Health and Safety Update

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Health & Safety Comment Summary

- **Increased paperwork**
  - Client notification requirements in client education require much additional paperwork.
  - Wanting to remove client signature requirements from certain hazard notification forms (similar to deferral language above).
  - Wanting to reduce written notifications of hazards requirements to specific circumstances
- **Radon**
  - Concerns over informed consent requirement
  - Clarification requested of where precautionary measures and informed consent are necessary
  - Clarification of “mitigation” requested
  - Concerns over increased H&S costs in high radon areas
  - Concerns over State restrictions/requirements around providing radon services (CA)
  - Request removal of listed precautionary measures and vapor barrier installation standards, they should be in field guides

Health & Safety Comment Summary cont…

- **Latitude in H&S vs. IRM**
  - Requesting latitude in definition of H&S vs. IRM - Both support of and opposition to defining EMC and H/S; frequent requests for latitude in definitions
- **Deferral/Referral**
  - Confusion about deferral/referral requirements, especially when other resources are scarce
  - Concerns over deferral notification requirements
  - Questions about waiting list re-instatement
- **ASHRAE compliance**
  - Increased flexibility requested, e.g., not always suitable for housing stock
  - Objections to client refusal of fans equaling deferral
  - Objection to adoption of 62.2-2016, wish to stay with 2013 version

Health & Safety Comment Summary cont…

- **Asbestos**
  - Testing issues: Ask for allowance to conduct environmental asbestos testing; Questioning availability of personal monitors that detect asbestos; indicating all known test methods are inadequate for vermiculite
  - Friable asbestos – Definition (some recommend DOE develop definition, or point to existing definition)
  - Training requirements clarification
  - Concerns over ability to identify ACM without a license
- **Combustion and Cooling Appliance Issues (includes safety devices)**
  - CAZ testing, fireplace, CO -- Do not like requirement/language, request clarification for fireplace testing procedures, request additional language describing what to look for when inspecting solid fuel burning equipment, want more detail on CO device requirements
  - Object to requiring removal of unsafe secondary units, want to allow “abandonment”

Health & Safety Comment Summary cont…

- **At-risk – Cooling**
  - Concerns about defining 'at risk' for cooling measures, want it to be based solely on CDD, similar to heating replacement requirement
- **In-progress Inspections**
  - Concern over requirements for in-progress inspections to evaluate worker practices, i.e., safe work practices, lead safe work, OSHA requirements. Adds to expenses in rural areas, WAP monitors may not be qualified to evaluate OSHA compliance, etc.
- **Code Compliance**
  - Opposition to code compliance beyond scope of Wx
  - Concern over liability/ability of workers to cite specific codes triggering code compliance work
  - Concern over code officials requiring WAP to correct non-WAP-related issues
  - Concerns that guidance allows insulation over live K&T
  - Concerns over need to hire licensed electricians OR have unqualified staff provide client information about electrical hazards

Health & Safety Comment Summary cont…

- **Lead Safe Weatherization requirement going away – Just need to follow RRP**

Estimator - First Opportunity

- Initial walk through – document problems
  - Air Monitoring
- Initial Blower Door test
  - Baseline – get it right or nothing else will be
  - Other tests with BD going – pressure pans, zone pressures, infrared camera
  - Furnace and water heater testing
  - Oven
  - Worst Case
  - ASHRAE 62.2

Estimator – Considerations when doing the work order

- How will measures affect test results?
- Estimate the final blower door reading for ASHRAE 62.2
- Are there going to be Worst Case issues when done?
- Do we need contractors to finish their work before the crew starts?

Crew – Start of the job

- Initial walk through – check work order and familiarize yourself with what will be done
  - Air monitoring
  - At same time others can be doing initial blower door test
  - Foreman decide if any other testing should be done at the start (pressure pans, zone pressures, etc.)
  - Don't spend a lot of time at the beginning on testing

Crew – end of the day

- Worst case test – if any work is done that changes conditions or if estimator saw problems
  - Document this on Worst Case sheet – just state it was checked and sign or initial
  - If a problem is detected do something to provide relief
  - May want to check CO in flues
  - At minimum provide a CO alarm

Crew – end of the job

- Check fan flows of installed ventilation – make sure they meet the required CFM
- Pressure pans – do they meet the standard?
  - Do we need to do a Leakage to Outside (Duct Blaster)?
- Room to Room – do they meet the standard?
- Blower door – final check for large air leakage
- Zone pressure diagnostics

Crew – end of the job

- Cost Effective Guidelines – only after no major leakage is found
  - Do not use long periods of time for this – 15 to 20 minutes should be plenty
- Record final blower door number
- Do Worst Case test – if it passes you are done. If not, do what is required to fix and test again.
- When everything is done, go through all the paperwork on the tests and check for accuracy.

