

JOHNS MANVILLE TWO-PART HYBRID CLOSED CELL SPRAY POLYURETHANE FOAM AND FIBERGLASS INSULATION SYSTEM RECOMMENDATIONS FOR WALLS

OBJECTIVE

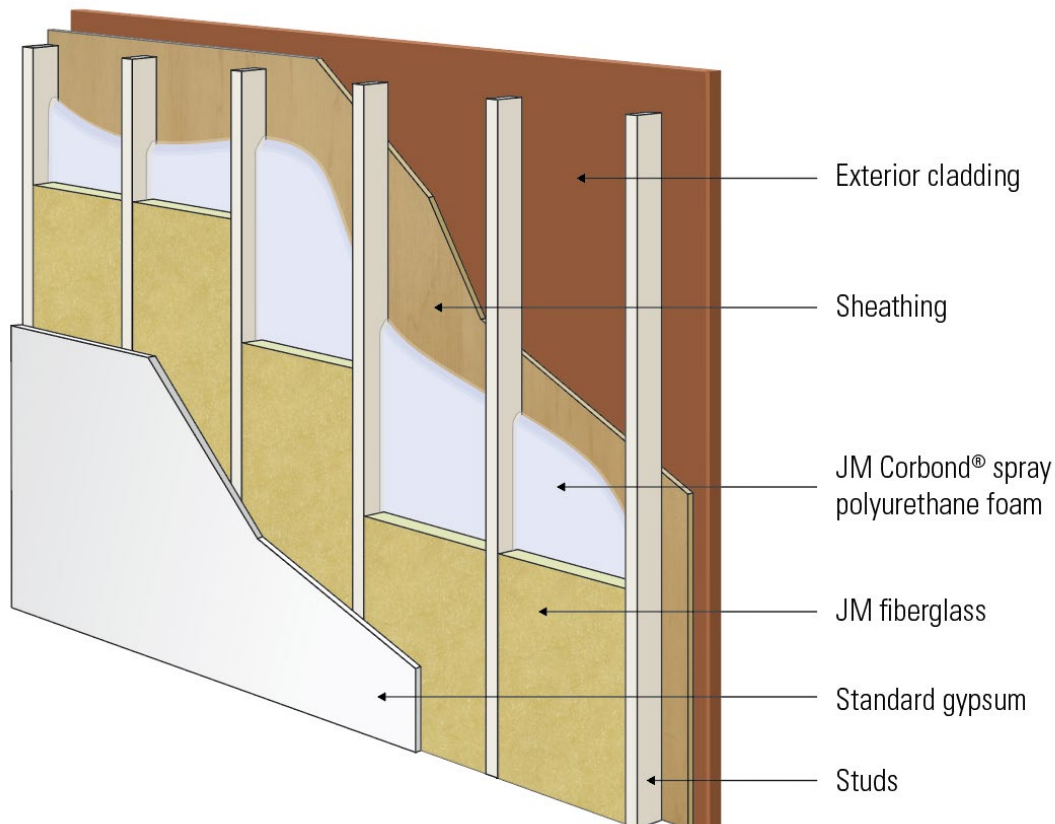
This technical bulletin describes benefits and guidelines for using closed cell spray polyurethane foam (SPF) and fiberglass insulation in a two-part hybrid system for walls in various climate zones.

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 insulation, 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 unfaced fiberglass insulation is an effective method to combine the robust thermal, air-sealing, and vapor retarder performance of spray foam with the economic benefits of fiberglass.

A hybrid insulation system is simply one that combines closed-cell spray polyurethane foam, usually between 1" and 2" thick, with the remainder of the framing cavity filled with fiberglass. The fiberglass can be a blow-in system, such as Johns Manville Spider® Plus or Climate Pro® BIBS®, or it can be JM Formaldehyde-free™ fiberglass batts.



RECOMMENDED APPLICATIONS

Choosing a hybrid insulation system requires reviewing the necessary thermal needs, as well as addressing issues like condensation control, 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.

