U.S. Department of Housing and Urban Development
Office of Policy Development and Research

Concrete Masonry Homes:
Recommended Practices

Concrete Masonry Homes: Recommended Practices

Prepared for

National Association of Home Builders
Washington, DC

National Concrete Masonry Association
Herndon, VA

Portland Cement Association
Skokie, IL

and

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Foreword

The U.S. Department of Housing and Urban Development (HUD) in the past several years has focused on a variety of innovative building materials and systems for use in residential construction. HUD's interest in alternative materials has focused on addressing barriers to innovations and educating home builders, home buyers, code officials, and design professionals in key aspects of a particular material's use, including limitations, advantages, availability, and cost in an effort to accelerate development, acceptance, and implementation by the home building industry. Innovative design and construction approaches using wood, steel, and concrete materials have thus far been addressed as viable alternatives to conventional residential construction methods and materials.

Concrete masonry units (CMUs) have also been identified because of the material's availability, strength, durability, fire resistance, and success in the commercial and localized residential markets. CMUs are hollow blocks constructed of concrete that are stacked, typically in a running bond pattern, and held together with mortar. CMUs comprise a significant percentage of the United States residential foundation wall market and have a long history of residential use above grade in Arizona, Florida, Texas, and other parts of the southern United States.

Even though CMUs are used in residential construction, builders and designers are often hesitant to explore approaches that differ from conventional practice. In many instances, such reluctance can be attributed to a lack of information, lack of sharing across regional barriers, or localized customs in building materials and methods. Therefore, CMU demonstration homes were constructed in nontraditional masonry market regions of the United States to identify the major issues related to the design and construction of CMU homes. The results are presented in *Building Concrete Masonry Homes: Design and Construction*. The major issues identified in that report serve as the basis for this document and its recommended construction practices.

This report, *Concrete Masonry Homes: Recommended Practices*, focuses on the attachment or installation of foundations, floors, roofs, insulation, utilities, and finishes to concrete masonry walls as well as on special tools and fasteners available for use with concrete masonry. An effort has been made to provide construction details that highlight the use of masonry in conjunction with various innovative materials such as cold-formed steel framing and engineered wood products.

We believe that providing this information to the home building industry will promote healthy competition and help define optimal use of all of our natural resources while enhancing housing affordability.

Xavier de Souza Briggs
Deputy Assistant Secretary for
Research, Evaluation, and Monitoring
U.S. Department of Housing and Urban Development

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Executive Summary

Concrete Masonry Homes: Recommended Practices was developed as a guideline for using concrete masonry in the construction of homes in the United States. This document was prepared in response to previous research efforts funded by the U.S. Department of Housing and Urban Development (HUD), the National Concrete Masonry Association (NCMA), and the Portland Cement Association (PCA). The previous years' research efforts focused on constructing two demonstration homes to help identify key issues builders face when constructing homes with concrete masonry, especially homes with above-grade walls in nontraditional masonry markets. The results of that study are documented *in Building Concrete Masonry Homes: Design and Construction*. The connection of various materials and products to concrete masonry walls was one key issue identified by the study, particularly in regions unfamiliar with concrete masonry construction.

This document focuses primarily on the attachment of common residential materials and elements to concrete masonry wall construction. The installation of certain materials or products commonly affects the installation of other materials or elements; in addition, tools and fasteners used for one type of application may be used for another. Needless to say, materials and elements may be installed in many possible combinations. In an effort both to present an abundance of information in a concise manner and limit the amount of cross-referencing between fact sheets, this document is divided into seven fact sheets as listed below. Each fact sheet focuses on a specific type of connection or attachment. The first three fact sheets primarily address structural connections, the fourth focuses on common finishes that may be used on CMU walls, the fifth deals with thermal aspects of CMU construction, the sixth concentrates on utility placement alternatives, and the seventh considers common tools and fasteners used to install the items discussed in the previous fact sheets.

FS•1, Foundation Connections
FS•2, Floor Connections
FS•3, Roof Connections
FS•4, Finish Attachments
FS•5, Insulation Placement
FS•6, Utility Placement
FS•7, Tools and Fasteners

To gain a greater understanding of residential concrete masonry construction and the various possible combinations for the installation of materials and elements, the reader is encouraged to read the entire document and determine, well before the design stage, which issues are of primary importance and how the selected priority items affect other elements of construction. For example, insulation is not shown in the illustrations found in Fact Sheets 1 through 4; the reason is that various alternatives concerning insulation placement, if required by local code, are covered in Fact Sheet 5. By combining the information presented in Fact Sheets 1 through 4 with that found in Fact Sheet 5, a CMU wall may be constructed to meet local energy code requirements, as applicable. In addition, by reading the information presented in Fact Sheet 6, the reader can determine how the choice of insulation placement determines the installation of utilities. Finally, by reading Fact Sheet 7, the reader can identify what tools and fasteners are needed during construction based on the required types of attachments.

Foundation Connections

FS · 1

An information series on residential concrete masonry technology

SUMMARY

A foundation in residential construction may consist of a footing, wall, slab, pile or pier, or combination of two or more of these elements. Residential foundation systems in the United States are most often constructed of concrete masonry or concrete. Of these foundations, stem walls in conjunction with slabs on grade and monolithic slabs on grade are the most common in the Southeast, basements most common in the East and Midwest, and crawl spaces most common in the Northwest and West. Other types of foundations may be used depending on local tradition or special site conditions.

Given that many residential foundations are constructed with concrete masonry, builders should be familiar with foundation details using concrete masonry. In certain areas of the country, however, home builders and designers are less familiar with CMU construction practices.

The details shown herein are "generic" and "typical" for low-wind and seismic areas (less than 110 mph three-second-gust wind speed and less than Seismic Design Category D). It is suggested that the designer or builder consult local building codes and recognized standards to determine footing size, reinforcement requirements, anchor bolt spacing, and thermal requirements.

