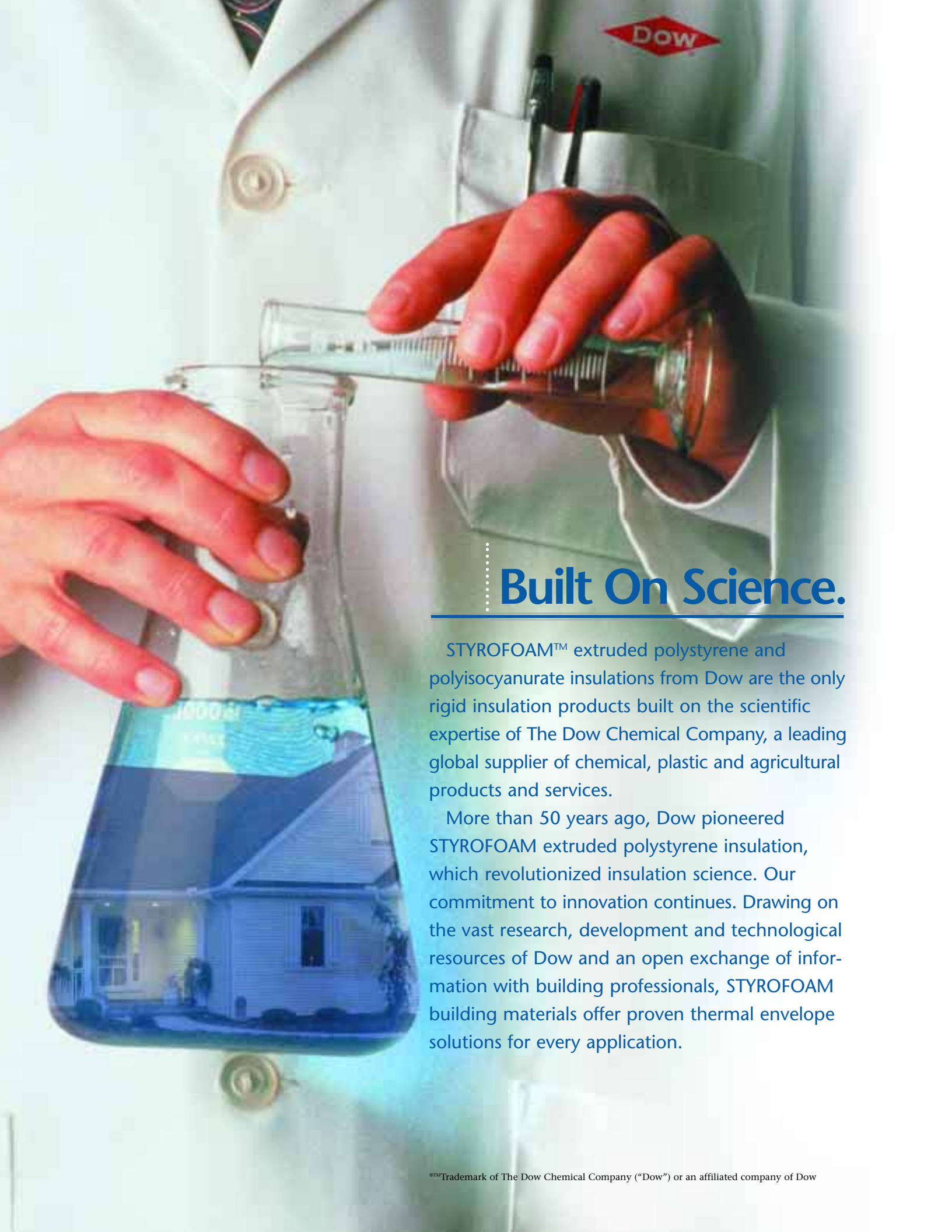




Why You Should Use Insulated Sheathing.

There is a science to adding value.





Built On Science.