The 2015 International Building Code and International Residential Code each address the need for certain types of vapor retarders in wall assemblies in certain climate zones. These codes also provide insulation options to manage condensation risks, which then allow the use of a Class III vapor retarder (typically latex paint), rather than Class I or II vapor retarder materials. The Spray Polyurethane Foam Alliance (SPFA) has also published a more generalized guidance, based on the ratio of SPF R-value to total R-value. Requirements from the codes and recommendations from SPFA are summarized in the table below. A map of U.S. energy code climate zones is also below for reference.

INSULATION FOR CONDENSATION CONTROL

Climate Zone	Minimum R-value of Air-Impermeable Insulation		Minimum Ratio of SPF R-Value / Total R-value (%) ^b
	2x4 Walls ^a	2x6 Walls ^a	
4C	R-2.5	R-3.75	35%
4A, 4B	n/a	n/a	40% (4A), 35% (4B)
5	R-5	R-7.5	40% (5A), 35% (5B)
6	R-7.5	R-11.25	50%
7	R-10	R-15	60%
8	R-10	R-15	60%

a. Contributes to, but does not supersede, thermal resistance requirements for wall assemblies in International Energy Conservation Code.

b. SPFA-147 Spray Polyurethane Foam for Hybrid Insulation Systems - Part 2: Climate Zones 4-7

U.S. ENERGY CODE CLIMATE ZONES

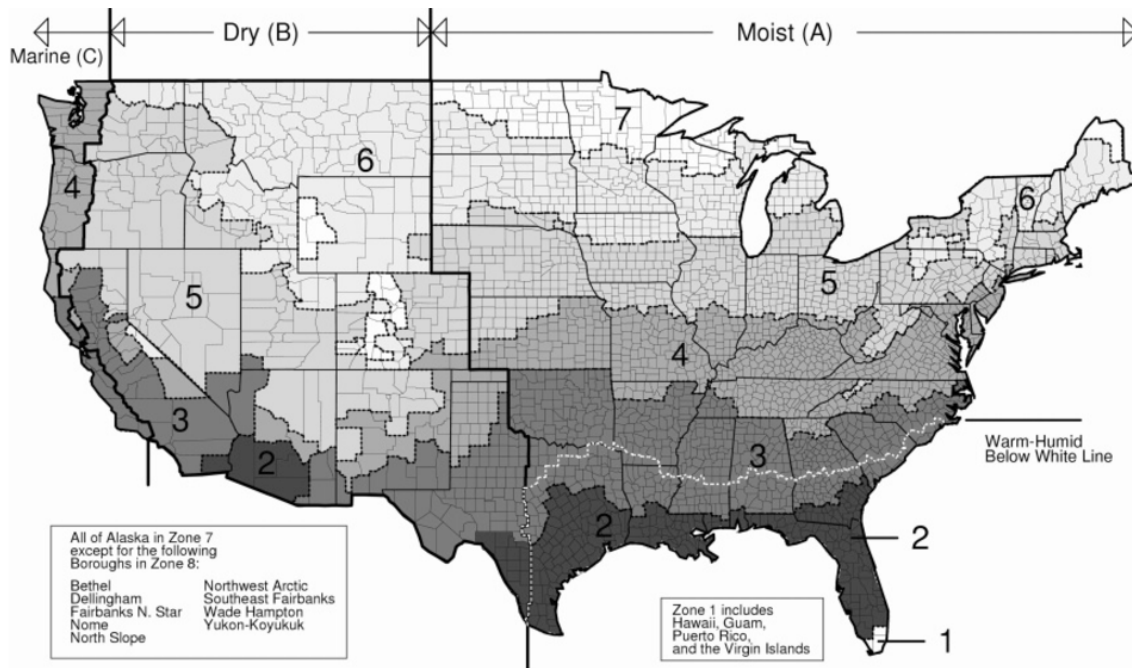


Figure 301.1
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JOHNS MANVILLE RECOMMENDED HYBRID SOLUTIONS

The tables below describe recommended hybrid insulation solutions, combining JM Corbond III® spray foam with JM Formaldehyde-free™ fiberglass batts, Climate Pro® BIBS®, or Spider® Plus products. All of the recommended solutions below comply, where applicable, to the requirements in the 2015 codes for condensation control and energy efficiency. Additionally, all the solutions presented have been analyzed for moisture performance using WUFI software (a computer-based model for simulating heat and moisture behavior of building assemblies). The following solutions focus on using between 1" and 2" of SPF towards the exterior of the framing cavity, with the balance filled with some form of fiberglass, to deliver the most cost-effective hybrid solution.

