WALL: SINGLE WYTHE CMU DESIGN E

SINGLE WYTHE CONCRETE BLOCK WALL– DRAINAGE CAVITY MESH
VAPOR PEREABLE AIR BARRIER– INSULATION– VAPOR BARRIER– DRYWALL

DETAIL	TABLE OF CONTENTS: SINGLE WYTHE CMU DESIGN E	SKETCH NUMBER
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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 E:**

Single wythe concrete block with R-7 interior insulation. Commercial grade spun-bonded polyolefin air barrier, rigid insulation, vapor barrier, interior drywall.

Advantages:
Single wythe concrete block walls are inexpensive to build, but are susceptible to leaks. This design attempts to cure that by creating a drainage cavity on the interior using 3/8 or so thick plastic mesh (looks like expanded metal lath). Intermittent shims fastened to the block are used to fasten the air barrier to the wall. These can be lath strips running vertically or intermittently per the spun-bonded polyolefin manufacturer's instructions for air barrier attachment. Since it is supported in both positive and negative wind directions, it should be fine. To compensate for the thermal bridging of the 25ga Z furring the insulation has been increased from R-5 to R-7 using the ASHRAE averaging method. Alternatively, COMcheck EZ can be used to determine the insulation. If batts and studs are used, the code prescriptively says to use R-11 stud cavity and R-3 continuous insulation. It is important to note that the air barrier is connected with compatible sealants or tape to the metal flashings as well as to metal termination and transition angles.