Final Inspection

- Begin with file review – check all diagnostic numbers to see that they meet standards
  - Look for anomalies – numbers that don't look right, large differences from one test to another, tests that got worse
- Check to see any problems in testing were resolved – furnace cleaned, make up air added, correct ventilation added

Final Inspection

- For DOE grants the QCI can decide if the testing documentation is good – remember that it is on the inspector and the agency if the State or DOE comes in and finds inaccurate testing
- The State will test where deemed necessary

Testing Equipment

- Always keep calibration and other maintenance up to date
  - You can check fans and manometers against each other at your agency. Same with furnace testing equipment and air monitoring devices.
- Check hoses and fittings before starting
  - Cracked or worn ends on hoses can make a huge difference

Testing

Air Monitoring – BPI 1200

- **Section 7.3.3 Carbon Monoxide**
  - 7.3.3.2.1 Upon entering the building, the ambient air shall be sampled to determine the level of CO in the building by conducting measurements in the occupied space, including utility rooms.
  - 7.3.3.2.2 The auditor shall continue to monitor CO levels in the ambient air at all times while in the work environment.

Testing

Air Monitoring – BPI 1200

- **Section 7.3.3 Carbon Monoxide**
  - **7.3.3.3.1 If the CO instrument indicates an ambient CO level of 70 ppm or greater, the auditor shall immediately terminate the inspection and notify the homeowner/occupant of the need for all building occupants to evacuate the building. The auditor shall immediately leave the building and the appropriate emergency services shall be notified from outside the home.**

Testing

Air Monitoring – BPI 1200

- **Section 7.3.3 Carbon Monoxide**
  - **7.3.3.3.2 If the CO instrument indicates an ambient CO reading in the range of 36 ppm-69 ppm, the auditor shall advise the homeowner/occupant that elevated levels of ambient CO have been detected. Windows and doors shall be opened. The auditor shall recommend that all possible sources of CO be turned off immediately. Where it appears that the source of CO is a permanently installed appliance, the auditor shall recommend that the appliance be turned off and the homeowner/occupant shall be advised to contact a qualified professional.**

Testing

Air Monitoring – BPI 1200

- **Section 7.3.3 Carbon Monoxide**
  - **7.3.3.3.3 If the CO instrument indicates an ambient CO reading in the range of 9 ppm- 35 ppm, the auditor shall advise the homeowner/occupant that CO has been detected and recommend that all possible sources of CO be checked and windows and doors opened. Where it appears that the source of CO is a permanently installed appliance, the homeowner/occupant shall be advised to contact a qualified professional.**

Testing

Manometers

- Calibration
- Make sure to turn the unit on before attaching hoses
- Make sure settings are correct for the test you are doing

Testing

Pressure Pan Readings

- Visually inspect and fix before starting – a pre test may give an idea where to look for big leaks
- Be consistent – try to use the same amount of pressure (maybe use a weight)
- Standards on back of diagnostic sheet

Testing

Pressure Pan Readings

Mobile Homes

1. If belly return, convert it to a living space return system.
2. Inspect the duct work visually and then seal all penetrations in the duct trunk line, boots, the ends of the duct runs and furnace plenum if accessible from the interior.
3. When the above duct sealing work is completed conduct a pressure pan test on all duct registers.

Testing

Pressure Pan Readings

Mobile Homes

4. If the sum of the pressure pan readings is an average of 1 or less and all penetrations in the duct trunk line (boots, end of trunk line, visible penetrations) are sealed, the task may be considered acceptable. If pressure pan readings of 1pa on average is unachievable, there must be good documentation on why

duct work is being left as is.

Testing
Pressure Pan Readings

Mobile Homes

5) The duct blaster may also be used to test the duct work. If this procedure is used, the task may be considered complete if the cfm leakage to the outside (measured at 25 pa) is less than 10% of the total floor space. (Example; if a mobile home is 14X66, the area is 924 sq. ft. The duct blaster reading must be less than 10%of the floor area of 924, or 92.4 cfm). If the duct blaster reading is above 10%, good documentation must be provided as to why duct work was left as is.

Testing

Mobile Home

- The ideal leakage is 0 pa and 0 cfm leakage to the outside. The above is only the acceptable limits. We should strive to reduce all leakage as much if possible.
- Don't forget this tool – it may save you a lot of work

Testing

Zone Pressure Diagnostics

1. Should be used as a tool to determine how much air leakage in unconditioned spaces
2. Add a hole should be done if possible.

