VERMONT'S WEATHERIZATION PROGRAM

Technical Policies & Procedures Manual

(2020 Edition)

VERMONT

DEPARTMENT FOR CHILDREN & FAMILIES

OFFICE OF ECONOMIC OPPORTUNITY

TABLE OF CONTENTS

Acknowledgments

This manual was developed to provide greater clarity in program expectations to WAP providers and clients and to better ensure parity of services throughout the state of Vermont. This content represents a collective body of knowledge cultivated by hundreds of dedicated weatherization professionals spanning forty plus years. Many thanks are due to all who have worked for, and on behalf of, the Vermont WAP over the years.

Special Thanks

It would be difficult to convey adequate thanks to the past and present members of Vermont WAP's Technical Excellence Committee for all of the invaluable contributions—the content knowledge, mental effort and time—that they have invested into the original 2012 production and ongoing maintenance of this manual. Thank you!

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Weatherization Works

Introduction: A Guide to Using this Procedures Manual

A Note About Intent

Well trained and skilled people are and will continue to be the foundation of the Weatherization program's success. Thorough evaluation and diagnostic testing is critical to every job. Deciding what actionable steps to take in any given case with thoughtful consideration of all available information is essential.

The intent of this manual is to outline clarity in expectations in hopes that a clearly painted picture of ends-goals inspires creative solutions and innovations from the field that enable those goals to be met the majority of the time.

The intent of the policies and procedures outlined within this manual is not to disempower field staff, stunt creative problem solving or lock the program into a robotic approach to all WAP work.

In cases where the end-goals as defined in this procedure manual do not make good sense for an individual client or project, we challenge and encourage WAP network staff to identify a better way. Please outline an individualized scope of work and submit the plan for review to the OEO. A workplan that is well grounded in building science principles, suits a client's needs and presents an impactful investment will be viewed favorably.

Continuous programmatic improvement and maximized impact of our work is a vision that can come to fruition if we all work toward it together. If you are working through a challenging project and think you've identified a better way to solve the puzzle, please pursue it. We at the OEO will gladly work with you to ensure your innovations are crafted in a manner that is able to meet program obligations. Thanks to everyone in the weatherization network for the thoughtful decisions and heavy lifting being performed daily.

Introduction: A Guide to Using this Policies & Procedures Manual

Manual Overview

The main body of this manual contains 10 sections. Each section establishes minimum standards that must be met in order for a collection of prospective improvement measures to be classified as a weatherization project; more importantly, as an allowable, comprehensive, cost-effective, long-lasting and safe weatherization project.

The 10 primary sections are…

Section 1: Top of Building
Section 2: Bottom of Building
Section 3: Sides of Building
Section 4: Non-Energy Saving Measures
Section 5: General Energy Waste Reduction Measures
Section 6: Airsealing
Section 7: Mechanical Ventilation
Section 8: Mobile Home Policies & Procedures
Section 9: Mobile Home Priority List
Section 10: Quality Control Inspections

Sections 1, 2 & 3

Details the core "energy-saving-framework" for comprehensive weatherization projects by outlining program expectations related to the Top, Bottom & Sides of buildings.

Section 4

Establishes parameters for WAP project components that yield little-to-no energy savings on their own but that are often needed to ensure that comprehensive, cost-effective, long-lasting, and safe WAP projects are accomplished. Amongst other content areas, this section covers Health, Safety & Indoor Air Quality related policies.

Section 5

Outlines program policies for some basic low-cost measures that can save a little bit of energy when installed but that do not require a formal cost-benefit analysis on every single project. Some of the improvement measures installed during traditional Weatherization Assistance Program projects that are included in this measure category are funded by Efficiency Vermont—materials such as efficient light bulbs and low-flow showerheads.

Section 6

Outlines program policies related to building airsealing *(for site-built homes only)*.

Section 7

Outlines program policies related to mechanical ventilation, including Vermont WAP's application of the ASHRAE 62.2-2016 Standards.

Section 8

Outlines program policies that are specific to mobile homes and explains how to apply the information contained throughout the rest of the policy manual to mobile home projects.

Section 9

Vermont WAP's—Department of Energy approved—Mobile Home Priority List.

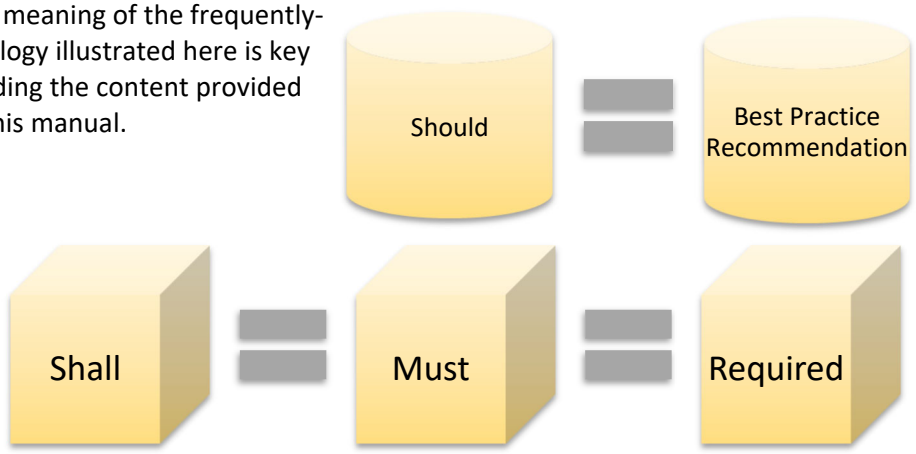
Section 10

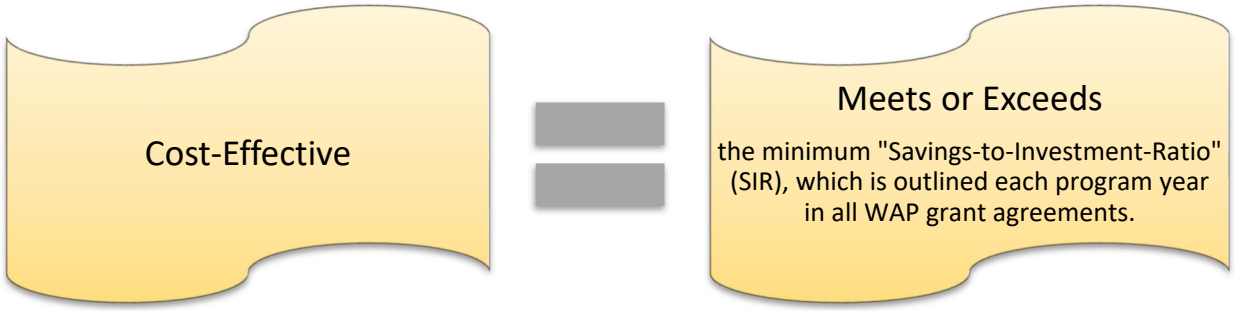
Outlines program policies related to Quality Control Inspections on WAP projects.

Introduction: A Guide to Using this Procedures Manual

Key Terminology

The intended meaning of the frequently-used-terminology illustrated here is key to understanding the content provided throughout this manual.





At the time this manual was issued, the minimum savings-to-investment ratio was established at 1.0.

Introduction: A Guide to Using this Procedures Manual

Program Rules

The following program rules apply unless policy exceptions are outlined for specific measures in subsequent sections of this manual.

Cost-Effectiveness Screening Requirements: Energy Saving Measures

All prospective energy saving measures shall be screened for cost-effectiveness using the Hancock Energy Audit Tool (HEAT) or a comparable—State of Vermont and Department of Energy approved—energy modeling software. Installation of prospective energy saving measures utilizing WAP funding is allowable when measures are screened as cost-effective in a site-specific energy model.

Cost-Effective Energy Saving Measures: Are They Required or Not?

Many improvement measures are required every time they are screened as cost-effective. But some measures are optional whenever they are cost-effective. Additional clarity on required versus optional improvement measures are provided throughout Sections 1-10 of this manual.

- ✓ Note that "optional" energy saving measures should only be included in weatherization projects when doing so will not prevent a WAP provider from maintaining the established maximum allowable job cost average (JCA) across a WAP grant period. Most commonly a WAP grant period is one year but occasionally there are exception to this. A maximum allowable JCA is established in every WAP grant.

- ✓ Energy saving measures should be prioritized for inclusion in a WAP project according to their "Savings to Investment Ratios" (SIRs), with priority given to measures with the highest SIRs.

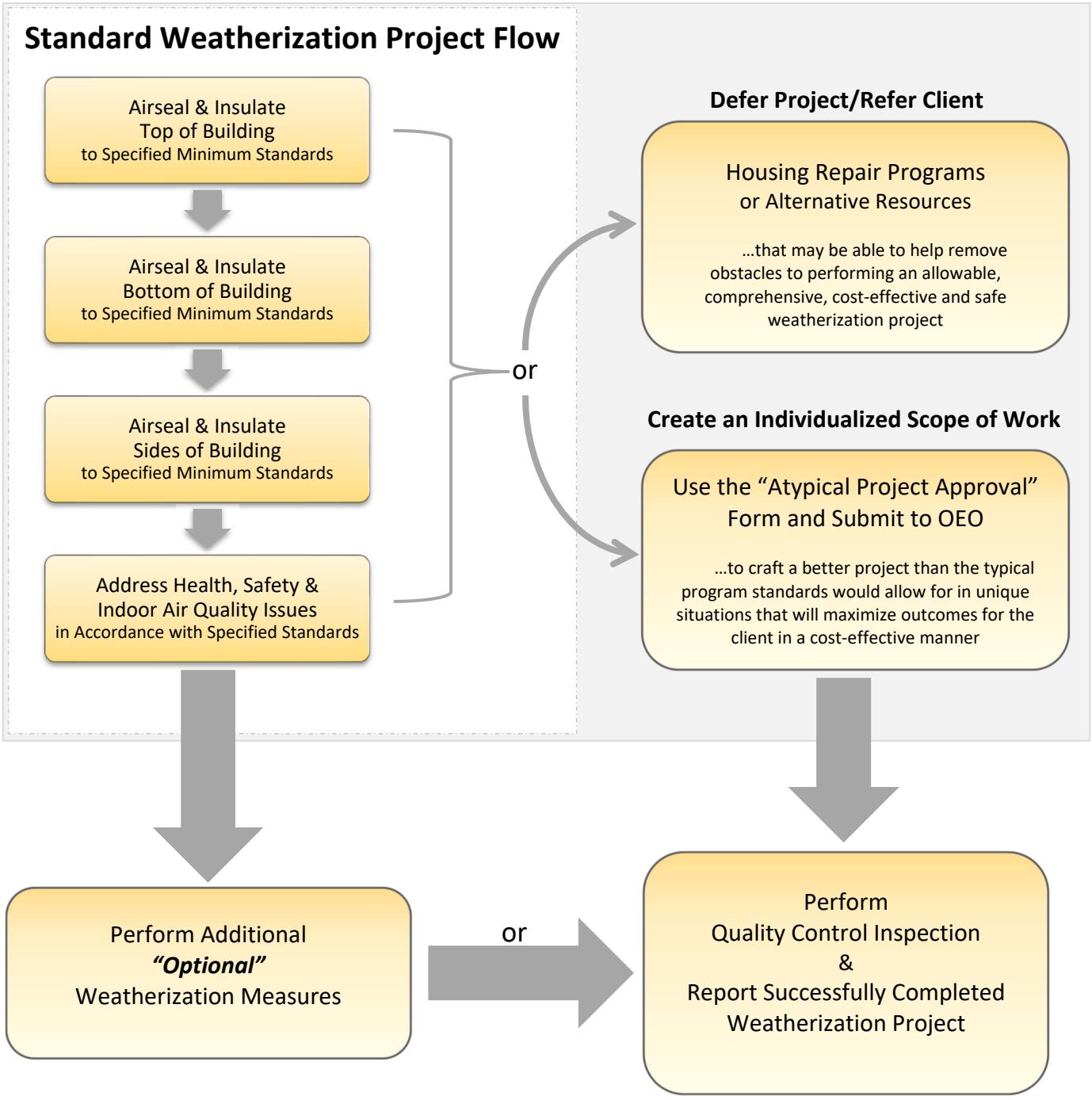
Cost-Effectiveness Screening Requirements: Weatherization Projects as-a-Whole

There is a duality to the cost-effectiveness screening requirements for weatherization projects. Yes, individual energy saving measures need to be screened for cost-effectiveness. But a significant portion of the prospective improvements for many WAP projects are classified as Non-Energy Saving Measures. When delivery of a comprehensive, cost-effective, long-lasting, and safe WAP project requires multiple Non-Energy Saving Measures there may be a point where the project as-a-whole is no longer cost-effective. In some cases, projects that are not cost-effective have to be deferred and/or referred to other programs. Section 4 and Appendices, F & G thoroughly outline program policies related to non-energy saving measures, project as-a-whole screening requirements and WAP deferrals.

Introduction: A Guide to Using this Procedures Manual

Weatherization Standards: Typical Project Expectations Flow Chart

The graphic below illustrates the framework and flow of a typical weatherization project. More detail is provided on the first three pages of this introductory section and throughout this manual.



Weatherization Works

Section 1: Top of Building

Flat Attics

There are air sealing & insulation requirements in every flat attic space.

Air Sealing Requirements |

All air bypasses into the attic shall be sealed air tight before completion of a weatherization project.[i]

Attic air sealing must address all wire penetrations, plumbing vent stacks, attic hatches, surface mounted ceiling fixtures, recessed lighting fixtures, exhaust fan assemblies, chimney/flue chases, partition walls, merger walls between adjoining building sections, and all other miscellaneous bypasses that provide pathways for indoor air to move into the attic.

All air sealing measures must be screened for cost effectiveness. If attic air sealing measures do not screen as cost-effective for energy saving benefits alone, they can—and in most cases they must—be completed for air quality and building durability purposes. In the event an attic air sealing measure does not screen as a cost-effective energy saving measure, it shall be performed during the weatherization project as an incidental repair measure unless written OEO approval to omit specific measures on an individual job is attained/recorded in the job file using the "Atypical Project Approval" form.[i]

Insulation Requirements |

All attic insulation measures must be screened for cost effectiveness prior to installation & shall only be installed whenever the insulation measure screens as cost-effective.

All insulation—preexisting or added by WAP—must be assigned an "effective" insulation value based on the manner it is installed. "Engineered" R-values cannot to be used.

Attics shall be insulated with cellulose whenever possible

All "effective" R-values shall be determined using the BPI tables included as Appendix K of this manual.

Final WAP Funded Insulation Levels: Whenever insulation is added by the WAP, the effective R-value at project completion shall be R-49 (+/- R-3) wherever roof clearance allows. When the available roof clearance prevents an R-49 installation from being achieved, but the overall installation is still cost effective, insulation must be added up to the roofline.

*The incremental cost to install R-values greater than R-49 must be paid for using Non-WAP funding.

Flat Attics

Mandatory Attic Airsealing | 2016 Policy Adjustment

Effective July 2016

1. There is now an allowable testing procedure that can be performed at an energy audit, or <u>before</u> the WAP crew starts <u>any shell work</u>, to quantify the existing attic air leakage.
2. There is now a defined threshold for attic air-leakage levels that allows an agency to opt out of some mandatory attic airsealing measures for a project when the test results indicate that the air leakage into the attic is less than the established threshold.

The Testing Procedure Required | to opt out of some attic airsealing measures

- **Zonal Pressure Diagnostics using Add-a-Hole Zone Modification**

The Threshold Required | to opt out of some attic airsealing measures

- **If the CFM50 air leakage into the attic represents 30% or less of the attic sq. ft. before the WAP work begins then an agency can opt out of some attic airsealing measures during the project.**

Determining the Threshold | An Example Scenario:
If the attic footprint is 1,000 sq. ft., then a maximum test result of 300 CFM50 leakage between the house and attic would be acceptable.

- 300 CFM50 = 30% of the attic sq. ft.
- 300 CFM50 would roughly translate to 30 sq. in. of leakage area.

Mandatory v. Discretionary Attic Airsealing Measures

Mandatory attic airsealing measures become optional when:

1. A ZPD test using add-a-hole zone modification is performed at an energy audit, or at some other time before the WAP crew begins any building shell work.
   -and-
2. The test results—from before the WAP crew begins any building shell work—indicate that the threshold required to opt out of some required attic airsealing measures is already met.

Section 1: Top of Building

Flat Attics

Mandatory Attic Airsealing | 2016 Policy Adjustment

Mandatory v. Discretionary Attic Airsealing Measures

Below is a breakdown of measure requirements when the allowable ZPD testing has been performed and the acceptable attic air leakage threshold for a given project is met prior to any building shell work being performed by weatherization crews.

Becomes Optional	Still Mandatory
(1) Accessing and airsealing at every wire penetration	(1) Airsealing attic hatches
(2) Accessing and airsealing at every interior wall top	(2) Airsealing around chimneys/flues
(3) Accessing and airsealing at every exterior wall top	(3) Airsealing recessed lights
	(4) Airsealing fans/fan venting
	(5) Airsealing plumbing penetrations and any other miscellaneous bypasses that are not specifically identified in this table

Note that if ZPD testing is not performed on an individual weatherization job as outlined in this 2016 policy revision, then all attic airsealing measures are mandatory unless written OEO approval to omit specific measures on an individual job is attained and recorded in the job file. This written approval shall be requested using the "Atypical Project Approval" form and uploaded to the HES job file.

Section 1: Top of Building

Flat Attics

Perimeter Pull, Air Sealing & Batt Insulation Encapsulation Requirements |

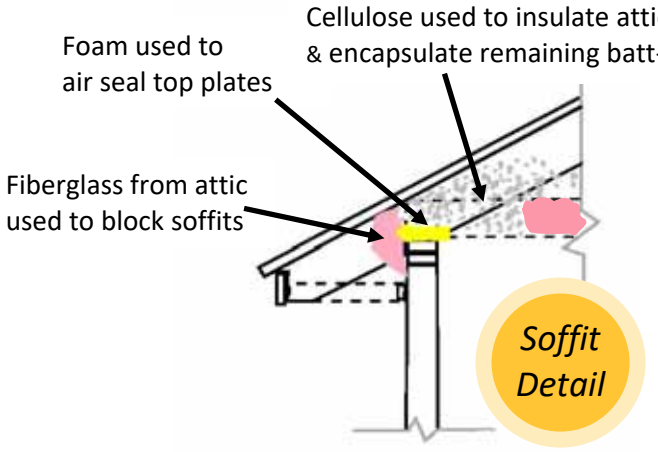
Perimeter Pull Method: Any preexisting fiberglass batting shall be removed from the outer perimeter of the attic before any additional insulation is installed. After the perimeter is cleared of fiberglass—and all attic air sealing measures are complete and verified to be effective—the remaining fiberglass batting must be completely encapsulated with loose-fill insulation. The new insulation gets blown in around the attic perimeter and on top of the fiberglass batting.

The perimeter pull also creates access to air seal exterior wall tops.

The perimeter pull, air sealing and encapsulation process is a lot of work, but it is essential to do this before adding more insulation over pre-existing fiberglass batting.

Remember, if there are air pockets between the ceiling and the batt insulation, heat from the house will escape into and then out of the attic underneath that insulation.

This type of heat loss is most problematic with strapped ceiling assemblies, but the perimeter pull is required on all WAP projects with flat attic areas, even those without ceiling strapping. Without performing a perimeter pull, airsealing and encapsulation process, additional insulation added into the attic will likely have a limited impact.



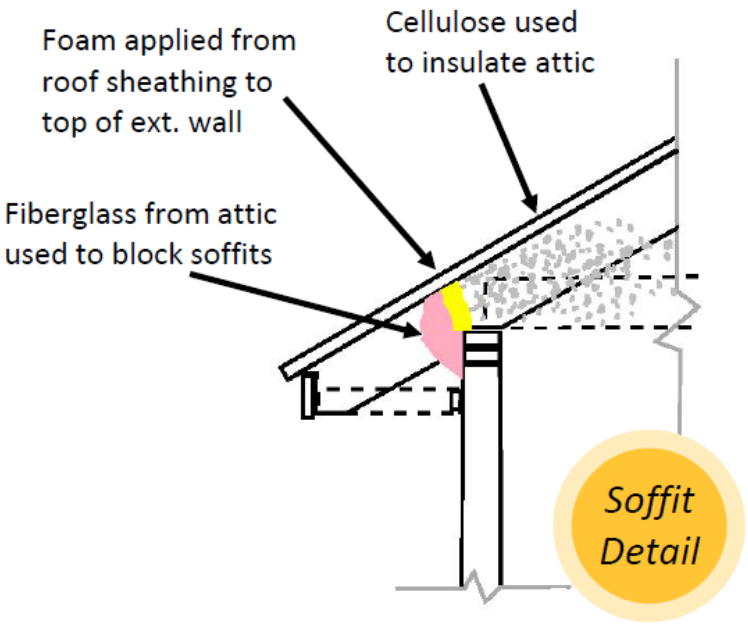
The top of gable end walls must also be thoroughly air sealed during every project.

At the eaves, all top plates must be evaluated, accessed and air sealed during every project. [i]
Whenever possible, it is recommended that a blocker/backing material be used to aid the adherence of spray-applied foam materials to the outer edge of the exterior wall top and to keep cellulose out of the soffit when insulating. In the detail above, a piece of scrap fiberglass batting is used for this purpose.

Flat Attics

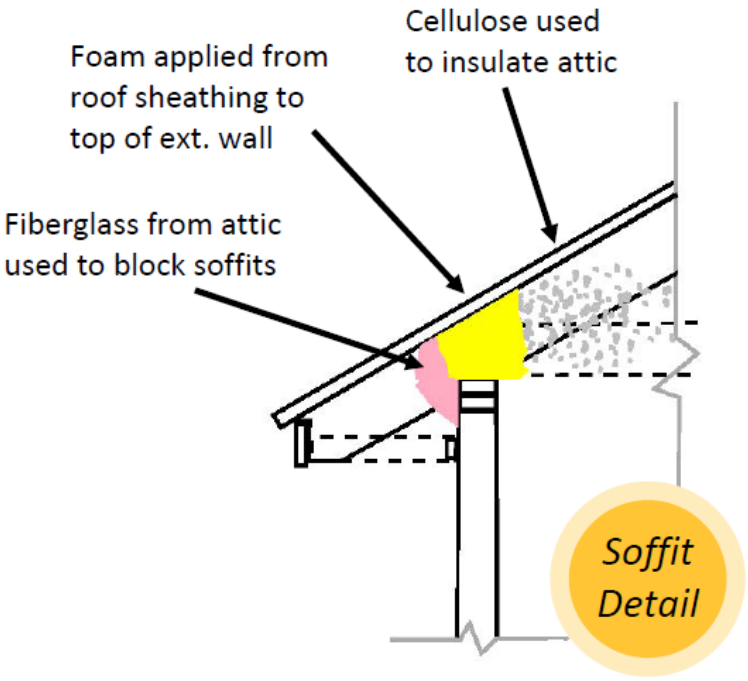
Non-Allowable Measure Installation Techniques |

1. Installing a continuous spray foam barrier between soffit and attic



It is **not-allowable** practice to apply a continuous coating of spray foam from the underside of the roof sheathing down to the top of the exterior wall using WAP funding. Airsealing applications in this area of the building shall be focused on preventing indoor air from entering the attic space.

2. Installing a wedge of spray foam at the eaves of shallow pitched roofs



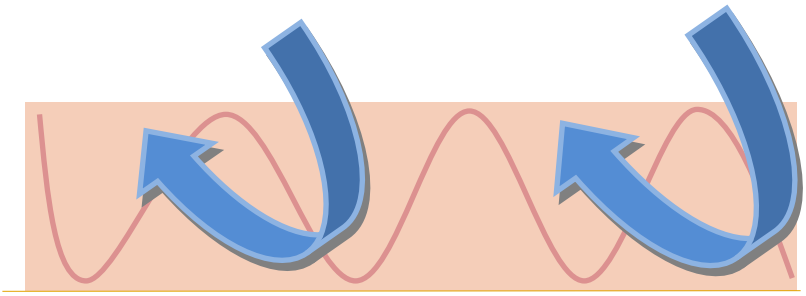
It is **not-allowable** practice to apply a wedge of spray foam at the eaves of an attic using WAP funding. The technique of installing closed-cell spray foam in this manner does maximize the R-value achieved per-inch in low-roof-clearance areas and there can be positive impacts associated with this installation technique. However, the cost to effectively deliver R-6 per-inch insulation values in this area of the building using closed-cell spray foam compared to the cost to deliver between R-3 to 4 per-inch values using other insulation materials does not yield a large enough return on investment to justify investing WAP funding in this manner.

Flat Attics

Intrusion & Wind-Washing |

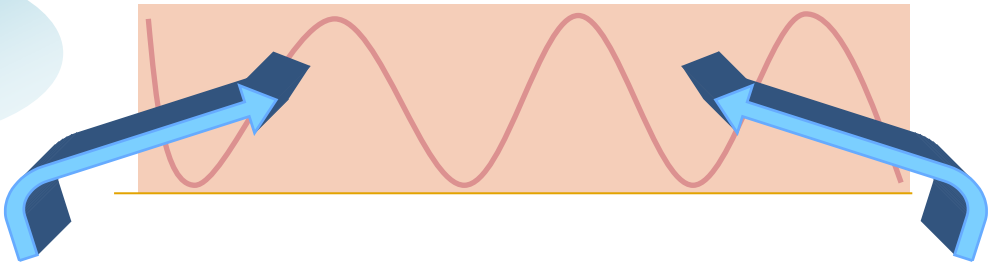
According to the Department of Energy, intrusion and wind-washing can combine to reduce insulation effectiveness up to 50%.

Intrusion



Intrusion: Department of Energy Definition
Air moving into and out of insulation, without going through the wall or ceiling assembly. It will occur even when a good air barrier is present on one surface.

Wind-washing



Wind-washing: Department of Energy Definition
Wind-washing is a phenomenon particular-to fiberglass attic insulation. Air entering and leaving the attic through the attic vent openings is frequently able to blow through flat fiberglass attic insulation, removing heat as it goes.

Section 1: Top of Building

Flat Attics

Passive Attic/Roof Ventilation Policy |

Use of WAP funding to install vent baffles in attics/roof systems is discouraged. This is only an allowable installation using WAP funding if all five conditions outlined below are met.

1. Each baffle is installed in a manner that will protect the attic insulation from both intrusion and wind washing.

2. The perimeter top plates have been thoroughly evaluated, blower door assisted diagnostic testing has been performed and the perimeter top plates have been verified not to leak air between the house and attic.

3. The airsealing work at all miscellaneous bypasses between the living space and the attic has been verified as effective with blower door assisted smoke testing.

4. The perimeter pull method is utilized if there is preexisting fiberglass batt insulation.

5. An attic insulation measure screens as cost-effective (inclusive of the additional ancillary cost for the vent baffle installation).

Pre-existing Vent Baffles |

If vent baffles are already present at the eaves area in a flat attic it is allowable to leave them in place as long as conditions one through four outlined above are satisfied at the conclusion of the weatherization project.

Flat Attics

Miscellaneous Policies |

Electrical Boxes

All electrical boxes that are exposed during the normal course of weatherization work will be flagged to be seen above the level of the attic insulation. Recessed lights and exhaust fans will also be flagged to be seen above the level of the insulation.

Exception: Pre-existing insulation will not be excavated for the sole purpose of identifying and flagging every electrical box when there is already pre-existing insulation covering areas where electrical boxes may or may not exist and there is no air-sealing work being performed in the area that would prompt the requirement to identify and mark the locations of each electrical junction.

Insulation Markers

Insulation will be adequately marked for depth in each separate accessible attic area. In larger attics, depth markers will be installed, at minimum, in every 300 square feet of attic area. All depth measurements will begin at the air barrier.

Recessed Lighting

All recessed light fixtures, including those that are IC rated, shall have an airtight enclosure installed that separates each recessed light from any airsealing and insulation materials. The enclosure must provide a three-inch minimum airspace around all components of the light fixture. If a recessed light fixture cannot be verified as IC rated, then the maximum allowable R-value for the top of the airtight enclosure shall be R-13. If a recessed light fixture can be verified as IC rated, then the R-value installed over the top of the airtight enclosure during a weatherization project must be between R-13 and R-49.

Exhaust Fans

All exhaust fans shall have an airtight enclosure installed that separates the device itself from any airsealing and insulation materials. The enclosure must provide a three-inch minimum airspace around all components of the exhaust fan except the vent outlet. The R-value installed over the top of the airtight enclosure during a weatherization project must be between R-13 and R-49.

Whole House Fans

In the rare case there is a functioning whole house fan in the attic, it is recommended that the device be disconnected and removed from operation as part of the project. If the client is not agreeable to removal of the whole house fan, then an enclosure like those built around pull-down attic access stairs shall be installed. All standards outlined on Section 1: Page 11 of this policy manual shall apply to this measure whenever operational whole house fans are present and the weatherization client is not amenable to disconnection and removal of the device as part of the weatherization project.

Section 1: Top of Building

Flat Attics

Attic Hatch | Standard Assembly

Whenever roof clearance allows a hatch assembly must be installed unless continued access into the attic from a ceiling hatch is not desired by the client. A durable insulation dam shall be installed around all attic hatch openings. The dam must extend at least 2" higher than the settled insulation depth at the completion of the weatherization project.

Hatches built by Wx crews must have at least four inches of HI-R sealed to the interior surface of hatch assembly, w/all edges taped.

Attic hatch panels shall have a minimum effective R-value of 21.

Higher R- values are strongly encouraged whenever roof clearance allows.

Hatch assemblies 7 sq. ft and smaller are not screened as individual measures. They are ancillary to the energy saving work performed in the attic.

Q-lon or comparable

If pre-manufactured panels are being used as attic hatches, it is recommended that additional sheets of either Hi-R *(polyisocyanurate)* or pink/blue-board *(extruded polystyrene)* get added on top of the panel, with the edges sealed and taped, to maximize R-value.

Alternatively, additional inches of closed-cell spray foam can be applied to the top of the pre-manufactured panels.

Use of felt weather-stripping is not allowable.

Flat Attics

Attic Access | Walk up Staircase

Whenever possible a hatch panel shall be located at the top of the staircase.

Plan A: One Surface separates house from attic

The Backup Plan: Making the stairwell the thermal boundary increases the number of surfaces that need to be addressed and reduces the R-values between the house and attic. When the stairwell area is addressed in this manner, it is often difficult to get an effective airseal that keeps warm indoor air out of the attic. For these reasons, treating the walls of the stairwell, the stairs, and the door at the bottom of the staircase is discouraged practice. However, if building a hatch assembly at the top of the stairwell is not practical, or the weatherization client will not allow the installation, then it is allowable to make the stairwell the thermal boundary.

If the weight or functionality of a large hatch assembly presents a concern, the hatch panel should be divided into sections or a counter-weighted pulley system should be installed. Both hatches pictured above meet the minimum R-21 requirement and provide a good tight airseal when closed.

Flat Attics

Attic Access | Pull Down Stairs

Unless the thermal boundary has been moved up to the roofline, a high quality attic hatch assembly shall be built and installed to enclose pull-down staircases.

The assembly is to include a durable insulation dam, a Q-lon (*or comparable quality weatherstrip)* and a removable top panel that provides an airtight seal when closed.

R-21 Minimum

A Site Built Enclosure Over Pull Down Stairs

Assembly Requirements:

- ✓ R-21 is the minimum allowable insulation value for hatch assemblies of any size.
- ✓ Higher R-values should be strived for whenever:
  a. Roof clearances allow
  b. For assemblies 8 sq. ft. and larger only, the measure must screen as cost-effective to increase the hatch assembly R-value above R-21
- ✓ The sides of a hatch assembly/insulation dam shall be sealed air tight.
- ✓ The surrounding blown-in attic insulation should continue up the insulation dam to the height of the Q-lon whenever possible.

If the Q-lon is positioned above the settled depth of any blown-in insulation, then the sides of the assembly shall be insulated separately with either HI-R (polyisocyanurate) or closed-cell spray foam products. The R-value of the foam used on the sides of the insulation dam/hatch assembly will then become the reference point for standards requiring that the R-value for the top of the hatch assembly meets or exceeds the value of the "adjoining insulated assembly".

Sloped Ceilings | Closed Cavity

All possible efforts shall be undertaken to ensure sloped ceilings are insulated to the highest performance value possible within the existing closed cavity.

The same policy applies to decked attic floors which are covered on Section 1: Page 11.

Tubing Up

Tubing Down

Every roofline/attic must be evaluated & thoroughly airsealed regardless of how many there are.

Whenever cost-effective, a roof insulation upgrade must also be performed.

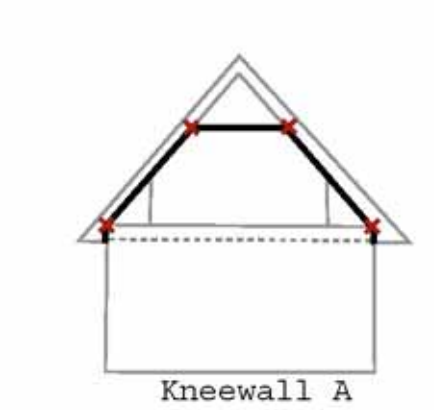
Complicated/Numerous Rooflines & Attics

All air sealing measures must be screened for cost effectiveness. But, just like in a flat attic, even if roof air sealing measures do not screen as cost-effective for energy saving benefits alone, they still can—and must—be completed for building durability/air quality purposes. In the event a roof air sealing measure does not screen as an energy saving measure, it shall be considered a required incidental repair measure and completed during the weatherization project.

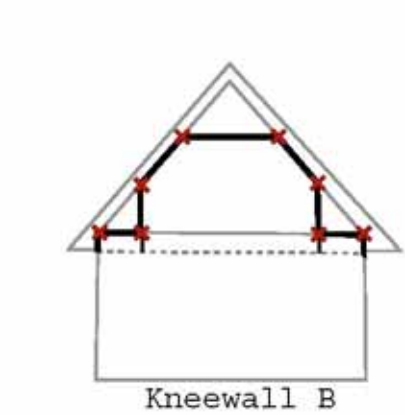
Kneewall Closets | Placing the thermal boundary

The ***preferred thermal boundary*** shall be established at the slope as indicated here.

This method reduces the number and difficulty of the air sealing tasks required to properly establish a continuous thermal envelope. It also decreases the amount of surface area to be insulated.



When this method is used the floor system underneath the kneewall must be thoroughly air sealed. Tubing in and densepacking underneath the kneewall in each floor bay is not acceptable practice for this air sealing task. The area must be accessed and rigid insulation air sealed in place. Stuffing a fiberglass batt or alternative blocking/backing material under the kneewall in each floor bay and then spray foaming over the Blocking/backing material is also acceptable for this task.



Plan A:
Treating the slope as the thermal boundary

To ensure a complete thermal envelope, the following surfaces shall always be air sealed and insulated:

- ✓ Sloped roof section between the eaves and the top of the kneewall
- ✓ Rimjoist area
- ✓ Gable end walls
- ✓ When applicable, any exterior walls extending above the kneewall closet.

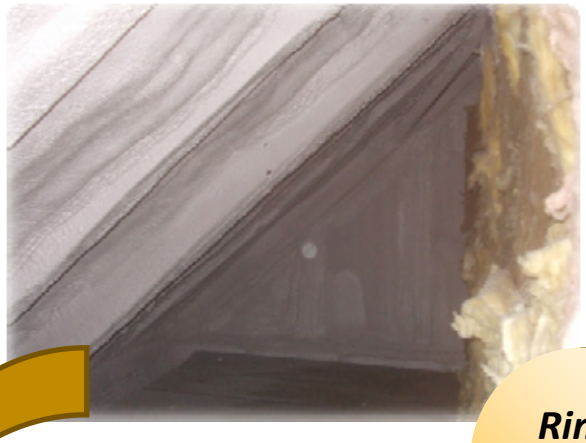
Plan B:
Treating the kneewall as the boundary

Allowable in two instances:

1. The kneewall framing provides a deeper cavity to insulate than the roof system framing does.
2. The kneewall closet is over unheated space *(e.g. a bonus room above a garage or an exterior porch)* and insulating the kneewall floor system will not be necessary.

Kneewall Closets | Rim Joists/Beams

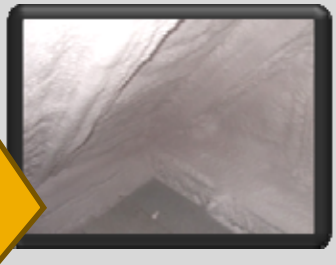
Whenever there is an accessible kneewall closet, the rim shall be addressed during a weatherization project.



Rims Matter

With Spray-foamed slopes…

…With Dense-packed slopes



On the eaves sides it is required to either:

a) remove an outer floor board or cut a swath of the outer subflooring away to expose the rim area to make it possible to airseal & insulate the rim with foam products.

-or-

b) drill through the kneewall closet floor and densepack out to the rimjoist/beam on the eaves sides of a building with cellulose.

The rim & endwalls must always be thoroughly sealed and insulated inside each kneewall closet to ensure a complete thermal envelope.

Section 1: Top of Building

Accessible Attics that could be used for storage[ii] |

Insulating Decked Attic Floors | Thoroughly densepacking the floor cavities is the minimum insulation requirement in floored attic spaces. Installing more insulation over the flooring is encouraged if cost-effective but it's not required.

Airsealing Decked Attic Floors |
In some cases, a densepacked cellulose installation alone can adequately air seal the house from the attic. **However, it is strongly encouraged that prior to densepacking… (a) sections of flooring get removed to allow for targeted airsealing work—including foam-sealing over the top of all partition walls—and then, (b) the flooring be reinstalled prior to the installation of the densepacked cellulose.**

Maximizing Thermal Performance in Accessible Attic Spaces
It is allowable to divide an attic into sections or provide runways using insulation dams.
This is one way to maintain the level of attic functionality a weatherization client requests while still being able to maximize insulation value over portions of an attic floor.

Project A

Example R-30 Assemblies

Project B

Thermal Boundary Options

If a client does not want loose-fill cellulose installed over sections of a floored attic because the space is used, consider multiple approaches.
Either insulation method shown left is encouraged if…
a) practical
b) desired by client
c) cost-effective

Establish Thermal Boundary…
Maintain Storage Area…
Maximize Insulation Value…

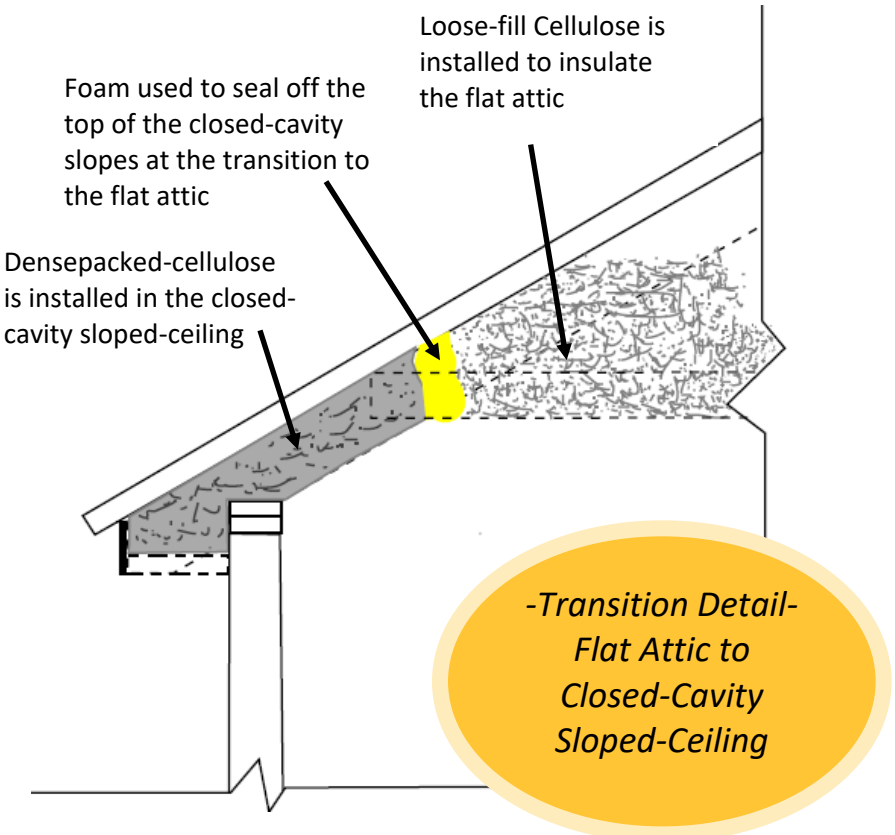
During both Wx projects pictured above, 2-inch-thick HI-R *(polyisocyanurate)* provided another (R-13) over the 5-inch cavities that were densepacked with cellulose (R-18) during the projects. [ii]

Transition Between Flat Attic & Closed Cavity Sloped Ceiling

Required Use of the Perimeter Pull Method | Any preexisting fiberglass batting shall be removed from all sides around the outer perimeter of the flat attic section before any additional insulation is installed. This includes the area where the flat attic floor transitions down into a closed-cavity sloped-ceiling. After the perimeter is cleared of fiberglass—and all attic air sealing measures are complete and verified to be effective—the remaining fiberglass batting must be completely encapsulated with loose-fill insulation. The new insulation gets blown in around the attic perimeter and on top of the fiberglass batting. Additional information about the perimeter pull method is included on page 4 earlier in this section of the policy manual.

A Non-Allowable Measure Installation Technique |

1. Installing a continuous foam barrier to separate the flat attic from the closed-cavity sloped-ceiling



-Transition Detail- Flat Attic to Closed-Cavity Sloped-Ceiling

It is **not-allowable** practice to separate the flat attic from the closed cavity slopes by installing a continuous foam barrier from the underside of the roof sheathing down to the flat attic floor. The installation restriction at this transition applies for spray foam barriers and rigid foam barriers sealed in place.

Permanently sealing off the top of the closed cavity slopes at the transition into a flat attic area would require an OEO approved atypical project approval form for the individual project.

Top of Building Airsealing Protocols | Summary

Every "Top of Building" surface that is part of the pressure boundary —including attics, rooflines & exterior surfaces inside kneewall closets—must be evaluated and airsealed. [i]

Measure Screening Requirements

All airsealing measures must be screened for cost-effectiveness. If attic air sealing measures do not screen as cost-effective for energy saving benefits alone, they can—and in most cases they must—be completed for air quality and building durability purposes.

How to Proceed if this Type of Airsealing Measure Fails to Screen

In the event a "Top of Building" air sealing measure does not screen as an energy saving measure, it shall be considered a required building durability and air quality measure and be completed during the weatherization project as an incidental repair measure unless written approval to omit specific measures on a specific job is attained by OEO and recorded in the job file.

Verification of Measure Effectiveness

All "Top of Building" airsealing measures shall be verified for effectiveness using smoke sticks/pencils in tandem with a blower door assembly prior to project closeout.

- ✓ Note that the use of alternative pressure diagnositcs and/or infrared cameras to verify the successful completion of airselaing measures is also encouraged. However, these techniques must be utilized in addition to, not instead of, the required use of blower door assisted smoke testing.

Measure Cost Allocation for Airsealing Related Work

Efforts to access surfaces and fixtures within flat attics so they can be airsealed, including performing perimeter pulls of pre-existing batt insulation shall be screened and charged to the attic airsealing measure(s), not to the attic insulation measure(s).

Time spent testing and verify the effectiveness of top of building airsealing efforts shall be recorded to airsealing measure(s), not to insulation measure(s).
Whenever cost-effective, the most applicable *Airsealing* measure coding shall be used.
Whenever non-cost-effective, the *Incidental Repair - Non-Screenable Top of Building AS Requirements* measure coding shall be used.

Clarifying note about mandatory airsealing measures v. cost-effective airsealing
The only other area of a home where airsealing work is required regardless of individual measure cost-effectiveness, is at surfaces that separate a house from an attached or tuck-under garage. All other airsealing measures must be cost-effective to be included in a weatherization project scope of work.

Section End Notes

[i] In July 2016 this mandatory attic airsealing policy was adapted to allow for certain attic airsealing measures to be considered optional rather than mandatory if a certain performance standard could be demonstrated by performing Zonal Pressure Diagnostics using Add-a-Hole Zone Modification. See pages 2-3 in this section of the policy manual for detailed information about this 2016 policy revision. Note that if ZPD testing is not performed on an individual weatherization job as outlined in this 2016 policy revision, then all attic airsealing measures are mandatory unless written OEO approval to omit specific measures on an individual job is attained and recorded in the job file. This written approval shall be requested using the "Atypical Project Approval" form and uploaded to the HES job file.

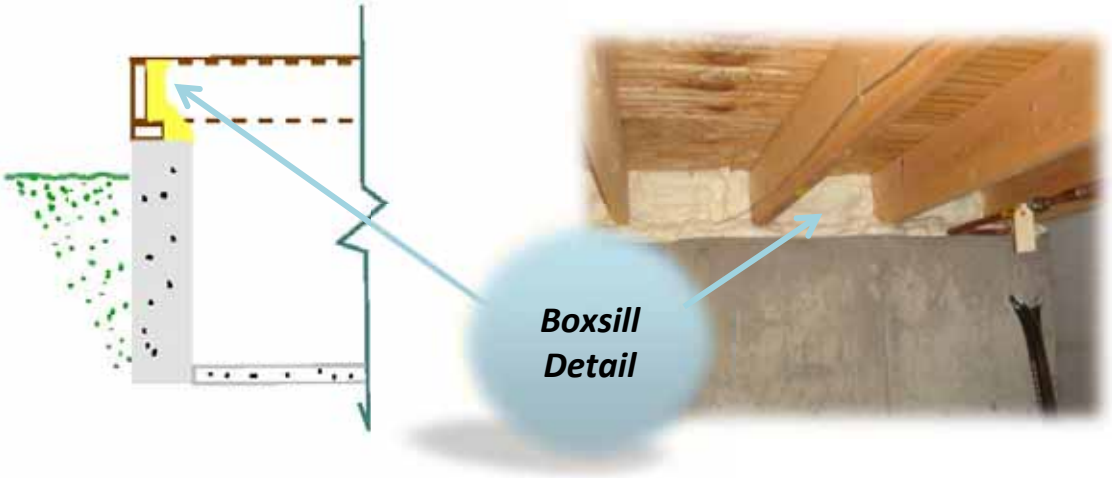
[ii] Fire retardant policies apply. The example photos included on page 15 (Projects A & B) were taken a number of years ago and do not meet current fire retardant policies. If installed on those example projects today, the foam board selected for the installations would need to be a fire rated foam board product or the foam board would need to be covered. See Appendix P of this policy manual for detailed information on current fire retardant policies.

Section 2: Bottom of Building

Basement & Crawlspace
Boxsills, Bandjoists, & Beams

Air Sealing & Insulation Requirements

Every foundation boxsill/bandjoist/beam shall be thoroughly airsealed & insulated during all Wx projects



Each bandjoist, boxsill and/or beam shall be airsealed and insulated w/ a minimum of 2" thick Hi-R (polyisocyanurate) or a 3" nominal application of closed-cell spray foam.

Exceptions to the standard installation requirement for boxsills/bandjoists are outlined below:

- ✓ When the basement is finished and there is no access to the sill area without demolition this measure is not required, but it is allowable and encouraged when cost-effective.
- ✓ When there is a beam serving as the rim/sill with a 6 inches or greater true dimensional thickness this measure is not required, but it is allowable and encouraged when cost-effective.
- ✓ If the floor framing on the gable end doesn't provide enough access to install foam products out at the sill, the outer bay of the floor system shall be densepacked with cellulose or fiberglass.
- ✓ Do not isolate any plumbing/heating piping to the cold side of a foam insulation installation.

