WALL: BRICK VENEER DESIGN B

BRICK VENEER– CAVITY– CONTINUOUS INSULATION
USED AS SHEATHING & AIR BARRIER– STEEL STUD BACK UP WALL

DETAIL	TABLE OF CONTENTS: BRICK VENEER DESIGN B	SKETCH NUMBER SK–B0 1 OF 8
ENERGY CODE: CONCEPTUAL DETAILS FOR EDUCATIONAL PURPOSES ONLY	**Date:** 10/18/2001 **Scale:** 1–1/2"=1'–0" **Drawn:** ---	

Boston Society of Architects
Building Envelope Committee
52 Broad Street
Boston, MA 02109

Building Envelope Designs meeting the requirements of the new Massachusetts Energy Code 780 CMR 13

For Educational Purposes Only

Acknowledgments:

Process: The BSA Building Envelope Committee was approached by the Board of Building Regulations and Standards to develop building envelope details demonstrating compliance with the new energy code. Richard Keleher AIA, chairman and founder of the BSA building envelope committee appointed a task force to develop a narrative and details to demonstrate compliance with the new energy code. The task force developed the details and narrative below, which were then reviewed by the building envelope committee members.

The BSA was under contract with the Peregrine Energy Group, a contractor to the Board of Building Regulations and Standards to deliver pdf format drawings and a narrative of the system alternatives. Shepley Bulfinch Richardson and Abbott, Architects, Boston, acted as prime consultant to the BSA to develop the deliverables.

The task force decided to select, review, verify and edit some of the designs from the "Architects Guide to The New Energy Code", by Mark Kalin, available in hard copy and in electronic form as publication No. 263 from the BSA.

The following task force members contributed their time and knowledge in the development of these designs:

Wagdy Anis AIA	**Shepley Bulfinch Richardson and Abbott, Task force chair.**
Mark Kalin FAIA, FCSI	**Kalin Associates Inc.**
Jeff Wade AIA, CSI	**ADD Inc**
Lance Robson AIA	**Building Envelope Technologies Inc.**
Steven Rigione	**HKT Architects Inc.**

In addition to reviews by the subcommittee members, the following members of the BSA's Building Envelope Committee performed very helpful reviews of the details before publishing:

Len Anastasi, CSI	**Lennel Specialties**
Vince Camalleri AIA	**Simpson Gumpertz and Heger**
Ken Crocco AIA	**ArchiTech Consulting Inc., Chicago Chapter AIA**
Richard Keleher AIA, CSI	**Shepley Bulfinch Richardson and Abbott**
Don Klema AIA	**Kallmann McKinnell and Wood Architects**
Joseph Lstiburek, PhD. P. Eng.	**Building Science Corporation**
Ned Lyon P.E.	**Simpson Gumpertz and Heger**
Fred Nashed AIA	**Architectural Consulting Services**
Oscar Padjen AIA	**Padjen Architects, Inc.**
Allan Schmaltz	**Unerectors Inc.**

The designs must be reviewed by a design professional before applying them for applicability to a specific project, including the limitations imposed by the interior and exterior environment of a building. Some designs are more durable than others, and cost is also a variable. The designs are based on a maximum of 35% interior relative humidity in the winter and normal exterior conditions in Massachusetts. Some of the designs fail if the interior RH is higher, and should be modified. Any misapplication or misinterpretation of these designs is the sole responsibility of the user.

In all of the designs below, continuity of the air barrier from foundations to roof is a focus, including closure of all penetrations. None of the designs have been reviewed by a structural engineer. The structural support of the air barrier is taken into consideration to withstand positive and negative air pressures, but should be reviewed by a structural engineer for transfer to the backup wall and structure. The systems and anchorages normally designed by specialty engineers such as light-gage steel studs, stone and precast concrete connections have also not been engineered. Alternatives within each design are discussed below.

Roof:
No attempts to vary the low-slope roofing design were made. Remember that the new energy code establishes a relationship of 10 times less permeable for the roof membrane than the vapor barrier in the roof assembly. Roof membranes vary from 2 to 0.03 perms, therefore the vapor barrier should be from 0.1 to 0.003, based on the roof membrane permeability.

Design A shows a pitched shingle roof and a metal roof. The concept of tying the roof air barrier to the wall air barrier is demonstrated. The shingle roof is ventilated due to the shingle manufacturer's warranty requirements. If the metal roofing standing seams are sealed, then it too should be ventilated. Otherwise the metal roof assembly is non-ventilated roof and takes advantage of the code roof ventilation exception for air-tight roof assemblies.

Design A also shows a penetration conceptually. The concept of air-tightening all penetrations should carry through all the designs.

Also in design A is an enlarged detail of a window connection, as an example of connecting a window-frame to the wall air-barrier. This is applicable to all the designs. Window crack perimeter sealants should be used that are compatible with polyethylene, such as low or ultra-low-modulus silicone. For small windows up to 5’ or 6’, one-part spray polyurethane foam may be used. A membrane, properly connected with compatible sealants and termination bars to window and membrane may also be used. The same tie-in location is true of louvers, metal door frames and store fronts. Curtain wall is tied in at the tube face of the glazing pocket.

