Updated January 10, 2012

MEMORANDUM FOR EUMMOT PROGRAM MANAGERS

FROM: FRONTIER ASSOCIATES

SUBJECT: Frequently Asked Questions (FAQs) about the Frontier Developed Duct Tool

The following FAQs and terminology are for use with the Frontier Duct Tool:

I. Application Questions (AQ#) and Answers (AA#)
Application questions and answers are related to data and information that are required to be entered into the application tool.

II. Duct Tool Questions (DTQ#) and Answers (DTA#)
Duct Tool questions and answers are related to the data and information to help the user understand the development duct tool and the relation to ASHRAE 152.

III. Methodology Questions and Answers (MQ#)
Methodology questions and answers are explained to help the user understand the reasoning for the values used in the calculation process.

IV. Terminology
The terminology section was added specifically to clarify the FAQs. Additional FAQs and terms will be added as needed to assist program managers and users of the duct tool.

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I. Application Questions

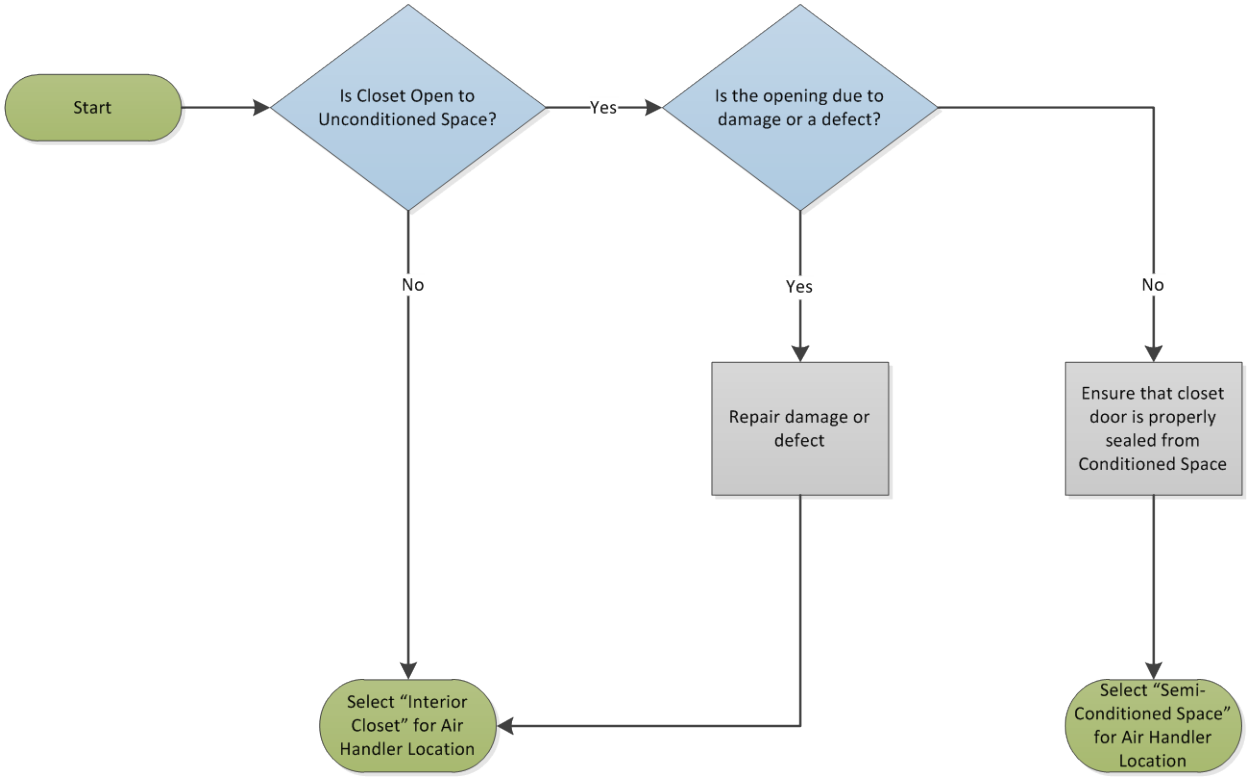
AQ1. When entering data into the Duct Tool, what selection should be entered for the "air handler location" when the air handler is located in a closet without a ceiling and closet is open to the attic? What if the closet door is sealed from conditioned space? What if there is a defect in the ceiling such as a gap around the plenum?