STYROFOAM™ extruded polystyrene and polyisocyanurate insulations from Dow are the only rigid insulation products built on the scientific expertise of The Dow Chemical Company, a leading global supplier of chemical, plastic and agricultural products and services.

More than 50 years ago, Dow pioneered STYROFOAM extruded polystyrene insulation, which revolutionized insulation science. Our commitment to innovation continues. Drawing on the vast research, development and technological resources of Dow and an open exchange of information with building professionals, STYROFOAM building materials offer proven thermal envelope solutions for every application.

Within Every Great Home Is Great Science.

No matter how well you build your home, it isn't complete until you add a layer of rigid foam insulation from Dow. STYROFOAM extruded polystyrene and polyisocyanurate insulations from Dow provide the scientific footing to help solve the energy and moisture issues that can compromise building performance.

Above-grade walls and the roof make up the largest and most visible portion of a home. And there are two major issues homes face in every climate: energy loss and moisture.



Insulated sheathing from Dow Building & Construction helps reduce energy loss and control moisture to optimize the structure's performance and add value for builders and homeowners.

Depend on the insulation science expertise of Dow to help you build more value into your homes.



A microscopic view of rigid foam insulation reveals millions of closed cells that effectively trap air.



Styrofoam INSIDE INSULATION

To insulate is to reduce the transfer of heat. Insulations are formed by trapping air in a material. But not all insulating materials are created equal. The more compartments of air across a given span of material, the greater the thermal resistance, or R-value**.

Insulated sheathings from Dow contain about a million tiny pockets of trapped air in every cubic inch of material. Proprietary formulations and manufacturing processes ensure that these cells are closed, which enables the insulation to resist moisture and maintain R-value.

An insulation's performance is greatly reduced when the trapped air is able to circulate or move freely within the insulation material. This happens primarily through convective air movement. Insulation performance is also reduced when the trapped air is displaced, which can happen through compression or moisture uptake.

Rigid foam insulation from Dow has a closed-cell structure. Air can't infiltrate or circulate within the boards, and they resist moisture. So the trapped air stays trapped ... and the insulating value remains high.

** R means resistance to heat flow. The higher the R-value, the greater the insulating power.



87% of homeowners rank energy efficiency as their most important upgrade.

Home heating and cooling payments are the largest costs for families after the mortgage.

Stop Energy Loss.

After the mortgage, home heating and cooling payments represent the largest portion of most household budgets. So it isn't surprising that 87 percent of homeowners rank energy efficiency as their most important upgrade. In fact, 28 percent are willing to spend an extra \$2,500 for energy improvements, and 27 percent would invest \$5,000^{††}. With insulated sheathing from Dow Building Materials, you can offer your customers a value-added and cost-effective solution to energy loss. And insulating goes a long way toward

conserving precious natural resources for future generations.

STYROFOAM extruded polystyrene and polyisocyanurate insulations from Dow cover the entire wall to help alleviate the conditions that lead to energy loss, including:

- moisture intrusion
- air infiltration
- thermal bridging through wood framing
- air convection in the wall cavity
- wood frame and mechanical detailing that reduce the amount of cavity insulation



THE RIGHT PRODUCT FOR THE JOB

When it comes to insulation, one size doesn't fit all. Different parts of a structure require insulating materials that offer different performance characteristics. That's why Dow offers a variety of insulation products with different properties.

STYROFOAM extruded polystyrene insulation combines exceptional moisture resistance with long-term, stable R-values. Polyisocyanurate insulation from Dow also offers high R-values, with special laminated facers that enhance resistance to moisture and damage. And insulation accessories, like STYROFOAM Sill Seal foam gasket and All-Purpose Tape, add to a home's energy efficiency.

Above grade or below, inside and outside, Dow offers the broadest array of rigid foam insulation and accessories to fit the specific needs of the builder, regardless of climate conditions.