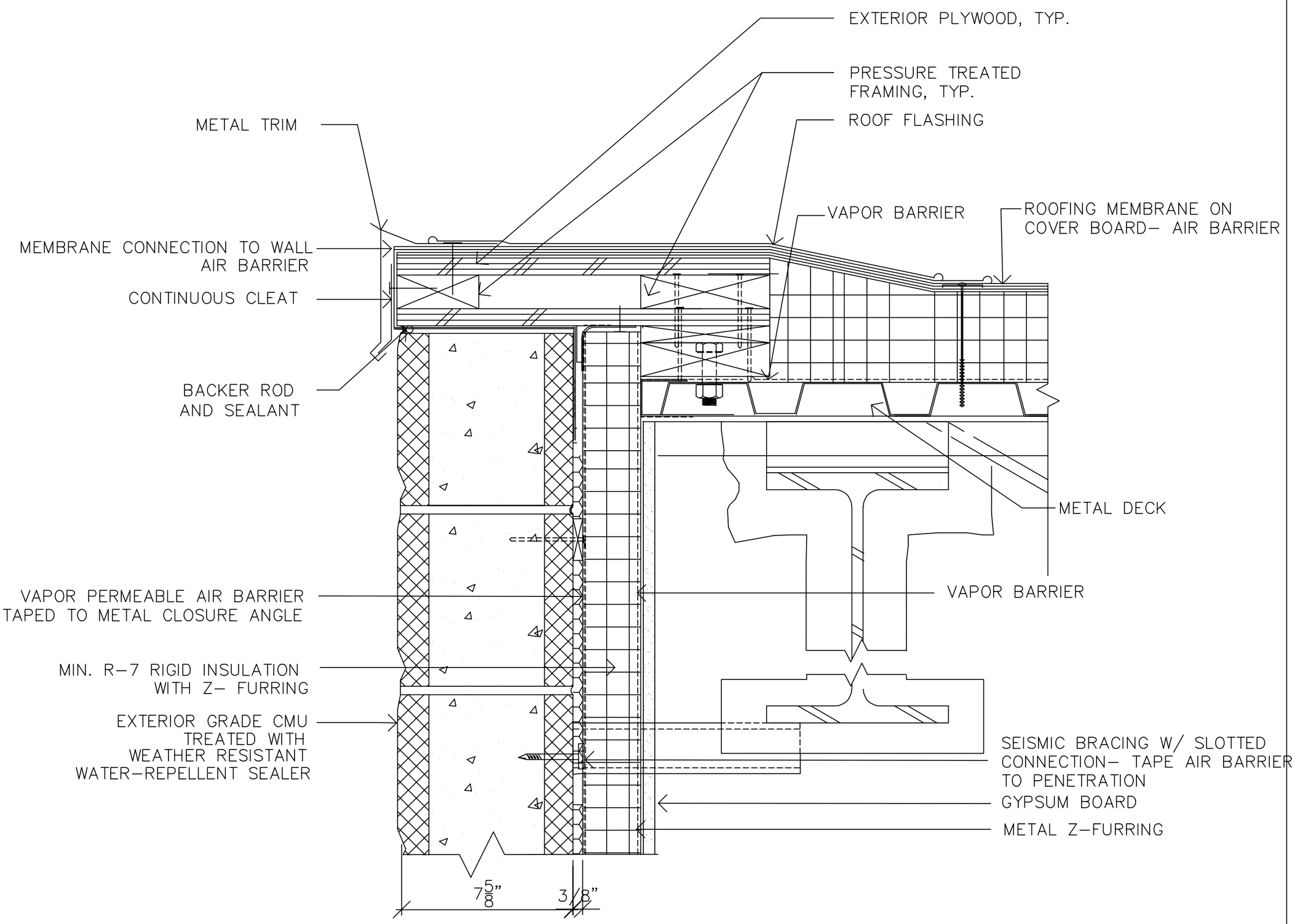
Air barrier alternatives:
None

Insulation alternatives:

- Furring studs and batt or semi-rigid rock-wool or glass fiber insulation may be used.