For higher-wind and seismic areas, homes should be built in accordance with local codes and recognized standards; refer to the Resources section for more information.

FOUNDATION TYPES

Stem Wall and Monolithic Slab on Grade

Slab-on-grade floors are popular in the southeastern United States. A slab-on-grade floor is approximately 4-inch-thick concrete in residential construction and is supported by or rests on approved fill beneath it. Foundations used in conjunction with slabs on grade can be constructed a variety of ways; however, the two most popular ways are:

- ✔ foundation stem wall and slab on grade; and
- ✔ monolithic slab on grade (thickened-edge slab).

Refer to Figures 1-1a and 1-1b for *foundation stem wall and slab on grade* and Figure 1-2 for *monolithic slab on grade.* The figures illustrate the foundation types and some recommended methods for constructing slab-on-grade foundations.

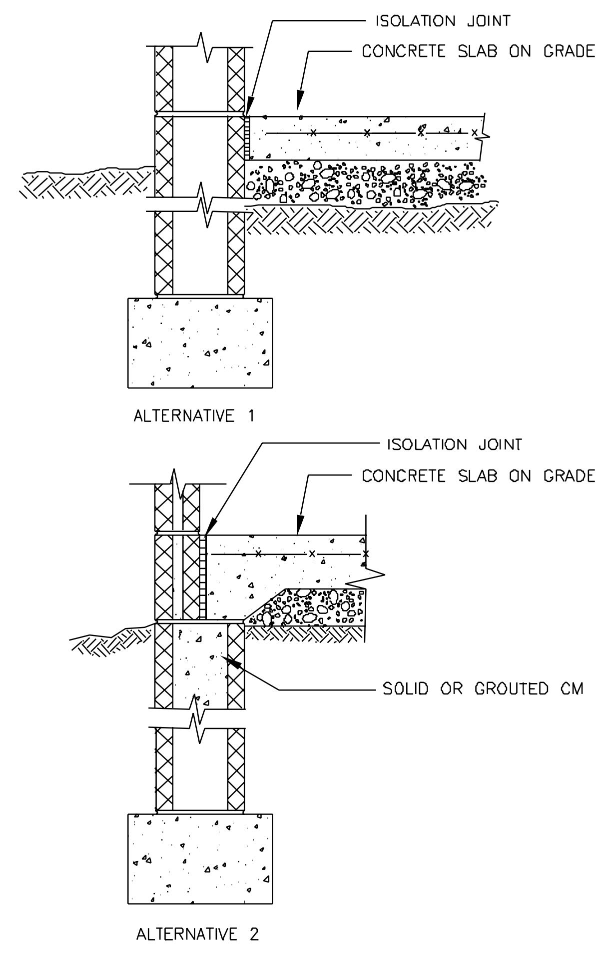

Figure 1-1a: Foundation Stem Wall and Slab on Grade

Foundation stem wall and slab on grade construction uses a concrete floor that is supported by the earth beneath it and isolated from the concrete masonry walls. The stem walls are erected first and the slab poured afterward.

The slab may also be supported by the concrete masonry stem wall at the perimeter and by the fill beneath. The concrete masonry stem wall is constructed to form a continuous ledge on which the slab's edges bear. The detail shown in Figure 1-1a, Alternative 1, is used when differential settlement at the slab edge (between the foundation and slab) may be a problem. Alternatives 2, 3, and 4 may be used if little or no differential settlement between the slab and the foundation is expected. All alternatives are acceptable.

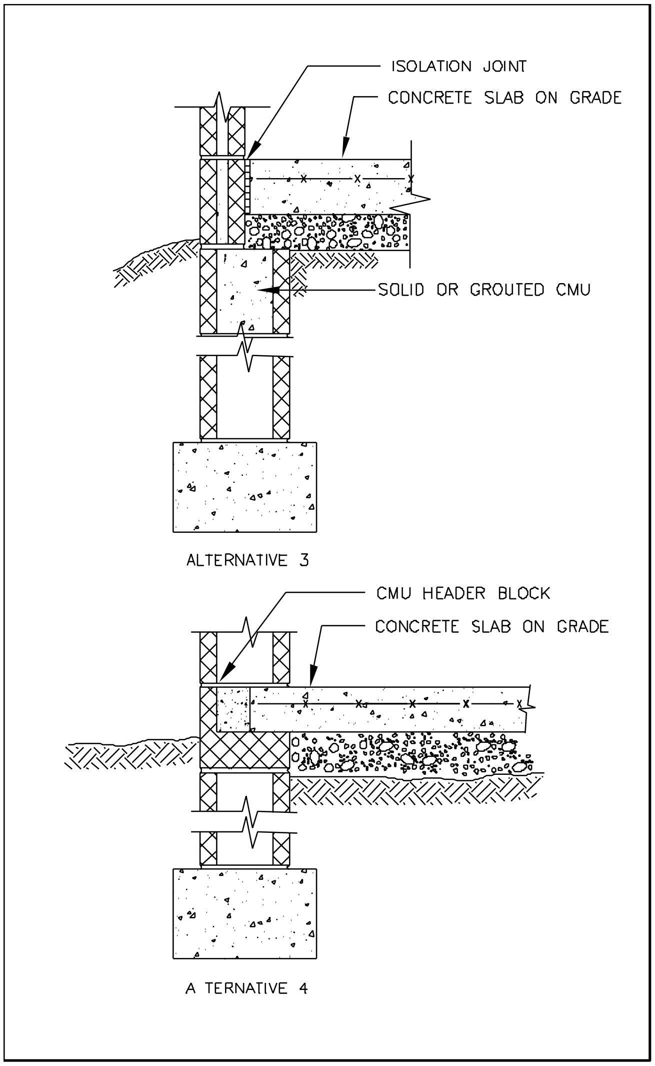

Figure 1-1b: Foundation Stem Wall and Slab on Grade

Designers typically specify an isolation joint between the slab and the wall to allow the slab to shrink or expand independent of the wall. Asphalt-impregnated fiber sheathing is one commonly used isolation joint material. If the slab is not allowed to move independently, cracking may occur perpendicular to the wall. On many residential job sites, however, the slab is cast against the wall, or a more rigid material is used to provide a slippage surface. There is no evidence to suggest that homes constructed with the slab cast against the wall perform less adequately than homes built with isolation joints. Although not currently required in the *International Residential Code*, an isolation joint is suggested in this guide as a *best practice* simply because it may make any cracks less evident and thus reduce customer dissatisfaction. It can also serve as a screed mark for maintaining a level finished slab surface.

