

DETAILS FOR HALF-HIGH CONCRETE MASONRY UNITS

TEK 5-15 Details (2010)

INTRODUCTION

Concrete masonry offers numerous functional advantages, such as structural load bearing, life and property protection, durability and low maintenance. Half-high concrete masonry units offer the additional advantages of a veneer-like appearance in economical single wythe construction. As for all concrete masonry units, integrally colored half-high brick-like units provide enduring strength and lasting resistance to fire and wind while maintaining a virtually maintenance-free façade. These attributes are appealing for both new construction and renovations in historic districts.

Many designers are turning to half-high masonry because of its economy. As an alternative to a traditional cavity wall, these walls offer the same finished appearance, exterior durability and low maintenance coupled with a shorter construction time because of the single wythe loadbearing design. This TEK describes the use of half-high units for single wythe masonry construction. For veneer applications, see Refs. 1 and 2.

HALF-HIGH UNITS

Half-high concrete masonry units are produced to the same quality standards as other concrete masonry units. ASTM C 90 (ref. 3) governs physical requirements such as minimum compressive strength, minimum face shell and web thicknesses, finish and appearance, and dimensional tolerances.

Like other concrete masonry units, half-highs are produced in a variety of sizes, unit configurations, colors and surface textures. In addition, special shapes, such as corners and bond beam units are also available.

WALL PERFORMANCE

Structural design considerations for half-high construction are virtually the same as those for conventional concrete masonry units. One aspect that may be different for half-high units is the unit strength. Typical nonarchitectural concrete masonry units have a minimum unit strength of 1,900 psi (13.10 MPa), corresponding to a specified compressive strength of masonry, f'_m , of 1,500 psi (10.34 MPa). Half-high and other architectural units, however, are typically manufactured to a higher unit strength. Designers should check with producers about the strength of locally available units, with the intent of taking advantage of these higher strengths in their designs when available.

Section properties for half-high units are essentially the same as for full-height units, and the same design aids can be used for both (see Ref. 4). In addition, because the core sizes are also typically the same as for full-height units of the same thickness, considerations for maximum reinforcing bar size as a percentage of the cell area are the same as well. See Ref. 5 for more detailed information.

Because there are more horizontal mortar joints in a wall constructed using half-high units, there is slightly less concrete web area in the wall overall. Although this theoretically reduces the wall weight, in practice the wall weights of walls constructed using half-high units are within 1 psf (0.05 kPa) of those for full height units (see Ref. 6).

To facilitate the construction of bond beams, half-high bond beam units are typically available with depressed webs to accommodate horizontal reinforcement. Grouting two half-high units provides an 8-in. (203-mm) deep bond beam, as shown in Figures 1 through 3. Note that the bottom unit of the bond beam should have depressed webs to accommodate the horizontal reinforcement, but the top unit need not have depressed webs.



**Single Wythe Half-High Construction
in Hartland, Wisconsin**

Related TEK:
3-8A, 5-7A, 19-2A

Keywords: bond beam, construction details, flashing, reinforced concrete masonry, single wythe construction, water penetration resistance

Performance criteria for fire resistance, energy efficiency and acoustics of half-high units can be considered to be the same as for similar full height units. See Refs. 7 through 11 for further information. In addition, detailing window openings, door openings, etc., is the same as for single wythe masonry walls constructed using full-height units.

