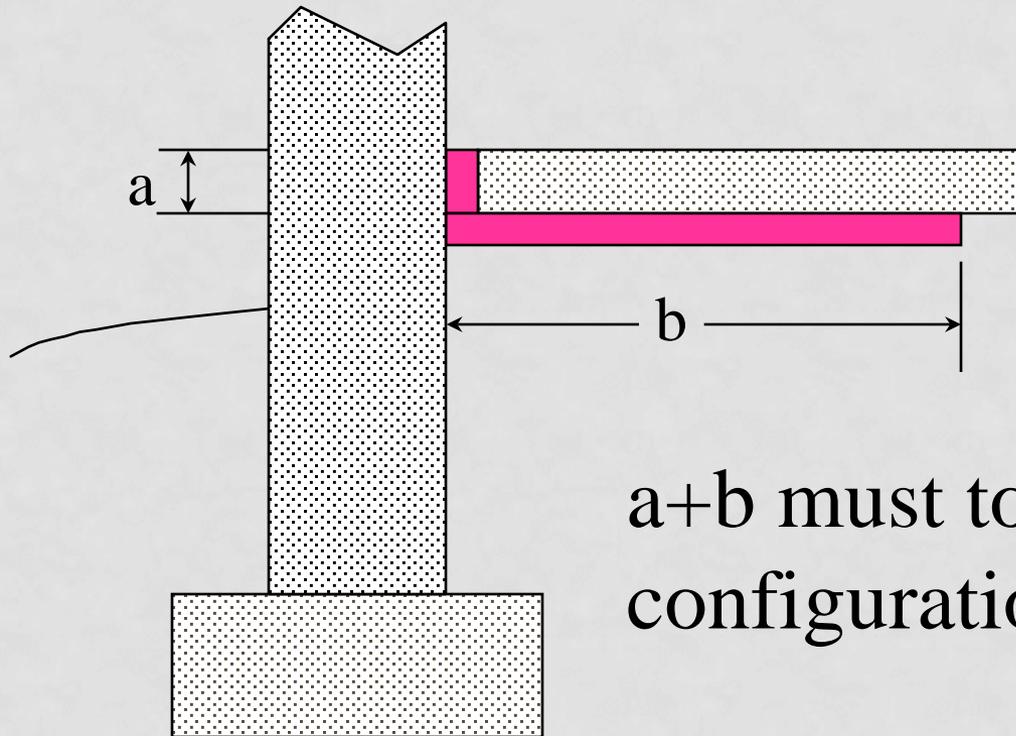
- Insulation is required when top of slab is:
 - At or above grade
 - Less than 12" below grade
- Insulation requirement applies to walk out portion of conditioned basement (includes unheated basement below an uninsulated floor)
- Insulation depth (or total of depth + width) must be at least 48"

SLAB INSULATION--EXAMPLE 1



“a” must be 48” (inside or outside frost wall)

SLAB INSULATION--EXAMPLE 2



$a+b$ must total 48" (other configurations possible)

FLOORS

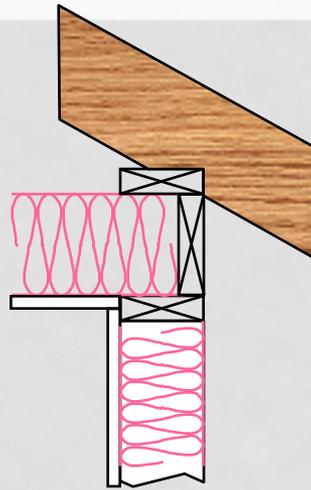
- If exposed floor (over outdoors):
 - Ceiling R-values apply
- If over unconditioned space (basement, crawl space or garage):
 - Floor R-values apply

