

9. REFERENCE DATA

It was found that the leakage for each construction and joint treatment was related to the operating static pressure and the outside surface area of the duct system.

For product design and performance reference data, refer to manufacturers' data sheets.

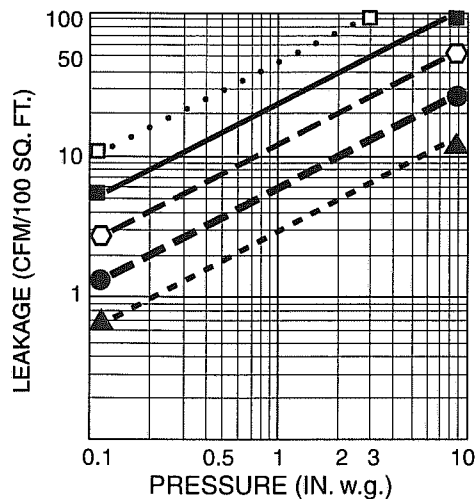
The form of this relationship was a power function:

$$F = C_L \times P^N, \text{ where}$$

- F = leakage, cfm per 100 square feet of duct;
- C_L = leakage coefficient or leakage class, dimensionless;
- P = duct static pressure, inches w.g.
- N = dimensionless rational number.

With minor variations, the ASHRAE testing found N to be 0.65 for all duct materials and constructions. The leakage coefficient C_L varied with material, construction and joint treatment. The results from fibrous glass duct were analyzed, and a classification was assigned based on the upper limits of the leakage measured for all of the duct board constructions. Reinforced fibrous glass duct board, tested up to 3" w.g. (750 Pa), was found to be a Class 6 system.

SMACNA has tabulated the leakage data to allow a designer to estimate the leakage per 100 square feet of duct outside surface area. The following chart summarizes this data. Again, fibrous glass duct systems are considered as Class $C_L = 6$ for purposes of this chart.



LEGEND:

- $C_L = 48$ Unsealed rectangular sheet metal duct
- $C_L = 24$ Sheet metal ducts with differing levels of joint and seam sealing
- $C_L = 12$ Reinforced rectangular fibrous glass duct board
- $C_L = 6$ or rectangular sheet metal with all joints sealed
- ▲ $C_L = 3$ Non-reinforced fibrous glass duct, round or rectangular, or spiral sheet metal duct

COMPILATION OF FIBROUS GLASS DUCT CHARACTERISTICS AND LIMITATIONS

1. Flexural rigidity

Average in the board, not less than rating of 475, 800, or 1400 pounds-inches² per inch of width when tested in accordance with NAIMA Test Method AHS-100-74.

2. Maximum static pressure in duct

2" w.g. (500 Pa), positive or negative.

3. Maximum air velocity in duct

Rated at 2,400 feet per minute (12 m/sec) or greater.

4. Maximum allowable deflection

One one-hundredth of duct span.

5. Maximum allowable stress in steel members used for reinforcement or support

22,000 pounds per square inch (152 MPa).

6. Board fatigue

No significant deformation or deficiency of duct sections after 50,000 cycles at 3 to 4 cycles per minute from natural sag to 1½ times operating pressure.

7. Water Vapor Sorption

Water vapor sorption of the duct board shall not exceed 5% by weight under conditions of 120°F (49°C) dry bulb at 95% relative humidity for 96 hours' duration when tested in accordance with ASTM C 1104.

8. Temperature

40°F (4°C) minimum inside duct. 250°F (121°C) maximum inside duct. 150°F (66°C) maximum duct surface temperature.

9. Corrosiveness

Non-corrosive in contact with galvanized steel, copper, or aluminum when compared to control specimen in contact with clean sterile cotton when tested in accordance with ASTM C 665.

10. Closure

Closure materials (pressure sensitive tapes, heat activated tapes, glass fabric and mastic) shall conform to Underwriters Laboratories Standard UL 181A. When installed in accordance with manufacturers' instructions, closure systems will conform to UL 181 Class 1 Air Duct requirements.

11. Safety standards

National Fire Protection Association Standards 90A/90B.

12. Bacteria and fungal growth resistance

Fibrous glass duct products meet fungal and bacterial growth requirements when subjected to microbial attack as described in UL 181 and in ASTM C 1338 (no-growth procedure). Standard practices ASTM G 21-96 (fungus test) and G 22-95 (bacteria test) are also used to evaluate microbial growth.

13. Reinforcement testing

Test programs have demonstrated that fibrous glass duct systems, including fittings and accessory items, are capable of maintaining their structural integrity through 50,000 cycles at 1½ times system design pressurization. This testing demonstrates the reliability of properly constructed systems, but does not imply that systems should be operated at pressures above their reinforcement rating.

14. Restrictions

Fibrous glass duct systems should not be used in the following applications:

- Kitchen or fume exhaust ducts, or to convey solids or corrosive gases.
 - Installation in concrete or buried below grade.
 - Outdoors.
 - As casings and/or housings of built-up equipment.
 - Immediately adjacent to high temperature electric heating coils without radiation protection. Refer to NFPA Standard 90A, and also to pages 3-25 and 3-26 of this Standard, for proper design.
 - For vertical risers in air duct systems serving more than two stories.
 - With equipment of any type which does not include automatic maximum temperature controls.
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- In variable air volume systems on the high pressure side unless reinforced to withstand the full fan pressure.
- As penetrations in construction where fire dampers are required, except as shown on page 3-24 with the fire damper installed in a sheet metal sleeve extending through the wall.

15. Mounting of accessories

When mounting equipment, dampers, damper operators, control motors, etc., the duct system shall be adequately reinforced and supported to accommodate the additional weight of the material and equipment without damage to the duct material. Particularly important is the mounting of both dampers and their operators on the same sleeve or mounting plate.

16. Moisture control

The following precautions should be taken to avoid soaking of duct board with liquid water:

- When using either evaporative coolers or humidifiers, the immediate area around the device introducing water into the system should be protected by using a drip pan and protective sheet metal sleeve.
- Duct systems running through non-conditioned space and used for cooling only must be tightly closed during the heating season to prevent accumulation of water vapor in the duct system.
- Fibrous glass duct materials that have become wet at the job-site before or during installation should not be installed. Duct systems which, in service, are found to be wet should be replaced. Consult the product manufacturer for further information.

17. Compliance with Building Codes

Fibrous glass insulated duct systems meet the following model codes and most other applicable codes:

ICC - International Code Council, Inc.

- International Mechanical Code
- International Building Code
- International Residential Code
- International Energy Code

Note: This code is replacing BOCA, CABO, ICBO, and SBCCI codes, although some jurisdictions may continue to reference some of them.

BOCA - Building Officials and Code Administrators International

- National Building Code
- National Mechanical Code:
refer to International Mechanical Code (see below)

CABO - Council of American Building Officials

- One and Two Family Dwelling Code
- CABO Model Energy Code

ICBO - International Conference of Building Officials

- Uniform Building Code
- Uniform Mechanical Code

SBCCI - Southern Building Code Congress International

- Standard Building Code
- Standard Mechanical Code

Refer to area codes and municipal ordinances for additional local requirements for ducted HVAC systems.

See Appendix for current code edition and how to contact code organizations.