Testing

Zone Pressure Diagnostics

- One thing most of us have probably not been doing – must take a baseline reading to the zone before starting the blower door
  - Same method as baseline setup for blower door readings
- Remember that this test does not give an accurate reading of how much leakage there is. It only gives an indication that something is going on that may require further investigation and/or testing (add-a-hole, infrared, etc).
- Be careful of airflow across the hose end in the attic

Testing

Zone Pressure Diagnostics

- Add-a-Hole test – will tell how much leakage in sq. inches
  - Do if high blower door
  - You want to drop the difference by at least 15 pascals – example: if you started at 37 open the hole until you reach 22 or less
  - Don't go much below 15 difference – you will lose accuracy

Testing

Infrared Camera

- Always best used with blower door running
- Identify air leakage and insulation voids
  - Verify work quality
  - Can be used for documentation
  - If possible get in the zone and pressurize

Testing

Room to Room Pressure Test

- Check room pressure with air handler running
  - Room WRT main body of the house
  - Not the way BPI does the test
- Must be less than 3 pascals difference
- If more, relieve pressure
  - Undercut doors, transfer grills, add returns
- If client absolutely will not allow, document client ed was at least done

Testing

Cost Effective Guidelines

- Must be done on every home
  - No MVR or BTL
- Do all main air sealing work before starting
  - Check zone pressures before starting CEG
- Make sure your Admin has updated labor rates in WxPro – needs to be done anytime wage rates change
- Use short time periods - 15 to 20 minutes should be plenty

Testing
Cost Effective Guidelines

BLOWER DOOR TEST DATA & BLOWER DOOR GUIDED AIR SEALING (WCEG)					
Test Conditions:	Baseline Pressure:	Pa	Door Opening Used:		
Test	**CFM_{50}**		**CEG/100 CFM_{50} = $**		
Initial Test		No. in Crew	Minutes	CFM_{50} Reduction	Cost per 100 CFM_{50}
Test 1					
Test 2					
Test 3					
Test 4					
Test 5					
Final Test			Minimum Ventilation Rate =		

Testing

Worst Case Spillage Test

- Changed to follow BPI 1200 Section 7.9
  - Aligns several different standards
  - Will be incorporated into the SWS nationwide
  - We already have been given a variance to begin following the standard
- No longer requires draft test or depressurization limits
- Based on years of research on spillage failures

Testing

Worst Case Spillage Test

Test Steps (refer to Field Standards for details)	Test 1	Test 2
1. Ambient CO must be monitored at all times during testing. (See table on bottom.)		
2. Deactivate all combustion appliances and exhaust fans.		
3. Inspect combustion appliances and venting before test setup.		
4. Put dwelling in wintertime condition; close all exterior doors and windows.		
5. Clean/replace furnace and dryer filters.		
6 Open all interior doors with return air or exhaust fan(s) and/or dryer on other side.		
7. Close all other interior doors.		
8. Setup and adjust manometer to measure pressure of CAZ WRT outdoors.		
9. Record **Baseline Pressure** of CAZ WRT outdoors or run Baseline function on DG-700.	Pa	Pa
10. Turn on all exhaust fans, and dryer. (Do not turn on whole house cooling fan.)	Pa	Pa
11. If furnace exists, check to see if greater depressurization exists with or without the air handler on. **(If the air handler fan cannot be activated without firing furnace activate furnace and air handler and proceed).**	Pa	Pa
12. Open and close CAZ door to verify where greater depressurization exists.	Pa	Pa
13. Record the position of the door to the CAZ. (circle door position)	Open/ Closed/ No Change	Open/ Closed/ No Change
14. From the above steps, enter the most negative number of the CAZ WRT outdoors.	Pa	Pa

Testing

Worst Case Spillage Test

FLUE SPILLAGE		
1. Under worst-case conditions, fire appliances individually. Begin with the smallest BTU appliance; Record spillage at 2 minutes. If vent is cold record spillage at 5 minutes. (SEE NOTES BELOW)	Spillage	Spillage
Water Heater	Yes / No	Yes / No
Furnace/Boiler	Yes / No	Yes / No
Other Appliance description:	Yes / No	Yes / No
2. If appliance fails/spills, correct problem. (i.e. makeup air, seal open returns, etc.)		
3. If dwelling has other combustion appliance zones, repeat test there.		
4. Return dwelling, exhaust fans, and combustion appliances to normal settings.		
5. Record highest ambient CO levels during spillage testing.	ppm	ppm

Ambient CO Limits	
9 - 35 ppm	Look for sources of CO, advise resident, and continue testing.
36 – 69 ppm	Shut off all combustion appliances, ventilate, and advise resident.

Notes: Under worst-case conditions, fire appliances individually. Always begin the smallest BTU appliance. Spillage must not exist after 2 minutes in a warm vent (i.e. water heaters, furnaces in heating mode). Spillage must not exist after 5 minutes for furnaces with cold vent (not during heating season).

Testing

Worst Case Spillage Test

- Remember to do end of the day tests
  - Anytime work is done that might affect the CAZ
- As before, this is the last thing done before leaving the job!
- Consider getting the new wireless gauge – saves time checking door closures and other steps when doing worst case.

