Sequencing Exterior Masonry Systems

Essential for maximizing energy conservation/performance/efficiency

BY JEFF SNYDER

It's no surprise that interest in thermal performance is rising as fast as energy prices. Coupled with continuing concern for moisture migration, thermal cavity wall design with air/vapor/moisture barriers is taking front and center position in the brick veneer on metal stud market. Increased R-Value and energy conservation benefits of cavity wall design, long advocated by masonry experts, has finally found a permanent second home. The era of cheap low performance metal stud systems may simply be remembered as the Moicest Age (moist, ice cold and mold).

This trend of events presents a double edged sword. On one side, redemption for masonry advocates; on the other, the problematic reality of blending these systems to ensure intended thermal and drainage performance. Unlike the simply detailed, efficient to construct and less expensive loadbearing CMU backed cavity wall, brick veneer on metal stud or on insulated cavity wall metal stud systems often (by contract documents) involve four or more subcontractors to assemble. Oversight by designers or any one component installer can lead to performance failure resulting in damaging leaks and increased energy consumption, not to mention expensive repairs, occupant health concerns and high perpetual maintenance costs.

Complex exterior brick veneer metal stud systems with proper component sequencing and schedule must be correctly detailed and specified so that project managers, superintendents and subcontractors will have layered components of these systems correctly. When errors in details arise or mistakes by other trades become evident, it is critical to notify responsible parties through proper chain of command. Covering up someone else's mistakes often comes back to haunt you!

A multitude of masonry design and installation educational resources are available from the Masonry Institute of Michigan and numerous other industry organizations. Utilizing these resources could eliminate detail errors or omissions. Project managers who micro-subcontract or misappropriate compon-

Learning Objectives

After reading this article, you will have learned:

1. Importance of proper component sequencing and scheduling for exterior masonry systems
2. That single source responsibility for cavity wall systems installation promotes higher performance accountability
3. How to choose performance characteristics and system compatibility of each cavity wall component

See page 60 for test and answer form.

OUTDATED: DO NOT ATTEMPT TO USE THESE EVER AGAIN

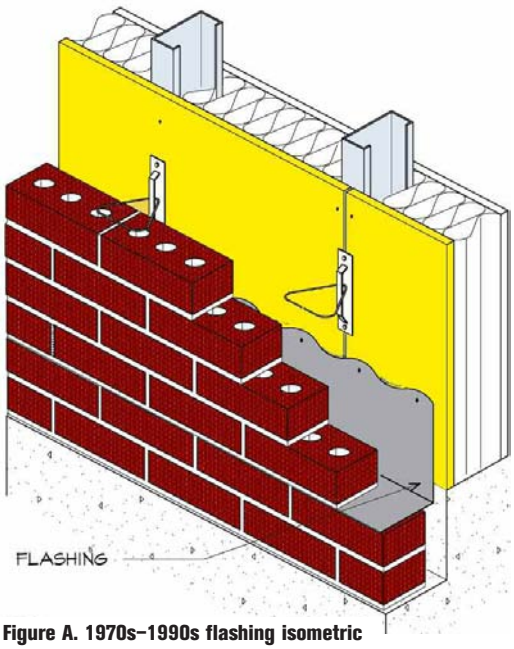

Figure A. 1970s–1990s flashing isometric

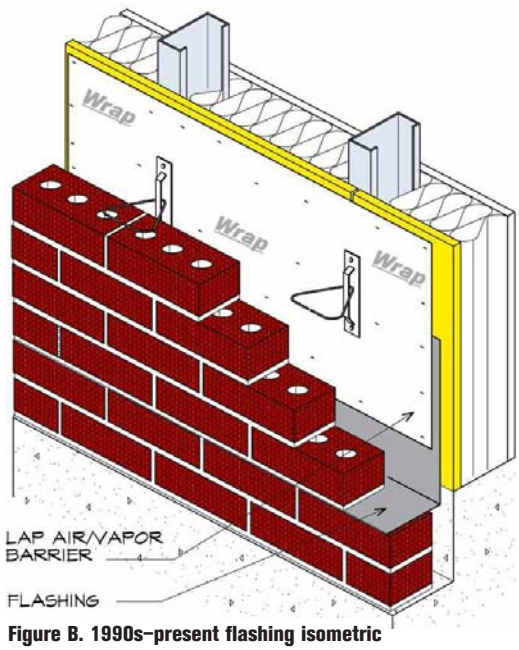

Figure B. 1990s–present flashing isometric

ents contribute to sequencing errors, or equally as important, mistakes made by field installers who lack knowledge or initiative to identify problems or do not insist on corrective measures.