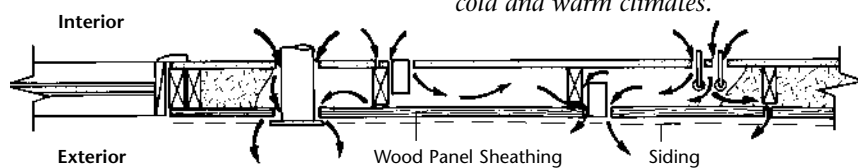
^{††}Based on a 2000 survey by Cahners Residential Group and HousingZone.com

Air Infiltration

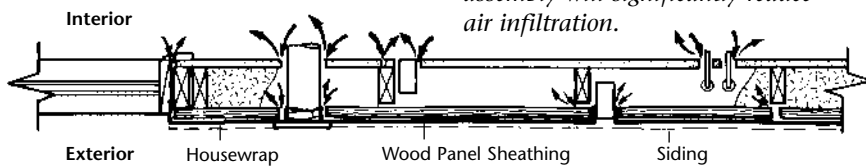
Air infiltration is the largest single cause of heat loss in most homes, accounting for 38 percent of energy loss. According to a study conducted by The Ohio State University⁸, STYROFOAM extruded polystyrene insulation reduced air infiltration by 30 percent compared to an identical home sheathed with fiberboard.

⁸“Energy Usage Comparisons of Identical, Non-Inhabited Residential Homes with Two Types of Insulation and a Program Simulation of the Required Heating Loads,” The Ohio State University Department of Mechanical Engineering Environmental Control Group

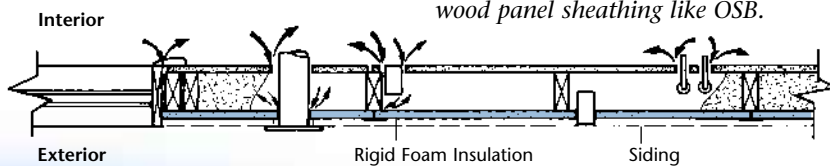
Wood panel sheathing, like OSB, leaks air through the wall system in cold and warm climates.



Adding housewrap to the wall assembly will significantly reduce air infiltration.



Using rigid foam insulation directly over the studs reduces air infiltration better than housewrap over wood panel sheathing like OSB.



BASIC PHYSICS

Nature always tries to equalize. Air at higher pressure tries to move to areas of lower air pressure. Wind outside of a house and the operation of its mechanical heating and cooling equipment can create pressure differences between the inside and the outside of a home. These air pressure differences cause air movement between the inside and the outside of a house.

Water vapor is the same way. It moves from areas of high concentration to areas of low concentration. Since warm air holds more moisture than cold air, water vapor tends to be found moving from warm areas to cooler areas. As it moves through wall or roof areas, this water vapor may meet a surface whose temperature is lower than its dew point. This can result in condensation accumulating in the cavity, compromising the performance of the cavity insulation and causing unseen damage to drywall, wood framing and OSB or plywood sheathing.

The two basic laws of physics to remember when insulating a home:

- Air moves from high pressure to low pressure, even through the walls and roof of your house.
- Moisture moves from high concentration to low concentration, including through the walls and roof of the house.

STYROFOAM rigid foam insulation can reduce these flows to save money and reduce moisture problems.

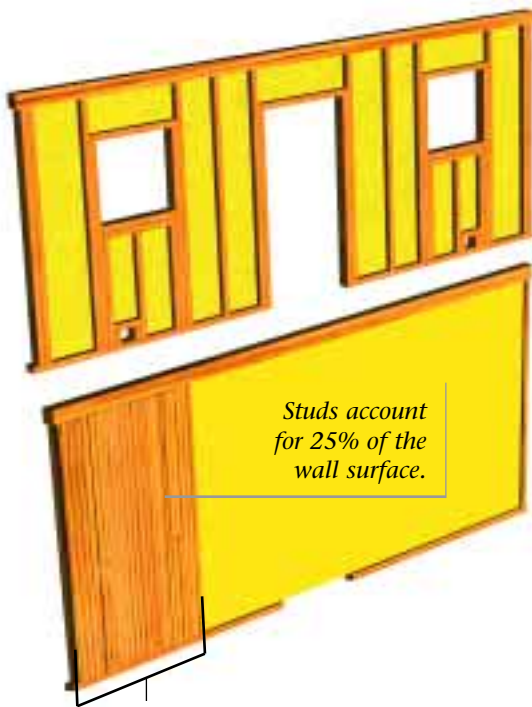


Thermal Bridging

Wood is a poor insulator, and the studs and rafters in a home create a thermal bridge that heat can pass through. In a typical home, thermal bridging through studs accounts for 17 percent of the energy loss.

