The purpose of this technical bulletin is to provide factual scientific information about the two rigid urethane foam chemistries commonly used in insulated metal panels (IMPs). The foam core in IMPs is often characterized as either a “PUR” (polyurethane) or “PIR” (polyisocyanurate) depending on the expected chemical reactions of the two primary components in the foam. PUR foams are essentially made by reacting a “polyol” component and an “iso” component in which the OH groups of the polyol component chemically balance the NCO groups of the iso component and form urethane linkages. In PIR foams, the iso components react with each other in trimerization reactions to form isocyanurates. Excess iso reacts with polyol to form urethane linkages as well. In straight PUR foams, the expected reaction is between NCO and OH groups. In PIR foams, the primary reaction is with NCO-NCO groups. Secondary reactions are with OH groups.

Both products produce cost effective rigid foams with excellent insulating properties, structural strength and adhesion to the metal faces of IMPs.

PIR foams generally have greater resistance to burning, lower levels of smoke generation and higher decomposition temperatures than PUR foams. This is attributed to an increase in aromatic ring composition. The use of aromatic polyester polyols augments these properties.

AWIP utilizes a proprietary PUR/PIR formulation, in other words, a “hybrid” which results in panels with outstanding insulation, high structural strength and fire performance properties together with superior flexibility, substrate adhesion and excellent cell structure uniformity.

From the standpoint of building material specifications, it would be technically incorrect to make the assumption that “polyurethane” or “polyisocyanurate” foam is superior. Instead, minimum physical properties should be listed as performance specifications for the foam core of IMPs. It is the processing that ensures consistency in the foam core and adhesion to the steel facings and that will result in a premium composite product. AWIP maintains the latest state of the art technologies in its processing and mixing equipment which is duplicated at all facilities.

Example:

Density (in-place):  2.1 - 2.5 pcf
Compressive Strength:  25 psi
K Factor (max):  0.14 @ 75º F mean temperature
Shear Strength:  26-32 psi
Closed Cell Content:  95% minimum
Dimensional Stability:  14 day aged (ASTM D 2126):
  •  At -20 ºF:  < 1% volume change
  •  Dry Heat 158 ºF:  < 1% volume change
  •  Humid Heat 158 ºF:  < 2% volume change