A *monolithic slab on grade* is also commonly referred to as a thickened-edge slab. It consists of a concrete floor and concrete foundation placed at the same time to form a monolithic footing and slab. Refer to Figure 1-2 for a typical monolithic slab on grade.

Regardless of the perimeter foundation type, slabs are cast thicker under interior load-bearing walls to help support the loads from above. Thus, the location of the interior masonry walls must be known so that preparations for thickened interior slab footings can be made. Refer to Figure 1-3 for some recommended methods for supporting interior masonry walls.

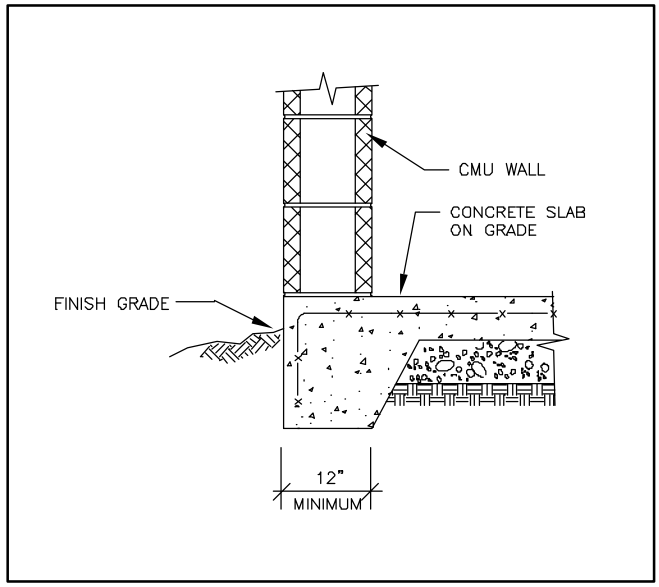

Figure 1-2: Monolithic Slab on Grade (Thickened-Edge Slab)

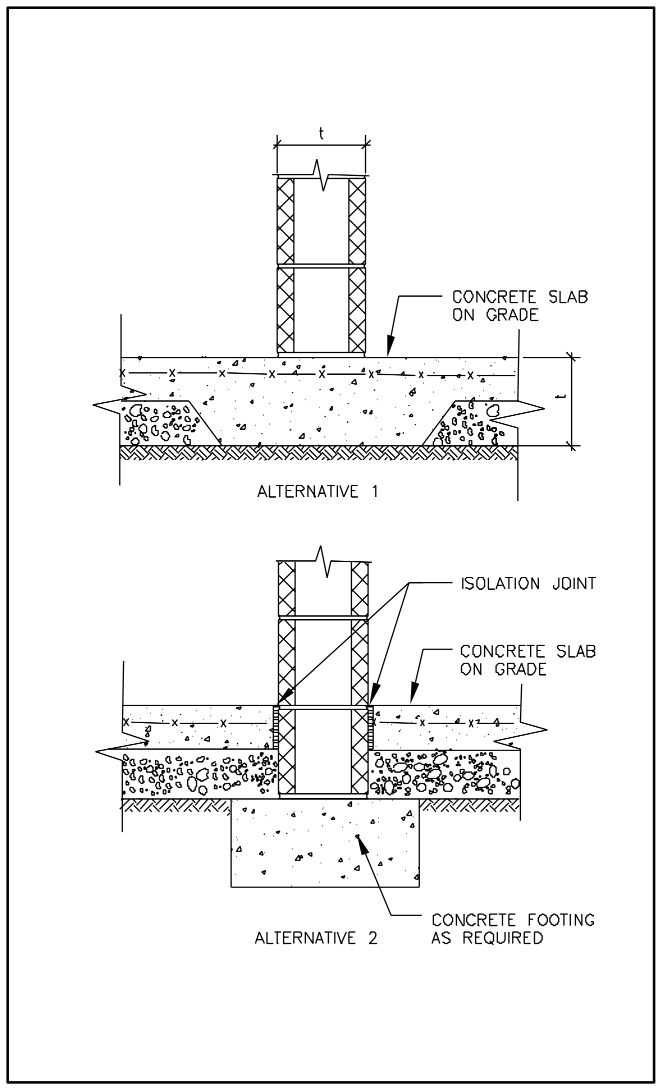

Figure 1-3: Interior Bearing-Wall Foundation

Basements

Basement foundations are popular in the Northeast and Midwest. A basement is defined as that portion of a building that is partly or completely below grade. It may be used as habitable space. Refer to Figure 1-4, which illustrates the recommended method for constructing basement foundations.

Basements are constructed with an independent concrete slab that is isolated from the concrete masonry walls. The basement floor is typically poured after the concrete masonry walls have been erected or partially erected.

Designers typically specify an isolation joint to allow the slab to shrink or expand independent of the wall. Although considered a *best practice*, isolation joints may not be necessary in residential construction; refer to the *Stem Wall and Monolithic Slab on Grade* section for a discussion on the use of isolation joints.

Note that a reinforcement dowel between the footing and CMU wall is not required in Figure 1-4 for basement wall construction. The reason is that the slab on grade is placed within the wall perimeter and thus provides adequate resistance against inward slipping caused by backfill loads; however, temporary bracing is recommended if the slab is not placed before backfill placement.

