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Zonal Pressure Diagnostics (ZPD) Study

Many of our customers are familiar with the “Series Leakage” diagnostic test methods (the **Add a Hole**, **Open a Door** and **Vent** methods) developed by Michael Blasnik and used to estimate the amount of air leakage from attached zones in a house. These procedures, commonly referred to as Zonal Pressure Diagnostics (ZPD), are now routinely used in many state weatherization programs and by expert building performance consultants around the country. What you may not know is that by far the most comprehensive study of the use of these methods in low-income weatherization has recently been completed.

In 2000, the Energy Center of Wisconsin commissioned a study of ZPD test methods. The main research team for the project consisted of Dave Bohac, Jim Fitzgerald and Brian Foust of the Center for Energy and the Environment, Gary Nelson and Collin Olson of The Energy Conservatory, and Michael Blasnik of Michael Blasnik and Associates. The goals of the study were to evaluate the accuracy and usefulness of the ZPD methods and to suggest simple and cost-effective procedures for how and when crews should perform these tests. The project included many evaluation components including:

- ❑ Surveys of state weatherization agency staff and weatherization crews to determine how ZPD tests are currently being used.
- ❑ Laboratory tests to measure the actual performance of different types of openings used in the **Add a Hole** method (e.g. comparing attic hatches to carefully cut holes in thin materials).
- ❑ Refinement and development of test protocols and calculation procedures for all three ZPD methods. This included development of calculation procedures for estimating ZPD test result uncertainties to help determine if the test results are reliable.
- ❑ Hundreds of detailed ZPD tests were performed by 6 different weatherization crews to help assess the reliability and repeatability of the various test methods. The crews, who all attended specialized field trainings, conducted the detailed tests during the course of their regular weatherization work.

Study Results

- ❑ Of the weatherization agencies responding to a mail survey, 69% reported that they currently use one or more ZPD test methods. However, the survey results showed that there is a wide variation in how the test methods are used in the field.

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- ❑ The laboratory tests on different zone opening types showed that a typical opened attic access hatch has substantially more air flow (up to 36% more) through it than expected. Holes cut into cardboard or other thin materials (used to **Add a Hole**) behaved as expected. These results will allow **Add a Hole** calculation methods to be adjusted for the type of opening added.
 - ❑ An analysis of the field data collected by the weatherization crews found that the majority of zones looked at in the study had initial zone to outside pressures large enough to permit accurate testing. In addition, approximately 80% of the zone tests performed provided reasonably reliable leakage results (estimated errors of less than 25% or 200 CFM50).
 - ❑ The study produced a new zone leakage estimate calculation procedure called the “Hybrid” method. The **Hybrid** approach combines the traditional **Add a Hole** method with a modified **Open a Door** method (now called the **Flow** method). This new **Hybrid** method compares the results of the two methods and automatically chooses the most reliable result based on uncertainty calculations.
 - ❑ The **Vent** method results suggest that it does not provide reliable leakage estimates. One of the main problems with the **Vent** method is the unknown amount of background construction leakage in the zone being tested. However, the Vent method may still have use as a rough screening tool and as a way to provide guidelines related to the use of pressure-only diagnostic approaches.
 - ❑ Simulations of typical zone tests indicate that measuring baseline house and zone pressures (i.e. the initial pressures before the Blower Door is turned on) is very important. Failure to measure baseline pressures, even in moderate weather conditions, can cause large errors.
 - ❑ Significant connections **between** attic zones were found to occur in about 10% of the zones tested in the study. Zone connections lead to overestimated leakage results, and make it difficult to achieve final leakage reductions (because all connections must be sealed). Checking for zone connections (by monitoring zone pressures) is recommended whenever connections are suspected.
- The report also includes a proposed crew protocol for how and when to use the revised ZPD calculation methods. However, because use of ZPD methods remains complicated, many decisions will need to be made at the state level on how to interpret and incorporate the findings of the study into each state’s program.
- One way TEC is trying to help get the study results out into the field is the development of a ZPD Calculation Utility (**see below**) which incorporates many of the revised calculation methods into an easy to use PC based program. The ZPD program is available for free from TEC’s website beginning in October 2002.
- A copy of the full ZPD report is available online from the Energy Center of Wisconsin’s website www.ecw.org/prod/208-1.pdf.

ZPD Calculation Utility

The ZPD Calculation Utility is a simple Windows based program which can be used to quickly perform ZPD calculations using many of the improvements recommended in the Energy Center’s study. The ZPD calculation utility is comprised of 7 Steps (or screens) which are used to input test information and display test results. The ZPD Calculation Utility assumes that the Blower Door test results and zone pressure measurements are being collected using either an Energy Conservatory digital pressure gauge, or as part of an automated Blower Door test using an APT system.

The program includes the new **Hybrid** calculation method, estimated uncertainties in the leakage results, a check for zone connections and online Help screens. Test files can also be stored and printed. A Palm OS version will also be available soon. Data files from the Palm version can be uploaded to your PC and read by the Windows program, allowing data entered on site using a Palm to be viewed and printed at a later date.