Vapor barrier alternatives:

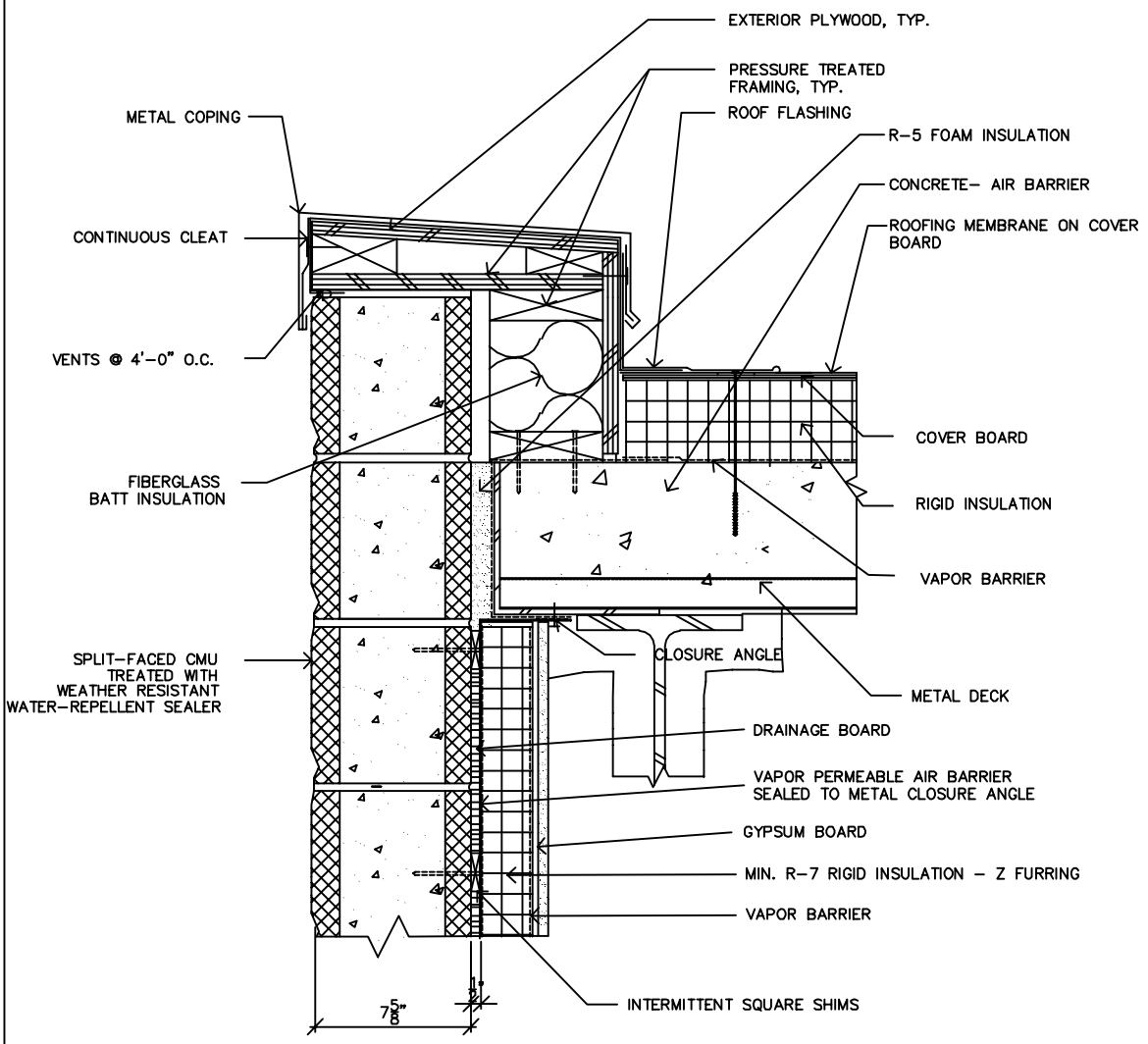
- Foil-backed drywall
- Polyethylene
- Reinforced foil
- Any vapor barrier meeting the 0.1 perm maximum requirement.