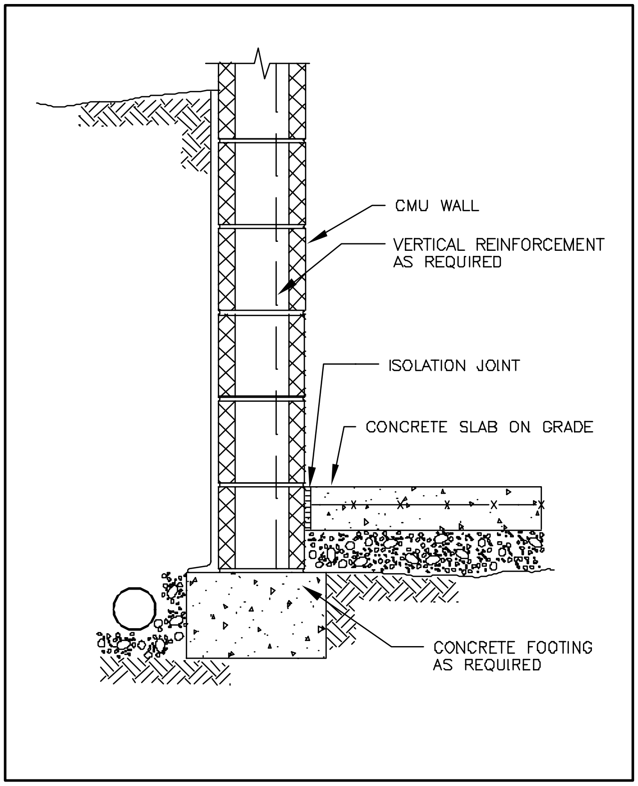

Figure 1-4: Basement Wall

Some designers may specify vertical reinforcement in basement walls depending on the depth of unbalanced soil and the type of soil or lateral soil pressure. Many factors influence a basement wall's performance, particularly backfill soil type, compaction method, foundation drainage, depth of backfill, the vertical load on the wall, and workmanship. Any one of these factors may affect performance of the construction. As a rule of thumb, the *International Residential Code* and most local codes allow unreinforced basement wall construction if the soil pressure is no greater than 30 psf; however, it limits the depth of unbalanced backfill based on wall thickness. Refer to the *International Residential Code* or the applicable local building code for maximum backfill heights for plain masonry foundation walls.

Horizontal bed joint reinforcement, if installed, is placed in the mortar joint between block courses. Its purpose is to tie the wall together and provide resistance to cracking due to temperature expansion and shrinkage in the wall.

Crawl Spaces

Crawl space foundations are popular in the Northwest, West, and Mid-Atlantic regions. A crawl space is defined as that portion of a building that uses a perimeter foundation wall to create an under-floor space that is not habitable. A crawl space may or may not be below grade. Refer to Figure 1-5, which illustrates some recommended methods for constructing crawl space foundations.

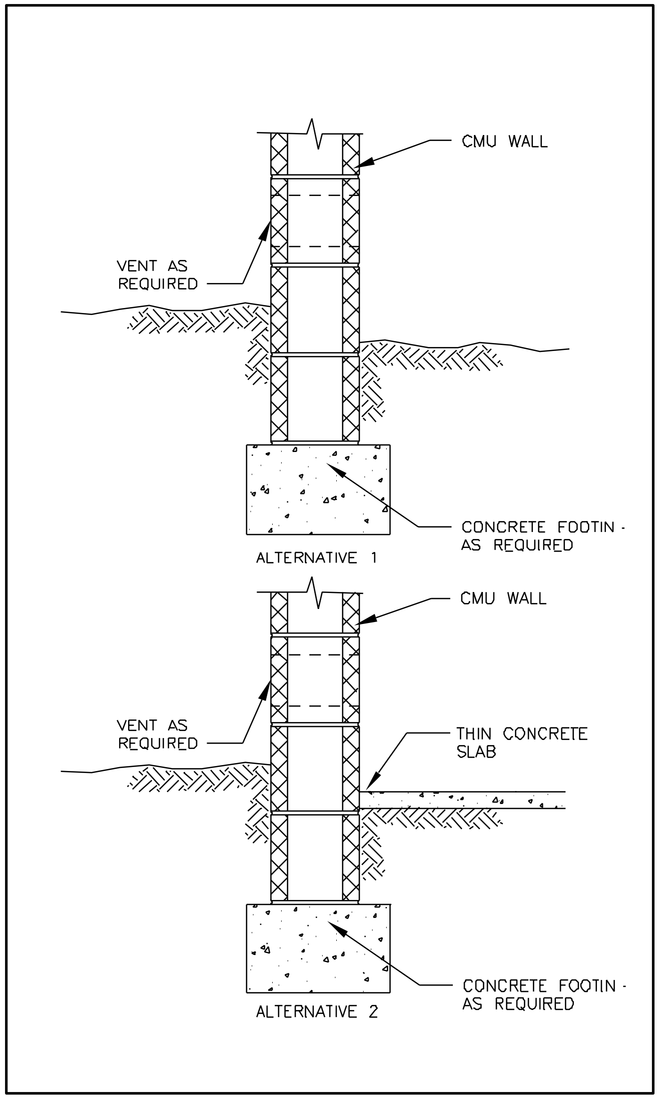

Figure 1-5: Crawl Space Wall

Crawl spaces may be constructed with a thin concrete slab but more likely have a soil or gravel covering with a vapor retarder. A crawl space foundation with a soil or gravel covering does not require any special connections; the concrete masonry wall is simply a stem wall.

Crawl space walls are typically less than 4 feet in height with less than 3 feet of backfill; vertical reinforcement is not required as is sometimes required in basement wall construction. Venting of crawl spaces is required in the *International Residential Code*; however, it may be omitted in certain applications, particularly if a vapor retarder is provided and the foundation is adequately drained. Refer to the local building code to determine if venting is required and what options are approved to achieve satisfactory moisture control.