CONSTRUCTION

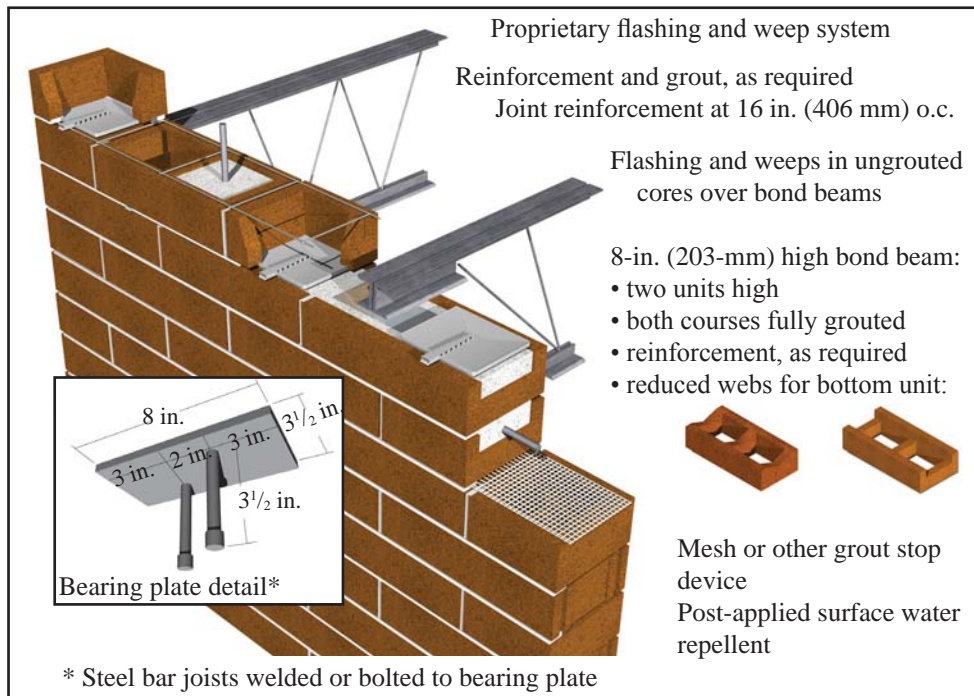
Construction with half-highs is very similar to that for conventional units. Some differences include: an increased number of courses laid per wall height, greater amount of mortar needed, as well as the difference in bond beam construction noted above. Crack control considerations are the same as for full height units.

As an alternative to supporting trusses by means of a pocket in the masonry wall or by joist hangers, Figure 4 shows a unique

application where half-high units have been corbelled out to provide bearing for a wood truss floor. This also provides continuous non-combustible bearing thickness without the need to stagger the joists. See Ref. 12 for additional floor and roof connection details.

As for any single wythe construction, particular care should be taken to prevent water from entering the building interior. Dry walls are attained when both the design and construction address water movement into, through and out of the wall. Considerations include potential sources of water, unit and mortar characteristics, crack control, workmanship, mortar joint tooling, flashing and weeps, sealants, and water repellents. For single wythe masonry, an integral water repellent in both the units and mortar, as well as a compatible post-applied surface water repellent are recommended. See Refs. 13 -18 for more information.

Figure 1 shows a proprietary flashing system that collects and directs water to the exterior of the wall and out weep holes,



without compromising the bond at mortar joints in the face shells (see Ref. 15 for recommended flashing locations). There are a number of generic and proprietary flashing, drainage, weep, mortar dropping control, and rain screen systems available. Single wythe flashing details using conventional flashing are included in Ref. 14.

Solid grouted single wythe walls tend to be less susceptible than ungrouted or partially grouted walls to moisture penetration, since voids and cavities where moisture can collect are absent. As a result, solid grouted walls do not require flashing and weeps, although they do require other moisture control provisions, such as sealants and water repellents. For partially grouted walls, flashing should be placed in ungrouted cells.