ATTIC INSULATION AT THE EAVES

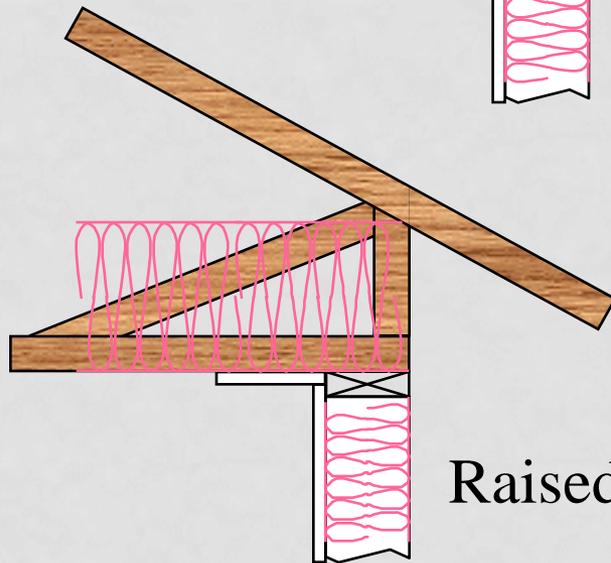
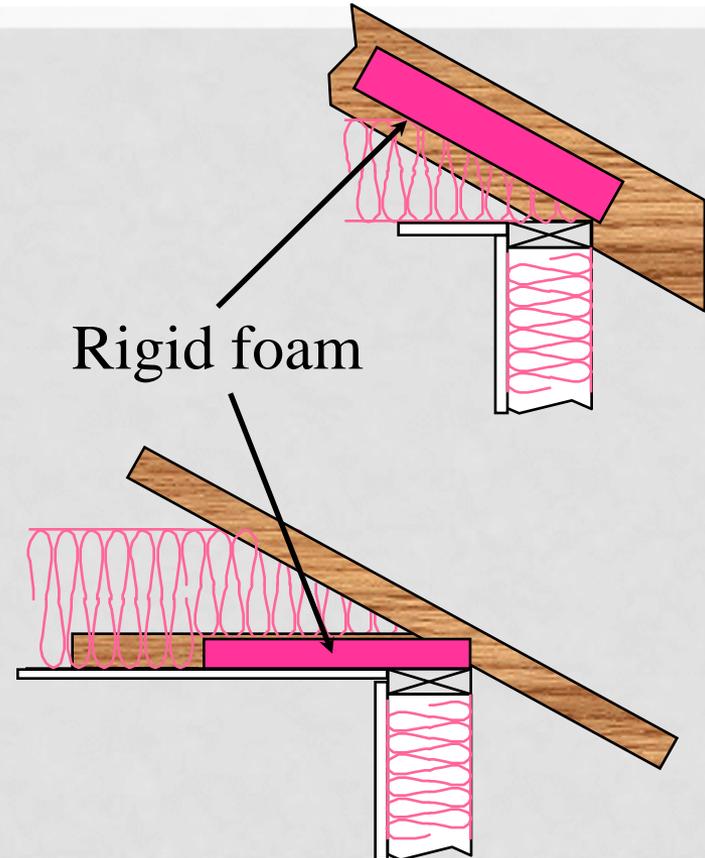
- Table assumes diminished insulation at eaves
 - R-49 required
- If full R-value extends to above outside face of exterior wall, only R-38 required

RAISED TRUSS EXAMPLES

Raised rafter
(engineered)



Rigid foam



Raised heel truss

OTHER CONDITIONS FOR TABLES

- 1% of window area and up to one door exempt from U-value requirements
 - Still must include square footage in glazing percentage
 - Allows use of decorative window or door

FAST TRACK TABLE

Prescriptive Requirements

Single-Family and Multi-Family Homes ~ *Fast-Track Method*

<i>Component</i>	<i>Package 1</i>	<i>Package 2</i>	<i>Package 3</i>	<i>Package 4</i>	<i>Package 5</i>
1. Ceiling R-Value	R-49	R-49	R-28 cont.	R-60 attic / R-49 slope	R-49
2. Above-Grade Wall R-value	R-13+10	R-25	R-21 cont.	R-20 cav.	R-13+10
3. Floor R-value	R-30	R-30	R-30	R-30	R-30
4. Basement/Crawl Space Wall R-value	R-15/20	R-15/20	R-15/20	R-15/20	R-15/20
5. Slab Edge R-value	R-15, 4ft.	R-15, 4ft.	R-15, 4ft	R-15, 4 ft	R-10, 4 ft
6. Heated Slab R-value (Edge and Under)	R-15	R-15	R-15	R-15	R-15
7. Window and Door U-value	0.32	0.28	0.32	0.28	0.28
8. Skylight U-value	0.55	0.55	0.55	0.55	0.55
9. Maximum Air Leakage	3 ACH50	3 ACH50	3 ACH50	3 ACH50	3 ACH50
10. Maximum Duct Leakage	4 CFM25/ 100 CFA	4 CFM25/ 100 CFA	4 CFM25/ 100 CFA	4 CFM25/ 100 CFA	4 CFM25/ 100 CFA