FOOTINGS

The most common footing in residential construction is the continuous spread footing. Many building codes include tables prescribing the minimum footing width for concrete and masonry walls for a given building material, height, backfill height, and soil condition. Some general rules of thumb for sizing a residential concrete footing follow:

- ✔ The minimum footing thickness is one-third the total footing width or 6 inches, whichever is greater.
- ✔ The footing width projects a minimum of 2 inches from both sides of the wall, but not greater than the footing thickness.

The footing is commonly unreinforced except when located in high-wind or seismic areas, when stepped footings are used due to sloped sites, or when sites have difficult soil conditions. Although some designers may specify one or two longitudinal No. 4 bars for wall footings, steel reinforcement is usually not required for residential-scale structures in relatively stable soils.

In addition, some designers may specify a No. 4 vertical bar or dowel between the basement walls and footing at 4 to 8 feet on center. The dowel transmits the lateral soil loads from the wall to the footing; however, a concrete slab that abuts the base of the foundation wall provides enough lateral support in residential structures.

RADON

Check the local building code to determine if radon-resistant construction is required. Typically radon-resistant construction measures require the builder to

- ✔ place a vapor retarder, such as polyethylene, beneath the concrete floor slab and on below-grade walls. If no concrete slab exists, place the retarder over the soil or gravel in the crawl space;
- ✔ ensure that the top course of the foundation wall is either solid or grouted solid; and
- ✔ seal penetrations in the slab and below-grade walls.

For more information on radon control methods and construction details for areas with elevated radon levels, refer to the Resources section.

MOISTURE

Local building codes typically require basement walls to be dampproofed from the top of the footing to the finished grade. In areas where a high water table or other severe soil-water conditions are known to exist, exterior foundation walls enclosing habitable or storage space should be waterproofed with a membrane extending from the top of the footing to the finished grade. In crawl space construction, a vapor retarder should be placed over the soil and covered with a few inches of soil or gravel to reduce moisture problems. In most cases, the most important feature is good foundation and surface drainage. Refer to Figure 1-6 for recommendations regarding moisture and water control in below-grade foundations.

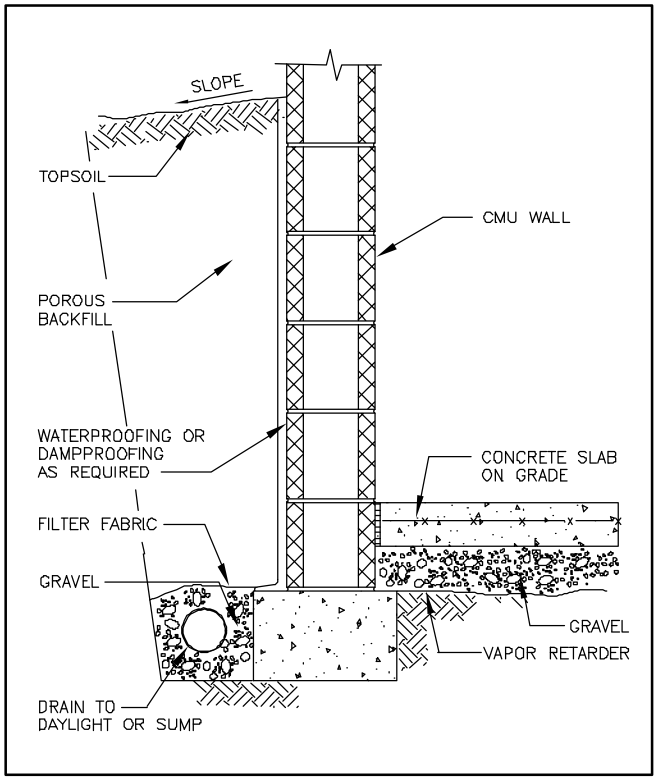

Figure 1-6: Moisture and Water Control Measures

CONCLUSIONS

Good construction details are vital to the satisfactory performance of masonry residential structures.

The foregoing construction details are a compilation of recommended practices that not only resist structural forces and loads but also address moisture, movement, and other related issues that can compromise the integrity of a well-constructed home.

RESOURCES

NAHB Research Center, Inc.
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National Concrete Masonry Association (NCMA)
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Portland Cement Association (PCA)
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Publications
☎ 800.245.2691
💻 http://www.huduser.org

📖 ACI 530/ASCE 5/TMS 402, *Building Code Requirements for Masonry Structures*. American Concrete Institute (ACI), American Society of Civil Engineers (ASCE), and The Masonry Society (TMS), 1999.

📖 ASTM E1465, *Standard Guide for Radon Control Options for the Design and Construction of New Low-Rise Residential Buildings.* American Society for Testing and Materials (ASTM), draft.

📖 *International Residential Code.* International Code Council, Inc. (ICC), Falls Church, Virginia, 2000 (pending completion).

Floor Connections

FS · 2

An information series on residential concrete masonry technology

SUMMARY

Connecting conventional and innovative floor systems to a concrete masonry wall may require some techniques that are unfamiliar to home builders. Although many proprietary floor systems are currently available, this fact sheet focuses first on common floor systems in homes constructed of standard dimensional lumber. Wood trusses, wood I-joists, cold-formed steel framing, steel bar joists, concrete block and joist systems, and precast concrete floor systems are also addressed. While steel bar joists and precast concrete floor systems are rare in single-family construction, they are included herein because they are used in multifamily construction. The several ways to connect the floor system to the wall are grouped into three categories as follows:

- ✔ direct-bearing connections;
- ✔ pocket connections; and
- ✔ ledger connections.

Light-frame builders may not be familiar with ledger and pocket connections. Such connections typically do not find much use in light-frame construction. However, ledger and pocket connections are not new to the building industry. For example, wood floor-to-masonry ledger and pocket connections were used in the United States during the 1700s, 1800s, and 1900s in residential masonry homes and continue to perform satisfactorily.

Similarly, residential builders may not be familiar with steel-frame or concrete floor systems. The construction details illustrated herein for steel-frame and concrete floor systems are similar to those details used in commercial construction.