Rigid foam insulation is a safety net for your home. It covers all of the framing that can't be insulated by cavity insulation, reducing energy flow out of the structure. It significantly reduces air infiltration. And because it moderates the wall cavity temperature, rigid foam insulation reduces the potential for moisture condensation.

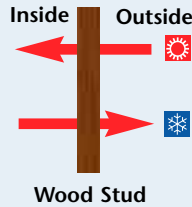
Start with insulated sheathing to provide a continuous layer of thermal protection to the wall. Add cavity insulation to achieve total desired insulation value.



25%

of surface area is wood, which has no thermal protection if an uninsulated sheathing is used.

Thermal bridging creates significant energy loss in both hot and cold conditions.

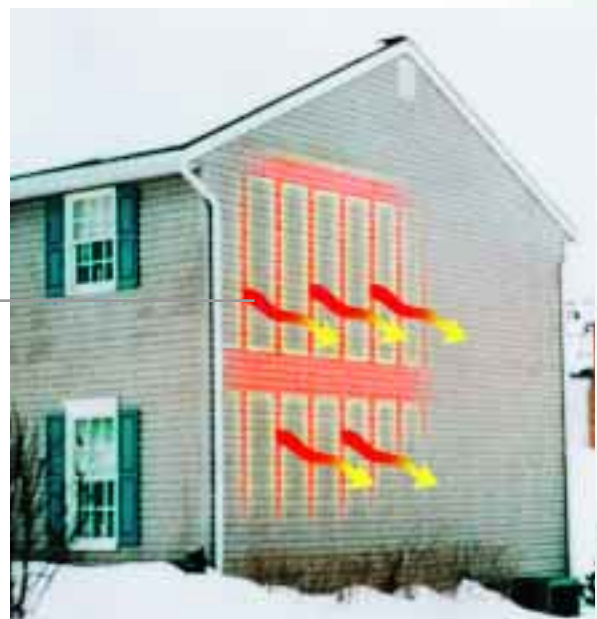


In a wall insulated only with cavity insulation, heat moves easily through the studs and wood panel sheathing, lowering the effective R-value of the wall system.

Thermal bridging is energy loss through the wood frame.



Wood framing is not a good insulator. Heated and cooled air is bridged through uninsulated wood framing.





Using rigid foam insulation from Dow closes thermal bridges created by wood components to significantly improve R-value, as much as 32 percent.

Specialized roof insulation products from Dow combine rigid foam with roof deck material to form an energy-efficient alternative to roof deck alone.



⋮ Air Convection

According to the laws of physics, hot air rises and cool air drops. This rising and falling of air within the cavity sets up a circular motion of the air called convective looping.

In the wall cavity, air near the warm wall rises while air near the cool side falls. The air convection displaces air trapped in cavity insulation, like fiberglass or cellulose, lowering R-value. A layer of foam insulation over the wall moderates the temperature inside the cavity. This reduces the potential for convection heat loss and increases the insulation value of the wall system.

In a cathedral or vaulted ceiling assembly, air convection works the same way. The temperature difference between the inside and outside of the ceiling creates convection between the drywall to the inside of the home and the roof sheathing to the outside.

Air movement in the cavity reduces insulation efficiency, contributing to energy loss.



Wood Frame and Mechanical Detailing That Reduce Cavity Insulation

Cavity insulation is most effective when it is installed properly. Even so, several factors can limit the effectiveness of cavity insulation no matter how good the insulation is or how well it was installed:

- structural requirements and wood framing
- plumbing, electrical junctions and wiring
- HVAC duct work

With these factors, the R-value of a wall is much lower than expected.