FAST TRACK TABLE - STRETCH CODE

Prescriptive Requirements

Stretch Code ~ *Fast-Track Method*

<i>Component</i>	<i>Package 1</i>	<i>Package 2</i>	<i>Package 3</i>	<i>Package 4</i>	<i>Package 5</i>
1. Ceiling R-Value	R-60 attic/ R-49 slope	R-49 attic/R-49 slope	R-60 attic/R-49 slope	R-28 cont.	R-60 attic/R-49 slope
2. Above-Grade Wall R-value	R-13+10	R-25 cav.	R-20 cav.	R-21 cont.	R-20+10
3. Floor R-value	R-30	R-38	R-38	R-30	R-30
4. Basement/Crawl Space Wall R-value	R-20 cont./ R-13+10	R-20 cont./ R-13+10	R-20 cont./ R-13+10	R-20 cont./ R-13+10	R-15 cont./ R-20 cav.
5. Slab Edge R-value	R-15, 4ft.	R-15, 4ft.	R-15, 4ft	R-15, 4 ft	R-15, 4 ft
6. Heated Slab R-value (Edge and Under)	R-15	R-15	R-15	R-15	R-15
7. Window and Door U-value	U-0.28	U-0.28	U-0.28	U-0.30	U-0.30
8. Skylight U-value	0.55	0.55	0.55	0.55	0.55
9. Maximum Air Leakage	3 ACH50	3 ACH50	3 ACH50	3 ACH50	3 ACH50
10. Maximum Duct Leakage	4 CFM25/ 100 CFA	Inside thermal boundary	Inside thermal boundary	Inside thermal boundary	Inside thermal boundary

FAST TRACK: THINGS TO REMEMBER

Glazing area percent of **gross** wall area

- Must also include windows of conditioned basement (even if the wall they are in is not considered above-grade) and skylights

Floors over outside air use ceiling R-value

Meet conditions of the table

SOFTWARE METHOD

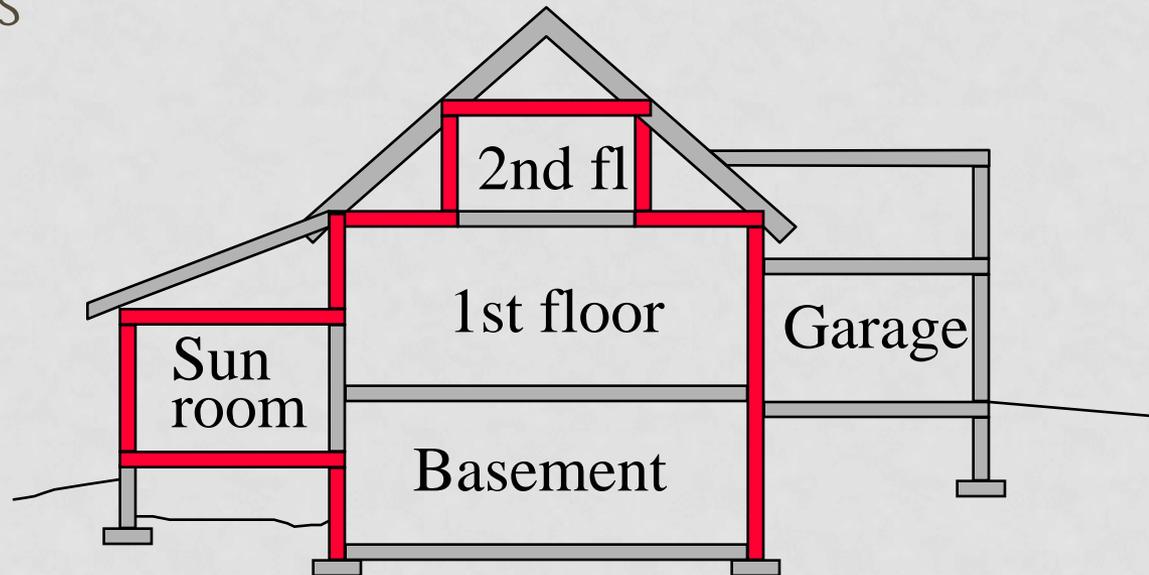
Advantages

- Easy to try variations, update changes
- Reduces calculation time and errors
- Use for wide variety of designs
- Do-it-yourself, with basic computer skills
- Generates report automatically



