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SUBJECT: **MECHANICALLY ATTACHED SINGLE-PLY FASTENER LOAD STUDY w/ INSULFOAM EPS**

FROM: **THOMAS L. SAVOY, TECHNICAL DIRECTOR**

Insulfoam EPS has been used in conjunction with mechanically attached single-ply membranes since the single-ply membranes inception. The application at this time typically required the EPS to be overlaid with a coverboard such as woodfiber board. In the fall of 1998 Insulfoam introduced the first advancement in these type of applications in the form of our Secure-Ply. Secure-Ply is Insulfoam's proprietary slip-sheet product, that when used in conjunction with Insulfoam EPS, provides for UL Class A listings with numerous single-ply membranes. Since this time, Insulfoam has expanded its UL test program and now has obtained Class A Maintenance and Repair listings, again with several single-ply membranes but without any coverboard or slip sheet.

Questions regarding Insulfoam EPS systems capability to resist membrane fastener load decay were brought forward. Many individuals felt that Type II EPS would be adequate but suspected the acceptability of lesser densities even when covered with slip-sheets although Types I, VIII, II and IX have been used in all types of roofing. To address these questions Premier Industries- Technical Center embarked on a study of fastener load decay when fasteners typically used in mechanically attached single-ply membranes were placed over insulation systems. The test program required that several repetitions of each insulation system take place. Samples of the insulation system were placed in the framework of a Dillon Compression Test Apparatus and covered with a typical mechanically attached single-ply membrane. The membrane was attached in such a manner to duplicate a typical field application. Once the membrane and insulation systems were in place a typical 2" membrane fastener plate was placed in the center of the membrane. The force of the test apparatus was channeled through a 2" diameter column onto the plate. A load was applied to the plate at a rate of 0.2 in/min. until 120 pounds was reached. The crosshead was then stopped and the load recorded regularly for a period of 72 hours. A load of 120 pounds was used as several fastener manufacturers suggested that a plate exhibit this load in typical applications.

The following insulation systems were evaluated: Typical polyisocyanurate purchased in the market place, standard Type I Insulfoam EPS (0.90 pcf min.), Type I EPS with Secure-Ply, Type VIII (1.15 pcf min.) Insulfoam EPS, Type VIII EPS with Secure-Ply. Type II Insulfoam EPS (1.35 pcf min.) and Type IX Insulfoam EPS (1.80 pcf min.). On the backside, you will find the graphs representing the data recorded from these tests.

Previous work completed in the roofing industry has purported that an insulation system be deemed acceptable when the fastener load under a 3" diameter exceeds 60 pounds of force after 72 hours. This value would be less than 60 pounds when evaluating a 2" fastener plate as is the case with membrane fasteners. It should be noted that the industry has not established a minimum clamping pressure requirements but rather they depend on the membranes wind uplift testing results that are not dependent on the insulation system beneath a mechanically attached membrane.

A review of the graphed data shows that there is not a significant difference in the end result for all systems tested. The following lists the average load retained for each system after the 72-hour monitoring period:

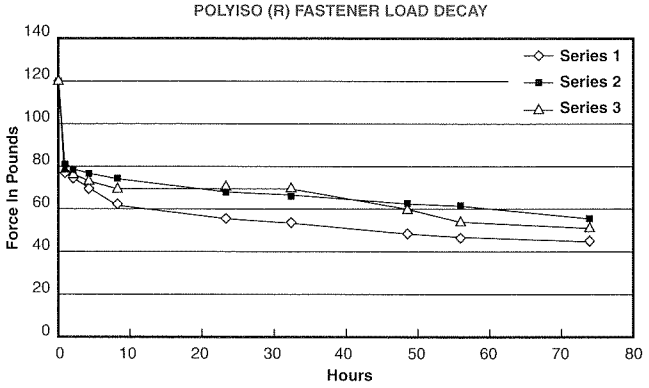
Polyisocyanurate .....50.6 lbs.
Type I EPS .....49.5 lbs.
Type I EPS w/Secure-Ply .....55.5 lbs.
Type VIII EPS .....56.5 lbs.
Type VIII EPS w/Secure-Ply .....62.1 lbs.
Type II EPS .....62.1 lbs.
Type IX EPS .....67.5 lbs.

As one can see in the EPS products, an increase in density improves the end result. The addition of Secure-Ply to the lesser density EPS improves the load retention by 10-15%. In all cases except the Type I EPS the final values exceeded the results obtained by the polyisocyanurate tested. Considering that this material is used under mechanically attached single-ply membrane without concern to retained clamping pressure, logic would hold that the systems tested that exceed this value would also be acceptable in these applications.

