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change to 120.3 Pipe insulation protection

Additional submitted attachment is included below.

Howard Ahern
Airex Manufacturing
67140 Garbino Rd
Cathedral City, Ca 92234

Comment to Change 120.3

120.3

(b) **Insulation Protection.** Pipe Insulation shall be protected from damage due to sunlight, moisture, ~~equipment maintenance~~ wind, and physical damage. Protection shall, at minimum, include the following:

removable for equipment maintenance. The cover shall be water retardant and provide shielding from solar radiation that can cause degradation of the material. Adhesive tape shall not be used to provide this protection.

2. Pipe insulation covering chilled water piping and refrigerant suction piping located outside the conditioned space shall include, or be protected by, a Class I or Class II vapor retarder. All penetrations and joints shall be sealed.

Justification

This change will clarify the intent of Section 120.30 B, 1
The intent of these sections is not only protection of pipe insulation from weather but to insure the insulations thermal conductivity energy savings integrity last the life of the mechanical system as per the intent of the code. In order to remove the opportunity for misunderstanding so that the code has its intended result, the term “equipment maintenance” must be clarified. The compliance manuals and ASHRAE state that the protection be removable for maintenance.

The intent was originally from the ASHRAE 90.1 standard. The ASHRAE handbook CHAPTER 10. INSULATION SYSTEMS FOR REFRIGERANT PIPING states that “The **protective jacketing must be installed independently and in addition to any factory- or field-applied vapor retarder** –

The California Mechanical code Chapter 11 CMC 1109.
Refrigerant pipe joints erected on the premise shall be exposed for visual inspection prior to being covered or enclosed. ASHRAE 15.8.9

This requirement make it crucial that protective coverings be able to be removed to comply with visual inspection with destroying the insulation.

Removing protection without damaging the insulation is stated in both 2019 compliance manuals.

2019 Residential Compliance Manual January 2019 page 4-15
Source: Table 120.3-A of the Energy Standards

Insulation used for refrigerant suction lines located outside a condition space, must include a Class I or Class II vapor retarder. The vapor retarder and insulation must be protected from physical damage, UV deterioration, and moisture **with a covering that can be removed for equipment maintenance without destroying the insulation**. Insulation is typically protected by aluminum, sheet metal jacket, painted canvas, or plastic cover. Adhesive tape should not be used as insulation protection because removal of the tape will damage the integrity of the original insulation during preventive maintenance.

2019 Nonresidential Compliance Manual January 2019 page 4-71

The Energy Standards also require that exposed pipe insulation be protected from damage by moisture, UV and physical abrasion including but not limited to the following:

1. Insulation exposed to weather shall be installed with a cover suitable for outdoor service. The cover shall be water retardant and provides shielding from solar radiation that can cause degradation of the material**. Insulation must be protected by an external covering** unless the insulation has been approved for exterior use using a recognized federal test procedure. Adhesive tape shall not be used as protection for insulation exposed to weather
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(*This language highlighted in blue from the manual should be changed as there is no approved of consensus testing for insulation exposed to weather. There are so many test that are 1 year 3 year 5 year etc. Is the manual saying just a 1 year UV test is acceptable, of course not? UV testing is unreliable as exposure depends on many factors and depends where material is located as such no UV test or standard are in any of the California codes or any codes for energy or mechanical in the US.*
Heat is major factor in the degrading of insulation that is part of the solar radiation as such not covered by any consensus testing. In addition the code call for protecting against physical damage which again is not covered by a test, but this is just a suggestion not part of my comment change)

2. Insulation covering chilled water piping and refrigerant suction piping located outside the conditioned space shall have a Class I or Class II vapor retarder. All penetrations and joints of which shall be sealed.

Just as Adhesives Tape are not permitted as it will limit maintenance and damage insulations permeability characteristics as Removal of tape damages the integrity of the

original insulation into pieces, specially, if the insulation has reached thermoset state, and adhesives will prevent water vapor from escaping to keep the insulation dry, the protective cover should be removable.

Protective covering must also protect from physical damage so if the protection covering does get damaged from stepping on it, dropping tools on it, birds, lawn trimmers etc.it can be replaced, keeping the insulations thermal conductivity integrity and insuring the insulation system last the life of the mechanical system and avoiding the costly replacement of the insulation.

Removable protection also allows less costly maintenance and replacement of any damaged insulation.

Example of saving from protecting the insulation can be measured in Dr Kourmohammadi PE, Ph.D. CPD, CIPE, CFPE LEED AP Impact and Advantages of Removable Insulation Protective Covers.

Paper on Protective covers which calculated the BTU and Electrical energy saving of exposed Freon lines for residential and multifamily purposes that had exposed lines due to no protective covering and degraded insulation.

Freon lines exposed 3 ft to 5 ft

0.15/kwhr cost of electricity (peak demand cost can be at

0.25$/kwhr)

10 hours operation

365 days

¾" Freon line

½" insulation property 0.020227 Btu/(hr F ft)

For the California region it amounted to a $1.00 per foot annual savings

Example of cost saving average 5ft per unit in California with a population of 39 million and

If only half of the population for example had a heating and /Cooling system with an average of 5ft exposed piping with degraded or no insulation , Protected pipe insulation would amount to **an yearly electrical saving of $975,000,000**

This is electrical saving and does not include the saving to home and building owners from not having a costly expenses of replacing the insulation for maintenance.

Bibliography:
Impact and Advantages of

Removable Insulation Protective Covers

Dr. “Saum” K. Nourmohammadi, PEx3, Ph.D. CPD, CIPE, CFPE,

Bibliography:
Impact and Advantages of

2017 ASHRAE Handbook

Cost Impact:
There are a wide variety of removable protective coverings by over 40 manufactures and are available at most supply distributors. These can be as simple as a bent piece of sheet metal or plastic channels, cladding, PVC covers, Jackets, aluminum covers etc. Many covering require much less labor compared to painting or banding and they are currently being used in California and all over the US so there no increase cost.

Thank you
Howard Ahern
760-250-1625
howard.ahern@airexmfg.com