DETAIL AT ROOF EDGE

REFERENCE DETAIL: REGISTERED PROFESSIONAL TO REVIEW PRIOR TO USE

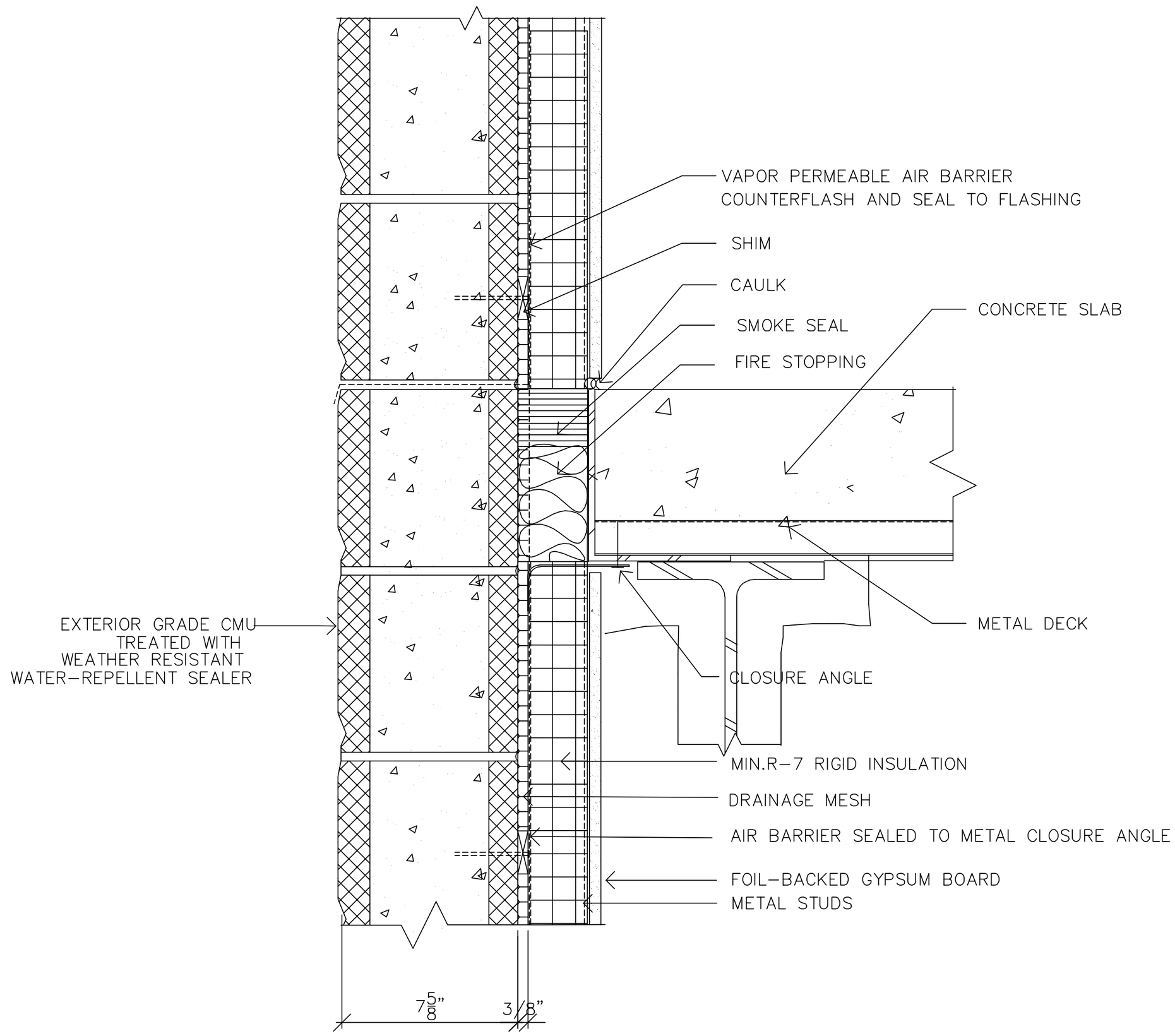
DETAIL	TITLE: WALL DESIGN E	SKETCH NUMBER SK–E1
ENERGY CODE: CONCEPTUAL DETAILS FOR EDUCATIONAL PURPOSES ONLY	Date: 10/10/2001 Scale: 3"=1'–0" Drawn: –––	2 OF 8