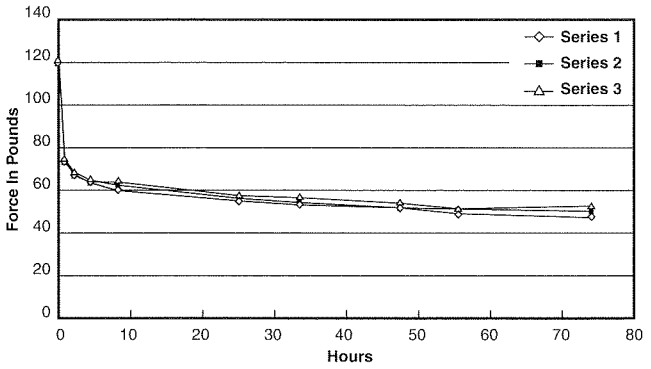
With the advancements in our industry taking place each day, the above data provides the support necessary to allow the consideration of Type I EPS with Secure-Ply and the increased densities of Insulfoam EPS to be used under mechanically fastened membranes. In those membrane systems where compatibility of EPS with the chemistry of the membrane are of concern the Secure-Ply slip-sheet provides the necessary divorcement between the membrane and the EPS. In systems outside UL's maintenance and repair criteria the Secure-Ply provides the replacement of coverboards such as 1/2" woodfiber or gypsum for Class A Listings when required.

If there are questions regarding the data presented in this document and or questions pertaining to the use of Insulfoam EPS in roofing systems, please feel free to contact Premier Industries-Technical Center @1/800-469-8870.

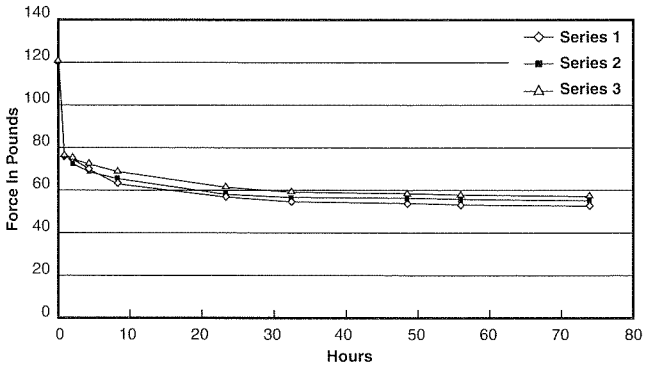
POLYISO (R) FASTENER LOAD DECAY



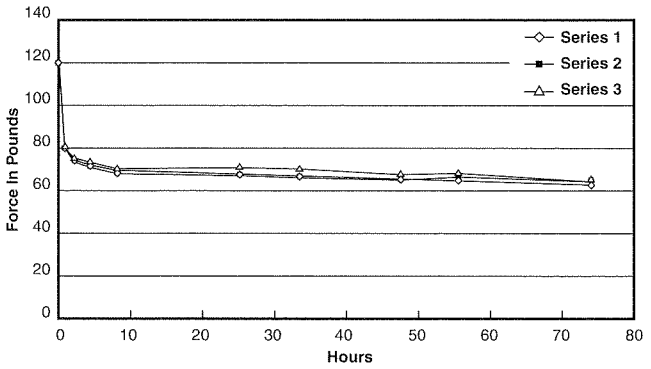
TYPE I EPS FASTENER LOAD DECAY



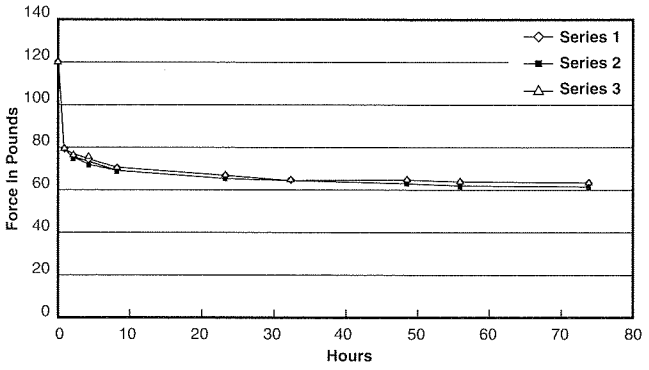
TYPE I EPS w/SECURE-PLY FASTENER LOAD DECAY



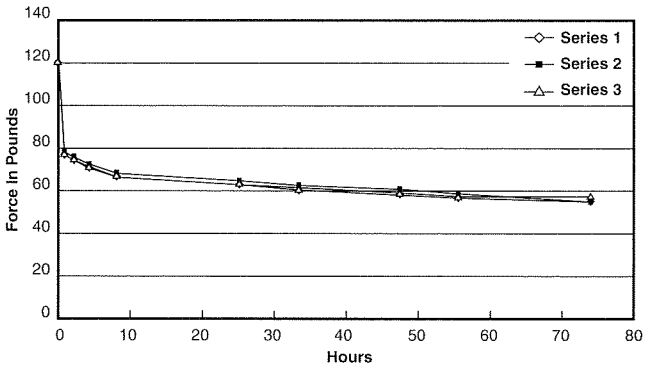
TYPE II EPS FASTENER LOAD DECAY



TYPE VIII EPS w/SECURE-PLY FASTENER LOAD DECAY



TYPE VIII EPS FASTENER LOAD DECAY



TYPE IX EPS FASTENER LOAD DECAY