717 17th St
Denver, CO 80202
(800) 654-3103
(303) 978-3661 FAX
specJM.com

TECHNICAL BULLETIN – Insulation Systems

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Johns Manville CORBOND III® Spray Foam Air Barrier Advantage

Objective: This technical bulletin describes the advantages of using JM CORBOND III® spray foam to minimize building envelope air leakage rates and provide thermal insulation in exterior spray foam applications compared to the installation practices required with other competitive spray foams. JM CORBOND III insulation is the only polyurethane spray foam accepted by the Air Barrier Association of America (ABAA) that can be used as a stand-alone system without additional material and labor costs associated with preparing penetrations and wallboard seams before applying the spray foam.

Background: Building codes and third party agencies such as ABAA continue to follow the building science community's recommendation that air sealing a building is as critical as providing thermal insulation to construct the most energy efficient buildings. One method of air sealing and thermally insulating a building in one step is to apply spray foam on the exterior side of the building envelope (**Figure 1**). One major drawback in this approach is, in standard application, all penetrations including ducts, PVC pipes, electrical conduits, brick ties, windows, and wallboard seams must be carefully prepared using primers and modified bitumen peel 'n' stick sealing tape before the spray foam is applied. These preparation steps have high costs associated with the material and the labor-intensive process.

Figure 1. JM CORBOND III spray foam used to thermally insulate and air seal the exterior building envelope.

The air leakage performance of an exterior wall assembly is tested using ASTM E2357 “Standard Test Method for Determining Air Leakage of Air Barrier Assemblies“. The test method is used by ABAA to determine the acceptability of a product such as polyurethane spray foam to meet their stringent specifications for an ABAA evaluated wall assembly for air tightness. In the test, a representative 8’ x 8’ wall assembly (**Figure 2**) is prepared and exposed to 2000 cyclic pressure loads up to 800 Pa and gusts of up to 1200 Pa that are meant to cause the wall assembly to bow and flex as would occur in real world applications. Preparation of the wall assembly for the test includes 1) priming the surfaces to ensure good adhesion of the modified bitumen peel ’n’ stick sealing tape, 2) taping all the potential leakage points including penetrations and wallboard seams as would be completed in actual wall construction, and 3) applying the polyurethane spray foam at the desired thickness. The wall assembly is tested in a pressure chamber capable of administering the cyclic loads and gusts described above. To meet ABAA performance requirements, the wall assembly must then have an air leakage rate not to exceed 0.2 L/s/m^2 at 75 Pa after the pressure structural loading is applied to the finished wall.