- **Design B:**

    Description:
    Brick, 2” cavity, 1” insulating sheathing (air barrier), R-11/R-13 (maximum), unfaced fiberglass batts in stud space (check climate zone), stud back-up wall.

Advantages & Disadvantages:
This wall type uses the rigid insulation as the air barrier. Studs should be separately braced. With R-5 insulating sheathing, this wall design does not need a vapor barrier up to 35% interior RH, but does, if the RH is higher. It uses code exception 3 to the vapor barrier requirements (see WUFI/ORNL IBP moisture analysis). The tape used to air-tighten the sheathing should be a high-quality peel-and-stick (primed) for durability. Since the tape is on the cold side of the wall, it is expected to be subject to temperature extremes and therefore probably somewhat less durable than a design that maintains the air barrier at more even temperatures. The drainage plane is the rigid insulation, so the upper edges of the tape are vulnerable to water intrusion. In order to further protect the tape on the sheathing, a 15 or 30# felt can be added on the outside of the rigid insulation. Note that the batt insulation R-value should not be exceeded so that the sheathing temperature remains above the dew-point. The rigid insulation value can be increased,

and the batts can then be deleted, or they can remain. Venting the brick cavity to the exterior at the top of any continuous obstruction such as at the coping and at relieving angles is always an advantage, to relieve water vapor generated by reverse vapor drive and promote more rapid drying of the brick.

Continuous Insulation alternatives:

- Extruded polystyrene
- Foil-faced polyisocyanurate sheathing board.

Stud cavity R-11/R-13 insulation alternatives:

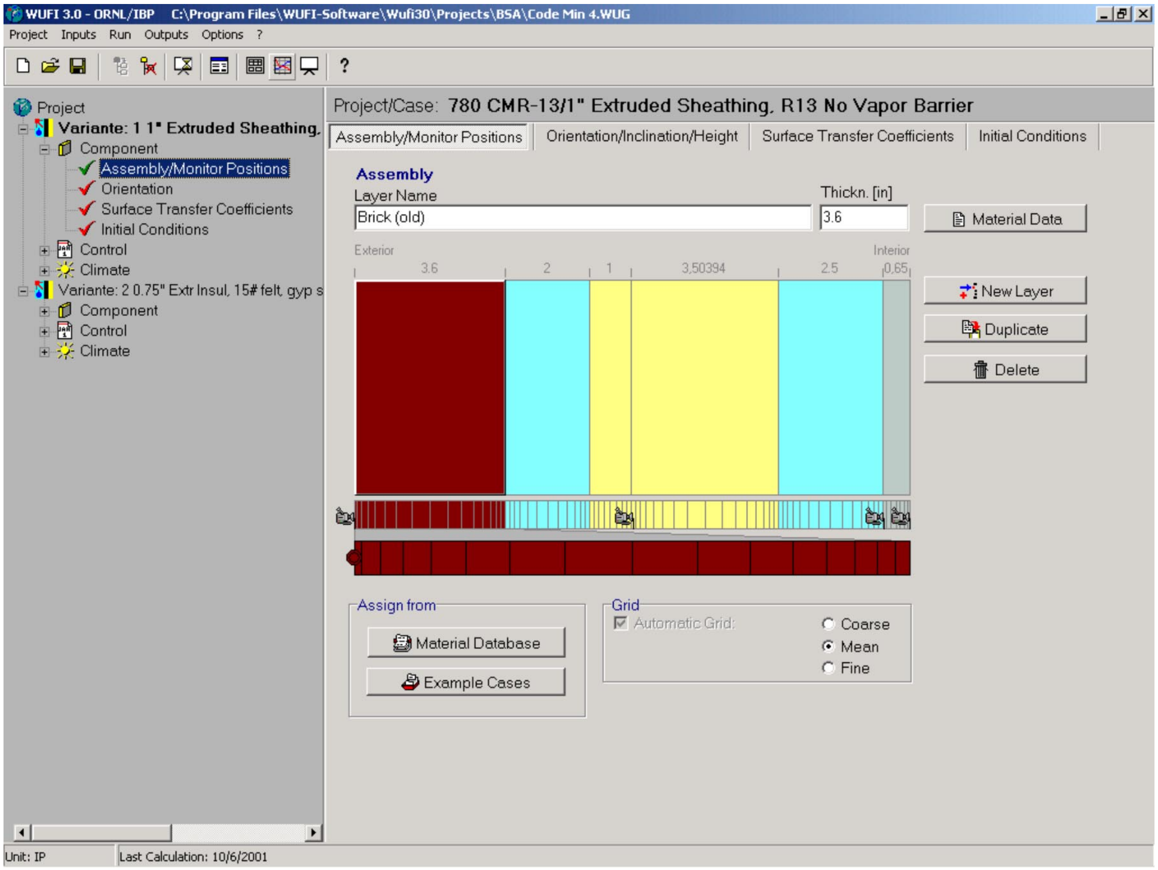
- Friction-fit fiberglass batts.
- Rockwool
- Cellulose
- Spray foam

Air Barrier Alternatives:

- Taped rigid insulation boards and peel and stick membrane trim work. Insulating sheathing must be mechanically fastened to withstand air pressures such as wind, stack and fan pressures. All penetrations must be made airtight.