Figure 1—Bearing Detail on Single Wythe Wall (ref. 19)

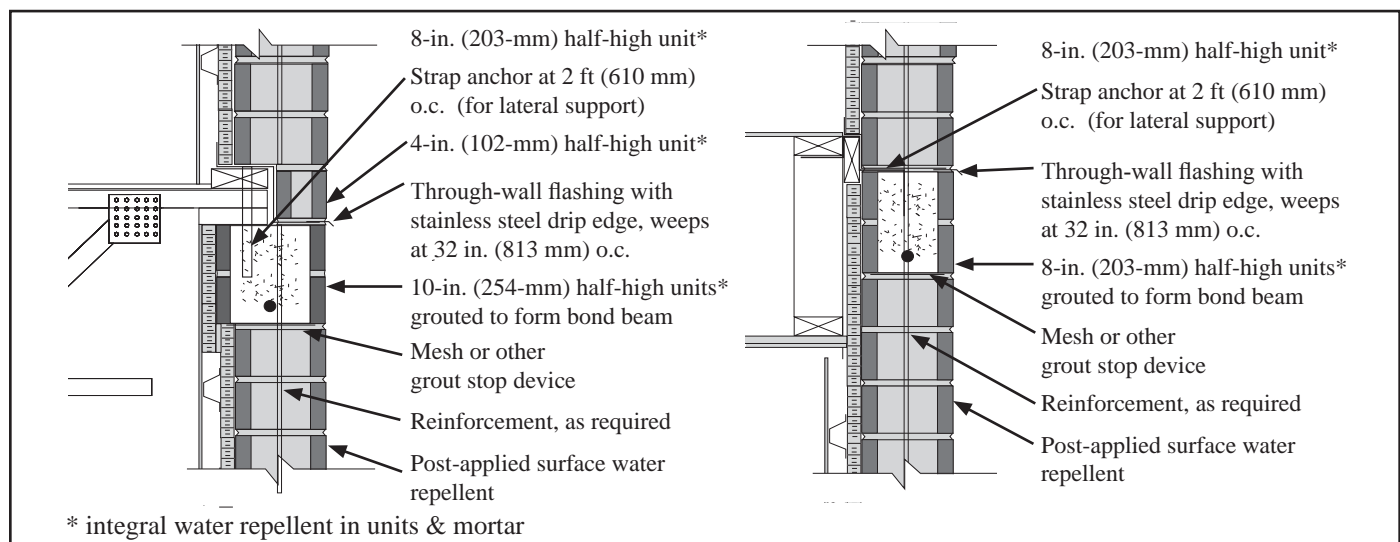


Figure 2—Exterior Loadbearing Wall With Wood Truss Floor (ref. 19)

