



WSU Energy Program presents:

WSEC-R 406.3 Option 3.5b

and other useful tool and tips

Jonathan P. Jones,
Programs Coordinator
WSU Energy Program
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Autobiographical... (Cliffs Notes version)



Jonathan P. Jones
Program Coordinator
WSU Energy Program
1-360-956-2042
energycode@energy.wsu.edu



ORNL New Wall Tool

What is ORNL?

Oak Ridge National Laboratory

“Oak Ridge National Laboratory is a U.S. multi-program science and technology national laboratory sponsored by the U.S. Department of Energy and administered, managed, and operated by UT–Battelle as a federally funded research and development center under a contract with the DOE, located in Oak Ridge, Tennessee.”



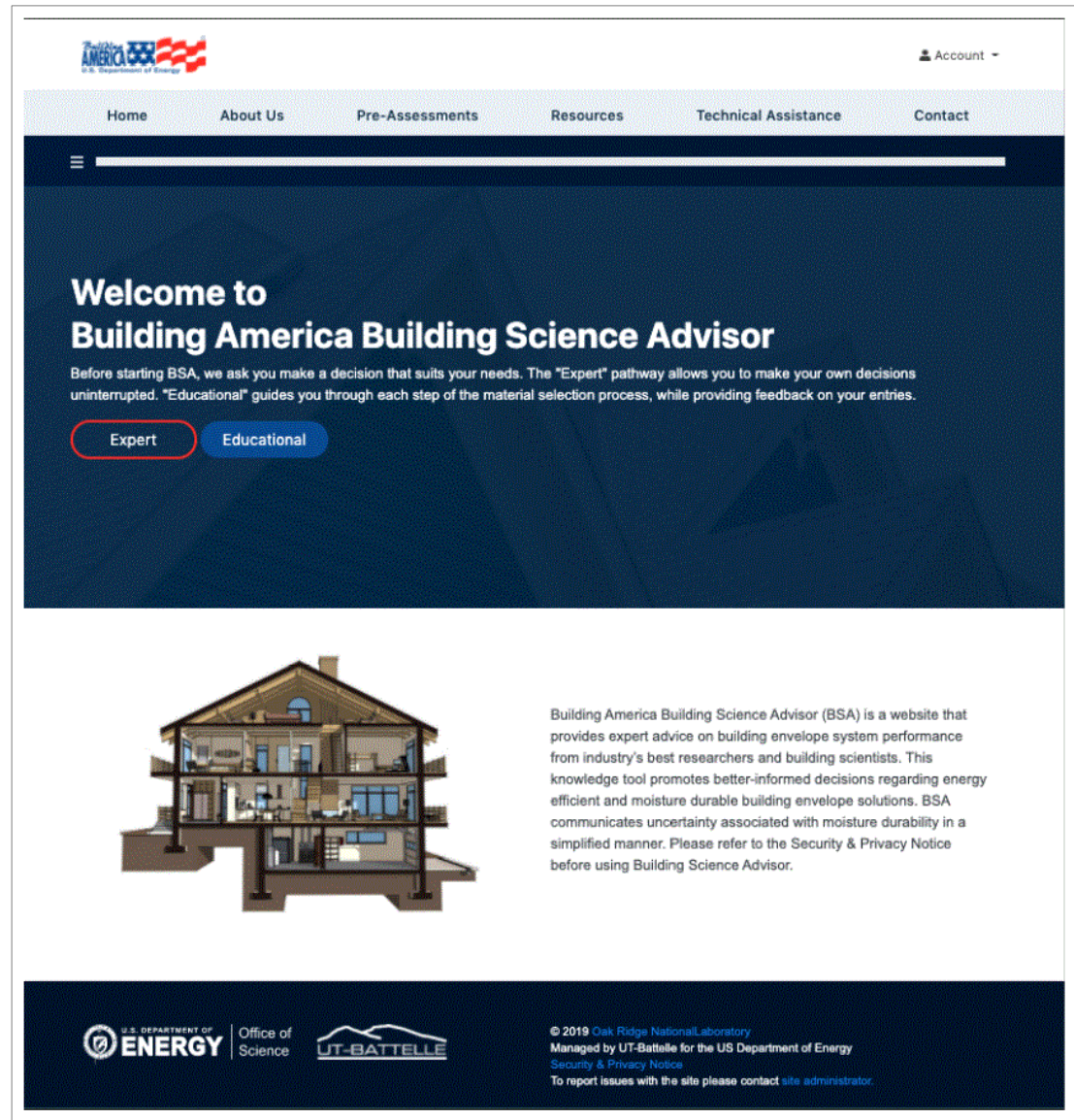
ORNL New Wall Tool

- WUFI
- Oakridge National Laboratory's new tool
- Equals new simple wall moisture software
 - Building Science Advisor