WUFI ORNL/IBP Moisture Study:

As apparent from the moisture study that follows, two monitors were placed in critical areas to monitor RH in the different materials. Monitor 2 is on the inner face of the polystyrene in contact with the batt insulation. Monitor 3 was placed in the air layer adjacent to the interior drywall. Monitor 1 is on the exterior of the brick and Monitor 4 on the interior face of the drywall. The graphs show that Monitor 2 climbs up to 80% RH in the winter which is the upper limit for a passing design. Monitors 3 and 4 are almost identical. They climb up briefly in the summer to 70% RH which shows that the reverse vapor flow is being well controlled and dissipated.


WUFI 3.0 - ORNL/IBP C:\Program Files\WUFI-Software\Wufi30\Projects\BSA\Code Min 4.WUG
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Project
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Orientation
Surface Transfer Coefficients
Initial Conditions
Control
Climate
Variante: 2 0.75" Extr Insul, 15# felt, gyp s
Component
Control
Climate
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Surface Transfer Coefficients
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Interior
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2.5
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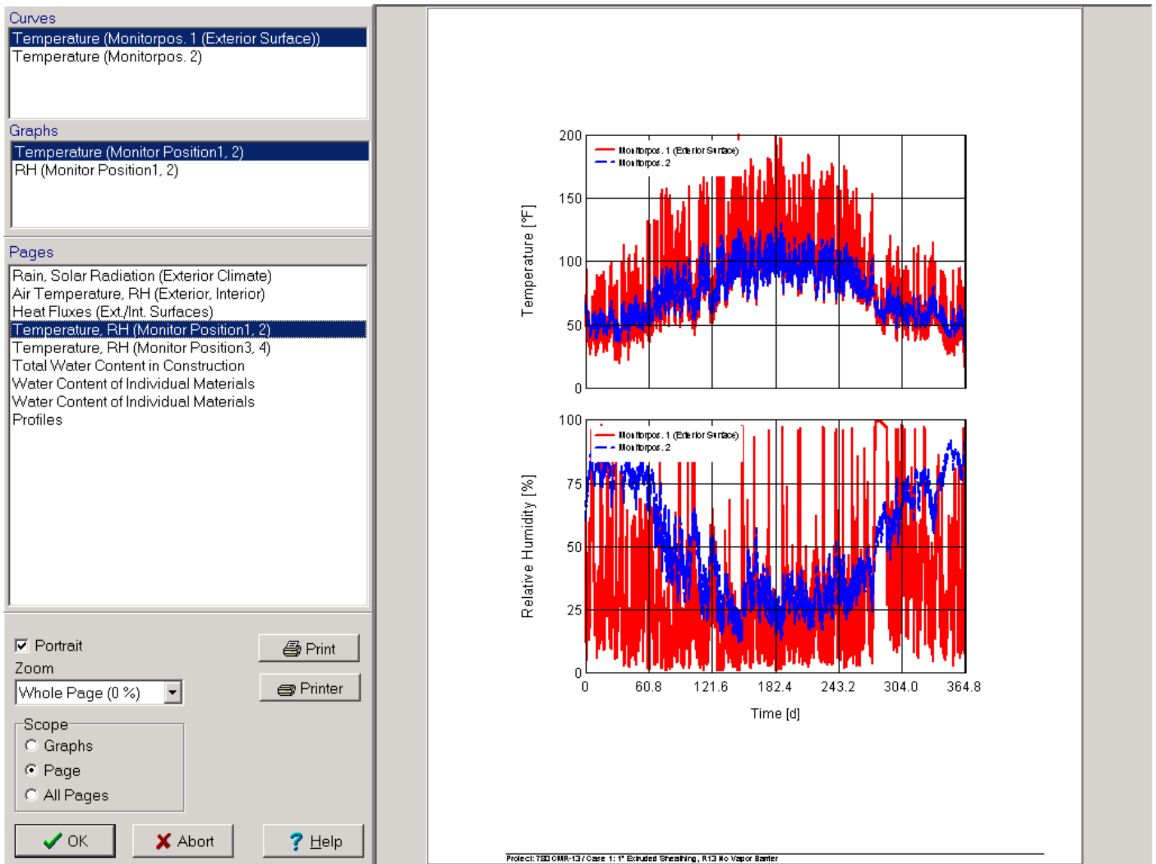
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Temperature (Monitorpos. 1 (Exterior Surface))