Rigid foam insulation is not affected by these limitations. A layer of rigid foam insulation over the entire wall covers the studs and augments cavity insulation for an energy-efficient wall or cathedral or vaulted ceiling.

Insulated sheathing provides the only consistent layer of insulation within the building envelope and in many cases is the only layer of thermal protection, making it a vital part of the wall system.



Plumbing limits the use and effectiveness of cavity insulation. HVAC ductwork limits the use of cavity insulation. And temperature differences between the supply duct and the exterior wall increase the potential for moisture.



Structural requirements may necessitate wood framing more frequently than 16" or 24" on center. This "extra" framing restricts the use of cavity insulation. Insulated sheathing on the exterior reduces thermal bridging through these framing members.



Cavity insulation must maintain its full loft to deliver the stated R-value of the product. Insulation that is forced into tight spaces will deliver a lower R-value.



Covering the entire wall with rigid foam insulation provides R-value where cavity insulation cannot.

Control Moisture.

Moisture is the **number 1** enemy of most building materials. Moisture from wind-driven rain on the outside and plumbing leaks and/or dew point condensation on the inside can compromise the R-value of cavity insulation and lead to mold, deterioration and wood rot.

Insulated sheathing on the exterior can help protect the home from wind-driven rain and dew point condensation.



It takes only a small amount of consistent moisture to create problems in a wall.

Wind-Driven Rain

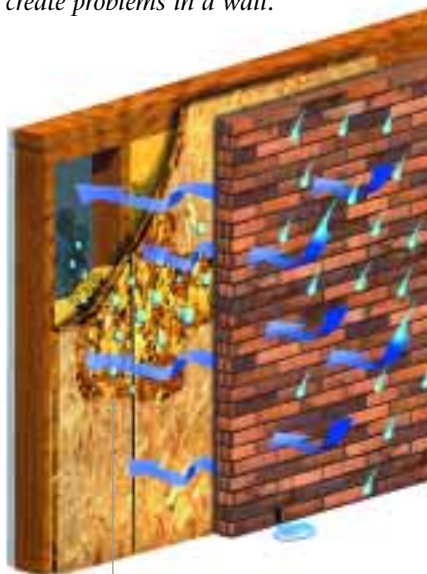
All brick and exterior sidings leak. Behind your siding or brick, you need a moisture-resistant product to manage wind-driven rain and other sources of exterior bulk water. When bulk water gets behind the exterior sheathing, it can penetrate the wall cavity. Pressure differentials and capillary forces compound the penetration of water into a wall system. Insulated sheathing from Dow over the studs not only insulates the wood and moderates the cavity temperature to reduce convection, it also deflects water, allowing it to drain out of the wall assembly.