AA1.
When the air handler is located in a closet open to the attic AND is sealed from the conditioned space, select "semi-conditioned space". This selection is similar to attic/garage except that it accounts for some leakage and heat transfer from conditioned space.

If the closet door is not sealed and the closet is sealed from the attic, select "interior closet/fur down" for the air handler location.

If the closet ceiling is open to the attic due to some defect or damage in the ceiling, the project sponsor should repair the damage or correct the defect and classify the air handler location as 'Interior Closet'.

*Refer to the following flow chart as a guide for choosing the proper air handler location:



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AQ2. Does interior closet/fur down only mean conditioned space?

AA2. Yes, provided there is insulation between the fur down and the unconditioned space.

AQ3. What is a return register and is there a default number that should be entered?

AA3. A return register is the inlet for air to return to the air conditioner or furnace. Most homes today are constructed with a filtered register as the only return register. There are situations where additional return register are installed. Examples include locations where there are obstructions in the return path and additional return grilles are necessary to provide the required filter area or to reduce the pressure drop for proper operation of the air handler.

AQ4. Can the duct tool be used when more than one air handler is installed.

AA4. Yes, the duct tool can be used for multiple units. Care must be taken to properly seal all supply and return air grilles and registers on the unit not being tested. The appropriate square footage must be entered.

Example: A 3600 square foot home is cooled by two units. 1700 of the 1850 square feet downstairs is conditioned by a 2.5 ton air conditioner and 1550 of the 1750 square feet upstairs is conditioned by a 3.5 ton air conditioner. When testing the upstairs unit, all openings on the downstairs unit are sealed off. And the results are entered into the duct calculator along with the 1550 square feet for the conditioned area.

AQ5. How do I input a Multi-family dwelling with multiple stories (eg – A two-story apartment complex that has individual dwellings on both floors)? Can I assume the dwelling is all upper floor or all lower floor?

AA5. The appropriate way to handle this scenario is to run the Duct Tool for each floor. Essentially all of the inputs will remain the same except for the "Building Type," which will be "SF: Upper Floor(s) of Multi-story Home" in the first instance and "SF: Lower Floor(s) of Multi-story Home" in the second instance.

AQ6. How do I input a Multi-family dwelling that has more than two dwellings under a continuous roof structure (typically with shared walls)?

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AA6. The current options do not address MF: Single-level dwellings. However, a reasonable estimate can be provided if the user assumes a SF: Single-story home and treats each dwelling/unit separately. (Eg – A four-plex complex would require four separate tests to be performed, and each test would be measured by the calculator individually.

AQ7. What if there is insulation on the attic ceiling rather than the attic floor?

AA7. If the attic ceiling is insulated, then the duct efficiency (or duct sealing) measure is not eligible for incentives. By insulating the ceiling of the attic, one expands the thermal envelope of the home to include the attic, which is now considered conditioned space. In this scenario, since all of the ductwork is considered to be in conditioned space, any leakage occurring within that duct system is occurring to or from conditioned space. Therefore, the deemed energy and demand savings for sealing duct systems do not apply in this case. This particular scenario may become more common as this insulation method continues to emerge as a best practice in constructing more energy efficient residences.

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II. Duct Tool Questions

DTQ1. What is the difference between the previous version of estimating duct leakage and the current method for estimating duct leakage?

DTA1. The previous version of estimating duct leakage was developed before a standard calculation method existed. It was based on the square footage of the residence.

Frontier developed a new method of estimating duct leakage using a "Simplified Approach" to ANSI/ASHRAE Standard 152-2004: Method of Test for Determining the Design and Seasonal Efficiencies of Residential Thermal Distribution Systems.

DTQ2. Why is the Duct Tool referred to as the ASHRAE 152 or ASHRAE 152 Duct Tool?

