Energy Code Options

Making it simple

Energy Code Options Simplified

- Course Outline:
  - Option overview
  - How it works
  - When it may be beneficial
  - The options table worksheet
  - Finding U-factors
  - The BCD calculator

- Objectives: The learner will understand
  - The advantages of using the option
  - How to do the calculations
  - How to find U-factors for various construction methods
  - How to find and use the BCD calculator

Energy Code Options Simplified

The Options Conundrum

- Options choice is required for new houses and large additions
- An options choice is optional for smaller additions and change of occupancy
- 6 envelope enhancement options
- In addition, 4 energy conservation measures
- Choose one from each part
- Allows for some flexibility in achieving energy efficiency

TABLE N1101.1(2)
ADDITIONAL MEASURES
(DELETE CURRENT 2014 ORSC TABLE AND REPLACE WITH THE FOLLOWING TABLE AND FOOTNOTES)

		TABLE N1101.1(2) ADDITIONAL MEASURES
Envelope Enhancement Measures (Select One)	1	**High efficiency walls** Exterior walls – U-0.044 / R-21 cavity insulation+R-5 continuous
	2	**Upgraded features** Exterior walls – U-0.055 / R-23 intermediate or R-21 advanced, Framed floors – U-0.022 / R-38, and Windows – U-0.28 (average UA)
	3	**Upgraded features** Exterior walls – U-0.055 / R-23 intermediate or R-21 advanced, Flat ceiling[e] – U-0.020 / R-60, and Framed floors – U-0.022 / R-38
	4	**Super Insulated Windows and Attic OR Framed Floors** Windows – U-0.22 (Triple Pane Low-e), and Flat ceiling[e] – U-0.020 / R-60 or Framed floors – U-0.022 / R-38
	5	**Air sealing home and ducts** Mandatory air sealing of all wall coverings at top plate and air sealing checklist[f], and All ducts and air handler contained within building envelope[d] or All ducts sealed with mastic[b]
	6	**High efficiency thermal envelope UA[g]** Proposed UA is 8% lower than the code UA
Conservation Measures (Select One)	A	**High efficiency HVAC system[a]** Gas-fired furnace or boiler AFUE 94%, or Air source heat pump HSPF 9.5/15.0 SEER cooling, or Ground source heat pump COP 3.5 or Energy Star rated
	B	**Ducted HVAC systems within conditioned space** All ducts and air handler contained within building envelope[d] *Cannot be combined with Measure 5*
	C	**Ductless heat pump** Ductless heat pump HSPF 10.0 in primary zone of dwelling
	D	**High efficiency water heater[c]** Natural gas/propane water heater with UEF 0.85 OR Electric heat pump water heater Tier 1 Northern Climate Specification Product

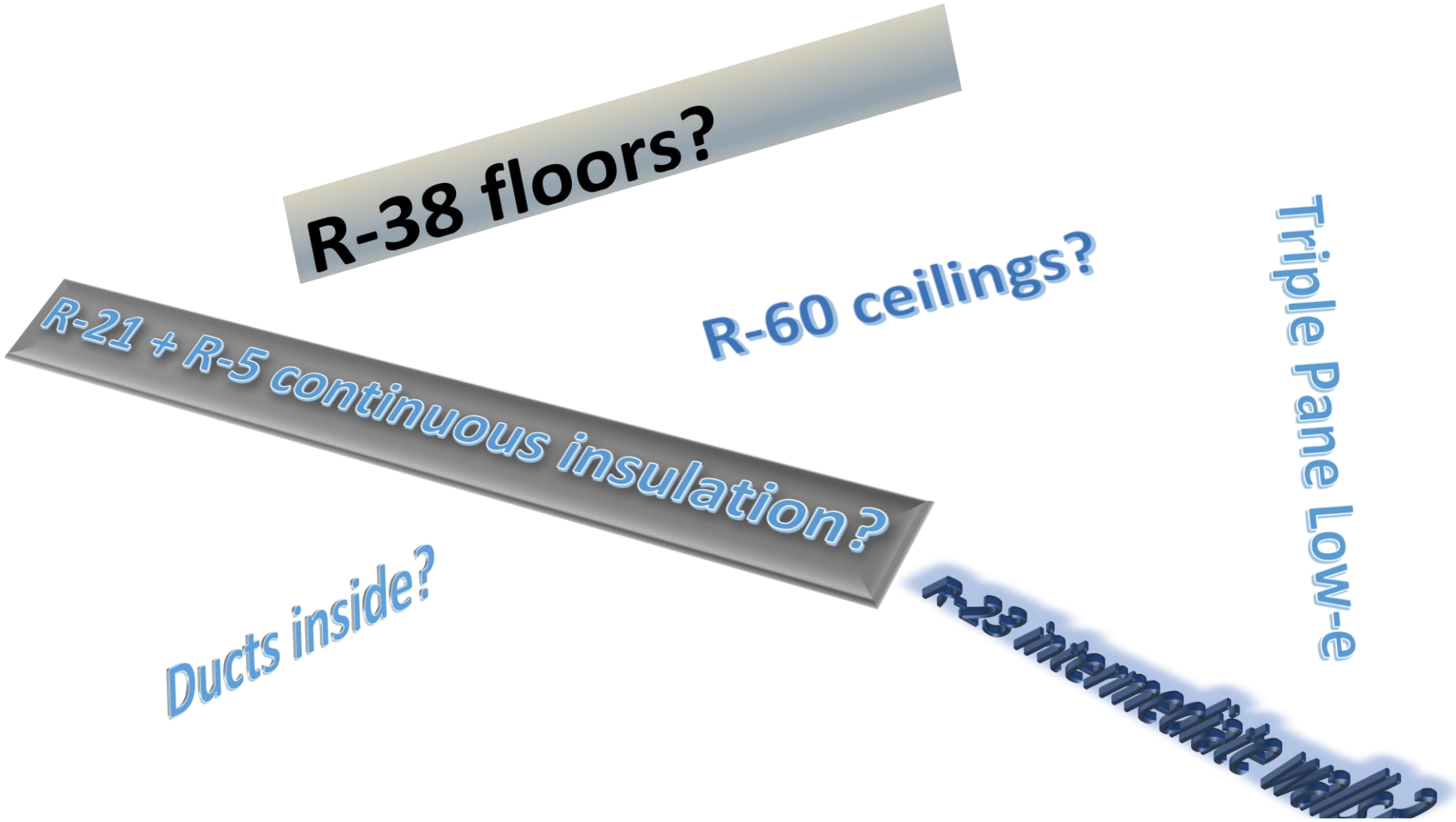
For SI: 1 square foot = 0.093 m², 1 watt per square foot = 10.8 W/m².

a. Appliances located within the building thermal envelope shall have sealed combustion air installed. Combustion air shall be ducted directly from the outdoors.
b. All duct joints and seams sealed with listed mastic; tape is only at appliance or equipment connections (for service and replacement). Meet criteria of Performan Tested Comfort Systems program administered by the Bonneville Power Administration (BPA).
c. Residential water heaters less than 55 gallon storage volume.
d. A total of 5 percent of an HVAC systems ductwork shall be permitted to be located outside of the conditioned space. Ducts located outside the conditioned space shall have insulation installed as required in this code.
e. The maximum vaulted ceiling surface area shall not be greater than 50 percent of the total heated space floor area unless vaulted area has a U-factor no greater than U-0.026.
f. Continuous air barrier. Additional requirement for sealing of all interior vertical wall covering to top plate framing. Sealing with foam gasket, caulk or ot approved sealant listed for sealing wall covering material to structural material (example: gypsum board to wood stud framing).
g. Table N1104.1(1) Standard base case design, Code UA shall be at least 8% less than the Proposed UA. Buildings with fenestration less than 15% of the

The Options Conundrum

- Most envelope enhancement options have multiple things that must be done to comply with the option
- Option has to be done as proscribed
- No credit if adding other energy saving designs
- May not fit unique design issues
- May not be the most cost effective way to save energy

The Option Conundrum



The Options Conundrum

- When you don’t know which options to choose…

- Choose the one that works best for your operation
  - Cost of labor
  - Cost of materials
  - Ability of your crew to do the work correctly
  - Ability of subs to do it correctly
  - Can suppliers get the right material to the job

The Options Conundrum

- Option 6 can solve a lot of the problem by allowing flexibility and an unlimited number of combinations of materials and building methods
- This is a design your own compliance method
- Performance equivalent to the other options

What is option 6 all about?

- Create your own option
- Great flexibility
- Choosing methods of construction that work best for you
- Freedom to be creative
- Easier to accommodate unusual construction problems
- Take advantage of reduced window area credit
- Accommodate customer priorities

Equal to or better...

Demonstrate your method is 8% more efficient than the minimum prescriptive requirements

How you do that:

- Compare the total energy demand for a code minimum house to the one designed the way you want to build
  - Calculate the energy loss through each thermal envelope element if built to minimum requirements of Table N1101.1(1)
  - Add the losses together
  - Calculate the energy loss through each thermal envelope element the way you have designed them
  - Add losses together
  - Compare the two totals
  - In compliance if your method is 8% more efficient than the code minimums
- Your heating contractor can use the calculations

Must use U-factors to calculate overall efficiency

Why U-factors?

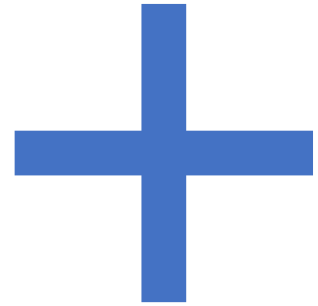
R-values for uniform materials

- Heat loss through an area losing heat uniformly over the whole area
- R-values used for an assembly of materials with different R-values cannot be added together

U-factors good for nonuniform assemblies

- Heat loss per square foot of any assembly, uniform or not
- U-factors can be added together even if materials are different.

How is a U-factor calculated?



- Calculate the U-factor for each different part of the assembly.
  - A U-factor is 1/R-value of a uniform material
- Calculate the percentage each element making up the assembly.
- This gives the average energy loss through a square foot of the assembly

Table N1104.1(1) The worksheet

- Provides a format for calculating and comparing

TABLE N1104.1(1)
RESIDENTIAL THERMAL PERFORMANCE CALCULATIONS

BUILDING COMPONENTS[b]	STANDARD BASE CASE[a]			PROPOSED ALTERNATIVE			
	Areas[c]	*U*-factor	Areas × *U*	*R*-value[d]	Areas[c]	*U*-factor[e]	Areas x *U*
Flat ceilings Vaulted ceilings[f] Conventional wood-framed walls Underfloor Slab edge Below grade walls		0.021 0.033 0.059 0.033 F=0.52[g] C=0.063[g]					
Windows Skylights		0.30 0.50					
Exterior doors[h] Doors with > 2.5 ft^2 glazing		0.2 0.4					
		CODE UA =				Proposed UA[i] =	

a. Base path 1 represents Standard Base Case from Table N1101.1(1). *U*-factors shall be adjusted to match selected Envelope Measure [Table N1101.1(2)].
b. Performance trade-offs are limited to those listed in column 1. Heat plant efficiency, duct insulation levels, passive and active solar heating, air infiltration and similar measures including those not regulated by code may not be considered in this method of calculation.
c. Areas from plan take-offs. All areas must be the same for both Standard Base Case and Proposed Alternate. The vaulted ceiling surface area for Standard Base Case must be the actual surface area from the plan take-off not to exceed 50 percent of the total heated space floor area. Any roof areas in excess of 50 percent for Base Case must be entered at U-0.021 (R-49) with "Flat Ceilings" area.
d. Minimum Component Requirements in so far as practicable: Walls R-15/U-0.080; Floors R-21/U-0.047; Flat Ceilings R-38/U-0.031; Vaults R-21/U-0.055; Below-Grade Wood, Concrete or Masonry Walls R-15/C-0.069; Slab Edge R-10/F-0.52; Duct Insulation R-8. *R*-values used in this table are nominal, for the insulation only and not for the entire assembly. Window and skylight *U*-values shall not exceed 0.65 (CL65). A single door not to exceed 28 square feet (2.6 m^2) per dwelling unit is permitted to be excluded from the thermal performance calculations. All other Door-values shall not exceed 0.54 (Nominal R-2).
e. *U*-factors for wood frame ceilings, walls and floor assemblies shall be as specified in Table N1104.1(2). *U*-factors for other assemblies, which include steel framing, brick or other masonry, stucco, etc., shall be calculated using ASHRAE *Handbook of Fundamentals procedures*.
f. Vaulted area, unless insulated to R-38, 0.027, may not exceed 50 percent of the total heated space floor area.
g. F = The heat loss coefficient, Btu/h/ft^2/°F per foot of perimeter. C= the heat loss coefficient Btu/h/ft^2-°F per square foot of underground wall.
h. A maximum of 28 square feet (2.6 m^2) of exterior door area per dwelling unit can have a *U*-factor of 0.54 or less. Default *U*-factor for an unglazed wood door is 0.54.
i. Proposed UA must be less than or equal to CODE UA. For compliance with Envelope Measure 6, the Proposed UA must be a minimum of 8 percent less than the CODE UA.