Temperature (Monitorpos. 2)
Graphs
Temperature (Monitor Position1, 2)
RH (Monitor Position1, 2)
Pages
Rain, Solar Radiation (Exterior Climate)
Air Temperature, RH (Exterior, Interior)
Heat Fluxes (Ext./Int. Surfaces)
Temperature, RH (Monitor Position1, 2)
Temperature, RH (Monitor Position3, 4)
Total Water Content in Construction
Water Content of Individual Materials
Water Content of Individual Materials
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Portrait
Zoom
Whole Page (0 %)
Print
Printer
Scope
Graphs
Page
All Pages
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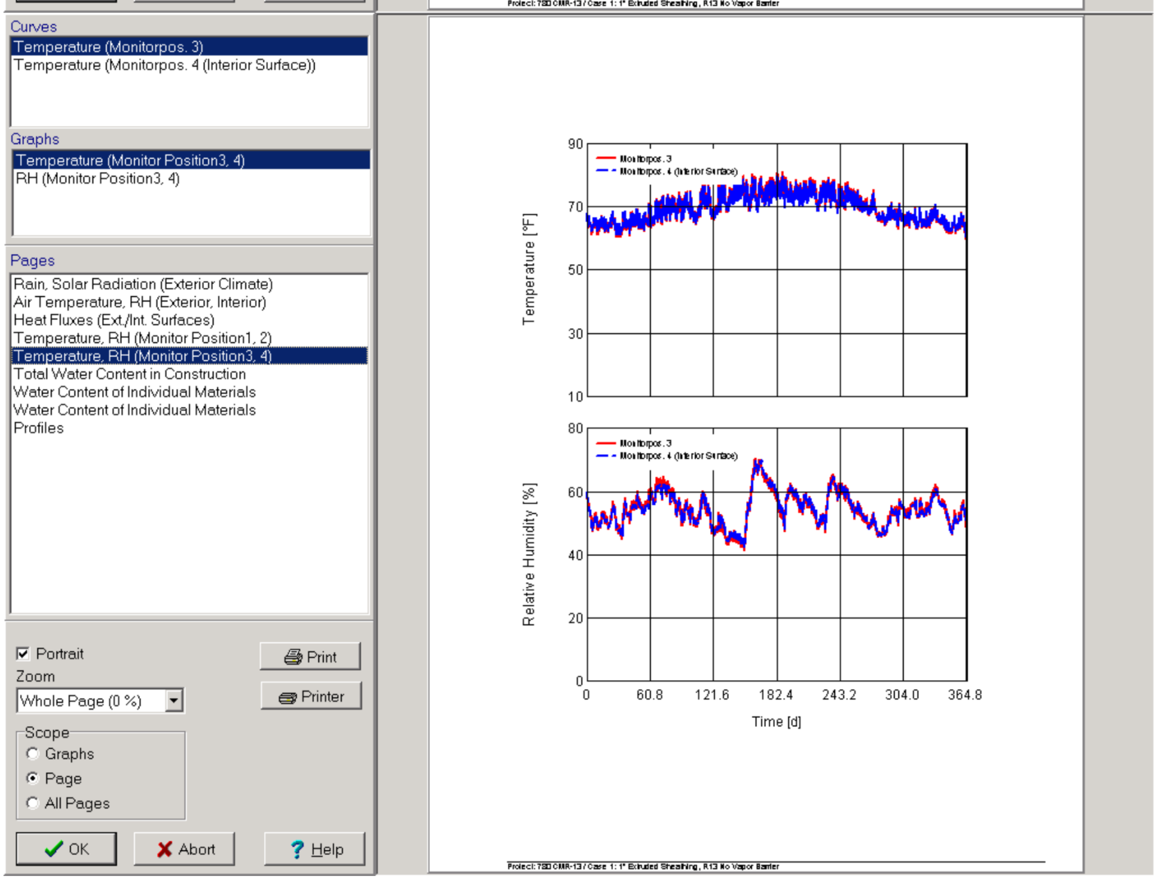
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Temperature (Monitorpos. 4 (Interior Surface))
Graphs
Temperature (Monitor Position3, 4)
RH (Monitor Position3, 4)
Pages
Rain, Solar Radiation (Exterior Climate)
Air Temperature, RH (Exterior, Interior)
Heat Fluxes (Ext./Int. Surfaces)
Temperature, RH (Monitor Position1, 2)
Temperature, RH (Monitor Position3, 4)
Total Water Content in Construction
Water Content of Individual Materials
Water Content of Individual Materials
Profiles
Portrait
Zoom
Whole Page (0 %)
Print
Printer
Scope
Graphs
Page
All Pages
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Abort
Help
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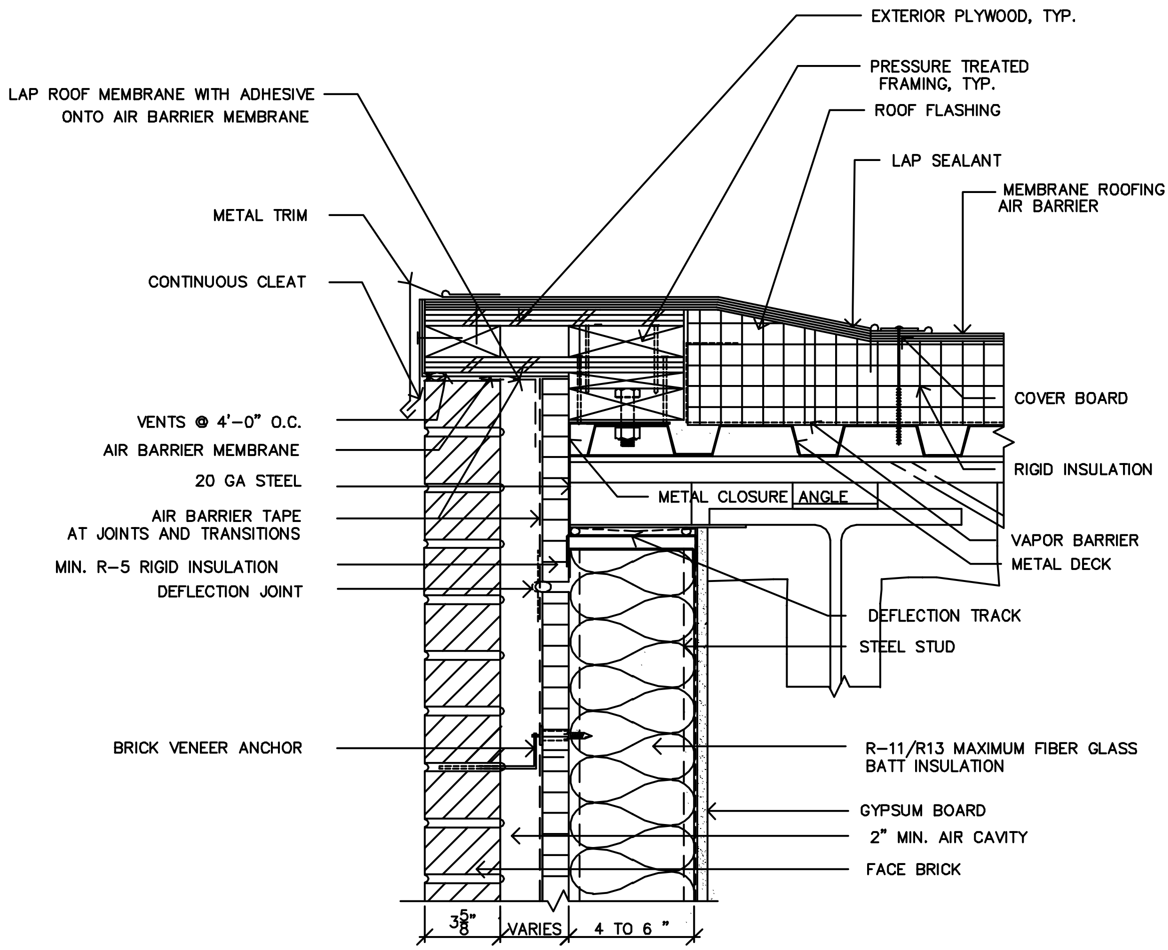