DTA2. Referring to the duct tool as the ASHRAE 152 or ASHRAE 152 Duct Tool is incorrect. The duct tool is not an ASHRAE product and the ASHRAE label should be removed from the duct tool name when making reference to the duct tool. While the Duct Tool is based on the methodology described in the ANSI ASHRAE 152-2004 Standard, it uses a simplified approach based on field and engineering experience to calculate duct efficiency.

DTQ3. What is the difference between the Duct Tool and the ASHRAE 152?

DTA3. The Duct Tool is used to estimate "Deemed Savings" (energy savings associated with duct leakage) in kWh and kW. The ASHRAE 152 Standard is used to estimate the efficiency of thermal distribution systems, including the equipment, duct, and piping.

DTQ4. Is duct leakage calculated using the ASHRAE Standard?

DTA4. The duct leakage calculation is based on a simplified approach to the ASHRAE 152 Standard. The duct tool has been simplified from the required 70+ entries to approximately 10 entries to make it a more user friendly product.

III. Methodology Questions

MQ1. How is duct leakage converted to Deemed Energy Savings values?

MA1. Converting duct leakage to Deemed Savings is a two step process.

Step 1: EnergyGauge USA DOE 2.1-E Hourly Home Energy Simulation Software is used to estimate the thermal performance for base and change cases of typical homes. The result is Raw Energy (kWh) and Demand Savings (kW).

Step 2: The simplified duct tool is used to estimate the duct leakage for the base and change cases of the same typical homes. The change in duct leakage is presented in a percentage point improvement in distribution system efficiency (DSE). Deemed savings values are then calculated by dividing the raw demand and energy savings by the applicable percentage point improvements in duct distribution system efficiency (DSE). The results are the deemed savings values in the lookup tables, given in units of kW or kWh per percentage point change in the corresponding distribution system efficiency (DSE) values.

MQ2. Why was duct leakage capped at 35 percent?

MA2. The duct leakage cap is utility specific and may be set to a lower value. The value of 35 percent was chosen because 1) several studies noted duct leakage test results were typically under 35 percent, 2) discussions with field testers also confirmed that results were within the 35 percent range, 3) leakage over 35 percent will not adequately cool or heat a home during design conditions if the heating and air conditioning systems were sized according to ACCA Guidelines, and 4) systems with duct leakage rates greater than 35 percent indicate the air conditioning system is in need of repair and repair work is outside the scope of work for energy efficiency incentives.

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IV. Terminology

Blower Door Test – a test used to determine the leakage of the residential envelope, namely leakage through walls, windows, and door cracks/gaps.

CFM_{25} – air volume measured in cubic feet per minute at a test pressure of 25 pascals.

CFM_{50} – air volume measured in cubic feet per minute at a test pressure of 50 pascals.

Conditioned Space – a space within a building structure that is heated, cooled, or indirectly heated or cooled and whose area space temperature is typically less than 90 degrees Fahrenheit during the cooling season and typically greater than 50 degrees Fahrenheit during the heating season.

Duct Blaster Test – a test used to test for duct leakage. The equipment necessary includes a test fan with a means to measure air flow such as orifice plates.

Fur down – construction for the purpose of concealing equipment and/or duct work. Typical building wall and ceiling materials (gypsum and 2x4 wood) are used.

Leakage to Outside – leakage of the ductwork to unconditioned space. The leakage is determined by using both a duct blaster and a blower door test. The blower door test creates pressure in the ductwork in conditioned space. The resulting duct leakage is considered as leakage to non-conditioned space.

Non-Conditioned Space – a space within a building that is neither heated, cooled, or indirectly heated or cooled and whose area space temperature typically exceeds 90 degrees Fahrenheit during the designed cooling season and whose area space temperature typically drops below 50 degrees Fahrenheit during the heating season.

Pascal – metric units of pressure used for relatively low pressures. 50 pascals is approximately equal to ¼" water column.

Return Register – the device, usually in the wall or ceiling, which air enters to return back to the air conditioner or furnace. Most return registers are filtered registers.

Total leakage – leakage of the ductwork when tested only with a duct blaster.

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