DOUBLEWALL VAV TERMINAL UNIT ISSUES

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OVERVIEW

We are seeing specifications on a number of projects that require double wall construction for VAV boxes. We are not sure of the logic behind the specifications, but want to point out some of the disadvantages of this type of construction, and offer a logical alternative.

Doublewall construction is often specified for air handlers, where moisture is often present in the areas near the cooling coils, surface temperatures may be near to wet bulb air temperatures, moist outside air may be present and there is a requirement to enter the unit for cleaning. None of these is true for a VAV box. In a VAV box there are no cooling coils, the air temperature will have risen at least a couple of degrees above the lowest building dew point temperatures, there should be no outside air anywhere near the unit, and even the largest fan powered box is too small to physically enter the unit for cleaning. So why is doublewall construction specified? One obvious answer is that someone makes one and has been able to get an engineer to have it specified.

If fiberglass erosion is a concern, facings are available which can reduce this potential. Foil facings are available, and have been in use for a number of years. Plastic films such as Mylar and Tedlar were often specified until someone noted that these facings, when exposed, were not only flammable to the point of being explosive, but one of them gave off cyanide gas when burned!

It is true that fiberglass is listed as a hazardous material in some codes, but it has never been proven to be an 'asbestos-like' material. Fiberglass will be harder to clean, and should it get wet, it will be a potential microbe breeding ground. Of course, double wall construction is not watertight, and should condensation (still can't figure out how that happens at this point in a system!) or other moisture get into the dark, fiberglass filled spaces, microbe contamination is just as likely!

The real problem is that fiberglass is the best sound absorbing material available. And VAV boxes are at the end of a duct run, near or over occupied spaces. There is little opportunity to attenuate sound produced by VAV terminals, particularly fan powered VAV boxes, and especially if they are over occupied spaces. If double wall construction is specified for the boxes, one must assume that duct lining is also prohibited. (If not then we have other pointed questions to ask!).

Lining selection in parallel fan boxes (where the fan is usually fairly small, doesn't operate all the time, and is acoustically isolated from the supply damper by a back draft damper) and single duct boxes is not sound critical, when lined duct and flexible duct are involved in the design. Indeed, a non-heat single duct is little affected by the lining selection. If duct lining after the unit is not allowed, add several NC to the predicted space sound level, however.

Series fan powered boxes, on the other hand, are extremely sensitive to lining selections. With these units, primary air is discharged directly into a cavity that is open to the plenum. The following are the available linings for Krueger VAV boxes (not all linings available with all units – check the price pages and catalogs). Some VAV box selection software accounts for lining options in preparing sound performance data.

The following are lining descriptions, and the acoustic effects on our quiet (KQFS) Series Fan Box:

- 1/2" 1.5lb Density (Std): Dual density fiberglass insulation with a tough outer layer. This is the base line, ARI certified data.
- 1" 3lb Density (drops 1 NC): A thicker version of the above. Note: Does not really add measurable sound attenuation or condensate protection.
- Steriliner (Duct Board - Foil inside) w/Steel Flanges (adds 7-10 NC): High density ductboard with a heavy foil facing on the exposed surface. Steel strips seal all edges.

- Sterilwall (Double Wall), Solid (adds 12 NC) and Perforated (adds 8 NC), 5 Insulation Options: The perforated is a 23% free area perforated sheet.
- Foil Encapsulated liner (0.5 and 1") (Adds 7-10 NC): This is a 'pillow' of light density fiberglass with a foil/scrim/kraft facing (duct liner) installed with the foil on the side exposed to the air stream. Edges are taped with foil tape and tucked under.
- Cellular (Adds 3-5 NC): Closed cell plastic-type foam, meeting NFPA-90a and UL-181 characteristics. Note; this is not 'Armaflex' insulation.
- No liner (Adds 12 NC): Unit must be externally wrapped to avoid condensation.

Note: the above acoustical effects are for the KQFS series fan box. The effects are less pronounced on the lower cost QFC series fan box as it doesn't have as much acoustical attenuation.

So what to use? When looking at costs and acoustics, if fiberglass is not to be tolerated (for whatever reason), the next choice is Cellular. This is a closed cell plastic material meeting the requirements of NFPA 90A for appliances, UL181 air erosion, flame spread, smoke generation and mold growth requirements, and is easily cleanable. It will not soak up liquid water. It is even available white in color to make soiling more obvious. It is in use by almost all major VAV box manufacturers (so it is not a proprietary product). And it only adds a few dB to the sound generation into the space.

Double wall on the other hand, can add 200% to the first cost of a series fan powered box. It can add 10 or more NC to the space (in effect requiring a greater number of smaller units to handle the load), and actually provides no real IAQ or other performance attributes to a project. We need to understand these issues, explain them to the engineering community, and get the double wall requirement relegated to air handlers where it makes sense.

The specification sheet for the cellular insulation is attached!

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SPECIFICATION
SUBMITTAL SHEET
Reviewed: 11/99

TRADE NAME: **IMCOLOCK , IMCOSHEET™**

DESCRIPTION: Engineered Polymer Foam Insulation
(A flexible, polymer based, low density, closed cell, chemically inert pipe and sheet insulation)

PHYSICAL PROPERTIES:

Operating Temperature Limits	210°F Maximum -330°F Minimum	(ASTM C 411)
Color	Black	
Density	1.5 lbs/ft^3	(ASTM D 1622, ASTM D 3575)
Water Vapor Permeability	0.0 perm-in	(ASTM E 96)
Water Absorption	0.0% (by volume)	(ASTM C 209)
Linear Shrinkage @ 200°F	< 4.0%	(ASTM C 534)
Mold Growth/Humidity; Air Erosion	No mold growth; No erosion	(UL 181, Sections 12 & 17)
Flame Spread (up to 1" wall)	not greater than 25	(ASTM E 84, CAN/ULC-S102.2-M88)
Smoke Developed (up to 1" wall)	not greater than 50	(ASTM E 84, CAN/ULC-S102.2-M88)
Thermal Conductivity @ 75°F	0.25 Btu-in/hr-ft^2-°F	(ASTM C 177, ASTM C 518)

STANDARD SIZES:

IMCOLOCK
1/4"CTS through 4"IPS
3/8", 1/2", 3/4", 1" wall (6' lengths);
5"-12"IPS, 1" wall (3' lengths).
Note: 3' lengths are NOT pre-glued

IMCOSHEET
Continuous rolls, 48" wide
Individual sheets 36"x 48"
Available thicknesses: 3/8"
1/2", 3/4", 1", 1-1/2", and 2"

APPLICATION CONSIDERATIONS/USES: IMCOLOCK: pre-slit pipe insulation with a pressure sensitive adhesive closure system (pre-glued). IMCOSHEET: sheet insulation. Used primarily for ambient service to retard heat gain and control condensation drip. Also used for reducing heat flow for hot water plumbing and liquid heating, dual temperature piping and for air conditioning and refrigeration systems. Competitive on an installed cost basis with other types of insulation for its recommended service.

SPECIFICATION COMPLIANCE: ASTM C 534*, ASTM E 162, ASTM E 662, UL 94 HBF, NFPA 90A/B

- Factory Mutual Research Corporation, Approved and Listed in Approval Guide
- New York City Department of Buildings, MEA #267-92-M VOL.II
- City of Los Angeles, General Approval, Research Report RR 8316
- Dade County, Florida, Product Control Approved, Acceptance No. 95-1215.08

*ASTM C 534 is limited to elastomeric materials. IMCOLOCK and IMCOSHEET meet or exceed all physical requirements listed in ASTM C 534 with the exception of density.

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