Building America Building Science Advisor

DRAINAGE PLANE

Reservoir claddings in combination with rain and sun call for behind-cladding drainage and ventilation. A reservoir cladding is anything that absorbs and stores moisture; such as brick, stone, wood, non-synthetic stucco, and fiber cement.

In addition, all exterior wall cladding systems leak to some extent. Some more than others…but all leak. Gravity, wind pressure and capillary action cause rain water entry through the rainy cracks, joints and small gaps in a building's exterior. With typical residential cladding systems - and commercial wall systems - it is not possible to seal all those pathways.

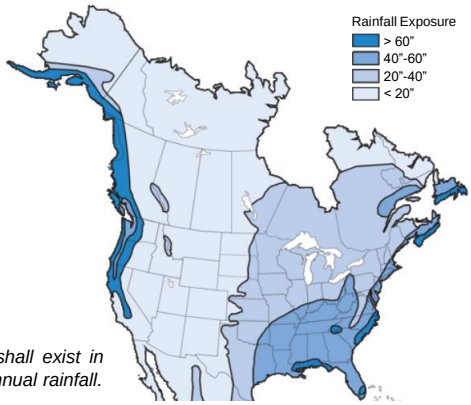

Figure 1: *A drainage plane shall exist in areas with more than 20" of annual rainfall.*

Cause and Effect

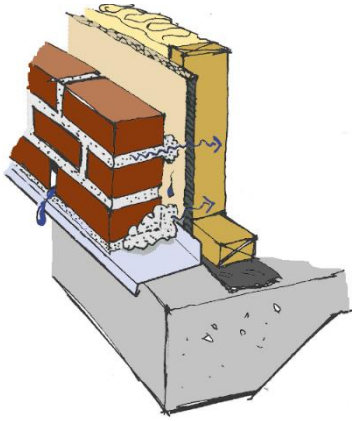

Figure 2: *Excessive mortar in drainage plane allows for inward drive of moisture.*

Wetting a reservoir cladding "charges" it. Think "moisture capacitor". Due to capillary forces of the absorptive cladding, a strong inward moisture transportation may occur. This transportation mechanism is even stronger when the sun hits the cladding and discharges the moisture. The heating of the stored water raises its vapor pressure and the warm water in the cladding drives both inward and outward. Outward is good, unless the paint coating has too low of a vapor permanence causing moisture to get stuck between the cladding and paint, resulting in bubbling and blistering.

? *What is a too low vapor permeance for a paint coating on the exterior of a reservoir cladding? - Less than 10 perms.*

Discharging the "moisture capacitor" inward can be a problem when moisture is absorbed by the sheathing, studs or insulation materials. Such unwanted moisture may result in biological growth of mold and mildew, and ever worse, deterioration of the structural strength due to wooden decay. Subsequently, the inwardly driven water needs to be handled.

Preventive Actions

The best way to manage this risk is to construct the wall system that allows for drainage behind the reservoir cladding. Back ventilation (Figure 3) requires a clear path behind the cladding, and openings at the bottom and top for air exchange. The width or the air gap will impact the drainage, but also the air exchange rate. The following minimum width applies:

- 1 inch - For vapor permeable sheathing (gypsum) + Brick/Stone
- ¼ inch – Wood/Stucco/Fiber Cement

For non-brick/stone/stucco cladding, a width of 1/32 to 1/16 inch will suffice, but 1/4 inch is recommended. With this approach, any water that leaks through the cladding will hit a water-resistant surface, and safely drain down the wall.

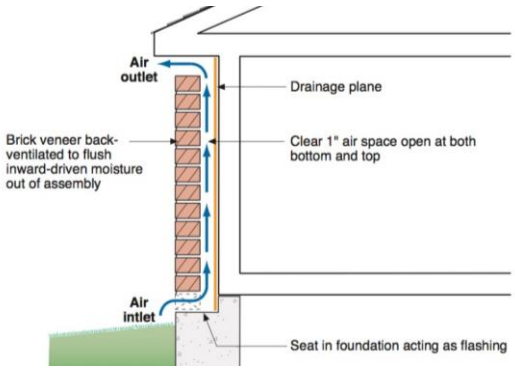

Figure 3: *Back ventilation for brick veneer walls.*

Remember to lap drainage plane materials over all exterior wall flashings so water flowing down the walls is directed away from the building. And, carefully seal around all penetrations through the wall.

References and Further Reading

BSI-061: Inward Drive - Outward Drying
BSI-038: Mind the Gap, Eh!
BSI-057: Hockey Pucks and Hydrostatic Pressure
Drainage Plane Behind Exterior Wall Cladding
Flashing at Bottom of Exterior Walls
Taped Insulating Sheathing Drainage Planes

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