

TECHNICAL BULLETIN — Insulation Systems

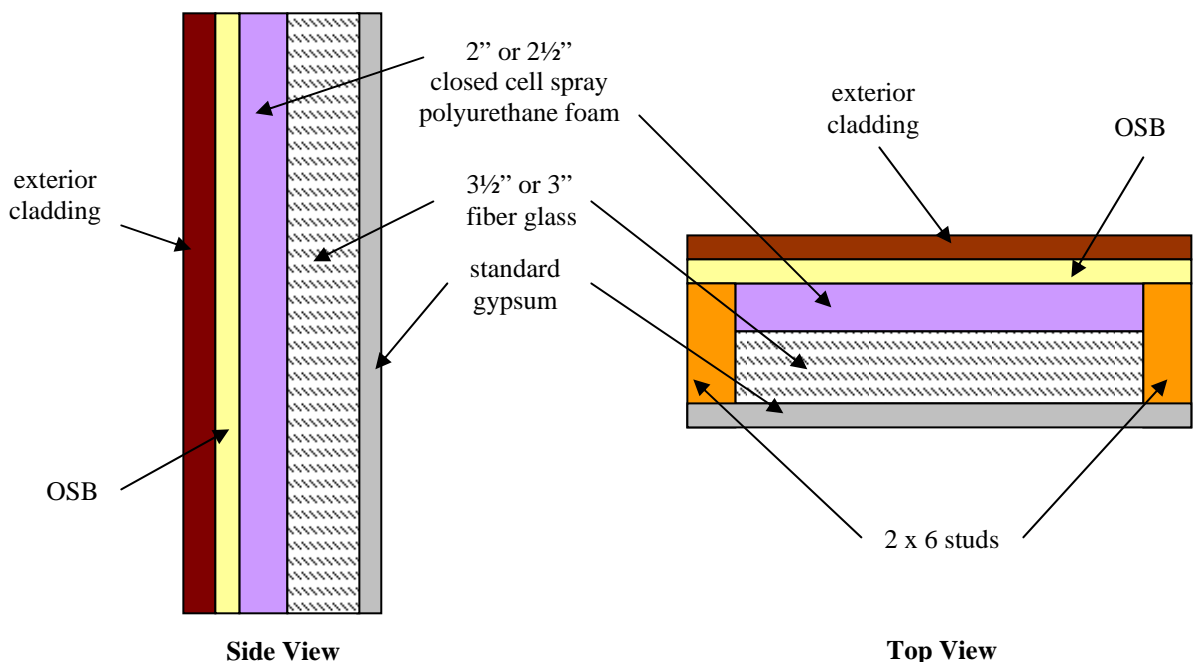
Bulletin Number: IST10-004
 Date: August 3, 2010
 Distribution: External

Johns Manville Two-Part Hybrid Closed Cell Spray Polyurethane Foam and Fiber Glass Insulation System Recommendations for Walls

Objective: This technical bulletin provides benefits and guidelines for using closed cell spray polyurethane foam and fiber glass insulation in a two-part hybrid system in various climate zones.

Background: Today's building industry understands the importance of insulating residential and commercial buildings to offset rising energy costs. Insulating the building requires not only effective thermal and acoustical building materials, but also air sealing techniques to provide an effective building enclosure. This is especially true in areas that are challenging to seal such as spaces that connect to the garage, within tub and shower enclosures, at the rim/band joist, around electrical outlets and pipes/tubing, and at building transitions such as wall-to-roof.

A two-part hybrid system that combines closed cell foam and fiber glass insulation is an effective method to combine the robust air barrier and vapor retarder of foam with the economical benefits of fiber glass. Schematics for a 2 x 6 wall cavity configuration are shown below.



