

PHRC Webinar Series | Tuesday, September 13 @ 1pm

# Rainscreen Gaps in Exterior Walls

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## Description

- Building enclosure design typically addresses the need for an exterior wall to be able to drain and dry moisture that is present throughout the year. Depending on the cladding system, this may be difficult to achieve using current practices, and may warrant the decision to include a designed drainage space, or a rainscreen, in the wall assembly. This webinar will discuss the benefits of rainscreen systems, the products available to create this designed space, and the best practices for integrating rainscreens into the overall assembly.



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## Learning Objectives

- Analyze the sources of moisture on exterior wall assemblies and the impact that moisture has on the durability of the overall system.
- Understand the material and product options available in order to create a rainscreen gap behind exterior cladding as well as cost implications of these systems.
- Discuss existing code requirements related to exterior moisture management and how rainscreen gaps fit into these provisions in order to provide a safe and sustainable assembly.
- Examine the impact of rainscreen systems on specific cladding types as well as the potential for failure of certain claddings without robust moisture management details.



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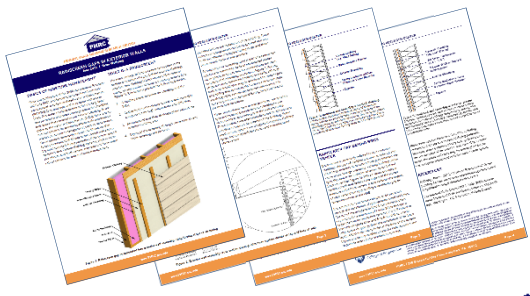
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## Builder Brief



<http://www.phrc.psu.edu/assets/docs/Publications/Rainscreen-Gaps-in-Exterior-Walls-FINAL.pdf>

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## Outline

- Where does moisture come from?
- How do we design for moisture?
- What is a rainscreen?
- What are some common rainscreen assemblies?

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## Where Does Moisture Come From?



**Bulk Moisture:**  
Rain, Snow, Ice

**Bulk Moisture:**  
Condensation

**Water Vapor:**  
Occupants, Cooking, Bathing

**Water Vapor:**  
Seasonal RH

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### What are the 4 D's

The diagram illustrates a cross-section of a building corner where a wall meets a roof. It highlights four key concepts: **Deflection** (indicated by a red dashed arrow showing the roof edge curving away from the wall), **Drainage** (indicated by a blue arrow showing water flowing down the exterior wall), **Durability** (indicated by a green arrow pointing to the exterior cladding), and **Drying** (indicated by a red arrow showing moisture moving out from the wall assembly).

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### Drainage

- **Drainage involves the shedding of any precipitation that is deposited and may penetrate the exterior cladding**
  - Water must be able to drain down and out (away) from enclosure
- **Properly designed enclosure systems (flashing, WRB, etc.) can address most of the remaining 10% of precipitation present at the enclosure**

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### Barrier vs. Water-Managed Systems

- **Barrier Systems**
  - “Face-sealed”
  - Precipitation is primarily addressed on the surface of claddings and at sealed joints
  - No provision for penetrating bulk moisture
- **Water-Managed Systems**
  - Including multiple bulk moisture control layers to address precipitation that penetrates the exterior layer of the assembly
  - Can include gaps for ventilation

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## What is a Drainage Plane?

- Control layer in an exterior wall assembly that serves as the primary surface for bulk moisture to drain down to an exit point in the enclosure
  - Water-managed systems
- Water-resistive barrier (WRB)

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## Rainscreen Systems

- **A rainscreen system is the designed inclusion of a gap behind exterior cladding, whether that cladding is a brick veneer, a fiber cement siding, or any number of other common products**
- **Rainscreens provide the following benefits:**
  - A capillary break between the cladding and the WRB.
  - Redistribution of moisture stored in wall assembly components through evaporation and diffusion.
  - An enhanced and clear drainage plane behind the exterior cladding.
  - Drying of the assembly through convection if ventilation openings are present.

