REFRIGERATION REVIEW

BOX-IN-A-BOX CONSTRUCTION

The use of IMPs (insulated metal panels) has become standard in the construction of refrigerated rooms. There are still some architects/engineers that are proponents of "box-in-a-box" construction for refrigerated facilities, primarily because they don't know how to design an envelope insulation steel system, which places the insulation and vapor barrier outside the steel or concrete system.

Attempts to use box-in-a-box construction in distribution centers can make them vulnerable to a lot of other casualties, specifically when bar joists penetrate insulated walls. The bar joist, when encapsulated, is still subject to corrosion. If adjacent refrigerated rooms in a facility are going to operate at temperature differences greater than 10°, each refrigerated area needs to be a separate steel system. There have been several cases where whole roof systems have collapsed because bar joists have corroded and have fallen onto the top of the racks.

The primary flaw in this type of construction is the formation of condensation on top

of and inside ceiling IMP panels, when panels less than 6” thick are used. Whenever the dew point temperature is reached inside or outside the IMP, condensation is formed. While some take the attitude that moisture can be evaporated off the top of the IMP when enough warm air passes over it, in actuality it will create a very humid air condition that places moisture in all areas that may be below the dew point. All insulated ceiling panels are supported by metal rods, and all penetrations for lights and air unit supports would penetrate that system. All penetrations must be sealed completely, and totally waterproof. The fallacy is that moisture, per the kinetic theory of gas, is moving around vibrating at the speed of sound. Moisture will eventually infiltrate cracks and panel joints, and while it may take several years, it occurs over time, particularly in freezer areas where ceiling panels will become so laden with ice and moisture to the point of falling due to their weight. Panels have been observed to reach over 1300 pounds because moisture, once it is inside of a panel, has no way of passing through the interior metal skin of the IMP. IMP ceiling panels have been observed to be bowed in the middle areas as much as 4” to 6” from the weight of water and ice. This makes sealing every crack, crevice, and penetration 100% tight very important.