The Building Science Advisor (BSA)

A practical tool to vet the moisture durability of assembly designs.



BSA Features

Provides user with sources of information to consider before performing an energy retrofit.

The screenshot displays the Building Science Advisor (BSA) web application. At the top, there is a header with the 'America's Energy' logo and navigation links for 'Entities', 'Administration', and 'Account'. Below this is a main navigation bar with links for 'Home', 'About Us', 'Pre-Assessments', 'Resources', 'Technical Assistance', and 'Contact'. A hamburger menu icon is visible on the left side of this bar. The main content area is titled 'Mode: Educational' and contains a paragraph explaining the purpose of the tool: 'When planning an energy retrofit or replacing damaged and/or deteriorated materials of your building envelope (the components of the house serving as a thermal and weather barrier between the inside and the outside), there are various aspects to consider. Among many things, the main areas are your roof, exterior walls, windows, basement/crawl space, and how airtight your building is. What approach to take depends on the condition of the building and your needs. Click on the items below to view more information on the specified retrofit categories.'

Below the paragraph is a list of five categories, each with a radio button icon:

- ☐ Roofs and Attics
- ☐ Exterior Walls
- ☐ Windows and Attachments
- ☐ Basements, Crawl Spaces and Foundations
- ☐ Building Airtightness

To the right of the text is a 3D cutaway illustration of a two-story house, showing the interior structure and various rooms. Below the list of categories, there is a paragraph: 'Other than exterior walls, the building science advisor is currently not setup to analyze the moisture durability of these types of retrofits, but the following links can provide some guidance regarding how best to approach retrofit measurements.'

A 'Next' button is located at the bottom right of the main content area. The footer contains the 'U.S. DEPARTMENT OF ENERGY' logo, the 'Office of Science' logo, and the 'UT-BATTELLE' logo. It also includes copyright information: '© 2019 Oak Ridge National Laboratory', 'Managed by UT-Battelle for the US Department of Energy', and links for 'Security & Privacy Notice' and 'To report issues with the site please contact site administrator.'

BSA Output Screen

Summarizes information on moisture durability and energy efficiency, and provides recommendations to improve performance.

Mode: Educational

Retrofit Performance

The indicators below show the thermal performance and moisture durability of the retrofit. Areas in green indicate good thermal and moisture performance. Poor thermal and moisture performance are reflected in the red and orange regions respectively. Below, guidance is provided to improve thermal performance and moisture durability of the wall retrofit.

Name of your wall here

Exterior Cladding

Air Space

Continuous Insulation

WRB Air Barrier

Exterior Sheathing


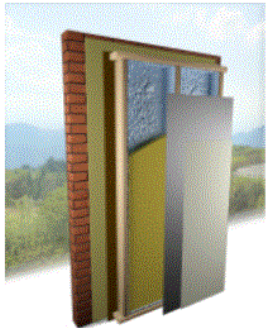
Wall Structure

Cavity Insulation

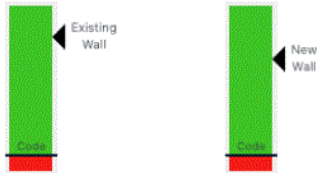
Insulation Thickness

Interior Vapor Retarder

Interior Finish



Moisture Durability[®]



Existing R-Value: **R-1.30**

New R-Value: **R-0.770**

Thermal Performance[®]

The code compliant level depicted above is derived from the 2018 International Energy Conservation Code (IECC) using the prescriptive path option without(?) continuous insulation.

Who do you call?

No not these guys....

These guys!