Testing

Furnace and Water Heater Testing

Job #	Name	Phone	
Address	City	State	Zip
Fuel Type	Heating System Type	Owner/Renter	
Input	Output	Date	

- This should all be filled out
- Also include Heating System and Water Heater type in comments in WxPro
  - Pictures will help

Testing

Furnace and Water Heater Testing

	Pre-test	Post-test		Pre-test	Post-test
Gas leaks	☐Yes ☐No	☐Yes ☐No	Open air returns	☐Yes ☐No	☐Yes ☐No
Venting problems	☐Yes ☐No	☐Yes ☐No	Missing main shutoff	☐Yes ☐No	☐Yes ☐No
Carbon indicators	☐Yes ☐No	☐Yes ☐No	Asbestos	☐Yes ☐No	☐Yes ☐No
			Heat exchanger check	☐Yes ☐No	☐Yes ☐No
Anticipator:	Measured:		Set at:	Reset:	
Cycling on high limit	☐Yes ☐No	☐Yes ☐No	Oil system smoke test		
Fan on (15 sec)/off temp	_____/_____	_____/_____	Draft, breech		
Spillage/backdraft	☐Yes ☐No	☐Yes ☐No	Draft, overfire		
Steady State Heatrise	Pre _____ - _____ = _____		Steady State Heatrise	Post _____ - _____ = _____	
Carbon monoxide	Pre _____ ppm	Post _____ ppm	High limit temp		
Check filter	☐Yes ☐No	☐Yes ☐No	Clean heat exchanger	☐Yes ☐No	☐Yes ☐No
Cleaned blower	☐Yes ☐No	☐Yes ☐No	Check belt	☐Yes ☐No	☐Yes ☐No
Blower amp. draw	☐Yes ☐No ____	☐Yes ☐No ____	A-coil dirty	☐Yes ☐No	☐Yes ☐No
Net stack temp			O2% or CO2%		
Efficiency %			Run final furnace cycle		☐Yes ☐No
Duct problems					

Testing

Furnace and Water Heater Testing

- We realize that readings taken on sealed combustion system from outside are not very accurate as far as efficiency and stack temp
  - Can still indicate problems

Testing

Furnace and Water Heater Testing

Acceptable Combustion Test Analysis Values			
Heating Unit Type	**Oxygen (O2)**	**Net Stack Temp**	**Smoke Test**
Gas	4-9 percent		
Atmospheric	4-9 percent	300-600 °F	NA
Fan-assisted	See man. Info.	300-480 °F	NA
Condensing	4-9 percent	See man. Info.	NA
Standard Power Burner		300-650 °F	NA
Oil (No. 1 & 2)			
Oil gun burner	4-9 percent	325-600 °F	1 or less
Flame Retention burner	4-7 percent	325-600 °F	1 or less

Testing

Furnace and Water Heater Testing

Acceptable Draft Test Ranges	
Outside Temperature (degree F)	Minimum Draft Pressure (Pa)
<10	-2.5
10-90	(Outside Temperature ÷ 40) – 2.75
>90	-0.5

Testing

Furnace and Water Heater Testing

— CO Thresholds for Fossil-Fuel Fired Combustion Appliances —

Appliance	Threshold Limit
Central Furnace (all categories)	400 ppm air free
Boiler	400 ppm air free
Floor Furnace	400 ppm air free
Gravity Furnace	400 ppm air free
Wall Furnace (BIV)	200 ppm air free
Wall Furnace (Direct Vent)	400 ppm air free
Vented Room Heater	200 ppm air free
Water Heater	200 ppm air free
Oven/Broiler	225 ppm as measured
Clothes Dryer	400 ppm air free
Refrigerator	25 ppm as measured
Gas Log (gas fireplace)	25 ppm as measured in vent
Gas Log (installed in wood burning fireplace)	400 ppm air free in firebox

Testing

Furnace and Water Heater Testing

H2O heater CO	ppm	ppm	H20 heater Draft		
Oven CO	ppm	ppm	Ambient CO	ppm	ppm

☐ At the time of this inspection, this heating system was operating properly.

Testing

Oven (Bake Burner)Testing

- BPI 1200 Section 7.9.7
- Visual Inspection and check for gas leaks
- Turn oven on to 500 degrees. After 5 minutes check CO in throat of oven.
- Action level 225 as measured.
  - We will not repair or replace at this time
  - Notify client and give CO alarm for kitchen
  - Make sure you are air monitoring while doing this test – watch ambient CO levels