Preexisting Boxsill Insulation Policy

Fiberglass batting at the sills

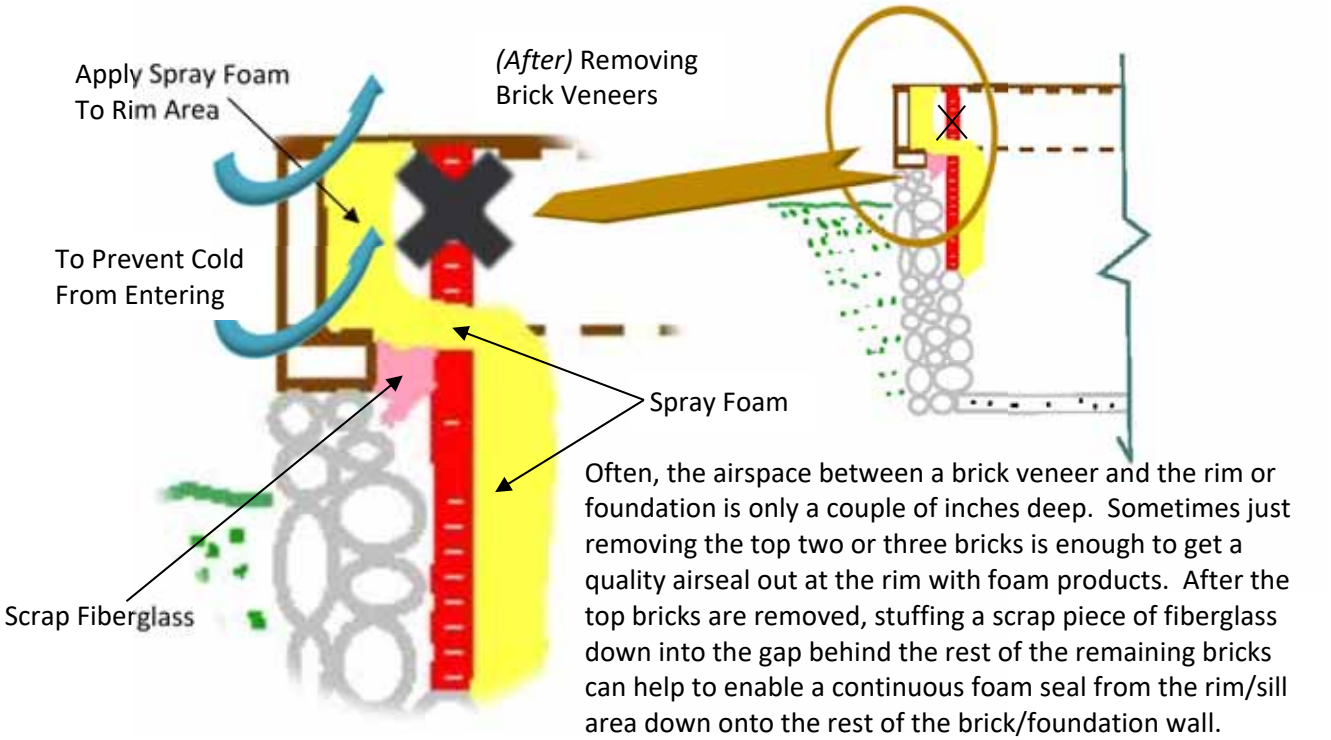
Whenever there is preexisting fiberglass batting installed at the boxsill it shall be removed and then the area shall be reinsulated.

Weatherization Works

Basement & Crawlspace
Boxsills, Bandjoists, & Beams

Creating Access to Enable Effective Installations

Brick Veneers
If there is a non-structural brick veneer and airspace located in front of the rim and/or foundation, the top rows of brick shall be removed prior to performing any airsealing or insulating measures with foam products.



Often, the airspace between a brick veneer and the rim or foundation is only a couple of inches deep. Sometimes just removing the top two or three bricks is enough to get a quality airseal out at the rim with foam products. After the top bricks are removed, stuffing a scrap piece of fiberglass down into the gap behind the rest of the remaining bricks can help to enable a continuous foam seal from the rim/sill area down onto the rest of the brick/foundation wall.

**Note that in the image above, if the brick wasn't removed and foam was applied over the brick, the rim and the outer section of the floor above it would be isolated to the cold side of the insulation. This would significantly reduce the effectiveness of the installed weatherization measures.

Alternate Approach
If the airspace behind the brick veneer is a 3 inch cavity or greater then insulating the cavity with blown in fiberglass is an allowable alternative measure.

Basement & Crawlspace
Boxsills, Bandjoists, & Beams

Creating Access to Enable Effective Installations

Suspended Ceiling Tiles
If there is a suspended ceiling with movable tiles, the tiles are to be temporarily removed and the boxsill area shall be addressed during a project.

Sheetrocked Ceilings
Cutting out a swath around the basement perimeter when there is a sheetrock *(or comparable)* ceiling in order to address the boxsill is allowable with client permission and if the measure screens as cost-effective inclusive of all additional ancillary-costs.

Non-Allowable Practice | Note that in finished basements it is not allowable practice to drill through the exterior side of the bandjoist to densepack the boxsill area from outside of the home due to the likelihood of drilling into electrical wiring at that location.

Thermal Barrier Requirements

If foam materials are applied exclusively to the bandjoist/beam/sill areas and foam does not extend down onto the interior of the foundation wall, then application of a 15-minute fire-retardant-barrier over the foam is not required by WAP*

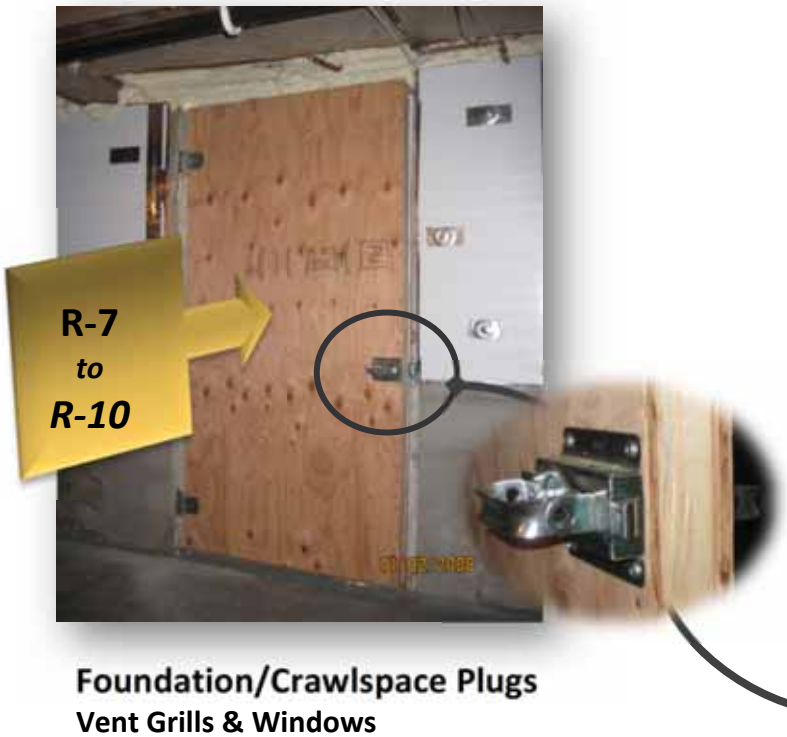
Local codes must still be adhered to

A 15-minute fire retardant barrier is not required by WAP for the foam installation pictured above.

Section 2: Bottom of Building

Basements & Crawlspaces

Large Foundation Openings



Foundation/Crawlspace Plugs

Vent Grills & Windows

- ✓ All foundation vent grills shall be sealed closed.
- ✓ Foundation windows shall be airsealed at minimum.
- ✓ If a client allows, foundation-window-plugs shall be airsealed into window openings.
- ✓ The installation of smaller, sandwich-door-style hatches is allowable if a durable, energy-efficient, and fully operational access point into a basement or crawlspace area is needed (see pics below). Providing locking mechanisms for crawlspace access points from the exterior is a client responsibility.

Sandwich Doors

Exterior crawlspace/ basement doors, including those at the base of a bulkhead stairway shall be addressed during each weatherization project.
If an existing door cannot be improved in a way that delivers an airtight seal and R-7 to R-10 performance, then a sandwich door shall be built and installed.

Extending Functional Measure Life

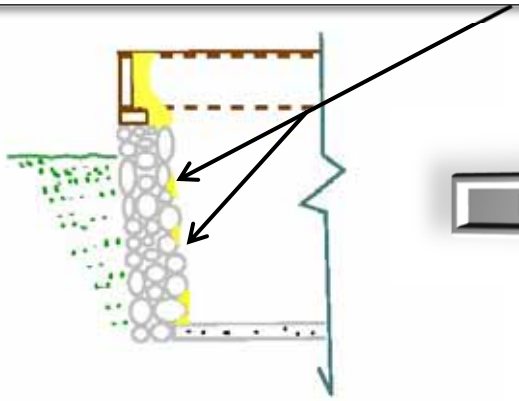
1. If the door is exposed to the elements, the use of pressure treated CDX is recommended for the outer layer of the door.
2. A durable, high quality gate latch is recommended instead of, or in addition to, barrel bolts on larger door assemblies. (see photo insert)

Note that the measure requirements outlined on this page are only applicable to unfinished basements and crawlspace areas that are inside the thermal envelope/pressure boundary.

Basements & Crawlspaces

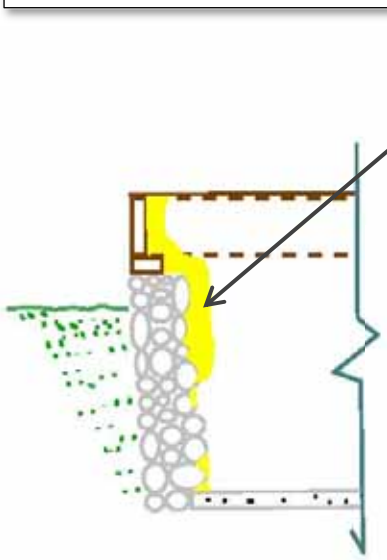
Foundations: Rubble & Stone

Blower door assisted airsealing shall be conducted on all rubble and stone foundation walls using the 100 CFM50 reduction per technician-hour rule unless the building is already below 5 ACH50. This applies to surfaces above and below ground level.



Required Measures

It is encouraged to airseal **and insulate** rubble and stone foundations with closed cell spray foam to a point at least two feet below grade.



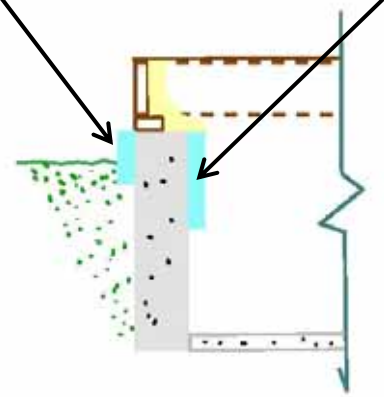
Optional Measures

It is also allowable to airseal and insulate an entire rubble or stone foundation wall if the measure is screened and determined to be cost-effective.

Basements & Crawlspaces

Foundations: Smooth Surfaces

With smooth foundation surfaces it is encouraged to insulate outside to at least six inches below grade or inside to at least two feet below grade using foam products.



Note that installing foundation insulation is not automatically required if the measure itself is cost-effective. Foundation insulation is always an optional weatherization measure.

Considering Multiple Approaches

The pictures above demonstrate two viable approaches for increasing the insulation value of a foundation wall. Both methods shown are allowable and encouraged when cost-effective. In a situation where multiple installation methods are possible, the most cost-effective installation method shall be utilized to insulate foundation walls.

Basements & Crawlspaces

Foundations: All types

Thermal Barrier Requirements

Whenever foam materials extend down onto the interior of the foundation wall, an application of a 15-minute-rated, fire-retardant-barrier is required over the materials used to insulate the foundation walls. This is a WAP requirement.*

**Local codes must still be adhered to regarding installed measures at the boxsill & foundation if they are more stringent than WAP requirements.*

"Thermax" (pictured above) meets this fire retardant requirement without a separate covering.

✓ **Appendix P of this manual includes more detailed information about thermal barrier requirements.**

Section 2: Bottom of Building

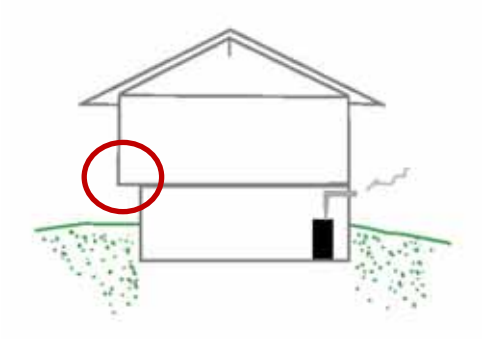
Basements & Crawlspaces

Cantilevered Floors: Closed Cavity

All possible efforts shall be made to ensure cantilevered floor systems that overhang the foundation wall are completely airsealed and insulated to the highest performance value possible to maintain a continuous thermal boundary.

Raised Ranches

If there is access to the sills, any pre-existing fiberglass batting in the cantilevered floor section should be removed. HI-R shall be installed at the boxsill area atop the foundation wall and the cantilevered floor system shall be densepacked with cellulose insulation through the HI-R as shown in the images below.

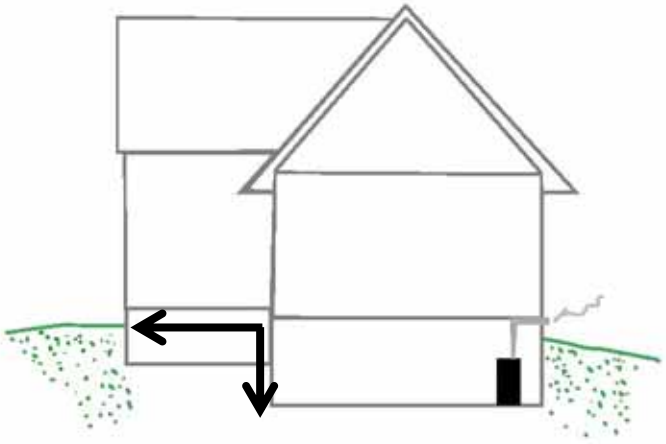


Alternate Approaches

If the basement is finished and there is no access to the sill without demolition then the installation of densepacked cellulose from the exterior is encouraged.

Basements & Crawlspaces

Placing the Thermal Boundary



The diagram above shows a full basement with a boiler located adjacent to a crawlspace that has no mechanical systems or plumbing lines. The arrows represent the surfaces that would need to be completely airsealed and insulated in order to place the crawlspace outside of the thermal envelope.

A weatherization technician installs blown in insulation into the floor system pictured above.

Floor v. Foundation

Whenever a basement/crawlspace houses a heating system or water heater it shall be considered inside the thermal boundary and the foundation must be thoroughly airsealed.

If the crawlspace/basement has no heating system or water heater then it can be considered inside or outside of the thermal boundary. Wherever the boundary is established it must be completely airsealed & adequately insulated by the end of a Wx project.

Multiple Basement Zones

Basement/crawlspaces must be completely airsealed from each other whenever (a) there are multiple basement/crawlspace zones and (b) the thermal boundary location changes from one zone to the next, e.g. the perimeter of one zone is the thermal boundary and in the next zone over, the ceiling is the thermal boundary.

Each floor system over a crawlspace must be sealed and insulated whenever a crawlspace zone is located outside of the thermal envelope.

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Basements & Crawlspaces

Moisture Issues: Impact on Weatherization Project Approaches

Prior to weatherizing a home it is important to evaluate whether the basement/crawlspace is dry, damp or wet.

The following are incidental repair measures that are allowable in order to alleviate moisture issues and maximize weatherization project outcomes.

Wet

Install new or improve existing gutters, extend downspouts away from buildings, install covers on sump pits, upgrade existing sump pumps, install new sump pits and/or sump pumps if none exists.

Damp

Install 6 mil or thicker poly over the ground, exposed ledge, onto rubble or stone walls, etc. to reduce the amount of moisture evaporated into the indoor air. This helps control humidity levels throughout the home and reduces the likelihood for moisture and mold problems after a weatherization project.

Dry

Standard weatherization work should proceed if there are no preexisting bulk water intrusion problems or ground- sourced moisture issues. If identified issues can be effectively improved (before or as part of the WAP project) and the *project-level* savings-to-investment-ratios exceed cost-effectiveness screening thresholds then weatherization work can proceed.

Weatherization Works

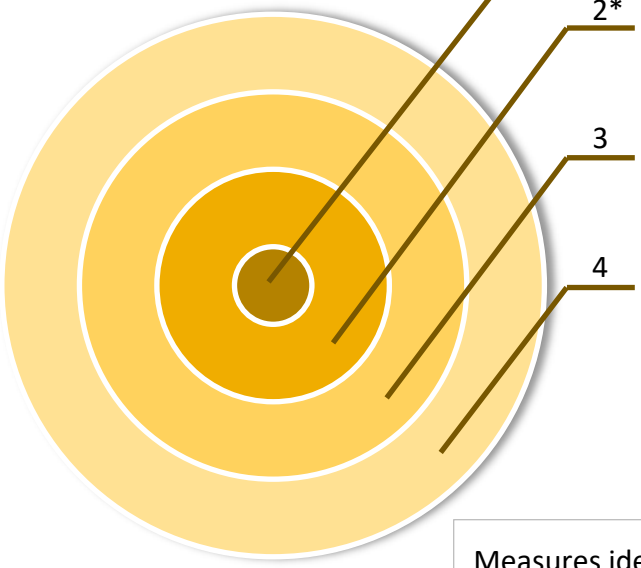
Section 2: Bottom of Building

Basements & Crawlspaces

Typical Measure Selection Guide: Summary

The following is a quick reference guide to summarize measure prioritization when the basement perimeter is the thermal boundary.

Targeting Measures…



1* Airseal & Insulate Boxsill/Rim

2* Airseal Return Side of Duct Systems & Verify Effectiveness

Airseal Foundation Walls*

**In Accordance with 100 CFM50 Reduction per Technician Hour Rule*

3 Insulate Foundation Walls

4 Boilers: Install Pipe Insulation on Heat Distribution Lines

Furnaces: Airseal Supply Side of Duct Systems

Airseal Basement Ceiling Bypasses

…In Dry Basements

Measures identified with an * are required on every project.

The content illustrated on this page shall be followed as a measure prioritization guide if the basement/crawlspace is dry or preexisting moisture issues will be addressed before or during the WAP project in accordance with Incidental Repair and Health and Safety policies.

Basement ceilings become an interior surface whenever the thermal boundary is established out at the basement perimeter. In these cases, blower door readings shall be taken with any interior doors leading down into the basement opened. Measures to airseal basement ceiling bypasses should be the lowest priority tasks pursued in homes meeting the criteria outlined on this page.

A Low Priority Measure

Weatherization Works

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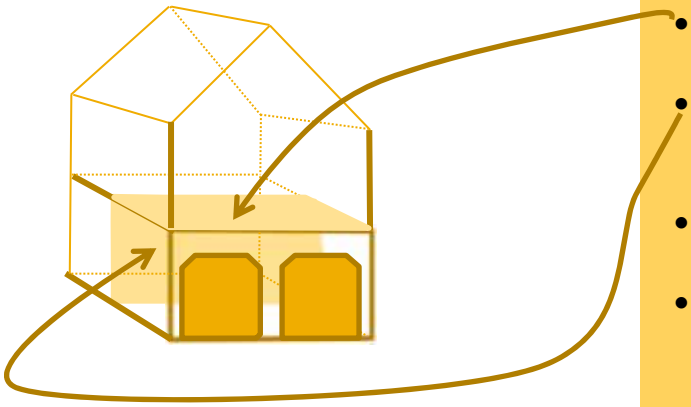
Basements & Crawlspaces
Tuck Under Garages

Put the Garage Outside



Or…

Put the Car Outside

Allowable measures that place the garage outdoors to optimize client safety and ensure a complete thermal envelope include:

- Airseal and insulate garage ceiling
- Airseal and insulate garage wall(s) bordering the basement
- Build Partition(s) as needed
- Airseal any door(s) separating the garage from the basement
- Airseal, insulate and/or reroute any <u>return</u>-ductwork in garage
- Insulate any plumbing and/or heat distribution lines in garage.

If either of these approaches is viable for the Wx provider and acceptable to the client then the most cost-effective work order shall be performed. If neither approach is viable for the Wx provider, or acceptable to the client, then Wx services are to be deferred.

Allowable measures that place the garage inside the thermal- boundary <u>after</u> permanently disabling the garage doors include:

- Frame a new wall system into the rough opening for a garage door. *A new wall may or may not include installation of a smaller door.*
- Airseal and insulate the exterior surfaces of the former garage in accordance with the policies outlined in this manual. *To prolong measure life, new building shell components that will be exposed to the elements must be constructed of exterior grade materials or paints/sealants must be applied after installation to prolong measure life.*

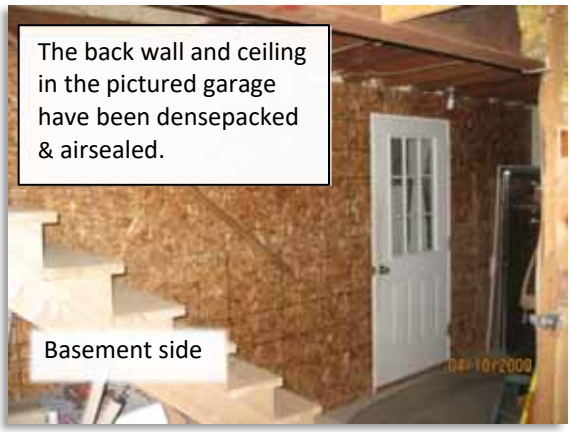
Weatherization Works

Basements & Crawlspaces

Tuck Under Garages

Tuck under garages must be isolated from the living space for health and safety purposes unless garage doors are permanently disabled.

This separation must be verified with smoke testing or series leakage testing.



Basements & Crawlspaces

Tuck Under Garages: Protocol Summary

Measure Screening Requirements

All "Garage Isolation" measures must be screened for cost-effectiveness. But even if "Garage Isolation" measures do not screen as cost effective for energy saving benefits alone, they can—and must—be completed for health, safety and indoor air quality purposes or weatherization is to be deferred.

How to Proceed if this Type of Measure Fails to Screen

In the event a "Garage Isolation" measure does not screen, in whole or in part, as an energy saving measure, then the entire measure—or portions of the measure—can be considered as an incidental repair cost. The portion of the project costs classified as incidental repairs must be included in the project-level SIR calculation. The project as-a-whole must screen as cost-effective inclusive of these incidental repair(s).

How to Proceed if Project Fails to Screen Due to Incidental Costs

If the project cannot absorb the needed incidental repairs without becoming non-cost-effective then weatherization shall be deferred and the client referred to alternate housing repair programs.

How to Proceed if Client Will Not Allow Garage Modifications

If none of the potential options for modifying tuck under garages (as outlined on page 12 in this section of the policy manual) is acceptable to the client then weatherization is to be deferred. A client cannot opt out of this requirement for their project.

Verification of Measure Effectiveness

All "Garage Isolation" airsealing measures shall be verified for effectiveness using smoke sticks/pencils in tandem with a blower door (or alternately by conducting series leakage testing) prior to project closeout.

- ✓ Note that the use of alternative pressure diagnostics and/or infrared cameras to verify the successful completion of airsealing measures is also encouraged. However, these techniques must be utilized in addition to, not instead of, the required use of blower door assisted smoke testing or series leakage testing.

Exterior Walls

Uninsulated Walls

Every uninsulated wall system that is, or will become, part of the thermal envelope shall be screened for energy improvement measures.

Uninsulated *Vs.* Poorly insulated

Whenever a potential energy improvement for an uninsulated wall section is determined to be cost effective, attempts to install the measure shall be taken during the project. For these wall sections, it is not allowable to exclude the insulation upgrades that meet or exceed minimum SIR levels from the scope of work.

Policy Exemption | Masonry Construction

Leaving a wall system uninsulated when potential upgrades do screen as cost-effective is only allowable with…

- masonry construction where there is no sheathing and/or vapor retardant layer to separate the interior side of the masonry wall materials from the insulation that would be added. This applies to structural masonry and masonry veneers.

The decision to insulate this type of wall system is at the sole discretion of the WAP agency.

Poorly Insulated Walls

Walls that appear to be poorly insulated during infrared scanning or while probing wall cavities must be thoroughly evaluated to determine the potential for energy improvement measures.

Walls that are determined to be poorly insulated, but that are not completely void of insulation, need to be screened for cost-effective improvement measures just like uninsulated wall systems.

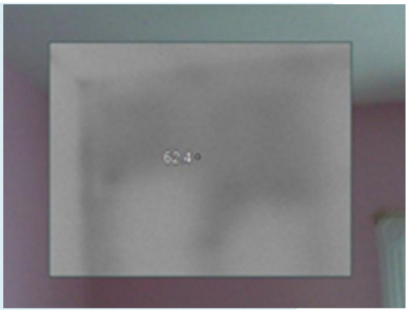
However, implementing potential improvement measures for poorly insulated wall systems that meet or exceed the minimum SIR guidelines are not automatically required.

Inclusion of this type of measure in a WAP project is optional and shall be prioritized along with other potential energy saving measures based on SIRs.

The use of infrared cameras as building diagnostic and quality assurance tools is recommended for all projects, all year long. The use of infrared cameras is required during (1) the energy audit, (2) the weatherization project installation & (3) the quality control inspection whenever there is a 10˚F temperature difference between the inside & outside of the building.

Modeling Wall Systems with Settled Insulation

When only a portion of a wall system is found to be void of insulation because the preexisting insulation has settled over time, **that section of wall shall be considered uninsulated and entered separately in the energy audit software**. Attempts must be made by the WAP to insulate the empty wall sections.



Weatherization Works

Exterior Walls

All exterior wall insulation upgrades shall be addressed from the building exterior and/or by tubing down from attics or kneewall closet areas whenever possible.

Material Preference

When a blown-in material is used to insulate exterior walls preference shall be given to dense-packed cellulose insulation.

Installation Standards

- ✓ Cellulose must be installed to at least 3.5 pounds per cubic foot using tube insertion methods.
- ✓ Two-hole installation methods (think 1980's) are not allowable.

Alternate Installation Techniques

Densepacking walls from inside is acceptable practice if working from the exterior is not possible and the client finds this approach acceptable. All holes must be patched. Installing chair rail over the holes is recommended. A first coat of finish materials shall be applied if chair rail or comparable is not installed.

Chair Rail Approach

Exterior Walls

Sheds, Cold Storage Areas, Split-Levels

Establishing Thermal Boundaries

In many buildings establishing a continuous thermal boundary is challenging. Whenever a heated space backs an unconditioned space and the wall between them is going to be considered part of the thermal boundary, then the surface is to be addressed using the protocols established for exterior walls.

Above, spray foam was utilized to separate an unheated storage area from the rest of the home.

Rim Joists (2nd Floor & Above)

Evaluation Requirements

- ✓ The thermal performance of every rim joist area must be thoroughly evaluated utilizing blower-door-assisted (BDA) pressure diagnostics and/or BDA infrared scanning.
- ✓ The full perimeter of the rim joist area must be entered/modeled separately from the exterior walls in the Hancock Energy Software **for every project**.

Improvement Requirements

With **Accessible Kneewall Closets**	***Without*** **Accessible Kneewall Closets**
Refer to the "Top of Building" section of this manual for complete airsealing and insulating protocols at the rim joist level.	Whenever potential energy improvements screen as cost-effective, an attempt to densepack the rim with cellulose using the bag & blow method shall be undertaken during the WAP project. If after reasonable attempts have been made, it is not possible to upgrade the rim in a timely, cost-effective manner, this shall be noted on the workscope and recorded in the client file.

Exterior Walls

Rim Joist (2nd Floor & Above)

Attempted Measure Exemption

Attempting to airseal/insulate the rim area is not required during a Wx project if the rim is a solid beam and there is no access to the beam from a kneewall closet area. However, this measure is allowable if:

- ✓ The measure is cost-effective *(inclusive of all necessary ancillary measure costs)*.
- ✓ The proposed execution of the measure is acceptable to the weatherization client.

Above, self-help project components enabled the rim (a 6" beam) to be included in the Wx project.

Suspended Ceilings

Wall sections above suspended ceilings shall be thoroughly evaluated on all Wx projects. If the wall sheathing is missing or in disrepair then, at minimum, the wall section shall be thoroughly airsealed *(see images below)*. If the area is insulated with fiberglass batting and the existing batting is exposed, then it is allowable practice to remove the exposed fiberglass and reinsulate the surface in accordance with the policies outlined for boxsills in the "Bottom of Building" section of this manual *(Section 2: Page 1)*.

Section 3: Sides of Building

Windows & Doors

Existing windows & doors shall only be improved as energy saving measures after all other potential energy-saving improvements have been completely addressed. Appropriate measure groups are identified below.

Energy Saving Measures

Airsealing Improvements	R-Value Improvements
✓ Door- Sweep/bottom ✓ Door- "Q-lon" or comparable *(do not use felt or foam)* ✓ Door- Adjustment/repair with airsealing benefit ✓ Window- Caulk/seal/weatherstrip ✓ Window- Sash locks, pulley seals ✓ Window- Install "Tyzall" or comparable window kit ✓ Window- Repair existing when glass is broken or missing *(at single pane only)*	✓ Door- Replace a hollow-core exterior door w/an R-5 *(+)* door ✓ Door- Fasten a layer of foam insulation board to a wooden door ✓ Window- Install metal-frame storm *(at single pane only)* ✓ Window- Install wood-frame storm *(at single pane only)*

Non-Energy Saving Measures

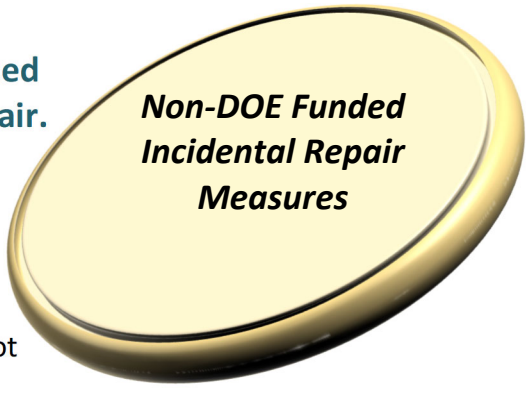
All window & door replacement measures, except the replacement of a hollow core door, shall be:

- **Classified as incidental repairs**
- **Performed using Non-DOE funding**

Window & doors shall only be replaced when they are damaged beyond repair.

Window example: A single pane window where the glass is badly cracked and the sash is too rotted for the successful installation of a replacement pane of glass.

Door example: An exterior door that cannot be adjusted or repaired to close and lock.



Section Overview

All measures that are programmatically defined as "non-energy saving measures" shall be vetted for allowability in accordance with the policies outlined in this manual.

Definitions | Energy Saving Measures Vs. Non-Energy Saving Measures

Energy Savings Measures are defined as measures that generate individual mmbtu savings projections and measure-level SIRs when entered in the Hancock Energy Software (HES).

Non-Energy Savings Measures are defined as measures that do not directly generate individual mmbtu savings projections or measure level SIRs when entered into HES.

Non-Energy Savings Measures include:

- Health & Safety Measures
- Incidental Repair Measures
- Ancillary Measures
- General Energy Waste Reduction Measures

This definition can be a little confusing because some of these Non-Energy Savings Measures will result in energy savings when installed. However, these measures are programmatically classified as non-energy saving in Vermont's program because they do not generate individual mmbtu savings projections and measure-level SIRs for each job.

This section of the manual has two parts:

- **Part A:** Outlines measure and budget classification policies for all non-energy saving measures.
- **Part B:** Details technical policy and procedures for various non-energy saving measures.

WAP Funded Program Activity & Code Compliance | A balancing Act

Successful execution of the WAP requires differentiation between imminently dangerous conditions and preexisting code compliance issues.

It is a violation of the weatherization grant to perform corrective actions for preexisting code compliance conditions that are not identified within this policy manual as issues that WAP providers can, or shall, address using WAP funding during weatherization projects.

Measure Classification | Impacts on Grants & Individual Jobs

Health & Safety, Incidental Repair & Ancillary Costs

Health & Safety Measures

For DOE grants only

These measures are classified to a separate budget category. The maximum allowable budget for health and safety is based on a percentage of the overall DOE Unit Production Budget.

The DOE Unit Production budget is the sum of (1) Materials (2) Program Support-Onsite and (3) Program Support-Offsite.

The DOE Job cost average is calculated using the sum of the same budgets/costs that make up the DOE Unit Production Budget: (1) Materials (2) Program Support-Onsite and (3) Program Support-Offsite. Health & Safety costs are excluded from the makeup of the DOE Job Cost average and from the DOE Unit Production Budget.

There is no cap on allowable Health & Safety costs for an individual job. The cap is only for the grant as-a-whole, so in effect there is a maximum allowable H & S job cost average for each DOE grant that is managed separately from the regular DOE job cost average.

The total expenditures on Health & Safety classified measures cannot exceed the budgeted total specified within each DOE grant agreement.

The costs associated with Health & Safety measures cannot be charged to any other budget line of the DOE grant other than the Health & Safety budget line.

All Health & Safety costs are excluded from any measure-level or project-level SIR calculations.

For Non-DOE grants only

There is no Health & Safety budget line in Non-DOE grants. These measures are not classified to a separate budget category in the grants.

H & S costs are included in the makeup of the Non-DOE Job Cost average and the Non-DOE Unit Production Budget.

The Non-DOE Unit Production budget is the sum of (1) Materials (2) Program Support-Onsite and (3) Program Support-Offsite. The costs associated with H & S measures are included within two of the above three budget lines. Any Material costs that are associated with H & S measures get recorded as materials. Any labor costs that are associated with H & S measures get recorded as Program Support-Onsite.

There is no cap on allowable H & S costs for an individual job and there is no direct cap on overall H & S costs during the grant period.

All H & S costs are excluded from any measure-level or project-level SIR calculations.

Measure Classification | Impacts on Grants & Individual Jobs

Health & Safety, Incidental Repair & Ancillary Costs

Health & Safety Measures

The following measures shall be classified as Health & Safety measures whenever they are completed during a weatherization project:

1. Lead-safe weatherization expenses *(must be recorded to a separate measure for every job within the Hancock Energy Software (HES) whenever lead safe weatherization work is performed)*
2. General safety devices: smoke alarms, and carbon monoxide alarms
3. General safety devices: fire extinguishers *(w/ solid fuel source in home only)*
4. Combustion appliance safety devices: Firematics, emergency switches, spill-switches, temperature/pressure relief system components and expansion tanks
5. CTE, repair or replace heating system *(whenever an SIR of 1.0 or greater cannot be attained, 100% of these measure costs must be recorded to an H & S measure in HES)*
6. Repair or replace chimneys, flues or SRJs *(this includes chimney liner installations)*
7. Forced hot air distribution systems *(any changes to the size or length of the duct system must be recorded to an H & S measure in HES)*

   Examples include:

   - ✓ Adding or removing sections of the return and/or supply ductwork
   - ✓ Increasing or decreasing the size e.g., diameter, of the ductwork used
   - ✓ With a dual furnace scenario - separating the distribution system from a no-longer or seldom used appliance that it was previously connected to
8. CTE, repair or replace water heater *(whenever an SIR of 1.0 or greater cannot be attained, 100% of these measure costs must be recorded to an H & S measure in HES)*
9. Provide either combustion air to appliance or CAZ pressure relief to increase appliance draft performance
10. Permanently disconnect ventless heaters
11. Repair stove/oven
12. Replace stove/oven *(not an allowable DOE expense, must use Non-DOE funding)*
13. Mechanical ventilation *(any work related to installing exhaust fans and/or dryer venting that does not produce thermal energy saving benefits)*
14. Installing poly or comparable on the ground *(including slip resistant runways)*

Measure Classification | Impacts on Grants & Individual Jobs

Health & Safety, Incidental Repair & Ancillary Costs

Incidental Repair Measures

These measures are non-energy saving measures, but they are classified and managed differently than Health & Safety measures. The following is applicable to all weatherization funding sources *(DOE & Non-DOE)*.

- Incidental Repair costs are included in the makeup of the job cost average.
- Incidental Repair costs are excluded from any measure-level SIR calculation(s).
- Incidental Repair costs are included in the project-level SIR calculation.

Incidental Repairs help to determine if prospective weatherization projects can be performed cost-effectively. The costs associated with all the needed incidental repairs are added together with all the costs of the energy savings measures[1] for each project. Then, these combined project costs (for the energy savings measures plus the incidental repair measures) get used to calculate the Savings to Investment Ratio (SIR) for the overall project.

A project must have a project-level SIR of 1.0 or greater to proceed. This is the minimum allowable SIR. A project that does not meet the minimum SIR requirement cannot be completed with Weatherization funding.

When the project-level SIR is less than 1.0 the following actions should be taken:

- Evaluate whether or not any of the recommended incidental repair work is non-essential to the weatherization project. If some incidental repair work can be trimmed from the scope of work, determine if the SIR is a 1.0 or greater without that work being included.
- Reassess the energy saving measures included on the scope of work to see if they can be accomplished in a different way that yields a better project-level SIR.
- If changing the scope of work is not a viable option, additional non-weatherization project funding options should be pursued to enable the project to proceed and to avoid a project deferral.

In cases where the options listed above are not able to increase the project-level SIR above the needed threshold, the project may need to be deferred.

Project deferral decisions shall be made in accordance with the policies outlined in Appendix F & Appendix G of this manual.

[1] Note the cost of the energy savings measures also includes their ancillary costs.

Measure Classification & Budget Allocations

Protocol Summary: Health & Safety, Incidental Repair & Ancillary Costs

Incidental Repair Measures

The following measures shall be classified as Incidental Repair measures whenever they are completed during a weatherization project:

1. Knob & tube wiring related measures
2. General electrical repair measures *(not knob and tube)*
   For example: junction box installations, frayed or pest damaged wiring, etc.
3. Required "Garage Isolation" measures

   Only the remainder of the garage isolation measure costs that fail to screen as cost-effective energy saving measures are classified as incidental repairs.
4. Required "Top of Building" Airsealing measures
   Only the remainder of the "Top of Building" A.S. measure costs that fail to screen as cost-effective energy saving measures are classified as incidental repairs.
5. Bulk water issues: roof repairs or install new/improve existing gutters
6. Bulk water issue: plumbing repairs to fix leaks
7. Bulk water issue: sump pits, sump pumps, trenching and drainage improvements
8. Remove heat lamp or replace heat lamp with alternative device
9. Forced hot air distribution systems:
   - ✓ Install new heat registers/grills
   - ✓ Patch or repair existing ducts
   - ✓ Site Built Homes Only | Duct Sealing & Insulation located within the pressure boundary
   - ✓ Site Built Homes Only | Duct Sealing & Insulation located outside of the pressure boundary can be classified as <u>either</u> General Energy Waste Reduction Measures <u>or</u> as Incidental Repair Measures.
10. Install fill pipes and/or vent pipes to the outdoors on fuel tanks
    - ✓ Only when none exists at all, not to improve existing conditions simply because the existing piping is not up to current code.
11. Most window and door improvement measures
    - ✓ See "HEAT" drop down measure lists and/or Section 3 of this manual, "Sides of Building", for a list of allowable exceptions to the incidental repair measure classification for window/door improvements.

    Funding source exclusion: Whenever a window or door improvement measure is completed and the measure is classified by the Vermont program as an incidental repair measure, the window/door work shall be paid for with Non- DOE funding. The rest of the project, minus the window/door work, can be DOE funded.
12. Vermiculite remediation work

    Funding source exclusion: DOE funds cannot be used for Vermiculite remediation measures. The rest of the project can be DOE funded.

Measure Classification & Budget Allocations

Protocol Summary: Health & Safety, Incidental Repair & Ancillary Costs

Ancillary Measures

These measures are lower-cost, non-energy saving measures that are integral components of an energy saving measure or a subset of energy saving measures within an overall projects' scope of work. The following is applicable to all weatherization funding sources *(DOE & Non-DOE)*.

- Ancillary costs are included in the makeup of the job cost average.
- Ancillary costs are included in measure-level SIR calculations.

Every energy-saving measure shall meet or exceed the current minimum SIR requirement to be completed during a project. The cost of all ancillary measures must be included in the SIR calculation for the energy saving measure.

Alternatively, the energy saving measure could be implemented without the ancillary components if that would enable the measure to meet the minimum SIR requirement and the installation could still be performed safely and meet all program standards.

Ancillary Measures

The following measures shall be classified as ancillary measures whenever they are completed during a weatherization project. The most applicable energy saving measure-group(s) to associate common ancillary items with are outlined in the table below:

Energy Saving Measure Group(s)	Ancillary Measure
Attic, Clg	Insulation dam- around chimney/flue
Attic, Clg	Insulation dam- general (18"-24" height)
Attic, Clg	Install vent baffle
Attic, Clg	Install gable vent
Attic, Clg, Wall	Cut access- no hatch present to attic or kneewall closet
Attic	Install or improve hatch less than 8 sq. ft.
Attic, Clg, Wall	Patch interior sheathing (less than 4 sq. ft.)
Attic, Clg, Wall	Patch interior sheathing (large area)
Attic, Clg, Wall	Install strapping
Wall	Install chair-rail
Rim	Expose rim- remove materials as needed
Fnd, Flr, Sill	Cut access- no hatch present to crawlspace
Sill	Expose sill- cut swath of ceiling materials
Fnd, Sill	Expose surface- remove brick, masonry, lath
Fnd, Floor, Rim, Wall	Apply fire retardant barrier over foam mats.

Non-Energy Saving Measures | Technical Requirements

General Safety Devices

Smoke Alarms	✓ One installed on each floor ✓ One installed in the immediate vicinity of each sleeping area
*For complete information on material specifications, installation & occupant education requirements refer to **Appendix E** of this manual.*	
Carbon Monoxide Alarms	✓ One installed in the immediate vicinity of each sleeping area.
*For complete information on material specifications, installation & occupant education requirements refer to **Appendix E** of this manual.*	
Fire Extinguishers	Installation of one per home is allowed by WAP only when a solid fuel sourced appliance is used within the home.

Combustion Appliances: Non-Allowable Installations

Ventless Heaters	
Fixed Installation	**Portable Models**
Ventless heaters must be disabled prior to weatherization and ***Wx Waiver 01*** must be signed by client. If the ventless heater is not disabled and the waiver form is not signed then weatherization is to be deferred.	In the case of a portable ventless heater, the client shall be warned of the dangers for continued operation and sign ***Wx Waiver 01***. If this waiver form is not signed by the client then weatherization is to be deferred.
*With either type of ventless heater, **Wx Waiver 01** shall be provided to and signed by the client prior to performing any WAP funded activity beyond an initial energy audit.* --- *These waivers are included in **Appendix H** of this manual.*	

Non-Energy Saving Measures | Technical Requirements

Combustion Appliance Safety Devices

Vermont WAP protocols for the required safety related components of domestic water heating and space heating systems are outlined below:

Gas Fired	*V.*	Oil Fired

Required System Components

All Systems:

- ✓ Emergency Switch
  (at top of stairwell or outside of a dedicated utility room)
- ✓ A means for disconnecting the power source at or within sight of the appliance.
  (the power cord for a plug-in type appliance or a breaker panel within sight of the appliance both meet this requirement)

Hydronic Systems:

- ✓ T & P relief valve & blow-off pipe *(within 6" of floor or down through floor/belly material)*
- ✓ Working expansion tank
  (unless this part is not required by system manufacturer)

All Systems:

- ✓ Emergency Switch
  (at top of stairwell or outside of a dedicated utility room)
- ✓ Firematic
  (plug or wheel type)
- ✓ Sleeved oil line above concrete
  (unless the fuel tank itself is located below ground)

It is not a requirement to replace the existing oil line for the sole reason that it is in contact with the ground as long as no portion of the oil line is underneath the ground/slab.

Hydronic Systems:

- ✓ T & P relief valve & blow-off pipe
  (within 6" of floor or down through floor/belly material)
- ✓ Working expansion tank
  (unless this part is not required by system manufacturer)

Optional Devices: Gas Appliances Only

- ✓ Firematic installation is not required but installation is allowable.

Optional Devices: Gas & Oil Appliances

- ✓ Spill switches are not required, but installation is allowable. Spill switch installation on Category 1 gas-fired appliances is encouraged, particularly if there is a wood stove or wood fireplace present in the home.

Non-Energy Saving Measures | Technical Requirements

Chimney & Flue Protocols

New Installations

When a new combustion appliance is installed by WAP the system installation must be fully code-compliant.

Preexisting Combustion Appliance Installations

Single Fuel Source

All chimneys and flue pipes must be clear of obstructions and in safe working order prior to any weatherization shell measures being completed. Chimney repairs and/or chimney liners can and shall be installed using WAP funding whenever an existing chimney and/or chimney liner is deemed unsafe. However, WAP funding cannot be used to install a chimney liner just because a chimney is not lined and is therefore deemed non-code compliant. Unlined chimneys that are free of obstructions and in working order shall not be lined using WAP funding just to meet code requirements if the appliance passes worst-case spillage and draft tests, passes WAP combustion testing protocols, and the preexisting chimney/flue condition presents no imminent danger to building occupants.

Multiple Fuel Sources w/ Shared Venting

Oil-Fired Appliances Mixed w/ Gas-Fired Appliances

Weatherization funding shall not be used to separate, or otherwise alter, the shared venting of oil and gas fired appliances with the following exception:

- One or all of the combustion appliances that share the same chimney fail worst-case spillage and draft tests and altering the preexisting shared venting setup is the least expensive way to ensure all the appliances in question are able to pass worst-case spillage and draft tests.

Non-Energy Saving Measures | Technical Requirements

Chimney & Flue Protocols

Preexisting Installations

Multiple Fuel Sources w/ Shared Venting

A Solid Fuel Mixed w/ Oil or Gas

Utilizing Weatherization funding to perform the actions outlined below is allowable:

To rectify a shared venting concern:

- Action 1 | Disconnect an appliance and cap one of the openings to the shared chimney or flue
- Action 2 | Install a different category water heater that does not need a chimney or install a water heater that utilizes a different fuel source.

To provide additional back-drafting protection in homes with this type of shared venting scenario:

- Action 3| Install spill switches on Category 1 gas appliances

Note the three allowable actions listed above are not WAP program requirements if the combustion appliances pass worst-case spillage and draft tests, pass WAP combustion testing protocols, and the preexisting chimney/flue condition presents no imminent danger to building occupants.

The following actions to rectify this type of shared venting concern are only allowable using WAP funding when certain conditions are met.

- Action 4 | Install a different category heating system
- Action 5 | Perform significant venting alterations (greater than $500.00)

Condition 1 | WAP funding can be used for Actions 4 or 5 to rectify a shared venting concern when performing those measures will be less expensive than performing any combination of Actions 1, 2, or 3.

-- or --

Condition 2 | WAP funding can be used for Actions 4 or 5 to rectify a shared venting concern when performing Actions 1, 2 or 3 is not likely to address the issue.

Non-Energy Saving Measures | Technical Requirements

Distribution Systems | Heating, Hot Water & Misc. Plumbing

Forced Air Systems

Ductwork shall be thoroughly evaluated during all Weatherization projects.

Evaluation requirements

Initial Evaluation at the Energy Audit:
All ductwork shall be thoroughly inspected by an energy auditor. Every furnace shall be evaluated for short-cycling by monitoring the fan limit controls whenever they are accessible. **In addition, a heat rise test shall also be completed on all forced hot air duct systems.**

Findings that Require WAP Corrective Actions:
If the unit short cycles or the heat-rise is outside of the manufacturers recommended range, **then the supply and/or return ductwork must be improved by WAP**. If the appliance-specific heat rise information is not available, then use a 45 to 70 degree range as the acceptable heat rise.

Final Evaluation at the Quality Control Inspection:

- ✓ Scenario A: Another evaluation for short-cycling and another heat-rise test is required by a quality control inspector if a problem with the distribution system was identified at the time of the energy audit and/or distribution system improvements beyond basic duct sealing measures were completed during the project.

- ✓ Scenario B: If no problems were identified during the energy audit, and the only distribution system improvements performed during the project were standard duct sealing measures, then another short cycling evaluation and heat rise test is not required during the QCI.

Additional Policy Guidance
The content of the archived Weatherization Technical Bulletin # 22 was incorporated into this TEC manual as Appendix I in 2012. This bulletin provides detailed guidance on procedures for evaluating furnace ductwork.

Non-Energy Saving Measures | Technical Requirements

Distribution Systems | Heating, Hot Water & Misc. Plumbing

Site-Built Homes | Forced Air - Heat Distribution Systems

Duct Sealing & Insulation		
Technical Protocols for ducts located **inside** of the pressure boundary		
Return Side	*Vs.*	Supply Side
All physically accessible joints on the return side of heat distribution systems need to be verified* as "leak-free" prior to completion of every weatherization project. When duct sealing measures are necessary, duct mastic shall be used to perform the work with the aid of mesh tape. ✓ Use of mesh tape is only allowable in tandem with duct mastic, not alone. ✓ Use of any other kind of tape for duct sealing purposes is not allowable. *The effectiveness of the duct sealing performed on return ducts inside the pressure boundary should be thoroughly evaluated and verified with smoke sticks *(or equivalent visual aids)* while the air handler is running.		Sealing the supply side of heat distribution systems is allowed. It is not required. This is a very low priority measure that should only be performed after all required weatherization measures have been performed.
Any ductwork that is located **inside** of the pressure boundary shall not be insulated using WAP funding.		

The measures covered in the table above can no longer be classified as General Energy Waste Reduction Measures. Instead, these measures shall be classified as Incidental Repair Measures on every project (effective 2019).

Non-Energy Saving Measures | Technical Requirements

Distribution Systems | Heating, Hot Water & Misc. Plumbing

Site-Built Homes | Forced Air - Heat Distribution Systems

Duct Sealing & Insulation
Technical Protocols for ducts located **outside** of the pressure boundary
Return Side & Supply Side
Any ductwork that is located **outside** of the pressure boundary shall be: 1. Sealed with duct mastic as needed with the aid of mesh tape. 2. Verified* as "leak free". 3. Insulated to R-8 minimum. *The effectiveness of the duct sealing performed outside the pressure boundary shall be verified with smoke sticks *(or equivalent visual aids)* while the air handler is running prior to insulating the ducts.

The measures in the table above can be classified as either General Energy Waste Reduction Measures or as Incidental Repair Measures (effective 2019).

Mobile Home | Forced Air - Heat Distribution Systems

- Whenever a workscope is developed for a mobile home project using the DOE approved priority-list, all duct sealing & insulation measures shall be classified as General Energy Waste Reduction Measures.
- Whenever a workscope is developed for a mobile home project by performing a site-specific energy model, these measures shall be classified as Energy Saving Measures that generate a Savings to Investment Ratio.