DETAIL AT ROOF PARAPET

REFERENCE DETAIL: REGISTERED PROFESSIONAL TO REVIEW PRIOR TO USE

DETAIL	TITLE: DETAIL AT ROOF PARAPET	SKETCH NUMBER
ENERGY CODE: CONCEPTUAL DETAILS FOR EDUCATIONAL PURPOSES ONLY	Date: 10/04/2001 Scale: 1-1/2"=1'-0" Drawn: ---	SK-E2 3 OF 8



DETAIL AT FLOOR SLAB

REFERENCE DETAIL: REGISTERED PROFESSIONAL TO REVIEW PRIOR TO USE

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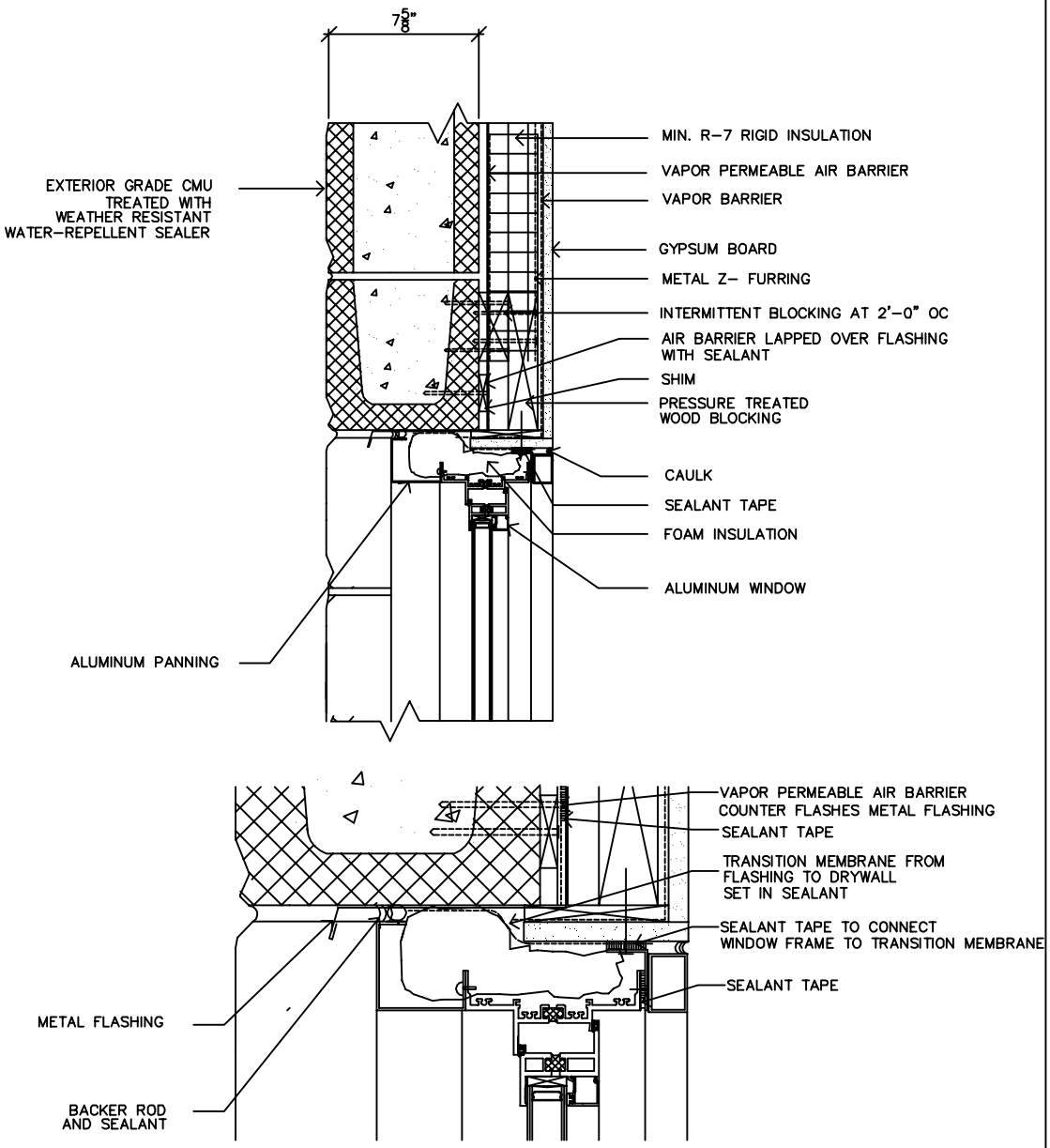
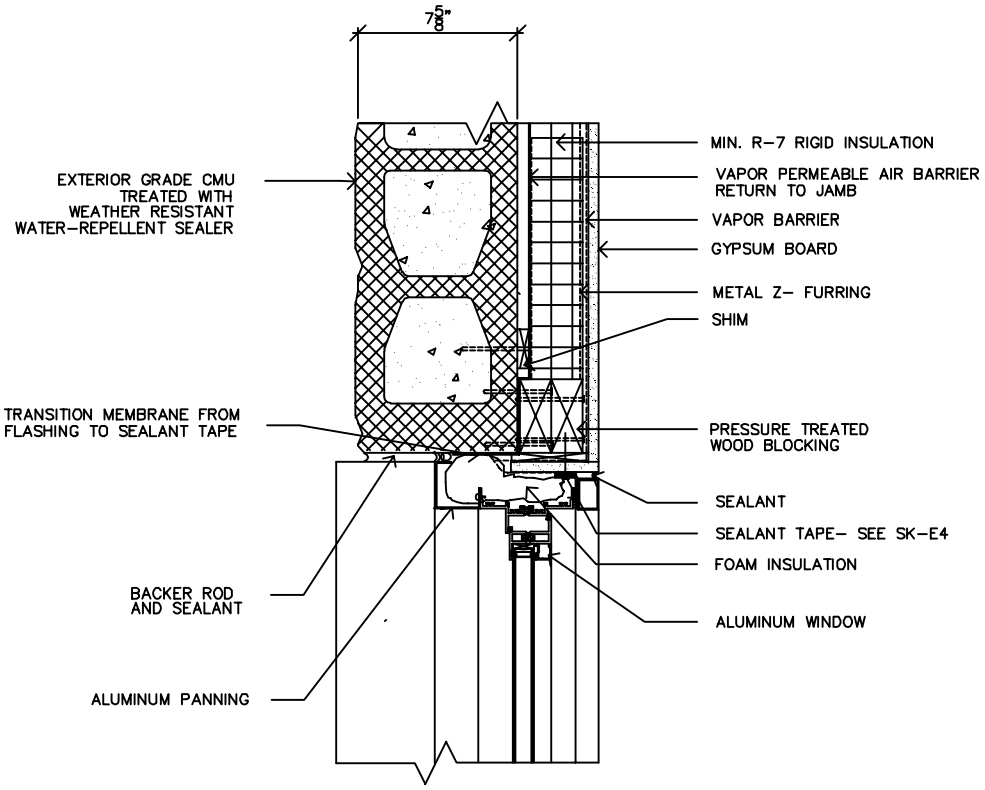
ENERGY CODE: CONCEPTUAL DETAILS FOR EDUCATIONAL PURPOSES ONLY	Date: 10/10/2001 Scale: 3"=1'-0" Drawn: ---	