To download either the PC or Palm programs, go to www.energyconservatory.com/zpd.html.

Contractor Presentation Booklet on HVAC Comfort Problems and Solutions

Explaining the many issues affecting home comfort can be extremely difficult, especially as it relates to the operation of a home's heating and cooling system. To help our customers make an effective sales presentation on HVAC comfort problems and solutions, we have recently developed a free contractor presentation booklet. The booklet covers the 5 most common problems keeping HVAC systems from delivering comfort including:

- Duct system leakage.
- Restricted airflow.
- Incorrectly sized equipment.
- Poorly installed equipment.
- Large hidden air leaks in the house.

For each of these problem areas, the booklet explains how comfort is compromised, and then recommends a "guaranteed comfort solution" which lays the foundation for an effective solution based sales presentation. The booklet includes colorful illustrations and photos and explains how diagnostic tools are used to find and fix the comfort problems that other contractors leave behind. The presentation booklet is a perfect compliment to our existing Home Health and Comfort Brochure and Video which are widely used to sell duct diagnostic and repair services.

The presentation booklet is available at no charge from our web-site (as a PDF file). Contractors can download the booklet (8 ½ x 11 format), and either display it on their laptop computer, or print and laminate the pages they want to use in their presentation. The booklet was designed primarily for HVAC contractors, but can be used by anyone needing help explaining typical comfort problems in houses. To download the presentation booklet file, go to www.energyconservatory.com/sales.html and click on "Download Contractor Presentation Booklet".

Meet Keith Ludwig

Hello All, my name is Keith Ludwig and I am the new calibration technician here at TEC.

I graduated from the University of St. Thomas, located in St. Paul, MN, in May 2001 with a Bachelor of Science degree in Physics. There I learned the fine art of Experimental Physics while working in the research labs, and came to appreciate working in a small team environment. In those research labs, I had the opportunity to work with a number of different physics-related fields including particle physics, solid-state physics, and thermodynamics/atmospheric physics.

When I graduated, I immediately sought to find a small company where my technical skills could be put to good use. After a long and exhausting search, I found TEC. As you can tell from my job title, I mainly focus on calibrating all the digital gauges, APTs and accessories, and Magnehelic gauges that our company sells. I also perform initial troubleshooting and low to mid level repair jobs on the gauges and devices that are returned to TEC for repair and recalibration. In addition, I am beginning to develop some computer programs for TEC along with Collin Olson, and collaborate on other assorted projects.

Discontinuation of Magnehelic® Gauges

Effective December 31, 2002, Magnehelic gauges will no longer be offered as an instrumentation option for the Minneapolis Blower Door System. Magnehelic gauges have been part of the Minneapolis Blower Door product line since it was first introduced nearly 20 years ago, providing a low cost gauge option for basic test applications. However, as Blower Door technicians have become more sophisticated, they have demanded more accurate and versatile gauges for their Blower Doors. The Energy Conservatory (TEC) has responded by offering a choice of digital pressure gauges and the Automated Performance Testing system. Both of these options provide increased Blower Door test precision and the ability to accurately measure the small pressure changes needed to conduct sophisticated building performance tests.

Starting in 2003, a limited number of Magnehelic gauges will be available from TEC to replace defective units. In addition, Magnehelic gauges can be purchased directly from Dwyer Instruments. However, gauges purchased from Dwyer will not have the customized face plates that have been a feature of the units sold by TEC.

New Filter Grille Attachment Panel

When pressurizing a duct system with the Minneapolis Duct Blaster, a central return grille is often the location chosen to attach the Duct Blaster fan to the ductwork. In this application, the square transition piece is typically taped to the outside of the filter grille, the flex duct from the Duct Blaster is secured over the transition piece, and then the remaining portion of the grille is sealed off with masking tape.

In order to speed up this sometimes time consuming attachment process, we have designed a special filter grille attachment panel which quickly fits into the open filter slot of a 20x20 filter grille and clips the Duct Blaster fan in place. To use the attachment panel, first open the filter grille door, remove the existing filter, and push the attachment panel into the open filter slot. The H-channel gasket on the edges of the attachment panel should provide an airtight seal between the gasket and the filter slot, and will securely hold the attachment panel in place. The Duct Blaster fan is then mounted directly onto the attachment panel (without the flex duct) using 4 clips on the attachment panel. In addition to saving time connecting up the Duct Blaster system, this attachment method provides greater fan flow by eliminating restrictions caused by the flex duct.

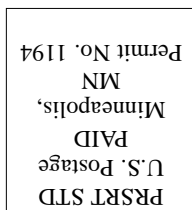
The 20x20 filter grill attachment panel costs \$60 and is available now. Other sizes may become available if this attachment method proves popular. **Note:** The attachment panel can only be used when pressurizing a duct system.

Upcoming Shows

The following is a list of industry tradeshows where TEC will be exhibiting. If you are in the area, stop by the booth and see some of the new products first hand.

Energy & Environmental Building Association, Phoenix, October 10 – 11, 2002 www.eeba.org

Affordable Comfort, Kansas City, MO, March 31 - April 5, 2003 www.affordablecomfort.org



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