Non-Energy Saving Measures | Technical Requirements

Distribution Systems | Heating, Hot Water & Misc. Plumbing

This section covers protocols for distribution system improvement measures classified as incidental repair measures.

Hydronic Heat Distribution System Improvements

Baseboard heating units, sections of radiant heat tubing and radiators are not to be installed or repaired by WAP unless:

- A unit of baseboard, section of radiant heat tubing or a radiator is leaking
- The improvement is intended to correct a short-cycling problem

When the type of repairs outlined above are necessary to fix or prevent water leaks in order to protect a WAP investment from water damage they are to be classified as incidental repair measures.

Domestic Hot Water & Misc. Plumbing Distribution Systems

Any miscellaneous plumbing repairs that are undertaken to fix or prevent water leaks in order to protect a WAP investment from water damage are to be classified as incidental repair measures. In addition to DHW supply lines, this policy is applicable to cold water piping and to drainage lines.

Measure Classification | Heating/DHW Appliances v. Distribution Systems

The incidental repair measure classification outlined on this page is specific to distribution systems.

Whenever a boiler or water heater is repaired or replaced for any non-energy efficiency upgrade reason, i.e., it does not produce at least a 1.0 SIR, the replacement of the appliance itself shall be classified as a health and safety measure.

Non-Energy Saving Measures | Technical Requirements

Indoor Air Quality & Building Durability

Bulk Water & Moisture Control

Damp Basements/Crawlspaces	V.	Wet Basements/Crawlspaces

Every basement and crawlspace with an earthen floor that can be categorized as damp—no recurring flooding or standing water issues—shall have six mil. poly sheeting *(or equivalent)* installed over the ground.

If a ground source moisture barrier cannot be installed over a damp earthen floor *(or there is an inaccessible/non-viewable crawlspace)* there are two allowable options, one of which must be followed to proceed with a weatherization project:

A. Inform client about importance of reducing ground source moisture levels, have client sign **Wx Waiver 02; Option A**, and defer the project until obstacles to ground moisture barrier installation have been removed.
B. Inform client about importance of reducing ground source moisture levels, have client sign **Wx Waiver 02; Option B** and proceed with weatherization activities.

A ground source moisture barrier shall not be installed over an earthen floor if a basement/crawlspace area is prone to flooding or standing water on the ground is a typical condition.

If however, any of the following measures are reasonably anticipated to transform the basement from a wet to a damp classification, then those actions shall be performed to control the bulk water issues and then the standard protocol for damp basements and crawlspaces shall be followed.

Sump Pumps	The installation of a sump pump *(and any required system trenching)* to reduce moisture problems is an allowable WAP expense.
Gutter Systems	Installing new or improving existing gutter systems are allowable WAP expenses.

Weatherization must be deferred in accordance with the deferral policy outlined in Appendix F of this manual when the scope of actions required to control bulk water issues in a wet basement or crawlspace zone is more extensive than the measures identified in this section or within section 2 of this policy manual.

Ground Source Moisture Barrier: Installation Details

- ✓ The installation of rolled roofing *(or comparable)* over a ground source moisture barrier in heavily trafficked areas is encouraged to provide improved traction and prevent slip and falls.
- ✓ Ground source moisture barrier must be overlapped at all seams by a minimum of 12 inches.
- ✓ When directly exposed to wind effects or the ground slope is likely to cause movement of the moisture barrier then it must be fastened to the ground with durable fasteners or ballast(s).

Non-Energy Saving Measures: Technical Requirements

Electrical Hazards

Knob & Tube Wiring Policies

This section outlines acceptable courses of action when knob and tube wiring is identified during a weatherization project:

1. Tenting/damming around the wiring is acceptable in flat attic areas as long as blown insulation will not be in contact with or installed above/over the knob and tube.
    - In a case where there is already insulation in contact with the knob & tube wiring in a flat attic area and the surface containing the knob & tube will remain the pressure/thermal boundary, the pre-existing insulation needs to be removed so effective tenting/damming can be practiced. Otherwise, the wiring will need to be removed before proceeding with the weatherization project.
    - This policy is applicable in both unfloored attics and in floored attics.
2. When (a) there is preexisting knob & tube wiring under a decked attic floor and (b) the thermal envelope will be moved up to the roofline and (c) WAP will not be weatherizing the attic floor at all, then the wiring will not need to be removed by WAP.
    - In this scenario, none of the preexisting insulation that is already in contact with the wiring needs to be removed by WAP because the weatherization project is not addressing that surface at all.
3. It is not a WAP requirement to remove preexisting knob and tube wiring when it is located within closed-cavity building surfaces (walls, floors or sloped ceilings) that will not be insulated during the project for these reasons:
    1. The closed cavity building surface already contains insulation, and
    2. Performing an insulation upgrade will not meet minimum SIR requirements.

Non-Energy Saving Measures: Technical Requirements

Electrical Hazards

Knob & Tube Wiring Policies

4. Preexisting knob and tube wiring does not have to be removed by WAP when it is located in an area of the building that will not receive any weatherization improvement measures during the project. For example:
   - Knob & tube located at the roof and gable end walls of an attic when the attic floor is the pressure/thermal boundary.
   - Knob & tube located at the basement ceiling when the basement perimeter is the pressure/thermal boundary.
5. Leaving preexisting knob and tube wiring in the building is not allowed when:
   - Sloped ceiling bays that are (a) part of the pressure/thermal boundary and (b) are void of insulation would have to remain uninsulated because insulation could not be installed without contacting the knob & tube wiring.
   - The execution of required "Top of Building" airsealing measures would not be possible due to the location of the knob & tube wiring.

Knob & Tube Wiring Protocol Summary

Measure Screening Requirements
All WAP funded knob & tube improvements shall be allocated as incidental repair measure costs and be included in project-level SIR calculations. The project as-a-whole must screen as cost-effective inclusive of these incidental repair costs.

How to Proceed if Project Fails to Screen Due to Incidental Costs
If the project cannot absorb the needed incidental repair costs without falling below the minimum required project-level SIR, then the project cannot be completed with Weatherization funding alone. Additional project funding options should be pursued to avoid a deferral. If no other funding options exist, the project will need to be deferred in accordance with Appendix G of this manual.

Client Notification
If knob and tube wiring is found anywhere in the building and WAP will be either deferring a project or leaving some of the knob and tube in place in accordance with this policy, it **must be communicated to the client in writing**. The written communication must specify whether or not there is/was any preexisting insulation in contact with the knob and tube. This acknowledgement must be signed by the client and a copy retained in the client file.

Non-Energy Saving Measures: Technical Requirements

General Electrical Hazards | Not Knob & Tube

Wiring Connections
All wiring connections within one foot of a surface that will be airsealed and/or insulated by WAP must be housed in a properly covered junction box.

Damaged Wiring
Any visibly compromised electrical wiring (frayed, rodent-damaged, etc.,) must be repaired. Electrical repairs must follow incidental repair policy.

Non-Energy Saving Measures: Technical Requirements

Lead Safe Weatherization | Vermont's WAP Protocols

This appendix provides clarification to the Vermont WAP network on specific protocols to follow with regards to the EPA RRP Final Rule.

Background & Reference Materials:
For the complete listing of requirements please refer to the Electronic Code of Federal Regulations "40 CFR Part 745". Sections 745.82, 745.84 and 745.86 provide particularly valuable information. *These three sections are included with this guidance in Appendix J.*

Vermont WAP Protocols & Record Keeping:
It is required to complete and upload the form below to the HES file for each individual project regardless of whether or not lead safe practices are required during the energy audit or the construction phase of a weatherization project.

- ✓ Signature Page/Pre-Renovation Form verifying the informational packet entitled, "Renovate Right: Important Lead Hazard Information for Families, Child Care Providers, and Schools" was provided to the client.

Lead Testing:
A lead test is required only if disturbing more than six square feet interior per room or 20 square feet total on the exterior. Whenever lead testing is required, the test results must to be recorded on the dedicated "Lead Test Form". *This form is included with this guidance in Appendix J.*

Any completed lead test form should be uploaded to the HES file regardless of the test results. Written documentation to an owner and/or tenant regarding the results of a lead test does not need to be provided unless the results are requested by the owner and/or tenant.

Certifications:
It is not a requirement to include individual print outs of the certifications for an agency or for individual renovators working on a specific project within each project file. Those certifications only need to be maintained on file in the weatherization office so they could be viewed upon request. However, daily documentation of each worker that performed "LEAD SAFE" work on each individual project is required. This documentation is accomplished using the daily labor log report and by performing labor details data entry in HES.

Non-Energy Saving Measures: Technical Requirements

Lead Safe Weatherization | Vermont's WAP Protocols

Additional WAP Requirements:
It is a requirement to record the following information and upload it within each individual HES project file where "Lead Safe Weatherization Practices " are necessary:

1. Always utilize the separate measure coding for all "LEAD SAFE" costs in HES.

2. Use the "LEAD SAFE" measure coding on all relevant program paperwork, crew labor logs, etc., through the final labor details entries recorded in HES.
   - Crew labor logs and entries made to the 'Labor Details" screen in HES must clearly indicate who performed "LEAD SAFE" tasks on the project.

3. Complete the "Renovation Checklist" for each project. *This form is included with this guidance in Appendix J.*
   - The fourth line on this form "Name of Assigned Renovator" must indicate the same person signing off/dating at the bottom of the form.

4. Photograph the containment areas that are setup at the job and the signage that is posted at the job. Upload these photos to the individual HES project file for future reference.

WAP Client Discretion & Opting Out

A weatherization client cannot opt out of any "Lead Safe" requirements for their project under any circumstance. All applicable rules apply to every weatherization project or the project is not to be completed.

Non-Energy Saving Measures: Technical Requirements

Potential Asbestos Containing Materials (ACMs)

This section is applicable to any potential asbestos containing materials (ACMs) except for Vermiculite. Vermiculite policies are outlined separately in Appendix G.

Potential ACMs in Friable Condition | If potential asbestos containing material is present in the home and it is in a friable condition or it is observably frayed, breaking apart or unraveling, then blower door testing is not-required by the WAP during the project. Any blower door testing that is performed must be positively pressured blower door testing unless the potential ACM that is in a friable condition gets tested by a qualified asbestos professional prior to performing the blower door test and the test results indicate the material does not contain asbestos.

Potential ACMs in Non-Friable Condition | If potential asbestos containing material is present inside the home and it is not in a friable condition and it is not observably frayed, breaking apart or unraveling, then blower door testing is required by the WAP during the project.

ACM Abatement & Repair | Only a qualified asbestos professional shall perform the abatement of, or repairs to, a potential ACM.

Reducing the WAP Scope of Work due to the Presence of Potential ACMs | A WAP provider must get written permission from the OEO to proceed with performing a weatherization project that omits standard required measures from the scope of work due to the presence of a potential ACM. The "Atypical Project Approval" form shall be used to request this permission for individual projects. Approvals must be uploaded by the WAP provider to the HES job file.

Energy Saving Measures v. General Energy Waste Reduction Measures

Some measures can be classified as either Energy Savings Measures (ESMs) or as General Energy Waste Reduction Measures (GEWRMs) depending on how they are recorded to individual jobs. The classification made on each job depends on how the measures are recorded into energy modeling software. If a measure is going to be considered an ESM, then it must be screened by approved energy modeling software and generate a measure-level SIR ≥ 1.0 to be included on the workorder and installed on the job. If the measure is going to be considered a GEWRM then it does not need to be screened and proven to yield a measure level SIR ≥ 1.0. Instead, the measure cost can be counted against a $250 maximum allowable per-job investment for GEWRMs. Some measures that can be classified as GEWRMs and count toward the $250 per job cap are covered specifically in this section of the manual. Any miscellaneous weatherization work that (a) requires minimal investment and (b) provides some form of energy waste reduction, can be included toward the per job GEWRM cap of $250.

Heat Distribution Systems

Site-Built Homes | Forced Air Distribution Systems - Located inside the pressure boundary

The measures covered in the table below can no longer be classified as General Energy Waste Reduction Measures. Instead, these measures shall be classified as Incidental Repair Measures on every project *(effective 2019)*.

Duct Sealing & Insulation		
Technical Protocols for ducts located **inside** of the pressure boundary		
Return Side	*Vs.*	Supply Side
All physically accessible joints on the return side of heat distribution systems shall be verified* as "leak-free" prior to completion of every weatherization project. When duct sealing measures are necessary, duct mastic shall be used to perform the work with the aid of mesh tape. ✓ Use of mesh tape is only allowable in tandem with duct mastic, not alone. ✓ Use of any other kind of tape for duct sealing purposes is not allowable. *The effectiveness of duct sealing performed on return ducts inside the pressure boundary should be thoroughly evaluated and verified with smoke sticks *(or equivalent visual aids)* while the air handler is running.		Sealing the supply side of heat distribution systems is allowed. It is not required. This is a very low priority measure that should only be performed after all required weatherization measures have been performed.
Any ductwork that is located **inside** of the pressure boundary shall not be insulated using WAP funding.		

Heat Distribution Systems

Site-Built Homes | Forced Air Distribution Systems - Located outside the pressure boundary

These measures can be classified as either General Energy Waste Reduction Measures or as Incidental Repair Measures (effective 2019).

Duct Sealing & Insulation
Technical Protocols for ducts located **outside** of the pressure boundary
Return Side & Supply Side
Any ductwork that is located **outside** of the pressure boundary shall be: 1. Sealed with duct mastic as needed with the aid of mesh tape. 2. Verified* as "leak free"*. 3. Insulated to R-8 minimum. *The effectiveness of duct sealing performed outside the pressure boundary shall be verified with smoke sticks *(or equivalent visual aids)* while the air handler is running prior to insulating the ducts.

Heat Distribution Systems

Mobile Homes | Forced Air Distribution Systems

- Whenever a workscope is developed for a mobile home project using the DOE approved priority-list, all duct sealing & insulation measures shall be classified as General Energy Waste Reduction Measures.
- Whenever a workscope is developed for a mobile home project by performing a site-specific energy model, these measures shall be classified as Energy Saving Measures that generate a Savings to Investment Ratio.

Set-Back Thermostats

- Whenever programmable/set-back thermostats are installed they shall be classified as General Energy Waste Reduction Measures.

Domestic Hot Water Systems

Water Heaters| Tank Insulation – No Longer a General Energy Waste Reduction Measure (since 2018)

Efficiency Vermont (EVT) no longer funds insulation measures for water heaters. The local WAP agency can add tank insulation measures into their WAP scopes of work. However, it is no longer allowable practice to classify tank insulation measures as General Energy Waste Reduction Measures on any WAP jobs. To pay for the tank insulation measure using WAP funding the measure must be proven to yield a measure level SIR of ≥ 1.0 by approved energy modeling software.

The minimum insulation value of any added tank insulation must be R-11. The insulation must be installed in a manner that does not obstruct draft diverters, pressure relief valves or thermostats. All panel covers over the water heater elements must be in place prior to insulating the tank. For electric water heaters only, the tank insulation must either be cut on 3 sides so that the insulation material can be folded back to allow for access to the panel covers over the elements or the location of the panel covers over the elements must be drawn onto the tank insulation with permanent marker so that the insulation could be cut back at a later time to service the appliance.

Water Heater Piping | Pipe Insulation – Still A General Energy Waste Reduction Measure (2020)

Efficiency Vermont no longer funds insulation measures for the piping leads connected to water heaters. WAP funding shall be used to insulate 12 ft. total of the cold and hot leads connected to all water heaters regardless of water heater fuel type and the type of plumbing piping that extends from the water heater. Three feet of the cold-water piping and nine feet of the hot-water piping extending from the water heater shall be insulated unless those lengths of piping are physically inaccessible. If those full lengths of piping (3 ft. cold/ 9ft. hot) are inaccessible, then the length of piping that is accessible shall be insulated. This amount of piping is to be insulated regardless of the distance between the water heater tank and the first elbow in the piping runs. All corners of the pipe insulation must be mitered and mechanical fasteners must be used. Tape can be used in addition to, but never instead of, mechanical fasteners. Zip-ties do count as mechanical fasteners. Installing 12 ft. of pipe insulation from all water heaters shall be classified as a General Energy Waste Reduction Measures on all jobs.

Additional General Energy Waste Reduction Measures (2019)

EVT technical protocols and funding shall be used for the following measure installations in all allowable cases:

- ✓ Efficient LED lighting products, Low-flow Faucet Aerators and/or Showerheads
- ✓ Water Heater Temperature Set-backs
- ✓ Advanced Power Strips, Energy-Efficient Refrigerators, Freezers and/or Clothes Washers
- ✓ Heat Pump Technologies

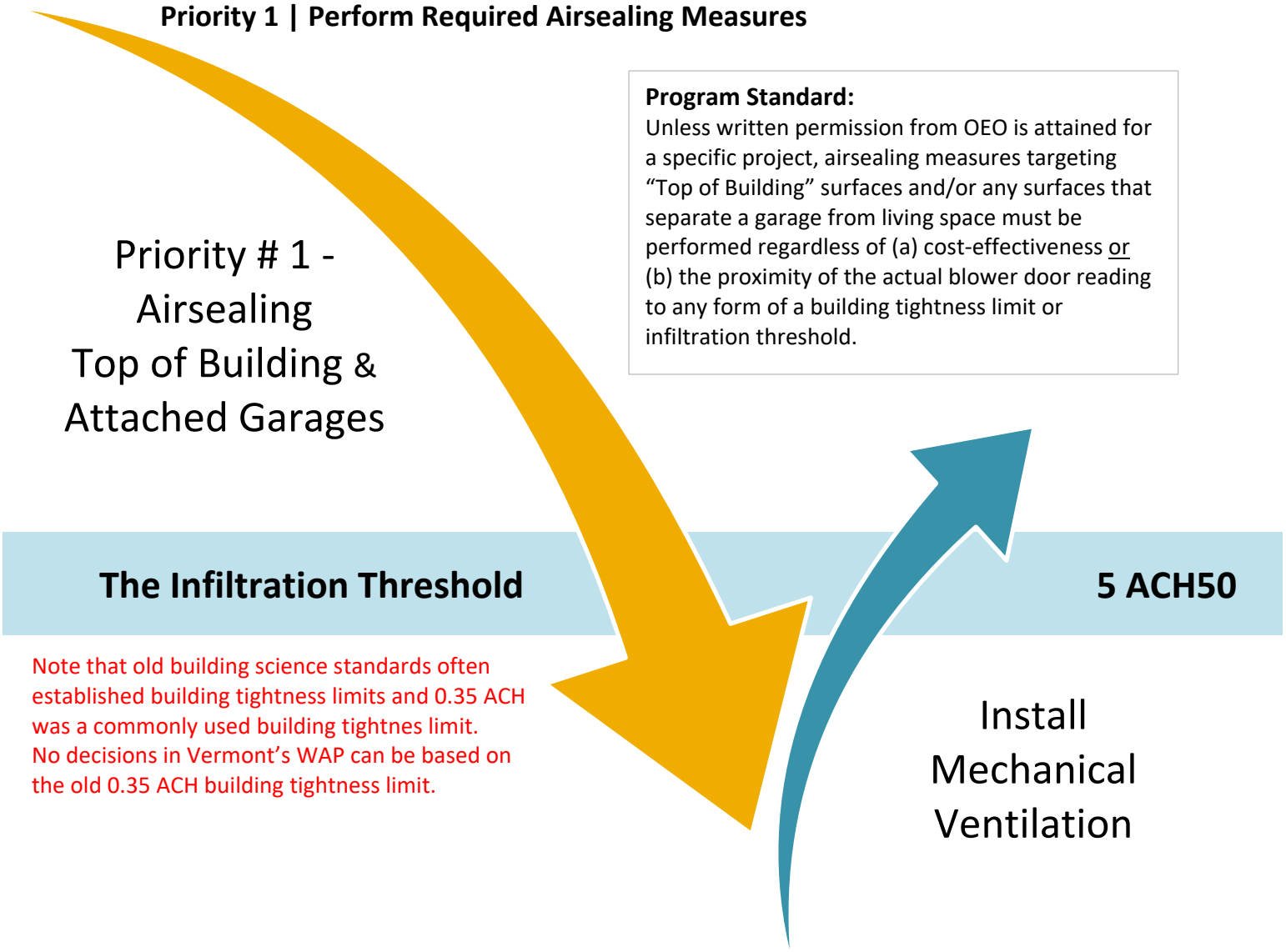
If the DHW fuel source prohibits the use of EVT funding, then all of the measures listed below still can and must be installed during every WAP job, unless the client declines their installation. These measures below shall be classified as General Energy Waste Reduction measures and be paid for with WAP funding in any cases where use of EVT funding is not allowed. Technical standards for these measure installations shall still adhere to EVT's most recent protocols:

1. Low-flow faucet-aerators 2. Low-flow shower-heads 3. Water heater temperature set-backs.

Required Airsealing Protocols in Site-Built Homes

Priority 1 | Perform Required Airsealing Measures

Program Standard:
Unless written permission from OEO is attained for a specific project, airsealing measures targeting "Top of Building" surfaces and/or any surfaces that separate a garage from living space must be performed regardless of (a) cost-effectiveness or (b) the proximity of the actual blower door reading to any form of a building tightness limit or infiltration threshold.



Order of Operations & Measure Prioritization:
It is essential to prioritize weatherization work that will tighten up the top of the building and isolate garages from living space. Performing this important work first and using the blower door routinely while a weatherization job is in progress is a great way to:

- ✓ Verify effectiveness of priority airsealing measures as they are performed
- ✓ Ensure that the infiltration threshold is only intentionally crossed for the highest priority measures

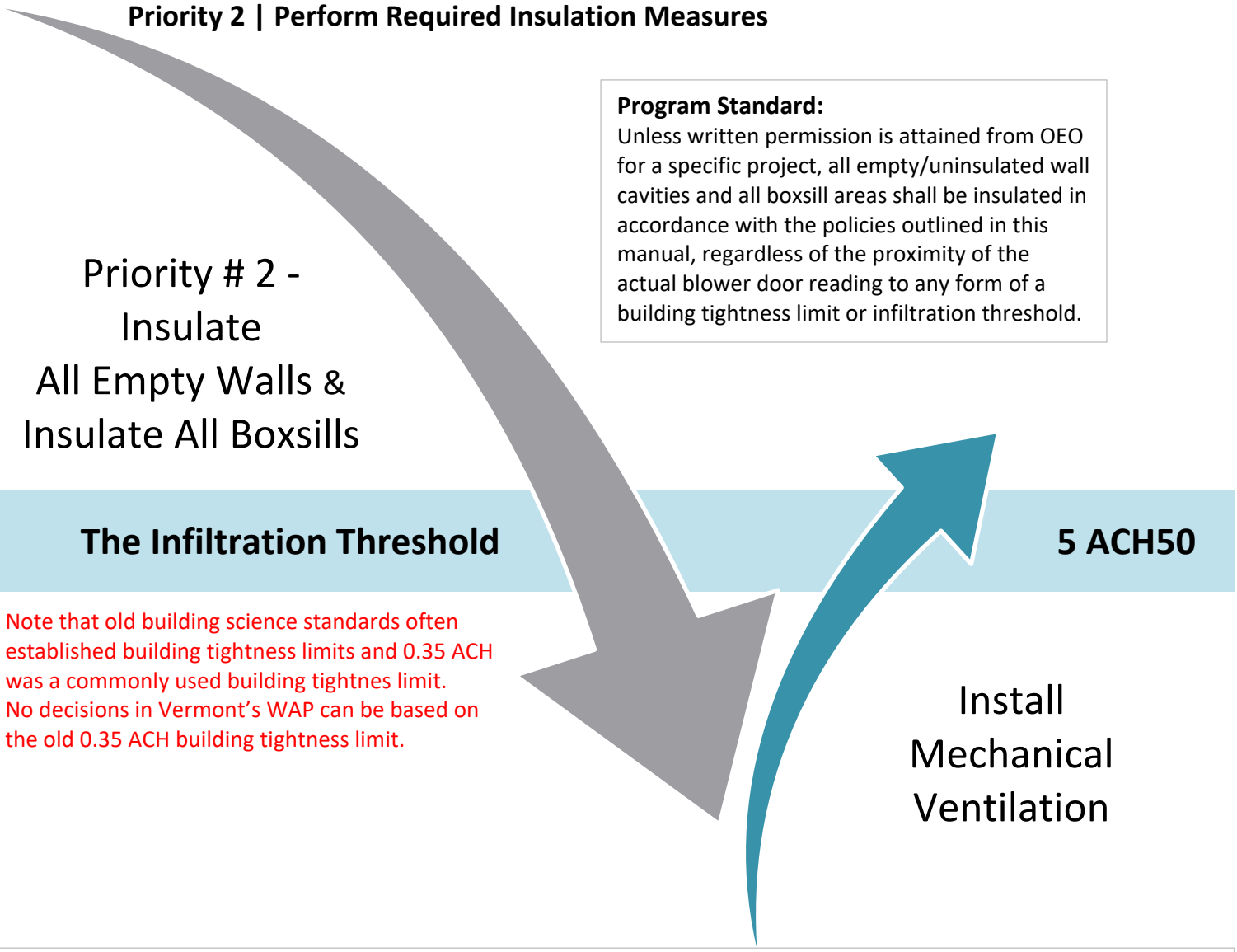
After all required weatherization measures are completed, no additional general airsealing measures shall be intentionally performed once the blower door reading is at or below the 5 ACH50 infiltration threshold.

Mechanical ventilation must be added as needed to satisfy the local ventilation alternative compliance path requirements of ASHRAE 62.2-2016. This applies regardless of if a blower door reading is above or below the 5 ACH50 infiltration threshold.

Required Airsealing Protocols in Site-Built Homes

Priority 2 | Perform Required Insulation Measures

Program Standard:
Unless written permission is attained from OEO for a specific project, all empty/uninsulated wall cavities and all boxsill areas shall be insulated in accordance with the policies outlined in this manual, regardless of the proximity of the actual blower door reading to any form of a building tightness limit or infiltration threshold.



Order of Operations & Measure Prioritization:

Prior to performing generalized airsealing work targeting the sides and bottom of the building shell it is important to install high priority insulation measures like wall insulation and boxsill insulation. During and after the installation of required weatherization insulation measures, job-in-progress blower door testing should be done. This is a great way to:

- ✓ Verify effectiveness of wall and boxsill weatherization measures as they are performed
- ✓ Ensure that the infiltration threshold is only intentionally crossed for the highest priority airsealing measures *(top of building airsealing + garage isolation)* and/or for the highest priority insulation meausures *(insulate empty walls and insulate the boxsill)*.

After all required weatherization measures are completed, no additional general airsealing measures shall be intentionally performed once the blower door reading is at or below the 5 ACH50 infiltration threshold.

Required Airsealing Protocols in Site-Built Homes

Priority 3 | Perform General Airsealing Measures

Program Standard:
General Airsealing Measures targeting the bottom & sides of the building shell shall only be performed **AFTER** all required WAP measures have already been (a) completed & (b) visually verified to be installed in an effective manner with the aid of blower door assisted smoke testing.
At this point in the project, when the remaining airsealing opportunities are located at the bottom & sides of the building, priority must be given to bottom of building airsealing work. For example, air sealing the perimeter of a rubble foundation with single-part foam or mortar.

Priority # 3 - General Airsealing Measures

when either…

(A) 100 (+) CFM50 reductions per technician hour worked are no longer being attained.

-- or --

(B) The 5 ACH50 Inflitration Threshold for the building is reached.

The Infiltration Threshold **5 ACH50**

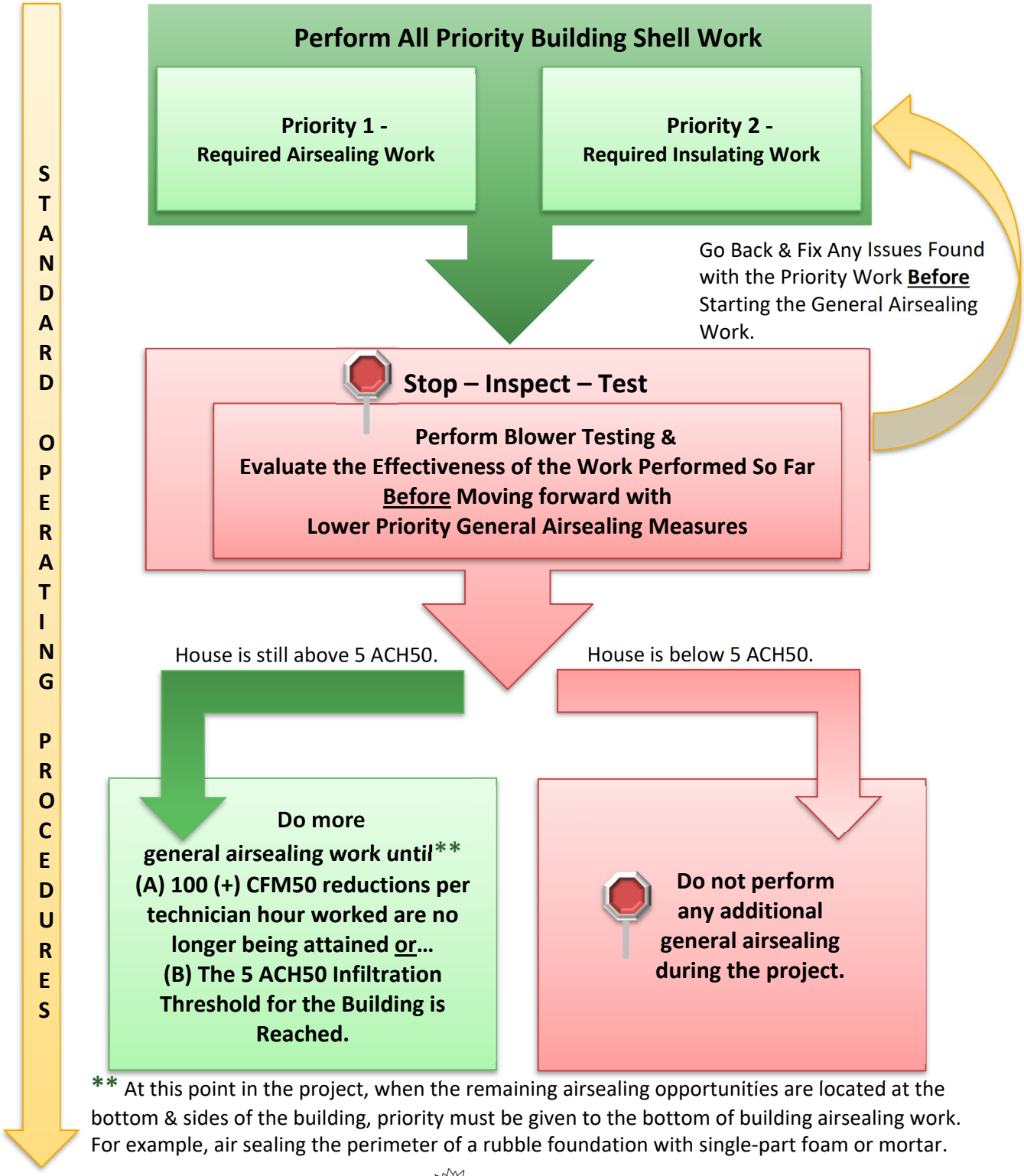
Note that old building science standards often established building tightness limits and 0.35 ACH was a commonly used building tightnes limit. No decisions in Vermont's WAP can be based on the old 0.35 ACH building tightness limit.

Order of Operations & Measure Prioritization:
After all required weatherization measures are completed, no additional generalized airsealing measures targeting the sides or bottom of the building shell can be intentionally performed once the blower door reading is at or below the 5 ACH50 infiltration threshold.

Weatherization Works

Required Airsealing Protocols in Site-Built Homes

Summary



** At this point in the project, when the remaining airsealing opportunities are located at the bottom & sides of the building, priority must be given to the bottom of building airsealing work. For example, air sealing the perimeter of a rubble foundation with single-part foam or mortar.

Weatherization Works

Mechanical Ventilation Standards

ASHRAE 62.2-2016 | General Compliance Expectations by Funding Source

- **All weatherization projects shall comply with ASHRAE 62.2-2016 for all DOE funded WAP projects without exception.**
- **All weatherization projects shall comply with ASHRAE 62.2-2016 for all Non-DOE funded WAP projects unless written OEO approval to omit specific measures on an individual job is attained and then recorded in the HES job file using the "Atypical Project Approval" form.**

- **If it moves air - measure it!**

  All ventilation capacity determinations must use actual measured fan-flow readings.

  No ventilation capacity determinations can use fan-flow estimates or capacity ratings from product manufacturers.

  Actual fan-flow readings are required before and after the WAP project.

Local Ventilation Requirements

By the conclusion of every Vermont WAP project, a minimum of one operational exhaust fan equivalent shall be present in the home to provide local ventilation. A one operational exhaust fan equivalent is defined as 30 cfm measured fan-flow. Any exhaust fan inside the home can contribute toward the minimum local ventilation requirement of 30 total cfm. This local ventilation capacity requirement is in effect on Vermont WAP projects even when there is zero determined need for dwelling-unit ventilation based on the ASHRAE 62.2-2016 local ventilation alternative compliance path calculations.

Mechanical Ventilation Standards

Dwelling-Unit Ventilation Requirements

Dwelling-unit ventilation requirements shall be calculated using the ASHRAE 62.2-2016 version of the RED Tool located at:

http://www.residentialenergydynamics.com/REDCalcFree/Tools/ASHRAE6222016

- ✓ The local ventilation alternative compliance path shall be used to determine dwelling-unit ventilation requirements.
- ✓ The nearest weather station shall be used. *(The use of weather stations located outside of Vermont is allowed when an out-of-state weather station is the closest weather station)*.
- ✓ The definitions included at the end of this TEC Manual section—titled, "Four Key Factors that Determine Mechanical Ventilation Requirements"—shall be used solely for the purpose of determining the mechanical ventilation requirements of dwelling units. These four definitions shall not be used for any other program purpose.
- ✓ Actual measured fan-flows shall be used.

Dwelling-unit ventilation can be met with continuously operating devices or with intermittently operating devices that are intentionally programmed to operate in compliance with the ASHRAE 62.2-2016 standard.

Dwelling-Unit Ventilation | CFM Installation Compliance Expectations by Funding Source

- On Non-DOE funded projects only, the installation of the dwelling-unit ventilation requirements as specified by the ASHRAE 62.2-2016 RED Tool is *optional* whenever the dwelling-unit ventilation requirement is ≤ 30 cfm.
- On DOE funded projects only, the installation of the dwelling-unit ventilation requirements as specified by the ASHRAE 62.2-2016 RED Tool is *optional* whenever the dwelling-unit ventilation requirement is ≤ 15 cfm.

Testing & Documentation Requirements - When

There are 2 required versions of the RED Tool File to save/upload to each HES job file.

1. **The Energy Audit Version |** A version documenting all on-site conditions found before the WAP project, including the actual measured existing fan-flows and the initial blower door reading.
2. **The QCI Version |** A version documenting all on-site conditions found after the WAP project, including the actual measured fan-flows and the final blower door reading.

An additional version of the RED Tool File is recommended, but not required, to be saved/uploaded to HES.

The Best Guess Version | A version prepared before the project begins that estimates what the final onsite conditions will be after the full scope of WAP work is installed, including the estimated fan-flow measurements and an estimate of the blower door reading that will be achieved at project completion.

Testing & Documentation Requirements - Where

All test results must get entered into the ASHRAE 62.2-2016 RED Tool. Each completed version of the RED Tool file shall be labeled clearly in the HES job file so it's obvious to anyone whether the information shown for each file version is from the beginning *or* the ending of the project (*or* if it's the "Best Guess" version of the RED Tool file). All of the completed RED Tool files shall be saved/uploaded to each HES job file.

Mechanical Ventilation Standards

Mechanical Ventilation Installations in Wet and/or Unfinished Basements

Mechanical, exhaust-only ventilation systems shall not be installed using WAP funding in any wet and/or unfinished basement/crawlspace areas as a remedy to moisture problems *or* bulk water intrusion issues.

Exhaust Fans| Venting Material & Installation Specifications

All exhaust fans must be vented to the exterior of the building shell in the manner outlined below by the conclusion of every WAP project. This includes (a) fans that were already in place before, and (b) fans that were installed during the WAP project.

- ✓ Rigid, smooth wall vent pipe (PVC or metal piping) shall be used whenever possible.
- ✓ Flexible vinyl/flexible plastic ducts shall not exist on any portion of a vent run.
- ✓ Flexible aluminized or semi-rigid metal venting materials are only allowed (a) if the installation of rigid materials is not possible, (b) as a short *(≤ 2 lin. ft.)* takeoff connecting the fan to a rigid, smooth-wall, vent pipe, or (c) as a short *(≤ 2 lin. ft.*) transition connecting the end of a rigid, smooth-wall vent pipe to an exhaust hood.
- ✓ All seams in the vent run must be sealed together in a durable fashion.
- ✓ Whenever possible a 1/8” to 1/4” pitch down toward the exhaust outlet at the exterior building shell shall be maintained on horizontal runs of vent piping to minimize the potential for condensation to form and drip back toward the exhaust fan.
- ✓ All vent piping sections located outside of the thermal envelope shall be insulated to R-8 or better. FSK-faced fiberglass, or comparable, is the recommended material choice for this installation whenever the venting materials cannot be fully encapsulated with loose-fill insulation materials. Use of foil-faced bubble-wrap materials is <u>not allowable</u> for this purpose. Use of spray foam insulation is allowable for this purpose.

Mechanical Ventilation Standards

Clothes Dryers | Venting Material & Installation Specifications

All clothes dryers must be vented to the exterior of the building shell in the manner outlined below by the conclusion of every WAP project.

- ✓ Smooth-wall metal vent pipe shall be used whenever possible.
- ✓ PVC piping shall not exist on any portion of a dryer vent run.
- ✓ Flexible vinyl/plastic ducts shall not exist on any portion of a dryer vent run.
- ✓ Flexible aluminized or semi-rigid metal venting materials are only allowed (a) if the installation of smooth-wall metal vent pipe is not possible, (b) as a short *(≤ 2 lin. ft.)* takeoff connecting the dryer to a smooth-wall metal vent pipe, or (c) as a short *(≤ 2 lin. ft.)* transition connecting the end of a smooth-wall metal vent pipe to an exhaust hood.
- ✓ Dryer vent pipe sections shall not be screwed together.
- ✓ All seams in the vent run shall be foil-taped. This is one of very few WAP measures where use of tape is acceptable and encouraged practice.
- ✓ Whenever possible, a 1/8" to 1/4" pitch down toward the exhaust outlet at the exterior building shell shall be maintained on the final horizontal section of the vent run that connect directly to the exhaust hood. This installation detail helps minimize the potential for condensation to form and collect in the vent piping.
- ✓ All vent piping sections located outside of the thermal envelope shall be insulated to R-8 or better. FSK-faced fiberglass, or comparable, is the recommended material choice for this installation. Use of foil-faced bubble-wrap materials is <u>not allowable</u> for this purpose. Use of spray foam insulation is allowable for this purpose.

Four Key Factors that Determine Mechanical Ventilation Requirements

Key Factor # 1 | Floor Area

Solely for the purpose of determining the mechanical ventilation requirements of dwelling units, Vermont's WAP adopts the ASHRAE 62.2-2019 definition of floor area* with the following add-on policy language:

> **"Unfinished below-grade, occupiable areas inside the pressure boundary"** shall be defined as an area with a 7 ft. or greater ceiling height and where the insulation value of the boxsill/bandjoist and foundation walls—extending down from the outer subflooring to a point 2 feet below grade level—is R-11 or greater.

***The Official Definition of Floor Area in the ASHRAE 62.2-2019 standard is below:**

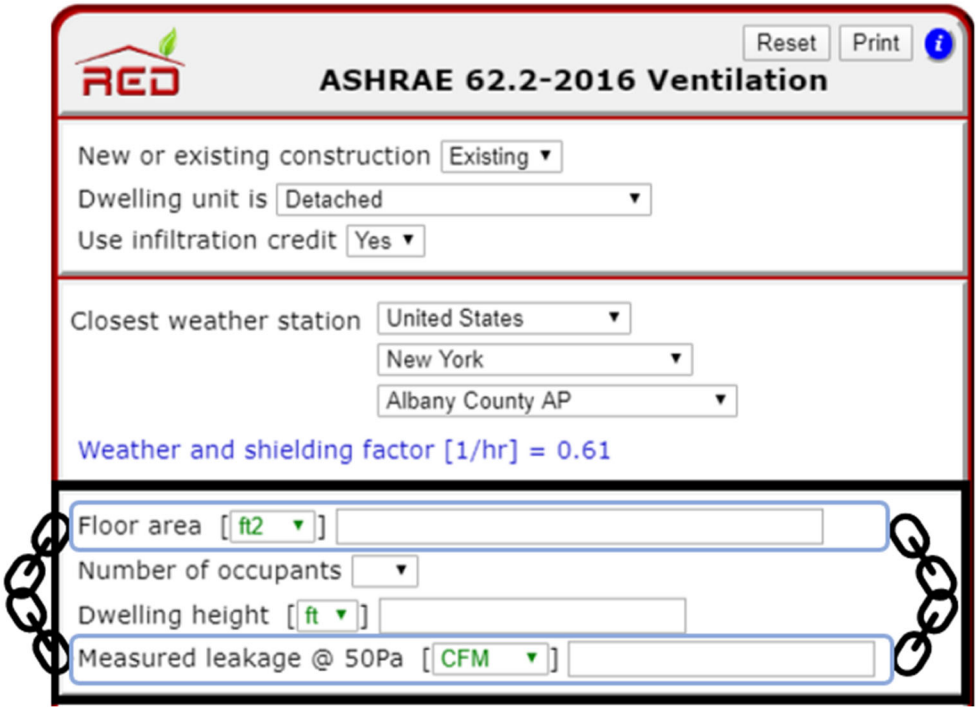
> All above- and below-grade finished areas as defined in ANSI Standard Z765, except that **unfinished below-grade, occupiable areas inside the pressure boundary** shall be included as floor area.

Mechanical Ventilation Standards

Four Key Factors that Determine Mechanical Ventilation Requirements

Key Factor # 2 | The Blower Door/CFM50 Result

The Floor Area entry must always link to the blower door testing setup that needs to be used and the Blower Door/CFM50 Result that needs to be entered into the ASHRAE 62.2-2016 RED Tool for purposes of determining the mechanical ventilation requirements of dwelling units



In actual practice, this usually means that when there is a door leading from the main living space down into a basement/crawlspace, two different blower door readings are taken. One test gets taken with the door to the basement opened. Another test gets taken with the door to the basement closed. The blower door reading taken with the basement/crawlspace door in the position that most closely links to the Floor Area entry is the result that must be entered into the ASHRAE 62.2 Red Tool. In other words:

- If the Floor Area entry in the Red Tool ***excludes*** a basement/crawlspace, then the door separating the living space from that basement/crawlspace must be closed when the blower door reading that gets entered into the Red Tool gets taken.
- If the Floor Area entry in the Red Tool ***includes*** a basement/crawlspace, then the door separating the living space from that basement/crawlspace must be opened when the blower door reading that gets entered into the Red Tool gets taken.

The visual above is taken from the ASHRAE 62.2-2016 RED Tool. The chains have been added to emphasize the link that we are required to make between the Floor Area entry & the Blower Door/CFM50 entry.

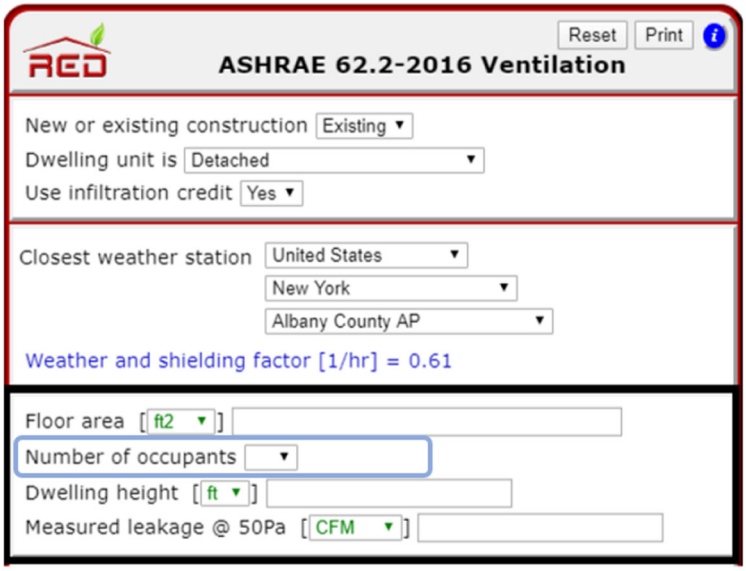
Mechanical Ventilation Standards

Four Key Factors that Determine Mechanical Ventilation Requirements

Key Factor # 3 | Number of Occupants

The bigger number out of the two possibilities below ***shall*** be entered into the ASHRAE 62.2-2016 Red Tool for purposes of determining the mechanical ventilation requirements of dwelling units:

1. The Number of Bedrooms + One
   or
2. The Actual Number of Occupants Residing in the Dwelling Unit

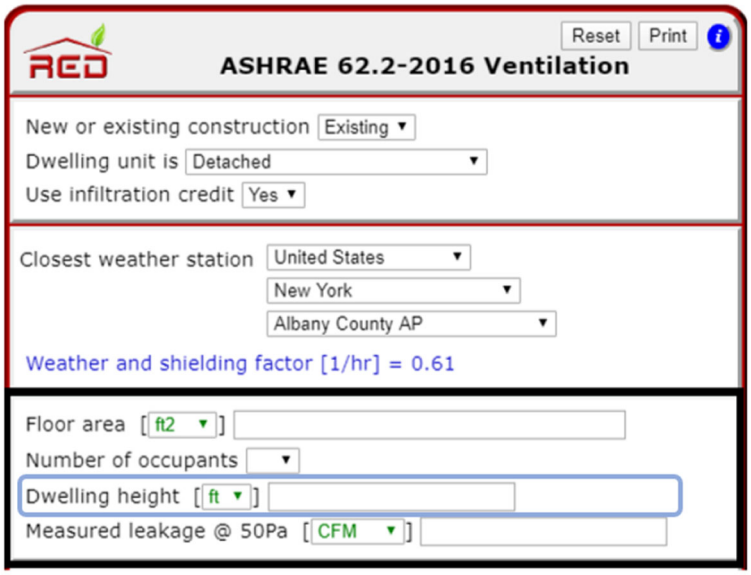


Mechanical Ventilation Standards

Four Key Factors that Determine Mechanical Ventilation Requirements

Key Factor # 4 | Dwelling Height

The total vertical distance between the lowest and the highest above grade points of the building—within the pressure boundary—shall be entered into the ASHRAE 62.2-2016 Red Tool as the Dwelling Height for purposes of determining the mechanical ventilation requirements of dwelling units:



Below is a clarifying note about basements related to Dwelling Height entries that we hope will be useful:

> Lots of basements in Vermont have uninsulated foundation walls but those basements are still considered to be within the pressure boundary It is common for approx. two feet of the foundation walls in basements like this to extend above grade-level.
>
> In these basements, you need to ***exclude*** the basement square footage in your ASHRAE 62.2-2016 Red Tool entry for Floor Area but you need to ***include*** the two feet of above-grade foundation walls in your ASHRAE 62.2-2016 Red Tool entry for Dwelling Height.

The Project Funding Source Matters for these Mechanical Ventilation Policies		
Item/Scenario	Type of WAP Funding Allowed for this Project	Additional Information
Some, but not all, of the Mechanical Ventilation Requirements outlined in Vermont's Technical Policies & Procedures Manual (including ASHRAE 62.2-2016 requirements) will be met during a project.	**HWAP only** *w/an OEO approved Atypical Project Approval form*	Any project that does not fully meet the mechanical ventilation requirements outlined in Vermont's Technical Policies and Procedures Manual (including ASHRAE 62.2-2016 requirements) cannot ever be a DOE funded job. The job can potentially be funded by HWAP but only with an approved Atypical Project Approval form from the OEO.
ASHRAE 62.2-2016 **Dwelling-Unit** Ventilation Requirements: ***ASHRAE's 15 CFM Discretion Rule***	**HWAP** or **DOE**	A project where (a) the installation of between 1 - 15 cfm for dwelling-unit ventilation is required according to the RED Tool and where (b) the agency elects not to install the dwelling-unit ventilation can be either a DOE or an HWAP funded job. An approved Atypical Project Approval form is not required as long as the required dwelling-unit ventilation, per the RED Tool, does not exceed 15 cfm and every other mechanical ventilation requirement outlined in Vermont's Technical Policies and Procedures Manual is met.
ASHRAE 62.2-2016 **Dwelling-Unit** Ventilation Requirements: ***Vermont's 30 CFM Discretion Rule***	**HWAP only**	A project where (a) the installation of between 16 - 30 cfm for dwelling-unit ventilation is required according to the RED Tool and where (b) the agency elects not to install the dwelling-unit ventilation cannot ever be a DOE funded job. The entire job must be an HWAP funded job in this scenario. An approved Atypical Project Approval form is not required as long as the required dwelling-unit ventilation, per the Red Tool, does not exceed 30 cfm and every other mechanical ventilation requirement outlined in Vermont's Technical Policies and Procedures Manual is met.