“Your feedback and guidance are sought on how to improve the tool and what additional features are needed to make this tool useful for your everyday activities.”

-Oak Ridge National Laboratory

Contact:

Michael Lubliner, Senior Energy Advisor

Oak Ridge National Laboratory

Lublinermr@ornl.gov

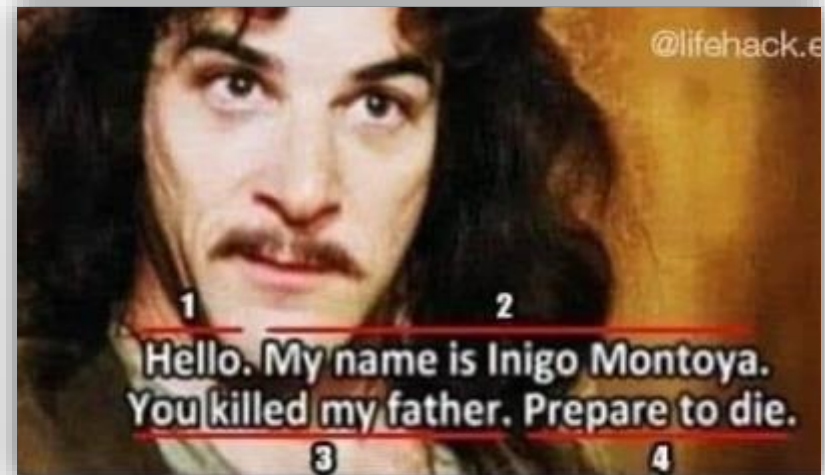
Cell 360-951-1569





How do we handle the hotline?

We follow this advice...



1. Polite greeting
2. Ask for name and contact number (speak slowly)
3. Answer the question...(hopefully)
4. Manage expectations!



WSEC-R 406.3 Option 3.5b

OPTION	DESCRIPTION	CREDIT(S)	
		All Other	Group R-2
3.5 ^a <u>Option 1</u>	Air-source, central heat pump with minimum HSPF of 11.0. To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and the minimum equipment efficiency.	1.5	N/A
3.5 ^b <u>Option 2</u>	<u>Air-source, inverter driven (variable speed) centrally ducted heat pump with minimum HSPF of 10.0 with at least one of the following:</u> <u>1. The system is listed on the ASHRAE Standard 90.1-2010 climate air source heat pump database.</u> <u>2. Compliance based on Section R402.1.4: Reduce the total conductive heat loss by 22%. This option shall not be used if any other envelope category has been selected to show compliance with Section R406.</u> <u>3. If Option 5.3 has been selected, upgrade the Tier III heat pump water heater to a Tier IV heat pump water heater that is a unitary (nonsplit) system.</u> <u>4. Use the appliance credit option 7.1, but the dryer is required to have a CEF of 3.93 or higher. This option is not available if it is already selected as one of the options to show compliance with Section R406.</u> <u>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and the minimum equipment efficiency.</u>	1.5	N/A
	Ductless split system heat pumps with no electric resistance heating in the primary living areas. A ductless heat pump system with a minimum HSPF of 10 shall be sized and installed to provide heat to entire dwelling unit at the design outdoor air temperature.	2.0	3.0

No double dipping!

Typo
Option 5.5

No double dipping!

No double dipping !