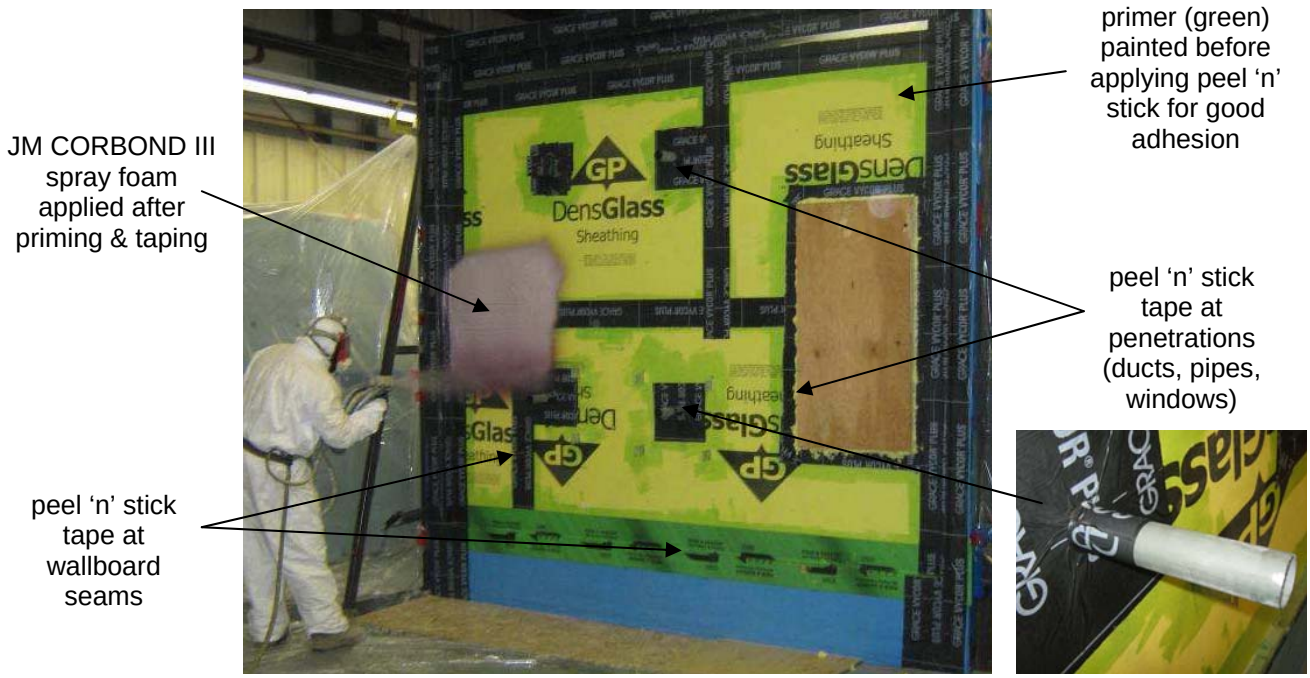

Figure 2. Standard preparation around penetrations and wallboard seams *with priming and taping*.

<u>JM CORBOND III Installation Advantage:</u>

Many spray foam manufacturers including Johns Manville meet ABAA air leakage requirements using ASTM E2357 *with the standard preparation protocol of priming and taping all penetrations and wallboard seams*. However, Johns Manville CORBOND III insulation is the only spray foam accepted by ABAA to meet air leakage requirement *without priming and taping*. Eliminating the need for priming and taping greatly reduces material costs and time since the spray foam can be applied directly after the wallboard is installed (**Figure 3**).

Without the priming and taping preparation steps, 2” of JM CORBOND III spray foam (R-13) provides an air leakage rate of only 0.0039 L/s/m^2 using ASTM E2357 – two orders of magnitude less than the ABAA requirement. Even more impressive, the low air leakage rate was obtained with an intentional 3/8” gap approximately 5 feet in length between two wallboards (**Figure 3**). The gap between the wallboards was filled and sealed by the JM CORBOND III when the spray foam was applied to the wall

using standard application techniques - no additional preparation. The superior performance of JM CORBOND III spray foam designed specifically with adhesion promoters results in product characteristics that outperform the other medium density polyurethane spray foams.

Figure 3. JM CORBOND III ASTM E2357 testing *without priming and taping* penetrations and wallboard seams.

In addition to meeting ABAA's air leakage requirement via test method ASTM E2357, Johns Manville conducted additional testing with JM CORBOND III spray foam *without priming and taping* to mimic cyclic environmental aging. **Table 1** describes the air leakage rate on a wall assembly 1) after pressure load cycling, 2) after temperature load cycling, and 3) after simultaneous temperature and pressure load cycling. The air leakage rate increased after the series of testing as would be expected after the harsh test conditions, but still remained below ABAA's requirements by one order of magnitude. The tests clearly indicate the wall assembly is extremely robust and should remain air tight after many years exposed to seasonal environmental changes.

Table 1. Air leakage rates on a JM CORBOND III wall assembly *without priming and taping* after exposure to pressure and temperature load cycling to mimic seasonal environmental changes.

Load Cycling Condition	Leakage Rate ($L/m^2/s$) at 75 Pa		Cycling Details
	Before	*After*	
Pressure Alone	0.0040	0.0039	2000 cycles at 800 Pa, pressure gusts at 1200 Pa (3 days total)
Temperature Alone	0.0110	0.0149	24 cycles from -68° to 150°F (3 days total)
Simultaneous Pressure and Temperature	0.0149	0.0257	24 cycles from -68° to 150°F and 1000 Pa (3 days total)

<u>Summary:</u>

JM CORBOND III spray foam insulation has demonstrated robust performance through stringent pressure and temperature cycling for use as an air barrier product under ABAA wall assembly guidelines. Spraying foam on the exterior side of a building envelope provides both thermal insulation and air leakage protection in one product to maximize building energy efficiency. Furthermore, JM CORBOND III insulation provides additional benefits compared to other manufacturers' polyurethane spray foams by eliminating the needs for costly and timely exterior penetration and wallboard seam preparation before the spray foam is applied. Johns Manville's product is the only ABAA accepted spray foam product with the additional testing to meet air leakage rate requirements without the use of priming and taping preparation procedures needed by all other competitors' products.