Where Do All These Rules Come From?	
Item	Is this a Unique Vermont Policy -or- Is this a Standard DOE policy based on ASHRAE 62.2-2016
Determining Fan-Flow All ventilation capacity determinations must use actual measured fan-flow readings. No ventilation capacity determinations can use fan-flow estimates or capacity ratings from product manufacturers.	Standard DOE Policy based on ASHRAE 62.2-2016
Local Ventilation Requirements By the conclusion of every Vermont WAP project, a minimum of one operational exhaust fan equivalent shall be present to provide local ventilation. A one operational exhaust fan equivalent is defined as 30 cfm measured fan-flow. Any exhaust fan inside the home can contribute toward the minimum local ventilation requirement of 30 total cfm. This local ventilation capacity requirement is in effect even when there is zero determined need for dwelling-unit ventilation based on the ASHRAE 62.2-2016 local ventilation alternative compliance path calculations.	Unique Vermont Policy
Local Ventilation Alternative Compliance Path **-Half Baths Do Not & Can Not Count-** When using the local ventilation alternative compliance path, it is not allowable practice to include half baths or to include the fan flow of any mechanical ventilation device located within a half bath in the calculations that determine the required dwelling-unit ventilation rate.	Standard DOE Policy based on ASHRAE 62.2-2016
Dwelling-Unit Ventilation **-Half Baths Could be Used as a Last Resort-** It would be acceptable for the mechanical ventilation device used to provide dwelling-unit ventilation to be located in a half bath if there were no other viable installation location options.	ASHRAE 62.2-2016 Gray Zone/Unique Vermont Policy

Where Do All These Rules Come From?	
Item	Is this a Unique Vermont Policy -or- Is this a Standard DOE policy based on ASHRAE 62.2-2016
Dwelling-Unit Ventilation ***15 CFM Discretion Rule***	Standard DOE Policy based on ASHRAE 62.2-2016
Dwelling-Unit Ventilation ***30 CFM Discretion Rule***	Unique Vermont Policy
Definition of Floor Area Solely for the purpose of determining the mechanical ventilation requirements of dwelling units, Vermont's WAP adopts the ASHRAE 62.2-2019 definition of floor area with the following add-on policy language: "Unfinished below-grade, occupiable areas inside the pressure boundary" shall be defined as an area with a 7 ft. or greater ceiling height and where the insulation value of the boxsill/bandjoist and foundation walls—extending down from the outer subflooring to a point 2 feet below grade level—is R-11 or greater.	Unique Vermont Policy
Fan Motor Replacements *-Mobile Homes Only-* It is acceptable to classify mobile home exhaust fan motor replacements as "maintenance". Because this measure is classified as maintenance, it is acceptable if the fan does not meet the ASHRAE 62.2-2016 normal compliance path standards for local ventilation after the motor replacement.	ASHRAE 62.2-2016 Gray Zone/Unique Vermont Policy
Fan Capacity Limits *-Mobile Homes Only-* In consideration of the inter-play between exhaust fans and MH combustion appliances, it is not allowable to install any exhaust-only mechanical ventilation device with a rated capacity from the device manufacturer > 80 cfm unless intentional steps are taken during the installation to ensure that the actual measured fan flow of the device is ≤ 80 cfm. This maximum, per-device, measured fan-flow must be assured for any exhaust-only devices that were *installed by WAP* before a mobile home project can pass the final QCI and be reported as a completed project. This applies to devices installed by WAP for local and/or dwelling-unit ventilation purposes.	Unique Vermont Policy

Where Do All These Rules Come From?	
Item	Is this a Unique Vermont Policy -or- Is this a Standard DOE policy based on ASHRAE 62.2-2016
Non-Allowable Mechanical Ventilation Installations in Wet and/or Unfinished Basements Mechanical, exhaust-only ventilation systems shall not be installed in any wet and/or unfinished basements or crawlspaces as a remedy to bulk water intrusion or moisture problems using WAP funding.	Unique Vermont Policy
Using the Atypical Project Approval Form Submission of an atypical project approval form to the OEO for consideration on a case-by-case basis when some, but not all, of the Mechanical Ventilation Requirements outlined in Vermont's Technical Policies & Procedures Manual will be met during a project.	Unique Vermont Policy

Mobile Home v. Site-Built Home Policies & Procedures

Some of the content included throughout this policy manual is not optimally suited to mobile homes. Sections 8 & 9 of this manual are written specifically for mobile homes. These mobile home policies and procedures are meant to provide clearer direction for the work performed in mobile homes versus the work performed in site-built homes. In an effort not to duplicate every policy provision in the TEC Manual that is applicable to both site-built and mobile homes, the following guidelines shall apply when interpreting mobile home policies and procedures:

- **For work in mobile homes only, the policy content contained within Sections 8 & 9 of this TEC Manual shall supersede any/all similar policy content contained within any other section of the manual.**
- **If there are policies outlined in any non-mobile home section of the TEC Manual and that same policy content/topic is not specifically covered in Sections 8 or 9, then the policy from the other, non-mobile home manual section shall apply to mobile homes. An example would be the requirements for oven testing. Even though the requirements related to oven testing are not specifically covered in Sections 8 or 9, they still apply in mobile homes.**

Non-Energy Saving Measures - Including Health & Safety Measures

1. All protocols regarding safety devices as outlined on Section 4, Pages 6 & 7 of this policy manual shall be met for all mobile homes (MH).
2. All plumbing vent stacks must extend to the outdoors. In roof-over situations, the vent stack cannot terminate in between the original and the new roof. The venting must be extended to the outdoors.
3. An evaluation by a qualified heating technician shall be performed whenever there are any signs of past or ongoing spillage or flame rollout issues to ensure that no spillage or flame rollout issues exist at the completion of a MH project. By conclusion of every MH project there shall be no visible signs of operational deficiencies or imminently dangerous conditions relating to any combustion appliances, including the appliance's combustion air intake, flue pipes or SRJ assemblies/roof wedges.
4. All combustion appliances shall pass all required combustion testing procedures and all appropriate spillage and draft tests performed at the worst-case scenario.
5. If the installation of CAZ pressure relief is performed by installing an open conduit between the CAZ and the outdoors, then the conduit shall be unobstructed and extend to the exterior of the building shell. The conduit cannot terminate in the crawlspace or in an attic/roof cavity. The conduit can only be routed through the floor and crawlspace area if it extends to the outside of the crawlspace skirting *(or comparable surface).* All conduit sections located within the crawlspace must be thoroughly airsealed to prevent crawlspace air from getting up into the mobile home.

Section 8: Mobile Home Policies & Procedures

Non-Energy Saving Measures Including Health & Safety Measures

6. Combustion air from the outdoors must be provided to all propane, natural gas or oil-fired combustion appliances in mobile homes. Note that combustion air intake pipes/conduits are different than the type of piping/ conduit described on the previous page that provide general CAZ pressure relief. The conduit delivering combustion air from the outdoors must connect directly to the burner or into the burner compartment of the combustion appliance. When the conduit delivering combustion air directly to the burner or into the burner compartment passes through the floor/mobile home belly it is allowable for the termination to be located within the crawlspace. It is also allowable to extend the combustion air conduit to the exterior of the mobile home skirting (or comparable), but only if the termination of the conduit is located above the typical snow accumulation level and has a mesh screen installed to deter rodents. When the conduit delivering combustion air to the burner passes through a mobile home ceiling, it shall extend to the exterior of the building shell. It cannot terminate in a mobile home attic/roof system.
7. Whenever there is a closeable door located in front of the furnace/furnace closet, the air handler must be engaged for an additional “MH furnace pressure imbalance test”. Modifications shall be performed until a passing test result is achieved. Refer to the the testing protocols outlined on the next page for more detailed information about these testing requirements.

MH Furnace - Pressure Imbalance Test

A Required Test Whenever There is a Closeable Door in Front of a MH Furnace Closet

- **Note that this is not a worst-case testing procedure.**
- **The completion of this required pressure test is important to do whenever there is a closeable door located in front of mobile home furnace closets because most mobile home furnaces do not have a ducted return side of the distribution system. Usually the small openings built into the cover of the furnace blower compartment are the only pathways for return air to get into the MH furnace's distribution system. This test is performed to ensure that the already limited return air pathways are not obstructed.**

Test Set Up & Instruction

The house must be put into winter mode with exterior doors and windows closed during this test. Air conditioners shall be either removed from windows or the air conditioner/window area shall be sealed over with plastic and painters tape or equivalent materials. No other exhaust appliances (fans, dryers, etc.) should be running during this test. With the mobile home in winter mode, set up a digital pressure gage to operate in pressure/pressure mode. One of the hoses should be attached to a pressure tap and run into the mobile home furnace closet (CAZ). The other pressure tap on the same channel does not need a hose attached to it as long as the digital gage itself is physically located in the hallway outside of the furnace closet. Otherwise a hose must be attached to the other pressure tap on the same channel and run to the hallway outside of the furnace closet.

At this point, the setup of the building and the digital gage will enable a measurement of the pressure difference between the furnace closet (CAZ) and the hallway. Turn on the furnace air handler and close the door to the furnace closet. Record the pressure difference indicated on the gage while the air handler is running.

Action Levels

With the air handler running, the difference in pressure across the closed door cannot exceed 7 Pa to avoid excessive pressure imbalances within the mobile home and to ensure that adequate return air is able to enter the furnace's distribution system.

If the pressure difference across the door is greater than 7 Pa with the air handler running, then corrective actions shall be taken to lower the number before a weatherization project can pass the final QCI and be reported as complete. If results are within the 5 - 7 Pa range, corrective actions are not required but are strongly recommended.

Corrective Action Strategies

Some recommended actions to alleviate the excessive pressure difference between the MH furnace closet (CAZ) and the rest of the mobile home are a) to install louvered grills into the door or into a partition wall between the CAZ and another room of the mobile home, b) to undercut the door or c) to completely remove the door. If opting to completely remove the door as a way to pass this pressure test, all hinges and hardware shall be removed from the door opening and the client must be informed about the importance of not reinstalling the door after the WAP project is completed.

Mechanical Ventilation

The following policies shall be adhered to during all MH projects.

Mechanical Ventilation Standards - General

- **All protocols regarding exhaust fan venting materials and installation specifications shall be met as outlined in Section 7 of this policy manual.**
- **All protocols regarding clothes dryers venting material and installation specifications shall be met as outlined in Section 7 of this policy manual.**
- **All ventilation capacity determinations must use actual measured fan-flow readings. No ventilation capacity determinations can use fan-flow estimates or capacity ratings from product manufacturers. Actual fan-flow readings are required before and after the WAP project.**

Local Ventilation

By the conclusion of every Vermont WAP MH project, a minimum of one operational exhaust fan equivalent shall be present in the home to provide local ventilation. A one operational exhaust fan equivalent is defined as 30 cfm measured fan-flow. Any exhaust fan inside the mobile home can contribute toward the minimum local ventilation requirement of 30 total cfm. This local ventilation capacity requirement is in effect on Vermont WAP projects even when there is zero determined need for dwelling-unit ventilation based on the ASHRAE 62.2- 2016 alternative compliance path calculations.

WAP-Installed Kitchen Range Hoods or Other High-CFM-Capacity Exhaust-Only Fans in Mobile Homes

It is recommended to have a working exhaust fan in the kitchen whenever a gas oven is present in both site-built and mobile homes. However, the benefits of installation should be weighed against other factors in the household, particularly in mobile homes.

In general, when evaluating existing fan-flows and planning for enhanced mechanical ventilation solutions in any mobile home, extra care must be taken to avoid installing ventilation capacity that unintentionally creates an environment where the MH combustion appliances are no longer able to pass worst-case spillage and draft tests. In consideration of the inter-play between exhaust fans and MH combustion appliances, it is not allowable to install any exhaust-only mechanical ventilation device with a rated capacity from the device manufacturer > 80 cfm unless intentional steps are taken during the installation to ensure that the actual measured fan flow of the device is ≤ 80 cfm. This maximum, per-device, measured fan-flow must be assured for any exhaust-only devices that were installed by WAP before a MH project can pass the final QCI and be reported as complete. This applies to devices installed by WAP for local and/or dwelling-unit ventilation purposes.

Dwelling-Unit Ventilation

The dwelling-unit ventilation requirements as outlined in Section 7 of this policy manual are applicable in all MH projects.

Documentation Requirements

The documentation requirements as outlined in Section 7 of this policy manual are applicable in all MH projects.

Mobile Home Ducts

Evaluation & Performance Testing Requirements|

- **Visual inspection of the mobile home duct boots and risers is required.**
- **Pressure-pan testing is required at each supply register.**
- **In addition to evaluating each duct boot and riser, the furnace base to trunk connection shall be accessed, evaluated and sealed on every mobile home project. Visual verification that this duct system transition is free of air leaks is required. The visual verification must be performed with the aid of smoke pencils while the furnace air handler is running.**

MH Pressure-Pan Testing | Test Set Up & Instruction

With the blower door running and the interior of the mobile home at -50 Pa with reference to the outside, a pressure-pan test shall be completed on every supply register in the mobile home.

Pressure-pan testing is required a) during the energy audit, b) by the installation crew (after improvements have been completed) and c) at the final QCI. The pressure-pan test results from the energy audit and the final QCI must be entered into the HES job file.

MH Pressure-Pan Testing | Action Levels

By conclusion of a mobile home project the test result at each register shall be ≤ 1.5 Pa or a written statement explaining why achieving the required test result would not be practical and cost-effective for the individual project must be provided in the HES job file.

MH Ducts Corrective Action Strategies | Sealing/Repairing Boots & Risers

Metal, mesh tape, and mastic are the only allowable materials for performing the repairs to mobile home duct boots and risers. With an exception for mesh tape used in tandem with duct mastic, use of tapes is not allowable for duct sealing purposes. If existing tapes are present, duct-tape, foil-tape, etc., the existing tape must be removed from the ducts before attempting to do any duct repairs/duct sealing work.

MH Pressure-Pan Testing | Documentation Requirements

There are 2 versions of the pressure-pan test results that must be entered into the HES job file.

1. A version documenting the results of each pressure-pan test at the energy audit.
2. A version documenting the results of each pressure-pan test at the final QCI.

Mobile Home Ducts

Evaluation & Improvement Requirements| Crossover Ducts

- **If there are crossover ducts, the following order of operations/decision matrix shall be followed:**
  1. Evaluate the condition of the crossover ducts during every energy audit
     - ✓ Evaluate for any damage or airleakage and to ensure adequate R-value
  2. A repair is required if there are any damaged sections.
  3. Replace the crossover duct instead of repairing it whenever duct replacement will enable a more durable and long-lasting installation without adding substantial costs above what the estimated repair costs would have been.
  4. Whenever a section of ductwork is replaced it must be with rigid duct materials rather than flexible duct materials.
- **All crossover ducts shall be insulated to R - 8 minimum by the conclusion of a mobile home project**.
- **It is strongly encouraged, but not required practice, to install foam board between the ground and any cross-over ducts when there is low-to-no ground clearance underneath the duct.**

All policies outlined above for crossover ducts are also applicable to any air conditioning ducts located below the mobile home belly material.

Mobile Home Heating Appliances

MH Furnaces | New & Replacement Installations

Whenever a mobile home furnace is being installed during a weatherization project AND the heating system utilizes propane or natural gas, the WAP installed appliance shall be both:

1. A Category IV Appliance| ***designed for production of condensate and positive draft pressure***
2. A Sealed Combustion Appliance

Written permission from OEO must be attained prior to the installation of any other category or type of MH furnace/central heating system when the fuel source is propane or natural gas.

Primary v. Secondary Heating Appliances | Determination of Primary System

The energy auditor has discretion in determining the primary fuel source and which appliance is to be deemed the primary heating system for each mobile home project.
Determining the primary heating fuel and appliance is not limited exclusively to historical energy consumption records. **When making this determination the auditor must talk with the client to ensure all of the following variables are considered**:

1. If there is more than one heating appliance, how often are they run at the same time or are they only used one at a time?
2. Which heating appliance would the client prefer to use if they had to make a choice between the multiple heating system options currently in the home? Why?
3. If a fuel assistance benefit is received, what fuel source is the benefit associated with?
4. What condition are each of the heating appliances in?
5. What is the projected cost to get each heating appliance operating in a safe and reliable manner?

Mobile Home Heating Appliances

Primary v. Secondary Heating Appliances | Determination of Primary System

WAP Purchasing Fuel for a Client Because the Client is out of Fuel During the Project

Fuel can be provided by the WAP if there is no fuel onsite and fuel is needed to get a heating appliance operational so it can be evaluated/tested.

- **During the Energy Audit | This is important to ensure good decisions can be made when developing the workscope for heating systems.**
- **During the QCI | This is important to help ensure the home is being left in a safe condition at the conclusion of the project and that any work performed on the heating system was effective.**

An example where the WAP may need to purchase fuel for a client to help determine the primary heating system is when a household is burning wood while the auditor is working through a project evaluation, the fuel tank for the MH furnace is empty and an informed decision is needed about whether to put a more significant investment into the wood stove or the mobile home furnace.

Primary v. Secondary Heating Appliances| Investment Allowances

It is allowable to invest more weatherization funding into the primary heating system than into those deemed as secondary heating appliances. Improvement expenses shall be capped at $500.00 for secondary heating appliances unless written permission to exceed this amount is granted by OEO. This written permission must be requested using the "Atypical Project Approval Form" and all approvals must be uploaded to the HES job file.

Wood Stoves | Disconnection & Removal

OEO does not encourage the practice of automatically having weatherization clients disconnect and remove all pre-existing wood stoves from mobile homes for the sole reason that the stove does not have a mobile home approval rating from the manufacturer. However, the disconnection/removal of a wood stove and the capping of the opening into a chimney or flue is allowable on a case by case basis if the appliance condition and setup are imminently dangerous and weatherization work cannot proceed safely until the safety hazard is removed.

Wood Stoves | Installation Improvements for Existing Stoves

It is allowable to perform modifications that make the continued operation of the existing wood stove safer using WAP funding. Some examples include:

1. Install non-flammable material on building surfaces underneath or beside the stove itself for heat shielding purposes.
2. Install non-flammable material between the flue pipe and building surfaces for heat shielding purposes.
3. Improve the venting materials or vent configuration.

Wood Stoves | New Installations

Whenever a new/replacement wood stove is installed during a WAP project it must be a mobile home approved stove. This requirement is applicable to stoves installed using WAP funding and to stoves installed by owners in rented mobile home situations.

Mobile Home Water Heaters

Mobile Home Rating Requirements | Existing Water heaters

- **Existing water heaters should not be automatically disconnected and replaced for the sole reason that the water heater does not have a mobile home approval rating from the manufacturer.**
- **Replacing the existing water heater with WAP funding is acceptable if the performance requirements outlined in the table below are not met, or if they cannot be met cost-effectively by making repairs.**

Mobile Home Rating Requirements | New/Replacement Water heaters

- **Whenever a water heater is installed during a weatherization project, the new appliance shall be mobile home approved. This mobile home rating requirement is applicable to all water heaters installed during the WAP project, including those installed by owners in rented mobile home situations.**

Evaluation, Testing & Performance Requirements|		
If an existing water heater has (a) no visible defects indicative of unsafe appliance operation, (b) no signs of spillage or flame rollout, (c) the flue pipe appears in good condition, (d) there is a provision of combustion air from the outdoors and (e) the results of combustion testing are acceptable, proceed to the following evaluation and testing steps:		
Scenario 1	*or*	**Scenario 2**
The water heater location allows for spillage and draft tests to be performed at worst-case.		**The water heater location** is isolated from the living space and accessed by an exterior panel.
Required Actions: Perform spillage and draft tests at worst-case and attain passing results		***Required Actions:*** 1. Complete a full combustion test, and then either; 2. *Option A:* Visually verify complete separation between the living space and water heater closet with blower door assisted smoke testing, or; *Option B:* Install a spill switch to provide an additional safety margin for error if the appliance was ever to back draft.

- Regardless of whether or not the existing water heater has a mobile home approval rating from the manufacturer, if all conditions outlined in this performance requirements table are satisfied then no water heater repairs/replacement are required by VT WAP.
- However, if all conditions outlined above are not satisfied, then at minimum, repairs to the existing water heater are required.
- Replacement of the water heater with WAP funding is acceptable if the performance requirements outlined above are not met or cannot be satisfied cost-effectively by making repairs.

Mobile Home Airsealing

MH Prioritized Airsealing Overview | Order of Operations

The steps below outline the required approach to mobile home airsealing work:

1-a. **Complete all required mobile home airsealing measures** outlined on pages 9-10 in this section of the policy manual.

-and-

1-b. **Complete all required mobile home insulation measures** outlined on pages 11-13 in this section of the policy manual.

2. **At this step in the mobile home weatherization project, performing diagnostic testing is required prior to doing any additional airsealing work:**
   - ✓ Perform worst-case spillage and draft tests for all combustion appliances.
   - ✓ Perform a blower door test.

3. **Determine Further Actions Based on the Results of the Required Diagnostic Tests from Step 2**
   If all combustion appliances in the mobile home easily pass spillage and draft tests at the worst-case scenario AND if the building is still above 10 ACH50 at this point of a MH project, then additional weatherization measures that provide airsealing benefits are recommended to be performed until one of the three things outlined below happens.
   a) Reductions of 100 CFM50 per technician hour worked are no longer achievable
   b) The home reaches a 10ACH50 threshold
   c) The combustion appliances in the home become unlikely to pass spillage and draft tests at the worst-case scenario if additional airsealing work continues

Below is a list of recommended areas in mobile homes to do additional airsealing work—unless/until one of the three things listed above as 3a, 3b & 3c happens:

- ✓ The merger point running along the top center of a double wide mobile home
- ✓ Surfaces backing an attic space when there are split level ceilings in a mobile home
- ✓ The joint between the top of a mobile home exterior wall and the mobile home ceiling
- ✓ Window and door weather-stripping/sweeps
- ✓ Installation of tyzalls or interior storms
- ✓ Installation of window clips or fasteners
- ✓ Generalized airsealing around windows and doors
- ✓ Generalized airsealing at window and door rough openings or trim
- ✓ Generalized airsealing at the joint of the floor to bottom of an exterior wall
- ✓ Generalized airsealing of wall paneling/sheathing
- ✓ Generalized airsealing at/around wall outlets

Mobile Home Airsealing

Note that none of the policies outlined in Section 6 of the TEC Manual are applicable to mobile homes and those policies shall not be followed during mobile home projects.

MH Prioritized Airsealing Overview | Required Measures

Top of Building

All holes, penetrations and voids in the mobile home ceiling shall be airsealed as needed to enable blown-in roof insulation to be installed without unnecessarily getting into the home.

Bottom of Building

Sealing the Belly Material: All holes, penetrations and voids in mobile home belly materials shall be sealed tightly in a durable manner.

Sealing the Floor, Floor Sheathing & Penetrations Underneath Cabinets: All holes and penetrations through the mobile home floor sheathing—that can be accessed from above—shall be sealed tightly to keep blown insulation from getting into the home during installation.

Note that it is not recommended to cut into/through the belly materials to airseal the floor sheathing from below UNLESS major deficiencies are identified AND working from underneath the home will be the most effective way to make improvements.

Two Example Scenarios:

1. An example of a major deficiency at the floor sheathing that may be worth accessing and improving from below would be a large opening through the floor underneath a tub or shower in the area around the p-trap assembly and plumbing lines.
2. An example where cutting into/through mobile home belly materials would not be recommended would be in order to gain access for airsealing work around small wire penetrations up through the floor system.

Sides of Building

Water Heater Closets with Exterior Access Panels

A foam-insulated-panel that is protected from the elements and that provides a tight air seal when closed shall be installed whenever there is an exterior access panel to a mobile home water heater closet. This measure is the only prescriptively required measure targeting the sides of mobile homes.

The technical specifications for improving the performance of exterior access panels to water heater closets are included on the next page.

Mobile Home Airsealing

Prioritized Airsealing Overview | Required Measures

Water Heater Closets with Exterior Access Panels | Technical Specifications

Recommended Approach

It is recommended to modify the rough opening, and install weather-stripping as needed[1], to accommodate the installation of a site-built, foam-insulated, sandwich-door-style access panel where the exterior side of the panel has a layer of sheathing ≥ ½ inch thickness and the interior side of the panel has a layer of sheathing ≥ ¼ inch thickness. The foam board insulation in the middle of the sandwich door assembly should be as thick as possible up to a 2 ¼ -inch maximum foam thickness. The available clearance between the panel and the water heater tank may only allow for a thin layer of foam insulation.

Minimum Standard

At minimum, a site-built, foam-insulated access panel must be installed similar to an attic-hatch-style assembly that only has sheathing attached to one side of the foam board. If a foam insulated access panel will be built in this manner, the one layer of sheathing shall be ≥ ½ inch thickness and must be directly bonded/fastened to the exterior facing side of the foam board in a manner that ensures air cannot freely infiltrate and move through the space between the foam board and the layer of sheathing. The foam board insulation should be as thick as possible up to a 2 ¼ -inch maximum foam thickness. The available clearance between the panel and the water heater tank may only allow for a thin sheet of foam insulation.

Alternate Approach that Reuses the Existing Access Panel

Attaching foam-board directly to the back side of an existing mobile home access panel does not fully comply with this standard alone but it can be an allowable part of the improvement measure performed in this area. To fully meet the acceptable minimum standard for this improvement measure when reusing the existing access panel, foam board must be bonded/fastened to the existing access panel in a manner where no air can freely infiltrate and move through the space between the foam board and the access panel. Then, a layer of sheathing ≥ ¼ inch thickness must be bonded/fastened to the interior facing side of the foam board in the same manner.

<u>Non-Compliant</u> Approach

The practice of friction fitting foam board insulation into the rough opening of the access point into the water heater closet does not meet this standard and represents a non-allowable installation.

[1] The installation of effective weatherstripping is a requirement no matter which materials/installation methods get used for these water heater access panels. Note that for certain door frames located at this part of the mobile home only adhesive compression foam weatherstripping will work.

Mobile Home Belly/Floor Systems

Belly/Floor System | Required Sealing Measures

Expectations are for all belly types and designs

By conclusion of a MH project, all holes, tears, voids in the mobile home belly material shall be completely sealed in a durable manner. Use of tape is not allowable for belly sealing purposes.

Belly/Floor System Perimeter-Section | Required Insulation Measures

Expectations are for all belly types and designs

The entire perimeter of the belly/floor system, including the wings/outriggers, shall be insulated to the maximum R-value possible using either blown-in fiberglass or cellulose insulation. Note that "Maximum R-value possible" does not mean add as much blown-in insulation as possible until no more insulation will physically fit into the space. The blown-in insulation installed by WAP shall be installed to the insulation density that both a) maximizes the R-value performance achieved per inch and b) ensures a dense-packed installation is achieved.

Belly/Floor System Center-Section | Required Insulation Measures

Expectations are varied by belly design type

The center sections of the belly/floor system for each individual project shall be weatherized in accordance with the policies outlined below for the most comparable belly/floor system type and design.

Belly Type A | Joists run crossways. Wings/outrigger section of belly is flat. Center belly material sags/has a rounded bottom.

The center belly section must have an average "effective" R-19 by the conclusion of the project. When adding blown insulation to achieve an average "effective" R-19 in the center belly section, the blown-in insulation shall not be densepacked. This must be a loose-fill installation only. Also, the center belly cavity cannot be completely filled up with insulation in the portions of the belly cavity that measure 10" or deeper.

Belly Type B: Joists run crossways. Wings/outrigger section of belly is flat. Center belly is flat but dropped down lower resulting in a deeper belly cavity in the center section than out at the wings/outriggers.

The center belly section must have an average "effective" R-19 by the conclusion of the project. When adding blown insulation to achieve an average "effective" R-19 into a center belly section, the blown-in insulation shall not be densepacked. This must be a loose-fill installation only. Also, the center belly cavity cannot be completely filled up with insulation in the portions of the belly cavity that measure 10" or deeper.

Belly Type C: Joists run longways. Wings/outrigger section of belly is flat. Center belly is flat.

The entire center-belly section shall be insulated to the maximum R-value possible using either blown-in fiberglass or cellulose insulation, except for the section directly underneath the ductwork. Note that "Maximum R-value possible" does not mean add as much blown-in insulation as possible until no more insulation will physically fit into the space. The blown-in insulation installed by WAP shall be installed to the insulation density that both a) maximizes the R-value performance achieved per inch and b) ensures a dense-packed installation is achieved. No insulation shall be intentionally blown into the section of the belly cavity directly underneath the ductwork even if space allows. Instead, foam board shall be installed underneath the ductwork/belly material to an "effective" R-10 value in this area.

Mobile Home Ceilings/Roof Systems

Ceilings/Roofs | Required Insulation Measures

Typical Mobile Home Roof Designs

Any portion of a mobile home attic/roof system where the cavity depth between the ceiling and roof is deeper than 14 inches shall not be insulated with more than 14 total inches of insulation even if more insulation would fit. The 14 total inches of insulation includes the preexisting insulation and the insulation installed by the WAP. It references the final "settled-depth" of the insulation.

- **By conclusion of each mobile home project every attic/roof system section shall be insulated to a minimum, average "effective" value of R-40 *(without exceeding the 14 inches of insulation limit in any portion of the mobile home attic/roof)*.**
- **Whenever a minimum, average "effective" value of R-40 is not possible due to space limitations between the ceiling and the roof:**
  - ✓ **Each ceiling/roof system section shall be insulated with blown-in insulation to the maximum R-value possible *(without exceeding the 14 inches of insulation limit in any portion of the mobile home attic/roof)*.**

Mobile Home with Roof-Over

Whenever there is a roof-over that allows for physical access into the attic space between the two roof lines, then the original roof cavity shall always be sealed and insulated prior to adding any additional insulation over the top of the original roof.

If there is already batt-insulation over the original roof, a perimeter-pull shall be done on all sides. Additional blown-in insulation must be added to achieve a minimum "effective" R-40 value throughout the roof/attic area everywhere that the roof clearance allows for an "effective" R-40 to be attained.

Mobile Home with Split-Level Ceilings

In mobile homes with split-level ceilings, the interior walls backing up to attic space shall not be insulated with fiberglass batting if the space is large enough to physically access. The wall sections must be either densepacked with cellulose, spray foamed with closed-cell spray foam, insulated with foam-board, or insulated with blown-in fiberglass insulation. Any existing fiberglass-batting must be removed from the attic wall prior to installing any of these allowable materials.

Miscellaneous Mobile Home Policies

Abbreviated Recommended v. Required Actions Tables | Based from FAQs

Description	Recommended	Required
Boxing-in pressure tanks, well pumps or other mechanicals found between the ground and mobile home belly material is:	X	
Adding pipe insulation to water lines found between ground and mobile home belly material is:	X*	
Whenever additional air is provided to the home to alleviate excessive CAZ depressurization by cutting through the floor, the piping/conduit must be routed through the floor opening and extend out through the skirting. The conduit must also be sealed and insulated. This is:		X
For an existing heating system in a mobile home, the installation of solid flue pipe, solid offsets or sweeps is:		X
For an existing heating system in a mobile home where there are adjustable venting materials present instead of solid flue pipe or solid offsets or sweeps, the vent pipe materials are to be replaced:		X
For a new heating system installed by WAP the installation of solid flue pipe, solid offsets or sweeps is:		X
Measuring actual exhaust fan flow at an energy audit is:		X
Measuring actual exhaust fan-flows at the quality control inspection is:		X
Ensuring that the total measured fan-flow in every mobile home meets or exceeds 30 cfm capacity for local ventilation purposes is: *Note the measured fan-flows from multiple fans can be added together to reach this minimum 30 cfm total measured fan-flow requirement for local ventilation purposes.*		X
Taking actions during installation to ensure that the actual measured fan-flow is ≤ 80 cfm for any exhaust appliance installed in a mobile home during a WAP project when the rated capacity from the manufacturer exceeds 80 cfm is:		X
Installing foam board underneath crossover ducts when there is little-to-no ground clearance underneath the ducts is:	X	

*Installation of heat tape is also allowable.

Section 9: Mobile Home Priority List

The 12 Priority List Items | General Overview

Items one - eight shall be performed during every project whenever the outlined conditions are applicable to the mobile home and the Mobile Home Priority List (MHPL) is used to develop the scope of work. Items nine - twelve are sequenced in order of typical energy saving cost-effectiveness. These items are the primary energy saving measures required for all projects where the MHPL is used to develop the scope of work.

Note that some, but not all, mobile home policies are included directly within this MHPL document. More detailed mobile home policies and procedures are referenced throughout this document wherever applicable.

Item 1: Non-Energy Saving Measures - Including Health & Safety Measures

A. All protocols regarding safety devices as outlined on Section 4, Pages 6 & 7 of this policy manual shall be met for all mobile homes (MH).

B. All plumbing vent stacks must extend to the outdoors. In roof-over situations, the vent stack cannot terminate in between the original and the new roof. The venting must be extended to the outdoors.

C. An evaluation by a qualified heating technician shall be performed whenever there are any signs of past or ongoing spillage or flame rollout issues to ensure that no spillage or flame rollout issues exist at the completion of a MH project. By conclusion of every MH project there shall be no visible signs of operational deficiencies or imminently dangerous conditions relating to any combustion appliances, including the appliance's combustion air intake, flue pipes or SRJ assemblies/roof wedges.

D. All combustion appliances shall pass all required combustion testing procedures and all appropriate spillage and draft tests performed at the worst-case scenario.

E. If the installation of CAZ pressure relief is performed by installing an open conduit between the CAZ and the outdoors, then the conduit shall be unobstructed and extend to the exterior of the building shell. The conduit cannot terminate in the crawlspace or in an attic/roof cavity. The conduit can only be routed through the floor and crawlspace area if it extends to the outside of the crawlspace skirting *(or comparable surface).* All conduit sections located within the crawlspace must be thoroughly airsealed to prevent crawlspace air from getting up into the mobile home.

F. Combustion air from the outdoors must be provided to all propane, natural gas or oil-fired combustion appliances. Note that combustion air intake pipes/conduits are different than the type of piping/ conduit described above that provide general CAZ pressure relief. The conduit delivering combustion air from the outdoors must connect directly to the burner or into the burner compartment of the combustion appliance. When the conduit delivering combustion air directly to the burner or into the burner compartment passes through the floor/mobile home belly it is allowable for the termination to be located within the crawlspace. It is also allowable to extend the combustion air conduit to the exterior of the mobile home skirting (or comparable), but only if the termination of the conduit is located above typical snow accumulation level and has a mesh screen installed to deter rodents. When the conduit delivering combustion air to the burner passes through a mobile home ceiling, it shall extend to the exterior of the building shell. It cannot terminate in a mobile home attic/roof system.

G. Whenever there is a closeable door located in front of the furnace/furnace closet, the air handler must be engaged for an additional "MH furnace pressure imbalance test". Modifications shall be performed until a passing test result is achieved. Refer to Section 8: Page 3 of this TEC manual for detailed requirements.

Section 9: Mobile Home Priority List

Item 2: Mechanical Ventilation

A. ***Local Ventilation:*** All local ventilation requirements as outlined in Sections 7 & 8 of the TEC Manual shall be met during each MHPL eligible project.

B. ***Dwelling-Unit Ventilation:*** All dwelling-unit ventilation requirements as outlined in Section 7 & 8 of the TEC Manual shall be met during each MHPL eligible project.

C. All protocols regarding exhaust fan venting materials & installation specifications shall be met as outlined in Section 7 of the TEC Manual.

D. All protocols regarding clothes dryers venting materials & installation specifications shall be met as outlined in Section 7 of the TEC Manual.

Item 3: Baseload

A. All Efficiency Vermont (EVT) protocols regarding evaluation for, and identification of, base load energy usage reduction and water conservation opportunities shall be adhered to. The installation, completion and verification of all improvement measures shall align with EVT protocols.

B. All protocols regarding General Energy Waste Reduction Measures as outlined in Section 5 of the TEC manual shall be adhered to.

Item 4: Ground-Source Moisture Barrier Installation

Either the installation of a moisture barrier over the ground or written documentation in the file why the measure was not installed is required during each MH project. The most common acceptable reason not to install a moisture barrier on the ground underneath a mobile home is when there are regular standing water conditions where ground water is likely to flow over and to pool on top of the material after installation. The installation of a moisture barrier over the ground is not required when there is a slab underneath the mobile home but the installation over the slab is still allowable.

Item 5: Exterior Door Replacement: Funding Source Restrictions Apply

Mobile home doors are eligible for replacement only when reasonable attempts to repair the existing door will not enable the door to be safely closed and locked. Replacement of mobile home doors are considered non-energy saving measures and are classified as incidental repair measures.

If an exterior door is replaced on a DOE funded WAP project, then that measure shall be paid for with Non-DOE funds.

Item 6: Window Replacement: Funding Source Restrictions Apply

Mobile home windows are eligible for replacement only when reasonable attempts to repair an existing window *(or to install an interior storm)* will not enable the window to be safely closed and locked. Replacement of mobile windows are considered non-energy saving measures and are classified as incidental repair measures.

If a window is replaced on a DOE funded WAP project, then that measure shall be paid for with Non-DOE funds.

Section 9: Mobile Home Priority List

Item 7: Enhanced Client Education/Efficiency Coaching

A. During the weatherization process each client's energy consumption history must be reviewed. The electricity consumption must be evaluated, disaggregated and discussed with the client.

B. At minimum, the importance and potential impact of the following must be covered with each client.

- Maintaining a clean furnace air filter
- Monitoring indoor moisture sources and humidity levels
- Importance of understanding and using exhaust fans
- Setting back thermostats when possible
- Carbon monoxide and back drafting issues

Item 8: Heating Appliances

A. All programmatic requirements regarding the determination of primary v. secondary heating appliances, the cleaning, tuning, evaluation and servicing of primary and secondary heating systems as outlined in Section 8 & Appendix A of the TEC Manual shall be adhered to.

B. Whenever a mobile home furnace is being installed during a weatherization project AND the heating system utilizes propane or natural gas, the WAP installed appliance shall be both:

1. A Category IV Appliance| ***designed for production of condensate and positive draft pressure***

   - and -

2. A Sealed Combustion Appliance

Written permission from OEO must be attained prior to the installation of any other category or type of MH furnace/central heating system when the fuel source is propane or natural gas.

Item 9: Duct System Enhancements

All programmatic requirements regarding duct system enhancements as outlined in Section 8 of the TEC Manual shall be adhered to on every MHPL eligible project.

Item 10: Prioritized Airsealing

All programmatic requirements regarding prioritized airsealing protocols, as they are outlined in Section 8 of the TEC Manual, shall be adhered to on every MHPL eligible project.

Note that none of the policies outlined in Section 6 of the TEC Manual are applicable to mobile homes and those policies shall not be followed during mobile home projects.

Section 9: Mobile Home Priority List

Item 11: Mobile Home Belly/Floor System

A. All programmatic requirements regarding weatherization improvements to a mobile home belly/floor system shall be implemented on every MHPL eligible project in accordance with Section 8 of the TEC Manual.

B. **Belly Sealing |** Expectations are for all belly types and designs
By conclusion of a MHPL project, all holes, tears, voids in the mobile home belly material shall be completely sealed in a durable manner. Use of tape is not allowable for belly sealing purposes.

C. **Perimeter of Belly/Floor System |** Expectations are for all belly types and designs
The entire perimeter of the belly/floor system, including the wings/outriggers, shall be insulated to the maximum R-Value possible using either blown-in fiberglass or cellulose insulation.

D. **Center of Belly/Floor System |** Expectations are varied by design type
The center sections of the belly/floor system shall be weatherized in accordance with the policies outlined within Section 8 of the TEC Manual for the most comparable belly/floor system type and design to the one found on each individual project.

Item 12: Mobile Home Ceilings/Roof Systems

A. All programmatic requirements regarding weatherization improvements to a mobile home ceiling/roof system shall be implemented on every MHPL eligible project in accordance with Section 8 of the TEC Manual.

B. **Typical Mobile Home Roof Designs**
Any portion of a mobile home attic/roof system where the cavity depth between the ceiling and roof is deeper than 14 inches shall not be insulated with more than 14 total inches of insulation even if more insulation would fit. The 14 total inches of insulation includes the preexisting insulation and the insulation installed by the WAP. It references the final "settled-depth" of the insulation.

- **By conclusion of each mobile home project every attic/roof system section shall be insulated to a minimum, average "effective" value of R-40 *(without exceeding the 14 inches of insulation limit in any portion of the mobile home attic/roof)*.**
- **Whenever a minimum, average "effective" value of R-40 is not possible due to space limitations between the ceiling and the roof:**
  - ✓ **Each ceiling/roof system section shall be insulated with blown-in insulation to the maximum R-value possible *(without exceeding the 14 inches of insulation limit in any portion of the mobile home attic/roof)*.**

C. **Mobile Home with Roof-Over**
Whenever there is a roof-over that allows for physical access into the attic space between the two roof lines, then the original roof cavity shall always be sealed and insulated prior to adding any additional insulation over the top of the original roof.

If there is already batt-insulation over the original roof, a perimeter-pull shall be done on all sides. Additional blown-in insulation must be added to achieve a minimum "effective" R-40 value throughout the roof/attic area everywhere that the roof clearance allows for an "effective" R-40 to be attained.

Buildings Non-Eligible for Use of the Mobile Home Priority List

If any of the following conditions are applicable to a mobile home project, the building is not eligible for use of the MHPL & a full house mobile home audit that generates an energy savings report is required.

1. The total cost of all incidental repair measures exceeds 13% of the total onsite job cost or exceeds a $750 maximum amount. If 13 % of the total onsite job cost would equal an amount greater than $750 then $750 shall be the maximum allowable cost of all incidental repair classified measures unless a full house audit is performed. Onsite job costs are the materials plus onsite labor costs as reflected in the HES program.
2. The pressure/insulation boundary is already located at the crawlspace perimeter instead of being located at the mobile home belly or the pressure/insulation boundary will be relocated to the crawlspace perimeter during the project.
3. The mobile home has been sited on a permanent foundation that provides an enclosed basement/crawlspace area.
4. A heating appliance will be replaced for non-health and safety reasons.
5. Any addition(s) to the original mobile exceed 25% of the original mobile home floor area.

Note that it is always allowable to perform a full house audit to develop the scope of work for any mobile home project instead of utilizing the mobile home priority list to develop the scope of work.

VT TEC Manual—Section 10: Quality Control Inspections

Eligibility for Performing Quality Control Inspections:

The table below outlines the professional credentials that must be attained in order to perform quality control inspections on weatherization projects. In addition, the table identifies which roles can and cannot be performed in addition to the final inspection duties on individual projects.

	Professional credentials required to perform final inspection duties		**Identifying when it is allowable for a QCI certified individual to perform multiple weatherization duties**		
Building size	BPI QCI credential is required	Succesful completion of a Tier-1 Accredited Multi Family QCI Course is required	A certified energy auditor can perform final inspection on a job where they also performed the energy audit	A certified production or operations manager who also supervises weatherization crew workers can perform the final inspection	A certified crew person can perform the final inspection **if** they did not perform any other work on that specific WAP job
1 - 4 units	Yes	No	Yes	No	Yes
5 (+) units	Yes	Yes	Yes	Yes	Yes

Requirements for Every Quality Control Inspection:

The table below outlines required responibilites of a certified quality control inspector by work category.

Review	**Visual Inspection**	**Photographic Documentation**	**Testing**
Client Job File	Attics	A sampling of photos of the installed measures is required. A joint effort between the crew and the inspector is often needed. It is strongly recommended that photos of attic airsealing work be taken prior to covering it up with insulation.	Exhaust Fan Flow
HES Energy Audit	Kneewalls		Combustion Testing
Scope of Work	Basements/Crawlspaces		W.C.D. Testing
Bids/procurement for any subcontracted work exceeding $1,500	Interior of Home		Blower Door assisted smoke testing at attached/tuck under garages
Results of combustion testing performed by WAP agency and subcontractors	Exterior of Home		Blower Door assisted smoke testing to attics/ through top of building surfaces
Worst case draft testing by auditor and by crew	Combustion Appliances		
Results of short cycling test and heat rise test whenever there is a furnace	Ductwork	Photos of the finished work **must** be taken **prior to** permanently sealing off any area and rendering it non-accessible (ex. kneewall closets or attics)	Verify all physically accessible return ducts are free of air leaks

Software Integration within the QCI Process:

Data Entry Requirements

There are data entry steps that must be performed before it is allowable to report a weatherization project as complete. The table below identifies the required data entry steps.

HES Screen Title	Required Action	Comments
Air Infiltration	Enter the actual tested post-Wx blower door reading	Required in order to calculate the final Energy Savings Report based on actual results
Combustion Test	Enter actual test readings for heating and domestic water heating combustion appliances	Required in order to document the final combustion test results in the software
CO Test	Enter post-Wx CO test results for cooking appliances	Required only in cases where pre-Wx test results were outside acceptable ranges and/or where work was performed on the cooking appliance during project
Installation & Inspection	**Enter the actual installed & inspected measure quantities for each measure to ensure they match the actual work that was performed on the project** with reference to the appropriate units (for example sq. ft. vs. each vs. lin. ft.)	Whenever a measure was on the work scope and then it was not installed and/or there are no transactions that can be associated to the measure then it must be reset to an installed/inspected measure quantity of zero prior to running the final Energy Savings report that is based on actual work performed
Inspection	Indicate each installed measure, and the job as a whole, has passed final inspection	This action in the software **must wait** until all measures performed, and the job as a whole, has been passed by the certified QCI
Energy Savings	Generate the final Energy Savings report based on actual work performed	This generates the final energy savings report which recalculates the project economics (SIRs) based on actual installations and transactions entered for each job

Software Integration within the QCI Process:

The HES "WAP Documents" Screen

There are a total of 17 line items on the HES screen titled "WAP Documents" where project information is uploaded and retained. The table below identifies which documents are required for every project file and those that are sometimes required dependent on project specific conditions.

	WAP Document Title	Every File	When Applicable
		Upload is required for every project	Upload is sometimes required dependent on the project specific conditions
1	Receipt of Lead Pamphlet	Yes - Always Required	
2	Client Rights & Expectations	Yes - Always Required	
3	Mold & Moisture Form		Yes – When Applicable
4	Energy Audit Project Photos (consolidated as single .pdf)	Yes - Always Required	
5	All Worst Case Draft Test Forms (Appendix C of TEC Manual)	Yes - Always Required	
6	All Red Calcs Tool Calculations	Yes - Always Required	
7	All Waivers (ventless heater, earthen floor, etc.)		Yes – When Applicable
8	Hazard Assessment and/or Deferral of Services Forms	Yes - Always Required	
9	2014 Weatherization Residential Audit Form or 2014 Mobile Home Audit Form	Yes - Always Required	
10	MF - 5 (+) Units - Upload from BEAST file		Yes – When Applicable
11	Add-On Program Docs, Efficiency Coach Forms (and VGS docs if applicable)	Yes - Always Required	
12	Transmittal Approval Form (upload DAACC file here if it's also a transmittal approval)		Yes – When Applicable
13	Atypical Project Approval Form		Yes – When Applicable
14	Crew & QCI Photos - During and After Project Photos (consolidated as single .pdf)	Yes - Always Required	
15	Miscellaneous Document Uploads 1		Yes – When Applicable
16	Miscellaneous Document Uploads 2		
17	Miscellaneous Document Uploads 3		

Software Integration within the QCI Process:

The HES "WAP Documents" Screen *(continued from last page)*

Below is additional information about required items to upload to the HES WAP Documents screen.

Every File		When Applicable	
The additional items identified below need to be uploaded into one of the existing 17 WAP Document locations for every project		The additional items identified below need to be uploaded into one of the existing 17 WAP Document locations whenever project specific conditions make it applicable to the job	
1	A **Fully** Signed QCI Form *-Signed by the Client, the Certified Inspector **& the Weatherization Program Director***-*	1	All of the additional forms and record keeping required when lead safe weatherization practices are used
2	Record keeping related to **all** subcontracted work performed on the job (invoices from subs, procurement efforts made, etc.)	2	All required vermiculite documentation and record keeping
3		3	All required confined spaces documentation and record keeping

***It is not allowable practice for an alternate member of the local WAP team to sign on behalf of the Certified Inspector or sign on behalf of the Weatherization Program Director without prior written approval by OEO.**

Required Information to Provide WAP Clients:

Prior to reporting a successfully completed weatherization project, the following deliverables must be provided to the client.

Required Deliverable		Comments
1	Weatherization Project Label	The recommended placement for these "stickers" is on the cover of the electrical panel
2	A **Partially** Signed QCI Form *-Signed by both the Client & the Certified Inspector-*	The button in the HES program that produces the required report to use for each job is titled "Entire Agency QC Form"
3	Installed Materials Receipt	This receipt is required in order to comply with CFR 460.17 & the Federal SWS The information required for these reports was incorporated into a HES report in 2016. Delivery of this HES report to every client has been a Vermont WAP requirement since 10-01-2016

It's difficult to have 100 % of the information needed to provide complete versions of all three of these deliverables to the client during the in-person final inspection. Mailing and/or emailing these deliverables to clients is acceptable practice.