JM HYBRID SOLUTIONS FOR 2X4 WALLS¹

Spray Foam Thickness & R-value ²	Cavity Insulation Type ³	Cavity Insulation Thickness & R-Value ^{4,5}	Total Cavity R-Value	System U-factor ⁶
1", R-7	R-11 FG batts	2½", R-8.9	15.9	0.080
1", R-7	R-13 FG batts	2½", R-10.2	17.2	0.076
1", R-7	Spider Plus / Climate Pro BIBS	2½", R-10.5	17.5	0.076
1½", R-10.5	R-11 FG batts	2", R-7.8	18.3	0.073
1½", R-10.5	R-13 FG batts	2", R-8.8	19.3	0.070
1½", R-10.5	Spider Plus / Climate Pro BIBS	2", R-8.4	18.9	0.071
2", R-14	Spider Plus / Climate Pro BIBS	1½", R-6.3	20.3	0.067

Similar analysis is shown below for 2x6 stud wall cavities using the same assumptions that were used in the 2x4 configuration. Overall, the additional foam is necessary compared to the 2x4 geometry due to the increased thermal value of the added cavity insulation in the 2x6 configurations and higher potential for condensation issues at the foam-cavity insulation interface. Below is a table showing possible hybrid assemblies for 2x6 walls.

JM HYBRID SOLUTIONS FOR 2X6 WALLS¹

Spray Foam Thickness & R-value ²	Cavity Insulation Type ³	Cavity Insulation Thickness & R-Value ^{4,5}	Total Cavity R-Value	System U-factor ⁶
1", R-7	R-19 FG batts	4½", R-15.2	22.2	0.061
1½", R-10.5	R-19 FG batts	4", R-14.2	24.7	0.058
1½", R-10.5	Spider Plus / Climate Pro BIBS	4", R-16.8	27.3	0.055
2", R-14	R-13 FG batts	3½", R-13	27	0.055
2½", R-17.5	R-13 FG batts	3", R-11.6	29.1	0.052
2½", R-17.5	Spider Plus / Climate Pro BIBS	3", R-12.6	30.1	0.051
4", R-28	Spider Plus / Climate Pro BIBS	1½", R-6.3	34.3	0.045

It is important to note that not all of the solutions listed above are appropriate for all climate zones. Some systems may require additional continuous insulation to meet energy code requirements, and some may also require a Class II vapor retarder (e.g. kraft-facing) to manage condensation risks. However, hybrid systems should ideally be selected so as to not require an additional vapor retarder.

The examples above do not represent all possible hybrid combinations. JM Corbond MCS spray foam could be used instead of Corbond III, which would slightly change the required thickness of SPF. Deeper wall framing, from larger lumber or staggered-stud systems, or for cathedral ceilings, or floors, all present a wide array of possible product combinations, that can all result in effective hybrid systems. 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.

1. Comply with local building and energy codes when selecting hybrid system solutions.
 2. Spray foam R-values based on JM Corbond® III values of R-7 at 1" thickness.
 3. Consult Johns Manville for assemblies using alternate cavity insulation

4. Fiberglass batt R-values take into account compression when appropriate.
 5. JM Spider Plus R-values based on 1.8pcf density.
 6. U-factors are given in units of Btu/ft²·hr·°F, and assume 16" o.c. framing spacing.

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Technical specifications as shown in this literature are intended to be used as general guidelines only. The physical and chemical properties of the insulation listed herein represent typical, average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. The properties are based on using appropriate spray foam application equipment settings for mixing, temperature and pressure. They are supplied as a technical service and are subject to change without notice. Any references to numerical flame-spread or smoke-developed ratings are not intended to reflect hazards presented by these or any other materials under actual fire conditions. Check with the sales office nearest you for current information. All Johns Manville products are sold subject to Johns Manville's Limited Warranty and Limitation of Remedy. For a copy of the Johns Manville Limited Warranty and Limitation of Remedy or for information on other Johns Manville thermal and acoustical insulation and systems, call the 800 number or write to the address above.