Three parts to the table

- List of ***building components*** that make up the exterior envelope

BUILDING COMPONENTS[b]	STANDARD BASE CASE[a]			PROPOSED ALTERNATIVE			
	Areas[c]	*U*-factor	Areas x *U*	*R*-value[d]	Areas[c]	*U*-factor[e]	Areas x *U*
Flat ceilings		0.021					
Vaulted ceilings[f]		0.033					
Conventional wood-framed walls		0.059					
Underfloor		0.033					
Slab edge		F=0.52[g]					
Below grade walls		C=0.063[g]					
Windows		0.30					
Skylights		0.50					
Exterior doors[h]		0.2					
Doors with > 2.5 ft^2 glazing		0.4					
		CODE UA =				Proposed UA[i] =	

- ***Standard base case*** Maximum allowed U-factors for each building component from Table N1101.1(1) and a way to calculate the over all energy loss from each component

BUILDING COMPONENTS[b]	STANDARD BASE CASE[a]			PROPOSED ALTERNATIVE			
	Areas[c]	*U*-factor	Areas × *U*	*R*-value[d]	Areas[c]	*U*-factor[e]	Areas x *U*
Flat ceilings		0.021					
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Underfloor		0.033					
Slab edge		F=0.52[g]					
Below grade walls		C=0.063[g]					
Windows		0.30					
Skylights		0.50					
Exterior doors[h]		0.2					
Doors with > 2.5 ft^2 glazing		0.4					
		CODE UA =		Proposed UA[i] =			

- ***Proposed Alternative*** to describe your chosen U-factors and the over all energy loss from each component

BUILDING COMPONENTS[b]	STANDARD BASE CASE[a]			PROPOSED ALTERNATIVE			
	Areas[c]	*U*-factor	Areas x *U*	*R*-value[d]	Areas[c]	*U*-factor[e]	Areas x *U*
Flat ceilings		0.021					
Vaulted ceilings[f]		0.033					
Conventional wood-framed walls		0.059					
Underfloor		0.033					
Slab edge		F=0.52[g]					
Below grade walls		C=0.063[g]					
Windows		0.30					
Skylights		0.50					
Exterior doors[h]		0.2					
Doors with > 2.5 ft^2 glazing		0.4					
		CODE UA =				Proposed UA[i] =	

READ THE FOOTNOTES

- How to input information correctly
- Limitations
- Instructions
- exceptions

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b. Performance trade-offs are limited to those listed in column 1. Heat plant efficiency, duct insulation levels, passive and active solar heating, air infiltration and similar measures including those not regulated by code may not be considered in this method of calculation.
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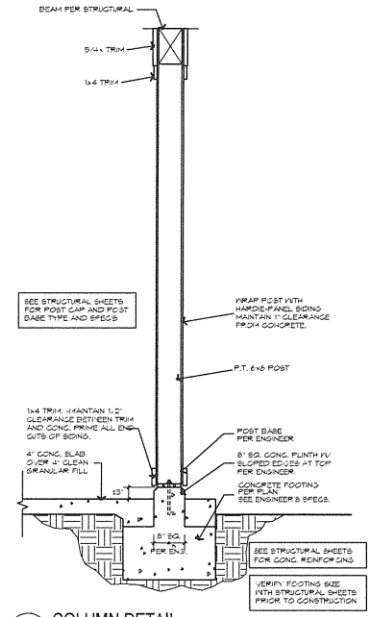
i. Proposed UA must be less than or equal to CODE UA. For compliance with Envelope Measure 6, the Proposed UA must be a minimum of 8 percent less than the CODE UA.

From the footnotes:

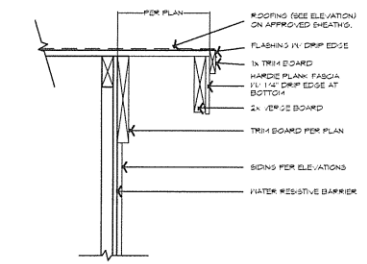
Footnote D requires minimum allowed amounts of efficiency for each building component. Your U-factor cannot be higher than these amounts.

One door up to 28 square feet in area can be omitted from calculation (must be eliminated in both calculations)



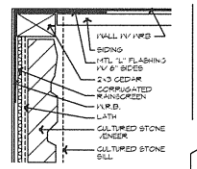
1 A1.1 COLUMN DETAIL

SCALE: 1"=1'-0"



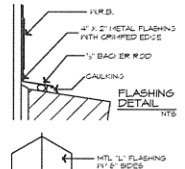
2 A1.1 VERGE/RAKE DETAIL

SCALE: N.T.S.



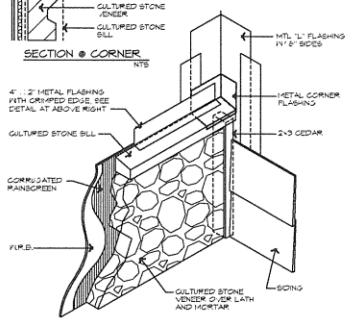
SECTION @ CORNER

NTS



FLASHING DETAIL

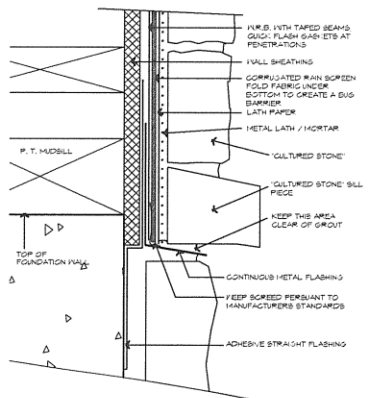
NTS



3 A1.1 STONE VENEER AT EXTERIOR CORNER DETAIL

SCALE: 1½" = 1'-0"

FLASHING DETAILS



4 A1.1 STONE BASE FLASHING DETAIL

SCALE: NTS

FLASHING DETAILS

GENERAL NOTES AND SPECIFICATIONS

- CONSTRUCTION SHALL FULLY COMPLY WITH THE CURRENT OREGON EDITION OF THE INTERNATIONAL RESIDENTIAL CODE (IRC). ALL ADDITIONAL STATE AND LOCAL CODE REQUIREMENTS (2017 EDITION OF THE ORSC)
- WRITTEN DIMENSIONS ON THESE DRAWINGS SHALL HAVE PRECEDENCE OVER SCALED DIMENSIONS. PLEASE NOTIFY THE ARCHITECTURAL TEAM OF ANY VARIATIONS FROM THESE DRAWINGS.
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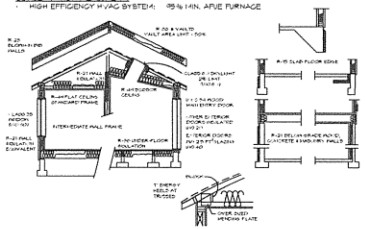
- INSTALL APPROVED FOAM TYPE INSULATION AT FLOOR AND PLATE LINES. OPENINGS IN PLATES, CORNER STUD CAVITIES AND AROUND DOOR AND WINDOW ROUGH OPENINGS CAVITIES.
- INSTALL WATERPROOF GYPSUM BOARD IN AND ABOVE ALL SHOWER AND TUB AREAS TO HEIGHT OF ABOVE THE FLOOR.
- EXHAUST ALL VENTS AND FANS DIRECTLY OUTSIDE VIA INSULATED DUCTS. BATHROOMS CONTAINING A SHOWER OR BATHTUB MUST HAVE A FAN CAPABLE OF 50 CFM CONTROLLED BY A DEHUMIDISTAT, TIMER OR OTHER SIMILAR MEANS OF CONTROL.
- CONSULT THE CERTIFIED LIGHT-FRAMED DRAWINGS FOR BEAM SIZES AND LATERAL ENGINEERING INFORMATION.
- GAS FURNACE: 95% MIN. AFUE TO BE INSTALLED IN AN INSULATED, THERMALLY CONDITIONED SPACE WITH INSULATION INSTALLED IN WALL CAVITIES OF CLOSET.
- ALL HVAC DUCTING TO BE INSTALLED IN AN INSULATED, CONDITIONED SPACE.
- ALL EXTERIOR CUT SURFACES TO BE PRIMED.
- REFER TO ROOF AND WINDOW INSTALLATION MANUALS FOR ROOFING, FLASHING, AND INSTALLATION STANDARDS.

LEGEND HOMES ENVELOPE STANDARDS:
MEETS OR EXCEEDS THE 2017 EDITION OF THE ORSC PRESCRIPTIVE ENVELOPE REQUIREMENTS)

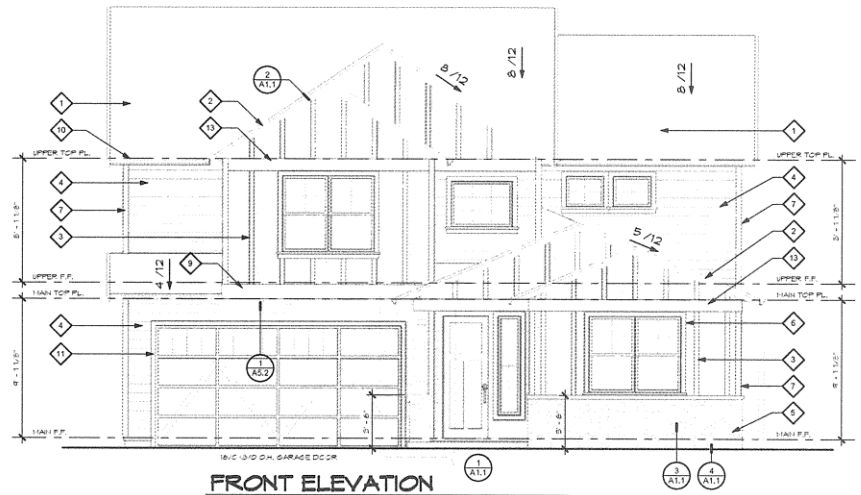
ADDITIONAL MEASURES CHOSEN:

ENVELOPE ENHANCEMENT MEASURE #5:
- A WHOLE BUILDING VENTILATION SYSTEM COMPLYING WITH TABLE N1101.1(3)
- AIR SEALING AT TOP PLATES AND AIR SEAL CHECKLIST
- TESTED WITH A BLOWER DOOR AND FOUND TO EXHIBIT NO MORE THAN:
  1. 4.0 AIR CHANGES/HOUR AND
  2. PERFORMANCE TESTED DUCT SYSTEMS

CONSERVATION MEASURE 2:
- HIGH EFFICIENCY HVAC SYSTEM: 95 % MIN. AFUE FURNACE

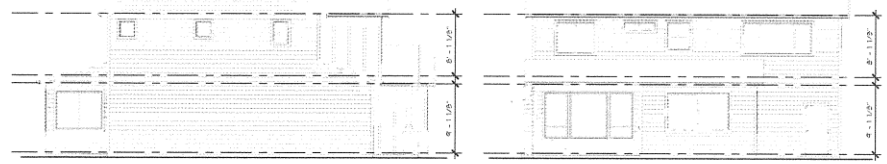


Jurisdiction: City of Corvallis, Benton County, Oregon – 2017 ORSC



FRONT ELEVATION

1/4" = 1'-0"



LEFT ELEVATION

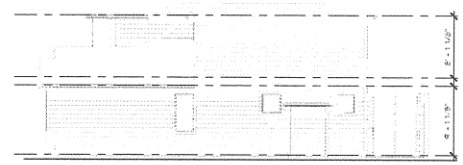
1/8" = 1'-0"

REAR ELEVATION

1/8" = 1'-0"

FARMHOUSE ELEVATION KEYNOTES

1. ROOFING (TYPICAL): 30 YEAR HEAVY WEIGHT FIBERGLASS COMPOSITION ROOFING. DRIP FLASHING AT ALL EDGES.
2. VERGE BOARD TYPICAL: RS 1X2 TRIM ON 2X8 VERGE BOARD. PROVIDE 5/4 X 8 SHINGLES AND LAP SIDING OR 1x3 (8 PANEL SIDING) TRIM BOARD, FLAT ON WALL AND BUTT TO UNDERSIDE OF ROOF SHEATHING FOLLOWING GABLE END VERGE BOARD.
3. SIDING (TYPICAL): HARDIE STUCCO BOARD SIDING W/ 1X3 BATTENS PER ELEVS.
4. SIDING (TYPICAL WHERE SHOWN): HARDIE-BOARD LAP SIDING.
5. CULTURED STONE (AS SHOWN): WITH CAST MASONRY TRIM AROUND WINDOWS PER PLAN. INSTALL PER MANUFACTURERS SPECIFICATIONS.
6. WINDOW & DOOR TRIM: 5.4 X 4 TRIM AT PANEL SIDING (NO TRIM AT LAP SIDING EXCEPT AT EMPHASIZED ELEVATION & AT FRONT ELEVATION AS SHOWN) FLASH ABOVE ALL HORIZONTAL TRIM.
7. 5/4 X 4 CORNER TRIM AT LAP SIDING, 1 X 4 CORNER TRIM AT PANEL SIDING.
8. GRICK SET AT 4:12 PITCH
9. HORIZONTAL TRIM: 2:12 WITH 26 GA. Z' FLASHING OVER TOP AND INTEGRATED W/ WRB.
10. GUTTERS (TYP.U.N.O.): 6" FASCIA STYLE 26 GA. STEEL GUTTER WITH 2"x3" STEEL DOWNSPOUTS. ALL GUTTERS TO BE SPIKED A MIN. OF 24" O.C. ALL JOINTS TO BE SCREWED AND SEALED WITH "ALCO GUTTER SEAL OR EQUIV. CONNECT ALL DOWNSPOUTS TO RAIN DRAINS WHERE PROVIDED.
11. GARAGE DOOR TRIM SURROUND: 5/4 X 6 AT TOP, 5/4 X 4 AT SIDES
12. HARDIE STUCCO BOARD SIDING W/ 1X4 BATTENS AT 48" O.C.
13. HORIZONTAL TRIM: 5/4:10 WITH 26 GA. Z' FLASHING OVER TOP AND INTEGRATED W/ WRB.