Performing Successful Quality Control Inspections & Closing Out Weatherization Projects:
Weatherization projects can only be reported as completed to OEO after a quality control inspection has been performed by a certified inspector that includes all required testing procedures and when all measures for the job have been passed by the certified inspector.

Extenuating Circumstances:

Unsuccessful Attempts to Schedule or Perform Inspection
If attempts to perform an inspection are seemingly not possible, written permission from OEO must be attained in order to report a project as completed and close it out. It is not allowable to report a completed project without performing a thorough final inspection unless written permission to do so is attained by the OEO office.

If a client is non-responsive to phone or email communications the local provider must send a written letter to the client outlining the importance of the inspection.

It is recommended that phone calls to the client be attempted at different times of the day and that any program staff that will be working in the area visit the home in attempt to make contact with the client and enable the in-person final inspection.

A contacts log demonstrating diligent attempts to complete final inspection is to be retained in the client file.

Once informed of difficulties in connecting with a client, OEO staff will work to support local providers and make additional attempts to communicate with the client in order to enable the final inspection to occur. OEO staff will also mantain a contacts log.

If after working together, the local and OEO offices are unsuccessful in performing a final inspection, OEO will communicate permission to close out the project in writing.

The contacts logs and written permission to close out the project must be retained in the client file by uploading into the WAP documents section of the HES system.

Partial Inspection Performed
If there is no fuel and it is needed in order to perform a complete quality control inspection then fuel can be provided by WAP when it represents the only way to get a combustion appliance operational for testing and evaluation purposes.

Written permission from OEO must be attained in order to report a project as completed and close it out in cases where only a partial insection has been performed.

This documentation must be retained in the client file by uploading into the WAP documents section of the HES system.

Clean, Tune & Evaluation Requirements

Primary Heating System		
For each home a primary heating appliance must be determined by the energy auditor. The clean and tune requirements for the primary heating system are two-fold; based on the elapsed time period since the previous CTE was performed and results of diagnostic testing during the energy audit.		
Oil Fired	*V.*	**Gas Fired**
A primary oil fired heating appliance shall be cleaned, tuned and evaluated by a qualified technician unless this task has been completed **within the past 9 months** from the date of the energy audit and the results of all combustion, spillage and draft testing conducted during the energy audit are acceptable.		A primary gas fired heating appliances shall be cleaned, tuned and evaluated by a qualified technician unless this task has been completed **within the past 18 months** from the date of the energy audit and the results of all combustion, spillage and draft testing conducted during the energy audit are acceptable.
Secondary Heating Systems & Domestic Hot Water Systems		
A secondary heating appliance or water heater shall be cleaned, tuned and evaluated by a qualified technician whenever results of diagnostic testing performed by WAP are not acceptable. The date of the last CTE has no bearing on whether or not a WAP agency must order a CTE for this category of appliances.		

Solid Fuel Burning Appliances
Shall be visually inspected for safe operation
If system appears unsafe then a qualified technician must perform a system CTE.
Note that installation of optional, factory issued, combustion air kits that are not already installed on solid fuel burning appliances is allowable utilizing WAP funding.

Appendix A: Combustion Appliance Protocols

Determining Primary v. Secondary Heating Appliances

The energy auditor has discretion in determining the primary fuel source and which appliance is to be deemed the primary heating system for each project. Determining the primary heating fuel and appliance is not limited exclusively to historical energy consumption records.

When making this determination the auditor must talk with the client to ensure all of the following variables are considered:

1. If there is more than one heating appliance, how often are they run at the same time or are they only used one at a time?
2. Which heating appliance would the client prefer to use if they had to make a choice between the multiple heating system options currently in the home? Why?
3. If a fuel assistance benefit is received, what fuel source is the benefit associated with?
4. What condition are each of the heating appliances in?
5. What is the projected cost to get each heating appliance operating in a safe and reliable manner?

WAP Purchasing Fuel for a Client Because the Client is out of Fuel During Project

Fuel can be provided by the WAP if there is no fuel onsite and fuel is needed to get a heating appliance operational so it can be evaluated/tested.

- **During the Energy Audit | This is important to ensure good decisions can be made when developing the workscope for heating systems.**
- **During the QCI | This is important to help ensure the home is being left in a safe condition at the conclusion of the project and that any work performed on the heating system was effective.**
  - ✓ An example where the WAP may need to purchase fuel for a client to help determine the primary heating system is when a household is burning wood while the auditor is working through a project evaluation, the fuel tank for the furnace is empty and an informed decision is needed about whether to put a more significant investment into the wood stove or the furnace.

Appendix A: Combustion Appliance Protocols

Investment Allowances for Primary v. Secondary Heating Appliances

It is allowable to invest more weatherization funding into the primary heating system than into those deemed as secondary heating appliances. Improvement expenses shall be capped at $500.00 for secondary heating appliances unless written permission to exceed this amount is granted by OEO. This written permission must be requested using the "Atypical Project Approval Form" and all approvals must be uploaded to the HES job file.

Required Order of Operations

Combustion Appliances *Vs.* Building Shell

Under no circumstances shall any airsealing or insulation improvements to the building shell be performed before all conditions outlined below are met.

Required Prerequisites to Building Shell Improvement Measures

1. Initial spillage, draft and combustion testing shall be completed by an energy auditor
2. All applicable CTE requirements must be performed by a qualified technician
3. Any repairs—or replacements—that are necessary to ensure all combustion appliances are in safe working order must be completed
    - This policy includes ovens and ranges

Appendix A: Combustion Appliance Protocols

Clean, Tune & Evaluation Requirements

<table>
<tr><th colspan="3">Domestic Cooking Appliances</th></tr>
<tr><th>Gas Ovens</th><th>v.</th><th>Gas Range Tops</th></tr>
<tr><td>All gas ovens <u>shall</u> be tested at the energy audit. Turn the oven up to the highest possible bake setting (not broil).</td><td></td><td>All gas stove top burners <u>shall</u> be tested at the energy audit.</td></tr>
<tr><td>For consistency testing shall be done well down inside the exhaust vent prior to the introduction of dilution air.

Test inside oven flue</td><td colspan="2"> 
Test 12” above center of each flame

For consistency testing shall be done 12” above the center of each individual burner.</td></tr>
<tr><td>Action Levels | If CO concentrations in the flue are lower than 200 ppm after 5 minutes document the measurement. The oven has passed the test. If CO levels are greater than 200 ppm after 5 minutes document the measurement and retest at the 10-minute mark.

Repairs <u>must</u> be attempted if CO concentrations are still greater than 200 ppm at the 10-minute mark.

If a CO concentration lower than 200 ppm is attained between the 5 and 10-minute marks, the owner (and occupant, if applicable) shall be made aware of the condition and the risks of CO exposure. Repairs are allowed but not required in these cases.</td><td></td><td>Action Levels | If the measured CO level is between 35 -100 ppm at the test location after 2 minutes, the owner (and occupant, if applicable) shall be made aware of this condition and repairs should be attempted.

Repairs <u>must</u> be attempted if CO concentrations are greater than 100 ppm at the test location after 2 minutes of operation.</td></tr>
<tr><td colspan="3">Record Keeping Requirements | All CO test results must be recorded in HES for each project.</td></tr>
<tr><td colspan="3">Oven Replacements | Replacing ovens with DOE funding is not allowed. Oven replacements are allowable in some cases using Non-DOE Weatherization Funding. However, all oven replacement requests must be submitted to OEO for approval prior to ordering the new oven.</td></tr>
<tr><th colspan="3">QCI Testing Requirements – Ovens & Range Tops</th></tr>
<tr><td colspan="2">Testing the CO levels for Ovens & Range Top burners during the QCI is required whenever a CO problem was identified during the audit or at any other point during the project.</td><td>Testing the CO levels for Oven & Range Top burners during the QCI is recommended (not required) when no CO problems were identified during the audit or at any other point during the project.</td></tr>
</table>

Combustion Appliance Testing Procedures

Ambient CO Monitoring Requirement

Ambient levels of carbon monoxide must be continuously monitored whenever performing draft and/or combustion testing. If ambient CO levels exceed 35 ppm the testing shall be aborted, the appliance turned off, the CAZ ventilated, and a qualified technician must be contacted immediately to schedule a system evaluation. Ambient levels shall be monitored 10 feet away from the flue opening of a combustion source.

When to Perform Combustion Testing

At minimum combustion testing is required two separate times during the course of every weatherization project.

1. At the Energy Audit
2. At the Final Quality Control Inspection

Many appliances will require a third combustion test.

Another combustion test must be performed every time a heating technician provides services during a weatherization project, even if the scope of work performed is limited to a system clean, tune and evaluation.

Written results of this combustion test must be provided
by the heating technician to both the weatherization agency and to the homeowner.

Diagnostic Equipment

An approved combustion analyzer must be utilized.

Above are some of the many combustion analyzers available to weatherization professionals.

Weatherization Works

Combustion Appliance Testing Procedures

Test Location Protocols

A combustion test must always be completed prior to the introduction of dilution air. Various combustion, spillage and draft test locations are specified throughout this section.

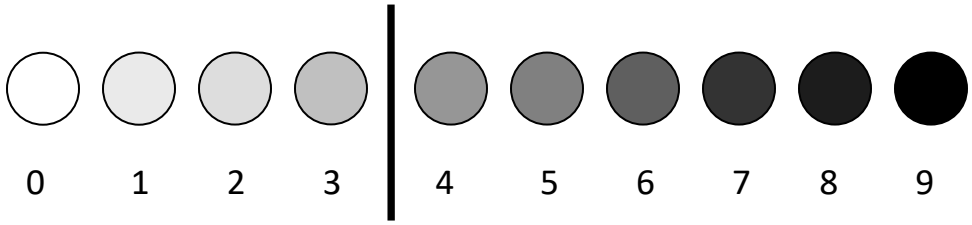
Smoke Testing

All Combustion Appliances

Smoke Tester

It is always recommended to pull a smoke reading prior to inserting the probe of a combustion analyzer into the flue of a combustion appliance.

High smoke production can damage the combustion analyzer.



Proceed

Abort Testing Procedures

A system clean, tune, & evaluation is mandatory whenever there is a smoke reading higher than zero.

This CTE requirement applies to all combustion appliances

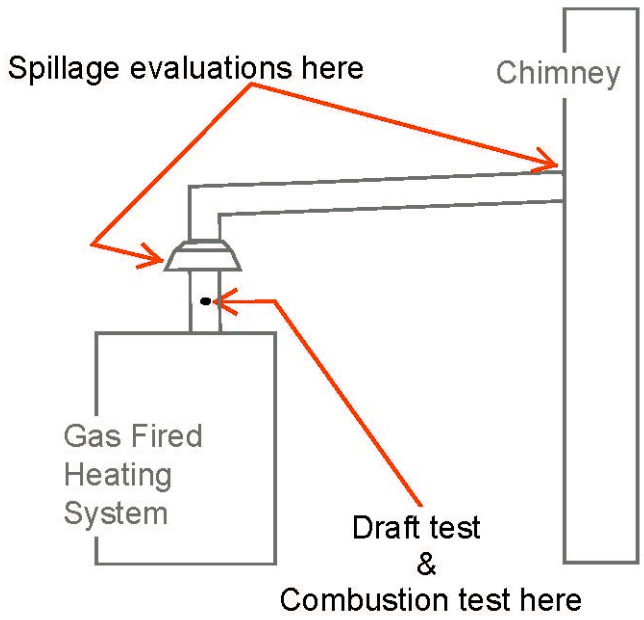
Combustion Appliance Testing Procedures

Test Location Protocols

Category 1 Appliances Include:

- ✓ Atmospheric Draft Appliances
- ✓ Induced Draft Appliances

Category 1: Atmospheric Draft Appliances

Gas Fired Equipment		
For atmospheric drafting gas fired equipment, **with a bell shaped dilution hood installed in the vent run at a point where sections of the flue pipe are located on each side of the bell hood**, the combustion test and draft test shall be completed by drilling an opening in the flue pipe as shown in the diagram to the right. This method applies to some boilers and furnaces.		
System Details	Minimum Distance: Test Hole to Elbow	Minimum Distance: Test Hole to Dilution Hood
W/ Bell Shaped Dilution Hood	**6”**	**6”**

All Category 1 Appliances:

- ✓ Are designed to have a negative draft pressure
- ✓ Are <u>not</u> designed to produce condensate

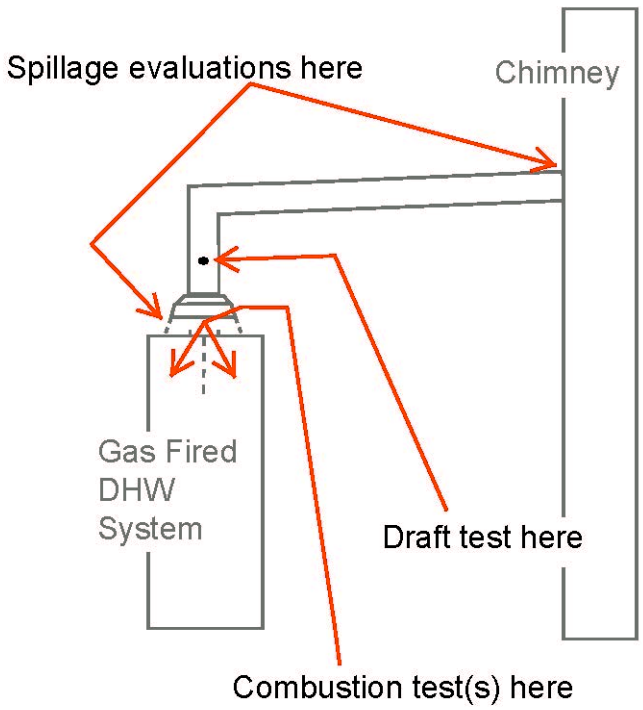
Combustion Appliance Testing Procedures

Test Location Protocols

Multiple Combustion Ports:

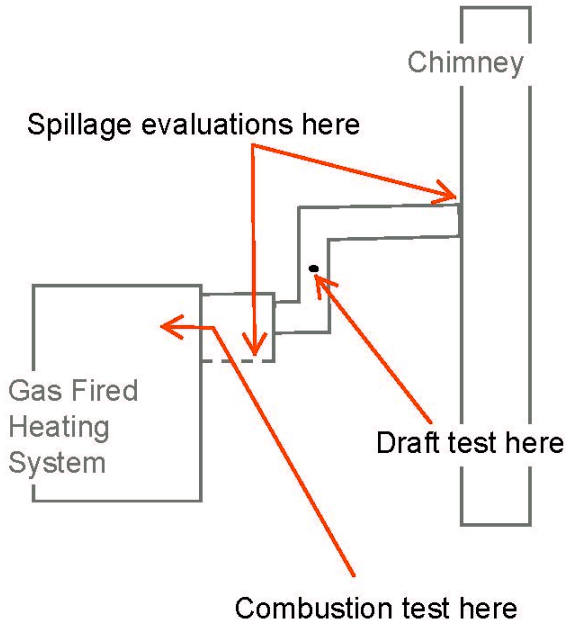
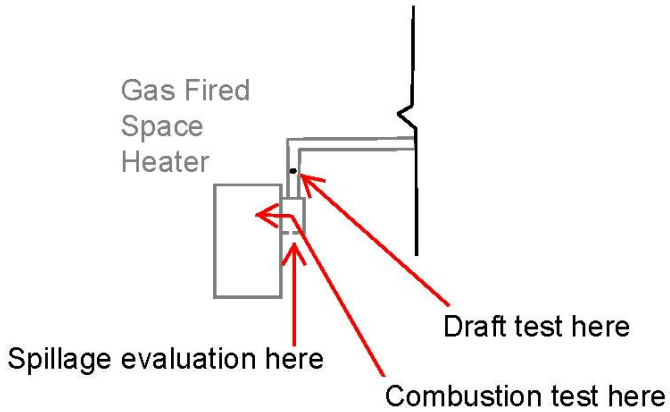
- ✓ Many water heaters have a baffle separating the combustion ports
- ✓ It is important to perform combustion analysis on both sides

Category 1: Atmospheric Draft Appliances *(continued)*

<table>
<tr><th colspan="3">Gas Fired Equipment</th></tr>
<tr><td>For atmospheric drafting gas fired equipment, with a bell shaped dilution hood located atop the appliance and before the beginning of the flue pipe run, the combustion test(s) and draft test shall be completed in separate locations as shown in the diagram to the right. This method applies primarily to water heaters.</td><td colspan="2"> 
</td></tr>
<tr><td>System Details</td><td>Minimum Distance:
Test Hole to Elbow</td><td>Minimum Distance:
Test Hole to Dilution Hood</td></tr>
<tr><td>W/ Bell Shaped Dilution Hood</td><td>6”</td><td>6”</td></tr>
</table>

Combustion Appliance Testing Procedures

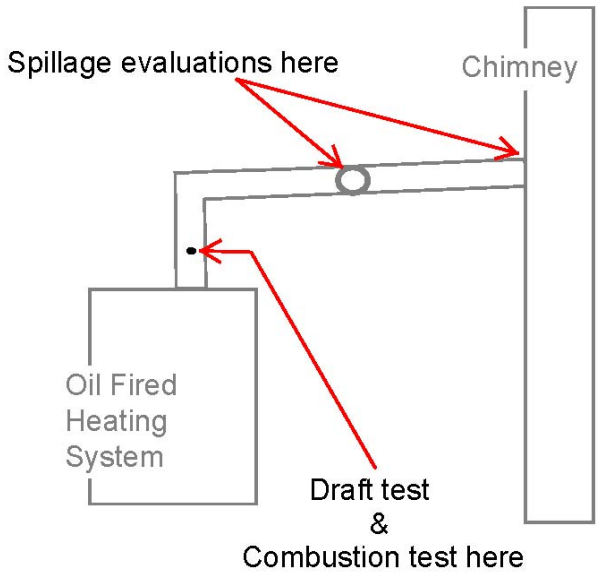
Category 1: Atmospheric Draft Appliances *(continued)*

<table>
<tr><th colspan="3">Gas Fired Equipment</th></tr>
<tr><td>For atmospheric drafting gas fired equipment, with a box shaped dilution hood located before the beginning of the flue pipe run, the combustion test and draft test shall be completed in separate locations as shown in the diagram to the right. This method applies to some boilers and furnaces.</td><td colspan="2"> 
</td></tr>
<tr><td>System Details</td><td>Minimum Distance:
Test Hole to Elbow</td><td>Minimum Distance:
Test Hole to Dilution Box</td></tr>
<tr><td>W/ Box Shaped
Dilution Hood</td><td>6”</td><td>6”</td></tr>
<tr><td>Space heaters shall be tested in the same manner as an equivalent central heating system.
~
In the example shown, a spillage evaluation is conducted at the dilution box, a test hole is drilled to measure appliance draft, and combustion testing is done inside –each– combustion port prior to the introduction of dilution air.</td><td colspan="2"> 
</td></tr>
</table>

Combustion Appliance Testing Procedures

Test Location Protocols

Category 1: Atmospheric Draft Appliances *(continued)*

Oil Fired Equipment	
On many appliances, particularly oil fired appliances, the same test hole used for a combustion test can also be used for the draft test. ~ **For atmospheric drafting oil fired equipment** the combustion test and draft test shall be completed by drilling an opening in the flue pipe as shown in the diagram to the right. This method applies to boilers, furnaces, and stand-alone water heaters.	

System Details	Minimum Distance: Test Hole to Elbow	Minimum Distance: Test Hole to Barometric Control
W/ Barometric Damper	**6”**	**6”**
Without Barometric Damper	**6”**	***-NA-***

Providing Combustion Air and/or CAZ Pressure Relief

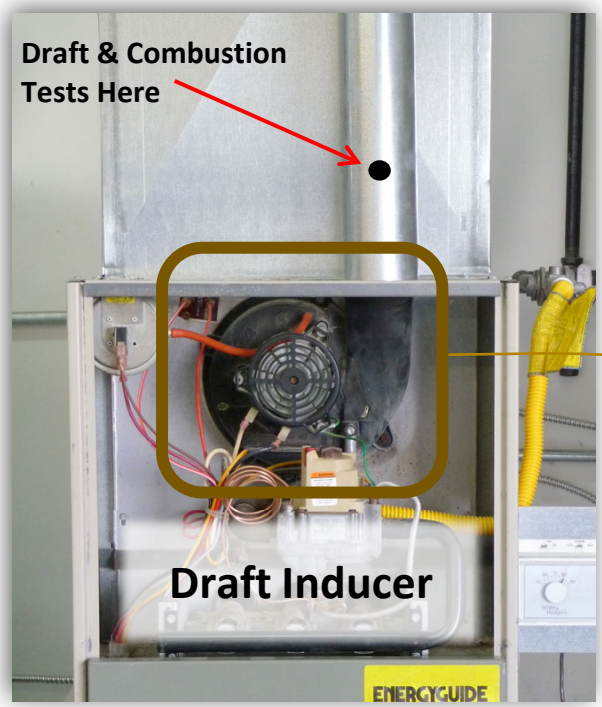
Installation of combustion air products such as AirBoots, FurnaceBoots, Fan in a Can, etc., is allowed and encouraged to assist Category 1 appliances establish and maintain acceptable draft levels in efficient housing stock.

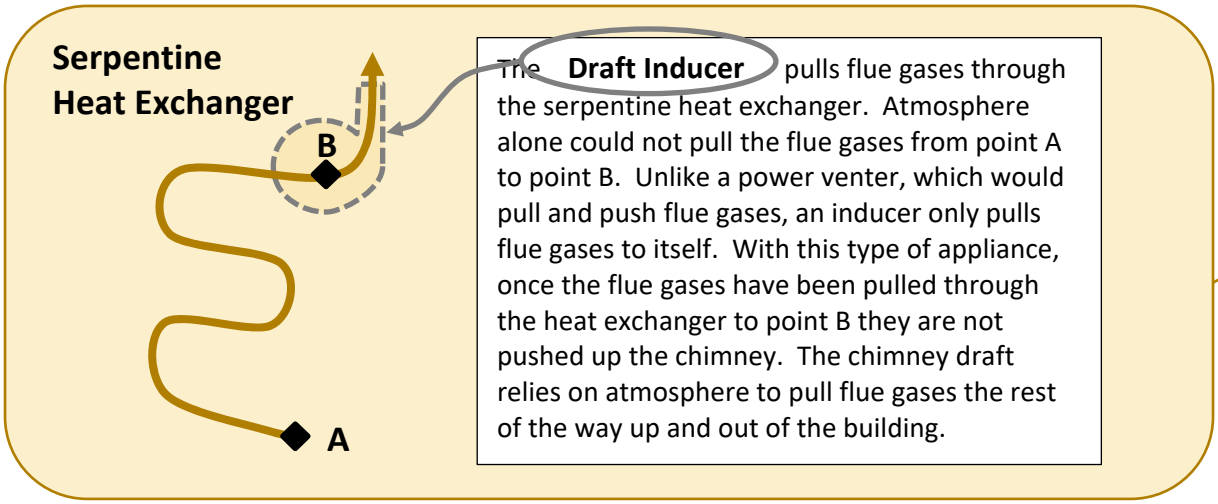
Installing combustion air devices will not change the category of an appliance nor will the appliance become “sealed-combustion” after system modifications are complete. However, these modifications will help an appliance operate more safely in efficient housing stock.

Installation of passive air inlets is allowable only when factory issued combustion air devices are not compatible with a specific appliance. If a passive air inlet is necessary to establish and maintain acceptable appliance draft, the inlet shall be located as close to the appliance as possible.

Combustion Appliance Testing Procedures

Category 1: Induced Draft Appliances

Gas Fired Equipment		
Induced draft appliances are often confused with power vented appliances. **But Induced draft appliances are still Category 1 appliances. They have a negative draft pressure and they are not designed to produce condensate.** The combustion test and draft test shall be completed by drilling an opening in the flue pipe as shown in the diagram to the right. This method applies to all induced draft combustion appliances.		
System Details	Minimum Distance: Breach to Test Hole	Maximum Distance: Breach to Test Hole
Induced Draft	**6”**	**10”**



Appendix A: Combustion Appliance Protocols

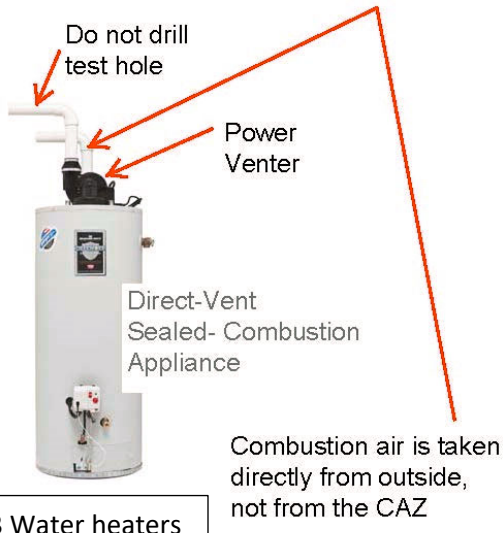
Combustion Appliance Testing Procedures

Category 3 & 4: Positive Pressure Draft Appliances

Gas & Oil Fired Equipment

All category 3 & 4 appliances have positive pressure draft. They are differentiated by whether or not they are designed to produce condensate in the flue. Category 3 appliances are not designed to produce condensate. Category 4 appliances are designed to produce condensate. Either category type of appliance may or may not be direct vented and sealed-combustion.

Power Vented	**v.**	**Direct-Vent Sealed-Combustion**



Both appliances shown above are Category 3 Water heaters

Combustion air provided from CAZ	Combustion air piped in directly from outdoors

These are positive pressure draft systems.

For all category 3 & category 4 appliances, regardless of whether or not the appliance is direct- vent and/or sealed-combustion, the combustion test shall be completed at the terminus of the vent piping by inserting the probe of a combustion analyzer as far into the vent opening as is possible from outdoors.

Do not drill a test hole in the flue!

Modified spillage evaluations are still required for these appliance types.

See Appendix D for additional spillage evaluation protocols for positive-pressure draft systems.

Combustion Appliance Testing Procedures

Drilling Test Holes in Different Types of Venting Materials

Frequently Asked Question:
If an atmospheric drafting gas appliance is vented with "B" vent should I still drill a test hole in the flue?

Answer: Yes / No

- **"B" Vent** is a double wall pipe with an outer layer of galvanized steel and an inner layer made of aluminum. It is commonly used to vent gas fired appliances (with negative pressure draft) and it is acceptable practice to drill a test hole in this type of flue pipe to perform combustion and/or draft testing.

- **L" Vent** is another type of double wall pipe which is used to vent oil fired appliances. The inner layer of "L" vent is stainless steel rather than aluminum. It is also acceptable practice to drill a test hole in this type of flue pipe to perform combustion and drafting

Sealing Test Holes in Various Types of Venting Materials		
Flue Type	Required Materials/Methods	Encouraged Materials/Methods
Single Wall	Aluminized tape applied over test hole	Insert a metal plug then seal with aluminized tape
"B" Vent	A tight fitting bolt with high-temp caulking applied to threads inserted into the test hole	Aluminized tape over the bolt after it's threaded into place
"L" Vent	A tight fitting bolt with high-temp caulking applied to threads inserted into the test hole	Aluminized tape over the bolt after it's threaded into place

Combustion Appliance Testing Procedures

Carbon Monoxide Action Levels & WAP Expectations

The previous pages in this section outline when, where and how to perform a variety of testing procedures on different appliance types. The table below emphasizes important action levels regarding measured carbon monoxide readings and expectations for WAP agencies.

Carbon Monoxide Level (in the stack)	WAP Expectations		
	Auditor or Inspector on site	Local WAP Agency	Qualified Service Technician
100 ppm(+)	Inform client & WAP office before leaving the site. Prior to leaving the site, install a CO detector on the same floor of the building where the problematic combustion appliance is located.	Immediately coordinate service for the combustion appliance.	After repairs have been performed, contact the local WAP office as soon as possible during regular business hours. Include written appliance diagnosis, scope of repairs and combustion test results along with invoice for services.
400 ppm(+) **-AND-** Appliance Spillage is Identified	Same actions as above. **-AND-** Disabling the appliance before leaving the site is required.	Same actions as above. **-AND-** Coordinate for provision of temporary space heating as needed until safety issue is fully resolved.	Same actions as above.

~Required Follow up & Verification: From the beginning of October through the end of April, an auditor or inspector employed by the local WAP *(not a subcontractor/vendor)* is required to complete a site visit and perform a combustion test after the repairs are completed to verify the safety issue was resolved. **This onsite follow up must be completed within two weeks of the service call date.** Note that this seasonal requirement is applicable for heating appliances only.

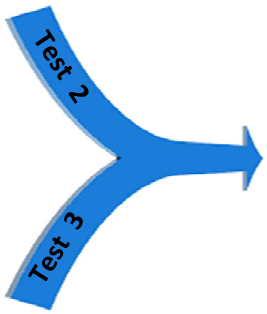
~Recommended Follow up & Verification: For the remainder of the year, this onsite follow up by a WAP employee is recommended for heating appliances. For non-heating appliances this onsite follow up is recommended throughout the calendar year.

Appendix B: Worst-Case Draft Testing Procedures

Frequency of Testing | Minimum Requirements

Worst-case draft testing is required a minimum of three separate times during every weatherization project*.

Required Test 1 | Energy Audit
Required Test 2 | Final Day of the Weatherization Installation Phase
Required Test 3 | Quality Control Inspection



***Acceptable Test Consolidation |** When a BPI Certified Quality Control Inspector is present on the project site during the final day of the weatherization installation phase, the certified inspector can perform final worst-case draft testing with the WAP installation team as they finish up their work.

This is only allowable if the certified inspector has not been involved in the installation of any of the weatherization measures and is not the supervisor of any installation team members.

This is the only scenario where the required tests from the final day of the weatherization installation phase and from the quality control inspection can be combined.

Note that conducting worst case draft testing is allowable and encouraged at the end of each day during the weatherization installation phase when the measures installed are anticipated to have a significant airsealing benefit.

Frequency of Testing | Additional Requirements Based on ACH50 Results

Worst-case draft testing is required every day of the weatherization project whenever the infiltration level in the building is below the ACH50 thresholds listed below:

- **Site-Built Homes |** Daily testing is required whenever the ACH50 is 5 or less.
- **Mobile homes *(single wide & double wide)* |** Daily testing is required whenever the ACH50 is 10 or less.

Appendix B: Worst-Case Draft Testing Procedures

Worst-Case Testing Requirements by Appliance Type

Appliances Designed to Operate with Negative Draft Pressure in the Flue			
Appliance Type	Measure Worst-Case CAZ Depressurization	Must Pass Spillage Test **within 2 Minutes**	Measure Worst-Case Draft in Flue
Category 1 -Atmospheric Draft -Does not provide DHW	**Yes**	**Yes** ***at Worst-Case***	**No**
Category 1 -Atmospheric Draft -Provides DHW	**Yes**	**Yes** ***at Worst-Case***	**Yes**
Category 1 -Induced Draft -Does not provide DHW	**Yes**	**Yes** ***at Worst-Case***	**No**
Category 1 -Induced Draft -Provides DHW	**Yes**	**Yes** ***at Worst-Case***	**Yes**

Appliances Designed to Operate with Positive Draft Pressure in the Flue			
Appliance Type	Measure Worst-Case CAZ Depressurization	Must Evaluate for Spillage	Measure Worst-Case Draft in Flue
Category 3 -Positive Draft Pressure -Non-Condensate	**No**	**Yes** ***at Natural Conditions*** *- no spillage for any amount of time is acceptable-*	**No**
Category 4 -Positive Draft Pressure -Produces Condensate	**No**	**Yes** ***at Natural Conditions*** *- no spillage for any amount of time is acceptable-*	**No**

Appendix B: Worst-Case Draft Testing Procedures

Establishing & Measuring Worst-Case Depressurization in the Combustion Appliance Zone

Please note that this testing is only required for combustion appliances designed to operate with negative draft pressure in the flue.

Step 1: Measure the Baseline Pressure

Set up the pressure gauge to measure the pressure difference between the combustion appliance zone *(CAZ)* and the outdoors. The gauge should be setup to read the CAZ pressure with reference to *(WRT)* outside pressure. The house should be set up with all windows and exterior doors closed, all exhaust appliances off, all combustion appliances off or in pilot mode, any fireplace dampers closed and all interior doors opened.

Step 2: Establish the Worst-Case Depressurization

Remember, the goal is for you to find the worst-case scenario and then evaluate the draft of the combustion appliances while the CAZ is in that "worst-case" condition.

Doing this correctly could potentially save lives. Take your time. If you are not sure about the correct way to establish the worst-case depressurization in a particular CAZ, please do ask for assistance.

These guidelines are intended to assist weatherization staff establish worst-case depressurization in the CAZ so one can test the draft of a combustion appliance with confidence that the CAZ is set up in a true "worst-case" condition. The specific order of steps taken to get from the baseline condition into the worst-case condition can be done in more than one way.

When trying to get to worst-case depressurization watch your pressure gauge as you turn on any clothes dryers, exhaust fans, central vacuum systems, HRVs/ERVs and furnace air handlers. Continue to watch the gauge as you open and close interior doors.

Whatever combination of running appliances and door configurations creates the greatest negative pressure reading in the CAZ (WRT) is the Worst-Case Depressurization.

- Always make sure that the dryer lint trap is clean or removed.
- Always make sure that the furnace filter is clean or removed.

Appendix B: Worst-Case Draft Testing Procedures

Spillage Testing | General Requirements

A spillage evaluation must be completed for all heating systems and water heaters unless the appliance burns a solid fuel, e.g., cord wood or pellets.

Spillage shall be checked with smoke pencils, powder puffers and/or mirrors.

For appliances vented into a chimney, spillage shall be checked where the flue pipe connects into the chimney/chimney liner, at every barometric damper/control and at each diverter hood/box. For more information about spillage evaluations refer to Appendix A, Combustion Appliance Protocols.

Spillage Testing | Appliances Designed to Operate with Negative Draft Pressure in the Flue

Every combustion appliance that is designed to operate with a negative draft pressure in the flue shall be tested for spillage under worst-case depressurization conditions. This requirement applies to all Category 1-Atmospheric Drafting Appliances and all Category 1-Induced Draft Appliances. This requirement applies to appliances that provide the domestic hot water supply and to appliances that do not provide the domestic hot water supply. This requirement also applies to any appliances that are designed to have negative draft pressure in the flue even if those appliances are direct-vented and/or sealed-combustion units. If the appliance is designed to have a negative draft pressure in the flue it must be tested for spillage under worst-case conditions.

The combustion appliance shall pass the spillage test within two minutes.

Corrective action must be taken by the WAP whenever an appliance fails to pass the spillage test within two minutes.

Spillage Testing | Appliances Designed to Operate with Positive Draft Pressure in the Flue

No spillage for any length of time is acceptable for these types of combustion appliances. A visual inspection of the entire length of the vent run between the appliance and the building exterior must be performed while the appliance is running.

If there are any signs of spillage at any seam/joint/connection along the vent run, corrective actions must be performed to prevent spillage of flue gases into the building.

Appendix B: Worst-Case Draft Testing Procedures

Draft Testing | Appliances Designed to Operate with Negative Draft Pressure in the Flue

When a combustion appliance designed to operate with negative draft pressure in the flue passes the spillage test, the next step to take in the worst-case testing process depends on whether or not the appliance provides domestic hot water (DHW). The table below outlines the next step of the worst-case testing process for negative draft pressure appliances.

Appliance Provides DHW	Appliance Does Not Provide DHW
	
The appliance has passed the spillage test. Next, wait for the appliance to reach steady state and then test the strength of draft. Record the strength of draft and compare it to the "minimum acceptable worst-case draft levels" table. These appliances must pass both the spillage test and the strength of draft test or corrective action must be taken by the WAP.	The appliance has passed all required steps of the worst-case draft testing process. Record the worst-case depressurization level and document that the appliance has passed the spillage test. Note that it is allowable for a WAP technician to perform additional testing (e.g. measure the strength of draft at steady state) but additional testing is not required by the WAP.

Appendix B: Worst-Case Draft Testing Procedures

Minimum Acceptable Worst-Case Draft Levels (at various outdoor temperatures)

Appliances Designed to Operate with Negative Draft Pressure in the Flue & that also do provide DHW											
Degrees F	<10	10	20	30	40	50	60	70	80	90	>90
Pascals	-2.5	-2.5	-2.25	-2	-1.75	-1.5	-1.25	-1	-0.75	-0.5	-0.5

The table above provides the minimum acceptable draft levels for combustion appliances at various outdoor temperatures.

- When the temperature is less than 10 degrees Fahrenheit, the minimum draft level is always -2.5 Pascals.
- When the temperature is greater than 90 degrees Fahrenheit, the minimum draft level is always -0.5 Pascals.
- Whenever the outdoor temperature is between 10 – 90 degrees Fahrenheit, the minimum draft level is calculated using the formula below:

  (T_out ÷ 40) – 2.75

  The results of this calculation for a sampling of outdoor temperatures is included in the table above for reference.

Corrective action must be taken by the WAP whenever the minimum acceptable worst-case draft level outlined here is not achieved when the appliance reaches steady state.

Appendix B: Worst-Case Draft Testing Procedures

Testing Appliance Draft

Category 1: Atmospheric or Induced Draft Appliances

"In The Flue" Draft Testing Location
by Venting Configuration & Fuel Type:

System Details	Minimum Distance: Test Hole to Elbow	Minimum Distance: Test Hole to Barometric Control**
Oil Fired	6"	*NA*
Oil Fired w/ barometric damper	6"	6"
Gas Fired w/ diverter (bell or box type)	6"	*NA*
Gas Fired w/ barometric control	6"	6"

***Whenever there is a barometric control, the test hole shall be located at the appliance side of the barometric control, not on the chimney side of the barometric control.*

Common Scenario: An oil-fired appliance equipped with an AFG Series Beckett burner and a barometric damper.

FAQs About Draft Testing Locations For this Common Scenario:
When is testing the strength of draft in the section of flue pipe located on the chimney side of a barometric control needed? Is it allowable?

Guidance: Drilling a draft test hole in the section of flue pipe on the chimney side of the barometric control is never required in this scenario. This draft test location could only be used in addition to the required spillage and draft testing location which is located on the appliance side of the barometric damper. It is allowable as a secondary testing location and could potentially be a valuable test to perform when trouble shooting a draft problem.

For more detailed information on Combustion, Draft & Spillage Test Locations refer to Appendix A, Combustion Appliance Protocols

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Do not drill holes in the flue pipe for appliances with positive draft pressures = Category 3 & 4.

Appendix B: Worst-Case Draft Testing Procedures

Frequently Asked Questions

Question: If I turn on the dryer and all the exhaust fans and then test the appliance draft am I doing a worst case draft test correctly?

Answer: This is…

True / (False)

…but why?

Clarifying Example: If an appliance—a fan, a dryer, etc.—is turned on and the CAZ pressure gets more positive, then any doors separating that appliance and the CAZ should be opened and closed. If that appliance is still making the CAZ more positive, with the door both opened and closed, then it should be turned off. The appliance is not contributing to worst-case depressurization and should not be running when the worst-case draft measurement is taken.

If an exhaust appliance makes the CAZ more negative, but only with an interior door in one position but not another, then the appliance should be left on and the door should be left in whichever position makes the CAZ go the most negative while the appliance is running.

Question: If a furnace air handler cannot be engaged with a button on the fan limit control do I still need to try and include the air handler in the worst case depressurization measurement?

Answer: Yes, but this is tricky and there are **three common scenarios** that require different approaches.

Scenario 1 of 3:

House w/ an oil or gas furnace & an electric water heater

To test the worst-case draft of the furnace:

Turn up the T-stat to get the furnace to engage. Measure the draft in the flue after the burner turns on—with a cold chimney and before the air handler engages—and then measure the draft again immediately after the air handler engages. Document the lower of the two draft readings. Also monitor the CAZ depressurization while the furnace is running and determine if the CAZ goes more negative after the air handler kicks in. Document the largest negative number in the CAZ as the worst-case depressurization.

If the CAZ goes significantly more negative when the air handler turns on and/or the draft in the flue pipe gets significantly weaker check for leaky return ducts. It is possible for a furnace to back draft itself if the returns are leaky enough! This is one of many good reasons to seal the return side of the distribution system with duct mastic.

Appendix B: Worst-Case Draft Testing Procedures

Frequently Asked Questions

Question (from previous page): If a furnace air handler cannot be engaged with a button on the fan limit control do I still need to try and include the air handler in the worst case depressurization measurement?

Answer: Yes, but this is tricky and there are **three common scenarios** that require different approaches.

Scenario 2 of 3:

House w/ an oil or gas furnace & an oil or gas water heater vented into separate chimneys

To test the worst-case draft of the furnace:

Follow all of the steps listed previously in scenario 1.

To test the worst-case draft of the water heater:

If the CAZ was more negative with the furnace *(more specifically the air handler)* running during the furnace testing procedures then leave the furnace running while testing the water heater draft. Otherwise, turn the furnace off *(and wait for the air handler to shut off)* before testing the water heater draft.

Scenario 3 of 3:

House w/ an oil furnace and a gas water heater vented into a shared flue

To test the worst-case draft of the furnace: Follow all steps listed previously in scenario 1.

To test the worst-case draft of the water heater:

Turn up the T-stat to get the furnace to engage. Wait for the air handler to engage. Monitor the CAZ depressurization while the furnace is running and determine if the CAZ goes more negative after the air handler kicks in. If the air handler does not make the CAZ more negative it is not contributing to worst case depressurization. Turn off the furnace, wait a few moments for the chimney to cool and then fire up the water heater and test the draft.

If the air handler does make the CAZ more negative it needs to be on when testing the draft of the water heater. This is counter intuitive because the furnace will have preheated the chimney which will likely strengthen the draft of the water heater that shares the same flue. Because of this, the timing for when to fire the water heater is important. Wait for the furnace to meet the T-stat setting in the home. This will shut off the burner but the air handler will continue to operate for a few minutes until shutting off on the low limit of the fan control. Allow the chimney to cool down as much as possible within the time frame allowed by the low limit setting of the fan control and then fire the water heater and test the draft. This will be the worst-case scenario for the water heater draft test; highest level of CAZ depressurization with the coolest chimney/flue temperature possible after the furnace's burner shuts off.

Appendix C: Worst-Case Draft Testing Form { 2020 Version }

WAP Client & Project Information: ____

Blower Door at Energy Audit (CFM50): ______________________ Blower Door at Energy Audit (ACH50): ______________________

5 ACH50 in this house = ___________(CFM50) / 10 ACH50 in this house = ___________(CFM50)

Daily Worst Case Draft Testing is Required Whenever a Site-Built Home is 5 ACH50 or Less & Whenever a Mobile Home is 10 ACH50 or Less

Appliance Name / Description	Appliance Type	Appliance Category	Fuel Type
	☐ Boiler ☐ Furnace ☐ Space Heater ☐ Water Heater	☐ Category 1 ☐ Category 1 – Induced Draft ☐ Category 3 ☐ Category 4	☐ Oil ☐ Kerosene ☐ Propane ☐ Natural Gas

Test #	Date:		Outdoor Temp:		Person Testing:				☐ Pre-Wx ☐ During Wx ☐ Post-Wx		
Worst-Case CAZ Depressurization:	- 6(+)	- 5	- 4	- 3	- 2	- 1	0	+ 1	+ 2	Spillage Test Result:	☐ Pass ☐ Fail
Worst-Case Draft (Measure in Flue):	- 9(+)	- 8	- 7	- 6	- 5	- 4	- 3	- 2	- 1	0	
Test #	Date:		Outdoor Temp:		Person Testing:				☐ Pre-Wx ☐ During Wx ☐ Post-Wx		
Worst-Case CAZ Depressurization:	- 6(+)	- 5	- 4	- 3	- 2	- 1	0	+ 1	+ 2	Spillage Test Result:	☐ Pass ☐ Fail
Worst-Case Draft (Measure in Flue):	- 9(+)	- 8	- 7	- 6	- 5	- 4	- 3	- 2	- 1	0	
Test #	Date:		Outdoor Temp:		Person Testing:				☐ Pre-Wx ☐ During Wx ☐ Post-Wx		
Worst-Case CAZ Depressurization:	- 6(+)	- 5	- 4	- 3	- 2	- 1	0	+ 1	+ 2	Spillage Test Result:	☐ Pass ☐ Fail
Worst-Case Draft (Measure in Flue):	- 9(+)	- 8	- 7	- 6	- 5	- 4	- 3	- 2	- 1	0	

Worst-Case Testing is Not Required for Category 3 & Category 4 Appliances, but a Thorough Evaluation for Spillage is Still Required

Weatherization Works

VERMONT
DEPARTMENT FOR CHILDREN & FAMILIES
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Appendix C: Worst-Case Draft Testing Form { 2020 Version }

Daily Worst Case Draft Testing is Required Whenever a Site-Built Home is 5 ACH50 or Less & Whenever a Mobile Home is 10 ACH50 or Less

Appliance Name / Description	Appliance Type	Appliance Category	Fuel Type
	☐ Boiler ☐ Furnace ☐ Space Heater ☐ Water Heater	☐ Category 1 ☐ Category 1 – Induced Draft ☐ Category 3 ☐ Category 4	☐ Oil ☐ Kerosene ☐ Propane ☐ Natural Gas

Test #	Date:	Outdoor Temp:	Person Testing:	☐ Pre-Wx ☐ During Wx ☐ Post-Wx

Worst-Case CAZ Depressurization:	- 6(+)	- 5	- 4	- 3	- 2	- 1	0	+ 1	+ 2	Spillage Test Result: ☐ Pass ☐ Fail
Worst-Case Draft (Measure in Flue):	- 9(+)	- 8	- 7	- 6	- 5	- 4	- 3	- 2	- 1	0

Test #	Date:	Outdoor Temp:	Person Testing:	☐ Pre-Wx ☐ During Wx ☐ Post-Wx

Worst-Case CAZ Depressurization:	- 6(+)	- 5	- 4	- 3	- 2	- 1	0	+ 1	+ 2	Spillage Test Result: ☐ Pass ☐ Fail
Worst-Case Draft (Measure in Flue):	- 9(+)	- 8	- 7	- 6	- 5	- 4	- 3	- 2	- 1	0

Test #	Date:	Outdoor Temp:	Person Testing:	☐ Pre-Wx ☐ During Wx ☐ Post-Wx

Worst-Case CAZ Depressurization:	- 6(+)	- 5	- 4	- 3	- 2	- 1	0	+ 1	+ 2	Spillage Test Result: ☐ Pass ☐ Fail
Worst-Case Draft (Measure in Flue):	- 9(+)	- 8	- 7	- 6	- 5	- 4	- 3	- 2	- 1	0

Test #	Date:	Outdoor Temp:	Person Testing:	☐ Pre-Wx ☐ During Wx ☐ Post-Wx

Worst-Case CAZ Depressurization:	- 6(+)	- 5	- 4	- 3	- 2	- 1	0	+ 1	+ 2	Spillage Test Result: ☐ Pass ☐ Fail
Worst-Case Draft (Measure in Flue):	- 9(+)	- 8	- 7	- 6	- 5	- 4	- 3	- 2	- 1	0

Worst-Case Testing is Not Required for Category 3 & Category 4 Appliances, but a Thorough Evaluation for Spillage is Still Required

Weatherization Works

Appendix C: Worst-Case Draft Testing Form { 2020 Version }

Daily Worst Case Draft Testing is Required Whenever a Site-Built Home is 5 ACH50 or Less & Whenever a Mobile Home is 10 ACH50 or Less

Appliance Name / Description	Appliance Type	Appliance Category	Fuel Type
	☐ Boiler ☐ Furnace ☐ Space Heater ☐ Water Heater	☐ Category 1 ☐ Category 1 – Induced Draft ☐ Category 3 ☐ Category 4	☐ Oil ☐ Kerosene ☐ Propane ☐ Natural Gas

Test #	Date:	Outdoor Temp:	Person Testing:	☐ Pre-Wx ☐ During Wx ☐ Post-Wx

Worst-Case CAZ Depressurization:	- 6(+)	- 5	- 4	- 3	- 2	- 1	0	+ 1	+ 2	Spillage Test Result:	☐ Pass ☐ Fail
Worst-Case Draft (Measure in Flue):	- 9(+)	- 8	- 7	- 6	- 5	- 4	- 3	- 2	- 1	0	

Test #	Date:	Outdoor Temp:	Person Testing:	☐ Pre-Wx ☐ During Wx ☐ Post-Wx

Worst-Case CAZ Depressurization:	- 6(+)	- 5	- 4	- 3	- 2	- 1	0	+ 1	+ 2	Spillage Test Result:	☐ Pass ☐ Fail
Worst-Case Draft (Measure in Flue):	- 9(+)	- 8	- 7	- 6	- 5	- 4	- 3	- 2	- 1	0	

Test #	Date:	Outdoor Temp:	Person Testing:	☐ Pre-Wx ☐ During Wx ☐ Post-Wx

Worst-Case CAZ Depressurization:	- 6(+)	- 5	- 4	- 3	- 2	- 1	0	+ 1	+ 2	Spillage Test Result:	☐ Pass ☐ Fail
Worst-Case Draft (Measure in Flue):	- 9(+)	- 8	- 7	- 6	- 5	- 4	- 3	- 2	- 1	0	

Test #	Date:	Outdoor Temp:	Person Testing:	☐ Pre-Wx ☐ During Wx ☐ Post-Wx

Worst-Case CAZ Depressurization:	- 6(+)	- 5	- 4	- 3	- 2	- 1	0	+ 1	+ 2	Spillage Test Result:	☐ Pass ☐ Fail
Worst-Case Draft (Measure in Flue):	- 9(+)	- 8	- 7	- 6	- 5	- 4	- 3	- 2	- 1	0	

Worst-Case Testing is Not Required for Category 3 & Category 4 Appliances, <u>but a Thorough Evaluation for Spillage is Still Required</u>

Weatherization Works

Appendix C: Worst-Case Draft Testing Form { 2020 Version }

Daily Worst Case Draft Testing is Required Whenever a Site-Built Home is 5 ACH50 or Less & Whenever a Mobile Home is 10 ACH50 or Less

Appliance Name / Description	Appliance Type	Appliance Category	Fuel Type
	☐ Boiler ☐ Furnace ☐ Space Heater ☐ Water Heater	☐ Category 1 ☐ Category 1 – Induced Draft ☐ Category 3 ☐ Category 4	☐ Oil ☐ Kerosene ☐ Propane ☐ Natural Gas

Test #	Date:	Outdoor Temp:	Person Testing:	☐ Pre-Wx ☐ During Wx ☐ Post-Wx							
Worst-Case CAZ Depressurization:	- 6(+)	- 5	- 4	- 3	- 2	- 1	0	+ 1	+ 2	Spillage Test Result:	☐ Pass ☐ Fail
Worst-Case Draft (Measure in Flue):	- 9(+)	- 8	- 7	- 6	- 5	- 4	- 3	- 2	- 1	0	

Test #	Date:	Outdoor Temp:	Person Testing:	☐ Pre-Wx ☐ During Wx ☐ Post-Wx							
Worst-Case CAZ Depressurization:	- 6(+)	- 5	- 4	- 3	- 2	- 1	0	+ 1	+ 2	Spillage Test Result:	☐ Pass ☐ Fail
Worst-Case Draft (Measure in Flue):	- 9(+)	- 8	- 7	- 6	- 5	- 4	- 3	- 2	- 1	0	

Test #	Date:	Outdoor Temp:	Person Testing:	☐ Pre-Wx ☐ During Wx ☐ Post-Wx							
Worst-Case CAZ Depressurization:	- 6(+)	- 5	- 4	- 3	- 2	- 1	0	+ 1	+ 2	Spillage Test Result:	☐ Pass ☐ Fail
Worst-Case Draft (Measure in Flue):	- 9(+)	- 8	- 7	- 6	- 5	- 4	- 3	- 2	- 1	0	

Test #	Date:	Outdoor Temp:	Person Testing:	☐ Pre-Wx ☐ During Wx ☐ Post-Wx							
Worst-Case CAZ Depressurization:	- 6(+)	- 5	- 4	- 3	- 2	- 1	0	+ 1	+ 2	Spillage Test Result:	☐ Pass ☐ Fail
Worst-Case Draft (Measure in Flue):	- 9(+)	- 8	- 7	- 6	- 5	- 4	- 3	- 2	- 1	0	

Worst-Case Testing is Not Required for Category 3 & Category 4 Appliances, but a Thorough Evaluation for Spillage is Still Required

Material Standards

All materials installed utilizing WAP funding shall meet the standards outlined in 10 CFR Part 440, Appendix A.
In addition, the Vermont WAP protocols outlined within this appendix shall be followed.

