Quadrant
Performance Materials

July 2023

To Whom It May Concern:

Quadrant Performance Materials has successfully passed the Unvented Attic Assembly Test (also known as the UVA and/or the End Use Configuration Test) as evidenced by the test report issued by Priest & Associates. The abbreviated test report is included immediately after this page.

Please feel free to contact the undersigned should you have any questions.

Sincerely,

--Stephen Davis
Product Manager
Quadrant Performance Materials

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PRIEST & ASSOCIATES
CONSULTING, LLC

ENGINEERING EVALUATION

For Inclusion of *EnviroSeal® High-Yield (HY) and EnviroSeal® No Mix* Insulation

in Unventilated Attics without an Ignition Barrier

Project No. 11239

Prepared for:

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June 12, 2023

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Abstract

This Engineering Evaluation describes the tests performed and analysis conducted to allow the use of EnviroSeal® HY and EnviroSeal® No Mix in unvented attic spaces. The 2015 IRC and IBC both allow testing of end-use configurations. AC377 (2015) also permits alternate testing/analysis in Section 3.2.2.3. Testing was conducted on EnviroSeal® HY with one verification test on EnviroSeal® No Mix (per Intertek analysis of Cone Calorimeter data Ref. Priest EEV 10934A). It has been shown that EnviroSeal® HY, when applied to an unvented attic (pitched roof truss construction with attic hatch) with the same volume as an NFPA 286 room, self-extinguishes due to oxygen depletion within 33 seconds and remains extinguished for 5 hours (or more) without external aid (suppression). Two different modeling techniques have predicted the time to self-extinguishment for EnviroSeal® HY in larger size volumes (3X NFPA 286 volume). The two models predict self-extinguishment times of 48 seconds (PAC Model) and 57 - 64 seconds (NIST CFAST Model) for an attic three times the NFPA 286 room volume. Real-scale testing of a 3X volume attic has demonstrated self-extinguishment in approximately 45 seconds, which matches the PAC predictions with reasonable accuracy (48 seconds). Ignition tests with various sources (lighter, torch, arc welder, box burner) indicate that it is difficult to cause a runaway flame spread event for EnviroSeal® HY or EnviroSeal® No Mix when ignited with various small ignition sources on flat surfaces for up to 3 minutes. A full-scale 1X volume test with a 20-minute exposure from a small ignition source (6 to 8-inch torch flame) resulted in no fire growth. In a ventilated test with a hole in the roof (6 in. x 6 in.) and the floor hatch open, the foam fire remained controlled (encapsulated flame spread events twice for 7 minutes), at which time the fire test data indicates that the fire extinguished due to oxygen depletion without intervention. A test added by Intertek on EnviroSeal® No Mix shows a self-extinguishing time of 42 seconds for a 1X volume attic.

The conclusions reached by this evaluation are true and correct, within the bounds of sound engineering practice. All reasoning for our decisions is contained within this document.

Submitted by,

Mike Luna
President

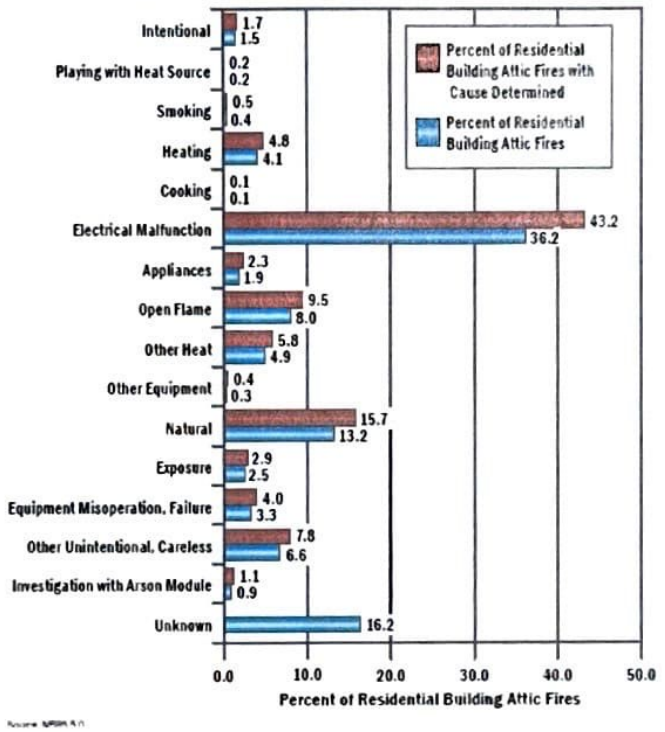
June 12, 2023

Reviewed and approved,

Deg Priest
Chief Executive Officer

June 12, 2023

Figure 3. Residential Building Attic Fires by Cause (2006–2008)