RIGHT ELEVATION

1/8" = 1'-0"

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THE AUSTIN FARMHOUSE
(2) CAR, GARAGE LEFT
a 2,112 sq. ft. Single Family Residence

FILE NAME : Austin-F 2112 SF

DRAWN BY: PLY

SCALE : As Indicated

PLOT DATE : 1/30/2018 3:13:18 PM

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SHEET TITLE: Build'g Elevations

SHEET NUMBER: A1.1

First step

- Does extra credit for reduced window area apply?
  - Calculate total wall area (3022 Sq. Ft.)
  - Multiply by 15% (453.3)
    - Enter total wall area minus 15% under standard base case above grade walls (2568.7)
    - Enter 15% of the wall area under standard base case windows (453.3)
    - Enter net wall area (total wall minus windows and doors) in Proposed column (2642.4)
    - Enter actual window area in Proposed Alternative. (334.25)

- Enter 2568.7 wall area and 453.3 window area in the standard base case
- Enter the actual wall area and window area in the Proposed Alternative

BUILDING COMPONENTS[b]	STANDARD BASE CASE[a]			PROPOSED ALTERNATIVE			
	Areas[c]	*U*-factor	Areas x *U*	*R*-value[d]	Areas[c]	*U*-factor[e]	Areas x *U*
Flat ceilings Vaulted ceilings[f] Conventional wood-framed walls Underfloor Slab edge Below grade walls	2568.7	0.021 0.033 0.059 0.033 F=0.52[g] C=0.063[g]			2642.4		
Windows Skylights	453.3	0.30 0.50			334.25		
Exterior doors[h] Doors with > 2.5 ft^2 glazing		0.2 0.4					
		CODE UA =				Proposed UA[i] =	

Next step:

01

Find the total area of the other listed building components

02

Write it in the Areas column in both the standard base case and the proposed alternative section. (Must be identical in both except when the 15% window credit is allowed)

Procedure for making energy efficiency comparisons

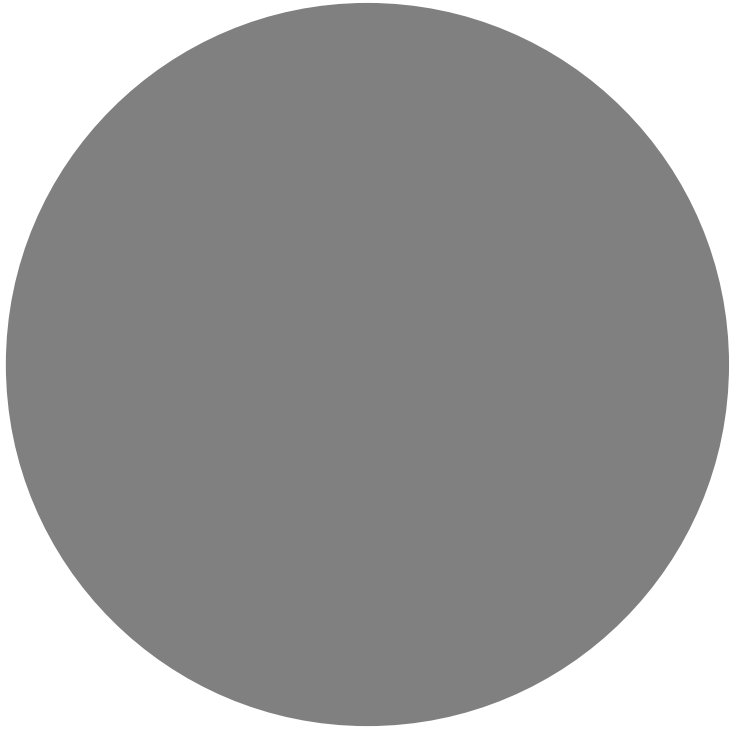
BUILDING COMPONENTS[b]	STANDARD BASE CASE[a]			PROPOSED ALTERNATIVE			
	Areas[c]	*U*-factor	Areas x *U*	*R*-value[d]	Areas[c]	*U*-factor[e]	Areas x *U*
Flat ceilings Vaulted ceilings[f] Conventional wood-framed walls Underfloor Slab edge Below grade walls	1911 2568.7 1483	0.021 0.033 0.059 0.033 F=0.52[g] C=0.063[g]			2642.4		
Windows Skylights	453.3	0.30 0.50			334.25		
Exterior doors[h] Doors with > 2.5 ft^2 glazing	45.33	0.2 0.4					
		CODE UA =				Proposed UA[i] =	

Next step:

- Multiply each area times the U-factor listed
- Add all the U-factors together to get the total energy loss through the whole building assembly

BUILDING COMPONENTS[b]	STANDARD BASE CASE[a]			PROPOSED ALTERNATIVE			
	Areas[c]	*U*-factor	Areas x *U*	*R*-value[d]	Areas[c]	*U*-factor[e]	Areas x *U*
Flat ceilings	1911	0.021	40.13		2642.4		
Vaulted ceilings[f]		0.033	151.55				
Conventional wood-framed walls	2568.7	0.059	48.94				
Underfloor	1483	0.033					
Slab edge		F=0.52[g]					
Below grade walls		C=0.063[g]					
Windows	453.3	0.30	135.99		334.25		
Skylights		0.50					
Exterior doors[h]	45.33	0.2	9.07				
Doors with > 2.5 ft^2 glazing		0.4					
		CODE UA =	385.68			Proposed UA[i] =	

- Flat ceilings—length x width of all flat ceilings minus skylights
- Vaulted ceilings—actual surface area of all vaulted ceilings minus skylights
  - Remember vaulted ceiling area greater than 50% of the heated floor area must be at least U-0.021 (R-49)
- Conventional wood framed walls—building perimeter x wall height minus door and window openings
- Underfloor—length x width of floor, including cantilevers
- Slab edge—Total perimeter of the slab



How to calculate area easily

- Below grade walls—total area of basement walls not including portions of the wall more than 2’ above ground—that is above grade wall
- Windows—Framed opening sizes
- Skylights—Framed opening sizes
- Exterior doors—width x height
- Doors with more than 2.5 ft^2 of glass—width x height

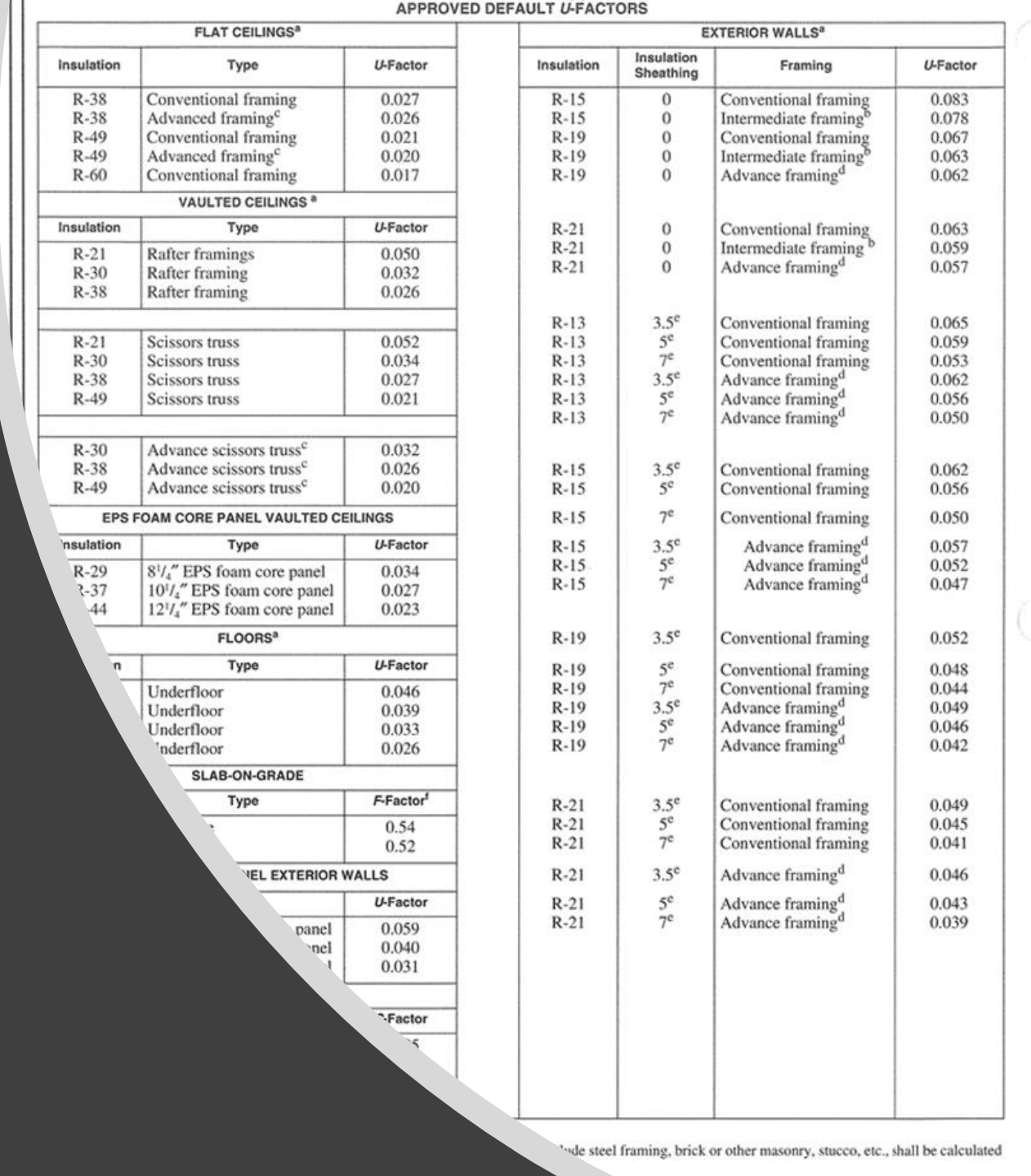
How to calculate area easily

Next step—Enter the U-factor you plan to use for the assembly in the Proposed Alternative column

BUILDING COMPONENTS[b]	STANDARD BASE CASE[a]			PROPOSED ALTERNATIVE			
	Areas[c]	*U*-factor	Areas × *U*	*R*-value[d]	Areas[c]	*U*-factor[e]	Areas x *U*
Flat ceilings	1911	0.021	40.13		2642.4	.020	
Vaulted ceilings[f]		0.033					
Conventional wood-framed walls	2568.7	0.059	151.55			.059	
Underfloor	1483	0.033	48.94			.026	
Slab edge		F=0.52[g]					
Below grade walls		C=0.063[g]					
Windows	453.3	0.30	135.99		334.25	.28	
Skylights		0.50					
Exterior doors[h]	45.33	0.2	9.07			.2	
Doors with > 2.5 ft^2 glazing		0.4					
		CODE UA =	385.68			Proposed UA[i] =	