Radiant Floors

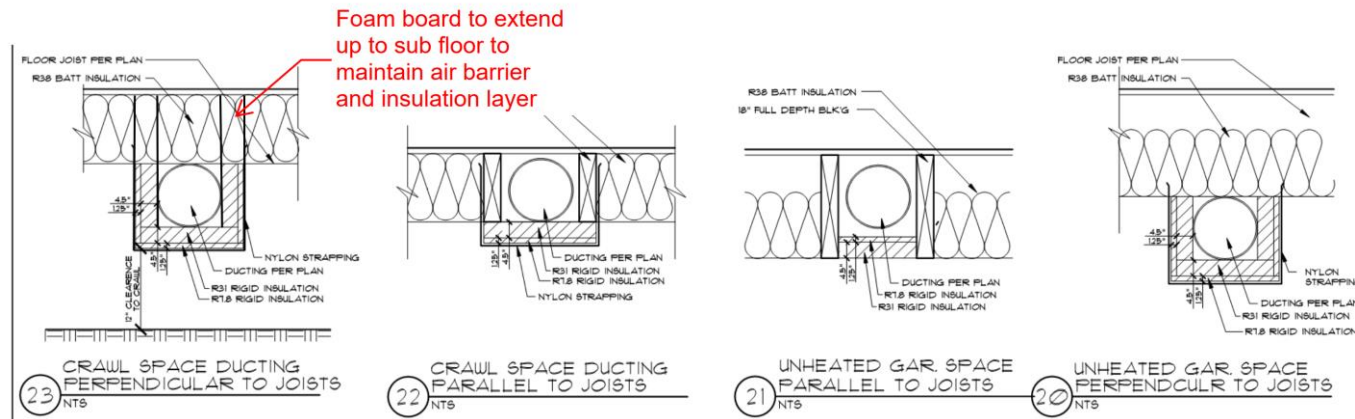
- Fuel type matters!
- Primary heat source 406.2
- Electric resistive heating = lots of credits needed = big \$





Ducts inside the crawlspace

- Below/in garage floor



- In the crawlspace ducts inside?
 - Conditioned crawlspace?
 - As per AHJ
- Can ducts go inside the exterior walls?
 - No.

Ventilation

Three ways to ventilate:

Exhaust Only

- Typically known as spot ventilation

Supply Only

- Usually integrated
- Some stand-alone systems
 - Can be combined with exhaust only to create a balanced system

Balanced Ventilation

- Typically done with HRV/ERV equipment
 - Also known as balanced ventilation with recovery
- A balanced and commissioned supply and exhaust fan
 - Typically known as balanced without recovery

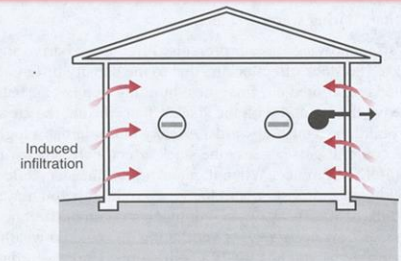


Figure 12.1
Exhaust Ventilation System

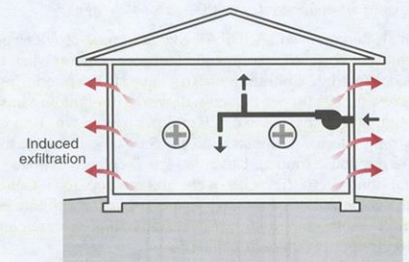


Figure 12.2
Supply Ventilation System

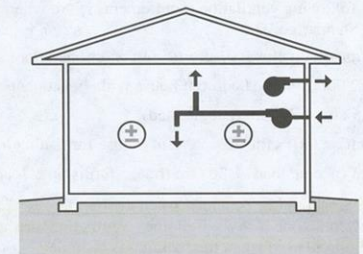


Figure 12.3
Balanced Ventilation System



Ok, so how do we do this?





Residential Ventilation Codes

IRC & IMC (Multi-family)

- Ventilation performance - Section M1505
- Opening locations - Section M1502.3
- Outside opening protection

Don't do stupid stuff...

- | | |
|----------------|----------------------|
| – Design | – Controls |
| – Balanced | – Distributed |
| – Rates | – Tested |
| – Intermittent | – Sone (M1505.4.1.1) |

- Section 401 Mechanical Ventilation
Really, big (7 sections).

(403.4 Group-R Whole House Mechanical Ventilation System



ASHRAE 62.2 and the Energy Code



But what does it all mean!?





There's a cheat sheet for that...

WHOLE-HOUSE MECHANICAL VENTILATION AIRFLOW RATE

DWELLING UNIT FLOOR AREA (square feet)	NUMBER OF BEDROOMS				
	0 - 1	2	3	4	5 or more
Airflow in cfm					
< 500	30	30	35	45	50
501 - 1,000	30	35	40	50	55
1,001 — 1,500	30	40	45	55	60
1,501 - 2,000	35	45	50	60	65
2,001 - 2,500	40	50	55	65	70
2,501 - 3,000	45	55	60	70	75
3,001 - 3,500	50	60	65	75	80
3,501 — 4,000	55	65	70	80	85
4,001 — 4,500	60	70	75	85	90
4,501 — 5,000	65	75	80	90	95

For SI: 1 square foot = 0.0929 m², 1 cubic foot per minute = 0.0004719 m³/s.