DEFINITION: BUILDING ENVELOPE

- Components that separate conditioned spaces from outdoors, or from unconditioned spaces



MEASURING BUILDING COMPONENTS

- Gross wall area: exterior dimensions, including windows and doors; including band joists between insulated walls. Includes slopes within 30 degrees of vertical.
- Window, Skylight, Door: use rough opening size
- Basement walls: Treat each wall separately. For conditioned basements, walls that are mostly above grade are included with the other above-grade walls

BASEMENTS

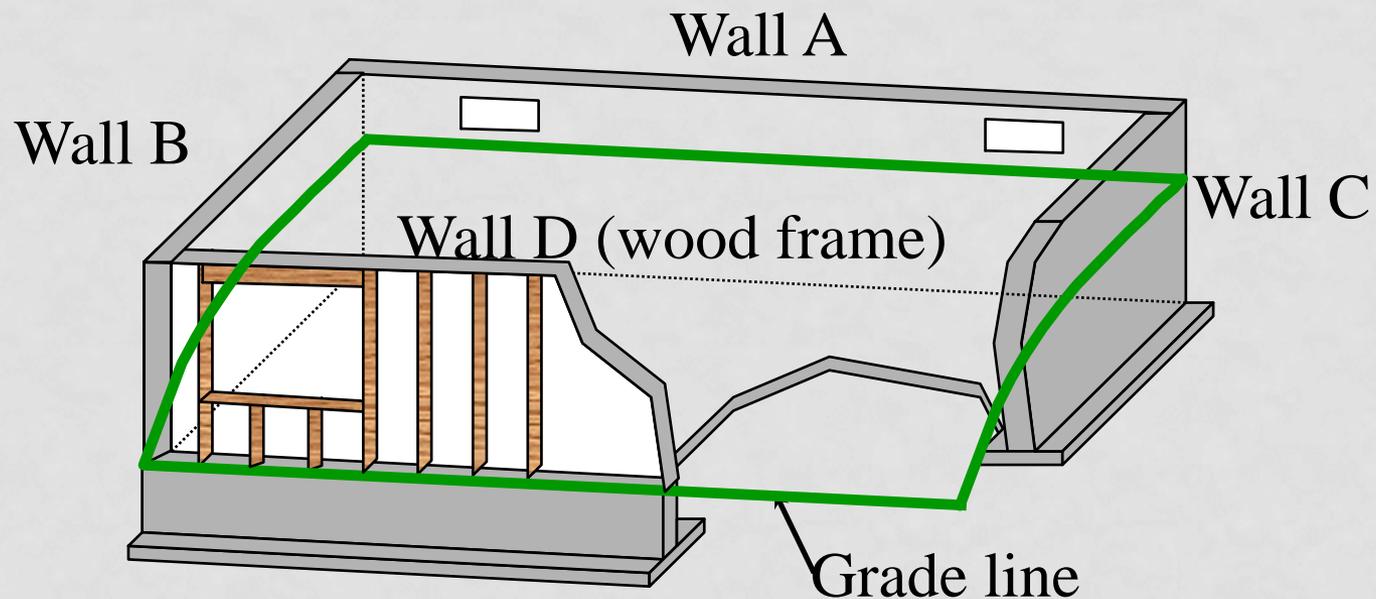
- **Conditioned** -- heated basement, or unheated basement below an *uninsulated* floor:
 - Foundation walls must be insulated
 - Ducts and pipes do not need insulation or sealing
- **Unconditioned** -- unheated basement below an *insulated* floor:
 - Foundation walls need not be insulated
 - Insulate walls of basement stairs, stairs to second floor
 - Insulate ducts and pipes