How to find U-factors

- Find it in Table N1104.1(2)
- Find it on the plans



APPROVED DEFAULT *U*-FACTORS

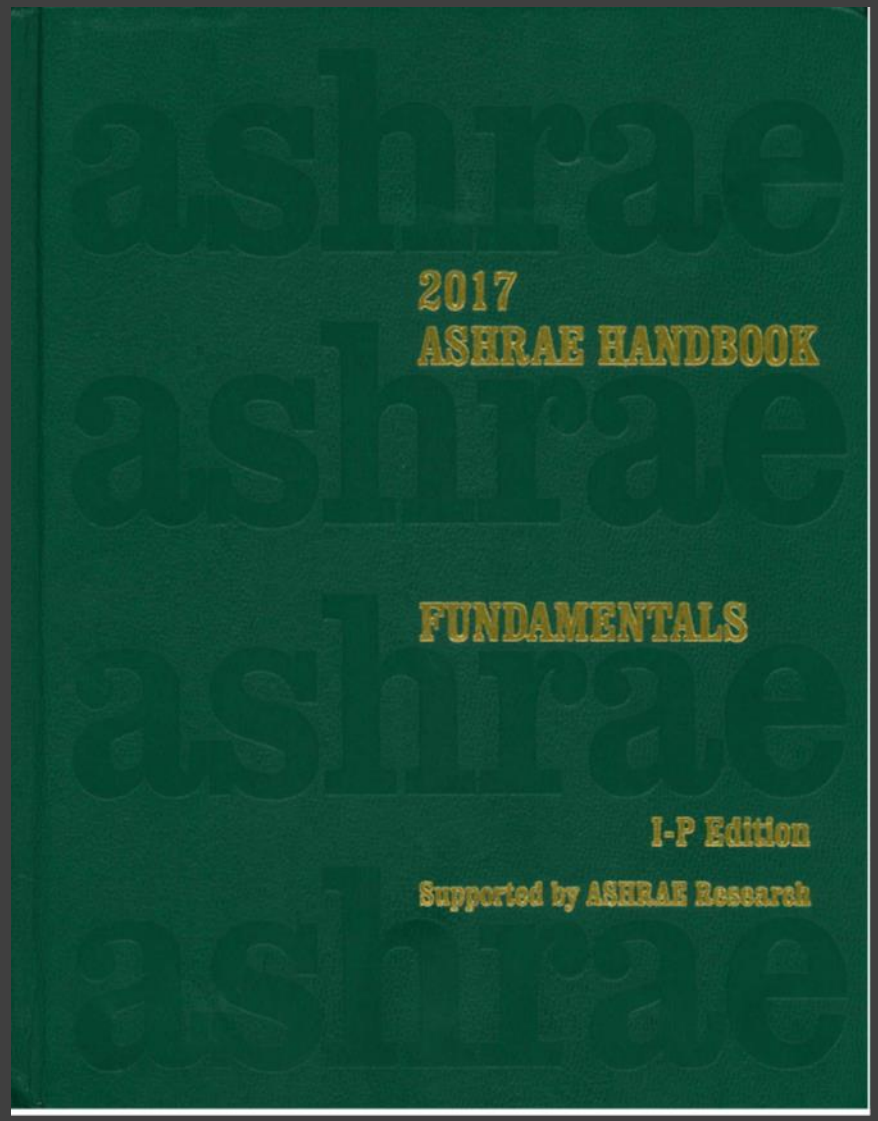
FLAT CEILINGS[a]		
Insulation	Type	*U*-Factor
R-38	Conventional framing	0.027
R-38	Advanced framing[c]	0.026
R-49	Conventional framing	0.021
R-49	Advanced framing[c]	0.020
R-60	Conventional framing	0.017
VAULTED CEILINGS[a]		
Insulation	Type	*U*-Factor
R-21	Rafter framings	0.050
R-30	Rafter framing	0.032
R-38	Rafter framing	0.026
R-21	Scissors truss	0.052
R-30	Scissors truss	0.034
R-38	Scissors truss	0.027
R-49	Scissors truss	0.021
R-30	Advance scissors truss[c]	0.032
R-38	Advance scissors truss[c]	0.026
R-49	Advance scissors truss[c]	0.020
EPS FOAM CORE PANEL VAULTED CEILINGS		
nsulation	Type	*U*-Factor
R-29	$8^1/_4$″ EPS foam core panel	0.034
-37	$10^1/_4$″ EPS foam core panel	0.027
-44	$12^1/_4$″ EPS foam core panel	0.023
FLOORS[a]		
n	Type	*U*-Factor
	Underfloor	0.046
	Underfloor	0.039
	Underfloor	0.033
	nderfloor	0.026
SLAB-ON-GRADE		
	Type	*F*-Factor[d]
		0.54
		0.52
EL EXTERIOR WALLS		
		U-Factor
	panel	0.059
	nel	0.040
		0.031
		-Factor
		.5

EXTERIOR WALLS[a]			
Insulation	Insulation Sheathing	Framing	*U*-Factor
R-15	0	Conventional framing	0.083
R-15	0	Intermediate framing[b]	0.078
R-19	0	Conventional framing	0.067
R-19	0	Intermediate framing[b]	0.063
R-19	0	Advance framing[d]	0.062
R-21	0	Conventional framing	0.063
R-21	0	Intermediate framing[b]	0.059
R-21	0	Advance framing[d]	0.057
R-13	3.5[e]	Conventional framing	0.065
R-13	5[e]	Conventional framing	0.059
R-13	7[e]	Conventional framing	0.053
R-13	3.5[e]	Advance framing[d]	0.062
R-13	5[e]	Advance framing[d]	0.056
R-13	7[e]	Advance framing[d]	0.050
R-15	3.5[e]	Conventional framing	0.062
R-15	5[e]	Conventional framing	0.056
R-15	7[e]	Conventional framing	0.050
R-15	3.5[e]	Advance framing[d]	0.057
R-15	5[e]	Advance framing[d]	0.052
R-15	7[e]	Advance framing[d]	0.047
R-19	3.5[e]	Conventional framing	0.052
R-19	5[e]	Conventional framing	0.048
R-19	7[e]	Conventional framing	0.044
R-19	3.5[e]	Advance framing[d]	0.049
R-19	5[e]	Advance framing[d]	0.046
R-19	7[e]	Advance framing[d]	0.042
R-21	3.5[e]	Conventional framing	0.049
R-21	5[e]	Conventional framing	0.045
R-21	7[e]	Conventional framing	0.041
R-21	3.5[e]	Advance framing[d]	0.046
R-21	5[e]	Advance framing[d]	0.043
R-21	7[e]	Advance framing[d]	0.039

de steel framing, brick or other masonry, stucco, etc., shall be calculated

How to find U-factors

- Calculate using the methods from the ASHRAE Handbook of Fundamentals



Next step:

- Multiply each assembly area times your U-factor.
- Add all the U-factors together to get the total energy loss through the whole building assembly for they way you have designed it.

BUILDING COMPONENTS[b]	STANDARD BASE CASE[a]			PROPOSED ALTERNATIVE			
	Areas[c]	*U*-factor	Areas x *U*	*R*-value[d]	Areas[c]	*U*-factor[e]	Areas x *U*
Flat ceilings	1911	0.021	40.13		2642.4	.020	38.22
Vaulted ceilings[f]		0.033					
Conventional wood-framed walls	2568.7	0.059	151.55			.059	155.90
Underfloor	1483	0.033	48.94			.026	38.56
Slab edge		F=0.52[g]					
Below grade walls		C=0.063[g]					
Windows	453.3	0.30	135.99		334.25	.28	93.59
Skylights		0.50					
Exterior doors[h]	45.33	0.2	9.07			.2	9.06
Doors with > 2.5 ft^2 glazing		0.4					
		CODE UA =	385.68			Proposed UA[i] =	335.34

Last step:

Compare the Code UA total to your Proposed UA total

If your Proposed UA total is 8% lower than the Code UA total you pass (Code UA minus 8%)

If not, see how far off it is and consider what changes you might make in your plan to easily reach that number.

Compare standard base case to the alternative

BUILDING COMPONENTS[b]	STANDARD BASE CASE[a]			PROPOSED ALTERNATIVE			
	Areas[c]	*U*-factor	Areas x *U*	*R*-value[d]	Areas[c]	*U*-factor[e]	Areas x *U*
Flat ceilings	1911	0.021	40.13			.020	38.22
Vaulted ceilings[f]		0.033					
Conventional wood-framed walls	2568.7	0.059	151.55		2642.4	.059	155.90
Underfloor	1483	0.033	48.94			.026	38.56
Slab edge		F=0.52[g]					
Below grade walls		C=0.063[g]					
Windows	453.33	0.30	135.99		334.25	.28	93.59
Skylights		0.50					
Exterior doors[h]	45.33	0.2	9.07			.2	9.06
Doors with > 2.5 ft^2 glazing		0.4					
		CODE UA =	385.68			Proposed UA[i] =	335.34

Proposed UA / CODE UA = > than 8 Percent

335.34 / 385.58 = .869 = 13% better

Pass!

Now, the easy way

State of Oregon: Building

www.oregon.gov/bcd/pages/index.aspx

OREGON.GOV | Home | Codes | Boards | Laws & rules | Licensing | Continuing education | Inspector training | Permits | Forms | Email updates

Building Codes Division

Need to renew a license?

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Codes and standards

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- Adopted codes online
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- Code interpretations
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Permit services

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Inspector certification and training

- Inspector certification pathways
- Inspector Training Program
- Course descriptions
- Certification holder search
- 2017 Code change class schedule

9:07 AM
2/6/2018

Adopted codes online

The division works to ensure the adopted codes and standards are accessible. Eight of the adopted specialty codes are available to read online. The remaining codes are comprised of multiple standards listed on the program pages.

Amendments, errata, helpful tools, and additional information can be found on the code program page.

Oregon codebooks online

The following are read-only versions of the codebooks and do not have copy and paste options available. Each codebook is available to purchase as a pdf download, loose-leaf binder, or softbound book. Find out where you can purchase a codebook.

2017 Oregon Residential Specialty Code (ORSC)
Effective Oct. 1, 2017
Based on the 2015 International Residential Code (IRC)
2014 ORSC is available until Jan. 1, 2018.

2017 Oregon Electrical Specialty Code (OESC)
Effective Oct. 1, 2017
Based on the 2017 NFPA 70, National Electrical Code
Amendments to the NEC - Table 1-E

2017 Oregon Plumbing Specialty Code (OPSC)
Effective Oct. 1, 2017
Based on the 2015 Uniform Plumbing Code (UPC)

2014 Oregon Structural Specialty Code (OSSC)
Effective July 1, 2014
Based on the 2012 International Building Code (IBC)

2014 Oregon Energy Efficiency Specialty Code (OEESC)
Effective July 1, 2014
Based on the 2009 International Energy Conservation Code (IECC)

2014 Oregon Mechanical Specialty Code (OMSC)
Effective July 1, 2014
Based on the 2012 International Mechanical Code (IMC) & International Fuel Gas Code (IFGC)

- Adopted codes online
- Code programs
  - Overview
  - Commercial structures
  - ▶Residential structures
  - Boilers and pressure vessels
  - Electrical
  - Elevators
  - Mechanical
  - Plumbing
  - Energy efficiency
  - Reach
  - Amusement rides
  - Manufactured dwellings
  - Parks
  - Recreational vehicles
  - Codebook history
- Code program contacts
- Statewide alternate methods
- Statewide code interpretations
- Appeal decisions
- Purchase codebooks

public to adopt, amend, and interpret the Oregon Residential Specialty Code (ORSC). This code applies to the construction, reconstruction, and repair of one- and two-family dwellings and townhouses.

Adopted codebook

2017 Oregon Residential Specialty Code (ORSC)
Effective Oct. 1, 2017
Based on the 2015 International Residential Code (IRC)
2014 ORSC is available until Jan. 1, 2018.

Amendments

R329 - Dwelling units containing lofts - Amendments | Effective Jan.1, 2018
Get more information.

Program activities

Residential and Manufactured Structures Board
Code committees and rulemaking hearings

Program tools and resources

Low Volume Windows

Low volume window label and exempt fenestration label program

Inspection tools

Cite it, write it rule
Cite it, write it checklist
Antifreeze fire sprinkler system advisory
ASCE 7-10: Oregon Wind Map and Risk Category Code Language

Calculators

Residential thermal performance

How to use the thermal performance calculator
New: 2017 ORSC Residential thermal performance calculator
2014 ORSC Residential thermal performance calculator

Bracing

Information about rules, code adoption, board meetings, the latest newsletter, and more. We will keep you updated.

Contact a code specialist

Permits

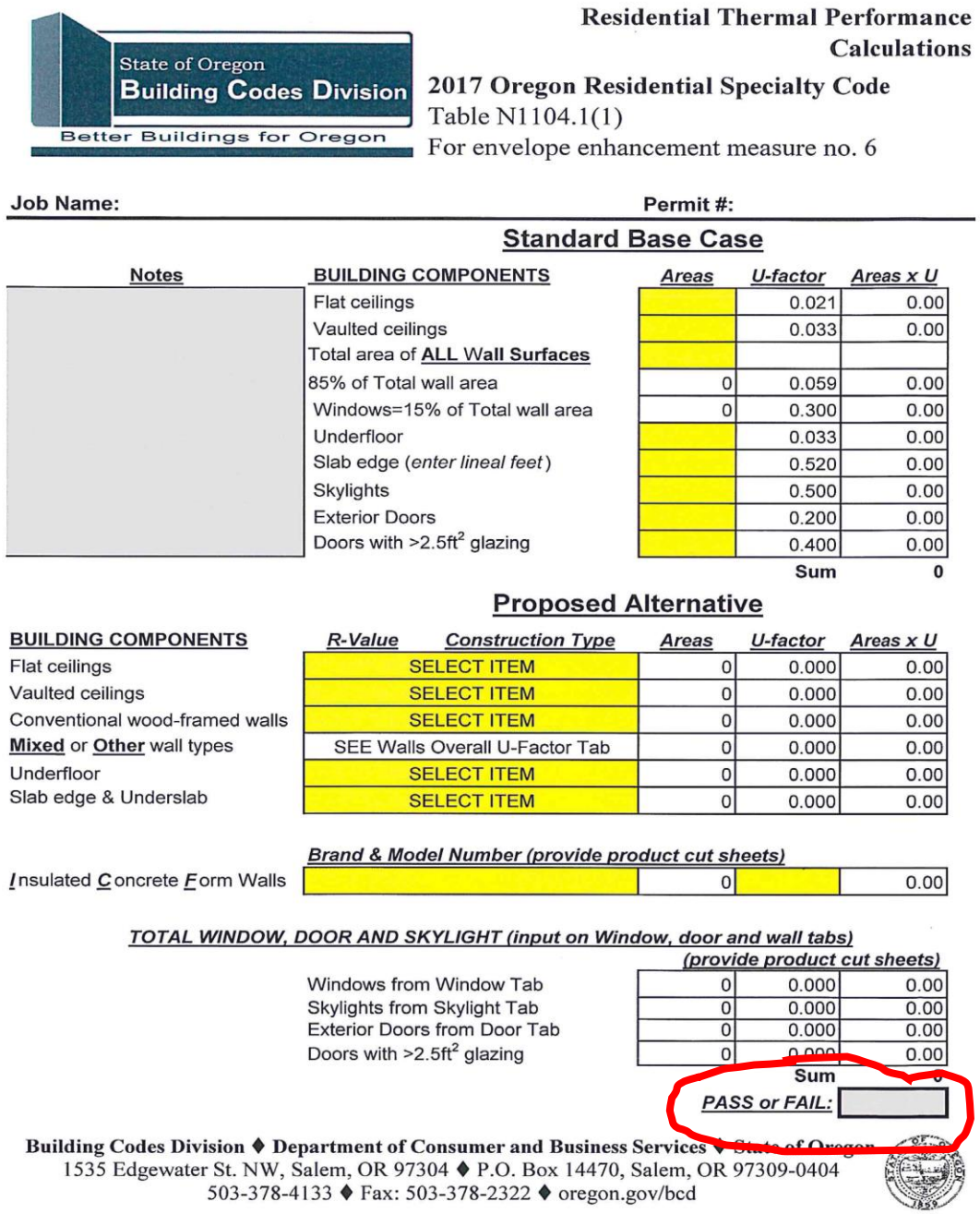
Home and property owners
ePermitting
Minor label permits
Local building department directory