DETAIL AT ROOF EDGE

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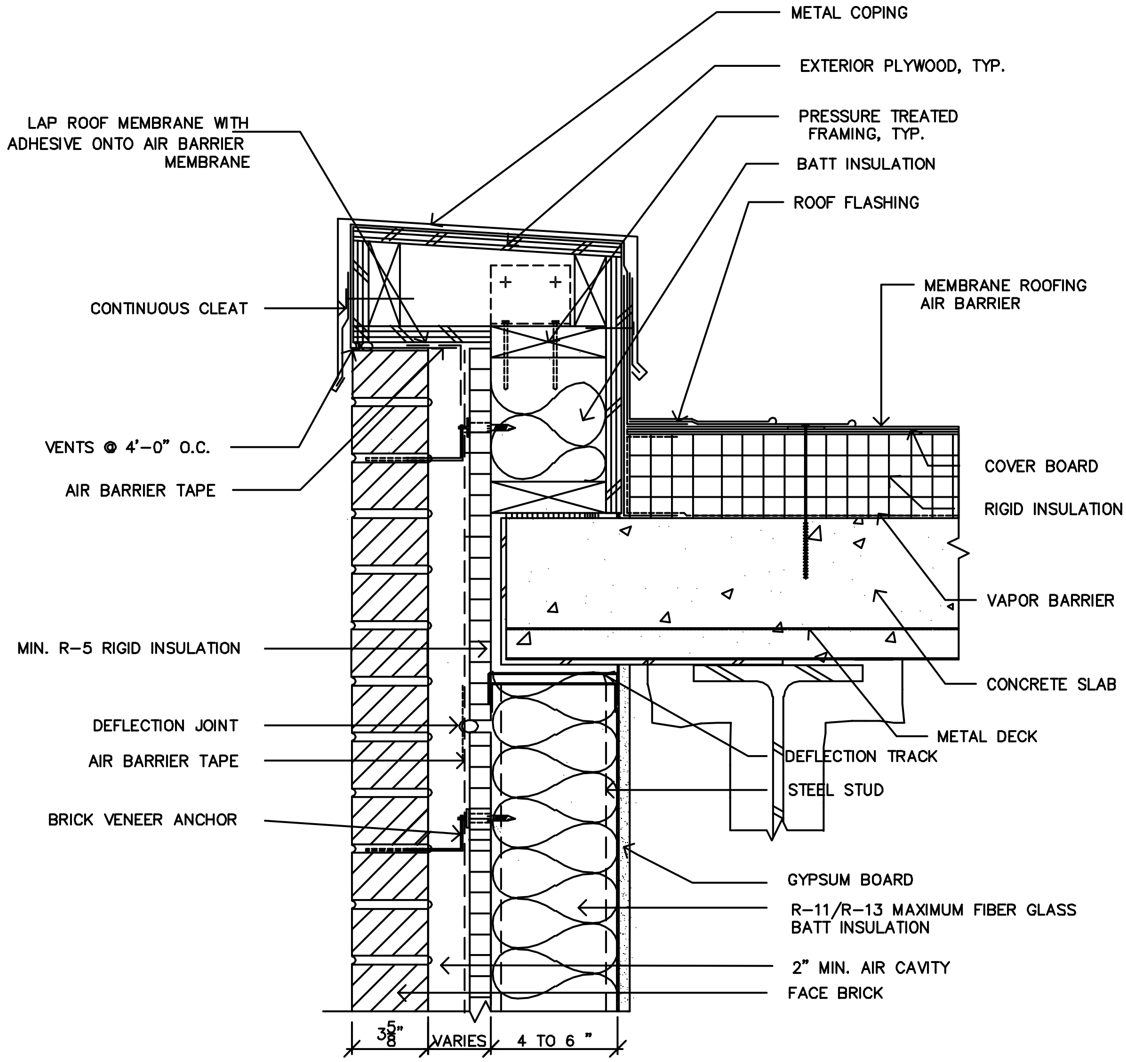