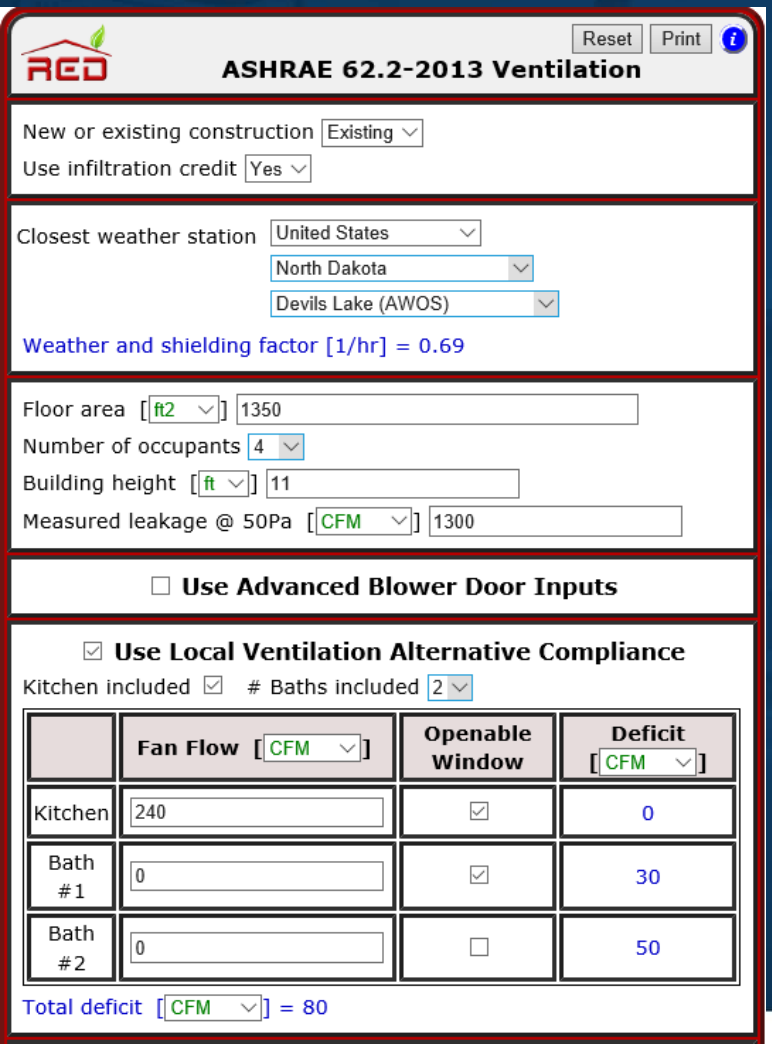
Testing

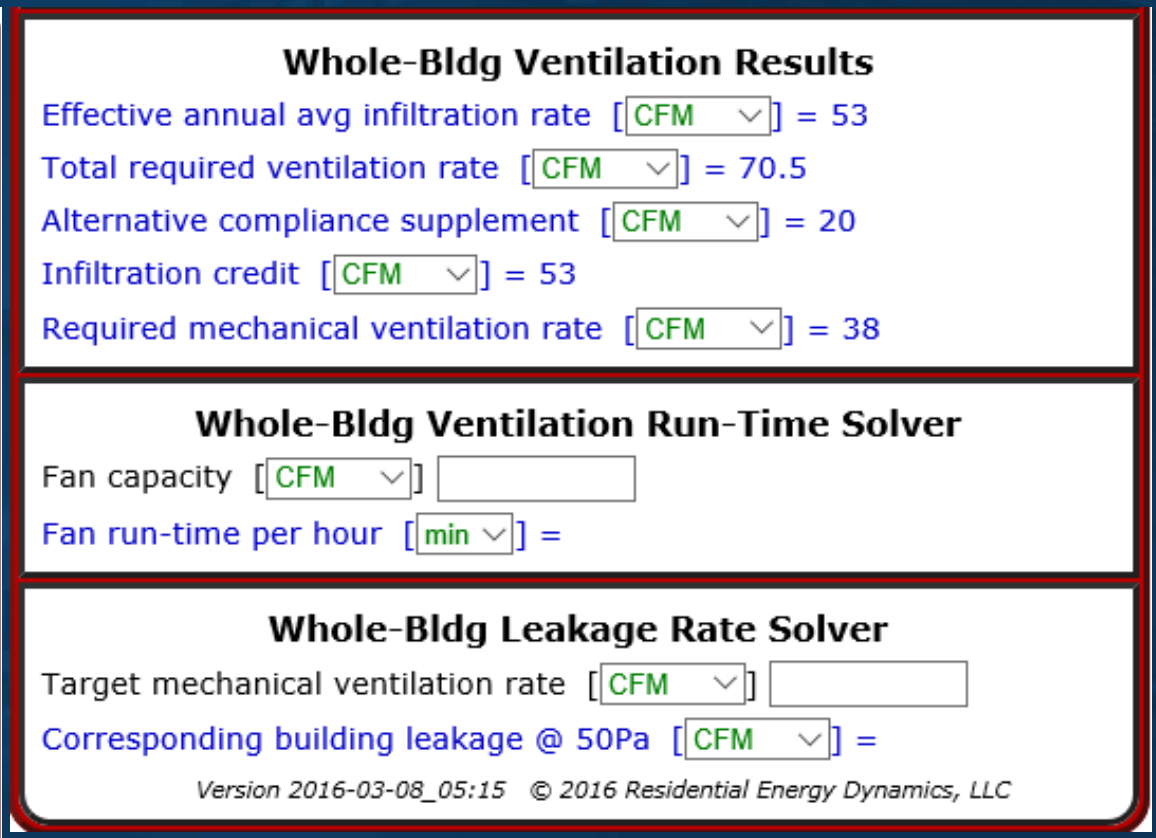
ASHRAE 62.2

- Information needed
  - Living space square footage
  - Number of bedrooms plus one or occupants – whichever is higher
  - Fan flows – kitchen and bathroom exhaust
  - Estimated blower door reading after weatherization – best guess
- Run RED to get Required Mechanical Ventilation

