

TECHNOTE

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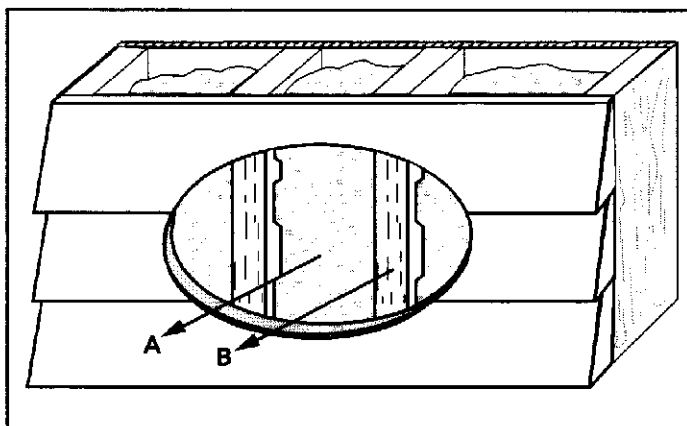
Most "R-19 Walls" Are Not R-19

STYROFOAM® Brand Insulation in frame wall sheathing applications

Only the wall cavities are R-19. The other 25% is uninsulated. It's the framing. Result: An R-19 wall is really an R-16 wall.

That's why you need STYROFOAM® brand insulating sheathing – to block that framing loss. In fact, an inch of STYROFOAM will reduce the framing loss by 32% in the wall construction shown. That's a major saving. And here's the calculation to prove it. With OSB sheathing the U-value through the framing is 0.105 (1/9.56); with 1" STYROFOAM it's only 0.071 (1/13.99). That's a 32% saving in heat loss through the framing.

Here's proof. In the illustration of a 2"x6" stud wall, the heat flow through the cavity (A) is quite low, since the cavity is well insulated.



On the other hand, the heat flow through the stud (B) is quite high, since the stud is not insulated. When noninsulating sheathings such as plywood or OSB are used, the R-value through the framing is less than half the insulation value through the cavity. So it's not surprising that a lot of heat escapes through the framing.

When the heat losses through the high-R cavity (20.68) and the low-R framing (9.56) are added together, the effective R-value of the total wall drops to R-16 – a drop of 23%. That's why most R-19 walls are not R-19!

When you then compare the heat loss through the framing with the total wall heat loss (0.0262/0.0625), you discover that 42% of the wall heat loss in this typical 2"x6"

stud wall is escaping directly through the framing!

Wall Component	R-Value Through Cavity A	R-Value Through Framing B
Inside Air Film	0.68	0.68
1/2" Interior Gypsum	0.45	0.45
2"x6" Wood Stud (16" o.c.)	—	6.88
Fiberglass Batt (6.5" compressed to 5.5")	18.00†	—
7/16" OSB	0.57	0.57
Wood Siding	0.81	0.81
Outside Air Film	0.17	0.17
Total R-Values	20.68	9.56
U-Values (=1/R-value)		
Area Weighting	0.0484	0.105
Cavity 75%, Framing 25%	x 0.75	x 0.25
	0.0363	+ 0.0262
Effective U-Value	0.0625	
Effective R-Value (1/U)	16.0	

† "R-19" Batts are manufactured up to 6.75" thick. When compressed into a 5.5" wall cavity, their R-19 value is reduced to between R-17 and R-18.



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Effective R-Value Calculations

Framing	Stud Spacing	Framing Area	Fiberglass Batts	STYROFOAM* Brand Insulation R-5.0 (1")	STYROFOAM* Brand Insulation R-3.0 (nom. 1/2")	3/16" OSB R-0.57	1/2" Plywood R-0.62	1/2" Wood Fiberboard R-1.32
2"x4"	16" o.c.	25%	R-11	15.8	13.7	11.1	11.1	11.9
2"x4"	24" o.c.	22%	R-11	16.1	14.0	11.3	11.4	12.2
2"x4"	16" o.c.	25%	R-13	16.9	14.8	12.0	12.1	12.9
2"x4"	24" o.c.	22%	R-13	17.3	15.1	12.3	12.4	13.2
2"x4"	16" o.c.	25%	R-15	18.0	15.7	12.8	12.9	13.8
2"x4"	24" o.c.	22%	R-15	18.4	16.1	13.3	13.3	14.2
2"x6"	16" o.c.	25%	R-18	20.9	18.8	16.0	16.1	16.9
2"x6"	24" o.c.	22%	R-18	21.4	19.2	16.5	16.5	17.3
2"x6"	16" o.c.	25%	R-21	22.4	20.2	17.3	17.4	18.2
2"x6"	24" o.c.	22%	R-21	23.0	20.7	17.9	17.9	18.8

The effective R-value of a wall is its *real* R-value, an average of the low heat flow through the cavity area and the high heat flow through the framing area. The effective R-value reflects how your homes will actually perform under heating and cooling conditions.

In the illustration on the front, the cavity R-value had to be discounted 23% to match its effective R-value. For your

HVAC contractor to calculate heat loss and gain correctly, supply him with accurate, effective R-values.

Refer to the table, which shows the effective R-values with different combinations of construction materials. **Note from the highlighted R-values that a 2"x4" wall with R-13 batts and 1"-STYROFOAM brand insulating sheathing has a higher effective**

R-value than a 2"x6" wall with R-19 batts and noninsulating 3/16" OSB sheathing. In addition, STYROFOAM greatly reduces air infiltration.

Compare your construction costs for these two walls. Most builders find the 2"x4" wall less costly—also, more familiar to framing crews.

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WARNING: STYROFOAM brand insulation products are combustible and may constitute a fire hazard if improperly used or installed. Consult Dow for further information. The material contains a flame retardant additive to inhibit accidental ignition from small fire sources. During shipping, storage, installation and use, these products should not be exposed to open flame or other ignition sources.

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