Laws and rules

ORS 455 State Building Code
OAR 918-480 Residential code

The BCD Calculator

- Fill in the yellow areas
- Use pull down menus for U-factors
- Let the program do the math
- Indicator at the bottom for pass or fail



State of Oregon
Building Codes Division
Better Buildings for Oregon

Residential Thermal Performance Calculations

2017 Oregon Residential Specialty Code
Table N1104.1(1)
For envelope enhancement measure no. 6

Job Name: **Permit #:**

Standard Base Case

Notes	BUILDING COMPONENTS	Areas	U-factor	Areas x U
	Flat ceilings		0.021	0.00
	Vaulted ceilings		0.033	0.00
	Total area of **ALL Wall Surfaces**			
	85% of Total wall area	0	0.059	0.00
	Windows=15% of Total wall area	0	0.300	0.00
	Underfloor		0.033	0.00
	Slab edge (*enter lineal feet*)		0.520	0.00
	Skylights		0.500	0.00
	Exterior Doors		0.200	0.00
	Doors with >2.5ft^2 glazing		0.400	0.00
			Sum	**0**

Proposed Alternative

BUILDING COMPONENTS	R-Value	Construction Type	Areas	U-factor	Areas x U
Flat ceilings		SELECT ITEM	0	0.000	0.00
Vaulted ceilings		SELECT ITEM	0	0.000	0.00
Conventional wood-framed walls		SELECT ITEM	0	0.000	0.00
Mixed or **Other** wall types		SEE Walls Overall U-Factor Tab	0	0.000	0.00
Underfloor		SELECT ITEM	0	0.000	0.00
Slab edge & Underslab		SELECT ITEM	0	0.000	0.00

	Brand & Model Number (provide product cut sheets)			
Insulated Concrete Form Walls			0	0.00

TOTAL WINDOW, DOOR AND SKYLIGHT (input on Window, door and wall tabs) (provide product cut sheets)

Windows from Window Tab	0	0.000	0.00
Skylights from Skylight Tab	0	0.000	0.00
Exterior Doors from Door Tab	0	0.000	0.00
Doors with >2.5ft^2 glazing	0	0.000	0.00
		Sum	**0**

PASS or FAIL:

Building Codes Division ♦ Department of Consumer and Business Services ♦ State of Oregon
1535 Edgewater St. NW, Salem, OR 97304 ♦ P.O. Box 14470, Salem, OR 97309-0404
503-378-4133 ♦ Fax: 503-378-2322 ♦ oregon.gov/bcd

AutoSave Off
res-overall-u-factor-calculator-17orsc (7) - Excel
howard asch
File Home Insert Page Layout Formulas Data Review View Help PDF Tell me what you want to do Share
Cut Copy Format Painter Paste Clipboard
Arial 10 Font
Wrap Text Merge & Center Alignment
General Number
Conditional Formatting Format as Table
Normal Bad Good Neutral Styles
Insert Delete Format Cells
AutoSum Fill Clear Sort & Filter Find & Select Editing
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Document Recovery

Excel has recovered the following files. Save the ones you wish to keep.

energy calc w entrys.xlsx [O...
Version created last time the...
2/6/2018 10:05 AM

energy calc w entrys (versio...
Version created from the last...
2/8/2018 4:06 PM

energy calc w entrys.xlsx [O...
Version created last time the...
2/7/2018 4:40 PM

Which file do I want to save?

Close

Conventional wood-framed walls	R-23, Intermediate - Blown-In	1665.75	0.056	93.28
Mixed or **Other** wall types	SEE Walls Overall U-Factor Tab	0	0.000	0.00
Underfloor	R-38, Underfloor	1483	0.026	38.56
Slab edge & Underslab	SELECT ITEM	0	0.000	0.00

	Brand & Model Number (provide product cut sheets)			
***I**nsulated **C**oncrete **F**orm Walls*		0		0.00

TOTAL WINDOW, DOOR AND SKYLIGHT (input on Window, door and wall tabs)
(provide product cut sheets)

Windows from Window Tab	334.25	0.280	93.59
Skylights from Skylight Tab	0	0.000	0.00
Exterior Doors from Door Tab	45.33	0.200	9.07
Doors with >2.5ft^2 glazing	0	0.000	0.00
		Sum	**272.716**

PASS or FAIL: **FAIL**

-5.5%

Building Codes Division ♦ Department of Consumer and Business Services ♦ State of Oregon
1535 Edgewater St. NW, Salem, OR 97304 ♦ P.O. Box 14470, Salem, OR 97309-0404
503-378-4133 ♦ Fax: 503-378-2322 ♦ oregon.gov/bcd

Measure 6 | Windows Overall U-Factor | Doors Overall U-Factor | Skylights Overall U-Factor | Walls Overall U-Factor ...
Ready Page: 1 of 1
115%
4:13 PM 2/14/2018

The BCD Calculator

- Click windows overall U-factor tab at the bottom
- Insert area and U-factor of each window in the yellow spaces
- See the example

Windows Overall U-Factor

Average Window U-Factor

Window Designation	Area of Window(s)	U-Factor of Assembly
Window - 1		
Window - 2		
Window - 3		
Window - 4		
Window - 5		
Window - 6		
Window - 7		
Window - 8		
Window - 9		
Window - 10		
Window - 11		
Window - 12		
Window - 13		
Window - 14		
Window - 15		
Window - 16		
Window - 17		
Window - 18		
Window - 19		
Window - 20		
Window - 21		
Window - 22		
Window - 23		
Window - 24		
Window - 25		
Window - 26		
Window - 27		
Window - 28		
Window - 29		
Window - 30		
	Square Feet	Average U-Factor
Total:	0	0.000

EXAMPLE

Average Window U-Factor

Window Designation	Area of Window(s)	U-Factor of Assembly
Window - 1	25	0.32
Window - 2	20	0.30
Window - 3	15	0.35
Window - 4	30	0.32
Window - 5	10	0.30
Window - 6	25	0.32
Window - 7	25	0.32
Window - 8	25	0.32
Window - 9		
Window - 10		
Window - 11		
Window - 12		
Window - 13		
Window - 14		
Window - 15		
Window - 16		
Window - 17		
Window - 18		
Window - 19		
Window - 20		
Window - 21		
Window - 22		
Window - 23		
Window - 24		
Window - 25		
Window - 26		
Window - 27		
Window - 28		
Window - 29		
Window - 30		
	Square Feet	Average U-Factor
Total:	175	0.319

Instructions:

1. Enter area of window type in yellow area.
2. Enter U-Factor of window in yellow area.
3. Value in green cell will be automatically entered into Table N1104.1(1) spreadsheet under "Standard Base Case".
4. Value in blue cell will be automatically entered into Table N1104.1(1) spreadsheet under "Proposed Alternative".

Note 1:

Window that have the same U-Factor may be combined into one entry. For example two wood framed windows, one 25ft^2 and one of 30ft^2, both having a U-Factor of 0.32 can be entered as one wall with a combined area of 55ft^2.

Note 2:

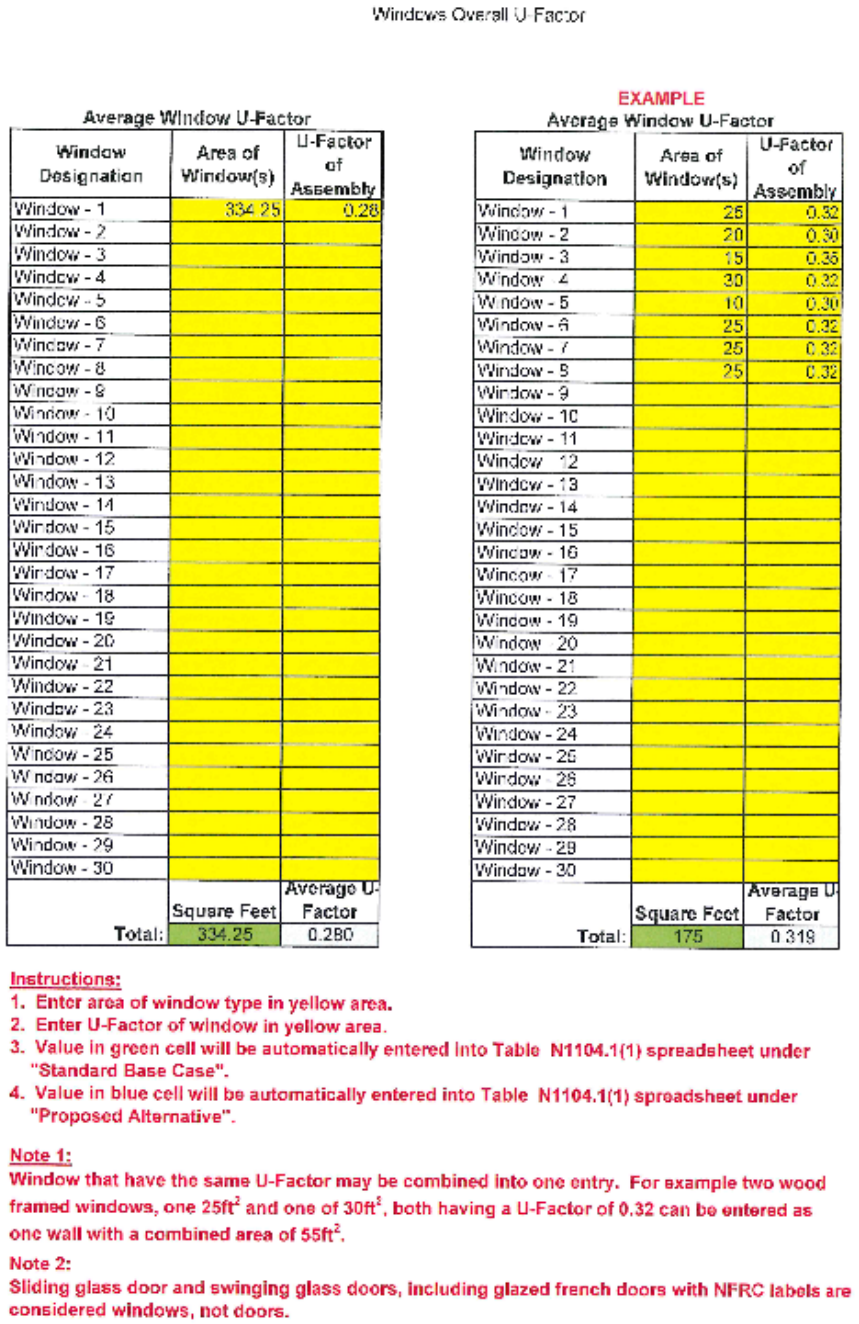
Sliding glass door and swinging glass doors, including glazed french doors with NFRC labels are considered windows, not doors.