Looking back — leaks cause mold and wasted energy

Until recently, brick veneer on metal stud details often lacked simple lapping to divert downward-flowing moisture over flashing and out weep holes. It wasn't uncommon to find exterior sheathing with minimum grade 20 mil plastic flashing (PVC) haphazardly nailed to the face, providing a direct channel for infiltrated rainwater to enter occupied space (Figure A). Surprisingly, this same detail, with only a slight variation, still dominates brick veneer on metal stud design. The addition of minimum code required building paper (or wrap) diverts infiltrated rainwater down over adhered flashing and out weeps (Figure B). Code alternatively allows moisture resistant sheathing with sealed seams, which is barely better than the previous standard when it comes to flashing performance. Even with a few improvements there are major shortcomings.

None of these systems benefits from recent understanding of dewpoint development or effective thermal performance. In extreme summer and winter conditions, moisture can develop in batt-insulated stud space, facilitating mold development on paper-backed drywall and batt-insulation. Reams have been written on the topic as courts have dealt with the problem of mold related claims. Rising energy costs in conjunction with simplified techniques for calculating effective (real) thermal performance of batt-insulated exterior metal stud systems have spurred reconsideration of outdated details.

Looking forward: quality details reduced risk

Today, brick veneer on metal stud systems increasingly reflects the demand to improve energy efficiency, reduce risk of rain leakage and minimize mold resulting from (dew-