DETAIL AT WINDOW HEAD

REFERENCE DETAIL: REGISTERED PROFESSIONAL TO REVIEW PRIOR TO USE

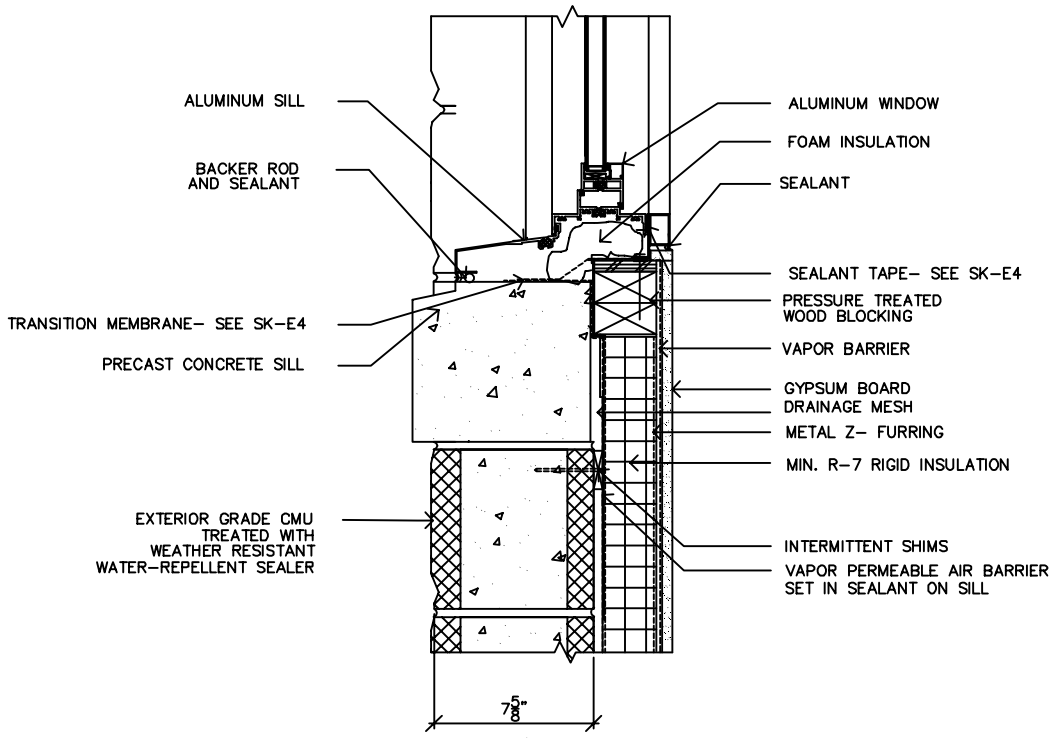
DETAIL	TITLE: DETAIL AT WINDOW HEAD	SKETCH NUMBER SK-E4 5 OF 8
ENERGY CODE: CONCEPTUAL DETAILS FOR EDUCATIONAL PURPOSES ONLY	Date: 10/10/2001 Scale: 1-1/2"=1'-0" Drawn: ---	



DETAIL AT WINDOW JAMB

REFERENCE DETAIL: REGISTERED PROFESSIONAL TO REVIEW PRIOR TO USE

DETAIL	TITLE: DETAIL AT WINDOW JAMB	SKETCH NUMBER SK-E5 6 OF 8
ENERGY CODE: CONCEPTUAL DETAILS FOR EDUCATIONAL PURPOSES ONLY	Date: 10/10/2001 Scale: 1-1/2"=1'-0" Drawn: ---	