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## Pressure-Moderated Rainscreen

- **Cladding with a vertical airspace or gap behind it that allows bulk water to drain to the exterior**
  - Can be vented or unvented
  - Suitable for low- to mid-rise buildings
- **Pressure-Equalized Rainscreens**
  - Creates compartmentalized air spaces behind cladding that allow air pressures to equalize
  - Driving force for rain penetration can be neutralized
  - Suitable for high-rise buildings

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## Rainscreen Gap Size

- **Research and observation have shown that an effective rainscreen must employ a gap with a minimum depth of 1/4 inch**
  - It is common, however, for rainscreen gaps to have dimensions of 1/4, 3/8, 1/2, or 3/4 inch
  - The depth of the gap will often depend on the material used to construct the gap
  - For example, plywood furring strips typically come in thicknesses of 1/2 or 3/4 inch, while some proprietary products are manufactured to depths of 1/4 inch

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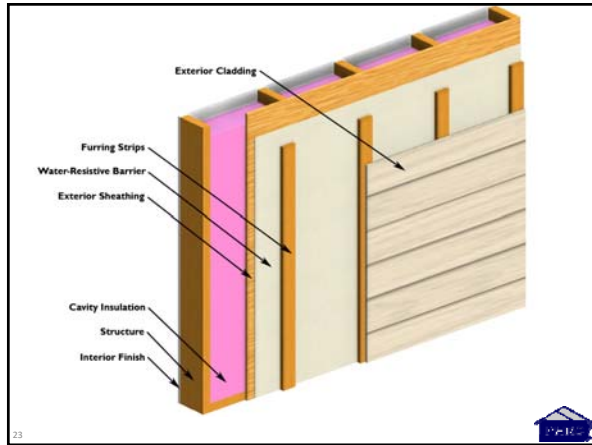
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## Rainscreen Material Options

- **Furring strips or strapping**
  - Commonly are made of wood-based materials or plastic products that are fastened into the main structure of the building
  - Spacing of furring strips depend on stud spacing (typically 16" or 24" o.c.)
  - Cladding can be attached to wood furring strips, but commonly need to be attached through plastic systems and directly to studs

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## Wood Furring Strips

- **Common materials:**
  - Plywood, 1x3, 1x4, etc.
  - Thickness depends on material (1/2", 3/4", etc.)



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## Do Wood Furring Strips Need to be PT?

- **Because rainscreen gaps are designed to remain dry between rain events, it is not a requirement that wood furring strips be treated**
  - When ripping material for use as furring strips, treatment does not always penetrate the full cross section of the wood member

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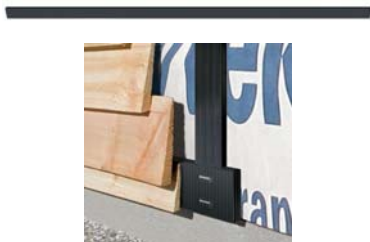
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## Proprietary Systems

- **Cor-A-Vent Sturdi-Strips™ Furring Strips**
  - Dimensions: 3/8" thick, 1-1/2" wide



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## Are Horizontal Furring Strips OK?

- Furring strips are most commonly installed vertically, although horizontal installation may be employed for those types of cladding that run vertically
  - Special accommodations should be made to allow water to drain around or behind horizontal members
- Vertical furring systems will likely perform better, but horizontal furring systems are still an improvement over no rainscreen gap

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## More Proprietary Systems

- Cor-A-Vent Sturdi-Batten™ Drainable Batten Strip
  - Ventilation channels oriented vertically for use with cladding systems that require horizontal furring
  - Dimensions: 7/16" thick, 1-1/2" wide



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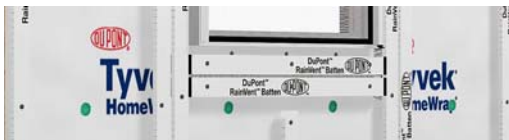
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## More Proprietary Systems

- Dupont™ Rainvent™ Batten
  - Provides vertical and horizontal ventilation
  - Dimensions: 3/8" thick, 1-5/8" wide



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## Rainscreen Material Options