TABLE M1505.4.3(2)

SYSTEM COEFFICIENT C_{system}

SYSTEM TYPE	DISTRIBUTED	NOT DISTRIBUTED
Balanced	1.0	1.25
Not balanced	1.25	1.5

TABLE M1505.4.3(3)

INTERMITTENT OFF WHOLE-HOUSE MECHANICAL VENTILATION RATE FACTORS^{a,b}

RUN-TIME % IN EACH 4-HOUR SEGMENT	50%	66%	75%	100%
Factor ^a	2	1.5	1.3	1.0

There's an app for that as well

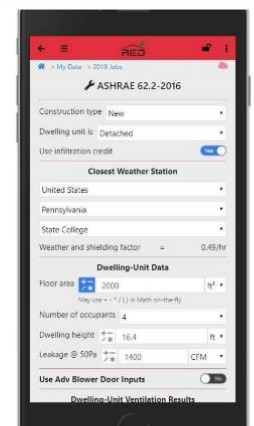
Tool categories

Ventilation Sizing
Airflow Measurement
Insulation and R-Value
Moisture
Domestic Hot Water
Electrical Usage
Weather Data

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Process and Timelines

2021/2022 Code Review and Adoption Schedule

Revised 1/24/22	Group 1 IBC, IFC, WSEC-Commercial, WUI	Group 2 IBC/IEBC, IRC, WSEC-Residential, UPC, IMC, WUI
January 2021	2021 model codes available	
February and March 2021	TAGs review 2021 significant changes to model codes & existing state amendments. TAG reports show recommendations to maintain or delete existing state amendments and flag changes to model codes needing further review.	
March 19, 2021 Council meeting	Council approves TAG reports and establishes a submission period for new statewide amendments.	
April 1- June 1	Submission period for proposed state amendments	
May 21; June 17 Council meetings	Council can accept proposals and refer them to the appropriate TAG, deny proposals, or take other actions.	
May through August 2021	TAGs review proposals and make recommendations to Council.	
September 17 Council meeting	Council accepts TAG and standing committee recommendations, overturn recommendations, or refer proposals back to TAG.	
October 2021	Preparing CR-102 with code proposals and APA documents.	
November 2021	Preparing CR-102 with code proposals and APA documents.	
December 2021	Preparing CR-102 with code proposals and APA documents.	
January 2022	File CR102 by 01/05/2022 (Council meeting on January 21)	TAGs review 2021 significant changes to model codes & existing state amendments and prepare reports.
February 2022	Public hearing/ written testimony for Group 1 (February 11 & February 25)	Council approves TAG reports and establishes a submission period for new statewide amendments. (Council meeting; February 18)
January 19 – March 11, 2022	Public comment period for Group 1	
March 2022	Public hearing/ written testimony for Group 1 (March 11) Council work session/action taken on Group 1 code proposals (Council meeting, March 18)	
February 21 – April 8, 2022		Submission period for proposed state amendments for Group 2
April 2022	Council action on Group 1 codes (Council meeting, April 22)	Council accepts proposals and refers them to the appropriate TAG. (Council meeting, April 22)
May 2022		TAGs review proposed state amendments and make recommendations to Council. Council accepts TAG/standing committee recommendations, overturn recommendations, or refer proposals back to TAG. (Council meeting, June 17)
June 2022		Preparing CR-102 with code proposals and APA documents
July 2022		File CR102
August 2022		Public Hearings/ written testimony on Group 2 codes
September 2022		Public Hearings/ written testimony on Group 2 codes
October 2022		Council work session on Group 2 (Council meeting, Oct. 21)
November 2022		Final Council action, adoption of Group 1 and Group 2 codes. (Council meeting Nov. 18) All actions must be taken by Dec. 1

Here now



Thank you

Jonathan P. Jones
Programs Coordinator
WSU Energy Program
1-360-956-2042
energycode@energy.wsu.edu