Explanation of Duct Leakage Report Terms and Results

Taken from "Techblast™ Duct Airtightness Test Program" by The Energy Conservatory.

MEASURED DUCT LEAKAGE

Test Type:

This is the Test Type selected on the Test Settings Screen.

Test Pressure:

This is the Test Pressure selected from the Test Settings Screen. The Test Pressure is the pressure in the duct system at which the duct leakage rate was measured.

Leakage Rate:

This is the measured duct leakage (in Cubic Feet per Minute) at the specified Test Pressure.

Leakage Area:

Once you have quantified the leakage rate, it is possible to calculate a Leakage Area of the duct system in square inches. The Leakage Area estimate is a useful way to visualize the physical size of all cumulative leaks in the duct system. The Leakage Area is defined in TECBLAST as the size of a sharp edged orifice which would leak at the same flow rate as the measured leakage, if the orifice were subjected to the Test Pressure.

$$\text{Leakage Area (sq in)} = \frac{\text{Duct System Leakage Rate (CFM)}}{1.06 \times (\text{Test Pressure})^{0.5}}$$

LEAKAGE PARAMETERS

Leakage as a Percent of System Airflow:

This is the measured duct leakage rate, divided by the Air Handler Flow entered in the Customer and Building Info Screen.

Leakage as % of System Flow = (Leakage Rate (CFM) / Air Handler Flow (CFM)) x 100

Leakage as a Percent of Floor Area:

This is the measured duct leakage rate, divided by the Building Floor Area entered in the Customer and Building Info Screen.

Leakage as % of Floor Area = (Leakage Rate (CFM) / Floor Area (sq ft)) x 100

Annual System Efficiency Loss:

TECBLAST uses a simple model for estimating an annual HVAC system efficiency loss from the measured duct leakage rate. The annual loss estimate can be applied separately to both heating and cooling modes of operation. The loss estimate uses the measured leakage rate, entered Duct System Parameters from the Test Settings Screen, along with a number of assumptions about the operating characteristics of the HVAC system.

Refer to Appendix E in the Duct Blaster Operation Manual for more information on how this estimate is calculated.

Note: Because duct leakage loss calculations are extremely complex, this estimation technique should be used with caution and should be viewed only as a rough estimate of the magnitude of losses possible. The duct leakage loss estimates do not include many important but complex impacts on system efficiency including latent load impacts, heat pump strip heating impacts, conduction losses, increases in infiltration from dominant duct leakage, or interactions of leakage on mechanical operating efficiencies, all of which can be significant depending on the type and location of the system being tested.

We do not recommend that this simple model be used for research purposes, program design studies or program impact evaluations. More sophisticated duct leakage loss models are available and better suited to those needs. Listed below are three references to other duct leakage loss models:

ASHRAE Standard 152P, Method of Test for Determining the Design and Seasonal Efficiencies of Residential Thermal Distribution Systems, ASHRAE, Atlanta GA, May 1999.

Development of a Practical Method for Estimating the Thermal Efficiency of Residential Forced-Air Distribution Systems, EPRI, Palo Alto CA, January 1997.

Improvements to ASHRAE Standard 152P, Paul Francisco and Larry Palmiter, Ecotope, Seattle WA, June 1999.

LEAKAGE SPLIT

Supply Side:

This is the estimated amount of leakage (expressed in CFM and square inches) in the supply side of the duct system. The supply side leakage is calculated by multiplying the measured total duct leakage rate and leakage area by the Supply Leakage Split value entered in the Duct System Parameters Screen.

Return Side:
This is the estimated amount of leakage (expressed in CFM and square inches) in the return side of the duct system. The return side leakage is calculated by multiplying the measured total duct leakage rate and leakage area by the Return Leakage Split value entered in the Duct System Parameters Screen.

DUCT LEAKAGE CURVE

Flow Coefficient (C) and Exponent (n):

Once the test data has been entered into the Data Table and plotted on the Test Graph, a "best-fit" regression line (called the Duct Leakage Curve) is drawn through the plotted data. The Duct Leakage Curve can be used to estimate the leakage rate of the duct system at any pressure. If you conduct a single point test, TECBLAST assumes an exponent (n) of 0.60 in its calculation procedures.

The Duct Leakage Curve is defined by the variables Coefficient (C) and Exponent (n) in the following equation:

$Q = C \times P^n$

where:

Q is airflow into (or out of) the duct system (in CFM).

C is the Coefficient.

P is the pressure difference between inside and outside of the duct system

n is the Exponent.

Correlation Coefficient:

The correlation coefficient is a measure of how well the collected test data fit onto the "best-fit" Duct Leakage Curve. The closer all data points are to being exactly on the
Duct Leakage Curve, the larger the calculated correlation coefficient (note: the largest possible value for the correlation coefficient is 1.0). Under most operating conditions, the correlation coefficient will be at least 0.99 or higher.

Testing in very windy weather can sometimes cause the correlation coefficient to be less than 0.99. In this case, you may want to repeat the test and increase the number of data points