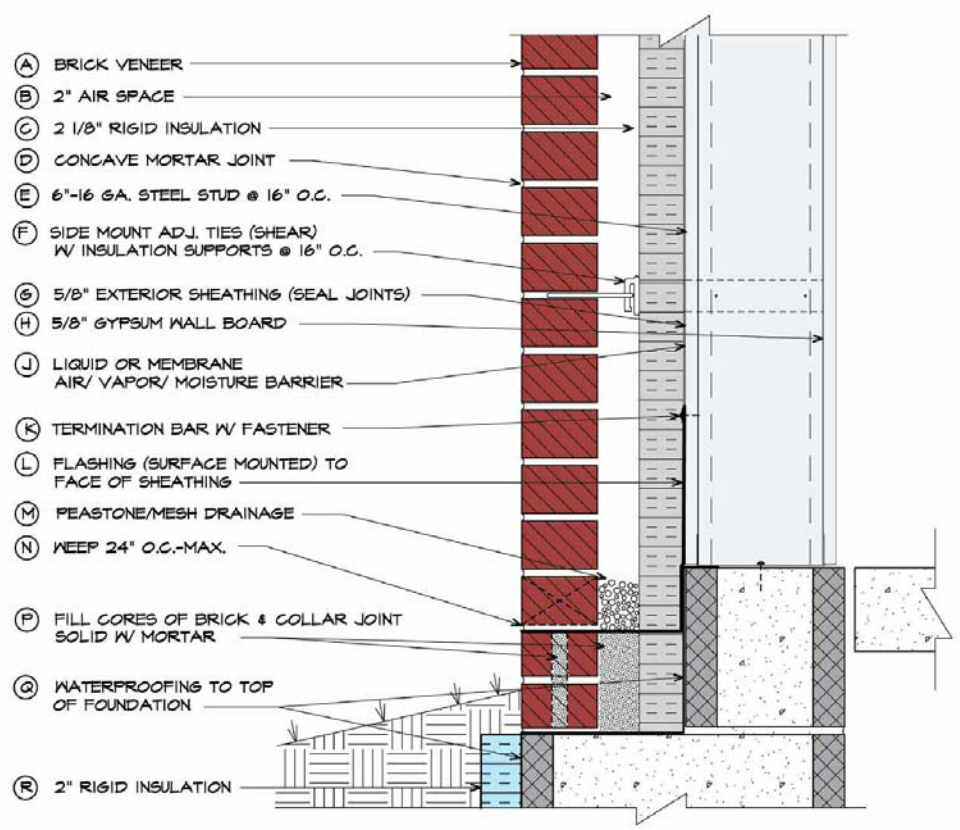

Figure C. Modern thermal/moisture cavity metal stud detail

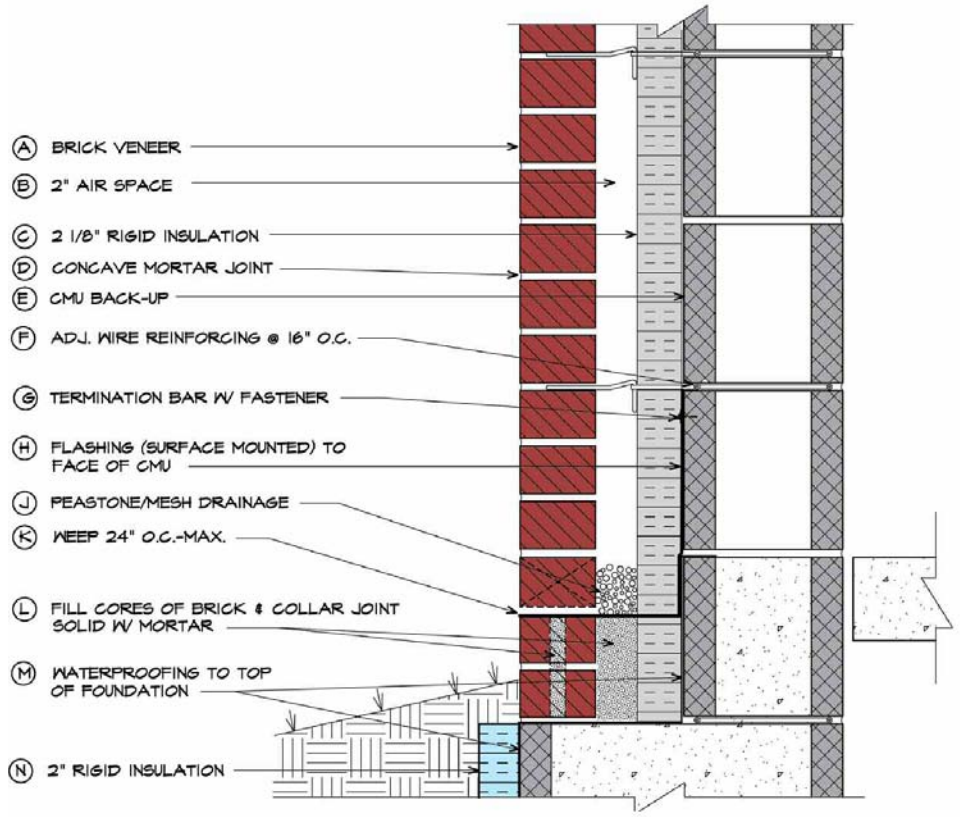

Figure D. Modern thermal/moisture cavity CMU detail

PROPER SEQUENCING – MASONRY CAVITY WALL SYSTEMS

METAL STUD BACK-UP	INSTALLER	CMU BACK-UP	INSTALLER
Structural steel	Steel Erector	Reinforced CMU	Mason
Metal stud assembly	Carpenter	CMU	Mason
Interior/exterior sheathing	Carpenter	CMU	Mason
		Alt. Fur and Drywall CMU	Carpenter
Thru-wall flashing	Mason	Thru-wall flashing	Mason
Alt. Exterior Wrap	Carpenter	N/A	N/A
Alt. Self-adhering air/vapor/ moisture barrier*	Mason or Carpenter or Waterproofer	N/A**	N/A
Brick tie system	Mason or Carpenter or Waterproofer	Brick ties system (installed with CMU)	Mason
Alt. Liquid applied air/vapor/ moisture barrier* (spray over ties)	Mason or Carpenter or Waterproofer	Alt. Liquid applied air/vapor/moisture barrier	Mason
Rigid insulation*	Mason or Carpenter or Waterproofer	Rigid Insulation	Mason
Brick veneer	Mason	Brick Veneer	Mason

* Responsibility for installation depends on the combination of components chosen by architect.
** Air/vapor/moisture membrane may be necessary by design.

Sequencing concerns with insulated cavity brick veneer on metal stud back-up systems:

- Include additional framing around columns, beams and openings to avoid gaps in brick tie spacing and ensure a flat surface to install a monolithic air/vapor/moisture and thermal envelope.
- Minimize gaps, seal and tape seams on exterior sheathing. Seal all penetrations and terminations including top, bottom, corners and jambs to ensure intended performance of air/vapor/ moisture barrier.
- Consider compatibility of thru-wall flashing with air/vapor/moisture barrier prior to installing each. If the mason is responsible for both, it isn't a problem. Otherwise, the mason, waterproofer and/or carpenter need to carefully sequence each layer.
- Select side-mounted (shear) or surface-mounted (tension) brick ties that complement the compatibility and sequencing of the air/vapor/moisture barrier, thru-wall flashing and rigid insulation.
- In short, scrutinize compatibility of each component and carefully plan installation sequencing to maximize structural, thermal and drainage performance of insulated cavity brick veneer on metal stud systems. If one component is prematurely installed it may adversely effect overall thermal and drainage performance. Changing any one component may alter compatibility with other components, requiring alternate choices and sequencing adjustments.

point developed) moisture within the metal stud space.