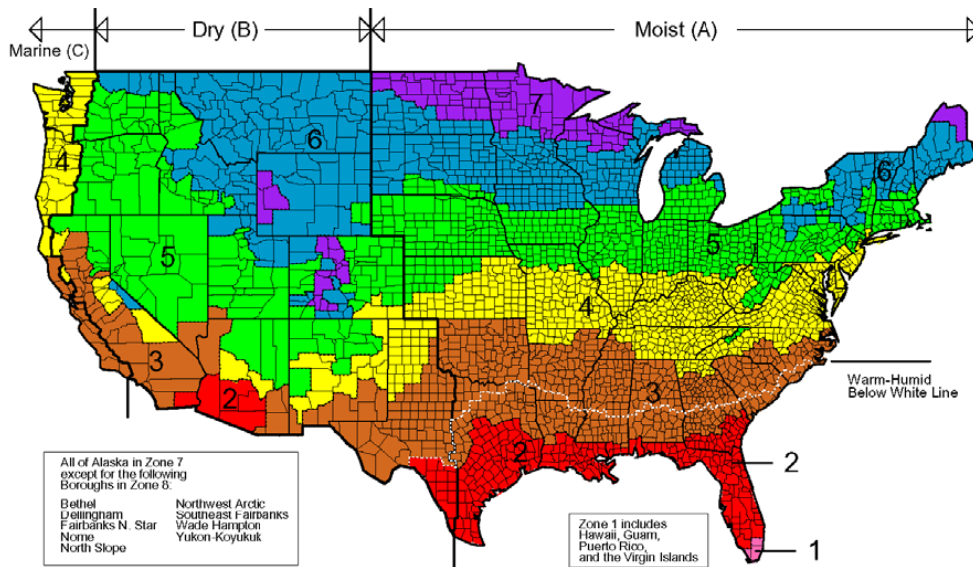
Recommended Applications: Choosing a type of insulation system within a wall cavity requires reviewing the necessary thermal and acoustical needs. In addition, building construction issues such as potential moisture related problems within the wall must be examined to ensure a long lasting structure. Johns Manville recommends a two-part hybrid system only when it is technically sound and adheres to best practices based on building science.

2 x 6 Framing: Below is a table outlining Johns Manville’s recommendations based on WUFI (a computer-based model for simulating one-dimensional heat and moisture behavior of building assemblies) analysis of several hybrid configurations in 2 x 6 stud wall cavities. The need for a vapor retarder (or not) is listed for 2” and 2½” layers of closed cell spray polyurethane foam placed against the exterior wall at the various Department of Energy climate zones. Fiber glass (batts, JM Spider®, BIBS®) fills the balance of the 5½” wall cavity and faces the interior wall. The need for a vapor retarder was determined by analyzing the time the interface between the closed cell spray polyurethane foam and fiber glass would be at greater than 99% relative humidity (condensing conditions). More than 700 total hours per year would indicate a high probability of moisture issues developing in the wall and therefore require the use of a vapor retarder.

Based on Johns Manville’s calculations, a vapor retarder is only required in Zone 6A (Minneapolis, MN) and Zone 7A (International Falls, MN) when 2” of closed cell spray polyurethane foam and 3½” of fiber glass are used in the wall cavity. No vapor retarder is required when 2½” of closed cell foam is used as the foam behaves as a sufficient vapor retarder and keeps surfaces warm enough to avoid excessive condensation in all climate zones.

DOE Zone	City	SPF/FG Configuration for 2 x 6 Construction	
		2"SPF / 3½"FG	2½"SPF / 3"FG
1A	Miami, FL	NO vapor retarder	NO vapor retarder
2A	Houston, TX	NO vapor retarder	NO vapor retarder
2B	Phoenix, AZ	NO vapor retarder	NO vapor retarder
3A	Atlanta, GA	NO vapor retarder	NO vapor retarder
3B	El Paso, TX	NO vapor retarder	NO vapor retarder
3C	San Francisco, CA	NO vapor retarder	NO vapor retarder
4A	Lexington, KY	NO vapor retarder	NO vapor retarder
4B	Albuquerque, NM	NO vapor retarder	NO vapor retarder
4C	Seattle, WA	NO vapor retarder	NO vapor retarder
5A	Detroit, MI	NO vapor retarder	NO vapor retarder
5B	Salt Lake, UT	NO vapor retarder	NO vapor retarder
6A	Minneapolis, MN	Class II smart VR REQUIRED	NO vapor retarder
6B	Casper, WY	NO vapor retarder	NO vapor retarder
7A	International Falls, MN	Class II smart VR REQUIRED	NO vapor retarder
7B	Vail, CO	NO vapor retarder	NO vapor retarder

- Wall assembly: Spunbond polyolefin building wrap, ½” OSB, ccSPF insulation, FG insulation, ½” interior gypsum board.
- When using masonry cladding such as bricks the above recommendations require standard ventilation and drainage detail.
- When using stucco cladding the above recommendations are based on use of a vapor permeable stucco system.
- The above table limitations may differ if insulating sheathing is used in place of ½” OSB.
- WUFI Model: North facing wall, “cold” year, ASHRAE 160P interior climate (criteria for moisture control design analysis in buildings), 4°F interior temperature range, heating & A/C (no dedicated dehumidification). Any deviation from the interior conditions used in the model will affect the recommendations in this bulletin.
- Kraft faced FG is a suitable product for 2” configurations that note Class II smart VR REQUIRED.
- JM Spider, BIBS, or batts (with or without a vapor retarder as noted above) can be used to fill in the cavity in addition to the closed cell foam. JM recommends the following when considering batts:
 - R13 FG batts are recommended for use with 2” of closed cell SPF.
 - R13 FG batts compressed to 3” (R11.6) are recommended for use with 2½” of closed cell SPF.
- When calculating R-value of JM Corbond III™ use 6.4 R/in.