Top of Building

- Preference shall be given to cellulose whenever a blown-in insulation material is utilized at attic, ceiling and/or kneewall closet surfaces.
- The installation of blown-in fiberglass or blown-in rockwool is not allowable at attic, ceiling or kneewall closet surfaces unless one of the following conditions is present:
    1. When there are closed cavity areas that house chimneys/flues/SRJs and insulation contact with those building components is unavoidable without demolition of finished interior surfaces. In this scenario, use of cellulose insulation is not allowable. Use of blown-in fiberglass or rockwool is allowable.
    2. When there are exposed masonry materials in the area to be insulated. An example would be a brick wall exposed to the attic. In this situation, a skim coating of closed-cell foam over the brick followed by the installation of blown cellulose is recommended. This technique provides a barrier between the masonry material and the blown cellulose insulation. Utilizing blown-in fiberglass in the area nearest to the masonry materials and then switching back to cellulose once adequate buffering has been accomplished with the blown-in fiberglass is also an allowable technique in this situation.
- Use of the following materials at attic, ceiling or kneewall closet surfaces is allowable:
    1. Polyisocyanurate *(HI-R)*
    2. Extruded polystyrene *(pink, blue or green board)*
    3. Closed-cell spray foam
    4. Expanded polystyrene *(white board)**

    *Preference shall be given to either polyisocyanurate *(HI-R)*, extruded polystyrene *(pink, blue or green board)* or closed-cell spray foam unless (a) it is clearly demonstrated that expanded polystyrene is a more affordable material choice for a measure installation based on the cost of the R-value achieved and (b) the expanded polystyrene has a factory installed protective layer on both sides of the foam sheet to enhance product durability.
- Use of expanded polystyrene *(white board)* is allowable as the inner composition layer of access panels/hatches in attic and kneewall closets without additional cost justification.
- The installation of fiberglass batting as an insulation measure at attic, ceiling and/or kneewall closet surfaces is not allowable.

Material Standards

All materials installed utilizing WAP funding must meet the standards outlined in 10 CFR Part 440, Appendix A.

In addition, the Vermont WAP protocols outlined within this appendix shall be followed.

Sides of Building

- Preference shall be given to cellulose whenever a blown-in insulation material is utilized at wall surfaces.
- Use of the following materials to insulate the sides of buildings is allowable:
    1. Polyisocyanurate *(HI-R)*
    2. Extruded polystyrene *(pink, blue or green board)*
    3. Closed-cell spray foam
    4. Expanded polystyrene *(whiteboard)**

    *Preference shall be given to either polyisocyanurate *(HI-R)*, extruded polystyrene *(pink, blue or green board),* or closed-cell spray foam unless (a) it is clearly demonstrated that expanded polystyrene is a more affordable material choice for a measure installation based on the cost of the R-value achieved and (b) the expanded polystyrene has a factory installed protective layer on both sides of the foam sheet to enhance product durability.
- Installation of open-cell foams is not allowable as sidewall insulation in non-maonry buidings.
- The installation of blown-in fiberglass or blown-in rockwool is not allowable at wall surfaces unless one of the following conditions are present:
    1. Masonry construction (structural masonry and/or masonry veneers) where there is no sheathing and/or vapor retardant coating to separate the interior side of the masonry wall materials from the insulation. The decision to insulate this type of wall system and the material choices are at the sole discretion of the WAP agency. Any chosen materials must meet 10 CFR 440, Appendix A.
    2. When there are closed cavity areas that house chimneys/flues and insulation contact with those building components is unavoidable without demolition of finished interior surfaces. In this scenario, use of cellulose insulation is not allowable. Use of blown-in fiberglass or rockwool is allowable.
- The installation of fiberglass batting as an insulation measure at wall surfaces is not allowable.

Material Standards

All materials installed utilizing WAP funding must meet the standards outlined in 10 CFR Part 440, Appendix A.

In addition, the Vermont WAP protocols outlined within this appendix shall be followed.

Bottom of Building

Boxsill

- The installation of polyisocyanurate *(HI-R)* or closed-cell spray foam as boxsill inulation is allowable.
  The installation of expanded polystyrene *(white board)*[1]*, extruded polystyrene *(pink, blue or green board)*, or open-cell spray foam as an insulation material at the boxsill/rim is not allowable unless a minimum of R-12 is achieved and it is clearly demonstrated that it is less expensive to achieve the needed R-value with one of these products than to achieve the same R-value performance with polyisocyanurate (HI-R) or closed-cell spray foam.
- The installation of fiberglass batting as an insulation measure at the boxsill/rim is not allowable.
- The installation of blown-in fiberglass is allowable as boxsill and/or foundation insulation in the cavity between a brick veneer and the structural foundation wall when the cavity is three inches deep or greater. Cellulose is not allowable in this installation scenario.

Foundation

- The installation of polyisocyanurate *(HI-R)*, extruded polystyrene *(pink, blue or green board)*, closed-cell spray foam, expanded polystyrene *(white board)*[1]* and/or rockwool board products is allowable as foundation insulation.
- The installation of fiberglass batting/blankets or open-cell spray foam as an insulation measure at the foundation is not allowable.
- When there is a cavity between a brick veneer and the structural foundation wall that is three inches deep or greater, the installation of blown-in fiberglass into the cavity is allowable practice. Cellulose is not allowable in this installation scenario.

Floor

- The installation of extruded polystyrene *(pink or blue board)*, polyisocyanurate *(HI-R)*, closed-cell spray foam, expanded polystyrene *(white board)*,* blown-in fiberglass, rockwool and/or cellulose is allowable as floor insulation.
- The installation of fiberglass batting or open-cell spray foam as floor insulation is not allowable.

[1] *It is only allowable to use expanded polystyrene products that have a factory installed protective layer on both sides of the foam sheet to enhance product durability.

Material Standards

Material Choice Policy Exceptions

Exception for Weatherization Client Self-Help Project Components
If a project will incorporate self-help components in order to maximize the comprehensiveness of the Weatherization services, then the installation of WAP provided fiberglass batting material by the client is allowable.

Thorough guidance shall be provided to client by WAP staff to help ensure the client understands the importance of installing the batting materials in direct contact with all surfaces, leaving no air-gaps around the fiberglass batting materials. While this approach is allowable, WAP providers are encouraged to find alternate self-help approaches.

Alternate self-help examples include:

1. Have a client install WAP provided house-wrap materials and strapping to prepare for a weatherization crew to install densepacked cellulose.
2. Have a client install WAP provided foam-board materials.

Miscellaneous Exceptions
Weatherization providers that want to use materials that are not allowed by this TEC Manual section must submit a request in writing to the OEO prior to using the material during a project.

Smoke Alarms

Material & Installation Standards

MATERIAL SPECIFICATIONS ***(NEW INSTALLATIONS & REPLACEMENTS)***

- Must be UL 217 listed
- Must posses photoelectric detection technology
- Combination smoke alarms that include ionization and photoelectric sensors in the same alarm are not permitted to be used for new installations or replacements per Vermont Fire and Building Safety Code
- Smoke alarm manufacturer shall warrant alarm for a minimum of 10 years
- Installing devices with sealed-10 year lithium batteries is now required

The following must be done prior to closing out a weatherization project in any existing one-dwelling-unit building that is owner-occupied.

EXISTING SMOKE ALARMS

- Alarms shall be tested for proper operation by using the alarm's "test" button.
- Alarms shall be checked for an expiration date.
- Alarms shall be replaced if (a) expired, meaning it has been in service longer than 10 years from the date of manufacture, (b) expiration date of device is unknown, or (c) if it fails to function properly during test.

INSTALLATION REQUIREMENTS

- One alarm **shall be installed on each floor of the building** including basements and conditioned attics.
- In a basement, an alarm shall be located on the ceiling at the bottom of the basement stairway if not already present in that location.
- An alarm shall be installed within the immediate vicinity of all sleeping rooms.
- In single family homes the alarm shall always be mounted on the ceiling at least 4" from a wall.
- In mobile homes it is acceptable to mount the alarm onto an interior wall 4" to 12" from the ceiling.
- Installation shall be in compliance with these standards and manufacturer's instructions.
- New alarm(s) shall be tested upon completion of installation.
- The **installation date shall be clearly marked on the device.**
- Alarms shall not be installed within 36 inches of a door to a bathroom containing a shower or tub.
- Alarms shall not be installed within 36 inches of forced air heating or cooling system registers or the tip of the blade of a ceiling fan.

OCCUPANT EDUCATION

- The occupant shall be instructed how to operate, test and maintain the alarm.
- The occupant shall be provided with the smoke alarm owner's manual.

Carbon Monoxide Alarms
Material & Installation Standards

MATERIAL SPECIFICATIONS ***(NEW INSTALLATIONS & REPLACEMENTS)***

- Must be UL 2034 listed
- Alarm manufacturer shall warrant alarm for a minimum of 5 years
- Installing devices with sealed-lithium batteries is now required

The following must be done prior to closing out a weatherization project in any existing one-dwelling-unit building that is owner-occupied.

EXISTING CARBON MONOXIDE ALARMS

- Alarms shall be tested for proper operation by using the alarm's "test" button.
- Alarms shall be checked for an expiration date.
- Alarms shall be replaced if (a) expired, meaning it has been in service longer than 10 years from the date of manufacture, (b) expiration date of device is unknown, or if it fails to function properly during test.

INSTALLATION REQUIREMENTS

- One alarm **shall be installed in the immediate vicinity of each sleeping area**.
- Installing one carbon monoxide "low-level-monitor" within the home is also allowable. This is encouraged practice. It is not a program requirement.
- Installing one alarm inside of each sleeping room that contains a fuel-burning appliance is recommended but it is not required.
- In single family and mobile homes **the alarm shall always be mounted on an interior wall 5' above the floor.**
- If a preexisting alarm (for example: a plug in device) is present and in good working order but it is not located in the required installation location, please leave the existing alarm in place and install a new one in the required location 5' above the floor.
- Installation shall be in compliance with these standards and manufacturer's instructions.
- New alarm(s) shall be tested upon completion of installation.
- The **installation date shall be clearly marked on the device**.
- Alarms shall not be installed within five feet of a combustion appliance, combustion appliance flue, supply or exhaust fan, kitchen or bathroom or storage area for chemicals.
- Alarms shall not be installed within five feet of an exterior door or window.

OCCUPANT EDUCATION

- The occupant shall be instructed how to operate, test and maintain the alarm.
- The occupant shall be provided with the carbon monoxide alarm owner's manual.

VT TEC Manual—Appendix F: Deferral & Home Repair Policies

WAP Project Deferral Policies & Procedures | Background

Vermont's WAP has made steady progress over the past few years to ensure that when project deferral decisions are made, they are made and communicated to clients in a consistent manner throughout the statewide WAP network.

Having zero project deferrals is not a realistic goal and it is not the goal of the WAP to eliminate all project deferrals. Some buildings do require repairs that are outside the allowable scope of services that the WAP can provide. However, the WAP does have some flexibility around "how much" investment can be made into individual projects. Because of the way WAP funding rules are structured, buildings with more energy savings opportunity can receive more investment from the program than buildings with less energy savings opportunity. This can sometimes make it challenging to define "how much" investment can or should be made into each individual building while still ensuring parity in service provisions to program clients throughout the state.

The intention of these policies and procedures is to provide a decision-making framework that yields a high-level of assurance that all project deferral decisions are being made using a consistent methodology for all clients.

WAP Project Deferral Policies & Procedures | Implications of Vermiculite Insulation

- If a building has vermiculite insulation: The policies outlined in Appendix G of this manual shall be followed.
- If a building does not have vermiculite insulation: The policies outlined in this section of the manual shall be followed.

WAP Project Deferral Policies & Procedures | Guidance Consolidation & Replacement Overview

The content included in this guidance supersedes and replaces any and all previously issued guidance related to project deferrals.

Previously issued guidance on this topic that is hereby replaced includes, but is not limited to:

- Vermont Weatherization Program Notice 2014-1
- Vermont Weatherization Program Notice 2015-2
- Vermont Weatherization Program Notice 2017-1
- Vermont Weatherization Program Memorandum 2018-02

Making Deferral Decisions in Rental Properties

The following excerpt is taken from Form 617, v4.1 entitled, Apartment Building Standards:
"The Vermont Home Weatherization Assistance Program (HWAP) requires that rental properties meet minimum standards to qualify for WAP funding. Building Owners who do not themselves qualify for WAP services must make any necessary upgrades prior to receiving WAP services, however WAP will assist in identifying problems and suggesting corrective action".

Form 617 is provided to all property owners. In addition to the general information conveyed on this form, WAP staff must provide a brief written list of any corrective actions that need to be made by a property owner to prevent a project deferral from occurring after evaluating their building(s).

The written list is to be based on observable conditions found during a walk through or building assessment.

Taking photographic documentation of the observable conditions is recommended.

Uploading Form 617, the written list of observable conditions found during the building evaluation and any photographic documentation into the WAP documents area of HES is required.

Determining When to Follow the Deferral Related Policies[1] for Rental Properties

- **Rent-to-own agreements**: Follow the polices for rental properties.
- **Life Leases:** Follow the policies for owner-occupied property.
- **Income Eligible Property Owner:**
  - ✓ Follow the policies for owner-occupied property if the income-eligible property owner lives in the building.
  - ✓ Follow the policies for rental properties if the income-eligible property owner does not live in the building.

[1] This breakdown of owner-occupied vs. rental-occupied properties does not extend to all WAP policies and procedures. This is specific to Vermiculite and Deferral Policies only.

Making Deferral Decisions in Owner-Occupied Homes

In some cases, WAP projects may need to be deferred. There are standard operating procedures (SOPs) that must be followed prior to making a project deferral decision for an owner-occupied home.

Types of Deferrals | Category 1 vs. Category 2

There are two different types of deferrals that will be covered in more detail throughout this guidance. The reasons for, and the timing of, a deferral decision impact the type of deferral. The programmatic requirements associated with each deferral category are outlined in this guidance.

- **A Category 1- Deferral** is a deferral that either occurs before the economic analysis of the project happens or that is made for reasons other than the economic analysis of the project and/or scope of work.
- **A Category 2- Deferral** is a deferral that is based on the economic analysis of the project and/or scope of work.

The First Three WAP Service Phases

The first three WAP service phases and the SOPs associated with each phase are established in this guidance.

- **Phase 1 |** Efficiency Coaching
- **Phase 2 |** Energy Audit/ Building Assessment
- **Phase 3 |** HES Data Entry, Initial Project Economic Analysis & Workscope Development

The First Three WAP Service Phases

STANDARD * OPERATING * PROCEDURES

Phase 1 | Efficiency Coaching

or

- All Efficiency Coaching/ Client Education services shall be provided.
- All EVT funded work shall be performed unless the client declines the services.
- The following WAP funded items shall be installed whenever the item is required by the TEC Manual or would provide a benefit to the household, unless the client declines the installation(s): Low-flow aerators & shower heads, 12 lin. ft. of pipe insulation on the leads to/from the DHW source, smoke & carbon monoxide alarms, a new furnace-filter, a programmable thermostat and a humidity gage.

Phase 2 | Energy Audit/ Building Assessment

or

- A comprehensive energy audit must be performed.

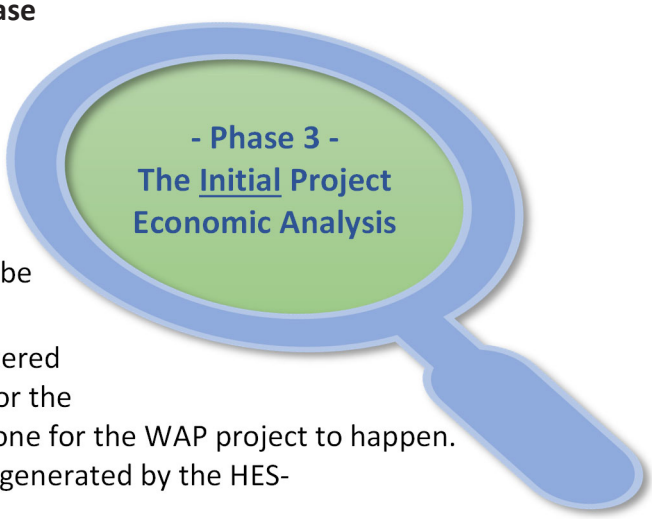
Phase 3 | HES Data Entry, Initial Project Economic Analysis & Workscope Development

or

- A complete "full-house" energy audit must be entered into HES.
- An HES Workscope must be produced.
- An HES Energy Savings Report must be produced.
- A DAACC analysis must be completed.
- Photo documentation of the hazards that could potentially cause a deferral must be taken and uploaded into the HES job file.

Submit a Waiver
to request permission to defer a project during any of these 3 phases

A Closer Look at the Third WAP Service Phase



Use of Historical Bid Data

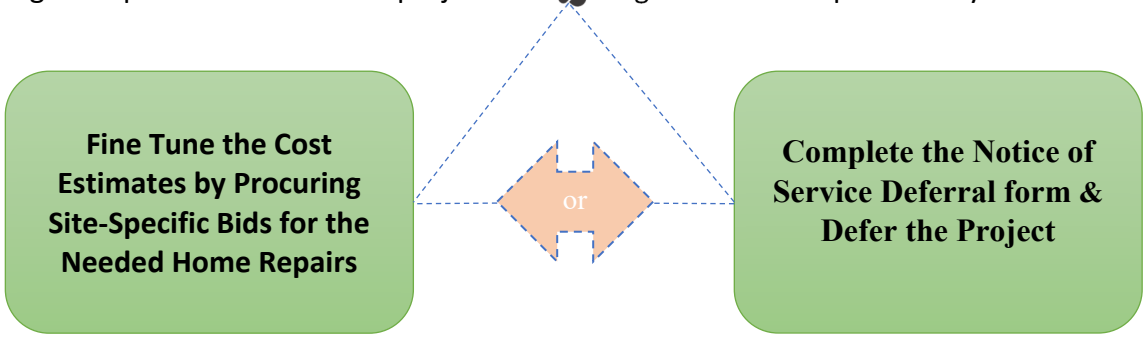
from similar situations is allowable at this stage of the WAP process for the purpose of compiling preliminary cost estimates for major home repairs, for example, knob & tube wiring replacements or plumbing repairs.

These preliminary cost estimates can be entered into HES as the estimated measure cost(s) for the major home repair work that needs to be done for the WAP project to happen. This will inform the project-level SIR results generated by the HES-Energy Savings Report.

The same preliminary estimates can also be entered into the DAACC. This will help determine approximately how much project funding could be available from a combination of programs/ funding sources to address the needed home repairs and to indicate whether a project is more likely to be doable or deferrable because of funding gaps.

Engage the Client

using the preliminary information from the DAACC and the HES Energy Savings Report as a starting point when presenting the likely scope of work and funding scenarios for the project. **Jointly determine** if there may be a manageable path forward for the project given all of the preliminary information.



STANDARD* OPERATING* PROCEDURES

Making Category 1- Deferral Decisions

Making Category 1- Project Deferral Decisions Prior to the Completion of the First Three WAP Service Phases		
Program Standard: A WAP agency must submit a waiver request—Form 540—to the OEO prior to deferring a project in an owner-occupied dwelling unit when the SOPs associated with the first three WAP service phases have not been completed in full. **Exceptions to the Program Standard:** Allowable exceptions to the above program standard are outlined in the table below. These are examples where Form 540 does not apply.		
Potential Issues	**Allowable Actions**	**Required Actions**
	for a WAP provider to take re: Project Deferral	
Exception 1 The client(s) is uncooperative, abusive or threatening to those who must engage with the client or perform work at the home during the project.	In these situations, a WAP provider can defer the project without performing WAP service phases 1, 2, and/or 3 as outlined in this guidance. The decision to defer any further service provisions can be made without submitting a waiver to OEO.	**Action 1 | Inform client in writing** --The reason that services are being deferred. --Terms & conditions that would need to be upheld in order to resume service provision. **Action 2 | Inform OEO** --That a deferral has been made and the cause. **Action 3 | Record Keeping** --Upload all the information provided to the client into the HES job file. --Indicate in HES that the job has been deferred along with the reasons for the deferral and the deferral date *(on the audit information screen).*
Exception 2 Illegal activities are being conducted in the dwelling unit.		

Making Category 1- Deferral Decisions

Making Category 1- Deferral Decisions **Prior to the Completion of the First Three WAP Service Phases**		
Program Standard: A WAP agency must submit a waiver request—Form 540—to the OEO prior to deferring a project in an owner-occupied dwelling unit when the SOPs associated with the first three WAP service phases have not been completed in full. **Exceptions to the Program Standard:** Allowable exceptions to the program standard are outlined in the table below. These are examples where Form 540 does not apply.		
Potential Issues	**Allowable Actions**	**Required Actions**
	for a WAP provider to take re: Project Deferral	
Exception 3 The dwelling unit has sewage or other sanitary problems (e.g., fleas or other pest infestation) that would endanger workers and that could potentially be worsened by proceeding with weatherization work.	In these situations, a WAP provider can defer the project without performing WAP service phases 1, 2, and/or 3 as outlined in this guidance. The decision to defer any further service provisions can be made without submitting a waiver to OEO.	**Action 1 | Inform client in writing** --The reason that services are being deferred. --The building and/or the site condition(s) that would need to be provided in order to resume service provision. --Provide referrals to other programs that may be able to help the client. **Action 2 | Inform OEO** --That a deferral has been made and the cause. **Action 3 | Record Keeping** --Upload all the information provided to the client into the HES job file. --Indicate in HES that the job has been deferred along with the reasons for the deferral and the deferral date *(on the audit information screen)*. --Whenever possible take photographic documentation of the conditions that caused the deferral and then store the photos in HES.

Making Category 1- Deferral Decisions

Making Category 1- Deferral Decisions
Prior to the Completion of the First Three WAP Service Phases

Program Standard: A WAP agency must submit a waiver request—Form 540—to the OEO prior to deferring a project in an owner-occupied dwelling unit when the SOPs associated with the first three WAP service phases have not been completed in full.

Some example scenarios of when/how to apply this program standard are included in the table below:

Potential Issues	Allowable Actions	Required Actions
	for a WAP provider to take re: Project Deferral	
Form 540 Applies -- Example # 1 The client has known health conditions or allergies that would prohibit the safe installation of insulation and/or other weatherization materials.	In these situations, a WAP provider can defer the project without fully performing WAP service phases 1, 2, and/or 3 as outlined in this guidance. **However, in this case, the decision to defer the project prior to completing the first 3 vermiculite service phases requires an approved waiver from OEO before communicating the deferral decision to the client.**	**Action 1 | Submit to OEO** --A Deferral Process Waiver (Form 540). --Photographic documentation of the building and site conditions. **Action 2 | Inform client in writing** *(after waiver approval from OEO)* --The Notice of Service Deferral must be completed in full (Form 537). --General information about what the likely WAP scope of work would include if the client were to bring the building or site conditions up to the needed standard must be provided (on form 537). A site-specific work scope does not have to be provided to the client. --General information about the likely benefits that would result from a weatherization project must be provided (on form 537). A site-specific benefit analysis does not have to be provided to the client. --Provide referrals to other programs that may be able to help the client if applicable (on this form). **Action 3 | Record Keeping** --Upload all the information provided to the client, including the Notice of Service Deferral into the HES job file (form 537). --Upload the OEO approved Deferral Process Waiver Form into the HES job file (form 540). --Upload photographic documentation of the building and site conditions to the HES job file. --Indicate in HES that the job has been deferred along with the reasons for the deferral and the deferral date *(on the audit information screen)*.
Form 540 Applies -- Example # 2 The client has known health conditions that prohibit the disturbance or removal of existing materials in the home that would need to be disturbed or removed to complete the weatherization project.		

Making Category 1- Deferral Decisions

Making Category 1- Deferral Decisions
Prior to the Completion of the First Three WAP Service Phases

Program Standard: A WAP agency must submit a waiver request—Form 540—to the OEO prior to deferring a project in an owner-occupied dwelling unit when the SOPs associated with the first three WAP service phases have not been completed in full.

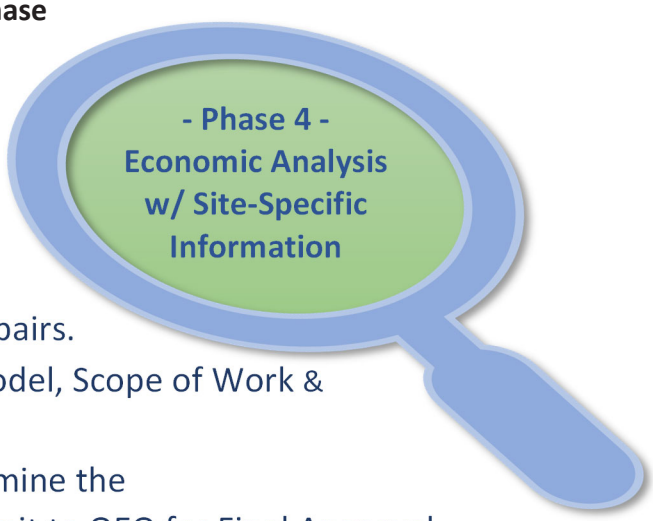
An example situation of when/how to apply this program standard is included in the table below:

Potential Issues	Allowable Actions	Required Actions
	for a WAP provider to take re: Project Deferral	
Form 540 Applies -- Example # 3 The building structure and/or the primary mechanical systems—electrical and plumbing—are in an observable state of disrepair that would require extensive corrective action before the home could be safely and effectively weatherized and it is highly likely that the non-energy saving home repair work for the building structure, and/or the primary mechanical systems, would exceed $8,500 even when excluding the cost of heating system related work or any vermiculite remediation.	In this situation, a WAP provider can defer the project without fully performing WAP phases 1, 2, and/or 3 as outlined in this guidance. **In this case, the decision to defer the project prior to completing the first 3 WAP service phases requires an approved waiver from OEO before communicating the deferral decision to the client**. Photographic documentation of the building and site conditions must be provided to OEO along with the request for waiver.	**Action 1 | Submit to OEO** --A Deferral Process Waiver (Form 540). --Photographic documentation of the building and site conditions. **Action 2 | Inform client in writing** *(after waiver approval from OEO)* --The Notice of Service Deferral must be completed in full (Form 538). --General information about what a likely WAP scope of work would include if the client were to bring the building or site conditions up to the needed standard must be provided (on form 538). A site-specific work scope does not have to be provided to the client. --General information about the likely benefits that would result from a weatherization project must be provided (on form 538). A site-specific benefit analysis does not have to be provided to the client. --Provide referrals to other programs that may be able to help the client (on form 538). **Action 3 | Record Keeping** --Upload all the information provided to the client, including the Notice of Service Deferral to the HES job file (form 538). --Upload the Deferral Process Waiver Form to the HES job file (form 540). --Upload photographic documentation of the building and site conditions to the HES job file. --Indicate in HES that the job has been deferred along with the reasons for the deferral and the deferral date *(on the audit information screen)*.

A Closer Look at the Fourth WAP Service Phase

Use Site-Specific Information

to perform an accurate economic analysis of the project during the fourth WAP service phase. Key requirements are below:



- Get Site-Specific Bids for Home Repairs.
- Generate a Site-Specific Energy Model, Scope of Work & WAP Project Cost Estimate.
- Create a DAACC File to Help Determine the Project Funding Breakdown & Submit to OEO for Final Approval.

Results of the Economic Analysis Are Used to Determine Next Steps*

DAACC File is Approved by OEO

- **Communicate with the client so they can decide whether or not to proceed with the project.**

or

DAACC File is Not Approved by OEO

- **Complete the Notice of Service Deferral Form & Defer the Project**

*Note that it is not allowable to defer a project simply because it is expensive when the project level SIR is 1.0 or greater and the Non-Energy Savings investment for the regular WAP funded job is less than the established threshold for the project.

Engaging the Client | Present the client with the proposed scope of work and the OEO approved funding breakdown for the project proposal. The sources for the approved funding breakdown are (1) the DAACC and (2) the HES Energy Savings Report. The client then decides if they want to proceed with the project.

The Next Course of Action Depends on the Client's Decision

Proceed w/ the Needed Home Repairs & the WAP Project

or

Complete the Notice of Service Deferral form & Defer the Project

STANDARD* OPERATING* PROCEDURES

A Closer Look at the Fourth WAP Service Phase | Economic Analysis w/ Site-Specific Information

Expectations for Working with Non-Weatherization, Specialty Building Trades on Behalf of WAP Clients

Local WAP Agencies are encouraged to work in strategic partnership with other organizations and contractors to provide solutions that enable WAP projects with substantial home repair needs to proceed whenever possible. However, WAP providers are not required to seek out cost estimates from, or contract with, the following types of non-weatherization, specialty building trades on behalf of WAP clients.

- Roofing Contractors (due to roof leaks/bulk water intrusion issues)
- General Contractors (due to unstructurally sound/unsafe structural components of the building)

Local WAP Agencies are expected to seek out cost estimates and procure services from other types of specialty building trades, e.g., electricians, HVAC technicians, plumbers, on behalf of WAP clients and make decisions about whether or not to proceed with or defer projects in accordance with the policies outlined throughout this section of the TEC manual.

Projects with Substantial Home Repair Needs | Performing an Economic Analysis of the Project

Deferrals and Additional Contributions Calculator (DAACC) -

An Investment Calculation Aid for WAP Projects in Homes that Need Substantial Home Repairs

The investment calculation aid, "DAACC Template_V.8._08-01-2020" or a newer DAACC file version shall be used to provide enhanced project investment analysis for all prospective weatherization projects prior to making a project deferral decision unless a qualifying Category 1- Project Deferral is made. Note that it is no longer allowable to use versions of the DAACC older than the "DAACC Template_V.8._08-01-2020" file version.

DAACC Usage Requirements in Homes that Need Substantial Home Repairs

- The DAACC shall be used prior to committing or using any funding from the following funding sources/budgets:
  a. The HWAP-Home Repair Budget

- The DAACC shall be used prior to making any Category 2- project deferral decision and prior to communicating any Category 2- project deferral decision to a weatherization client.[2]

When in the Process is the DAACC Used?

The number of times—and when—the DAACC is used largely depends on each WAP provider's preferences when trying to decide if a WAP project that needs substantial home repairs can proceed or not.

A WAP provider can, at their discretion, skip over phase 3 entirely and proceed directly from the 2nd to the 4th WAP service phase prior to completing the DAACC for the first time.

A Scenario Where it May be Beneficial to Skip Over Phase 3

- A WAP provider is confident that they will be able to proceed with a WAP project that needs substantial home repairs—at little to no cost to the client—given the likely scope of work and the funding sources available.

Using the DAACC During WAP Service Phase 3:

Historical bid data from similar scenarios is used to perform a rough economic analysis of the project during the 3rd WAP service phase. The historical bid data is entered into HES and the DAACC file to roughly estimate the project-level SIR and the funding breakdown for the project. The results of the roughly estimated funding breakdowns are shared and discussed with the client along with the proposed scope of work. Then, the WAP agency and client jointly determine if there may be a manageable path forward for the project.

If the joint decision is that the project seems viable, the WAP provider will then proceed to the 4th WAP service phase where they will procure site-specific bids for the needed home repairs.

Note that OEO approval of the roughly estimated versions of the DAACC file is not required before engaging the client.

[2] Unless written approval from OEO to communicate the deferral decision to the client is attained.

Projects with Substantial Home Repair Needs | Performing an Economic Analysis of the Project Using the DAACC During WAP Service Phase 4:

The site-specific bids for the home repair work are used to perform an accurate economic analysis of the project during the fourth WAP service phase. The site-specific bid information is entered into both HES and the DAACC file to accurately estimate the project-level SIR and the funding breakdown for the project.

After the agency has updated the HES & DAACC files, the DAACC file is submitted to OEO for approval. Once approved, the updated project proposal and the project funding breakdown are shared and discussed with the client. The client then decides whether or not to proceed with the project based on the information provided. If the client decides to defer the project at this point in the process, complete the Notice of Service Deferral form (form 538). Otherwise, proceed with the project.

Note that it is not allowable practice to defer a project simply because it is expensive when the project level SIR is 1.0 or greater and the Non-Energy Savings investment for the regular WAP funded job is less than the established threshold for the project.[3]

[3] Without prior written approval from OEO for the individual project.

Projects with Substantial Home Repair Needs | Performing an Economic Analysis of the Project

Minimum Project-Level SIR Requirement

- A weatherization project must have a project-level SIR of 1.0 or greater. If this minimum SIR cannot be achieved the project may need to be deferred.

Additional Project Investment Policies that are Supported by the DAACC:

- An investment threshold for Non-Energy Saving Measures (Non-ESMs) is established for each job. The investment threshold is set as a fixed percentage of the Total Net Job Cost Estimate. Currently, the Non-ESM threshold is set at 35 percent of the total net job cost estimate. The Total Net Job Cost Estimate is the Total Job Cost Estimate minus (a) Health & Safety Heating System Replacement costs and (b) Travel & Cleanup costs.
  - ✓ **This is an investment threshold. It is not an investment limit.** It is allowable to invest more than 35% of the total net job cost into Non-ESMs on a regular weatherization job without seeking approval.[4] However, investing more than 35% of the total net job cost into Non-ESMs on a regular weatherization job is not required.
  - ✓ **This is an investment threshold that impacts deferral decisions.** It is not allowable practice to defer a project simply because it is expensive when the Non-Energy Savings investment for the regular WAP funded job will be less than 35% of the total net job cost estimate.
  - ✓ **This is an investment threshold that impacts the accessibility of supplemental funding sources administered by OEO.** Only when the cost for the Non-ESMs exceeds 35% of the total net job cost does the job become eligible to use other supplemental funding sources administered by OEO. On eligible projects, the supplemental funding sources can be used to buy down the Non-ESM costs so that less of those costs get charged to the regular weatherization job.
- When the Non-ESM costs exceed the established threshold for a job that needs some form of home repair work, the job becomes eligible to use HWAP-Home Repair funding. The amount of HWAP-Home Repair funding that can be invested is calculated by the DAACC based on the workscope composition and job costs.
- There is a per-job cap for HWAP-Home Repair funding.
  - ✓ The allowable per-job cap is currently $3,000 per job.
- Approval forms are built directly into the calculation aid. "Section 1" of each approval form provides for a standardized and expedited project approval process. An optional "Section 2" on each of the approval forms is also available for use. This section can be used by a WAP agency that wants to request permission to adjust the standard funding breakdowns that were provided by the calculation aid for the job. OEO will review the DAACC files and make project approval decisions.
- Note these submissions can also serve as transmittal requests when the costs submitted for approval exceed the transmittal threshold.

[4] Unless the minimum Project-Level SIR requirement of 1.0 is not met.

Projects with Substantial Home Repair Needs | Funding Breakdown for a Sample Project

A sample funding breakdown for a project that has substantial home repair needs but does have a project-level SIR greater than 1.0 is shown in the table below.[5]

Total Knob & Tube Wiring Replacement Cost	**$4,500.00**
HWAP-Home Repair Funding Contribution	$3,000.00
Regular HWAP Job Funding Contribution (incidental repair measure)	$875.00
Remaining Balance of Funding Needed	**$625.00**

Allowable Actions:

In this scenario any of the following actions could be taken.

- Use leveraged income to pay for the remaining balance of $625.00
  - ✓ This results in a fully funded project at no cost to the low-income client.
- Use Non-OEO administered grant funding (e.g., USDA, Argosy) to pay for the remaining balance of $625.00
  - ✓ This results in a fully funded project at no cost to the low-income client.
- Use leveraged income to pay for (a) the remaining balance of $625.00 and for (b) the $875.00 that would have been charged to the regular HWAP Job as an incidental repair.
  - ✓ This results in a fully funded project at no cost to the low-income client and none of the home repair costs impact the HWAP job cost average.
- Use Non-OEO administered grant funding (e.g., USDA, Argosy) to pay for (a) the remaining balance of $625.00 and (b) for the $875.00 that would have been charged to the regular HWAP Job as an incidental repair.
  - ✓ This results in a fully funded project at no cost to the low-income client and none of the home repair costs impact the HWAP job cost average.
- Require the client to pay the $625.00 remaining balance of the knob & tube wiring replacement costs. Provide the client with the proposed scope of work, funding breakdown & referrals to other programs that may be able to help them secure the funds to cover the remaining balance of the abatement costs. Either proceed with or defer the WAP project depending on the client decision about contributing the remaining balance of the home repair/knob & tube replacement costs.

[5] All funding amounts shown in this table would be determined by the DAACC.

Projects with Substantial Home Repair Needs | Funding Breakdown for a Sample Project

A sample funding breakdown for a project that has substantial home repair needs but does have a project-level SIR greater than 1.0 is shown in the table below.[6]

Total Knob & Tube Wiring Replacement Cost	**$4,500.00**
HWAP-Home Repair Funding Contribution	$3,000.00
Regular HWAP Job Funding Contribution (incidental repair measure)	$875.00
Remaining Balance of Funding Needed	**$625.00**

Non-Allowable Actions:

In this scenario none of the following actions could be taken.

- Defer the WAP project because it is expensive.
- Ask the client to contribute any amount greater than the Remaining Balance of Funding Needed as calculated by the DAACC. In this example, $625.00.

[6] All funding amounts shown in this table would be determined by the DAACC.

Projects with Substantial Home Repair Needs | Funding & Invoicing Policies

Funding Administered by OEO

- **An HWAP-Home Repair budget line** has been added into the traditional HWAP grant agreements to supplement home repair efforts.

Allowable Uses of HWAP-Home Repair Funding

The allowable uses for this supplemental funding are outlined in the tables below.

Allowable Expenditure Types for HWAP-Home Repair Funding	
Type of Expenditure	**Is this Allowable Activity to Charge to this Budget?**
Subcontractor Material	**Yes**
Subcontractor Labor	**Yes**
WAP Agency Material*	**Yes**
WAP Agency Staff Labor**	**No**

*HWAP-Home Repair funding was created to help pay for substantial repairs that needed to be performed by specialty trades (subcontractors). However, non-subcontractor installed materials can be charged to HWAP-Home Repair funds if an agency can clearly demonstrate they have operationalized a cost classification methodology that ensures unduplicated billing practices for material expenditures within their HWAP Monthly Expenditure Report submissions. The unduplicated billing practices relate to (1) the HWAP-Home Repair budget line and (2) the more traditional Materials budget line of the HWAP Monthly Expenditure Report.

**Zero WAP agency staff labor costs can be charged to HWAP-Home Repair Funds. Only Subcontractor labor costs can be charged to these funds.

Additional Financial Considerations for OEO Administered Funding

- It is not allowable practice to have the client pay a contractor and then to reimburse the client for the expense. **The WAP shall pay contractors directly.**
- When using the DAACC, it is not allowable practice to have the client pay for the portion of the home repair costs that are prescribed to the regular weatherization project. **The WAP provider shall pay for these costs**.

Projects with Substantial Home Repair Needs | Making Category 2- Deferral Decisions

- **A Category 2- Deferral** is a deferral that is based on the economic analysis of the project and/or the scope of work.
  - This type of deferral is made when a project does not have a project-level SIR of 1.0 or greater.
  - This type of deferral is made when there is not enough funding to cover the full cost of the home repairs needed to enable the WAP project to happen and the client—after being presented with all of the information about the project—has decided to defer the project because of the funding gap.
  - This type of deferral is made when a client refuses the installation of a measure or multiple measures that are required to be included in the scope of work in order for the WAP project to happen. Examples may include refusal of garage isolation measures, ventless heater disconnection/removal or the installation of exhaust fans.

Finalizing Category 2- Deferral Decisions | Requirements

1 | Record the deferral decision and the information that was communicated to the client prior to the deferral decision being made on the Notice of Service Deferral (Form 538). This form must be completed in full. A completed copy must be provided to the client and a copy must be retained for the file.

2 | Upload the following to the HES job file:
  - All information provided to the client, including the Notice of Service Deferral (Form 538)
  - The completed version of the DAACC file that was used to inform the deferral decision
  - Photographic documentation of the building and site conditions

3 | Record the following information into the HES file on the audit information screen
  - That the job has been deferred
  - The reason(s) for the deferral
  - The date of the deferral decision

4 | Assign the appropriate Job Type on the HES audit information screen

Assign the appropriate "No Unit" Funding Source for the job on the HES selected measures screen

Add the job to the correct HES invoice

Projects with Substantial Home Repair Needs | Reactivating Deferrals

Eligibility Reverification Requirements When Reopening Deferred Projects

For Owner-Occupied Dwelling Units: When **all** of the following conditions are met, the household is automatically eligible for weatherization to proceed after the issues that caused the deferral have been addressed.

1. Prior to the deferral decision being made, the household was eligible for WAP services *when they transitioned off the client wait list and onto the open jobs/WIP list*.
2. There has been no change in ownership for the dwelling unit.
3. **Not more than two years** have elapsed between the date the client was informed in writing of the deferral decision and the date the weatherization agency was informed by client that weatherization work would be able to proceed. This duration of time shall be defined as the **eligibility grace period**.

Whenever a deferral is reactivated during the eligibility grace period there is no need for reapplication or a program eligibility reverification to occur.

If the eligibility grace period has elapsed, the household will need to provide an updated application packet to enable the agency to reverify their programmatic eligibility.

The original application date, efficiency coaching date and energy audit date shall be retained in the HES software program.

All reactivated deferrals shall be expedited to the front of the production que. This applies to all reactivated deferrals, even those where eligibility reverification is necessary due to the expiration of the eligibility grace period.

HWAP funding must be used to complete all reactivated deferral projects. DOE funding cannot be used.

For Rental Properties: When **all** of the following conditions are met, the project is automatically eligible for weatherization to proceed after the issues that caused the deferral have been addressed.

1. Prior to the deferral decision being made, the project was eligible for WAP services *when they transitioned off the project wait list and onto the open jobs/WIP list*.
2. There has been no change in ownership for the property.
3. **Not more than 12 months** have elapsed between the date the client was informed in writing of the deferral decision and the date the weatherization agency was informed by client that weatherization work could proceed. This duration of time shall be defined as the **eligibility grace period**.

Note that if the eligibility grace period has elapsed, the client will need to provide an updated application packet to enable the agency to reverify the project's programmatic eligibility.

Reactivated deferrals <u>are not</u> expedited to the front of the production que for rental properties. These projects are placed within the production que based on the date of the original efficiency coach visit relative to the coaching dates for other projects in the production que.

HWAP funding must be used to complete all reactivated deferral projects. DOE funding cannot be used.

Deferral Policies & Procedures | Documentation & Forms

This section provides a summary of the required deferral related documentation and forms for Vermont's WAP. This list is applicable to homes that do not have vermiculite. Refer to the list found in Appendix G for homes that contain vermiculite.

Document Number	Document Name	Use Requirements	Required Recipients of Documentation & Signature Requirements
Vermiculite Form 532	Notice of Presence of Vermiculite or Other Potential Asbestos Containing Materials (ACM)	This form must be used at every home with potential asbestos containing material. The client shall be informed about current policies and procedures related to vermiculite and/or other potential ACMs.	Is a Client Signature Required? --- **Yes**
			Is a WAP Agency Representative Signature Required? --- **Yes**
			Who Receives a Copy? --- **1| Client** **2| WAP Agency**
Vermiculite Form 534	Vermont Department of Health's, "Planning for Renovations and Demolitions: Asbestos and What You Need to Know"	This informational handout must be provided to any client / household with vermiculite insulation or other potential asbestos containing material.	Is a Client Signature Required? --- **No**
			Is a WAP Agency Representative Signature Required? --- **No**
			Who Receives a Copy? --- **1| Client**

Deferral Policies & Procedures | Documentation & Forms

Document Number	Document Name	Use Requirements	Required Recipients of Documentation & Signature Requirements
Form 536	Hazard Assessment Notification	This form must be used at every home that will receive weatherization services.	Is a Client Signature Required? --- **Yes**
			Is a WAP Agency Representative Signature Required? --- **Yes**
			Who Receives a Copy? --- **1| Client** **2| WAP Agency**

Deferral Policies & Procedures | Documentation & Forms

Document Number	Document Name	Use Requirements	Required Recipients of Documentation & Signature Requirements
Form 537	Notice of Service Deferral – Category 1	This form must be used when a deferral decision is made for the following reasons. **1 |** The client(s) is uncooperative, abusive or threatening to those who must engage with the client(s) or perform work at the home during the project. **2 |** Illegal activities are being conducted in the dwelling unit. **3 |** The dwelling unit has sewage or other sanitary problems (i.e., fleas or other pest infestation) that would endanger workers and that could potentially be worsened by proceeding with weatherization work. **4 |** The client has known health conditions that prohibit the installation of insulation and/or other weatherization materials. **5 |** The client has known health conditions that prohibit the disturbance or removal of existing materials in the home that would need to be disturbed or removed to complete the weatherization project.	Is a Client Signature Required? --- **No** Is a WAP Agency Representative Signature Required? --- **No** Who Receives a Copy? --- **1| Client** **2| WAP Agency**
Form 538	Notice of Service Deferral – Category 2	This form must be used when a deferral decision is made for any reason other than the reasons that are listed above or the reasons that are outlined on pages 6-9 of this appendix.	Is a Client Signature Required? --- **No** Is a WAP Agency Representative Signature Required? --- **No** Who Receives a Copy? --- **1| Client** **2| WAP Agency**

Deferral Policies & Procedures | Documentation & Forms

Document Number	Document Name	Use Requirements
Form 540	Non-Vermiculite Deferral Process Waiver Request	This waiver form must be submitted to OEO to request permission to defer a project where the "First 3 WAP Service Phases" have not been fully competed unless one of the allowable exceptions outlined on pages 6 and 7 of this appendix is the reason for the deferral. If one of the allowable exceptions outlined on pages 6 and 7 of this appendix is the reason for the deferral, then the project can be deferred without submitting this form to OEO. *Note that this form is only used in homes that do not contain vermiculite. Use form 539 in homes that contain vermiculite.*

VT TEC Manual—Appendix G: Vermiculite Policies

Vermiculite Policies & Procedures | Background

Vermont's WAP has made substantial progress since 2011 to incorporate vermiculite remediation efforts into weatherization projects. As the program gained experience related to vermiculite, programmatic policies and procedures were continuously improved.