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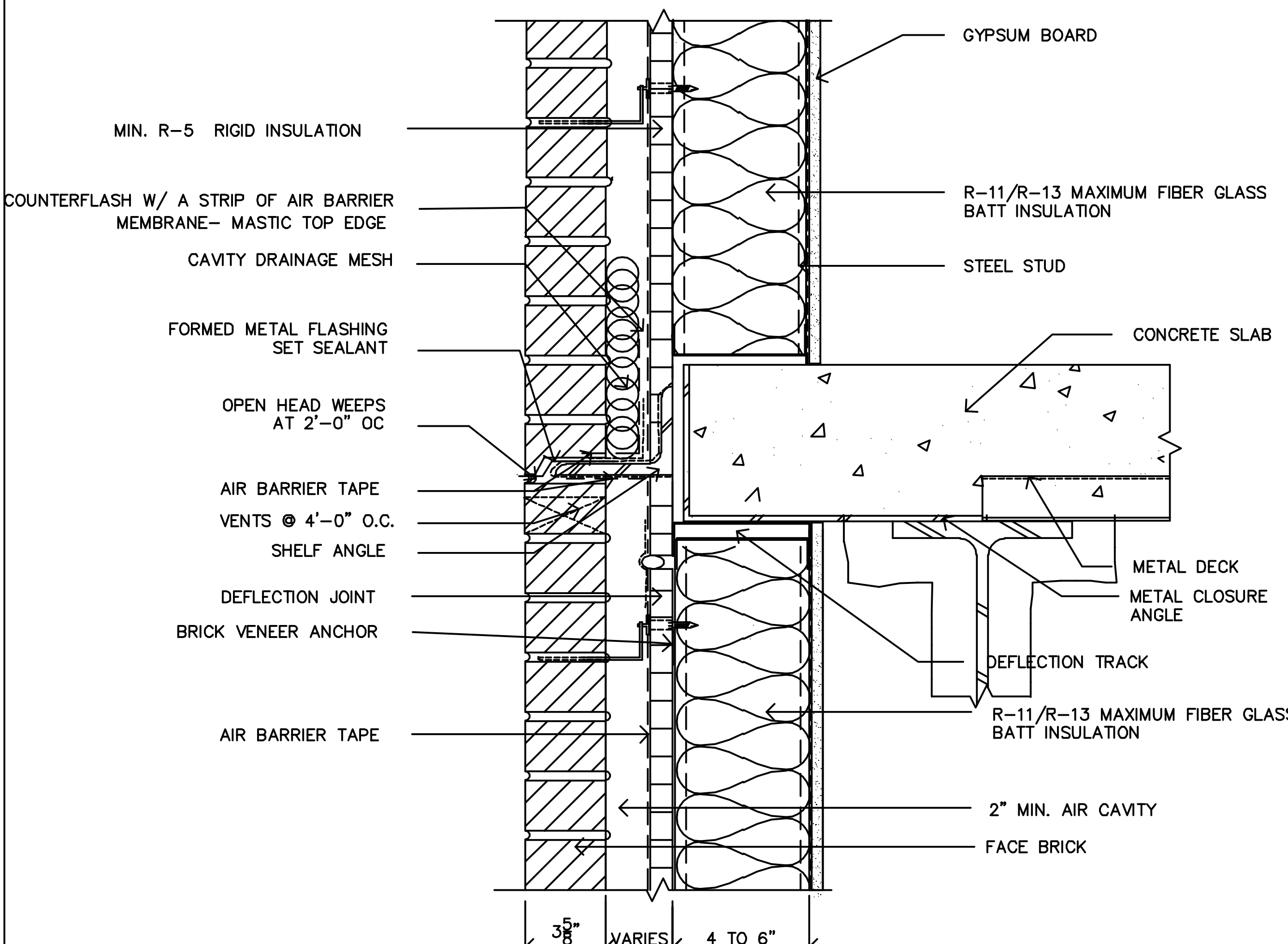