The details shown herein are "generic" and apply to typical wind and seismic areas (less than 110 mph, three-second-gust wind speed and less than Seismic Design Category D). It is suggested that the designer or builder consult the floor manufacturer before construction to determine if these generic details require modification when installing a proprietary floor system. Refer to local building codes and recognized standards for reinforcement and anchorage requirements. For additional requirements that may apply to special conditions, refer to the Resources section for more information.

CONNECTION TYPES

Direct-Bearing Connection

A direct-bearing connection is used when the wall below (i.e., foundation wall) does not continue to the story above or the wall below is wider than the wall above, providing a ledge with sufficient bearing area for the floor to bear on directly. The direct-bearing connection is the simplest and most familiar connection within the home building industry. The course of block on which the joists bear typically is a horizontal bond beam that ties the walls together in the story below; the bond beam is located at the top of each wall story.

Pocket Connection

A pocket connection is typically used when the wall below (i.e., foundation wall) continues to the story above the floor level without a change in wall thickness. The pocket connection consists of a void or "pocket" created in the wall by changing block placement or cutting into the block units after the wall is erected. The bearing surface on which the joists (or girders) bear typically is grouted solid creating a horizontal reinforced bond beam that ties together the walls in the story below.

The floor joist is then placed in the pocket providing a minimum amount of bearing, typically 3 to 4 inches. The local building code may require a wood floor joist to be fire cut to allow the floor joist to fall free from the wall in the event of fire.

Care must be taken to ensure that the use of a pocket does not adversely affect the strength of the wall. The pocket connections may interfere with the continuity of the vertical reinforcement in the wall. Rather than creating numerous pockets in a masonry wall for floor joists, a ledger connection or direct bearing connection is the preferred practice.

Ledger Connection

A ledger connection is used when the wall below continues at the same thickness to the story above the floor level or when the change in wall thickness does not allow for the minimum required bearing.

A ledger connection is often preferable to a pocket connection because the ledger board may be installed without affecting floor joist placement and does not require floor joist alignment with certain elements (i.e., pockets) of the wall. A ledger board, often preservative-treated 2x lumber, may be bolted to the concrete masonry wall after the wall is constructed. The mason may also grout the anchor bolts in the wall while laying the block courses. Refer to Fact Sheet 7 (FS•7) for the various types of fasteners that can be used with concrete masonry.

WOOD-FRAME FLOORS

Wood-frame floors are the most common type of floor system installed in residential construction. The floor may bear directly on a concrete masonry wall, it may be pocketed into the wall, or it may hang from the side of the concrete masonry wall.

Wood that is in direct contact with concrete masonry can potentially absorb moisture that may be present in the concrete masonry. To prevent decay, a moisture barrier (i.e., polyethylene sheet, sill sealer, felt, and galvanized sheet metal flashing) should be placed between the wood and the masonry. In lieu of using a moisture barrier, wood in direct contact with masonry must be either preservative-treated or of a durable species to prevent decay.

Standard Dimensional Lumber

Figures 2-1 through 2-3 illustrate some recommended methods for connecting wood-frame floors to concrete masonry walls.

Standard dimensional lumber used for residential floor systems is most often nominal 2 x 8s, 2 x 10s, or 2 x 12s, depending on span and loading conditions. In high-wind (i.e., greater than 110 mph, three-second-gust) or high seismic areas (i.e., Seismic Design Category D), additional metal connectors are often necessary.