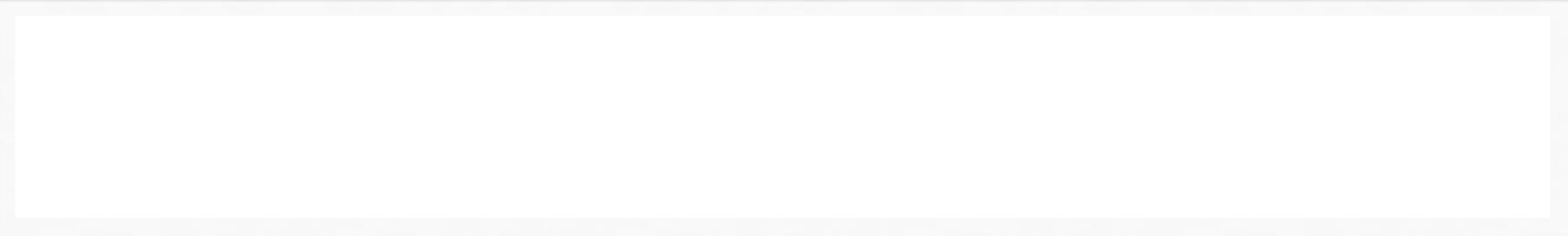
MEASURING CONDITIONED BASEMENTS

- Include foundation walls that are 50% or more above grade with other exterior walls
- Foundation walls that are more than 50% below grade, are considered “basement walls” (lower R-value requirement)
- If the basement is conditioned, include all windows and door areas from basement walls

WALKOUT BASEMENT EXAMPLE

- A, B and C are “basement walls” (mostly below grade)
- D is added to “gross wall area” and insulated as such
- Slab edge insulation is required for exposed edge at wall D







SOFTWARE METHOD: THINGS TO REMEMBER

Use gross ceiling and wall areas

Different R-values within the same component type are entered separately

Include all basement windows and doors in a conditioned basement

Enter access hatches as separate areas if R-value is different from surrounding area

★ HOME ENERGY RATING

Advantages

- High degree of flexibility
- Calculations done by energy specialist
- Gives credit for air sealing and passive solar gains (can be easier to pass)

Drawbacks

- Complete building design required

Can pay for the rating, but most are done as part of Efficiency Vermont's Residential New Construction program

☆ HOME ENERGY RATING: PROCESS

Send in sketch or plans with dimensions, fill out sheet with insulation, heating plans

Review report, decide on any changes

Two inspections, one pre-drywall, one upon completion

Final report includes energy code certificate, filled out and ready for signature