Window Schedule			
Quantity	size	square feet	U-factor
1	9/0 -4/0	36	0.28
1	3/0 -3/6	10.5	0.28
1	4/0 -1/0	4	0.28
1	5/0 -4/0	20	0.28
2	2/6 -2/0	10	0.28
1	4/0 -3/0	12	0.28
2	3/0 -5/0	30	0.28
1	2/0 -3/0	6	0.28
2	2/0 -2/0	8	0.28
2	6/0 -5/0	60	0.28
1	8/0 -5/0	40	0.28
1	3/0 -6/0	18	0.28
1	5/0 -6/0	30	0.28
2	2/6 -2/6	12.5	0.28
1	2/6 -5/0	12.5	0.28
1	3/0 -5/0	15	0.28
1	1/6 -6/6	9.75	0.28

Use the window schedule on the plans to find window area and U-factor

The BCD Calculator

- Enter window area and U-factor
- Let the program do the math
- Average U-factor and total window area will automatically appear on the first page
- The program subtracts window area from the total wall area and correct average U-factor is inserted



Windows Overall U-Factor

Average Window U-Factor

Window Designation	Area of Window(s)	U-Factor of Assembly
Window - 1	334.25	0.28
Window - 2		
Window - 3		
Window - 4		
Window - 5		
Window - 6		
Window - 7		
Window - 8		
Window - 9		
Window - 10		
Window - 11		
Window - 12		
Window - 13		
Window - 14		
Window - 15		
Window - 16		
Window - 17		
Window - 18		
Window - 19		
Window - 20		
Window - 21		
Window - 22		
Window - 23		
Window - 24		
Window - 25		
Window - 26		
Window - 27		
Window - 28		
Window - 29		
Window - 30		
	Square Feet	Average U-Factor
Total:	334.25	0.280

EXAMPLE

Average Window U-Factor

Window Designation	Area of Window(s)	U-Factor of Assembly
Window - 1	25	0.32
Window - 2	20	0.30
Window - 3	15	0.35
Window - 4	30	0.32
Window - 5	10	0.30
Window - 6	25	0.32
Window - 7	25	0.32
Window - 8	25	0.32
Window - 9		
Window - 10		
Window - 11		
Window - 12		
Window - 13		
Window - 14		
Window - 15		
Window - 16		
Window - 17		
Window - 18		
Window - 19		
Window - 20		
Window - 21		
Window - 22		
Window - 23		
Window - 24		
Window - 25		
Window - 26		
Window - 27		
Window - 28		
Window - 29		
Window - 30		
	Square Feet	Average U-Factor
Total:	175	0.319

Instructions:

1. Enter area of window type in yellow area.
2. Enter U-Factor of window in yellow area.
3. Value in green cell will be automatically entered into Table N1104.1(1) spreadsheet under "Standard Base Case".
4. Value in blue cell will be automatically entered into Table N1104.1(1) spreadsheet under "Proposed Alternative".

Note 1:

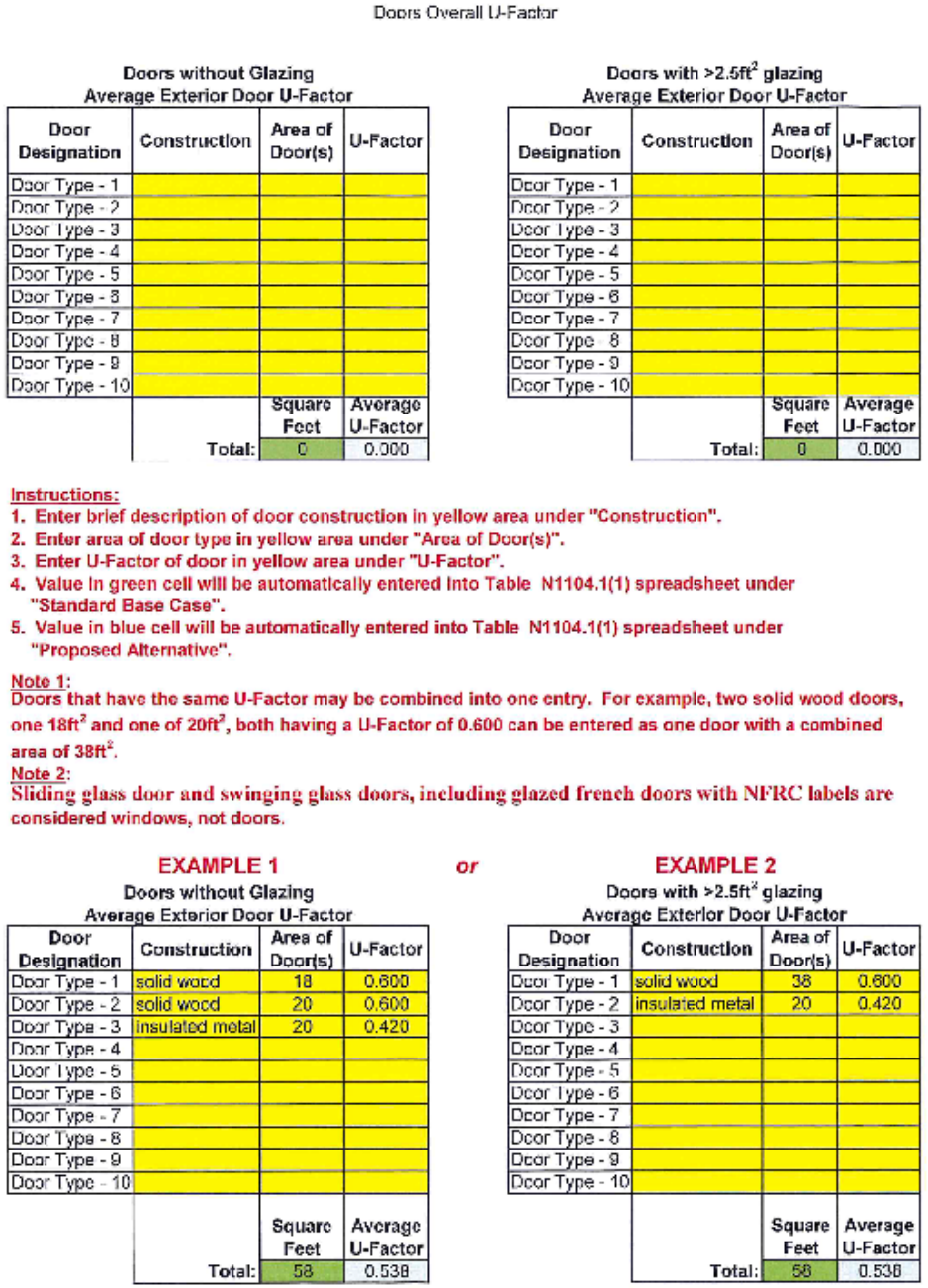
Window that have the same U-Factor may be combined into one entry. For example two wood framed windows, one 25ft^2 and one of 30ft^2, both having a U-Factor of 0.32 can be entered as one wall with a combined area of 55ft^2.

Note 2:

Sliding glass door and swinging glass doors, including glazed french doors with NFRC labels are considered windows, not doors.

The BCD Calculator

- Click the doors over all U-factor tab at the bottom



Doors Overall U-Factor

Doors without Glazing
Average Exterior Door U-Factor

Door Designation	Construction	Area of Door(s)	U-Factor
Door Type - 1			
Door Type - 2			
Door Type - 3			
Door Type - 4			
Door Type - 5			
Door Type - 6			
Door Type - 7			
Door Type - 8			
Door Type - 9			
Door Type - 10			
		Square Feet	Average U-Factor
	Total:	0	0.000

Doors with >2.5ft² glazing
Average Exterior Door U-Factor

Door Designation	Construction	Area of Door(s)	U-Factor
Door Type - 1			
Door Type - 2			
Door Type - 3			
Door Type - 4			
Door Type - 5			
Door Type - 6			
Door Type - 7			
Door Type - 8			
Door Type - 9			
Door Type - 10			
		Square Feet	Average U-Factor
	Total:	0	0.000

Instructions:
1. Enter brief description of door construction in yellow area under "Construction".
2. Enter area of door type in yellow area under "Area of Door(s)".
3. Enter U-Factor of door in yellow area under "U-Factor".
4. Value in green cell will be automatically entered into Table N1104.1(1) spreadsheet under "Standard Base Case".
5. Value in blue cell will be automatically entered into Table N1104.1(1) spreadsheet under "Proposed Alternative".

Note 1:
Doors that have the same U-Factor may be combined into one entry. For example, two solid wood doors, one 18ft² and one of 20ft², both having a U-Factor of 0.600 can be entered as one door with a combined area of 38ft².

Note 2:
Sliding glass door and swinging glass doors, including glazed french doors with NFRC labels are considered windows, not doors.

EXAMPLE 1 *or* EXAMPLE 2

Doors without Glazing
Average Exterior Door U-Factor

Door Designation	Construction	Area of Door(s)	U-Factor
Door Type - 1	solid wood	18	0.600
Door Type - 2	solid wood	20	0.600
Door Type - 3	insulated metal	20	0.420
Door Type - 4			
Door Type - 5			
Door Type - 6			
Door Type - 7			
Door Type - 8			
Door Type - 9			
Door Type - 10			
		Square Feet	Average U-Factor
	Total:	58	0.538

Doors with >2.5ft² glazing
Average Exterior Door U-Factor

Door Designation	Construction	Area of Door(s)	U-Factor
Door Type - 1	solid wood	38	0.600
Door Type - 2	insulated metal	20	0.420
Door Type - 3			
Door Type - 4			
Door Type - 5			
Door Type - 6			
Door Type - 7			
Door Type - 8			
Door Type - 9			
Door Type - 10			
		Square Feet	Average U-Factor
	Total:	58	0.538

Door Schedule			
Door type	size	square feet	U-factor
entry-solid	3/0 -8/0	24	0.2
garage-solid	2/8 -8/0	21.33	0.2

Use the door schedule on the plans to find door area and U-factor

- Separate tables for regular doors and for doors with more than 2.5 square feet of glazing
- See instructions
- See examples at the bottom
- Totals automatically sent to the calculator

Doors Overall U-Factor

Doors without Glazing
Average Exterior Door U-Factor

Door Designation	Construction	Area of Door(s)	U-Factor
Door Type - 1		24	0.2
Door Type - 2		21.33	0.2
Door Type - 3			
Door Type - 4			
Door Type - 5			
Door Type - 6			
Door Type - 7			
Door Type - 8			
Door Type - 9			
Door Type - 10			
	Total:	Square Feet: 45.33	Average U-Factor: 0.200

Doors with >2.5ft² glazing
Average Exterior Door U-Factor

Door Designation	Construction	Area of Door(s)	U-Factor
Door Type - 1			
Door Type - 2			
Door Type - 3			
Door Type - 4			
Door Type - 5			
Door Type - 6			
Door Type - 7			
Door Type - 8			
Door Type - 9			
Door Type - 10			
	Total:	Square Feet: 0	Average U-Factor: 0.000

Instructions:

1. Enter brief description of door construction in yellow area under "Construction".
2. Enter area of door type in yellow area under "Area of Door(s)".
3. Enter U-Factor of door in yellow area under "U-Factor".
4. Value in green cell will be automatically entered into Table N1104.1(1) spreadsheet under "Standard Base Case".
5. Value in blue cell will be automatically entered into Table N1104.1(1) spreadsheet under "Proposed Alternative".

Note 1:
Doors that have the same U-Factor may be combined into one entry. For example, two solid wood doors, one 18ft² and one of 20ft², both having a U-Factor of 0.600 can be entered as one door with a combined area of 38ft².

Note 2:
Sliding glass door and swinging glass doors, including glazed french doors with NFRC labels are considered windows, not doors.

EXAMPLE 1

Doors without Glazing
Average Exterior Door U-Factor

Door Designation	Construction	Area of Door(s)	U-Factor
Door Type - 1	solid wood	18	0.600
Door Type - 2	solid wood	20	0.600
Door Type - 3	insulated metal	20	0.420
Door Type - 4			
Door Type - 5			
Door Type - 6			
Door Type - 7			
Door Type - 8			
Door Type - 9			
Door Type - 10			
	Total:	Square Feet: 58	Average U-Factor: 0.538

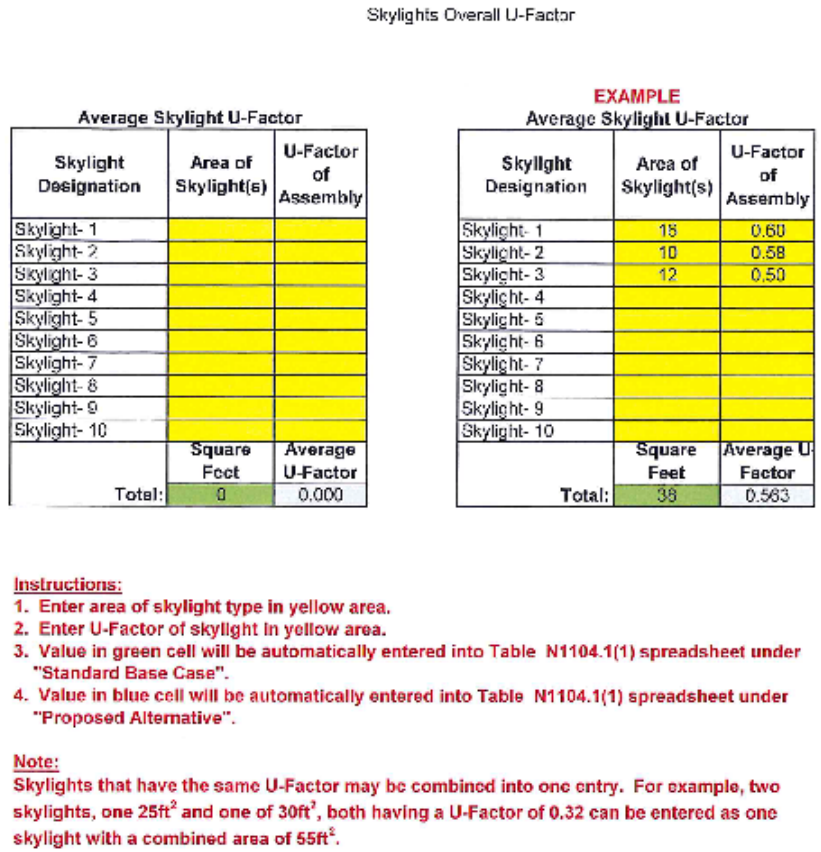
or

EXAMPLE 2

Doors with >2.5ft² glazing
Average Exterior Door U-Factor

Door Designation	Construction	Area of Door(s)	U-Factor
Door Type - 1	solid wood	38	0.600
Door Type - 2	insulated metal	20	0.420
Door Type - 3			
Door Type - 4			
Door Type - 5			
Door Type - 6			
Door Type - 7			
Door Type - 8			
Door Type - 9			
Door Type - 10			
	Total:	Square Feet: 58	Average U-Factor: 0.538