- **Three-dimensional mesh or mat products**
  - Proprietary systems installed beneath exterior claddings
  - These products are often manufactured in rolls and are installed in rows on the exterior of the building
  - Some mesh or mat systems are specifically designed for specific cladding types, including hardcoat stucco and manufactured stone veneer

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## Proprietary Systems

- **Benjamin Obdyke Slicker® Classic Rainscreen 6mm**
  - Vertically-channeled, three-dimensional matrix
  - Thickness = ¼"



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## More Proprietary Systems

- **Keene Driwall™ Rainscreen 020-1**
  - Entangled net drainage mat for exterior wall systems
  - Thickness = ¼"



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## Ventilation Openings

- Does a true rainscreen system require ventilation openings at the top and bottom of the exterior wall?
  - Yes, but the system will still perform well without them
- How do you provide these ventilation openings?

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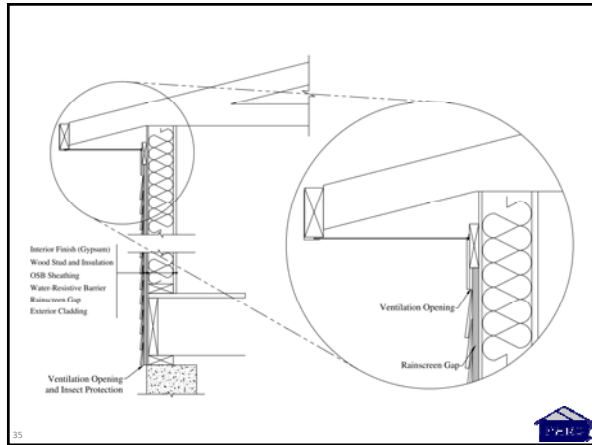
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## Common Rainscreen Assemblies

- Vented cladding as a rainscreen
- Rainscreen gaps behind reservoir cladding
  - Brick veneer
  - Wood siding
  - Exterior plaster

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## Vented Cladding

- **What is vented cladding?**
- **2009 International Residential Code**
  - **R601.3.3 Minimum clear air spaces and vented openings for vented cladding.** For the purposes of this section, vented cladding shall include the following minimum clear air spaces. Other openings with the equivalent vent area shall be permitted.
    1. Vinyl lap or horizontal aluminum siding applied over a weather resistive barrier as specified in Table R703.4.
    2. Brick veneer with a clear airspace as specified in Section R703.7.4.2.
    3. Other approved vented claddings.



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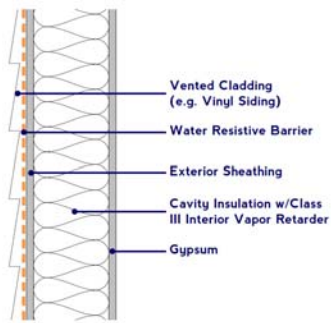
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## Vented Cladding




Vented Cladding (e.g. Vinyl Siding)

Water Resistive Barrier

Exterior Sheathing

Cavity Insulation w/Class III Interior Vapor Retarder

Gypsum



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## Reservoir Cladding

- **What is a reservoir cladding?**
  - Materials that absorb moisture from the surrounding environment and have significant moisture storage capacity
  - Examples:
    - Brick veneer
    - Adhered manufactured stone masonry veneer
    - Hardcoat stucco
    - Wood



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## Brick Veneer Code Requirements

- 2009 IRC
  - R703.7.4.2 Air space.
    - The veneer shall be separated from the sheathing by an air space of a minimum of a nominal 1 inch (25 mm) but not more than 4½ inches (114 mm).
  - R703.7.6 Weepholes.
    - Weepholes shall be provided in the outside wythe of masonry walls at a maximum spacing of 33 inches (838 mm) on center. Weepholes shall not be less than 3/16 inch (5 mm) in diameter. Weepholes shall be located immediately above the flashing.