THE CERTIFICATE

2011 Vermont Residential Building Energy Standards (RBES) Certificate				
This certificate is for projects started on or after October 1, 2011. Before completing this form, refer to the instructions in Section 7.2a of the Energy Code Handbook (3rd edition).				
Property Address (Street, City, ZIP Code)	Act 250 Permit #	NA	<input type="checkbox"/>	
Electric Utility serving this address	Construction START Date	Construction FINISH Date		
# Units	# Stories	# Conditioned Sq. Ft.	# Bedrooms	
Foundation Type:	<input type="checkbox"/> Basement	<input type="checkbox"/> Slab On Grade	<input type="checkbox"/> Crawl Space	
Thermal Envelope				
R. Basement / Crawl Space Walls	Basement Insulation Depth (ft)	U. Basement Windows	<input type="checkbox"/> NFRC <input type="checkbox"/> Default	
R. Unheated Slab	R. Floors over Unheated Spaces	R. Sloped Ceilings	Area (Sq. Ft.)	
R. Heated Slab	R. Above-Grade Walls	R. Flat Ceilings	Area (Sq. Ft.)	
R. Perimeter Slab Edge	U. Doors	<input type="checkbox"/> NFRC <input type="checkbox"/> Default	U. Skylights	<input type="checkbox"/> NFRC <input type="checkbox"/> Default
U. Windows	<input type="checkbox"/> NFRC <input type="checkbox"/> Default	R. Attic Access Hatch / Door		
Air Sealing Verified by: <input type="checkbox"/> Testing <input type="checkbox"/> ACH50 <input type="checkbox"/> CFM50 <input type="checkbox"/> Visual Inspection				
Ventilation System <input type="checkbox"/> Exhaust <input type="checkbox"/> Balanced Air Flow: _____ CFM <input type="checkbox"/> Rated <input type="checkbox"/> Measured				
Mechanical System Calculation Method: <input type="checkbox"/> ACCA Manual / 8th Edition Other: _____				
Primary Heating System Size (Btuh)	Primary Central Cooling System Size (Btuh)		<input type="checkbox"/> NA	
Calculated Heat Loss (Btuh)	Calculated Heat Gain (Btuh)			
AFUE or HSPF Efficiency	SEER or COP Efficiency			
<input type="checkbox"/> Programmable Thermostat	<input type="checkbox"/> Heat Pump Supplementary Heat Control			
Ducts <input type="checkbox"/> Ducts located within conditioned space				
R. Supply Ducts	Location	Duct Tightness (CFM @ 25 Pa)		
R. Return Ducts	Location	Test Performed at:	<input type="checkbox"/> Rough-in <input type="checkbox"/> Post-construction	
Combustion Safety <input type="checkbox"/> Spillage testing conducted on chimney-vented equipment				
<input type="checkbox"/> Fireplaces have gasketed doors with compression closure				
<input type="checkbox"/> Exterior air supply requirements met for solid fuel-burning appliances and fireplaces				
Other <input type="checkbox"/> Mechanical System Piping, R-3 <input type="checkbox"/> Accessible on-off switches for pool heaters				
<input type="checkbox"/> Circulating service hot water piping, R-3 <input type="checkbox"/> Automatic time switches for pool heaters				
<input type="checkbox"/> Automatic or Gravity dampers <input type="checkbox"/> Pool cover for all heated pools				
<input type="checkbox"/> Automatic controls for snow-melt systems <input type="checkbox"/> 50% of lamps in permanently installed fixtures are high efficacy				
Compliance Method Used <input type="checkbox"/> Post Track <input type="checkbox"/> REScheck Software Maximum UA: _____ Your UA: _____				
<input type="checkbox"/> Home Energy Rating Rating Score: _____ Rated by: _____				
I certify to _____ (Owner) that the above information is correct and that the premises listed HAVE been constructed in accordance with the Vermont Residential Building Standards (RBES) created under 21 V.S.A. § 266.				
Signature: _____ Print Name: _____				
Company: _____ Phone: _____ Date: _____				
21 V.S.A. § 266 requires this certificate label to be permanently affixed to the inside electrical service panel or heating or cooling equipment or nearby in a visible location. Copies also must be provided within 30 days following the sale of the property, to 1) the Dept. of Public Service, Planning & Energy Resources Division, 112 State St., Montpelier, VT 05602, and 2) the town clerk of the town where the property is located. NOTE: Noncompliance with RBES may result in action for damages under 21 V.S.A. § 266. This label does not specify all 2011 RBES requirements. QUESTIONS? CALL THE VT DEPT. OF PUBLIC SERVICE: 802-828-2811.				

- Provides:
 - Details about the house
 - Builder's word that house meets code
- Fill out & file
 - Post in house, file with town, copy to state

CERTIFICATION

- Certificates are available from Energy Code Assistance Center; others are acceptable if substantially similar
- Must be signed and posted on or near heating or cooling equipment or electrical service panel
- Copies must be sent to the Department of Public Service, and recorded in the town land records within 30 days of completion

OWNER-BUILDER DISCLOSURE STATEMENT

- Very similar to certificate
- Must meet certain conditions to qualify
 - Owner must actually be in charge of construction
 - Owner must live in building
 - Owner must disclose non-compliance (with details) to potential buyer, and file Owner/Builder Disclosure Statement with DPS and town land records within 30 days of sale

SUMMARY -- WHAT'S REQUIRED?

- Basic Requirements
- Performance Requirements -- Three Methods
 - ☎ "Fast Track" Method
 - 💻 Software Method
 - ★ Home Energy Rating
- Certification

RESOURCES

- Efficiency Vermont
 - Residential New Construction program
 - Home Performance with ENERGY STAR
- Vermont Green Home Alliance
 - LEED for Homes, Vermont Builds Greener, National Green Building Standard, Passive House

ENERGY CODE ASSISTANCE CENTER

- Information on products and techniques
- Copies of handbook, certificates, software
- Referrals to other programs

1-855-887-0673

Thanks to LaValley Building Supply for hosting today