Testing

ASHRAE 62.2

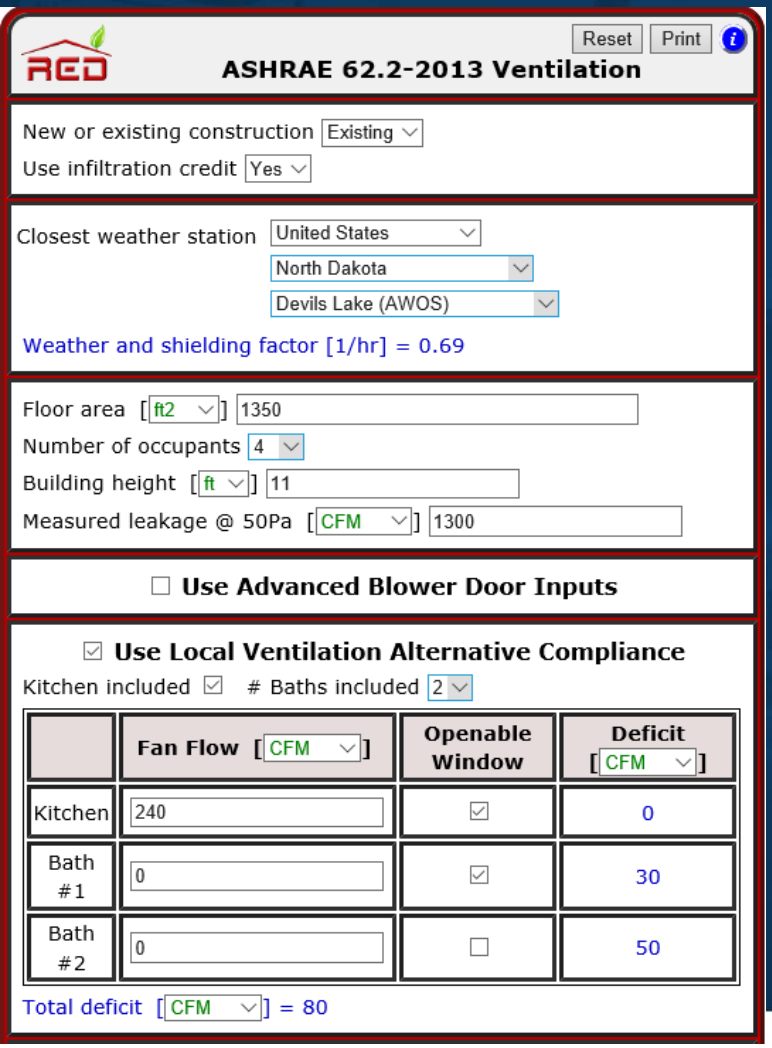


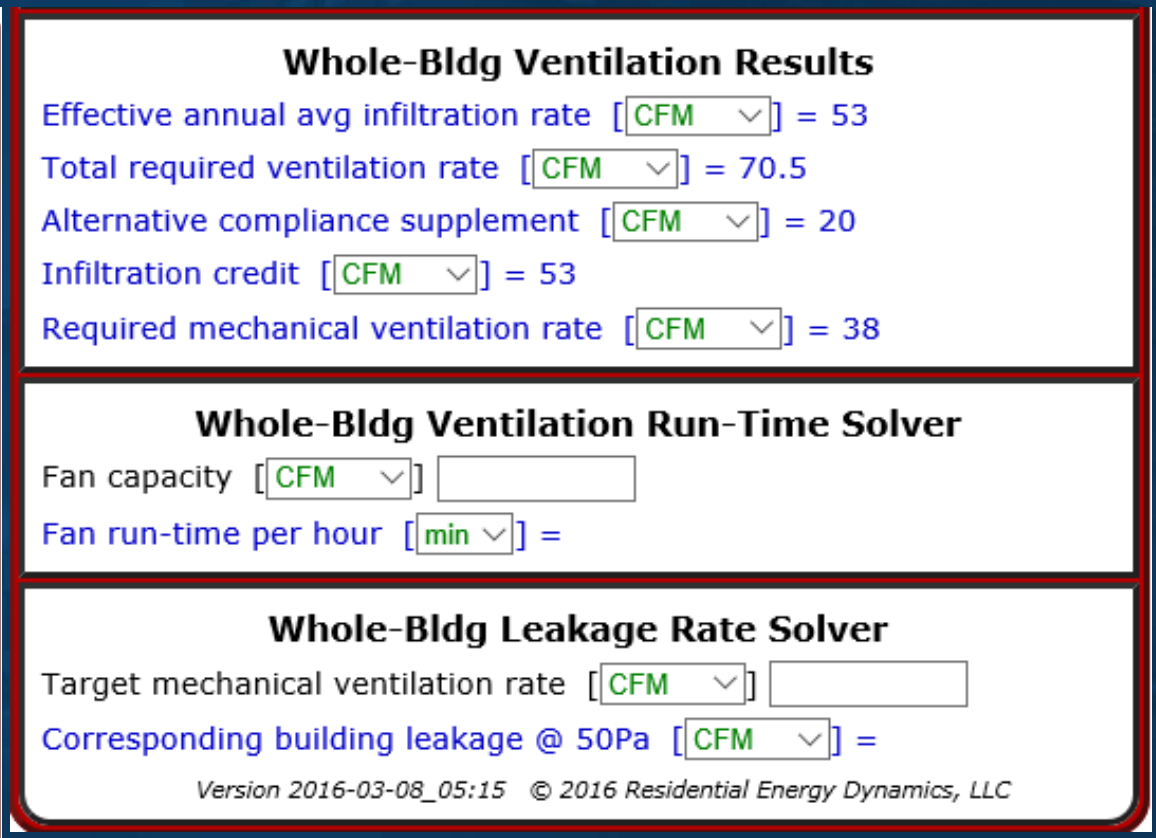


North Dakota LEGENDARY

Testing

ASHRAE 62.2



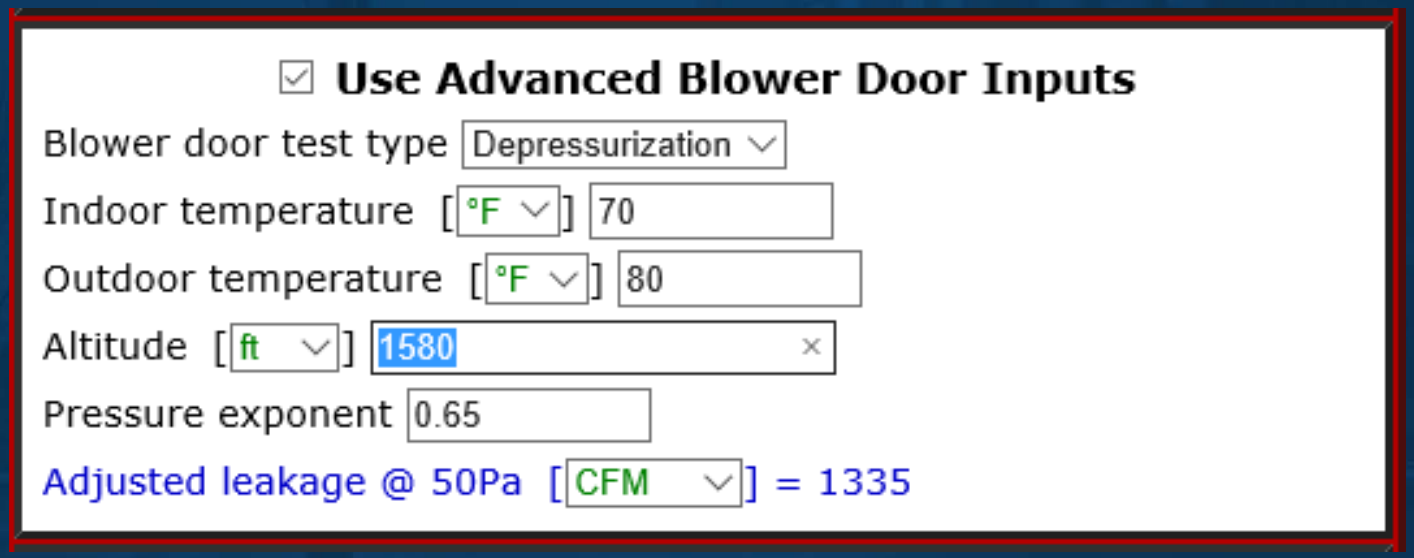


North Dakota LEGENDARY

Testing

ASHRAE 62.2

- May want to use Advanced Blower Door Inputs



Required mechanical ventilation rate [CFM] = 36

North Dakota LEGENDARY

Testing

ASHRAE 62.2

- Try to concentrate on sizing fans above the RMV as close as possible
- Stick with the fans that don't have all the fancy controls – KEEP IT SIMPLE STUPID!
  - Try not to use timers or slower fan speeds
  - Fans get dirty faster at slow speeds

Testing

ASHRAE 62.2

- Remember if RMV is 15 or less – no additional ventilation required
- You can use existing fans to meet the RMV – remember to label the switch
- Even if the ASHRAE calculation shows no additional ventilation is needed, if you see a problem you should still add ventilation!

