CUSTOMER BULLETIN 0717
ISO-C1® Polyisocyanurate Insulation
Flame Spread and Smoke Development

PURPOSE

This Customer Bulletin is another in a series of white papers aimed at providing our clients, engineers, contractors, fabricators, and friends with objective information on competitive products and on items that affect our industry. Marketing literature for insulation products on the internet and in printed media often address the flame spread index (FSI) and smoke developed index (SDI) as measured in accordance with ASTM E84 or comparable standards. This Customer Bulletin provides factual, clarifying information concerning ISO-C1's FSI and SDI as well as other important points relating to the combustion properties of polyisocyanurate foam.

This Bulletin is also intended to help end-users understand how the building code regulations impact the use of products such as Dyplast's ISO-CI® polyisocyanurate foam insulation which have achieved a flame spread index of less than 25 and a smoke density index of less than 450 in the ASTM E84 test (Class I). [1]

SUMMARY OF CONCLUSIONS

Unfortunately, across the US there is no Federal Building Code. Each State, or in some cases, local government, decides on what building codes to adopt. To assist with this process the International Code Council publishes an updated "model" code every three years that may be adopted in whole or in part by States and local jurisdictions. Thus, it is important to always check with local township or county officials about code requirements.

[1] These numerical data are not intended to reflect hazards present under actual fire conditions.

The latest versions of the International Building and Residential Codes issued in 2015 both list the basic requirements for foam plastic insulation as having a flame spread index of not more than 75 and a smoke density index of not more than 450 in the ASTM E84 test (i.e. Class II) with the proviso that foam plastic the insulation must be separated from the interior of the building by an approved 15-minute thermal barrier. However, the Codes do allow for exceptions to the 15-minute thermal barrier.

For example, foam plastic insulation may be spray-applied to sill plates and headers without a thermal barrier providing the foam meets the ASTM E84 Class I requirements and the foam thickness does not exceed 3 ¼ inches.

Another area where foam insulation products must meet the ASTM E84 Class I requirements is in the walls of freezers and coolers. In these cases, the foam insulation cannot exceed 10" in thickness and it must be covered by either aluminum metal skins having a thickness of not less than 0.032" or corrosion-resistant steel having a base metal thickness not less than 0.0160". In addition, the structure must be protected by an automatic sprinkler system.

Yet another important approved application for ASTM E84 Class I foam plastic insulation is in the exterior walls of single and multi-story buildings. For single story buildings, the foam insulation thickness cannot exceed 4" and the foam must be covered by identical metal skin thicknesses as in the case of the walls of freezers and coolers. Also, the building must be protected by an automatic sprinkler system.

For multi-story buildings, the foam plastic insulation, exterior coatings, and facings must be tested separately in the thickness intended for use, with the insulation thickness not to exceed 4" and each component must meet the ASTM Class I requirements. An exception is in the case of prefabricated or factory-manufactured panels having minimum 0.020-inch (0.51 mm) aluminum facings. These panels are permitted to be tested as

an assembly in accordance with and comply with the acceptance criteria of NFPA 285 where the foam plastic core is not exposed in the course of construction. Again, the building must be protected by an automatic sprinkler system.

The International Mechanical Code also sets recommendations for the insulation of piping and ducting in commercial and industrial situations. In some cases, a Class I foam having a flame spread index of not more than 25 and a smoke density index of not more than 450 in the ASTM E84 test may be used. However, a factor that is taken into consideration by fire marshals and local building officials when approving building plans is the number of people who will be occupying the "enclosed space" where the duct work or piping is to be installed. Where the occupational density is going to be high, as in hospitals, schools and hotels, an insulation meeting a flame spread index of not more than 25 and a smoke density index of not more than 50 is likely to be specified.

Dyplast does not represent itself as an expert on building or mechanical code matters, and there may be other applications where ASTM E84 Class I foam insulation may be used. We therefore recommend consulting with an architect or a specifier if you have detailed questions about other uses.

One other thing that must be taken into consideration when looking at the ASTM E84 test results on any foam plastic insulation is that the performance of the foam in the test does vary depending on the actual thickness tested. Usually the testing agencies perform the tests at foam thicknesses of 1.0" and 4.0" to cover the range of foam thicknesses likely to be encountered in most applications.

As a reminder, ISO-CI® 2.0 has obtained the following ASTM E84 results:

	Flame Spread Index[1]	Smoke Density Index[1]
At 1 inch thick	< 25	70

At 4 inches thick	< 25	250

ISO-CI® 2.0 has also been tested and approved by FM as a Specification Tested identified component of insulated building panels. As part of this Specification Tested listing, FM conducts audits twice per year and Dyplast is not allowed to make any changes to the foam formulation.