



Hazards / Problems Associated with Fiberglass Duct Liner and HVAC Insulation

Guidance for Insulating New HVAC/Ductwork DC Indoor Air Quality Work Group

Background

Fiberglass (fibrous glass or glass wool) internal duct liner has been used as acoustical and thermal insulation in many Heating, Ventilation and Air Conditioning (HVAC) systems. Indoor Air Quality (IAQ) complaints may arise when the fiberglass internal duct liner deteriorates over time. Deteriorating fiberglass duct liner, which is typically black in color, can migrate through supply diffusers. The liner can deposit in occupied spaces and onto flat surfaces, where it can cause complaints and adverse health effects.

Due to ongoing concerns about exposure to deteriorating fiberglass duct liner, the Indoor Air Quality Work Group of the UC Industrial Hygienists/Safety Committee has decided to address the issue and develop this guidance for the UC campuses.

Adverse Health Effects

1. Fiberglass carcinogenicity has been studied and classified by the following organizations:

- International Agency for Research on Cancer (IARC) has classified it as a possible human carcinogen
- National Toxicology Program (NTP) has classified it as an animal carcinogen
- American Conference of Governmental Industrial Hygienists (ACGIH) has classified it as an animal carcinogen (A3)
- Environmental Protection Agency (EPA) has classified it as an animal carcinogen.

Fiberglass, at a minimum, is an acute physical irritant to the skin, eyes, and upper respiratory tract. The following are occupational exposure limits for fibrous glass or glass wool fibers, developed by US and international agencies:

AGENCY / ORGANIZATION	EXPOSURE UNIT
Cal/OSHA PEL, 2001 (as an 8 hr TWA)	1.0 f/cc
ACGIH, 2008 TL V	1.0 f/cc A3
Safety & Health Committee, Bldg. & Construction Trades Department of the AFL-CIO (1991)	1.0 f/cc
Fed/OSHA REL (based on an 8 hr work day)	1.0 f/cc
Sweden (as an 8 hr TWA)	1.0 f/cc
Norway (as an 8 hrTWA)	1.0 f/c



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2. Microbial Contamination

Numerous IAQ case studies have shown that fiberglass duct liner, combined with dust, dirt and moisture, is a very good medium for microbial growth (examples: mold, fungus, Legionella bacteria). Microbial contamination in the BVAC system can cause serious long term odor nuisance and health effects for building occupants. Internally lined ductwork is difficult to maintain and clean. A clean BVAC system is crucial to building occupant health and well-being.

Economic Impact

Prefabricated ducts with interior fiberglass liner are less expensive, resulting in a lower "up-front" construction cost. However, internal lining creates a resistance to airflow, causes static pressure drop, and is difficult to clean and maintain. It also reduces the capacity of the ductwork. Thus, the system requires more energy and has a higher long term cost.

Exterior insulation on the other hand, is initially more labor intensive and has higher "upfront" cost. However, the HVAC system requires less energy to operate, is cheaper to maintain, and has lower long term cost when compared to internal duct lining.

Alternatives for Insulating New Ductwork

1. Exterior Insulation:

Insulating ducts on the exterior with bare metal on the interior is the ideal solution. Such a condition would eliminate dispersion of deteriorated fiberglass into the occupied space. It minimizes accumulation of dust and makes routine duct cleaning possible. Restrictions to air flow are minimized and overall, the system uses less energy to operate.

2. Other Types of Internal Liners:

Another alternative would be a new type of duct liner, which does not deteriorate, does not absorb moisture, and has a smooth and cleanable surface. We located four new duct/AHU liner products, all of which are various polymer types.

Recommendations

The UC IAQ Work Group makes the following recommendations:

1. Fiberglass insulation shall not be used in the HVAC systems, including the supply and return air plenums.
2. Large HVAC systems typically do not need internal duct lining, as noise is controlled by sound baffles or external acoustical insulation at the source in the mechanical room.
3. Rooftop HVAC units with long horizontal duct runs can be wrapped externally with fiberglass for thermal insulation and sound baffles can be used for noise attenuation.
4. Rooftop package units with short vertical duct runs should be installed with sound baffles for noise attenuation.
5. Laboratory buildings shall not have any internally lined ductwork.

REFERENCES

- (1) Occupational Exposure, Toxic Properties And Work Practices Guidelines for Fiber Glass American Industrial Hygiene Association (AIHA), 1991 edition
- (2) Threshold Limit Values (TLV) For Chemical Substances & Physical Agents American Conference of Governmental Industrial Hygienists (ACGIH); 2003
- (3) Permissible Exposure Limits for Fibrous Glass California Code of Regulations, Title 8, Section 5155
- (4) Permissible Exposure Limits for Nuisance Dust (includes fiberglass) Code of Federal Regulations, Part 1910.1000, Table Z-3