- IECC 2006

2 x 8 Framing: Similar analysis is shown below for 2 x 8 stud wall cavities using the same model assumptions that were used in the 2 x 6 configuration. Based on the WUFI model, 3" of foam is acceptable in most conditions without a vapor retarder, although zone 7A (International Falls, MN) will require 3½" on the exterior side of the wall with fiber glass filling the balance of the 7½" cavity. Overall, additional foam is necessary compared to the 2 x 6 geometry due to the increased thermal value of the added fiber glass in the 2 x 8 configurations and higher potential for condensation issues at the foam-fiber glass interface. No vapor retarder is required when 3½" of closed cell foam is used.

DOE Zone	City	SPF/FG Configuration for 2 x 8 Construction			
		2"SPF / 5½"FG	2½"SPF / 5"FG	3"SPF / 4½"FG	3½"SPF / 4"FG
1A	Miami, FL	NO vapor retarder	NO vapor retarder	NO vapor retarder	NO vapor retarder
2A	Houston, TX	Class II smart VR REQUIRED	NO vapor retarder	NO vapor retarder	NO vapor retarder
2B	Phoenix, AZ	NO vapor retarder	NO vapor retarder	NO vapor retarder	NO vapor retarder
3A	Atlanta, GA	NO vapor retarder	NO vapor retarder	NO vapor retarder	NO vapor retarder
3B	El Paso, TX	NO vapor retarder	NO vapor retarder	NO vapor retarder	NO vapor retarder
3C	San Francisco, CA	NO vapor retarder	NO vapor retarder	NO vapor retarder	NO vapor retarder
4A	Lexington, KY	Class II smart VR REQUIRED	NO vapor retarder	NO vapor retarder	NO vapor retarder
4B	Albuquerque, NM	NO vapor retarder	NO vapor retarder	NO vapor retarder	NO vapor retarder
4C	Seattle, WA	Class II smart VR REQUIRED	NO vapor retarder	NO vapor retarder	NO vapor retarder
5A	Detroit, MI	Class II smart VR REQUIRED	Class II smart VR REQUIRED	NO vapor retarder	NO vapor retarder
5B	Salt Lake, UT	Class II smart VR REQUIRED	NO vapor retarder	NO vapor retarder	NO vapor retarder
6A	Minneapolis, MN	Class II smart VR REQUIRED	Class II smart VR REQUIRED	NO vapor retarder	NO vapor retarder
6B	Casper, WY	Class II smart VR REQUIRED	NO vapor retarder	NO vapor retarder	NO vapor retarder
7A	International Falls, MN	Class II smart VR REQUIRED	Class II smart VR REQUIRED	Class II smart VR REQUIRED	NO vapor retarder
7B	Vail, CO	Class II smart VR REQUIRED	NO vapor retarder	NO vapor retarder	NO vapor retarder

- Using a Class II smart vapor retarder at the interior side of the wall cavity with 2" of spray foam and 5½" of fiber glass is acceptable and will not result in condensation issues between the foam and faced fiber glass.
- Kraft faced FG is a suitable product for scenarios that note Class II smart VR REQUIRED.
- JM Spider, BIBS, or batts (with or without a vapor retarder as noted above) can be used to fill in the cavity in addition to the closed cell foam. JM recommends the following when considering batts:
 - R19 FG batts are recommended for use with 2" of closed cell SPF.
 - R19 FG batts compressed to 5" (R16.3) are recommended for use with 2½" of closed cell SPF.
 - R19 FG batts compressed to 4½" (R15.3) are recommended for use with 3" of closed cell SPF.
 - JM Spider or BIBS is recommended for use with 3½" of closed cell SPF due to product availability.

Other Framing Depths: It is often not economically practical to insulate 2 x 4 walls with hybrid systems. However, for specific questions on acceptable designs for wall thicknesses other than those in this bulletin, please contact your JM representative.

Summary: Using a two-part hybrid system comprising of closed cell spray polyurethane foam and fiber glass is an effective and economical method of air sealing and insulating residential and commercial buildings. However, a thorough analysis should always be completed to ensure no problems such as condensation will occur within the wall due to the limitations of the foam and fiber glass combination within a specific climate zone or wall assembly.