DETAIL AT WINDOW SILL

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DETAIL	TITLE: WALL DESIGN E DETAIL AT WINDOW SILL	SKETCH NUMBER SK–E6 7 OF 8
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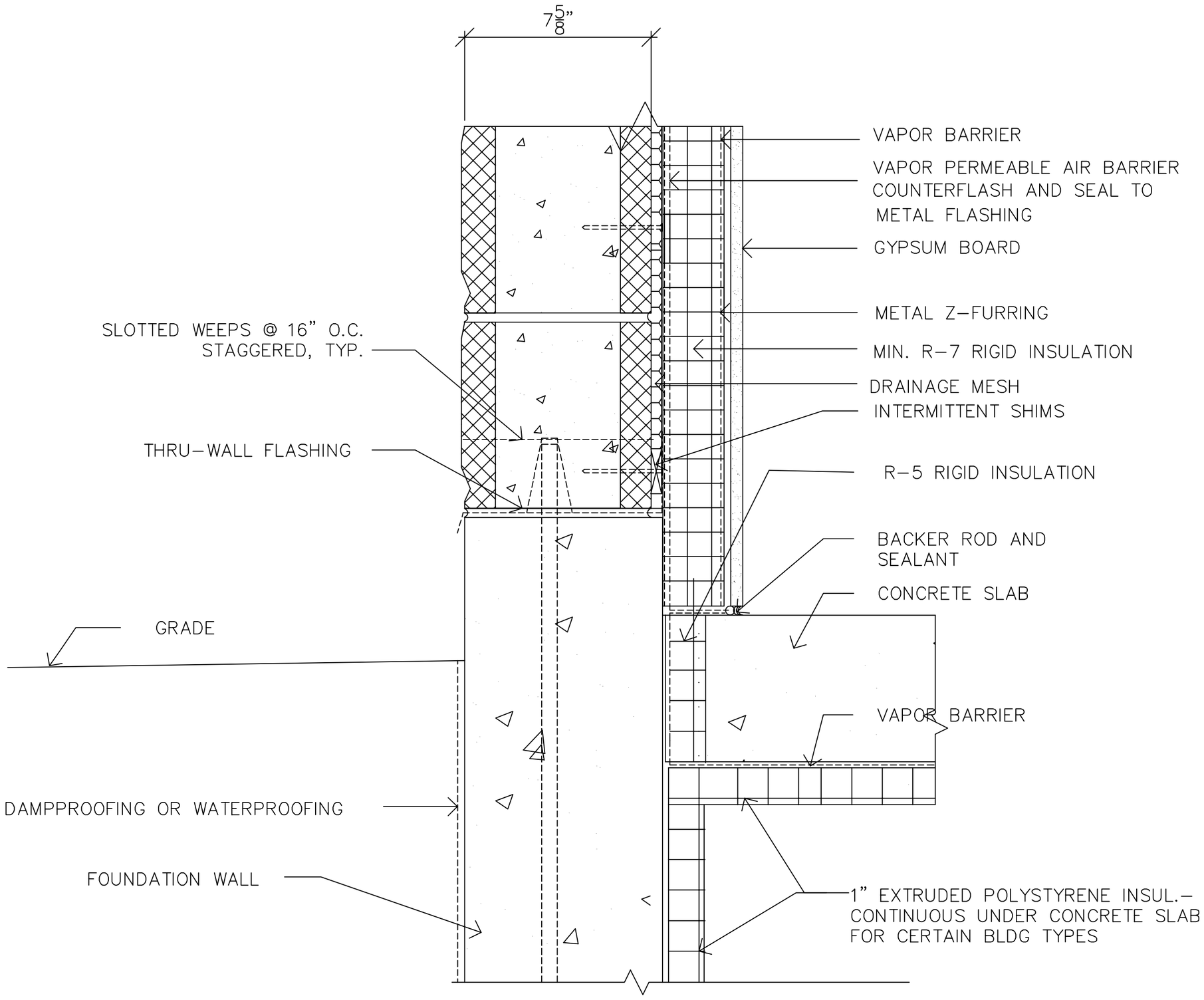

DETAIL AT FOUNDATION

REFERENCE DETAIL: REGISTERED PROFESSIONAL TO REVIEW PRIOR TO USE

DETAIL	TITLE: WALL DESIGN E DETAIL AT FOUNDATION	SKETCH NUMBER SK–E7 8 OF 8
ENERGY CODE: CONCEPTUAL DETAILS FOR EDUCATIONAL PURPOSES ONLY	Date: 10/10/2001 Scale: 3"=1'–0" Drawn: ---	