Overall, striving to continuously improve vermiculite policies and procedures as new information and funding opportunities came to light has been a good thing.

- WAP funding has successfully leveraged additional funding sources that have helped chip away at one of the biggest barriers to WAP projects.
- The presence of vermiculite is no longer cause for an automatic deferral of WAP services and fewer vulnerable Vermont families have been denied WAP services due to vermiculite.
- Many Vermont families have now received professional vermiculite remediation services and were then able to benefit from a comprehensive WAP project.

These accomplishments—and the continuously evolving nature of vermiculite policies—have come with some challenges. Among them, it has been difficult to keep up to date with Vermont WAP's vermiculite policies & procedures as things changed over time.

The goal of this appendix is to provide one comprehensive set of vermiculite policies for Vermont's WAP network to help guide future project work in homes with vermiculite.

Vermiculite Policies & Procedures | Guidance Consolidation Overview

The content included in this guidance supersedes and replaces any and all previously issued vermiculite guidance.

Previously issued guidance on this topic that is hereby replaced includes, but is not limited to:

- Vermont Weatherization Program Notice 2014-1
- Vermont Weatherization Program Notice 2015-2
- Vermont Weatherization Program Notice 2017-1
- Vermont Weatherization Program Memorandum 2018-02

Working in Homes with Vermiculite | Qualified Asbestos Professionals

Throughout this guidance, the term qualified asbestos professional is used. This can have different meanings depending on the type of services being referenced. Any individual or entity performing asbestos-related services in Vermont must be certified/licensed to perform that specific service in accordance with the Vermont Regulations for Asbestos Control.

The four types of asbestos service designations most applicable to WAP projects are:

1. Asbestos Inspector
2. Asbestos Project Designer
3. Asbestos Abatement Contractor
4. Asbestos Project Monitor

Some individuals or entities are qualified to perform all four of these asbestos related services. Others are qualified to perform some, but not all, of these four services.

Required Segregation of Duties | Avoiding Conflicts of Interest

- **It is never allowable for the same company that performs the vermiculite/asbestos remediation services to also have one of their own employees serve as the asbestos project monitor.**

The primary duties of the asbestos project monitor are to conduct the final visual and air clearance testing required for each project to determine if the area meets the state regulations for clearance. These duties cannot be performed by an employee of the company that performed the vermiculite/asbestos remediation services under any circumstance, even when the company is licensed to perform asbestos project monitoring services.

This regulation can make it seem like a WAP agency must procure the services of (1) a qualified asbestos abatement contractor and (2) an asbestos project monitor for every vermiculite remediation project. That is not necessarily the case.

It is acceptable for a WAP agency to procure the services of an asbestos abatement contractor and allow for the abatement contractor to subcontract out the asbestos project monitoring services to a qualified individual or entity. This is a common and acceptable industry practice. The only thing the asbestos abatement contractor performing the work cannot do is have one of their own employees serve as the project monitor.

Asbestos Services Procurement by the WAP

Required Services: A WAP agency must procure the following services for each vermiculite remediation project:

- An Asbestos Abatement Contractor & An Asbestos Project Monitor

  --or--

- An Asbestos Abatement Contractor *(who will be responsible for subcontracts with an Asbestos Project Monitor)*

Additional Services: A WAP agency can also procure the services of an asbestos inspector and/or an asbestos project designer to provide additional services. A common procurement example: A WAP agency can procure an asbestos professional that will serve the following roles: (1) Serve as the asbestos inspector, (2) serve as the asbestos project designer responsible for the design of the remediation project, (3) serve as the asbestos project monitor and (4) hire and manage an asbestos abatement contractor.

Working in Homes with Vermiculite | Asbestos Project Regulations & Permitting

Vermiculite is a Regulated Asbestos-Containing Material (RACM). All asbestos abatement projects involving RACMs must submit an Asbestos Abatement Project Permit Application Form (VDH Form A104). The form must be submitted at least 10 working days before an abatement project begins. This form must be completed and submitted by a qualified asbestos professional.

This permit application must be submitted with a diagram showing the location of the project activity within the building and payment for the permit, as specified in Section 7 of the Vermont Regulation for Asbestos Control.

For more information about the permitting process or the Vermont Regulations for Asbestos Control, please call (802) 863-7220 or (800) 439-8550 (toll-free in VT).

Small Scale Short Duration Activities (SSSD or 3SD) include any asbestos abatement activity that encompasses up to and including:

- ✓ 10 linear feet of asbestos-containing material (ACM) located on pipes

  or

- ✓ 10 square feet of ACM from any surface within the abatement area within a facility

All 3SD must be performed by a trained and certified Asbestos Worker or Supervisor. A completed 3SD notification must be sent to the Vermont Department of Health, using the 3SD Notification Form (VDH form L105). This form must be submitted within 48 hours of the activity.

Five WAP Project Approaches for Homes with Vermiculite

There are five possible ways to proceed with a WAP project in homes with Vermiculite. Some of them disturb the existing vermiculite in the home and some of them do not. The project approaches are:

1. Small-Scale Short-Duration Activities (3SD)
2. Abatement
3. Hybrid Approach
4. Alternative Approach
5. Weatherize the Rest of the Home

Guidelines for each approach are outlined in the following tables.

Working in Homes with Vermiculite | Five Project Approaches

There are five possible ways to proceed with a WAP project in homes with Vermiculite. Guidelines for each approach are outlined in the tables below.

Approach		Abbreviated Guidelines
When the Vermiculite Gets Removed		
1.	Small-Scale Short-Duration Activities (SSSD or 3SD)	✓ Remove less than 10 total square feet of vermiculite/asbestos containing material ✓ All 3SD must be performed by a qualified asbestos professional. ✓ No permit is required per Vermont Dep. of Health (VDH) ✓ A completed SSSD notification must be sent to the Vermont Department of Health, using the SSSD Notification Form (VDH form L105). ✓ This form must be submitted within 48 hours of the activity. ✓ Must notify VDH after work is completed ✓ Potentially eligible for HWAP-Vermiculite & VLite-Vermiculite Funding *(depends on DAACC results)* ✓ Potentially eligible for regular HWAP job funding *(depends on project-level SIR and DAACC results)* ✓ Potentially eligible for Zonolite Funding *(depends on vermiculite test results regarding barium)* ✓ **Not Eligible for DOE funding**
2.	Abatement	✓ Remove more than 10 total square feet of vermiculite/ asbestos containing material ✓ Project must get permitted through VDH by a qualified asbestos professional using an Asbestos Abatement Project Permit Application Form (VDH Form A104). ✓ The permit application form must be submitted at least 10 working days before an abatement project begins. ✓ Must notify VDH after work is completed ✓ Potentially eligible for HWAP-Vermiculite & VLite-Vermiculite Funding *(depends on DAACC results)* ✓ Potentially eligible for regular HWAP job funding *(depends on project-level SIR and DAACC results)* ✓ Potentially eligible for Zonolite Funding *(depends on vermiculite test results for barium)* ✓ **Not Eligible for DOE funding**

Working in Homes with Vermiculite | Five Project Approaches

Approach		Abbreviated Guidelines
When Vermiculite is Disturbed During the Weatherization Project but it is Not Removed from the Home		
3.	Hybrid Approach	✓ The regulatory requirements and the permitting process is the same for a hybrid project as it is for an abatement project. For example, the work still occurs in a VDH regulated & permitted asbestos abatement area and clearance testing is required. ✓ This approach is called a "hybrid" because a qualified asbestos professional and a weatherization professional are together in the abatement area simultaneously. ✓ The most common hybrid projects occur in attics or kneewall closets. The vermiculite is moved as needed so the attic can be effectively airsealed and then insulated. The vermiculite is not removed from the home. ✓ Potentially eligible for HWAP-Vermiculite & VLite-Vermiculite Funding *(depends on DAACC results)* ✓ Potentially eligible for regular HWAP job funding *(depends on project-level SIR and DAACC results)* ✓ **Not Eligible for Zonolite or DOE funding**

Working in Homes with Vermiculite | Five Project Approaches

Approach		Abbreviated Guidelines
When Vermiculite is Not Disturbed During the Weatherization Project and it is Not Removed from the Home		
4.	Alternative Approach	This approach can be considered when the area(s) of the building that have vermiculite can be effectively airsealed and insulated without disturbing the vermiculite. ✓ **Written OEO permission is required prior to using this approach** ✓ Alternative Approach requests & approvals are to be recorded on the Atypical Project Approval form. ✓ Asbestos contractors are not involved in the project ✓ There is no permitting required per VDH ✓ **Project is eligible for regular HWAP or DOE job funding** *(depends on project-level SIR)* ✓ Project is Not Eligible for HWAP-Vermiculite, VLite-Vermiculite, or Zonolite Funding ✓ Some examples of this approach include: - Airseal & insulate the slopes or attic from below using rigid foam sheet insulation & caulking. - Airseal & insulate over the attic floor-boards without disturbing the vermiculite located below the floor-boards.
5.	Weatherize the Rest of the Home	This approach can be considered when the area(s) of the building that have vermiculite do not present major airsealing opportunities and are already insulated. It can also be considered in cases where the vermiculite is located within an area that does not need to receive weatherization improvements. ✓ **Written OEO permission is required prior to using this approach** ✓ When using this approach, project requests & approvals are to be recorded on the Atypical Project Approval form. ✓ Asbestos contractors are not involved in the project ✓ There is no permitting required per VDH ✓ **Project is eligible for regular HWAP or DOE job funding** *(depends on project-level SIR)* ✓ Project is Not Eligible for HWAP-Vermiculite, VLite-Vermiculite, or Zonolite Funding ✓ Examples where this approach can be considered include: -The vermiculite is only located in the attic, it's already covered by several inches of loose-fill cellulose insulation and there are no major air sealing improvement opportunities in the attic. -There is vermiculite in the exterior walls but there is no vermiculite identified anywhere else. -There is vermiculite at the base of the chimney in the basement but there is no vermiculite identified anywhere else.

Working in Homes with Vermiculite | Rental Properties

The presence of vermiculite shall be treated as cause for automatic deferral of services in rental properties only. It is the responsibility of the property owner to remediate vermiculite prior to the receipt of WAP services.

The following excerpt is taken from Form 617, v4.1 entitled, Apartment Building Standards. "The Vermont Home Weatherization Assistance Program (HWAP) requires that rental properties meet minimum standards to qualify for WAP funding. Building Owners who do not themselves qualify for WAP services must make any necessary upgrades prior to receiving WAP services, however WAP will assist in identifying problems and suggesting corrective action".

Form 617 is provided to all property owners. In addition to the general information conveyed on this form, WAP staff must provide a brief written list of any corrective actions that need to be made by a property owner to prevent a project deferral from occurring after evaluating their building(s).

The written list is to be based on observable conditions found during a walk through or building assessment.

Taking photographic documentation of the observable conditions is recommended.

Uploading Form 617, the written list of observable conditions found during the building evaluation and any photographic documentation into the WAP documents area of HES is required.

Determining When to Follow the Vermiculite Guidance[1] for Rental Properties

- **Rent-to-own agreements**: Follow the vermiculite polices for rental properties.
- **Life Leases:** Follow the vermiculite policies for owner-occupied property.
- **Income Eligible Property Owner:**
  - ✓ Follow the vermiculite policies for owner-occupied property if the income-eligible property owner lives in the building that contains the vermiculite.
  - ✓ Follow the vermiculite policies for rental properties if the income-eligible property owner does not live in the building that contains the vermiculite.

[1] This breakdown of owner-occupied vs. rental-occupied properties does not extend to all WAP policies and procedures. This is specific to Vermiculite and Deferral Policies only.

Working in Homes with Vermiculite | Making Deferral Decisions in Owner Occupied Homes

In some cases, dwelling units that have vermiculite insulation may need to be deferred.

However, as of July 01, 2014, it is not allowable to defer a project solely due to the presence of Vermiculite insulation in owner-occupied homes.

There are standard operating procedures (SOPs) that must be followed prior to making a deferral decision for a dwelling unit that has vermiculite.

Types of Vermiculite Deferrals | Category 1 vs. Category 2

There are two different types of vermiculite deferrals that will be covered in more detail throughout this guidance. The reasons for, and the timing of, a deferral decision impact the type of deferral. The programmatic requirements associated with each deferral category are outlined in this guidance.

- **A Category 1- Vermiculite Deferral** is a deferral that either occurs before the economic analysis of the project happens or that is made for reasons other than the economic analysis of the project and/or scope of work.
- **A Category 2- Vermiculite Deferral** is a deferral that is based on the economic analysis of the project and/or scope of work.

The First Three Vermiculite Service Phases

The first three vermiculite service phases and the standard operating procedures associated with each phase are established in this guidance.

- **Phase 1 |** Efficiency Coaching
- **Phase 2 |** Energy Audit/ Building Assessment
- **Phase 3 |** HES Data Entry, Initial Project Economic Analysis & Workscope Development

Working in Homes with Vermiculite | The First Three Vermiculite Service Phases

STANDARD* OPERATING* PROCEDURES

Phase 1 | Efficiency Coaching

or

- All Efficiency Coaching/ Client Education services shall be provided.
- All EVT funded work shall be performed unless the client declines the services.
- The following WAP funded items shall be installed whenever the item is required by the TEC Manual or would provide a benefit to the household, unless the client declines the installation(s): Low-flow aerators & shower heads, 12 lin. ft. of pipe insulation on the leads to/from the DHW source, smoke & carbon monoxide alarms, a new furnace-filter, a programmable thermostat and a humidity gage.

Phase 2 | Energy Audit/ Building Assessment

or

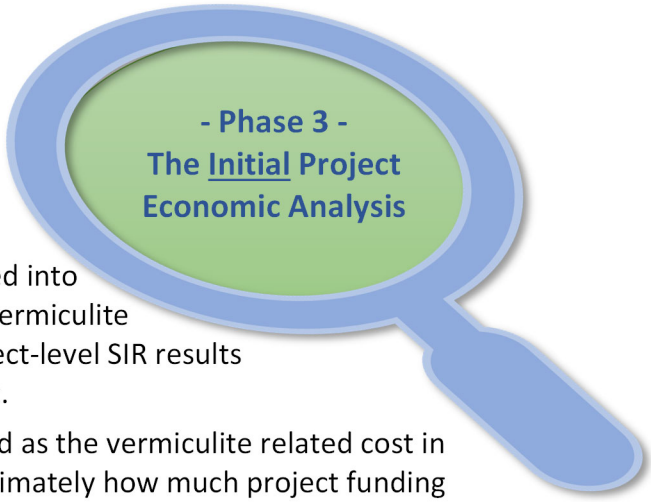
- A complete energy audit must be performed with the following exceptions:
  - ✓ A blower door test shall not be performed
  - ✓ The auditor does not have to walk or crawl through the areas of the home where vermiculite is present.
- (1) The Hazard Assessment Form & (2) The Notice of Presence of Vermiculite Insulation or Other Potential Asbestos Containing Material Form must be completed/signed by a WAP representative and signed by the client. The client and the agency each shall receive a copy of these signed forms.

Submit a Waiver
to request permission to defer a project during any of these 3 phases

Phase 3 | HES Data Entry, Initial Project Economic Analysis & Workscope Development

or

- A complete "full-house" energy audit must be entered into HES.
- An HES Workscope must be produced.
- An HES Energy Savings Report must be produced.
- A DAACC analysis must be completed.
- Photo documentation of the hazards that could potentially cause a deferral must be taken and uploaded into the HES job file.



Use Historical Bid Data

for vermiculite remediation from similar situations when producing a preliminary estimate to address the vermiculite.

This preliminary cost estimate can be entered into HES as the estimated measure cost for the vermiculite remediation work. This will inform the project-level SIR results generated by the HES Energy Savings Report.

The preliminary estimate can also be entered as the vermiculite related cost in the DAACC. This will help determine approximately how much project funding could be available from a combination of programs/ funding sources given two possible scenarios that hinge on the results of the Zonolite vermiculite testing.

Zonolite Vermiculite Testing

Does the Vermiculite Contain Barium?

- Scenario 1 | A vermiculite test indicates that there is barium in the vermiculite. Based on this test result, Zonolite funding would likely be available to cover some of the vermiculite abatement costs.
- Scenario 2 | A vermiculite test indicates that there is no barium in the vermiculite. Based on this test result, Zonolite funding would not be available to cover any of the vermiculite abatement costs.

Engage the Client

using the preliminary information from the DAACC and the HES Energy Savings Report as a starting point when presenting the likely scope of work and funding scenarios for the project. **Jointly determine** if there may be a manageable path forward for the project given all of the preliminary information.

Pursue Vermiculite Testing & Procure Site-Specific Project Cost Estimates

or

Complete the Notice of Service Deferral form & Defer the Project

STANDARD* OPERATING* PROCEDURES

Working in Homes with Vermiculite | Making Category 1- Vermiculite Deferral Decisions

In some cases, dwelling units that have vermiculite insulation may need to be deferred. **However, as of July 01, 2014, it is not allowable to automatically defer a project solely due to the presence of Vermiculite insulation in owner-occupied homes.** There are standard operating procedures (SOPs) that must be followed prior to making a deferral decision for a dwelling unit that has vermiculite.

Types of Vermiculite Deferrals | Category 1 vs. Category 2

There are two different types of Vermiculite deferrals that will be covered in detail in this guidance. The reasons for, and the timing of, a deferral decision impact the type of deferral. The programmatic requirements associated with each deferral category are outlined in this guidance.

- **A Category 1- Vermiculite Deferral** is a deferral that either occurs before the economic analysis of the project happens or that is made for reasons other than the economic analysis of the project and/or scope of work.
- **A Category 2- Vermiculite Deferral** is a deferral that is based on the economic analysis of the project and/or scope of work.

The following tables cover Category 1-Vermiculite Deferrals.

Making Category 1- Vermiculite Deferral Decisions
Prior to the Completion of the First Three Vermiculite Service Phases

Program Standard: A WAP agency must submit a waiver request—Form 539—to the OEO prior to deferring a project in a dwelling unit with vermiculite when the SOPs associated with the first three vermiculite service phases have not been completed in full.

Exceptions to the Program Standard: Allowable exceptions to the above program standard are outlined in the table below. These are examples where Form 539 does not apply.

Potential Issues The building has vermiculite and…	Allowable Actions for a WAP provider to take re: Project Deferral	Required Actions
Exception 1 The client(s) is uncooperative, abusive or threatening to those who must engage with the client or perform work at the home during the project.	In these situations, a WAP provider can defer the project without performing vermiculite service phases 1, 2, and/or 3 as outlined in this guidance. The decision to defer any further service provisions can be made without submitting a waiver to OEO.	**Action 1 | Inform client in writing** --The reason that services are being deferred. --Terms & conditions that would need to be upheld in order to resume service provision. **Action 2 | Inform OEO** --That a deferral has been made and the cause. **Action 3 | Record Keeping** --Upload all the information provided to the client into the HES job file. --Indicate in HES that the job has been deferred along with the reasons for the deferral and the deferral date *(on the audit information screen).*
Exception 2 Illegal activities are being conducted in the dwelling unit.		

Working in Homes with Vermiculite | Making Category 1- Vermiculite Deferral Decisions

Making Category 1- Vermiculite Deferral Decisions
Prior to the Completion of the First Three Vermiculite Service Phases

Program Standard: A WAP agency must submit a waiver request—Form 539—to the OEO prior to deferring a project in a dwelling unit with vermiculite when the SOPs associated with the first three vermiculite service phases have not been completed in full.

Exceptions to the Program Standard: Allowable exceptions to the program standard are outlined in the table below. These are examples where Form 539 does not apply.

Potential Issues **The building has vermiculite and…**	**Allowable Actions**	**Required Actions**
	for a WAP provider to take re: Project Deferral	
Exception 3 The dwelling unit has sewage or other sanitary problems (e.g., fleas or other pest infestation) that would endanger workers and that could potentially be worsened by proceeding with weatherization work.	In these situations, a WAP provider can defer the project without performing vermiculite service phases 1, 2, and/or 3 as outlined in this guidance. The decision to defer any further service provisions can be made without submitting a waiver to OEO.	**Action 1 | Inform client in writing** --The reason that services are being deferred. --The building and/or the site condition(s) that would need to be provided in order to resume service provision. --Provide referrals to other programs that may be able to help the client. **Action 2 | Inform OEO** --That a deferral has been made and the cause. **Action 3 | Record Keeping** --Upload all the information provided to the client into the HES job file. --Indicate in HES that the job has been deferred along with the reasons for the deferral and the deferral date *(on the audit information screen)*. --Whenever possible take photographic documentation of the conditions that caused the deferral and then store the photos in HES.

Making Category 1- Vermiculite Deferral Decisions
Prior to the Completion of the First Three Vermiculite Service Phases

Program Standard: A WAP agency must submit a waiver request—Form 539—to the OEO prior to deferring a project in a dwelling unit with vermiculite when the SOPs associated with the first three vermiculite service phases have not been completed in full.

Some example scenarios of when/how to apply this program standard are included in the table below:

Potential Issues **The building has vermiculite and…**	**Allowable Actions**	**Required Actions**
	for a WAP provider to take re: Project Deferral	
Form 539 Applies -- Example # 1 The client has known health conditions or allergies that would prohibit the safe installation of insulation and/or other weatherization materials.	In these situations, a WAP provider can defer the project without fully performing vermiculite service phases 1, 2, and/or 3 as outlined in this guidance. **However, in this case, the decision to defer the project prior to completing the first 3 vermiculite service phases requires an approved waiver from OEO before communicating the deferral decision to the client.**	**Action 1 | Submit to OEO** --A Vermiculite Deferral Process Waiver (Form 539). --Photographic documentation of the building and site conditions. **Action 2 | Inform client in writing** *(after waiver approval from OEO)* --The Notice of Service Deferral must be completed in full (Form 537). --General information about what the likely WAP scope of work would include if the client were to bring the building or site conditions up to the needed standard must be provided (on form 537). A site-specific work scope does not have to be provided to the client. --General information about the likely benefits that would result from a weatherization project must be provided (on form 537). A site-specific benefit analysis does not have to be provided to the client. --Provide referrals to other programs that may be able to help the client (on this form). **Action 3 | Record Keeping** --Upload all the information provided to the client, including the Notice of Service Deferral into the HES job file (form 537). --Upload the OEO approved Vermiculite Deferral Process Waiver Form into the HES job file (form 539). --Upload photographic documentation of the building and site conditions to the HES job file. --Indicate in HES that the job has been deferred along with the reasons for the deferral and the deferral date *(on the audit information screen)*.
Form 539 Applies -- Example # 2 The client has known health conditions that prohibit the disturbance or removal of existing materials in the home that would need to be disturbed or removed to complete the weatherization project.		

Making Category 1- Vermiculite Deferral Decisions
Prior to the Completion of the First Three Vermiculite Program Service Phases

Program Standard: A WAP agency must submit a waiver request—Form 539—to the OEO prior to deferring a project in a dwelling unit with vermiculite when the SOPs associated with the first three vermiculite service phases have not been completed in full.

An example situation of when/how to apply this program standard is included in the table below:

Potential Issues **The building has vermiculite and…**	**Allowable Actions**	**Required Actions**
	for a WAP provider to take re: Project Deferral	
Form 539 Applies -- Example # 3 The building structure and/or the primary mechanical systems—electrical and plumbing—are in an observable state of disrepair that would require extensive corrective action before the home could be safely and effectively weatherized and it is likely that the repairs to the building structure, and/or the primary mechanical systems, would exceed $5,000. This $5,000 cost threshold refers to onsite costs only and it excludes any estimated costs associated with work to remedy vermiculite issues, fix or repair the heating system(s) or to perform a standard weatherization project.	In this situation, a WAP provider can defer the project without fully performing phases 1, 2, and/or 3 as outlined in this guidance. **In this case, the decision to defer the project prior to completing the first 3 vermiculite service phases requires an approved waiver from OEO before communicating the deferral decision to the client**. Photographic documentation of the building and site conditions must be provided to OEO along with the request for waiver.	**Action 1 | Submit to OEO** --A Vermiculite Deferral Process Waiver (Form 539). --Photographic documentation of the building and site conditions. **Action 2 | Inform client in writing** *(after waiver approval from OEO)* --The Notice of Service Deferral must be completed in full (Form 538). --General information about what a likely WAP scope of work would include if the client were to bring the building or site conditions up to the needed standard must be provided (on form 538). A site-specific work scope does not have to be provided to the client. --General information about the likely benefits that would result from a weatherization project must be provided (on form 538). A site-specific benefit analysis does not have to be provided to the client. --Provide referrals to other programs that may be able to help the client (on this form). **Action 3 | Record Keeping** --Upload all the information provided to the client, including the Notice of Service Deferral into the HES job file (form 538). --Upload the Vermiculite Deferral Process Waiver Form to the HES job file. --Upload photographic documentation of the building and site conditions to the HES job file. --Indicate in HES that the job has been deferred along with the reasons for the deferral and the deferral date *(on the audit information screen)*.

Working in Homes with Vermiculite | Phase 4 – Site-Specific Economic Analysis of the Project

Use Site-Specific Information

to perform an accurate economic analysis of the project during the fourth vermiculite service phase. Key requirements are below:

- Perform Zonolite's Testing for Barium.
- Get Site-Specific Bids for Vermiculite Remediation.
- Generate a Site-Specific Energy Model, Scope of Work & WAP Project Cost Estimate.
- Create a DAACC File to Help Determine the Project Funding Breakdown & Submit to OEO for Final Approval.

Results of the Economic Analysis Are Used to Determine Next Steps*

DAACC File is Approved by OEO

- **Communicate with the client so they can decide whether or not to proceed with the project.**

or

DAACC File is Not Approved by OEO

- **Complete the Notice of Service Deferral Form & Defer the Project**

***Note that it is not allowable to defer a project simply because it is expensive when the project level SIR is 1.0 or greater and the Non-Energy Savings investment for the regular WAP funded job is less than the established threshold for the project.

Engaging the Client |

Present the client with the proposed scope of work and the OEO approved funding breakdown for the project proposal. The sources for the approved funding breakdown are (1) the DAACC and (2) the HES Energy Savings Report. The client then decides if they want to proceed with the project.

The Next Course of Action Depends on the Client's Decision

Proceed w/ the Vermiculite Remediation & WAP Project

or

Complete the Notice of Service Deferral form & Defer the Project

STANDARD* OPERATING* PROCEDURES

Working in Homes with Vermiculite | Performing the Economic Analysis for the Project

Deferrals and Additional Contributions Calculator (DAACC) -

An Investment Calculation Aid for WAP Projects in Homes that Contain Vermiculite

The investment calculation aid, "DAACC Template_V.8._08-01-2020" or a newer DAACC file version shall be used to provide enhanced project investment analysis for all prospective weatherization projects that will include some form of vermiculite remediation unless a qualifying Category 1- Vermiculite Deferral is made. It is no longer allowable to use versions of the DAACC older than the "DAACC Template_V.8._08-01-2020" file version.

DAACC Usage Requirements in Homes that Contain Vermiculite

- The DAACC shall be used prior to committing or using any funding from the following funding sources/budgets for vermiculite remediation work:
  a. The HWAP-Vermiculite Budget
  b. The VLITE-Vermiculite Budget
- The DAACC shall be used prior to making any Category 2- vermiculite project deferral decision and prior to communicating any Category 2- vermiculite project deferral decision to a weatherization client.[2]
- In most cases it is a requirement to use the DAACC prior to proceeding with a WAP project that will include some form of vermiculite remediation. However, there is one allowable way to proceed with a project that includes some form of vermiculite remediation without using the DAACC. It is likely this would only occur in projects with very minor vermiculite remediation needs because all conditions listed below shall be met:
  a. The project will not be deferred and a comprehensive WAP project will be completed.
  b. No HWAP-Vermiculite or VLITE-Vermiculite funding will be used for the project.
  c. The total contribution toward Vermiculite remediation efforts charged to the regular weatherization job/funding as an incidental repair measure does not exceed $1,500.
  d. The project-level SIR remains at 1.0 or greater when including all of the incidental repair measure costs for vermiculite remediation work that will be charged to the regular weatherization job/funding.
  e. The client is not being asked to contribute any funding toward the WAP project or any of the vermiculite remediation work.

[2] Unless written approval from OEO to communicate the deferral decision to the client is attained.

Working in Homes with Vermiculite | Performing the Economic Analysis of the Project

When in the Process is the DAACC Used?

The number of times—and when—the DAACC is used largely depends on each WAP provider's preferences when trying to decide if a WAP project that needs some form of vermiculite remediation can proceed or not.

A WAP provider can, at their discretion, skip over phase 3 entirely and proceed directly from the 2nd to the 4th vermiculite service phase prior to completing the DAACC for the first time.

A Scenario Where it May be Beneficial to Skip Over Phase 3

- A WAP provider is confident that they will be able to proceed with a WAP project that needs some form of Vermiculite remediation—at little to no cost to the client—given the likely scope of work and the funding sources available.

Using the DAACC During Vermiculite Service Phase 3:

Historical bid data from similar vermiculite remediation projects is used to perform a rough economic analysis of the project during the 3rd vermiculite service phase. The historical bid data is entered into HES and the DAACC file to roughly estimate the project level SIR and the funding breakdown for the project. For vermiculite abatement projects, two project versions are evaluated. One version with a Zonolite funding contribution and one version without a Zonolite funding contribution. The results of the two roughly estimated funding breakdowns are shared and discussed with the client along with the proposed scope of work. Then, the WAP agency and client jointly determine if there may be a manageable path forward for the project.

If the joint decision is that the project seems viable, the WAP provider will then proceed to the 4th vermiculite service phase where they will coordinate Zonolite vermiculite testing for barium and procure a site-specific bid for the vermiculite remediation.

Note that OEO approval of the roughly estimated versions of the DAACC file is not required before engaging the client.

Using the DAACC During Vermiculite Service Phase 4:

Site-specific bid information for the vermiculite remediation work and the known results from Zonolite's barium testing are used to perform an accurate economic analysis of the project during the fourth vermiculite service phase. The site-specific bid information is entered into both HES and the DAACC file to accurately estimate the project-level SIR and the funding breakdown for the project.

After the agency has updated the HES & DAACC files, the DAACC file is submitted to OEO for approval. Once approved, the updated project proposal and the project funding breakdown are shared and discussed with the client. The client then decides whether or not to proceed with the project based on the information provided. If the client decides to defer the project, complete the Notice of Service Deferral form (form 538). Otherwise, proceed with the project.

Note that it is not allowable practice to defer a project simply because it is expensive when the project level SIR is 1.0 or greater and the Non-Energy Savings investment for the regular WAP funded job is less than the established threshold for the project.[3]

[3] Without written approval from OEO for the individual project.

Working in Homes with Vermiculite | Performing the Economic Analysis for the Project

Minimum Project-Level SIR Requirement

- A weatherization project must have a project-level SIR of 1.0 or greater. If this minimum SIR cannot be achieved the project may need to be deferred.

Additional Project Investment Policies that are Supported by the DAACC:

- An investment threshold for Non-Energy Saving Measures (Non-ESMs) is established for each job. The investment threshold is set as a fixed percentage of the Total Net Job Cost Estimate. Currently, the Non-ESM threshold is set at 35 percent of the total net job cost estimate.
  - ✓ **This is an investment threshold. It is not an investment limit.** It is allowable to invest more than 35% of the total net job cost into Non-ESMs on a regular weatherization job without seeking approval.[4] However, investing more than 35% of the total net job cost into Non-ESMs on a regular weatherization job is not required.
  - ✓ **This is an investment threshold that impacts deferral decisions.** It is not allowable practice to defer a project simply because it is expensive when the Non-Energy Savings investment for the regular WAP funded job will be less than 35% of the total net job cost estimate.
  - ✓ **This is an investment threshold that impacts the accessibility of supplemental funding sources administered by OEO.** Only when the cost for the Non-ESMs exceeds 35% of the total net job cost does the job become eligible to use other supplemental funding sources administered by OEO. On eligible projects, the supplemental funding sources can be used to buy down the Non-ESM costs so that less of those costs get charged to the regular weatherization job.
- When the Non-ESM costs exceed the established threshold for a job that needs some form of vermiculite remediation, the job becomes eligible to use (1) HWAP-Vermiculite and (2) VLITE-Vermiculite funding. The amounts that can be invested toward vermiculite remediation from these budgets are calculated by the DAACC based on the workscope composition and job costs.
- Each of these supplemental budgets have per-job caps for vermiculite remediation activity.
  - ✓ The allowable per-job caps from each of the HWAP-Vermiculite and VLITE-Vermiculite budgets is set at $3,700 for a combined total of $7,400 per job.
- Approval forms are built directly into the calculation aid. "Section 1" of each approval form provides for a standardized and expedited project approval process. An optional "Section 2" on each of the approval forms is also available for use. This section can be used by a WAP agency that wants to request permission to adjust the standard funding breakdowns that were provided by the calculation aid for the job. OEO will review the DAACC files and make project approval decisions.
- Note these submissions can also serve as transmittal requests when the costs submitted for approval exceed the transmittal threshold.

[4] Unless the minimum Project-Level SIR requirement of 1.0 is not met.

Pre-Vermiculite Remediation vs. Vermiculite Remediation | Definitions & Differences

Vermiculite remediation projects require a lot of planning and project management effort. Sometimes there are multiple parties involved before, during, and after the actual vermiculite remediation takes place. Plus, the work is paid for using a combination of different funding sources that all have their own rules about allowable expenses. To effectively manage the project funding, it is essential to understand what is meant by "Pre-Vermiculite Remediation Services" versus "Vermiculite Remediation Services".

Definitions:

- **Pre-Vermiculite Remediation Services** include everything that happens (and still needs to be paid for) even if the actual vermiculite remediation project never ends up happening. Some examples include asbestos project design and vermiculite sampling/Zonolite barium testing services.
- **Vermiculite Remediation Services** include everything that happens during, or as a result of, the actual vermiculite remediation project happening. Some examples include the vermiculite abatement project, post abatement inspection services and post abatement clearance testing services.

Important Differences:

- There are different rules about allowable expenditure types for each of these two vermiculite related services that are outlined in detail on the following pages.
- Another important difference relates to the per-job investment caps for the HWAP-Vermiculite budget and the VLITE-Vermiculite grant.
  - ✓ Pre-Vermiculite Remediation Service costs do not count against the per-job investment caps.
  - ✓ Vermiculite Remediation Service costs do count against the per-job investment caps.
- The third important difference relates to the impact that these costs have on project-level SIR calculations.
  - ✓ Pre-Vermiculite Remediation Service costs do not count in project-level SIR calculations.
  - ✓ Vermiculite Remediation Service costs do count in project-level SIR calculations.

Allowable Uses of Primary Weatherization Funding | DOE vs. HWAP

- **DOE Funding:** It is never allowable to use any DOE funding for vermiculite remediation services (or for pre-vermiculite remediation services). However, the regular weatherization job can proceed as a DOE funded job when there is enough supplemental funding to cover the full cost of all vermiculite related work and DOE funds will not be used for any vermiculite related work.
- **HWAP Funding:** It is allowable practice to use HWAP funding for vermiculite related work.

  Any costs for vermiculite remediation services that will be invoiced to the traditional HWAP grant (not to the separate HWAP-Vermiculite budget line) shall be handled as follows:

  ✓ **For the Economic Analysis of the Project:** Subcontractor costs only shall be entered into the HES project. These costs need to be entered as incidental repair measures that are included in the project-level SIR calculation. This is automatically accomplished when using the HES Measure titled, "VML_Vermiculite Remediation Services".

  ✓ **For Invoicing:** All costs shall be included on the HWAP monthly expenditure report in accordance with an agency's standard accounting practices for cost-reimbursement weatherization grants.

  Any costs for pre-vermiculite remediation services that will be invoiced to the traditional HWAP grant (not to the separate HWAP-Vermiculite budget line) shall be handled as follows:

  ✓ **For the Economic Analysis of the Project:** Subcontractor costs only shall be entered into the HES project. These costs need to be entered as Non-SIR measures so that the costs do not impact the project-level SIR calculation. This is automatically accomplished when using the HES Measure titled, "VML_Pre-Vermiculite Remediation Services".

  ✓ **For Invoicing:** All costs shall be included on the HWAP monthly expenditure report in accordance with an agency's standard accounting practices for cost-reimbursement weatherization grants.

Additional Financial Considerations for OEO Administered Funding

- It is not allowable practice to have the client pay an asbestos subcontractor and then to reimburse the client for the expense. **The WAP shall pay the asbestos contractor directly.**
- When using the DAACC, it is not allowable practice to have the client pay for the portion of the vermiculite remediation costs that are prescribed to the regular weatherization project. **The WAP provider shall pay for these costs**.

Working in Homes with Vermiculite | Supplemental Funding for Vermiculite Remediation

Funding Administered by OEO

- **An HWAP-Vermiculite budget line** has been added into the traditional HWAP grant agreements to support vermiculite remediation efforts.
- **The VLITE-Vermiculite grants** are also issued to support vermiculite remediation efforts.

Additional Funding

- **Zonolite Funding** is now available to support vermiculite remediation efforts.
  - only for abatement projects -

The Zonolite Attic Insulation (ZAI) Trust was set up as part of a settlement with the W.R. Grace company to educate the public about the dangers of asbestos containing vermiculite mined by W.R. Grace under the product name Zonolite between 1963 and 1990 from a mine in Libby, Montana. The trust also provides partial reimbursement to home-owners for vermiculite abatement. The ZAI Trust Board of Directors agreed to work with Vermont's WAP to enable active weatherization clients to have access to ZAI trust funds without having to pay up front for abatement themselves and then—only after the abatement project was complete—be able to request a partial cost reimbursement from the ZAI Trust. This has eliminated a substantial cash-flow barrier for low-income Vermonters. Under this new agreement, Vermont's WAP coordinates payments to the asbestos contractor for the cost of the abatement services minus the amount that the ZAI Trust will contribute. After the project is finished and the payments to the abatement contractor can be verified, a claim is submitted by WAP to the ZAI Trust. Payments for the remaining balance of the abatement project are then made by the ZAI Trust directly to the abatement contractor.

Allowable Uses of Supplemental Vermiculite Funding

The allowable uses for this supplemental funding are outlined in the tables below.

Allowable Expenditure Types by Funding Source for Vermiculite Remediation Services

Type of Expenditure	Supplemental Funding Type		
	HWAP-Vermiculite Budget	VLITE-Vermiculite Grant	Zonolite
Subcontractor Material	**Yes**	**Yes**	**Yes**
Subcontractor Labor	**Yes**	**Yes**	**Yes**
WAP Agency Material*	No	No	No
WAP Agency Staff Labor*	No	No	No

*No WAP agency costs related to vermiculite remediation services can be charged to the HWAP-Vermiculite budget, the VLITE-Vermiculite grant or to Zonolite. Only Subcontractor costs can be charged to these supplemental funding types.

Working in Homes with Vermiculite | Allowable Uses of Supplemental Vermiculite Funding

Allowable uses for this supplemental funding are outlined in the table below.

Allowable Expenditure Types by Funding Source for Pre-Vermiculite Remediation Services			
	Supplemental Funding Type		
Type of Expenditure	HWAP-Vermiculite	VLITE-Vermiculite*	Zonolite*
Pre-Vermiculite Remediation Services **Performed by Qualified Asbestos Subcontractors** Examples Include: Professional Consultation, Site Evaluations & Testing Fees, i.e., Vermiculite Sampling/ Zonolite Barium Testing.	**Yes****	No	No
Pre-Vermiculite Remediation Services **Performed by WAP Agency Staff** Examples Include: Professional Consultation, Site Evaluations & Testing Fees, i.e., Vermiculite Sampling/ Zonolite Barium Testing.	No	No	No

* No costs for any pre-vermiculite remediation activities can be charged to VLITE or Zonolite

** It is only allowable to charge the costs for pre-vermiculite remediation activities to the HWAP-Vermiculite budget when the costs are from qualified asbestos subcontractors. No other costs associated with pre-vermiculite remediation activities can be charged to this budget.

Working in Homes with Vermiculite | Funding Breakdown for a Sample Abatement Project
A sample funding breakdown for a vermiculite abatement project with a project-level SIR greater than 1.0 is shown in the table below.[5]

Total Vermiculite Abatement Cost	**$12,500.00**
Zonolite Funding Contribution	$4,270.62
HWAP-Vermiculite Funding Contribution	$3,700.00
VLITE-Vermiculite Funding Contribution	$3,700.00
Regular HWAP Job Funding Contribution (incidental repair measure)	$500.00
Remaining Balance of Funding Needed	**$329.38**

Allowable Actions:
In this scenario any of the following actions could be taken.

- Request OEO permission to increase the amount of funding that would be charged to the regular HWAP Job by another $329.38 (only allowed if the project-level SIR would still be 1.0 or greater with this extra incidental repair measure cost added to the project).
  - ✓ This results in a fully funded vermiculite abatement project at no cost to the low-income client.
- Use leveraged income to pay for the remaining balance of $329.38
  - ✓ This results in a fully funded vermiculite abatement project at no cost to the low-income client.
- Use Non-OEO administered grant funding (e.g., USDA, Argosy) to pay for the remaining balance of $329.38
  - ✓ This results in a fully funded vermiculite abatement project at no cost to the low-income client.
- Use leveraged income to pay for (a) the remaining balance of $329.38 and for (b) the $500.00 that would have been charged to the regular HWAP Job as an incidental repair.
  - ✓ This results in a fully funded vermiculite abatement project at no cost to the low-income client and none of the abatement charges impact the HWAP job cost average.
- Use Non-OEO administered grant funding (e.g., USDA, Argosy) to pay for (a) the remaining balance of $329.38 and (b) for the $500.00 that would have been charged to the regular HWAP Job as an incidental repair.
  - ✓ This results in a fully funded vermiculite abatement project at no cost to the low-income client and none of the abatement charges impact the HWAP job cost average.
- Require the client to pay the $329.38 remaining balance of the abatement costs. Provide the client with the proposed scope of work, funding breakdown & referrals to other programs that may be able to help them secure the funds to cover the remaining balance of the abatement costs. Either proceed with or defer the WAP project depending on the client decision about contributing the remaining balance of the abatement costs.

[5] All funding amounts shown in this table would be determined by the DAACC.

Working in Homes with Vermiculite | Funding Breakdown for a Sample Abatement Project

A sample funding breakdown for a vermiculite abatement project with a project-level SIR greater than 1.0 is shown in the table below.

Total Vermiculite Abatement Cost	**$12,500.00**
Zonolite Funding Contribution	$4,270.62
HWAP-Vermiculite Funding Contribution	$3,700.00
VLITE-Vermiculite Funding Contribution	$3,700.00
Regular HWAP Job Funding Contribution (incidental repair measure)	$500.00
Remaining Balance of Funding Needed	**$329.38**

Non-Allowable Actions:

In this scenario none of the following actions could be taken.

- Defer the WAP project because it is expensive.
- Exceed the maximum per-job funding limit for HWAP-Vermiculite or VLITE-Vermiculite funding.
- Ask the client to contribute any amount greater than the Remaining Balance of Funding Needed as calculated by the DAACC. In this example, $329.38.

Working in Homes with Vermiculite | Making Category 2- Vermiculite Deferral Decisions

- **A Category 2- Vermiculite Deferral** is a deferral that is based on the economic analysis of the project and/or the scope of work.
  - This type of deferral is made when a project does not have a project-level SIR of 1.0 or greater.
  - This type of deferral is made when there is not enough funding to cover the full cost of vermiculite remediation services and the client—after being presented with all of the information about the project—has decided to defer the project because of the funding gap.

Finalizing Category 2- Vermiculite Deferral Decisions | Requirements

1 | Record the deferral decision and the information that was communicated to the client prior to the deferral decision being made on the Notice of Service Deferral (Form 538). This form must be completed in full. A completed copy must be provided to the client and a copy must be retained for the file.

2 | Upload the following to the HES job file:
- All information provided to the client, including the Notice of Service Deferral (Form 538)
- The completed version of the DAACC file that was used to inform the deferral decision
- Photographic documentation of the building and site conditions

3 | Record the following information into the HES file on the audit information screen
- That the job has been deferred
- The reason(s) for the deferral
- The date of the deferral decision

4 | Assign the appropriate Job Type on the HES audit information screen

Assign the appropriate "No Unit" Funding Source for the job on the HES selected measures screen

Add the job to the correct HES invoice

Working in Homes with Vermiculite | Reactivating Deferrals

Eligibility Reverification Requirements When Reopening Deferred Projects

For Owner-Occupied Dwelling Units: When **all** of the following conditions are met, the household is automatically eligible for weatherization to proceed after the issues that caused the deferral have been addressed.

1. Prior to the deferral decision being made, the household was eligible for WAP services *when they transitioned off the client wait list and onto the open jobs/WIP list*.
2. There has been no change in ownership for the dwelling unit.
3. **Not more than two years** have elapsed between the date the client was informed in writing of the deferral decision and the date the weatherization agency was informed by client that weatherization work would be able to proceed. This duration of time shall be defined as the **eligibility grace period**.

Whenever a deferral is reactivated during the eligibility grace period there is no need for reapplication or a program eligibility reverification to occur.

If the eligibility grace period has elapsed, the household will need to provide an updated application packet to enable the agency to reverify their programmatic eligibility.

The original application date, efficiency coaching date and energy audit date shall be retained in the HES software program.

All reactivated deferrals shall be expedited to the front of the production que. This applies to all reactivated deferrals, even those where eligibility reverification is necessary due to the expiration of the eligibility grace period.

HWAP funding must be used to complete all reactivated deferral projects. DOE funding cannot be used.

For Rental Properties: When **all** of the following conditions are met, the project is automatically eligible for weatherization to proceed after the issues that caused the deferral have been addressed.

1. Prior to the deferral decision being made, the project was eligible for WAP services *when they transitioned off the project wait list and onto the open jobs/WIP list*.
2. There has been no change in ownership for the property.
3. **Not more than 12 months** have elapsed between the date the client was informed in writing of the deferral decision and the date the weatherization agency was informed by client that weatherization work could proceed. This duration of time shall be defined as the **eligibility grace period**.

Note that if the eligibility grace period has elapsed, the client will need to provide an updated application packet to enable the agency to reverify the project's programmatic eligibility.

Reactivated deferrals <u>are not</u> expedited to the front of the production que for rental properties. These projects are placed within the production que based on the date of the original efficiency coach visit relative to the coaching dates for other projects in the production que.

HWAP funding must be used to complete all reactivated deferral projects. DOE funding cannot be used.

Vermiculite Policies & Procedures | Documentation & Forms

This section provides a summary of the required vermiculite documentation and forms for Vermont's WAP.

Document Number	Document Name	Use Requirements	Required Recipients of Documentation & Signature Requirements
Vermiculite Form 532	Notice of Presence of Vermiculite or other Potential Asbestos Containing Materials (ACM)	This form must be used at every home with potential asbestos containing material. The client shall be informed about current policies and procedures related to vermiculite and/or other potential ACMs.	Is a Client Signature Required? --- **Yes** Is a WAP Agency Representative Signature Required? --- **Yes** Who Receives a Copy? --- **1| Client** **2| WAP Agency**
Vermiculite Form 533	United States Environmental Protection Agency's Fact Sheet "Protect Your Family from Asbestos-Contaminated Vermiculite Insulation"	This informational fact sheet must be provided to all clients with vermiculite insulation.	Is a Client Signature Required? --- **No** Is a WAP Agency Representative Signature Required? --- **No** Who Receives a Copy? --- **1| Client**
Vermiculite Form 534	Vermont Department of Health's, "Planning for Renovations and Demolitions: Asbestos and What You Need to Know"	This informational handout must be provided to any client / household with vermiculite insulation or other potential asbestos containing material.	Is a Client Signature Required? --- **No** Is a WAP Agency Representative Signature Required? --- **No** Who Receives a Copy? --- **1| Client**

Vermiculite Policies & Procedures | Documentation & Forms

Document Number	Document Name	Use Requirements	Required Recipients of Documentation & Signature Requirements
Vermiculite Form 535	Vermont Weatherization Agency's Vermiculite Waiver	Each individual WAP agency is required to develop, maintain and use their own Vermiculite Waiver. Any update to the Waiver must be approved in writing by the OEO prior to use. The waiver must be used at each home with vermiculite insulation before proceeding with any weatherization construction/renovation services.	Is a Client Signature Required? --- **Yes**
			Is a WAP Agency Representative Signature Required? --- **Yes**
			Who Receives a Copy? --- **1| Client** **2| WAP Agency**
Form 536	Hazard Assessment Notification	This form must be used at every home that will receive weatherization services.	Is a Client Signature Required? --- **Yes**
			Is a WAP Agency Representative Signature Required? --- **Yes**
			Who Receives a Copy? --- **1| Client** **2| WAP Agency**

Vermiculite Policies & Procedures | Documentation & Forms

Document Number	Document Name	Use Requirements	Required Recipients of Documentation & Signature Requirements
Form 537	Notice of Service Deferral – Category 1	This form must be used when a deferral decision is made for the following reasons. **1 |** The client(s) is uncooperative, abusive or threatening to those who must engage with the client(s) or perform work at the home during the project. **2 |** Illegal activities are being conducted in the dwelling unit. **3 |** The dwelling unit has sewage or other sanitary problems (i.e., fleas or other pest infestation) that would endanger workers and that could potentially be worsened by proceeding with weatherization work. **4 |** The client has known health conditions that prohibit the installation of insulation and/or other weatherization materials. **5 |** The client has known health conditions that prohibit the disturbance or removal of existing materials in the home that would need to be disturbed or removed to complete the weatherization project.	Is a Client Signature Required? --- **No** Is a WAP Agency Representative Signature Required? --- **No** Who Receives a Copy? --- **1| Client** **2| WAP Agency**
Form 538	Notice of Service Deferral – Category 2	This form must be used when a deferral decision is made for any reason other than the reasons that are listed above or the reasons that are outlined on pages 11-14 of this appendix.	Is a Client Signature Required? --- **No** Is a WAP Agency Representative Signature Required? --- **No** Who Receives a Copy? --- **1| Client** **2| WAP Agency**

Vermiculite Policies & Procedures | Documentation & Forms

Document Number	Document Name	Use Requirements
Form 539	Vermiculite Process Waiver Request	This waiver form must be submitted to OEO to request permission to defer a project where the "First 3 Vermiculite Service Phases" have not been fully competed unless one of the allowable exceptions outlined on pages 11 and 12 of this appendix is the reason for the deferral. If one of the allowable exceptions outlined on pages 11 and 12 of this appendix is the reason for the deferral, then the project can be deferred without submitting this form to OEO. *Note that this form is only used in homes that contain vermiculite. Use form 540 in homes that do not contain vermiculite.*

Preparing & Submitting Documentation to the Zonolite Attic Insulation (ZAI) Trust

It is not allowable for a WAP Agency to ask the client to do anything more than sign and mail in any completed paperwork to the ZAI Trust. Preparation of all documentation required by the ZAI Trust shall be the responsibility of a WAP Agency and/or their designated qualified asbestos contractor.