CONCLUSIONS

This evaluation considered several end-use configurations of unvented attics, large- and small-scale testing, modeling, and analysis. The testing and fire modeling demonstrated that EnviroSeal® HY in unvented attics self-extinguishes rapidly and predictably, thereby validating the foam plastic's acceptable performance without a prescriptive ignition barrier. Testing, modeling, and analysis considered the following:

- Minimum and maximum thickness of foam plastic
- Room geometry, including volume (minimum and maximum), shape, and roof slope
- Potential fire sources
- Effect of openings to the attic space, including, but not limited to, the attic entry, direct venting for appliances, and unintended openings

The items above have been fully addressed in this evaluation.

The evidence submitted is outlined in this evaluation. Modeling indicates the self-extinguishing time in a much larger volume (2X to 7X NFPA 286 volume) unvented attic ranges from 41 to 64 seconds using the PAC Method. Testing has been conducted to validate the model up to 3X NFPA 286 volume with excellent agreement. The PAC model predicted a 48-second time to self-extinguishment. The actual test results for this size of room were approximately 45 seconds.

The small-scale testing indicates that EnviroSeal® HY in unvented attics will perform well (a runaway flame spread event is difficult to cause) in other fire scenarios, such as cigarettes, lighters, torches, and other small ignition sources when the ignition is on a flat surface away from a corner.

Additionally, when a 1X volume unvented attic is intentionally ventilated (up to a 6-inch hole in the roof, hatch open), a fire initiated in the attic appeared to fully extinguish at approximately 6 to 6.5 minutes, and the fire remained extinguished for at least 5 hours.

Test #1 was repeated on EnviroSeal® No Mix with the fire self-extinguishing in 42 seconds, which indicates that the 3X test should extinguish before 1 minute based on previous model results for EnviroSeal® HY.

The ignition tests indicate that short-duration small ignition sources (less than 3 minutes) will not cause a runaway flame spread event. However, the torch flame for 10 minutes shows that flames do spread uncontrolled after 3 minutes of torch exposure. It is expected that accidental ignitions with torches are of short duration (less than 1 minute). The 3-minute torch fire would constitute a different scenario unrelated to workers in the attic. The 3-minute torch test result implies that the test result for Test #2 (small ignition burner attic test) would result in a flame spread event and self-extinguishment after 3 minutes plus approximately 42 seconds to consume the oxygen to levels to cause flames to cease.

The conclusions of this evaluation permit the use of EnviroSeal® HY or EnviroSeal® No Mix in unvented attics when spray applied at the minimum and maximum thicknesses tested to insulate unvented attics – with no storage allowed. The following limitations apply:

a. Entry to the attic or crawl space is to service utilities, and no storage is permitted.
b. There are no interconnected attic or crawl space areas.
c. Air in the attic or crawl space is not circulated to other parts of the building.
e. Combustion air is provided in accordance with International Mechanical Code (IMC) Section 701.

Note – Item d. was removed since attic ventilation does not apply to unvented attics.

Based on the results and analysis presented herein, EnviroSeal® HY or EnviroSeal® No Mix foam does not require an ignition barrier when used in unvented attics, which utilize a horizontal downward opening hatch. The horizontally installed hatch is a pressure venting device and may use spring-loaded or pneumatic closure mechanisms but must not be locked.

All other codes related to unvented attics shall apply. Specifically, where small ignition appliances are present, combustion air shall not come from the enclosed space. When equipment is placed close to combustibles, those materials must be protected according to the Mechanical Code.

When EnviroSeal® HY or EnviroSeal® No Mix is applied in unvented attics conforming to IRC Section R806.5 [806.4] or Section 1203.3 of the 2015 IBC, the insulation may be applied to the underside of the roof sheathing and vertical surfaces (gables) to a minimum thickness of 3 inches and a maximum thickness of 18 inches but not in attic floors unless specific approval is granted for installation on attic floors. The results of this analysis apply to residential or commercial use since the technical background is not code dependent – but rather based on fire science principles, which apply to all unvented attic scenarios.

Items penetrating the roof deck shall be covered with at least 3 inches of EnviroSeal® HY or EnviroSeal® No Mix.

Signage shall be placed in the attic and state the following:

"Caution, this is an unvented attic by design.
No modification may be made to this unvented condition.
The attic shall not be vented.
Holes in the roof of the unvented attic should be immediately repaired and resealed.
The unvented attic shall not be used for storage.
See Intertek CCRR XXXXX (pending)"

~ End of Report ~