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6.2 VENTED AND UNVENTED ROOF ASSEMBLIES

Vented Roofs (For Pitches of 3:12 or Above)

When detailed correctly, vented roofs have a long, successful track record in the Pacific Northwest. Vented roofs provide the capacity for moisture to be removed from the underside of roof sheathing via convection currents in the vent cavity.

Because today we as an industry are insulating below the vented cavity as standard practice, the building itself is no longer heating the cavity. So, convection currents need to be carefully designed.

To establish sufficient stack effect for these convection currents:

- Install exterior air inlets at a location lower than outlets. Opposing vents with no or minimal elevation change will not generally provide sufficient airflow.
- Maintain a free-flowing channel between vents the full width of the rafter bay and with a minimum of 1” depth.

Note that the drying capacity of vented roofs can easily be short-circuited by bad workmanship or flawed design.
Be sure to avoid these four pitfalls:

- Bulk water intrusion via water leaks from outside (poor workmanship).
- Air-borne vapor intrusion via air leaks from inside (poor workmanship).
- Constricted airflow due to insulation baffles not fully spanning from rafter to rafter (poor workmanship).
- Vapor drive from inside (poor design).

Net Free Area (NFA) of exterior venting is to be a minimum of 1/300ths of the horizontal plane below the roof with equal parts at top and bottom. When in doubt, follow local code.

Unvented Roofs

Unvented roofs are increasingly common due to design priorities. An understanding of heat, air, and moisture as well as the causes of condensation is critical in detailing unvented roof assemblies. Potential pitfalls to avoid include:

- Incorrect ratio of vapor impermeable insulation (directly under the roofing and substrate, if present) to the vapor open insulation beneath it. If the vapor impermeable insulation is too thin then its bottom surface can be cold enough to allow condensation where it meets the vapor open insulation.
- Poor air sealing. If the assembly is not airtight then air movement through the assembly can carry moisture concentrations into the assembly, with significant risk of condensation.
- Careless detailing of partial penetrations. If not properly detailed, partial penetrations into the unvented roof assembly (for things like can lights or ceiling fans) can undermine the insulation and/or air tightness strategies alluded to above.
- Insufficient fill below the impermeable insulation layer. If air gaps are present between insulation layers, convection currents can significantly reduce the performance of the assembly and compromise durability.

Two potential unvented roof assemblies:
1. Preferred: Monolithic continuous exterior insulation (CI) above structural sheathing.

- 40% of insulation R-value to be above sheathing. If not feasible, additional analysis required.
- Roof sheathing to be air-sealed.
- CI to be installed in multiple layers to limit insulation by-pass from gapping of insulation.

2. Acceptable if above is not feasible: Closed-Cell Spray-Polyurethane Foam (ccSPF) at bottom of roof sheathing.

- R-value of ccSPF to be 40% of total assembly. If less, analysis is required.
- NO mechanical systems (electrical, plumbing, HVAC, fire suppression, etc.) can intrude into ccSPF layer.
- Insulation below ccSPF is to be blown-in fiberglass, blown-in cellulose, or open-cell Spray-Polyurethane Foam (ocSPF). No batt materials.

Because the drying capacity of unvented roof assemblies is inherently lower than vented ones, it is especially critical to control built-in moisture during construction. Control construction moisture content with tenting or temporary roofing when necessary. Moisture content in roof structure must be less than 18% prior to covering. Rigid insulation (if present) must be kept dry.

Roof assemblies must control for exterior moisture in a monolithic and complete fashion. Test roofing membranes for integrity prior to covering from below. In unvented ‘flat’ or low-slope roofs with parapets, perform a full ‘flood’ test to ensure leak-free installation of roofing membrane.

Drying of unvented roofing assemblies is, by definition, only provided to the interior. Therefore, moisture analysis of interior conditions and long-term management strategy is required at all wet locations or

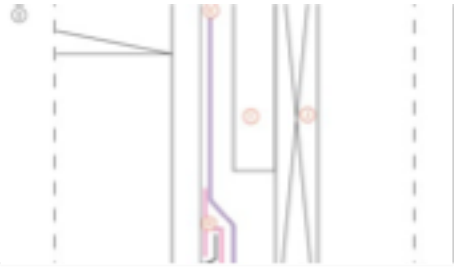
areas of high humidity generation such as steam showers, kitchens, baths, laundry, and pools. Special guidance and attention is required when selecting and installing roofing systems over these high humidity areas.

Note: For info about attics, see 5.3 Insulation – Attic Insulation (https://hammerandhand.com/best-practices/manual/5-envelopes/5-3-insulation/)

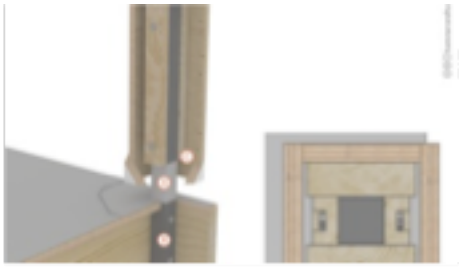
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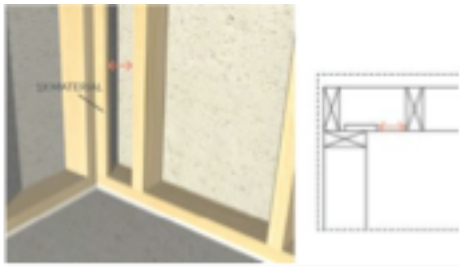
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