

INTERIOR STRAPPING WALL CONSTRUCTION

INTERIOR STRAPPING WALL CONSTRUCTION DETAILS (Wall 3)¹

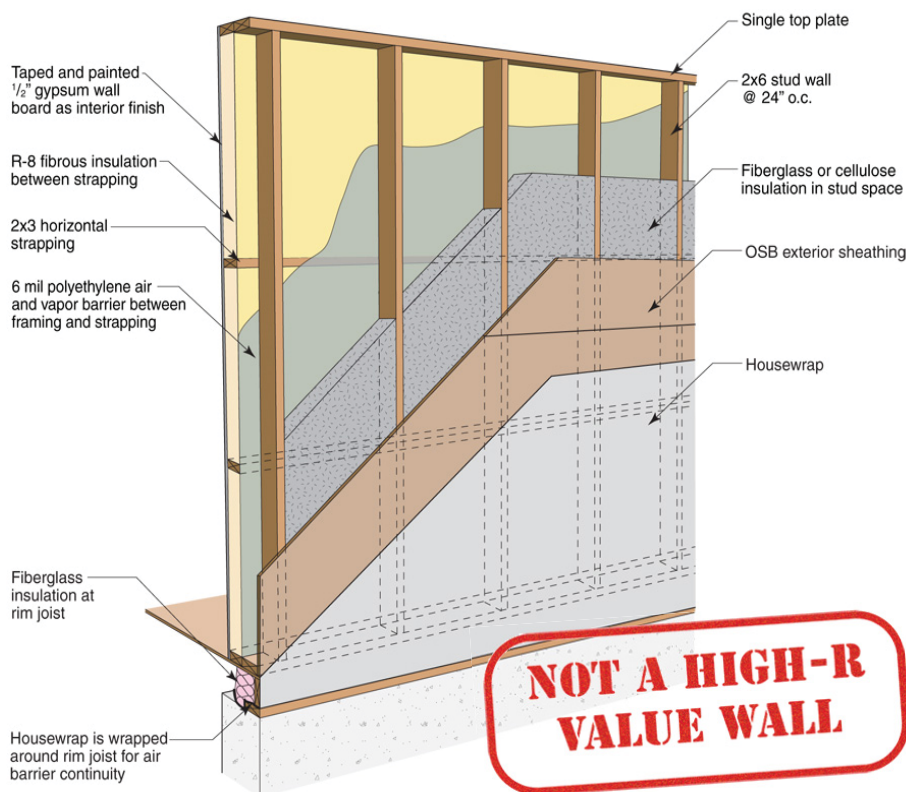
- 2x6 advanced framing
- 2x3 horizontal strapping
- Fibrous insulation between strapping
- 6 mil polyethylene air & vapor barrier
- Fiberglass or cellulose cavity insulation in stud space
- OSB exterior sheathing
- Housewrap

SCORING: How It Rates

The scoring of each wall system is based on the following five categories. A score of 1 is the lowest score in each category and represents the worst possible technology for each category or highest possible relative cost. A score of 5 is the highest score available in each category, and is representative of the best available technology available on the market or lowest relative cost.

Thermal Control	3
Durability	3
Buildability	3
Cost	4
Material Use	4
Total	17

Interior strapping in wall construction does increase the R-value over standard construction, but does not address thermal bridges at the rim joist, top plate or bottom plate. The minimal increases in whole wall R-value over standard construction may not be justified by the increased materials, cost and complexity of this wall system.



INTRODUCTION

This overview summarizes interior strapping wall construction including the advantages and disadvantages of this construction strategy. A more detailed analysis and direct comparison to several other walls can be found online.¹ The scoring system is subjective based on the relative performance and specifications between different wall systems. Complex two dimensional heat flow analysis and one dimensional hygrothermal modeling were used to determine moisture related durability risks for analysis.

For a more complete analysis of this and other wall constructions, go to www.buildingscience.com.

THERMAL CONTROL

Installed Insulation R-value: There is a range of installed insulation R-values in commercially available fiberglass batts. The installed insulation R-value for 2x6 fiberglass batt ranges between R-19 and R-21 for the framed portion of this wall, the strapped interior section is typically R-8 fiberglass insulation. When blown or sprayed cellulose insulation is used, the R-value is typically R-20 for 2x6 walls.

Whole-wall R-value: Using two dimensional heat flow analysis with thermal bridging effects and average framing factors, this wall construction achieves a whole wall R-value of approximately R-21.5.¹ Adding horizontal strapping to the interior surface helps minimize the thermal bridges through the stud wall, but there are still thermal bridges at the top plate, bottom plate and rim joist that decrease the installed insulation R-value.