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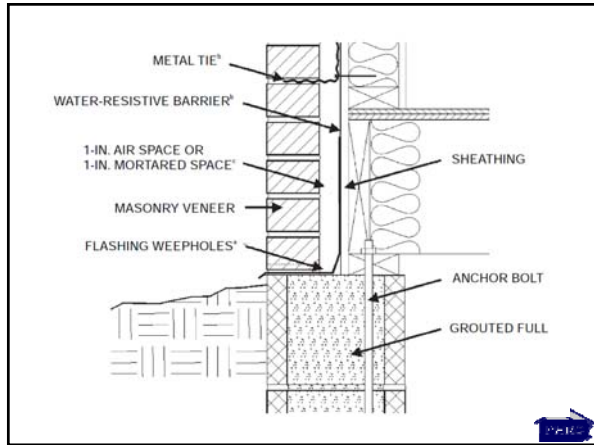
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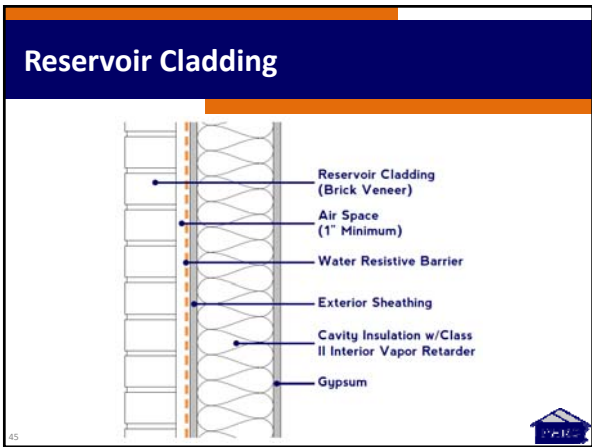
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### Wood Siding

- **Wood cladding is sensitive to moisture over long periods of time**
  - Traditionally, wood cladding was able to dry sufficiently when little insulation was present
  - Tighter enclosures with higher levels of insulation often warrant back venting of wood cladding to avoid cupping, rot, peeling of paint, etc.

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## Exterior Plaster

- Exterior plaster, including stucco and manufactured stone veneer, is considered a reservoir cladding
  - Rainscreen gaps are not required, but perform well in these assemblies

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## WRB in Exterior Plaster Assembly

- 2009 IRC R703.6.3 Water-resistive barriers.
  - Water-resistive barriers shall be installed as required in Section R703.2 and, where applied over wood-based sheathing, shall include a water-resistive *vapor-permeable* barrier with a performance at least equivalent to *two layers of Grade D paper*.
  - **Exception:** Where the water-resistive barrier that is applied over wood-based sheathing has a water resistance equal to or greater than that of 60 minute Grade D paper and is separated from the stucco by an *intervening, substantially non water-absorbing layer or designed drainage space*.

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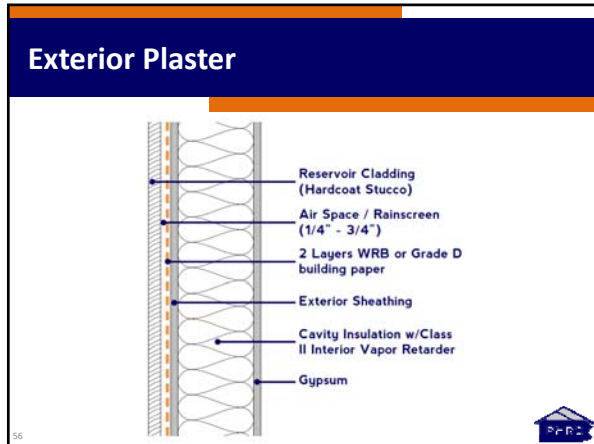
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### Conclusions

- Rainscreen gaps and systems can enhance a wall's ability to drain and dry moisture
- These gaps can be introduced using a variety of materials and methods
- It all comes down to details

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### Resources/References

- **References**
  - Green Building Advisor. (June 2013). *All About Rainscreens*. <http://www.greenbuildingadvisor.com/blogs/dept/musings/all-about-rainscreens> (September 8, 2016).
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    - <https://www.huduser.gov/portal/periodicals/cityscape/vol17num2/article14.html>

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