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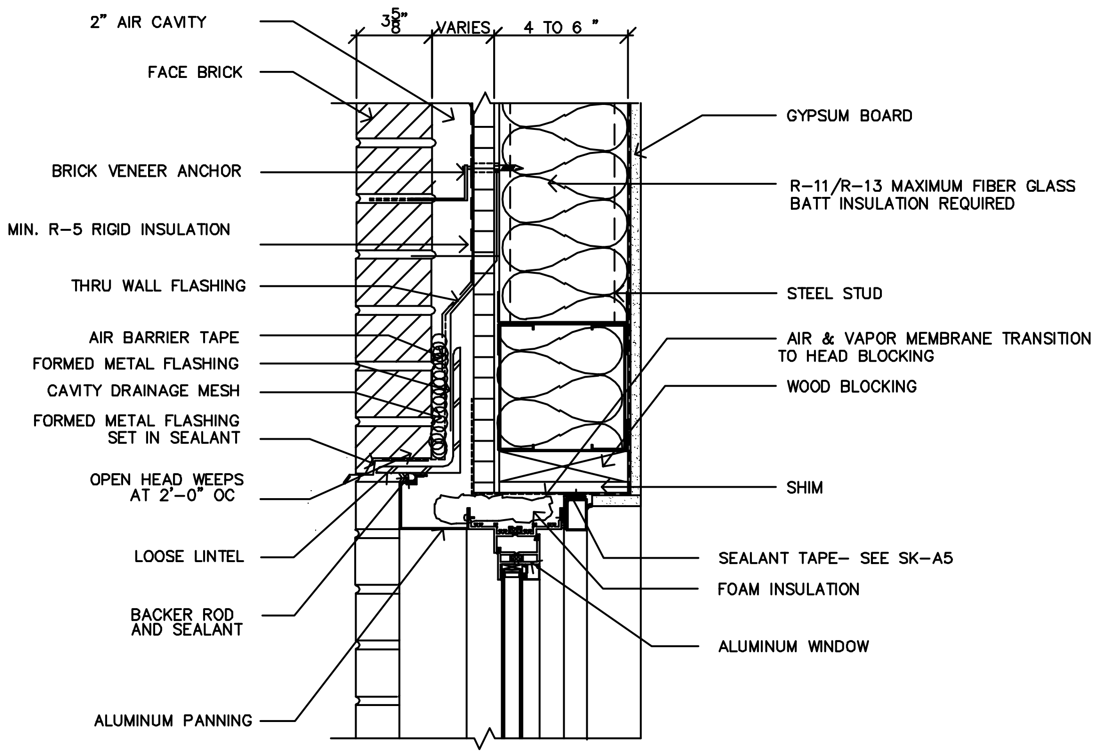

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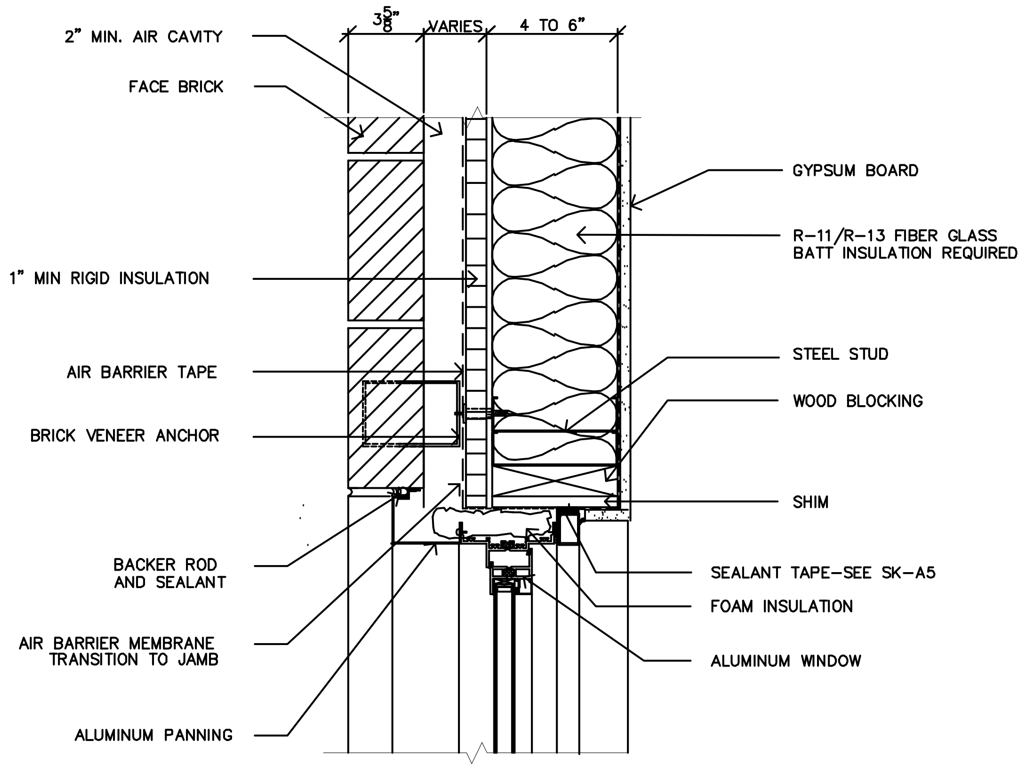