Air Leakage Control: Fiberglass batt, and both blown and sprayed cellulose are air permeable materials allowing possible air paths between the interior and exterior as well as convective looping in the insulation. Although densepack cellulose has less air permeance it does not control air leakage.²

Typical Insulation Products: Fiberglass batt, blown fiberglass, blown cellulose, sprayed cellulose.

DURABILITY

Rain Control: Rain leakage into the enclosure is the leading cause of premature building enclosure failure. Rain control is typically addressed using a shingle lapped and/or taped drainage plane such as building paper or a synthetic WRB (i.e. homewrap). Intersections, windows, doors and other penetrations must be drained and/or detailed to prevent the penetration of rain water beyond the drainage plane.³

Air Leakage Control: Air leakage condensation is the second largest cause of premature building enclosure failure with this type of wall construction. It is very important to control air leakage to minimize air leakage condensation durability issues. An air barrier is required in this wall system to ensure that through-wall air leakage is eliminated (ideally) or at least minimized. An air barrier should be stiff and strong enough to resist wind forces, continuous, durable, and air impermeable.⁴

Often the polyethylene vapor barrier will be constructed as the air barrier even though it is not stiff or strong enough to resist wind forces. If the polyethylene is installed between the stud wall and the interior strapping, there will be fewer holes made for electrical and plumbing services, and can be made more airtight than in standard construction.

Air need not leak straight through an assembly to cause moisture problems; it can also leak from the inside, through the wall, and back to the inside; or it can leak from the outside, through the wall, and back to the outside. Condensation within the studspace is possible if this type of airflow occurs, depending on the weather conditions. Hence, wall designs should control airflow into the studspace.⁵

Vapor Control: Fiberglass and cellulose are highly vapor permeable materials, so a separate vapor control strategy must be employed to ensure that vapor diffusion does not result in condensation on, or damaging moisture accumulation in, moisture sensitive materials. The permeance and location of vapor control is dependent on the climate zone. Installing the vapor control layer in the incorrect location can lead to building enclosure failure.⁶

Drying: Cellulose and fiberglass insulation allow drying to occur relatively easily, so drying is controlled by other more vapor impermeable enclosure components such as the vapor barrier and OSB sheathing. Installing vapor control on both sides will seal any moisture into the stud space, resulting in low drying potential, and possibly resulting in moisture-related durability risks. Ventilation behind vapor impermeable claddings and interior components (e.g. kitchen cabinets) can encourage drying.

Built-in Moisture: Care should always be taken to build with dry materials where possible, and allow drying of wet materials before close in. Cellulose is often sprayed in damp, and manufacturers recom-

mend drying before close in and moisture content limits. If a polyethylene vapor barrier is installed with relatively vapor impermeable OSB sheathing, drying could be slow if built-in moisture is present.

Durability Summary: The primary durability risks associated with these wall assemblies involve moisture damage related to rain water penetration or condensation (most likely the result of air leakage, but also potentially the result of vapor diffusion).

Cellulose insulated walls are slightly more durable because cellulose insulation is capable of storing and redistributing small amounts of moisture. Cellulose insulation is typically treated with borates which have been shown to protect itself and neighbouring wood material from mold growth and decay. Cellulose insulation also has decreased flame spread potential relative to other insulation materials.

BUILDABILITY

This type of construction is a modification of standard construction, but is not common, and construction trades may have difficulty with some of the detailing. All window and door penetrations will require plywood box frames to pass through both the interior strapping and exterior framing. If the poly is installed properly between the stud wall and interior strapping, there is decreased risk of moisture related durability issues often caused by penetrations such as electrical and plumbing.

COST

There will be increased costs over standard construction due to an increase in framing material, and complexity for construction, since this is not a standard construction technique. Costs vary tremendously from region to region.

MATERIAL USE

Using advanced framing will reduce redundant wood framing in the wall, but overall framing still increases for the interior strapping. Cellulose has a significantly lower embodied energy than fiberglass or rockwool.

TOTAL SCORE

Interior strapping in wall construction does increase the R-value over standard construction, but does not address thermal bridges at the rim joist, top plate or bottom plate. The minimal increases in whole wall R-value over standard construction may not be justified by the increased materials, cost and complexity of this wall system. Many higher performance designs for wall construction exist.

REFERENCES

- 1 Straube, J., & Smegal, J. (2009). *Building America Special Research Project - High-R Walls Case Study Analysis*. Retrieved from buildingscience.com.
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- 4 Lstiburek, J. (2008, 08 20). *BSD-104: Understanding Air Barriers*. Retrieved from buildingscience.com.
- 5 Straube, J. (2009, 04 22). *BSD-014 Air Flow Control in Buildings*. Retrieved from buildingscience.com.
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