- Click the skylight overall U-factor tab at the bottom



Skylights Overall U-Factor

Average Skylight U-Factor

Skylight Designation	Area of Skylight(s)	U-Factor of Assembly
Skylight- 1		
Skylight- 2		
Skylight- 3		
Skylight- 4		
Skylight- 5		
Skylight- 6		
Skylight- 7		
Skylight- 8		
Skylight- 9		
Skylight- 10		
	Square Feet	Average U-Factor
Total:	0	0.000

EXAMPLE

Average Skylight U-Factor

Skylight Designation	Area of Skylight(s)	U-Factor of Assembly
Skylight- 1	18	0.60
Skylight- 2	10	0.58
Skylight- 3	12	0.50
Skylight- 4		
Skylight- 5		
Skylight- 6		
Skylight- 7		
Skylight- 8		
Skylight- 9		
Skylight- 10		
	Square Feet	Average U-Factor
Total:	38	0.563

Instructions:

1. Enter area of skylight type in yellow area.
2. Enter U-Factor of skylight in yellow area.
3. Value in green cell will be automatically entered into Table N1104.1(1) spreadsheet under "Standard Base Case".
4. Value in blue cell will be automatically entered into Table N1104.1(1) spreadsheet under "Proposed Alternative".

Note:

Skylights that have the same U-Factor may be combined into one entry. For example, two skylights, one 25ft^2 and one of 30ft^2, both having a U-Factor of 0.32 can be entered as one skylight with a combined area of 55ft^2.

- Add the area and U-factor as per instructions and example
- Totals will be automatically entered into the calculator

Walls Overal U-Factor

MIXED or OTHER Wall Types
Average Wall U-Factor

Door Designation	Construction	Area of Wall(s)	U-Factor
Wall Type - 1			
Wall Type - 2			
Wall Type - 3			
Wall Type - 4			
Wall Type - 5			
Wall Type - 6			
Wall Type - 7			
Wall Type - 8			
Wall Type - 9			
Wall Type - 10			
		Square Feet	Average U-Factor
	Total:	0	0.000

Instructions:
1. Enter brief description of wall construction in yellow area.
2. Enter area of wall type in yellow area. Wall area minus window & door area.
3. Enter U-Factor of wall in yellow area.
4. Value in green cell will be automatically entered into Table N1104.1(1) spreadsheet under "Standard Base Case".
5. Value in blue cell will be automatically entered into Table N1104.1(1) spreadsheet under "Proposed Alternative".

Note:
Walls that have the same U-Factor may be combined into one entry. For example, two wood framed walls, one 160ft^2 and one of 700ft^2, both having a U-Factor of 0.055 can be entered as one wall with a combined area of 860ft^2.

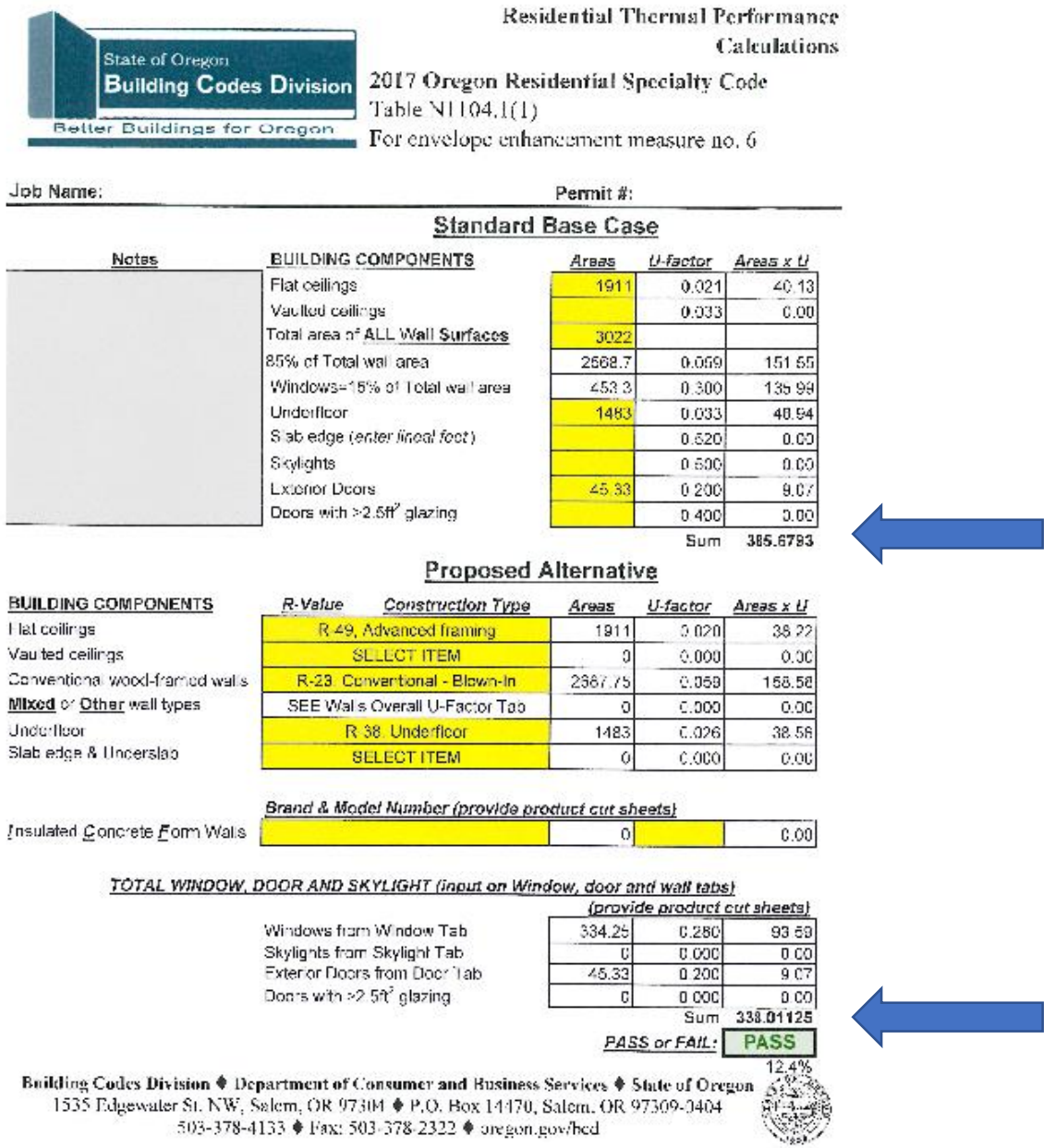
EXAMPLE

Average Wall U-Factor

Door Designation	Construction	Area of Wall(s)	U-Factor
Wall Type - 1	wood framed 2x6 16"oc w/ R-21	160	0.055
Wall Type - 2	wood framed 2x6 24"oc w/ R-21	700	0.055
Wall Type - 3	8" CMU Block solid filled	75	0.300
Wall Type - 4			
Wall Type - 5			
Wall Type - 6			
Wall Type - 7			
Wall Type - 8			
Wall Type - 9			
Wall Type - 10			
		Square Feet	Average U-Factor
	Total:	935	0.075

Pass or Fail?

- When all information is entered the total overall U-factor will be displayed and the box at the bottom will indicate whether the designed proposed passes or fails



State of Oregon
Building Codes Division
Better Buildings for Oregon

Residential Thermal Performance Calculations

2017 Oregon Residential Specialty Code
Table N1104.1(1)
For envelope enhancement measure no. 6

Job Name: Permit #:

Standard Base Case

Notes	BUILDING COMPONENTS	Areas	U-factor	Areas x U
	Flat ceilings	1911	0.021	40.13
	Vaulted ceilings		0.033	0.00
	Total area of ALL Wall Surfaces	3022		
	85% of Total wall area	2568.7	0.059	151.55
	Windows=15% of Total wall area	453.3	0.300	135.99
	Underfloor	1483	0.033	48.94
	Slab edge (enter lineal feet)		0.520	0.00
	Skylights		0.500	0.00
	Exterior Doors	45.33	0.200	9.07
	Doors with >2.5ft² glazing		0.400	0.00
			Sum	385.6793

Proposed Alternative

BUILDING COMPONENTS	R-Value	Construction Type	Areas	U-factor	Areas x U
Flat ceilings	R-49, Advanced framing		1911	0.020	38.22
Vaulted ceilings	SELECT ITEM		0	0.000	0.00
Conventional wood-framed walls	R-23, Conventional - Blown-In		2367.75	0.059	158.58
Mixed or Other wall types	SEE Walls Overall U-Factor Tab		0	0.000	0.00
Underfloor	R-38, Underfloor		1483	0.026	38.58
Slab edge & Unerslab	SELECT ITEM		0	0.000	0.00

	Brand & Model Number (provide product cut sheets)			
Insulated Concrete Form Walls		0		0.00

TOTAL WINDOW, DOOR AND SKYLIGHT (input on Window, door and wall tabs) (provide product cut sheets)

Windows from Window Tab	334.25	0.280	93.59
Skylights from Skylight Tab	0	0.000	0.00
Exterior Doors from Door Tab	45.33	0.200	9.07
Doors with >2.5ft² glazing	0	0.000	0.00
		Sum	338.01125

PASS or FAIL: PASS

12.4%

Building Codes Division ♦ Department of Consumer and Business Services ♦ State of Oregon
1535 Edgewater St. NW, Salem, OR 97304 ♦ P.O. Box 14470, Salem, OR 97309-0404
503-378-4133 ♦ Fax: 503-378-2322 ♦ oregon.gov/bcd

Making adjustments is easy

- Make changes if your design fails
- Make changes if you are significantly more efficient
- Reduce below the minimum prescriptive U-factors
- See what would happen if…