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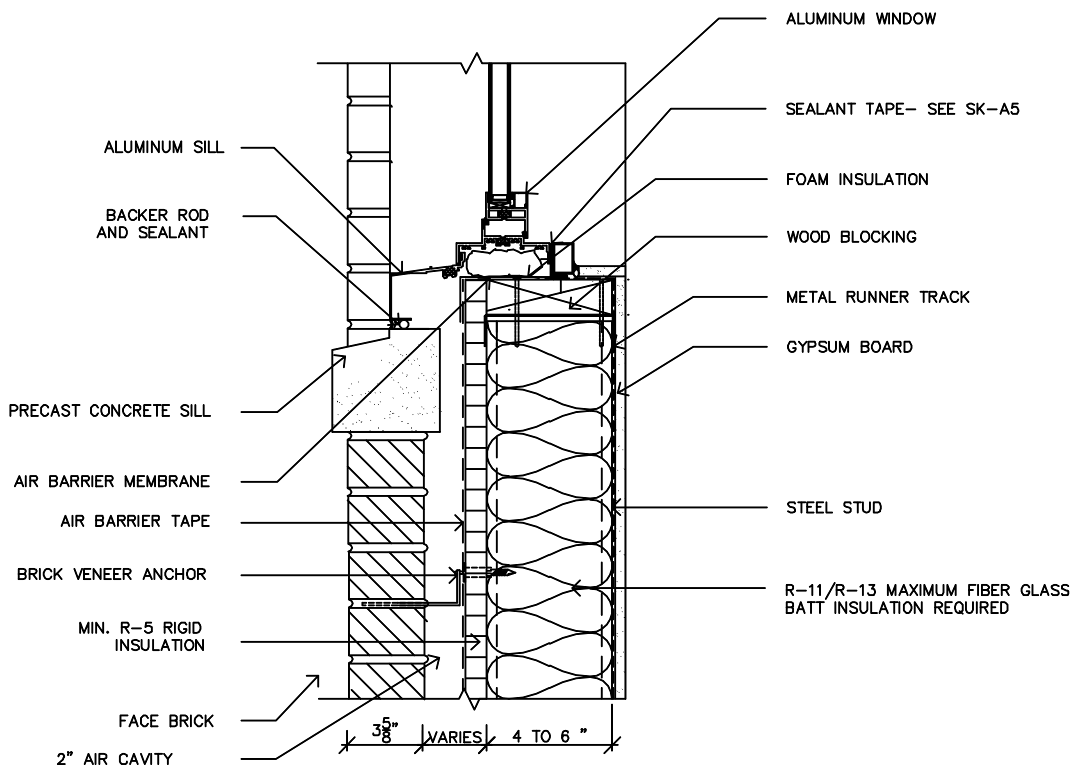

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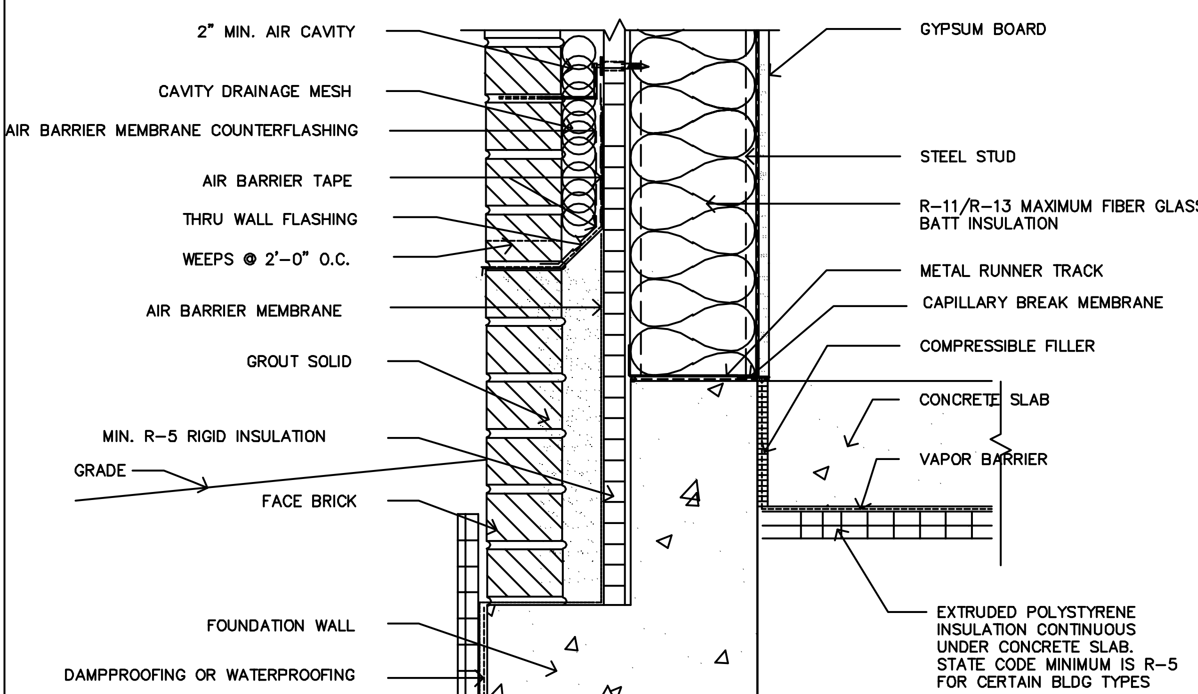

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