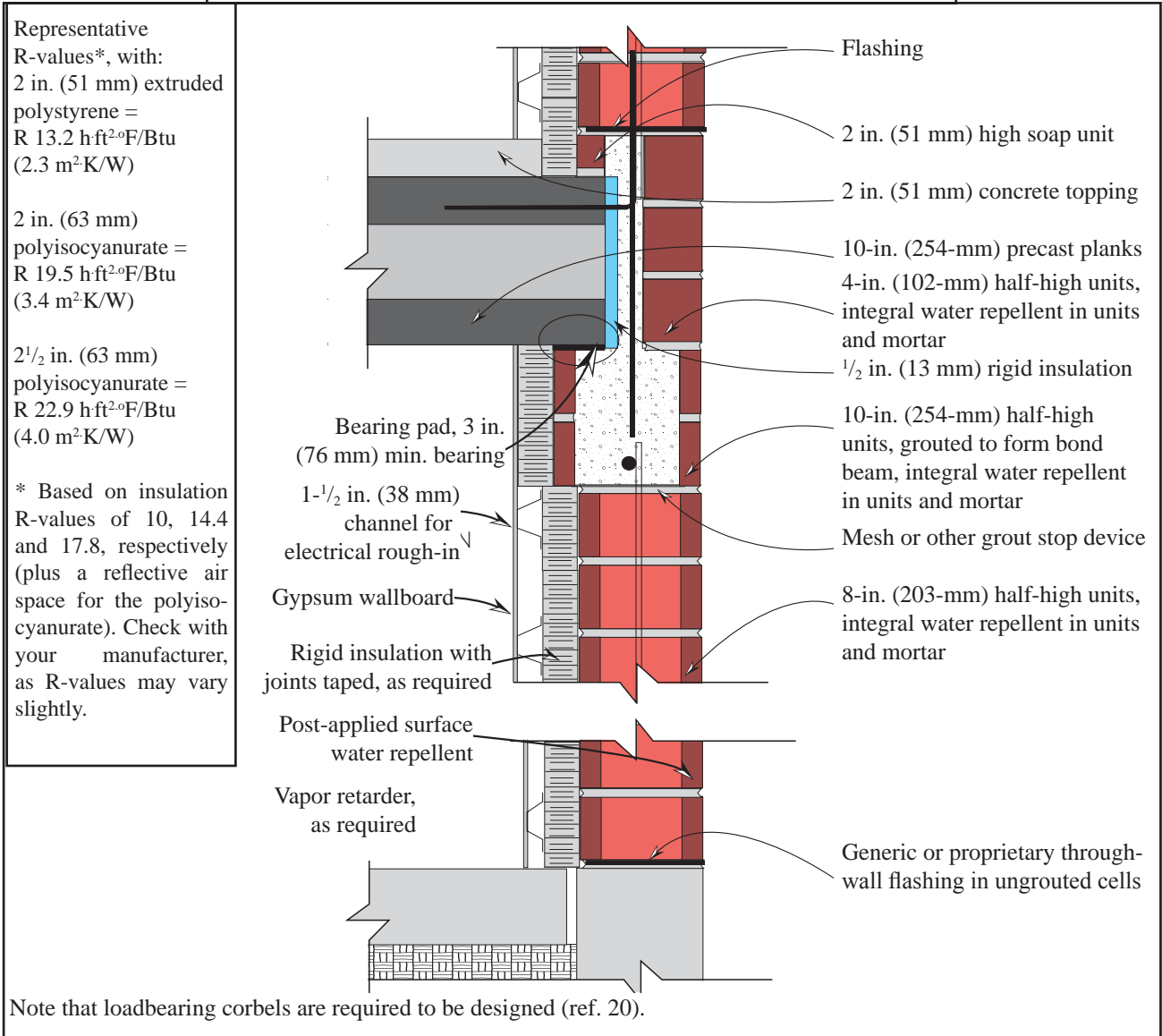
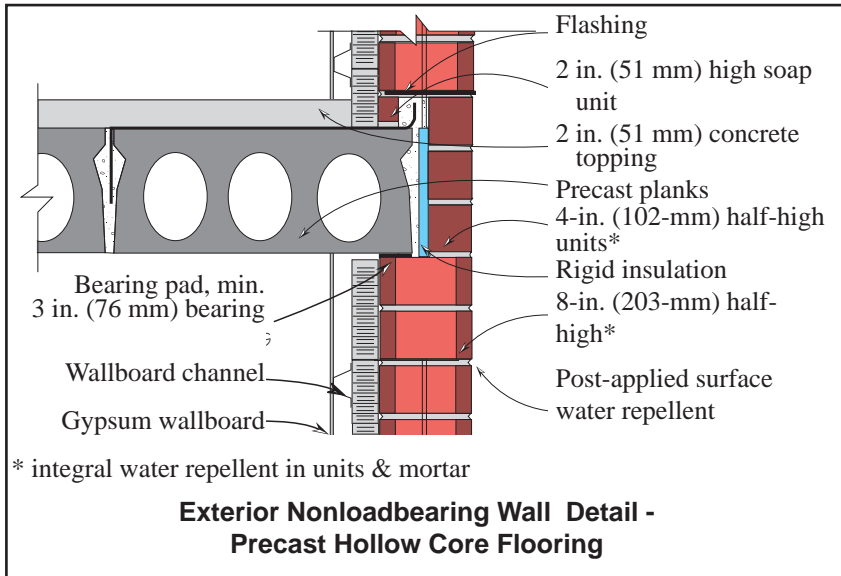


Figure 3—Exterior Wall With Precast Hollow Core Plank Floor (ref. 19)

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