Testing

ASHRAE 62.2

- Placement of fans
  - Often the bathroom fans are not the best option
  - Lower levels (basements, crawlspaces) may be better. Usually easier to install and vent out. A cord can be wired to the fan and plugged into an outlet. Remember to label the cord.
  - The lower level must communicate with the rest of the house
  - Always keep the CAZ in mind

Testing

ASHRAE 62.2

- Testing flow with the DG-700
  - Turn on and set to PR/FL
  - Set Device to EXH
  - Adjust the CONFIG button

Door Position	CONFIG Icon on DG-700
E1	A1
E2	B2
E3	C3

Testing

ASHRAE 62.2

- Testing flow with the DG-700
  - Connect the hose to the channel B input (top) tap and the other end to the flow hood
  - Read the flow on channel B
  - You can also measure the pascals and use the chart on the flow hood

Testing

ASHRAE 62.2

- **Testing flow with the DG-700**
  - When using the Exhaust Fan Flow Meter, the measured Metering Box pressure should never be greater than 8.0 Pascals, and never lower than 1.0 Pascals.
  - Largest fan you can measure is 124 cfm

Health and Safety Measures

- www.ndwap.com – ND Weatherization State Plan
  - 2017 Health and Safety Policy
  - ECM GHW H&S IRM Lists 2017
- Health and Safety Measures table 2017

Health and Safety Measures

Health and Safety Measures table 2017

Health and Safety Measures			
Allowed Measure	Average Cost	Frequency	Total
Ventilation	$280	83%	$232
LSW and RRP	$131	24%	$31
Knob and Tube cleanup	$2,137	12%	$256
Other Electrical Repair	$266	5%	$13
Testing (Blower Door, WCDT, etc)	$150	90%	$135
Plumbing repair	$227	15%	$34
Furnace Replacement	$2,650	4%	$106
Water Heater Replacement	$1,500	2%	$30
Duct work repair	$250	2%	$5
Furnace or Water Heater Repair	$157	5%	$8
CO meters	$65	96%	$62
Dryer Vents	$25	35%	$9
Smoke Alarms	$36	36%	$13
Total			$936

Expenditure Limits and Reporting - Health and Safety Measures

- The State's Health and Safety costs will not exceed 8.8 percent of the total annual Federal formula allocation.
- Average cost per home - $7,212
  - We have to average less that $936 per home H&S

Health and Safety Measures

Asbestos

Asbestos - in siding, walls, ceilings, etc	Removal of siding is allowed to perform energy conservation measures. All precautions must be taken not to damage siding. Asbestos siding should never be cut or drilled. Recommended, where possible, to insulate through home interior.	Inspect exterior wall surface and subsurface for asbestos siding prior to drilling or cutting.	Inform the client that suspected asbestos siding is present and how precautions will be taken.	Safe practices for siding removal and replacement. How to identify asbestos containing materials.
Asbestos - in vermiculite	When vermiculite is present, unless testing determines otherwise, take precautionary measures as if it contains asbestos. Blower door testing is allowed if determination has been made that no danger exists from depressurization. Encapsulation by an appropriately trained asbestos control professional is allowed. Removal is not allowed.	Assess whether vermiculite is present. Asbestos Hazard Emergency Response Act of 1986 (AHERA) certified prescriptive sampling is allowed by a certified tester.	Clients should be instructed not to disturb suspected asbestos containing material. Provide asbestos safety information to the client. Formally notify client if test results are positive for asbestos and signed by the client.	Audit training on how to recognize vermiculite.
Asbestos - on pipes, furnaces, other small covered surfaces	Assume asbestos is present in covering materials. Encapsulation is allowed by an AHERA asbestos control professional and should be conducted prior to blower door testing. Removal may be allowed by an AHERA asbestos control professional on a case by case basis with approval by the state. Approval would take into consideration how much energy savings could be achieved by not deferring the house and where the agency H&S average stands.	AHERA testing is allowed by a certified tester.	Clients should be instructed not to disturb suspected asbestos containing material. Provide asbestos safety information to the client.	How to identify asbestos containing materials.

Health and Safety Measures
Knob and Tube Wiring

- **Always under H&S**
- **Direct restitution – while it lasts**

Electrical, Knob-and- Tube Wiring	Minor upgrades and repairs necessary for weatherization measures and where the health or safety of the occupant is at risk are allowed.	Inspect for presence and condition of knob-and-tube wiring. Check for alterations that may create an electrical hazard. Voltage drop and voltage detection testing are allowed.	Provide information to client on over-current protection, overloading circuits, basic electrical safety/risks.	How to identify electrical hazards. Local code compliance.

Health and Safety Training

- **OSHA 10 (Required)**
- **Lead RRP (Recommended)**
- **Confined Space (Recommended)**

Questions?

More Discussion?