It's becoming more common today to see genuine insulated cavity brick veneer on metal stud systems that include heavy gauge metal studs (without batt insulation) fastened to structural steel, side stud mounted brick ties in shear, moisture-resistant exterior sheathing, spray or self-healing 40 mil membrane applied air/vapor/moisture barriers, R-12 rigid insulation, 2˝ of air space and 3 5/8˝ brick veneer (Figure C). Flashings are installed where downward migration of infiltrated cavity rainwater is interrupted, including base of wall, sills and heads, relief angles and parapets. Durable (tear resistant, ultraviolet resistant and extreme temperature resistant) flashings are mechanically fastened to the sheathing with pressure bar and screwed behind the rigid insulation. Moisture flows down along the brick back or rigid insulation face in the air space, onto the flashing, through mortar-dropping drainage mesh or pea stone and out weep holes. A good system if everyone is committed to investing in quality details, site management and qualified installers. It requires superb orchestration of the steel erector, carpenter, waterproofer and mason to assemble myriad component variables in perfect sequence to ensure intended layered performance.

The plethora of choices for each component of a cavity metal stud system can be confusing for designers. Adjustable brick ties are available for surface mounted in tension, surface mounted with prongs in tension and side mounted on metal stud webs in shear. Air/vapor/moisture barriers are available in trowel and roller grades, spray on applications and sheet membranes. Keep in mind that any one component choice — metal, composite or membrane flashings accessorized with pressure bar, primers, lap sealants, drip edges and weeps — impacts selection and installation sequence of every other component.

Sequencing to improve accountability and streamline schedules

The responsibility of sequencing which component should be installed, in what order and by whom to form a perfectly layered cavity metal stud system shouldn't be left to field installers from multiple trades trying to figure out architectural intent. It's a complex process of drawing well-thought-out details with complementary specs, accompanied by contract documents delegating components to the fewest appropriate trades in a manner that's logically sequenced to improve accountability and streamline schedules. The end product should be a high-performance thermal and layered drainage system able to handle Mother Nature on the outside and, to some degree, poorly calibrated mechanical systems on the inside.

To many this seems elementary. In reality, more often than not, carpenters and waterproofers are increasingly contracted to install cavity air/vapor/moisture systems and rigid insulation prior to masons arriving on site. Masons then are often unable to install thru-wall flashing or specified brick ties in proper layered sequence. Insulation must be removed at all flashing levels and sometimes air/vapor/moisture barrier must be scraped off to receive flashing. Also, alternate brick ties may have to be special ordered and expedited because the specified ties should have been installed prior to cavity spraying air/vapor/moisture membrane and/or attaching rigid insulation.

Carelessness in pointing out and repairing substrate or layering oversight by designers or mistakes by other trades has led to substantial failures. More often than not and regardless of true responsibility, blame seems to fall invariably in the lap of the mason contractor. Shortsightedness by others almost always negatively impacts perceptions of masonry performance. *Lesson learned:* never cover up sins of others, at least not without pursuing and documenting due diligence. Press project management for clarification from designers and insist the other trades correct their mistakes.

Single Source Responsibility

Whether brick is backed up with CMU or metal stud, qualified mason contractors are best suited to construct all facets of insulated cavity wall system assemblies. With CMU backup, masons responsibility encompasses assembly of the entire wall system (Figure D). With insulated cavity metal stud back-up, masons should be responsible for everything beyond the face of exterior sheathing. Masons have specialized scaffolding and hoisting equipment to access exterior brick veneer envelopes with training and experience necessary to layer each component in sequence. Single source responsibility of the masons, whether they self-perform or subcontract components, promotes high system performance accountability for schedule, quality control and warranty claims. Schedules are improved by reducing excess project management personnel and equipment redundancy causing jobsite logjams.

Jeff Snyder, president of Masonpro Inc., has 10 years masonry field and estimating experience. He received a BA from The College of Santa Fe, NM in 1981 and an MBA from New Mexico State University in 1983. He is a trustee for the MIM, a member of the Michigan Masonry Advisory Board and the MIM Generic Wall Design Committee. 800-659-4731, jeff@masonpro.com