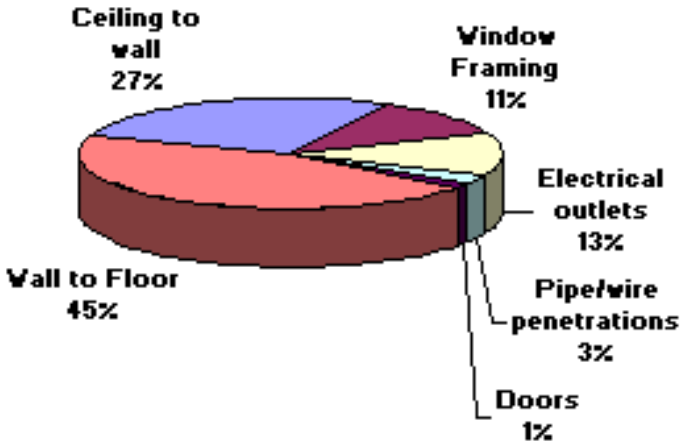
Studies Show Wall Cavity Insulation Impacts Less Than 2% of Total Home Air Infiltration

It has been suggested that certain types of wall cavity insulation provide superior performance to the labeled R-value of the insulating product due to a reduction in air infiltration. Results of independent third party field testing[1] by several reputable organizations have shown that wall cavity insulation has a negligible effect on the air infiltration of the building and that less than 2% of the total house air infiltration could potentially be influenced with cavity insulation[2]. These studies have shown that air infiltration though the walls of residential buildings is approximately 14%[2,3] of the total infiltration in the average home. The largest component of air infiltration through walls is at ceiling and floor interfaces (72 to 83%)[3]. A much smaller percentage of the air infiltration occurs through the wall at penetrations (3%) and electrical boxes (13%) representing **only 1.4 to 1.6% of the total infiltration of the entire building**. The majority of these studies conclude that the type of insulation used in a wall cavity has very little impact on reducing air infiltration. Refer to Chart One (below) for more information regarding contributions of wall infiltration paths.

Chart One: Air Infiltration Paths for Unsealed Framed Wall Cavities[3].



Furthermore, comparisons of air flow testing through fiber glass and cellulose demonstrate that neither material significantly resists air movement to the degree that it would be effective in reducing air infiltration or be considered an air barrier or vapor retarder[4]. Even though cellulose has a higher resistance to air flow than fiber glass, the small amount of air infiltration through the insulation is trivial with regard to the entire assembly. Differences with regard to air flow between the fibrous cavity materials are considered negligible and it can not be assumed that either product has a measurable advantage with regard to air infiltration. Also, houses insulated with low density polyurethane foam did not, on average, outperform fiber glass insulated houses.

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[1] National Association of Home Builders "Field Demonstration of Alternative Wall Insulation Products." January 1998
[2] G.K. Yuill, Ph.D "A Field Study pf the Effect of Insulation Types on the Air Tightness of Houses" January 1997
[3] Colliver, D.G. Evaluation of the techniques for the measurement of air leakage of building components. Final report of ASHRAE Research Project RP 438, University of Kentucky, Lexington. See example on following page for more information.
[4] National Research Council of Canada, Internal Report Internal Report IRC-IR-693 *"Sound Transmission Through Gypsum Board Walls: Sound Transmission Results"* October 1995

Controlling air infiltration in buildings is certainly an important consideration, as it has been shown to reduce energy consumption by as much as 35% while reducing the potential for moisture, dust, noise and pollution entry into the building. Good air infiltration control involves a properly balanced air distribution system and various measures to avoid gaps in the structure. As far as building materials, the studies referenced above demonstrate that the use of a correctly installed air barrier, caulks, and foams to reduce air infiltration has a much larger impact than the type of insulation used within the wall cavity (refer to Table One and Chart Two).

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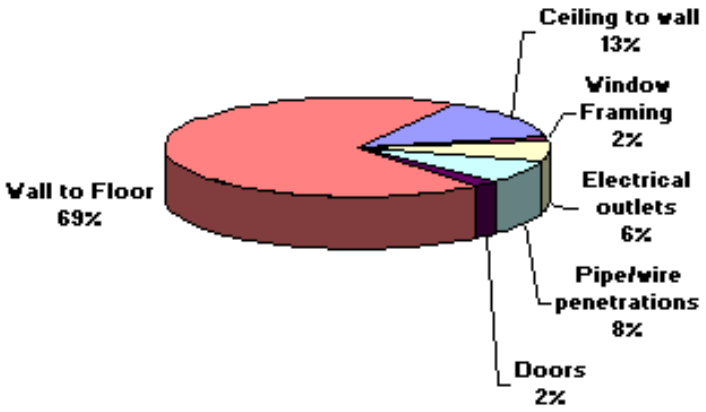
Table One: Air Infiltration Example Based on ASHRAE Method for Estimating Air Infiltration[5]

Infiltration Path	Metric	Typical Values[5]	Unsealed	Area (in^2)	% of Total	Sealed	Area (in^2)	% of Total
Wall to Bottom Plate	LFTC*	264 feet	0.2	52.80	45	.04	10.56	70
Ceiling to wall	LFTC*	264 feet	0.12	31.68	27	0.0075	1.98	13
Window framing	$in.^2/ft^2$	340 ft^2	0.039	13.26	11	.0007	0.24	2
Electrical outlets	$in.^2$/outlet	40 outlets	0.38	15.20	**13**	.023	0.92	**6**
Pipe/Plumbing/Wire penetrations	$in.^2$ per penetrate	4 penetrate	0.9	3.60	**3**	0.3	1.20	**8**
Doors	$in.^2/ft^2$	3 @ 22.5 ft^2	0.024	1.62	1	.004	0.27	2
Diffusion					<1%			<1%
Totals				118.16	100		15.17	100

*LFTC – Lineal Foot of Total Crack

Chart Two: Air Infiltration Paths for Sealed Framed Wall Cavities



[5] Based on 2 story National Association of Home Builders (NAHB) average house of 2272 ft^2, 8 ½ foot wall height, assumes 1 electrical outlet ever 6 lineal feet, 19 windows at 15% of total wall area and 3 exterior doors 3' wide.