What to Do When Vermiculite is Not Identified Until the Weatherization Construction Phase

If a WAP installer, e.g. a crew worker, is the first to identify vermiculite insulation at a home, the on-site installation team must immediately stop working in the area where the vermiculite exists and call their supervisor to inform them.

It is imperative that before any work resumes, the WAP agency informs the client about the presence of vermiculite, provides all the required forms, including Forms 532, 533, 544 & 545 and gets all the required vermiculite related consent forms signed.

This applies regardless of where the vermiculite is found or how much is found. The crew must stop working in that area and the agency must follow all applicable vermiculite guidance before work can resume.

What to Do When a WAP Installer is Attempting to Densepack the Exterior Walls of a Home and Finds Vermiculite Insulation

Please note that everything outlined above—informing the client, providing informational forms, getting consent forms signed—needs to be done prior to performing any of the steps below that outline where & how to drill additional holes in exterior walls after vermiculite is found in an exterior wall bay.

On the exterior of the building, drill a one-inch test hole 12-18 inches above the sill plate in the first wall bay closest to the corner of that wall. If no vermiculite is found, proceed to drill and insulate the wall.

- **If vermiculite is found |** Stop and do investigative drilling at the furthest point from where the vermiculite was found. If that bay has vermiculite as well, assume the entire wall has vermiculite and stop drilling and insulating that wall section.
- **If vermiculite is not found |** Continue to drill and insulate back toward the initial wall bay where the vermiculite was found. Stop drilling and insulating one wall bay before the point where vermiculite was initially found.

All individual wall sections shall be attempted to be insulated following the procedures listed above.

Health, Safety & Indoor Air Quality: Waiver 01

Ventless Heater(s): Permanent Installation

Ventless heaters pose health and safety risks. Ventless heaters exhaust all byproducts of combustion, including carbon monoxide, carbon dioxide, and water vapor into the living space. Using these heating appliances is dangerous. Once a home is weatherized it is even more dangerous to operate this type of heater. The primary risk to household occupants is carbon monoxide poisoning. Because these heaters produce moisture, their continued operation could also cause or worsen moisture problems in a home after weatherization. In order for your household to be weatherized, this heater must be permanently disconnected and removed from use.

By signing below client(s):

1. Are granting permission for the Weatherization Assistance Program to proceed with a weatherization project at their home.
2. Understand that their ventless heater(s) will need to be permanently disconnected and removed before their home can be safely weatherized.

Client Signature	Date	Client Signature	Date

Ventless Heater(s): Portable Models

Ventless heaters pose health and safety risks. Ventless heaters exhaust all byproducts of combustion, including carbon monoxide, carbon dioxide, and water vapor into the living space. Using these heating appliances is dangerous. Once a home is weatherized it is even more dangerous to operate this type of heater. The primary risk to household occupants is carbon monoxide poisoning. Because these heaters produce moisture, their continued operation could also cause or worsen moisture problems in a home after weatherization.

By signing below client(s):

1. Are acknowledging that a representative of their local WAP agency has informed them of the dangers these portable, ventless heaters present and advised against their continued use in the home.

Client Signature	Date	Client Signature	Date

Health, Safety & Indoor Air Quality: Waiver 02

Basements & Crawlspaces with Earthen Floors

An integral part of effective weatherization practice is moisture control. Before your home is tightened up during a weatherization project it is important to identify potential sources of moisture within the building. You have an earthen floor in your basement/crawlspace area. This is a significant moisture source. Placing a moisture barrier over the ground will slow the evaporation of moisture into your home and help to control indoor humidity levels after your house is weatherized. The installation of a moisture barrier over the ground is strongly recommended during your weatherization project.

All belongings and/or debris will need to be cleared from the ground so the Weatherization Assistance Program can install this important moisture barrier. This work to clear the ground is the responsibility of the client(s) and must be completed before any weatherization program work can begin **unless**:

1) Other arrangements for this work are made on subsequent written documentation provided to client(s) by the local weatherization provider, or if
2) Option B is signed below

Option A

By signing below client(s):

1. Are granting permission for the Weatherization Assistance Program to install a moisture barrier over the ground in their basement/crawlspace.
2. Are committing to remove all belongings and/or debris from the ground so that the Weatherization program can install this important moisture barrier.
3. Are committing to contact their local weatherization provider once this work to clear the ground is completed.

Client Signature	Date	Client Signature	Date

Option B

By signing below client(s):

1. Are declining the installation of a moisture barrier over the ground during the weatherization project.
2. Are agreeing to hold the Weatherization Assistance Program harmless for any moisture problems that exist, develop, or worsen in their home.

Client Signature	Date	Client Signature	Date

Weatherization Works

How to Evaluate Furnace Duct Work & Cure Short Cycling or Inadequate Ductwork Problems

Overview:

The amount of supply and return ductwork a hot air furnace has, can have a large effect on the actual efficiency of the unit, as well as the life expectancy of the unit. If there isn't enough duct work to deliver the heat the furnace produces, obviously clients are cold, operating costs go up, efficiency goes down, and eventually a premature crack in the heat exchanger will result (the furnace can't get rid of the heat and it stresses out the metal in the heat exchanger)

This bulletin is meant to help guide the energy auditor through the steps of evaluating furnace ductwork and its' efficiency. And when necessary, helping to cure the inadequate ductwork (short cycling) problem. Evaluating ductwork with a heat rise test should be done at every audit, and any problem cured. It doesn't take a lot of time, but huge improvements will result. This is what Weatherization is about.

Definition of Short Cycling (also called Shutting Off or Rocking on the High Limit):

Short Cycling is when the burner shuts off before a call for heat is met (t-stat setting isn't reached). It is shut off by the fan limit switch as a safety measure. The air handler will keep running. The temperature in the plenum will go down and the burner will come on again, only to shut off again quickly. This rocking back and forth on the hi limit setting is bad for the furnace. The heat exchanger is seeing temperatures it wasn't designed for, and will crack. It is also very inefficient and doesn't allow proper heat to be distributed to the living space.

Steps to enable auditor to evaluate furnace duct work:

1. Before performing your furnace combustion test, remove the cover off of the fan limit switch so that it is visible. Record the fan on, fan off, and hi limit settings. Keep an eye on this and note if the burner shuts off on the high limit switch when operating. It shouldn't. Adjusting these settings won't cure a short cycling problem. But it can affect the comfort of the client. Suggested Settings:
    - ✓ Fan ON: 130 degrees or lower
    - ✓ Fan OFF: 110 degrees or lower
    - ✓ High Limit: no higher than 200 degrees unless specified by manufacturer

2. **Heat Rise test**: Drill a small hole in a supply duct a few inches from where it exits the supply plenum (instead of in the plenum, so the thermometer doesn't see the heat exchanger) and then in the center of the return plenum. Place a digital or dial thermometer in both holes.

How to Evaluate Furnace Duct Work & Cure Short Cycling or Inadequate Ductwork Problems

Steps to enable auditor to evaluate furnace duct work (continued):

3. Perform your efficiency test, and before shutting off the furnace record the Temperatures in the supply and return side. Subtract these numbers and the difference will be the **heat rise** of the furnace. For a furnace with adequate duct work this heat rise should fall in the range of **45 degrees to 70 degrees.** Or check the exact specifications of the manufacturer (listed on the unit).

4. **If** the heat rise is outside that range and or the furnace is shutting off on the high limit switch, **see below**. If the heat rise is good, you are done evaluating.

What to do if Heat Rise is Excessive, or if furnace Short Cycles:

1. First check to ensure that the air filter is clean, and that all the registers in the living space are open and not obstructed with furniture or clothing, or covered with filter or cheese cloth. If they are, uncover or open them all and try again.
2. To determine if supply or return is inadequate, measure the amount of duct work that is coming off of the plenums, and check the charts below.
   - ✓ NOTE: Always check the size of the nozzle. It should be listed on an efficiency report, or on the unit itself. Downsizing the nozzle will occasionally cure short cycling (but don't downsize below manufacturers specs., and make sure the new nozzle provides enough heat for the home).
   - ✓ NOTE: a dirty or broken air handler, or slipping belt can cause an excessive heat rise and short cycling. Increasing blower speed can cure this, but will increase noise and discomfort at end of cycle. It is best to install adequate duct work first.

   TIP: To quickly determine if the return ductwork is limiting, remove the return cabinet door and allow the furnace to run. If it doesn't short cycle, this open door has provided enough return air and you know you must install more return duct work.

How to Evaluate Furnace Duct Work & Cure Short Cycling or Inadequate Ductwork Problems

Determining the Amount of Ductwork needed:

1. If a gas furnace, take the gas input and go to Table 1 to see what the approximate amount of square inches of supply and return duct is needed coming off of the plenums. (Use Table 3 to get the equivalent square inches for the appropriate round ducts. For rectangular ducts take the length times the width in inches to get square inches)
2. If an oil furnace, take the nozzle size times 138,200 Btu/ gallon times the efficiency to get the output, and go to Table 2 to determine the square inches of Supply and Return needed. (Or use CFM air flow if you are more familiar with that).
3. Determine which you are lacking in, supply or return and install a duct to the living space off of the plenum.

Tips and Traps:

1. Be wary of installing 6" ductwork. It moves very little air relative to 7 or 8". An 8" duct moves twice as much air as a 6" duct.
2. Remember, air flow is limited by the smallest restriction. For example, if you have a 10" duct (79 square inches) that supplies air to a 28 square inch register, you are only moving the amount of air that a 6" duct (28 square inch) would move. You need a larger register, at least 79 square inches, to supply all the air the 10" duct can move.
3. An 8 inch duct that Y's to 2 8 inch ducts only moves the amount of air of one 8 inch duct. Not a good design.
4. When installing new ductwork to improve air flow, always come off the plenum, not off of existing trunks or ducts (unless there is enough air flow available from the trunk).
5. Don't come off of the plenum with elbows or 90's. Use gradual boots if possible. Elbows cut the air flow dramatically.
6. Smooth walled duct work is recommended over flex duct. Although cheaper, flex duct kinks easy, has more resistance to air flow and isn't as durable.

How to Evaluate Furnace Duct Work & Cure Short Cycling or Inadequate Ductwork Problems

Table 1: Chart of Square Inches of Ducts Needed (off both the supply and return plenums) for gas furnaces.

Gas furnaces

Input BTU's	Square inched of Ducts needed (supply and return)
40,000	80 si each, supply and return
60,000	120
80,000	160
100,000	200
120,000	240

Table 2: Chart of Square Inches of Ducts and CFM air flow needed for various oil furnace sizes.

Oil furnaces

Output BTU's	Square Inches Duct needed (S & R)	Min. CFM Airflow
45,000 to 55,000	100 each s, and r	500
60,000 to 70,000	140	700
75,000 to 85,000	170	800
95,000 to 106,000	190	900
106,000 to 115,000	220	1100
125,000 to 150,000	280	1400

Table 3: Chart of Round Duct to Square Inch to CFM Air Flow to Heating BTU's.

Diameter	Square Inches	CFM Air Flow	Heating BTU's
6"	28	100	7,400
7"	38	145	10,700
8"	50	210	15,600
9"	64	290	21,500
10"	79	390	28,900
12"	113	620	45,900

How to Evaluate Furnace Duct Work & Cure Short Cycling or Inadequate Ductwork Problems

Examples of improper duct work:

An 8" supply branches to 2 8" supplies. It is only moving one 8" duct worth of air, not 2 like this contractor hoped. Cure: Each register should have been supplied with it's own duct coming from the plenum.

This return duct is moving only 8" worth of air (it's smallest restriction) not a full 12" as the contractor has hoped with his new 12" duct on right of this picture. This should have been 12" duct all the way to the floor register which would have needed to be enlarged to 113 square inches.

How to Evaluate Furnace Duct Work & Cure Short Cycling or Inadequate Ductwork Problems

Examples of improper duct work:

A dirty air filter will cut down air flow. Always leave a furnace with a clean air filter and attempt to educate the importance of such, to the client. Emphasize they will feel more heat from their registers when their furnace has a clean filter.

This bulletin was written as a guidance to evaluate and cure inadequate duct work problems, which are commonly found on Vermont Weatherization Jobs. These charts and numbers are only guidelines. **If the furnace doesn't short cycle, and the heat rise is fine, and providing enough heat, don't add more duct work just because the chart says to! This is meant as a tool to help diagnose the cure. Use common sense!** If you have more specific questions about this, please give me a call at 769-8376. If I can't answer the question, I will find someone who can.

By: Geoff Wilcox
Vermont Office of Economic Opportunity
Weatherization Assistance Program
Waterbury, VT
(802) 769-8376
Geoff.wilcox@state.vt.us

Reference Material for this came from:

1. Saturn Mechanical Systems Field Guide
2. Bacharach (Rudy Leatherman)

Appendix J: EPA RRP Final Rule

§ 745.82 Applicability.

(a) This subpart applies to all renovations performed for compensation in target housing and child-occupied facilities, except for the following:

(1) Renovations in target housing or child-occupied facilities in which a written determination has been made by an inspector or risk assessor (certified pursuant to either Federal regulations at § 745.226 or a State or Tribal certification program authorized pursuant to § 745.324) that the components affected by the renovation are free of paint or other surface coatings that contain lead equal to or in excess of 1.0 milligrams/per square centimeter (mg/cm^2) or 0.5% by weight, where the firm performing the renovation has obtained a copy of the determination.

(2) Renovations in target housing or child-occupied facilities in which a certified renovator, using an EPA recognized test kit as defined in § 745.83 and following the kit manufacturer's instructions, has tested each component affected by the renovation and determined that the components are free of paint or other surface coatings that contain lead equal to or in excess of 1.0 mg/cm^2 or 0.5% by weight. If the components make up an integrated whole, such as the individual stair treads and risers of a single staircase, the renovator is required to test only one of the individual components, unless the individual components appear to have been repainted or refinished separately.

(3) Renovations in target housing or child-occupied facilities in which a certified renovator has collected a paint chip sample from each painted component affected by the renovation and a laboratory recognized by EPA pursuant to section 405(b) of TSCA as being capable of performing analyses for lead compounds in paint chip samples has determined that the samples are free of paint or other surface coatings that contain lead equal to or in excess of 1.0 mg/cm^2 or 0.5% by weight. If the components make up an integrated whole, such as the individual stair treads and risers of a single staircase, the renovator is required to test only one of the individual components, unless the individual components appear to have been repainted or refinished separately.

(b) The information distribution requirements in § 745.84 do not apply to emergency renovations, which are renovation activities that were not planned but result from a sudden, unexpected event (such as non-routine failures of equipment) that, if not immediately attended to, presents a safety or public health hazard, or threatens equipment and/or property with significant damage. Interim controls performed in response to an elevated blood lead level in a resident child are also emergency renovations. Emergency renovations other than interim controls are also exempt from the warning sign, containment, waste handling, training, and certification requirements in §§ 745.85, 745.89, and 745.90 to the extent necessary to respond to the emergency. Emergency renovations are not exempt from the cleaning requirements of § 745.85(a)(5), which must be performed by certified renovators or individuals trained in accordance with § 745.90(b)(2), the cleaning verification requirements of § 745.85(b), which must be performed by certified renovators, and the recordkeeping requirements of § 745.86(b)(6) and (b)(7).

[73 FR 21758, Apr. 22, 2008, as amended at 75 FR 24818, May 6, 2010; 76 FR 47938, Aug. 5, 2011]

§ 745.84 Information distribution requirements.

(a) *Renovations in dwelling units*. No more than 60 days before beginning renovation activities in any residential dwelling unit of target housing, the firm performing the renovation must:

(1) Provide the owner of the unit with the pamphlet, and comply with one of the following:

(i) Obtain, from the owner, a written acknowledgment that the owner has received the pamphlet.

(ii) Obtain a certificate of mailing at least 7 days prior to the renovation.

(2) In addition to the requirements in paragraph (a) (1) of this section, if the owner does not occupy the dwelling unit, provide an adult occupant of the unit with the pamphlet, and comply with one of the following:

(i) Obtain, from the adult occupant, a written acknowledgment that the occupant has received the pamphlet; or certify in writing that a pamphlet has been delivered to the dwelling and that the firm performing the renovation has been unsuccessful in obtaining a written acknowledgment from an adult occupant. Such certification must include the address of the unit undergoing renovation, the date and method of delivery of the pamphlet, names of the persons delivering the pamphlet, reason for lack of acknowledgment (e.g., occupant refuses to sign, no adult occupant available), the signature of a representative of the firm performing the renovation, and the date of signature.

(ii) Obtain a certificate of mailing at least 7 days prior to the renovation.

(b) *Renovations in common areas*. No more than 60 days before beginning renovation activities in common areas of multi-unit target housing, the firm performing the renovation must:

(1) Provide the owner with the pamphlet, and comply with one of the following:

(i) Obtain, from the owner, a written acknowledgment that the owner has received the pamphlet.

(ii) Obtain a certificate of mailing at least 7 days prior to the renovation.

(2) *Comply with one of the following.* (i) Notify in writing, or ensure written notification of, each affected unit and make the pamphlet available upon request prior to the start of renovation. Such notification shall be accomplished by distributing written notice to each affected unit. The notice shall describe the general nature and locations of the planned renovation activities; the expected starting and ending dates; and a statement of how the occupant can obtain the pamphlet and a copy of the records required by § 745.86(c) and (d), at no cost to the occupants, or

(ii) While the renovation is ongoing, post informational signs describing the general nature and locations of the renovation and the anticipated completion date. These signs must be posted in areas where they are likely to be seen by the occupants of all of the affected units. The signs must be accompanied by a posted copy of the pamphlet or information on how interested occupants can review a copy of the pamphlet or obtain a copy from the renovation firm at no cost to occupants. The signs must also include information on how interested occupants can review a copy of the records required by § 745.86(c) and (d) or obtain a copy from the renovation firm at no cost to the occupants.

(3) Prepare, sign, and date a statement describing the steps performed to notify all occupants of the intended renovation activities and to provide the pamphlet.

(4) If the scope, locations, or expected starting and ending dates of the planned renovation activities change after the initial notification, and the firm provided written initial notification to each affected unit, the firm performing the renovation must provide further written notification to the owners and occupants providing revised information on the ongoing or planned activities. This subsequent notification must be provided before the firm performing the renovation initiates work beyond that which was described in the original notice.

(c) *Renovations in child-occupied facilities*. No more than 60 days before beginning renovation activities in any child-occupied facility, the firm performing the renovation must:

(1)(i) Provide the owner of the building with the pamphlet, and comply with one of the following:

(A) Obtain, from the owner, a written acknowledgment that the owner has received the pamphlet.

(B) Obtain a certificate of mailing at least 7 days prior to the renovation.

(ii) If the child-occupied facility is not the owner of the building, provide an adult representative of the child-occupied facility with the pamphlet, and comply with one of the following:

(A) Obtain, from the adult representative, a written acknowledgment that the adult representative has received the pamphlet; or certify in writing that a pamphlet has been delivered to the facility and that the firm performing the renovation has been unsuccessful in obtaining a written acknowledgment from an adult representative. Such certification must include the address of the child-occupied facility undergoing renovation, the date and method of delivery of the pamphlet, names of the persons delivering the pamphlet, reason for lack of acknowledgment (e.g., representative refuses to sign), the signature of a representative of the firm performing the renovation, and the date of signature.

(B) Obtain a certificate of mailing at least 7 days prior to the renovation.

(2) Provide the parents and guardians of children using the child-occupied facility with the pamphlet, information describing the general nature and locations of the renovation and the anticipated completion date, and information on how interested parents or guardians of children frequenting the child-occupied facility can review a copy of the records required by § 745.86(c) and (d) or obtain a copy from the renovation firm at no cost to the occupants by complying with one of the following:

(i) Mail or hand-deliver the pamphlet and the renovation information to each parent or guardian of a child using the child-occupied facility.

(ii) While the renovation is ongoing, post informational signs describing the general nature and locations of the renovation and the anticipated completion date. These signs must be posted in areas where they can be seen by the parents or guardians of the children frequenting the child-occupied facility. The signs must be accompanied by a posted copy of the pamphlet or information on how interested parents or guardians of children frequenting the child-occupied facility can review a copy of the pamphlet or obtain a copy from the renovation firm at no cost to the parents or guardians. The signs must also include information on how interested parents or guardians of children frequenting the child-occupied facility can review a copy of the records required by § 745.86(c) and (d) or obtain a copy from the renovation firm at no cost to the parents or guardians.

(3) The renovation firm must prepare, sign, and date a statement describing the steps performed to notify all parents and guardians of the intended renovation activities and to provide the pamphlet.

(d) *Written acknowledgment*. The written acknowledgments required by paragraphs (a)(1)(i), (a)(2)(i), (b)(1)(i), (c)(1)(i)(A), and (c)(1)(ii)(A) of this section must:

(1) Include a statement recording the owner or occupant's name and acknowledging receipt of the pamphlet prior to the start of renovation, the address of the unit undergoing renovation, the signature of the owner or occupant as applicable, and the date of signature.

(2) Be either a separate sheet or part of any written contract or service agreement for the renovation.

(3) Be written in the same language as the text of the contract or agreement for the renovation or, in the case of non-owner occupied target housing, in the same language as the lease or rental agreement or the pamphlet.

[63 FR 29919, June 1, 1998. Redesignated and amended at 73 FR 21760, Apr. 22, 2008; 75 FR 24818, May 6, 2010]

§ 745.86 Recordkeeping and reporting requirements.

(a) Firms performing renovations must retain and, if requested, make available to EPA all records necessary to demonstrate compliance with this subpart for a period of 3 years following completion of the renovation. This 3-year retention requirement does not supersede longer obligations required by other provisions for retaining the same documentation, including any applicable State or Tribal laws or regulations.

(b) Records that must be retained pursuant to paragraph (a) of this section shall include (where applicable):

(1) Records or reports certifying that a determination had been made that lead-based paint was not present on the components affected by the renovation, as described in § 745.82(a). These records or reports include:

(i) Reports prepared by a certified inspector or certified risk assessor (certified pursuant to either Federal regulations at § 745.226 or an EPA-authorized State or Tribal certification program).

(ii) Records prepared by a certified renovator after using EPA-recognized test kits, including an identification of the manufacturer and model of any test kits used, a description of the components that were tested including their locations, and the result of each test kit used.

(iii) Records prepared by a certified renovator after collecting paint chip samples, including a description of the components that were tested including their locations, the name and address of the NLLAP-recognized entity performing the analysis, and the results for each sample.

(2) Signed and dated acknowledgments of receipt as described in § 745.84(a)(1)(i), (a)(2)(i), (b)(1)(i), (c)(1)(i)(A), and (c)(1)(ii)(A).

(3) Certifications of attempted delivery as described in § 745.84(a)(2)(i) and (c)(1)(ii)(A).

(4) Certificates of mailing as described in § 745.84(a)(1)(ii), (a)(2)(ii), (b)(1)(ii), (c)(1)(i)(B), and (c)(1)(ii)(B).

(5) Records of notification activities performed regarding common area renovations, as described in § 745.84(b)(3) and (b)(4), and renovations in child-occupied facilities, as described in § 745.84(c)(2).

(6) Documentation of compliance with the requirements of § 745.85, including documentation that a certified renovator was assigned to the project, that the certified renovator provided on-the-job training for workers used on the project, that the certified renovator performed or directed workers who performed all of the tasks described in § 745.85(a), and that the certified renovator performed the post-renovation cleaning verification described in § 745.85(b). If the renovation firm was unable to comply with all of the requirements of this rule due to an emergency as defined in § 745.82, the firm must document the nature of the emergency and the provisions of the rule that were not followed. This documentation must include a copy of the certified renovator's training certificate, and a certification by the certified renovator assigned to the project that:

(i) Training was provided to workers (topics must be identified for each worker).

(ii) Warning signs were posted at the entrances to the work area.

(iii) If test kits were used, that the specified brand of kits was used at the specified locations and that the results were as specified.

(v) The work area was contained by:

(A) Removing or covering all objects in the work area (interiors).

(B) Closing and covering all HVAC ducts in the work area (interiors).

(C) Closing all windows in the work area (interiors) or closing all windows in and within 20 feet of the work area (exteriors).

(D) Closing and sealing all doors in the work area (interiors) or closing and sealing all doors in and within 20 feet of the work area (exteriors).

(E) Covering doors in the work area that were being used to allow passage but prevent spread of dust.

(F) Covering the floor surface, including installed carpet, with taped-down plastic sheeting or other impermeable material in the work area 6 feet beyond the perimeter of surfaces undergoing renovation or a sufficient distance to contain the dust, whichever is greater (interiors) or covering the ground with plastic sheeting or other disposable impermeable material anchored to the building extending 10 feet beyond the perimeter of surfaces undergoing renovation or a sufficient distance to collect falling paint debris, whichever is greater, unless the property line prevents 10 feet of such ground covering, weighted down by heavy objects (exteriors).

(G) Installing (if necessary) vertical containment to prevent migration of dust and debris to adjacent property (exteriors).

(iv) If paint chip samples were collected, that the samples were collected at the specified locations, that the specified NLLAP-recognized laboratory analyzed the samples, and that the results were as specified.

(vi) Waste was contained on-site and while being transported off-site.

(vii) The work area was properly cleaned after the renovation by:

(A) Picking up all chips and debris, misting protective sheeting, folding it dirty side inward, and taping it for removal.

(B) Cleaning the work area surfaces and objects using a HEPA vacuum and/or wet cloths or mops (interiors).

(viii) The certified renovator performed the post-renovation cleaning verification (the results of which must be briefly described, including the number of wet and dry cloths used).

(c)(1) When the final invoice for the renovation is delivered or within 30 days of the completion of the renovation, whichever is earlier, the renovation firm must provide information pertaining to compliance with this subpart to the following persons:

(i) The owner of the building; and, if different,

(ii) An adult occupant of the residential dwelling, if the renovation took place within a residential dwelling, or an adult representative of the child-occupied facility, if the renovation took place within a child-occupied facility.

(2) When performing renovations in common areas of multi-unit target housing, renovation firms must post the information required by this subpart or instructions on how interested occupants can obtain a copy of this information. This information must be posted in areas where it is likely to be seen by the occupants of all of the affected units.

(3) The information required to be provided by paragraph (c) of this section may be provided by completing the sample form titled "Sample Renovation Recordkeeping Checklist" or a similar form containing the test kit information required by § 745.86(b)(1)(ii) and the training and work practice compliance information required by § 745.86(b)(6).

(d) If dust clearance sampling is performed in lieu of cleaning verification as permitted by § 745.85(c), the renovation firm must provide, when the final invoice for the renovation is delivered or within 30 days of the completion of the renovation, whichever is earlier, a copy of the dust sampling report to:

(1) The owner of the building; and, if different,

(2) An adult occupant of the residential dwelling, if the renovation took place within a residential dwelling, or an adult representative of the child-occupied facility, if the renovation took place within a child-occupied facility.

(3) When performing renovations in common areas of multi-unit target housing, renovation firms must post these dust sampling reports or information on how interested occupants of the housing being renovated can obtain a copy of the report. This information must be posted in areas where they are likely to be seen by the occupants of all of the affected units.

[73 FR 21761, Apr. 22, 2008, as amended at 75 FR 24819, May 6, 2010; 76 FR 47939, Aug. 5, 2011]

LEADSAFETY for Remodeling, Repair and Painting

Test Kit Documentation Form

Weatherization Works

Owner Information

Name of Owner/Occupant: _____

Address: _____

City: _____ State: _____ Zip code: _____ Contact #: (____) ____- _____

Email: _____

Renovation Information

Fill out all of the following information that is available about the Renovation Site, Firm, and Certified Renovator.

Renovation Address: _____ Unit# _____

City: _____ State: _____ Zip code: _____

Certified Firm Name: _____

Address: _____

City: _____ State: _____ Zip code: _____ Contact #: (____) ____- _____

Email: _____

Certified Renovator Name: Date Certified: / /

Test Kit Information

Use the following blanks to identify the test kit or test kits used in testing components.

Test Kit #1

Manufacturer: _____ Manufacture Date: _____/_____/_____

Model: _____ Serial #: _____

Expiration Date: _____

Test Kit #2

Manufacturer: _____ Manufacture Date: _____/_____/_____

Model: _____ Serial #: _____

Expiration Date: _____

Test Kit #3

Manufacturer: _____ Manufacture Date: _____/_____/_____

Model: _____ Serial #: _____

Expiration Date: _____

Weatherization Works

Test Kit Documentation Form

Page __ of__

Renovation Address: ______________________________ Unit# ______

City: ______________ State: ______ Zip code: ____________

Test Location # ____ Test Kit Used: (Circle only one) Test Kit # 1 Test Kit # 2 Test Kit # 3

Description of test location: ______________________________

____

Result: Is lead present? (Circle only one) YES NO Presumed

Test Location # ____ Test Kit Used: (Circle only one) Test Kit # 1 Test Kit # 2 Test Kit # 3

Description of test location: ______________________________

____

Result: Is lead present? (Circle only one) YES NO Presumed

Test Location # ____ Test Kit Used: (Circle only one) Test Kit # 1 Test Kit # 2 Test Kit # 3

Description of test location: ______________________________

____

Result: Is lead present? (Circle only one) YES NO Presumed

Test Location # ____ Test Kit Used: (Circle only one) Test Kit # 1 Test Kit # 2 Test Kit # 3

Description of test location: ______________________________

____

Result: Is lead present? (Circle only one) YES NO Presumed

Test Location # ____ Test Kit Used: (Circle only one) Test Kit # 1 Test Kit # 2 Test Kit # 3

Description of test location: ______________________________

____

Result: Is lead present? (Circle only one) YES NO Presumed

Test Location # ____ Test Kit Used: (Circle only one) Test Kit # 1 Test Kit # 2 Test Kit # 3

Description of test location: ______________________________

____

Result: Is lead present? (Circle only one) YES NO Presumed

Test Location # ____ Test Kit Used: (Circle only one) Test Kit # 1 Test Kit # 2 Test Kit # 3

Description of test location: ______________________________

____

Result: Is lead present? (Circle only one) YES NO Presumed

Vermont Weatherization Assistance Program
Lead-Safe Renovation Checklist

Name of Firm: _____

Date and Location of Renovation: _____

Brief Description of Renovation: _____

Name of Assigned Renovator: _____

Name(s) of Trained Worker(s), if used: _____

Name of Dust Sampling Technician,
Inspector, or Risk Assessor, if used: _____

___ Copies of renovator and dust sampling technician qualifications (training certificates, certifications) on file.

___ Certified renovator provided training to workers on (check all that apply):

- ___ Posting warning signs
- ___ Setting up plastic containment barriers
- ___ Maintaining containment
- ___ Avoiding spread of dust to adjacent areas
- ___ Waste handling
- ___ Post-renovation cleaning
- ___ Test kits used by certified renovator to determine whether lead was present on components affected by renovation (identify kits used and describe sampling locations and results):

_____

___ Warning signs posted at entrance to work area.

___ Work area contained to prevent spread of dust and debris

- ___ All objects in the work area removed or covered (interiors)
- ___ HVAC ducts in the work area closed and covered (interiors)
- ___ Windows in the work area closed (interiors)
- ___ Windows in and within 20 feet of the work area closed (exteriors)
- ___ Doors in the work area closed and sealed (interiors)
- ___ Doors in and within 20 feet of the work area closed and sealed (exteriors)
- ___ Doors that must be used in the work area covered to allow passage but prevent spread of dust
- ___ Floors in the work area covered with taped-down plastic (interiors)
- ___ Ground covered by plastic extending 10 feet from work area—plastic anchored to building and weighed down by heavy objects (exteriors)
- ___ If necessary, vertical containment installed to prevent migration of dust and debris to adjacent property (exteriors)

___ Waste contained on-site and while being transported off-site.

___ Work site properly cleaned after renovation

- ___ All chips and debris picked up, protective sheeting misted, folded dirty side inward, and taped for removal
- ___ Work area surfaces and objects cleaned using HEPA vacuum and/or wet cloths or mops (interiors)

___ Certified renovator performed post-renovation cleaning verification (describe results, including the number of wet and dry cloths used): _____

_____

- ___ If dust clearance testing was performed instead, attach a copy of report

___ I certify under penalty of law that the above information is true and complete.

_____ _____

Name and title Date

EFFECTIVE R-VALUES FOR BATT INSULATION*

1. Measure the insulation thickness.

2. Determine the condition of the installation using the following criteria:
   - Good—No gaps or other imperfections.
   - Fair—Gaps over 2.5% of the insulated area. (This equals ⅜ inch space along a 14.5 inch batt.)
   - Poor—Gaps over 5% of the insulated area. (This equals ¾ inch space along a 14.5 inch batt.)

3. Look up the effective R-value of the installed insulation using the condition and measured inches.

	"Good"	*"Fair"*	*"Poor"*
Measured Batt Thickness (inches)	**Effective R-value (2.5 per inch)**	**Effective R-value (1.8 per inch)**	**Effective R-value (0.7 per inch)**
0	0	0	0
1	3	2	1
2	5	4	1.5
3	8	5	2
4	10	7	3
5	13	9	3.5
6	15	11	4
7	18	13	5
8	20	14	5.5
9	23	16	6
10	25	18	7
11	28	20	8
12	30	22	8.5

****Derived from ASHRAE document "Heat Transmission Coefficients for Walls, Roofs, Ceilings, and Floors" 1996***

DEFAULT WINDOW VALUES

Frame Type	Glazing Type	U-Value	SHGC	U-Value with low e	SHGC with low e
Wood	Single	.90	.65	N/A	N/A
	Single w/Storm	.49	.71	N/A	N/A
	Double	.49	.58	.39	.45
	Triple	.39	.53	.30	.45
Vinyl	Double	.46	.57	.36	.45
	Triple	.36	.52	.36	.45
Metal	Single	1.31	.80	N/A	N/A
	Double	.87	.73	N/A	N/A
Metal w/Thermal Break	Double	.65	.66	.53	.52
	Triple	.53	.60	.43	.52

TYPICAL INSULATION R-VALUES

Insulation Type	R-value per inch	Typical Applications
Cellulose, loose fill	3.7	Attic Floor
Cellulose, high density	3.2	Walls, Enclosed Cavities, Framing Transitions
Fiberglass, batts	3.0*	Basement Ceiling, Open Stud Walls, Attic Floor*
Fiberglass, loose fill	2.8	Attic Floor, Walls (existing)
Fiberglass, loose fill, fluffed below manufacturer's standards	uncertain	Do no install, or correct by blowing over with higher density
Rockwool	3.0	Attic Floor, Walls, Basement Ceiling (may be loose or batts)
Vermiculite	2.7	Attic Floor
Poly-isocyanurate, rigid board	7.0	Foundation Walls, Attic Access Doors
Polystyrene, expanded rigid board	4.0	Foundation Walls, Sill Plate
Polystyrene, extruded rigid board	5.0	Foundation Walls, Sub-Slab, Sill Plate
Low Density Urethane, sprayed foam	3.7	Attics, Walls (new construction); Sill Plate, Band Joist, Framing Transitions
Urethane, sprayed foam	6.0	Attics, Walls (new construction); Sill Plate, Band Joist, Framing Transitions
Urea Formaldehyde Foam	4.0	Attics, Walls (existing)

See chart on back of sheet for existing fiberglass batt evaluation

VT TEC Manual—Appendix O: Historic Preservation

Historic Preservation Policies & Procedures | Background

Section 106 of the National Historic Preservation Act (NHPA) requires Federal agencies, including the Department of Energy, to consider the effects of Federally funded projects on historic properties and to afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on such projects prior to the expenditure of any Federal funds.

The State Historic Preservation Office (SHPO) is a state governmental function created by the United States federal government in 1966 under Section 101 of the National Historic Preservation Act.

The State of Vermont SHPO office is responsible for administering and overseeing the NHPA (Section 106).

Vermont WAP Agencies are required to ensure that any federally funded work completed on a client's property does not adversely affect an historic property/home.

At this time, the following grants/programs are federally funded:

- The Department of Energy Weatherization Grants
- The OEO Stove Program *(DOE ARRA)*

Historic Preservation Policies & Procedures | Required Actions

Work prescribed in homes receiving federal funds must either undergo a SHPO review or be listed as an exempt activity in SHPO's "Document A—WAP Undertakings Exempt From Section 106 Review". The content from this SHPO document is included on pages 2-4 of this TEC manual section for reference.

Whenever a measure is not listed within SHPO's Document A, then it must be reviewed and approved by SHPO prior to installation. These reviews shall be initiated using SHPO's "Appendix B: Project Review Form For Non-Exempt Activities For WAP Undertakings". The content from this SHPO form is included on pages 5-6 of this TEC Manual Section for reference.

Record Keeping - Whenever a submission of SHPO's Appendix B is required, the form shall be uploaded to the HES project file. The stored version of the form needs to include the response from the SHPO office.

Historic Preservation Policies & Procedures | Policy Exemptions

- HWAP and other non-federally funded programs are not subject to SHPO review.

EXEMPT ACTIVITIES FROM SHPO REVIEW

DOCUMENT A—WAP UNDERTAKINGS EXEMPT FROM SECTION 106 REVIEW

All Undertakings will be done in accordance with applicable local building codes or the International Building Code, where applicable. In accordance with 36 CFR 800.3(a)(1), the following Undertakings have been determined to have no potential to cause effects on historic properties:

A. Exterior Work

1) Air sealing of the building shell, including caulking, weather-stripping, and other air infiltration control measures on windows and doors, and installing thresholds in a manner that does not harm or obscure historic windows or trim.
2) Thermal insulation, such as non-toxic fiberglass and foil wrapped, in walls, floors, ceilings, attics, and foundations in a manner that does not harm or damage historic fabric.
3) Blown in wall insulation where no holes are drilled through exterior siding, or where holes have no permanent visible alteration to the structure
4) Removable film on windows (if the film is transparent), solar screens, or window louvers, in a manner that does not harm or obscure historic windows or trim.
5) Reflective roof coating in a manner that closely resembles the historic materials and form, or with materials that restore the original feature based on historic evidence, and in a manner that does not alter the roofline, or where not on a primary roof elevation or visible from the public right-of-way.
6) Storm windows or doors, and wood screen doors in a manner that does not harm or obscure historic windows or trim.
7) In-kind replacement or repair of primary windows, doors and door frames that closely resemble existing substrate and framing
8) Repair of minor roof and wall leaks prior to insulating attics or walls, provided repairs closely resemble existing surface composite

B. Interior Work

Special Note: Undertakings to interior spaces where the work will not be visible from the public right of way; no structural alterations are made; no demolition of walls, ceilings or floors occurs; no drop ceilings are added; or no walls are leveled with furring or moved, should be automatically excluded from **SHPO** review. This work includes:

1. Energy efficiency work within the building shell:

a. Thermal insulation in walls, floors, ceilings, attics, crawl spaces, ducts and foundations
b. Blown in wall insulation where no decorative plaster is damaged.
c. Plumbing work, including installation of water heaters
d. Electrical work, including improving lamp efficiency
e. Sealing air leaks using weather stripping, door sweeps, and caulk and sealing major air leaks associated with bypasses, ducts, air conditioning units, etc.
f. Repair or replace water heaters
g. Adding adjustable speed drives such as fans on air handling units, cooling tower fans, and pumps
h. Install insulation on water heater tanks and water heating pipes
i. Install solar water heating systems, provided the structure is not visible from the public right of way
j. Install waste heat recovery devices, including desuperheater water heaters, condensing heat exchangers, heat pump and water heating heat recovery systems, and other energy recovery equipment
k. Repair or replace electric motors and motor controls like variable speed drives
l. Incorporate other lighting technologies such as dimmable ballasts, day lighting controls, and occupant-controlled dimming

2. ***Work on heating and cooling systems:***

    a. Clean, tune, repair or replace heating systems, including furnaces, oilers, heat pumps, vented space heaters, and wood stoves
    b. Clean, tune repair or replace cooling systems, including central air conditioners, window air conditioners, heat pumps, and evaporative coolers
    c. Install insulation on ducts and heating pipes
    d. Conduct other efficiency improvements on heating and cooling systems, including replacing standing pilot lights with electronic ignition devices and installing vent dampers
    e. Modify duct and pipe systems so heating and cooling systems operate efficiently and effectively, including adding return ducts, replace diffusers and registers, replace air filters, install thermostatic radiator controls on steam and hot water heating systems
    f. Install programmable thermostats, outdoor reset controls, UL listed energy management systems or building automation systems and other HVAC control systems

3. ***Energy efficiency work affecting the electric base load of the property:***

    a. Convert incandescent lighting to fluorescent
    b. Add reflectors, LED exist signs, efficient HID fixtures, and occupancy (motion) sensors
    c. Replace refrigerators and other appliances

4. ***Health and safety measures:***

    a. Installing fire, smoke or carbon dioxide detectors / alarms
    b. Repair or replace vent systems on fossil-fuel-fired heating systems and water heaters to ensure that combustion gasses draft safely to outside
    c. Install mechanical ventilation, in a manner not visible from the public right of way, to ensure adequate indoor air quality if house is air-sealed to building tightness limit

5. ***Wood and Pellet Stove activities:***

    d. Replacement of an existing pellet stove and vent kit with a new stove and vent kit within a pre-existing opening (through the wall opening).
    e. Replacing an existing wood stove and its venting with a new wood stove and new venting into the pre-existing chimney (thimble).
    f. Installation of a pellet or wood stove in a building less than 45 years old.
    g. Installation of a pellet or wood stove in a mobile home.
    h. Installation of a pellet stove vent kit in a non-historic addition (addition is less than 45 years old).

APPENDIX B: PROJECT REVIEW FORM FOR NON-EXEMPT ACTIVIIES FOR WAP UNDERTAKINGS

Vermont Division for Historic Preservation
Department of Energy/Office of Economic Opportunity
and WAP Undertakings

Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires federal agencies take into account the effects of federal actions on any historic property, including historic buildings and archaeological sites. To start the review process, please complete this form and submit it, with the information requested below, to the Division for Historic Preservation at ACCD.projectreview@vermont.gov.

1. Contact information:
    a. Wx Project Manager:
    b. Wx Agency:
    c. Email address:
    d. Phone number:

2. Application Information:
    a. Weatherization job number: Click or tap here to enter text.
    b. Project address: Click or tap here to enter text.

3. Please provide a short description of what is proposed during the Weatherization Project that needs SHPO review and approval: Click or tap here to enter text.

4. Project information:
    a. Project involves ground disturbance: Yes ☐ No ☐ N/A ☐
    b. Existing structures are more than forty-five (45) years old:
    Yes ☐ No ☐ N/A ☐
    c. Existing structures regardless of age are listed in the National Register of Historic Places or are part of an Historic District (check at orc.vermont.gov):
    Yes ☐ No☐ Unknown ☐
    d. Would the pellet stove vent be visible on the outside of the building from the public right-of-way?:
    Yes ☐ No☐

5. Please also submit:
    a. ☐ Project location map (can be annotated google map or similar)
    b. ☐ Site map (shows the areas of proposed ground disturbance)

Please email this form and supporting materials to ACCD.ProjectReview@vermont.gov and copy geoff.wilcox@vermont.gov

TO BE COMPLETED BY VDHP:

☐ Needs additional research because Historic Properties Affected

- ☐ Potential for Historic Architectural Properties to be affected – A Qualified Architectural Historian* will be required (**please see* pre-approved list of consultants)

☐ Determination of Eligibility for National Register required

Comments: Click or tap here to enter text.

- ☐ Potential for Archeological Historic Properties to be affected – a Qualified Archeological Consultant* will be required (**please see* pre-approved list of consultants)
  - ☐ Archaeological Resource Assessment (ARA) required
  - ☐ Phase 1 archaeological investigation required

Comments: Click or tap here to enter text.

☐ Approved with No Historic Properties Affected

- ☐ No Historic Resource Present in Area of Potential Effect
- ☐ Work will have No Effect on Historic Resource

Comments: Click or tap here to enter text.

☐ Approved as No Adverse Effect

- ☐ Approved with Concurrence of with Archaeology Resource Assessment
- ☐ Approved with Concurrence of with Phase 1 archaeology

☐ Adverse Effect

- ☐ Project MOA or other agreement docs required

Date Executed: Click or tap to enter a date.

- ☐ Treatment Plan required

Comments on treatment: Click or tap here to enter text.

X: _____

For: **Vermont Division for Historic Preservation**

WAP Requirements

All sheet foam and/or two-part spray foam materials that are purchased and/or installed by the WAP during a project **shall** at minimum be covered with an acceptable thermal or ignition barrier whenever the material is installed in an accessible living space and the material covers a continuous area greater than 30 square feet.

Notable Exceptions To & Clarification About the Requirements Above

- The rules of an authority having jurisdiction (AHJ) shall always supercede WAP requirements. WAP requirements shall be used as the default requirements only in the absence of another AHJ. Whenever an authority having jurisdiction, e.g., a building code official or fire marshall, implements/requires more stringent policies than the WAP requirements then the AHJ's rules must apply.
- Foam products can be purchased and/or installed by the WAP within accessisble living space and left uncovered if an AHJ has formally approved the uncovered installation in writing. The approval shall be recorded in the HES project file for it to be considered a viable approval.
- In any rental properties or 2 (+) dwelling unit buildings, all foam installed at the boxsill/rimjoist perimeter during a WAP project shall be covered with an appropriate barrier per the policies of the AHJ.
- At this time, foam products can be purchased and/or installed by the WAP at the boxsill/rimjoist perimeter without a thermal or ignition barrier in owner-occupied 1-dwelling unit buildings only *(unless a town has appointed another AHJ with authority that extends to owner-occupied 1-dwelling unit buildings)*.
- **Even in an owner-occupied 1-dwelling unit home, all of the foam purchased and/or installed by the WAP at the boxsill/rimjoist perimeter shall be covered with an appropriate barrier whenever the foam installation continues more than one-inch down the interior facing side of the foundation wall.**

Definitions

Accessible v. Non-Accessible Living Space

- Any area of the home that would require the use of tools, a ladder or a pull-down staircase in order for a person to gain access into the space can be considered non-accessible living space.
- All other spaces within the home shall be considered accessible living space.
- The vertical or horizontal assembly that separates the accessible living space from the non-accessible living space shall be the surface where the thermal or ignition barrier requirement is applied.

Appendix P: Thermal Barriers

Definitions *(continued)*

Thermal Barrier

- In section R316.4, the International Residential Code (IRC) defines a thermal barrier as ½-inch gypsum wallboard or a material that is equal in fire resistance to ½- inch gypsum wallboard.

Ignition barrier

- In section R316.5.3 of the IRC, ignition barriers are defined as 1 and ½- inch- thick mineral fiber insulation; ¼-inch- thick wood structural panels; 3/8- inch-thick particleboard; ¼ -inch-thick hardboard; 3/8-inch-thick gypsum board; or corrosion-resistant steel.

Intumescent Coating

- An intumescent coating is neither a thermal or ignition barrier because it is difficult to measure the installed thickness. However, intumescent coating is allowable to use as an alternative to either type of barrier when it (a) passes the applicable thermal or ignition barrier testing requirements and (b) the spray foam manufacturer has approved the coating to be used with their product.