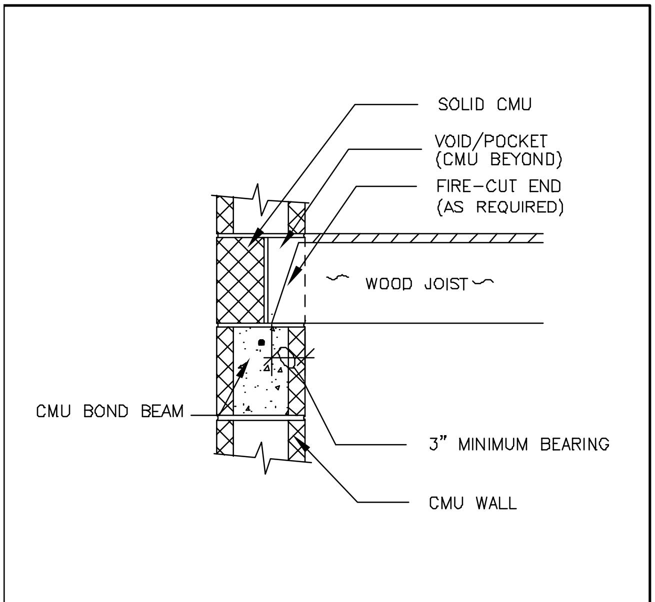

Figure 2-1: Wood Floor Pocket Connection

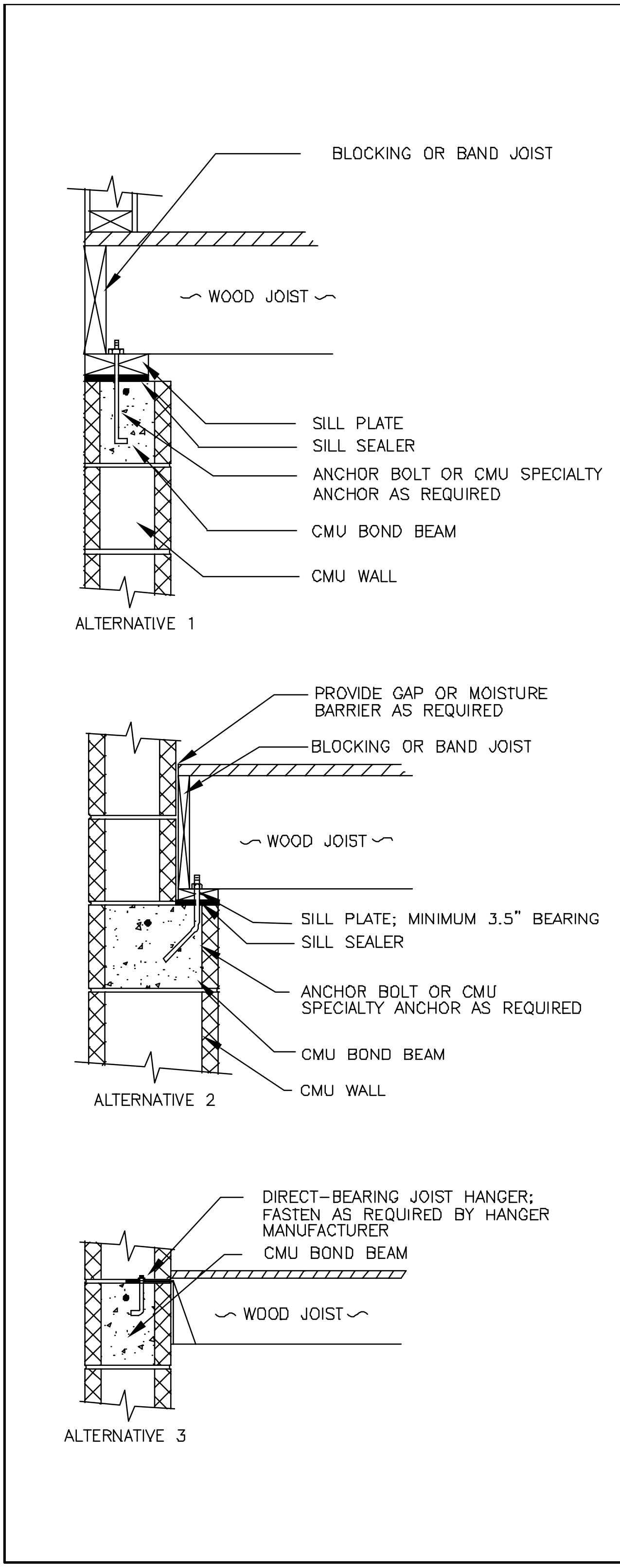

Figure 2-2: Wood Floor Direct-Bearing Connections

Wood Trusses

Wood trusses, also known as metal plate connected wood trusses, are becoming more popular because of their consistent quality, competitive pricing in many areas, and capability of spanning long distances. Wood trusses are most often fabricated of nominal 2-inch-thick standard dimensional lumber. They are designed by a truss manufacturer for given span and loading conditions.

The recommended methods for connecting wood trusses to concrete masonry walls are similar to those for standard dimensional lumber; refer to Figures 2-1 and 2-2. Additionally, Figures 2-4 and 2-5 illustrate some recommended methods for connecting wood floor trusses to concrete masonry walls by using direct-bearing or pocket connections. Consult the Resources section for more information and standard details on wood trusses.

In high-wind (i.e., greater than 110 mph, three-second-gust) or high seismic areas (i.e., Seismic Design Category D), an additional metal connector is often necessary.

