Adequate air tightness for the ducting systems can be ensured by selecting a static pressure construction suitable for the operating condition and by sealing the duct joint and connections properly. Project team must determine the pressure classes required for duct construction and should evaluate the amount of sealing, required to achieve system performance objectives. Installation guidelines, testing standards and requirements for the duct systems, must be included in the technical specification.

Prudent selection and application of sealing methods for joints, seams and connection points to systems by fabricators and installers, should be considered. It should also consider the designated pressure class, pressure mode (positive or negative), chemical compatibility of the closure system, potential movement of mating parts, workmanship, amount and type of handling, cleanliness of surfaces, product shelf life, curing time, and manufacturer-identified exposure limitations etc.

On completion of installation works, leakage testing for ductworks should be conducted by a DM approved company. Pressure testing must be carried out before the ductwork is insulated unless it is pre-formed ductwork. Methodology stated in SMACNA HVAC Air Duct Leakage Test Manual shall be followed for conducting the air leakage test.

SMACNA HVAC Air Duct Leakage Test Manual, DW/143 - Guide to good practice ductwork leakage testing and DW/144 - Specification for sheet metal ductwork, provides guidance to perform and record testing of air leakage from duct systems.

Test apparatus consists of an airflow measuring device, flow producing unit, pressure indicators and accessories necessary to connect the metering system to the testing duct system. Test apparatus should be accurate within ± 7.5% at the indicated flow rate and test pressure and should have calibration data or a certificate signifying manufacture of the meter in conformance with the ASME Requirements for Fluid Meters. ASME qualified orifice meters do not require calibration.

During testing, ducts should be tested at the specified pressure level, comparing the allowable amount associated with the leakage class and with the leakage in cfm for the section tested. When tests are conducted for different sections within the same system and pressure level, the average leakage rate should not exceed the allowable limit, even if one or more of the sections within the same system exceeds the allowable limits. If pressurisation is not achieved during the testing or leakage rate exceeds maximum allowable limits, visual inspection, smoke bomb test or similar techniques can be used to identify the leak sources.

If significant leaks are not observed, test team shall consider dividing the test segments into much smaller parts or use large test apparatus.

As per SMACNA Test Manual, duct surface leakage factor is identified through the following equation:

$F = C_L P^N$

where,

F is a leak rate per unit of duct surface area (typically cfm/100 ft^2)
C_L is a leakage class and is a constant
P is static pressure (typically in inches water gauge)
N is an exponent (most typically it is 0.65 but in some cases it can be between 0.5 and 0.9)

Duct leakage results in air infiltration and temperature imbalance. Hence, any observed leak source should be sealed properly after depressurising that zone. Zone should also be re-tested until leakage rate does exceed the acceptable limit. Materials like duct mastic, foil tape or aerosol sealants are commonly used to seal the ducts.