AIR BARRIER ESSENTIALS

What you should know BEFORE your next project begins

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Introduction

Air barriers offer energy saving opportunities

According to the U.S. Department of Energy, buildings account for about 76% of electricity use and 40% of all U.S. primary energy use and associated greenhouse gas (GHG) emissions. And 35% of the energy used within those buildings goes to heating, ventilation, and air conditioning.

The good news is that air barriers, when designed as part of a building envelope system, can cut building heating and cooling energy use by an average of 30%* across all climates . Instead of specifying oversized HVAC systems to compensate for energy losses, air barriers can help designers control the movement of air and moisture that cause those building energy losses in the first place.

But proper design and installation is essential

An insurance industry survey† looking at 17,000 construction defect claims indicated that 69% of them were associated with moisture-related defects in the building envelope system. And of those claims, 53% of them were due to faulty installation, and 19% were tied to design errors and omissions.

To help make building designers aware of air barrier opportunities and risks, Henry is proud to present the following look at **“Air Barrier Essentials”**.

*National Institute of Standards and Technology

† National Association of Insurance Commissioners. 2008. “Property and Casualty Insurance Industry 2007 Top 25 Companies by Countrywide Premium.” www.naic.org

Air, Vapor and Water Resistive Barrier Terms

Air barrier:

– A system that prevents uncontrolled airflow between conditioned and unconditioned spaces

Vapor barrier/vapor retarder:

– An element installed in an assembly to slow the migration of water vapor

Water-resistive barrier (WRB):

– A material installed on a substrate to prevent bulk water intrusion

30% ENERGY SAVINGS

The NIST reports that air barriers cut building heating and cooling energy consumption by an average of 30% across all climates.

Air Barrier Basics

Designed to control airflow into and out of the building, air barriers are a critical part of the building envelope.

Air barriers guard against several forces that diminish long-term building performance. That's because uncontrolled air leakage doesn't just drive heating and cooling costs. Air leakage can lead to several scenarios that will negatively impact the building lifecycle and the quality of the conditioned space.

What air barriers do for buildings:

Manage bulk water

Control air leakage

Maximize thermal performance

Manage condensation

Limit deterioration

Is it a system or product?

An air barrier is a continuous system consisting of:

- **Air barrier membrane**
- **Flashing and accessories**

Together, air barrier system components form a continuous plane of airtightness around the building enclosure. All air barrier components must be chemically compatible and properly installed to achieve effective, long-term air leakage control.

Building Envelope Design Principles

Once constructed, a building has to keep the outside out and the inside in. To help make sure it does, apply these principles when specifying a building envelope system.

Manage bulk water

Nothing has a greater impact on long-term building performance than water, which is why a basic level of weather-resistance is the minimum standard for building design and construction.

Control air leakage

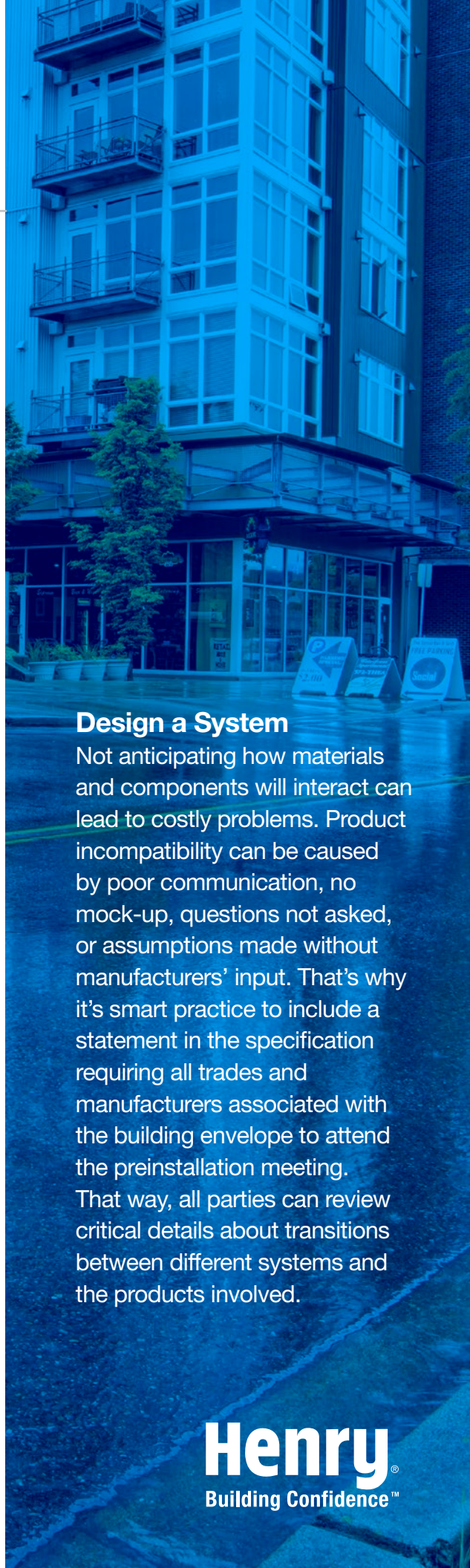
Uncontrolled airflow can cause condensation in the insulation and/or other building materials. Wet insulation decreases thermal resistance. Wet insulation and materials can freeze and thaw, accelerating aging and compromising building integrity and durability. To determine minimum air barrier material and assembly characteristics, refer to ASTM E2178 and ASTM E2357.