Styrofoam

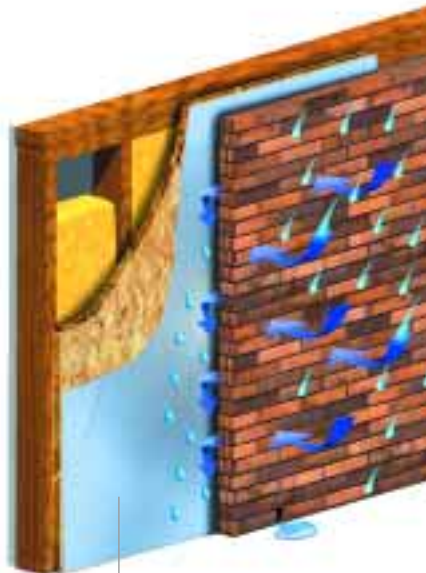
R-3

RESIDENTIAL
FOAM SHEATHING
INSULATION

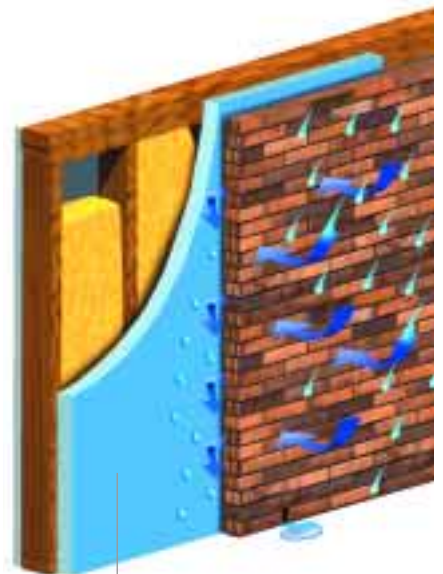
STYROFOAM extruded polystyrene insulation is inherently moisture-resistant, helping defend against moisture penetration and shed bulk water.



Wood panel sheathing, like OSB, can allow moisture to move into the wall cavity.



Adding housewrap to the wood panel sheathing will provide a drainage plane that helps protect the wall cavity from bulk water intrusion.



Building with insulated sheathing instead of wood panel sheathing and house-wrap not only provides a drainage plane to help protect the wall cavity, it also adds insulating value.



COMMON CONDENSATION

Dew point condensation is a common phenomenon in any home. Wherever there are surfaces cooler than the ambient air, condensation can occur. This is because warm air holds more moisture than cool air, and moisture always moves from areas of higher concentration to lower concentration. So, on a warm day, a container of cold liquid sweats on the outside where the warm air meets the cooler surface.

Condensation can be seen all around a home. Air-conditioning ductwork, cold water pipes and toilet tanks are common sources of condensate – water vapor that has turned to liquid water. Condensation within the wall cavity – on water pipes, on HVAC ductwork or on the walls themselves – can damage wood building materials and cavity insulation. Reducing temperature differentials within wall cavities is one way to prevent or minimize condensation.



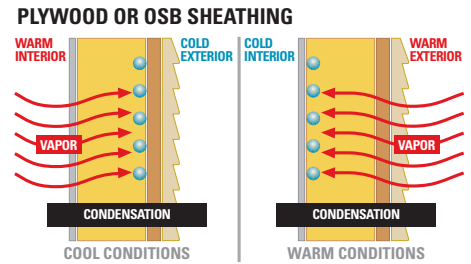
Water from the warm, moisture-laden air condenses on the cooler glass surface.

By isolating the glass surface from the humid air, the insulated cozy keeps condensation from reaching the glass.

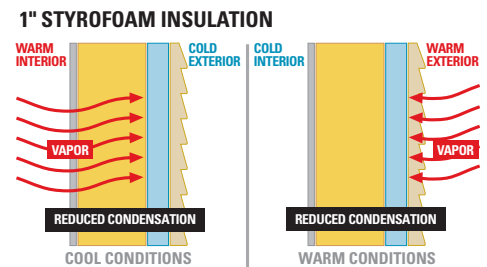
Dew Point Condensation

Dew point is a factor of humidity and temperature. When water vapor in the air meets a surface cooler than the dew point temperature, it condenses into liquid water. This is common in cavity walls and under the roof, where ambient temperature is warmer than a wall surface. Throughout the year, there's a warm side of the wall and a cool side of the wall. These conditions contribute to dew point condensation.

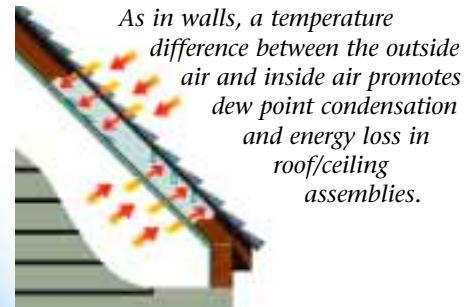
A layer of insulated sheathing will moderate the temperature of the wall cavity, reducing the potential for dew point condensation. Your Dow Building Materials representative can help you determine the right thickness of rigid foam insulation based on dew point analysis.



