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From Experience

Preventing Condensation on IMP Conduits

Condensation is a concern in every food plant. A particularly challenging condition for condensation control is when conduits penetrate Insulated Metal Panels (IMPs) in rooms operating below 40°F. When a conduit spans from the cold room through an IMP to a warmer space, typically with a temperature difference of 30°F or greater, condensation can form on the inside and outside of the warmer side of the conduit. Hixson's own field observations of conduits in the condition described above have confirmed this phenomenon time and again. As the conduit conducts heat from the warm space into the cold space, the conduit temperature near the IMP drops below the dew point in the warm space. Much like a cold beverage sitting outside on a summer day, water will "bead" on the surface and drip down the inside and outside of the conduit. With adequately insulated and sealed conduit however, the temperature of the exposed, uninsulated conduit in the warmer space can be maintained above the dew point and condensation avoided.

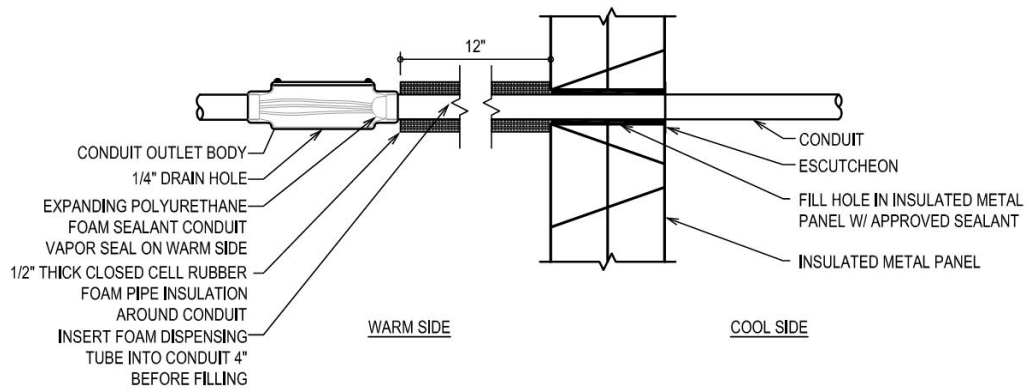
Until a few years ago, what constitutes a proper amount of insulation was a matter up for debate. To resolve this question, Hixson conducted trials to determine the most effective way to control condensation on conduits penetrating IMPs. The research demonstrated that with

the correct design, selection, and installation, condensation on and inside of conduit penetrations can be significantly reduced or eliminated. The optimum insulation coverage was found to be 12" of 1/2" insulation, which permitted the temperature of the uninsulated conduit that exits the insulation to remain above the dew point temperature in the warm space, and condensation was avoided. The insulation is also thick enough to keep the external insulation temperature above the dew point. Hixson found that conduits covered with too much insulation, such as 36" of 3/4" insulation in one trial, kept the temperature of the conduits at the end of the insulation too low, resulting in condensation in some conditions.

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EXPERIENCE IN BRIEF

Material	Thermal Conductivity (W/m*K)
Polystyrene (metal panel insulation)	0.03
Schedule 80 PVC	0.19
SST	16.3
PVC Coated Steel	N/A
Steel	50
Aluminum	247
Copper	398



Conduit penetration detail to reduce the chance of condensation in a warm environment.

While conduit penetrations are inevitable, condensation does not have to be. Per Hixson’s research, select materials for conduit with the lowest thermal conductivity possible that still meet corporate and facility standards for the environment where they are located. Less thermally conductive conduit transfers heat at a slower rate and is less susceptible to cooling below the dew point of the air in the warmer spaces. The detail provided above illustrates a typical conduit installation detail for IMP penetrations based upon the Hixson research. In addition, to prevent condensation from forming on the inside of the conduit, a vapor barrier should be put in place.

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Direct any comments or questions to:

Scott T. McGlamery, P.E.

Sr. Vice President, Director of Mechanical & Electrical Engineering

smcglamery@hixson-inc.com

Phone: 513.241.1230

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