Address vapor permeability

Understanding vapor drive and the anticipated dew point location will help identify the vapor permeance and materials needed to avoid trapping moisture. Your wall assembly design and climate will help determine whether you need a permeable or non-permeable solution.

Address thermal component

Avoiding heat transfer is essential, so insulation choices are important. Deciding on the best insulation type for your building and its placement in the wall assembly are key concerns.



Design a System

Not anticipating how materials and components will interact can lead to costly problems. Product incompatibility can be caused by poor communication, no mock-up, questions not asked, or assumptions made without manufacturers' input. That's why it's smart practice to include a statement in the specification requiring all trades and manufacturers associated with the building envelope to attend the preinstallation meeting. That way, all parties can review critical details about transitions between different systems and the products involved.

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Building Code Requirements

The most recent building codes include key air barrier requirements. Be sure to consider the following codes when designing your next air barrier:

The 2021 International Building Code (IBC) requires building performance evaluation by a code official, a registered design professional, or an approved agency. Compliance with the new requirement includes a final commissioning report to verify inspections as described in Section C402.5.1.5.

Starting in 2015, the International Energy Conservation Code (IECC) requires an air barrier in most building types for all climate zones (except 2B). Previous requirements only mandated an air barrier in climate zones 4 and greater. The expanded requirement means that air barriers for buildings in climate zones 1-3 are no longer optional in most cases.

The 2021 IECC establishes a baseline for energy efficiency by setting performance standards for the building envelope (defined as the boundary that separates heated/cooled air from unconditioned, outside air), mechanical systems, lighting systems and service water heating systems in homes and commercial businesses.

The National Fire Protection Association's (NFPA) 285 test is typically required when combustible components are installed on non-combustible construction types (Types I-IV). In 2012, the IBC expanded NFPA 285 compliance requirements to buildings with combustible air barriers. With recently increased air barrier and insulation requirements, the odds for an NFPA 285 compliance requirement are greater than ever. The Referenced Standards Section for the 2021 International Building Code (IBC) includes the 2019 version of NFPA 285. This change includes Type V construction and other considerations for compliant wall assembly options. The best way to ensure code compliance is to refer to an air barrier manufacturer's literature.

Other Air Barrier Influencers

Along with IBC and IECC codes, several other groups and programs also influence air barrier considerations:

Standards

American Society of Heating, Refrigerating and Air-Conditioning Engineers

US Army Corp of Engineers

Air Barrier Association of America

American Society for Testing and Materials

Canadian General Standards Board

Sustainability Programs

LEED

Living Building Challenge

Air Barrier Types

Commercial construction has seen a dramatic shift from mechanically fastened to fully adhered air barriers. Fully adhered membranes stay in place during extreme weather conditions and resist water migration in the event of a breach.

Self-adhered sheet air barriers

Advantages

- Manufacturer controlled thickness
- No mixing or spray equipment
- Bridges gaps/cracks without supplementary detailing
- For use with open joint claddings
- No VOCs

Considerations

- May require primer (some with VOCs)
- May require lap sealing
- Requires rolling to ensure substrate bond
- Requires caution during installation to prevent wrinkles/bubbles

Fluid applied air barriers

Advantages

- No seams
- Easier to apply to complex geometries
- Ideal for irregular/rough substrates
- Spray, roll and trowel application options
- For use with open joint claddings
- Quick curing technologies help avoid scheduling delays

Considerations

- May require spray equipment
- Thickness verification required
- Overspray caution
- Some slower curing technologies can impact scheduling due to weather delays
- VOC Compliant

Before Specification Starts…

As this guide outlines, an effective air barrier is a system within the larger building envelope and is subject to several design- and climate-specific requirements. In other words, beware of a one-size-fits-all approach to air barriers!

Rely on a trusted advisor

Before you begin designing your next building envelope system, be sure to talk to an experienced air barrier system advisor. Consider consulting with the experts at Henry® Company. For more than 80 years, our products and systems have helped manage the flow of water, air and vapor throughout the building envelope, as well as reduce a building's energy consumption. Through our innovation, we have been the first manufacturer in several air barrier categories. Today, our Building Envelope Systems® include an entire portfolio of compatible solutions to help you meet your challenges.

Schedule a meeting with a Henry Trusted Advisor.

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