If either surface of the wall is colder than the dew point temperature, water vapor in the wall cavity will condense into liquid water.

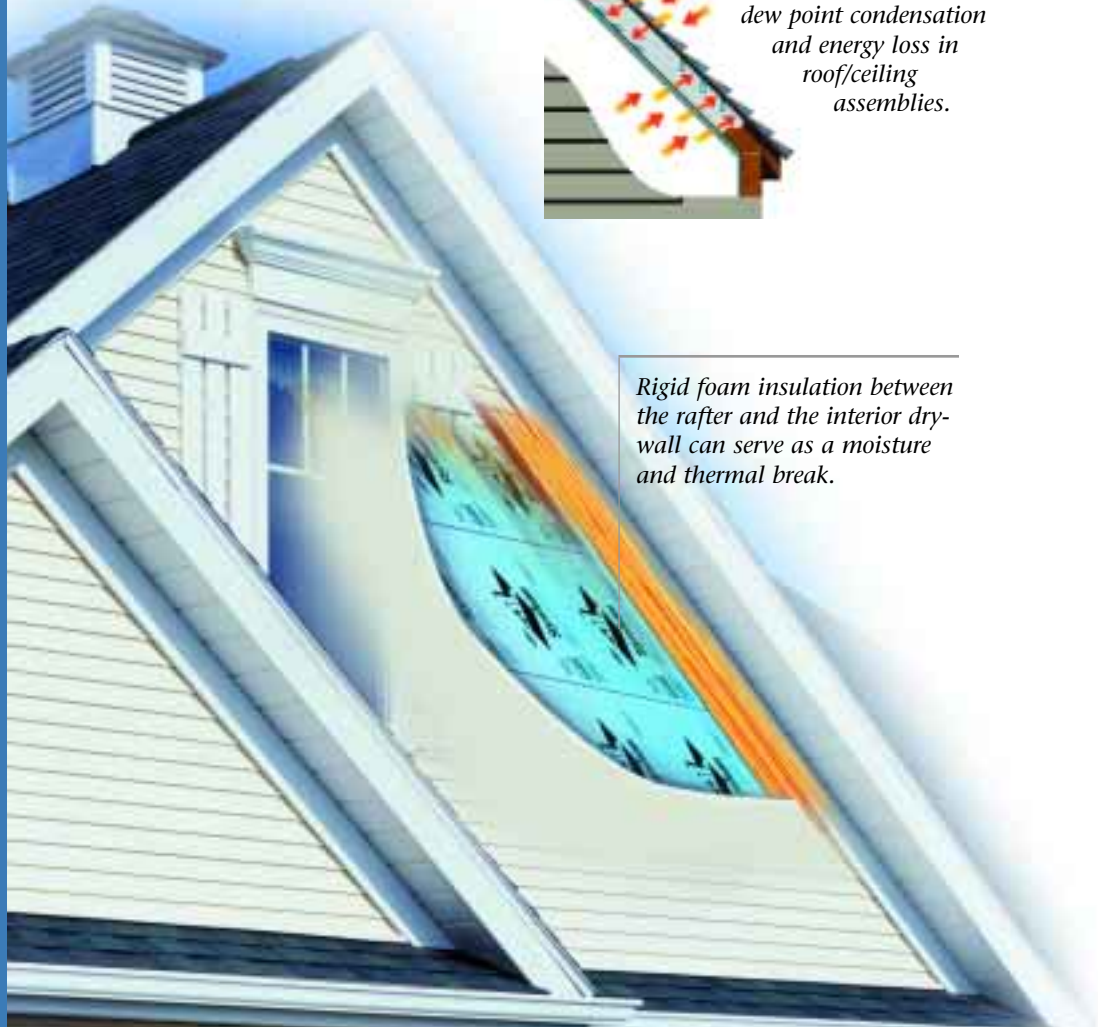


A layer of rigid foam insulation helps reduce condensation.



As in walls, a temperature difference between the outside air and inside air promotes dew point condensation and energy loss in roof/ceiling assemblies.