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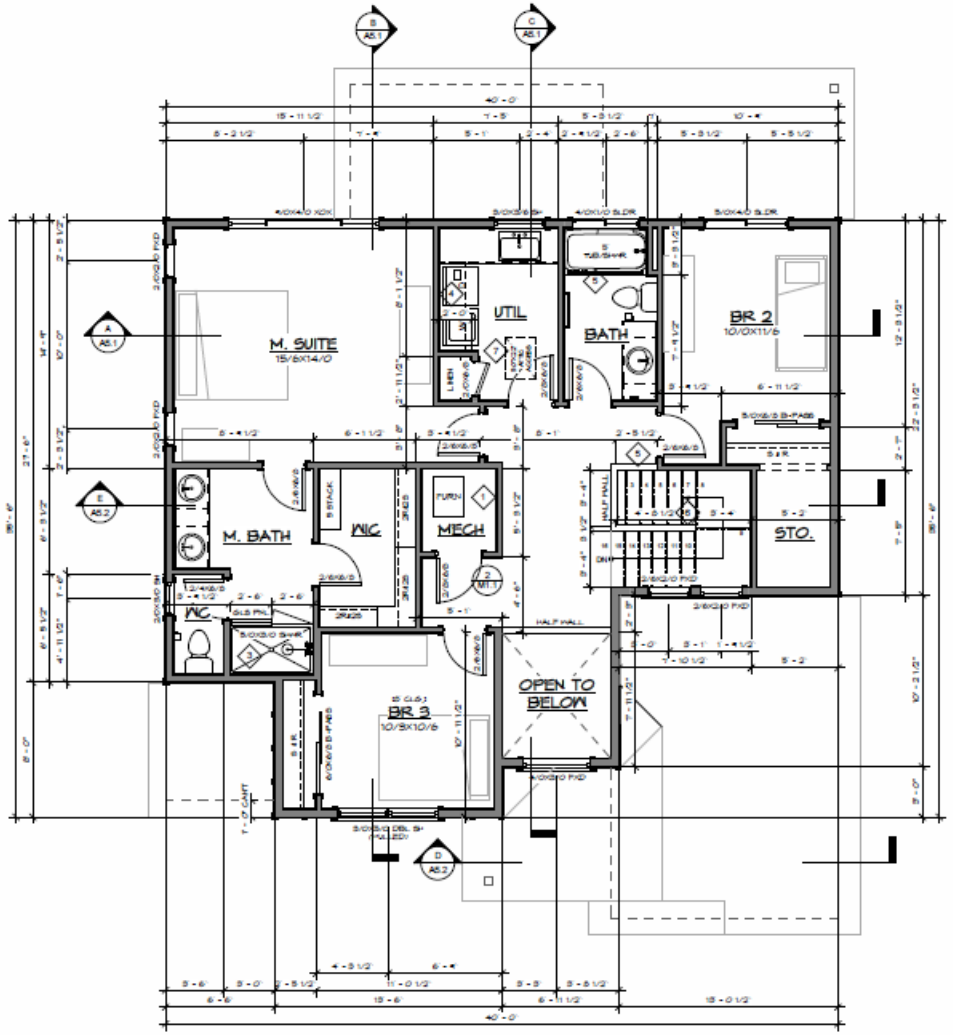
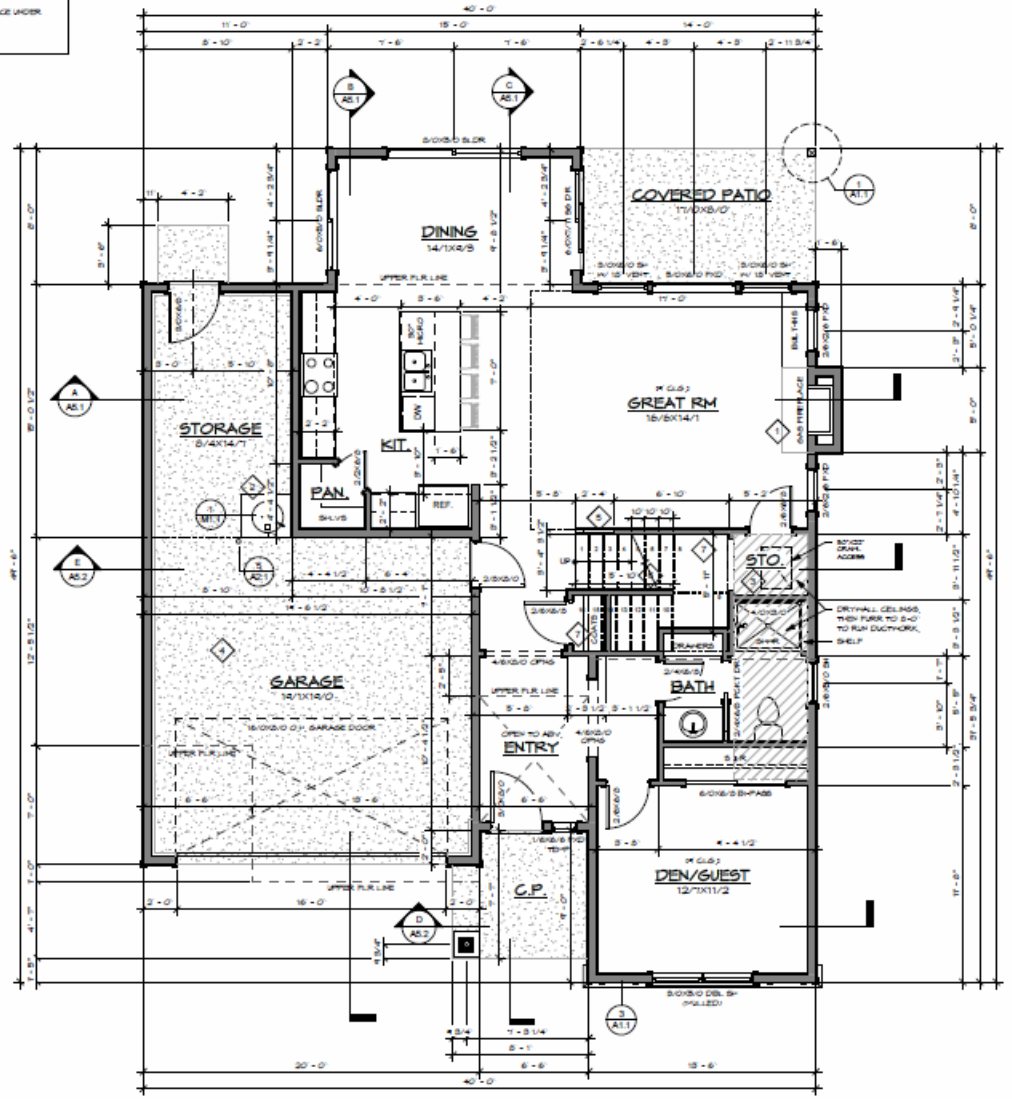


Upper Floor Plan



Main Floor Plan

THE AUSTIN FARMHOUSE
(2) CAR, GARAGE LEFT
a 2,112 sq. ft. Single Family Residence

FILE NAME : Austin-F 2112 SF
DRAWN BY: PLY
SCALE : 1/4" = 1'-0"
PLOT DATE : 1/30/2018 9:19:21 PM

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SHEET TITLE: Floor Plans

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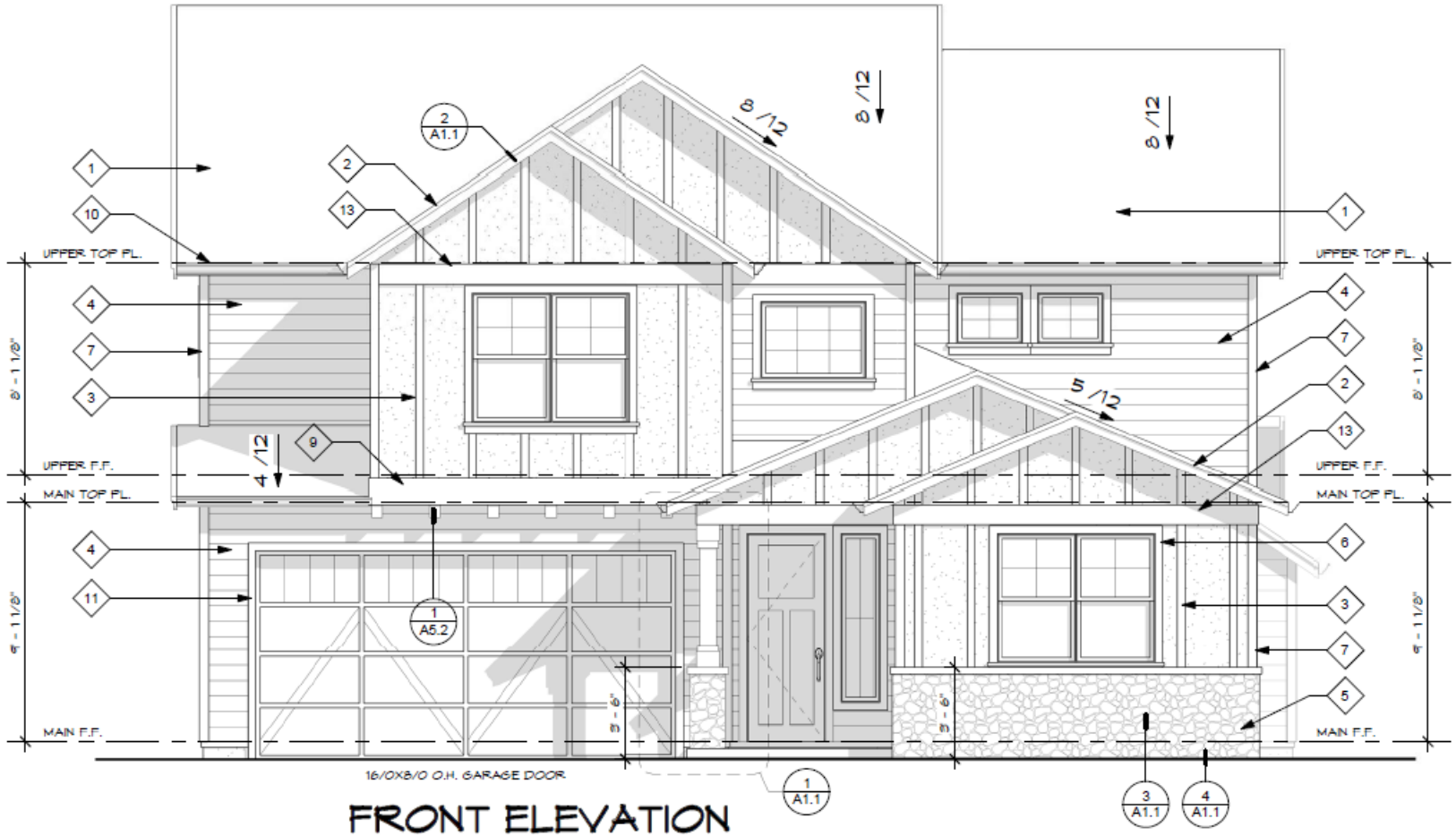

FRONT ELEVATION
1/4" = 1'-0"

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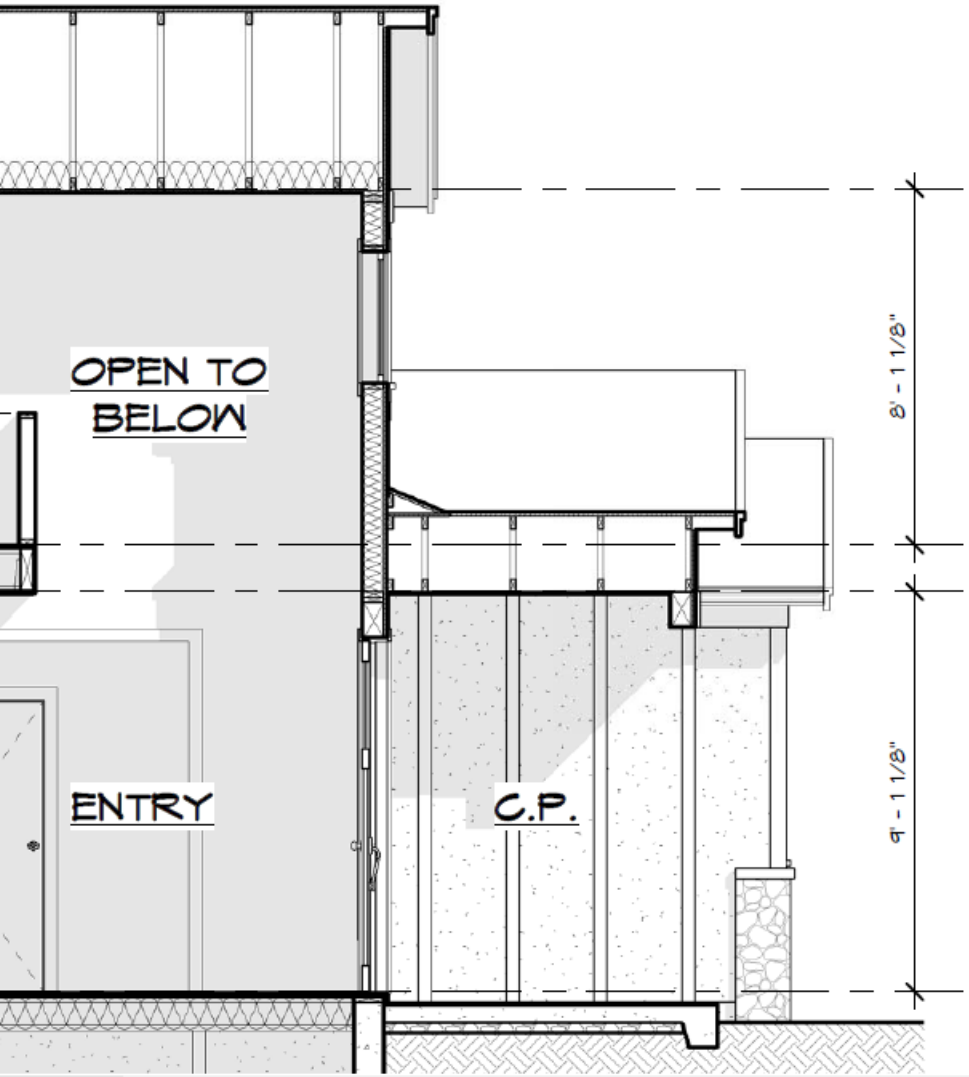

INSULATION:

SEE ENERGY TRUST OF OREGON ENERGY PERFORMANCE SCORE (EPS) PROGRAM

ALSO COMPLY WITH DOE THERMAL BYPASS CHECKLIST DETAILS

UNDERFLOOR – R38

WALLS – R23 BLOWN-IN-BIB

DUCTWORK – R-8

ATTIC BLOWN-IN – R49

INACCESSIBLE ATTIC SPACES – R-38 (MAX 50%)

CLADDING:

FOR ADHERED MASONRY CLADDINGS LEGEND DOES NOT REQUIRE PT PLYWOOD BEHIND THE CLADDING BUT DOES INSTALL A VENTILATED RAINSCREEN.

FOR THE BALANCE OF THE CLADDING WE USE A DRAINABLE HOUSEWRAP WRB (NOT A VENTED RAINSCREEN)

Summary

- Option 6 is a performance path
  - Flexibility
  - Allows more creativity
  - Allows many combinations of methods to reduce energy use
  - Allows credit for reducing window area
  - BCD calculator makes it easy as well as simple to make adjustments
  - Energy losses need to be calculated anyways for mechanical design

Oregon Home Builders Association is solely responsible for the content of this presentation

We wish to express our thanks to Legend Homes for providing the plans used in this presentation