Rigid foam insulation between the rafter and the interior dry-wall can serve as a moisture and thermal break.





Over structural sheathing, rigid foam adds insulation value and protects against moisture. Installing rigid foam insulation over wood panel sheathing will not only prevent air leakage and wind-driven moisture from affecting vulnerable wood components, it also creates a more even temperature within the wall so condensation is minimized, something housewrap alone can't do.

Maximize Your Investment.

When you add a layer of rigid foam insulation to your walls and roof, you can make the most of your investment, for you and for your customers. Rigid foam insulation is easy to install directly over uninsulated studs using let-in bracing or metal strapping to provide the code-required lateral bracing. (Refer to 2000 International Residential Code, Section R 602.10.3.) Many builders also install rigid foam as an insulating and weather barrier layer over wood panel sheathings such as OSB or plywood. And

specialty developed roof insulations combine insulation and roof deck in one easy-to-install product. Because it helps save so much energy, rigid foam insulation from Dow usually pays for itself in the first two years. And it can help reduce callbacks, strengthening your reputation.

Learn more about building value into your homes with rigid foam insulation. Call your Dow Building Materials representative today.

Insulated sheathings enhance the performance of the entire wall system. Rigid foam insulation provides an R-value of 5.0 to 6.5 per inch, but the benefits exceed pure R-value because insulated sheathing:

- insulates the wood framing
- insulates the mechanicals in the wall cavities
- insulates the exterior wall to reduce convection currents in the cavity insulation
- insulates the exterior wall to reduce the potential for dew point condensation



Insulated sheathing directly over the studs maximizes the wall's insulation value and provides a level, even surface for the exterior sheathing.



Build Green With Dow

Dow supports initiatives that help preserve our environment, and we strive for environmental sensitivity in our manufacturing processes and in our products. Dow produces insulating foams that:

- contain no CFCs
- are formaldehyde-free
- are not a known food source for mold or insects
- contain post-industrial recycled content
- are recyclable (extruded polystyrene)

Ask your Dow representative for more information.

NOTICE: Changes to the International Residential Code (IRC) require the installation of a weather-resistive barrier within most exterior wall assemblies in residential construction. The following Dow insulated sheathing products qualify as a weather-resistive barrier (WRB) when installed according to the installation instructions developed for "installation of foam sheathing as a weather-resistive barrier": STYROFOAM™ DURAMATE™ Plus, STYROFOAM Residential Sheathing, STYROFOAM Tongue & Groove, STYROFOAM Square Edge, STYROFOAM Residing Board, THERMAX™, TUFF-R™, and Super TUFF-R and therefore do not require the use of a building paper or a housewrap as a WRB. When a WRB is not needed, these Dow foam sheathings may be installed according to standard installation instructions for foam sheathing from Dow. Be sure products and installation procedures meet code requirements for your particular location.

NOTICE: STYROFOAM WEATHERMATE™ and STYROFOAM WEATHERMATE Plus housewraps have already qualified as weather resistive alternatives to the prescribed felt (see Evaluation Reports NER 593 and NER 640 for approved alternate).

NOTICE: No freedom from any patent owned by Dow or others is to be inferred. Because use conditions and applicable laws may differ from one location to another and may change with time, Customer is responsible for determining whether products and the information in this document are appropriate for Customer's use and for ensuring that Customer's workplace and disposal practices are in compliance with applicable laws and other government enactments. Dow assumes no obligation or liability for the information in this document. NO WARRANTIES ARE GIVEN; ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.

COMBUSTIBLE: Protect from high heat sources. Local building codes may require a protective or thermal barrier. For more information, consult MSDS, call Dow at 1-866-583-BLUE (2583) or contact your local building inspector. In an emergency, call 1-989-636-4400.

NOTE: Building and/or construction practices unrelated to insulation or housewrap could greatly affect moisture and the potential for mold formation. No material supplier, including Dow, can give assurance that mold will not develop in any specific system.

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