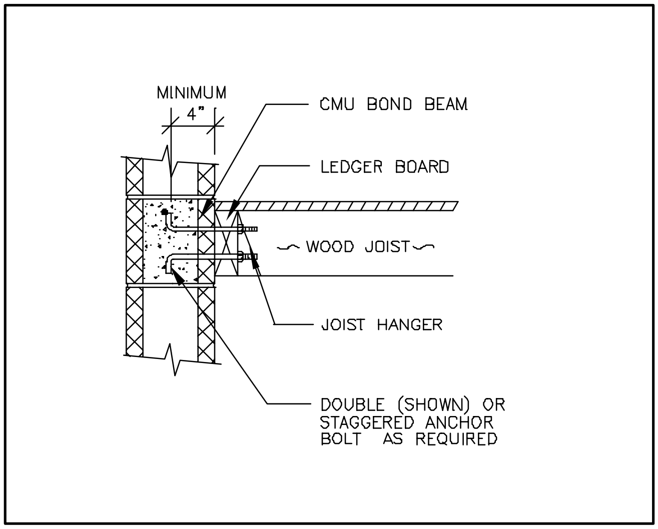

Figure 2-3: Wood Floor Ledger Connection

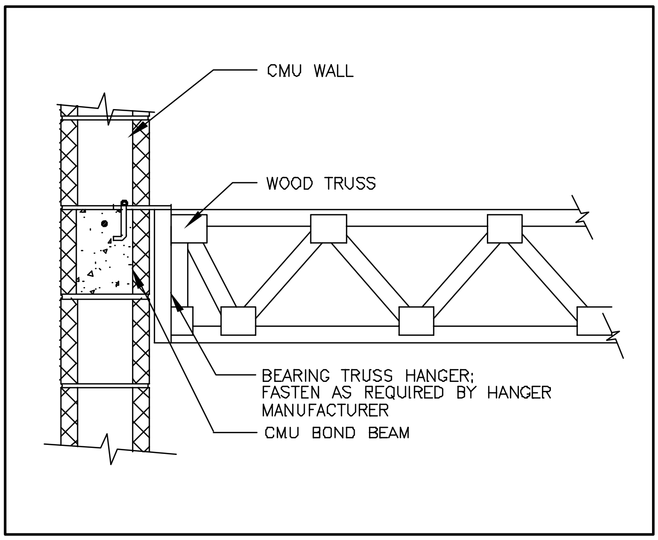

Figure 2-4: Wood Truss Floor Direct-Bearing Connection

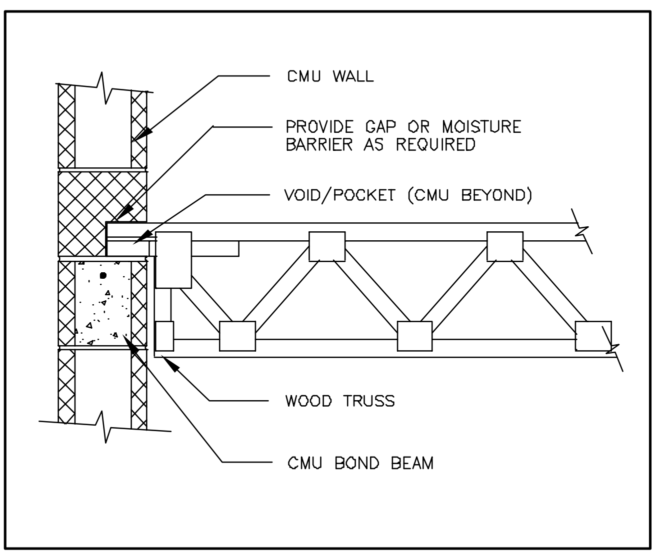

Figure 2-5: Wood Truss Floor Pocket Connection

Wood I-Joists

Wood I-joists are also very popular because of their consistent quality and capability of spanning relatively long distances. Wood I-joists resemble steel I-beams and are typically manufactured using plywood or oriented strand board for the web and solid sawn lumber for the flanges.

The recommended methods for connecting wood I-joists to concrete masonry walls are similar to those for standard dimensional lumber; refer to Figures 2-1 through 2-3. Consult the I-joist manufacturer for other possible methods of connecting wood I-joists to concrete masonry walls.

In high-wind (i.e., greater than 110 mph, three-second-gust) or high seismic areas (i.e., Seismic Design Category D), an additional metal connector is often necessary.

STEEL

Steel-frame floors are common in commercial structures because they are capable of spanning long distances. In addition, steel-frame floors may be used in residential construction.

Steel-frame floors most often bear directly on the wall below or are pocketed into the masonry wall; however, they may also be attached to the masonry wall by a ledger board or steel angle.

Cold-Formed Steel Framing

Cold-formed steel framing members are typically C-shaped with width and depth dimensions similar to solid sawn lumber. The framing members are placed at 16 or 24 inches on center. Cold-formed steel framing is installed much like solid sawn lumber.

To prevent corrosion, cold-formed steel that is in direct contact with concrete masonry requires a moisture barrier (i.e., polyethylene sheet, sill sealer, felt, and galvanized sheet metal flashing) placed between the steel and the masonry.

Figures 2-6 and 2-7 illustrate some recommended methods for connecting cold-formed steel-frame floors to concrete masonry walls by using a direct-bearing connection or a ledger board connection. In high-wind (i.e., greater than 110 mph, three-second-gust) or high seismic areas (i.e., Seismic Design Category D), an additional metal connector is often necessary.

Figure 2-6 shows the cold-formed steel floor framing attached directly to the concrete masonry wall; however, some builders prefer to install a wood sill plate on the concrete masonry wall and then attach the cold-formed steel framing to the wood. The cold-formed steel floor framing shown in Figure 2-7 is attached directly to the concrete masonry wall; however, wood may be used for this connection. As for the ledger board connection, some builders prefer to fasten the steel track to a preservative-treated wood ledger board before bolting to the wall, or they may choose to bolt a wood ledger board to the wall and then fasten the joist track to the wood ledger board. The use of wood with the cold-formed floor system is a matter of preference; refer to the Resources section for more information on cold-formed steel floor framing.

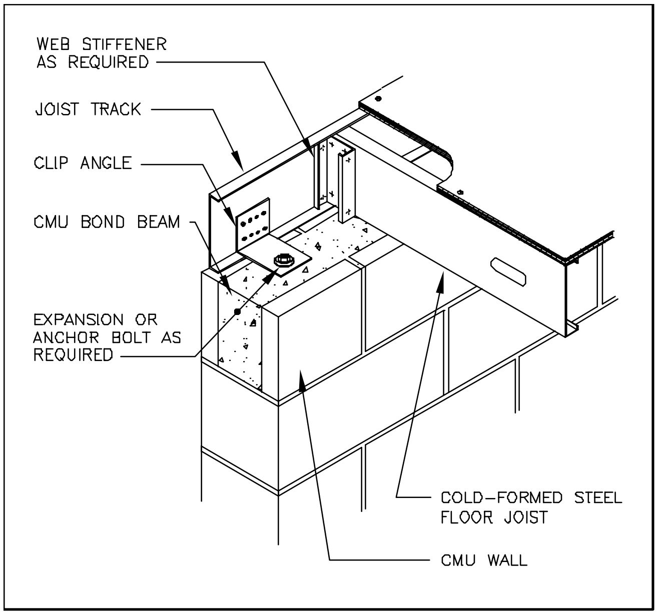

Figure 2-6: Cold-Formed Steel Floor Direct-Bearing Connection

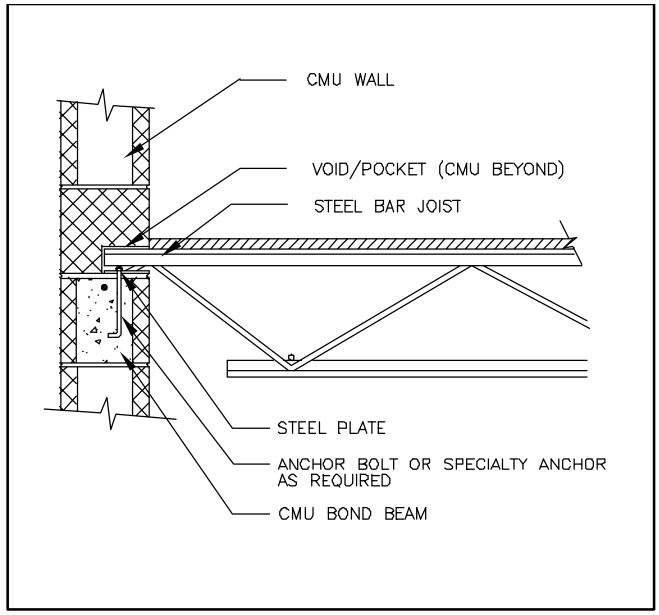

Figure 2-8: Steel Joist Floor Direct-Bearing Connection

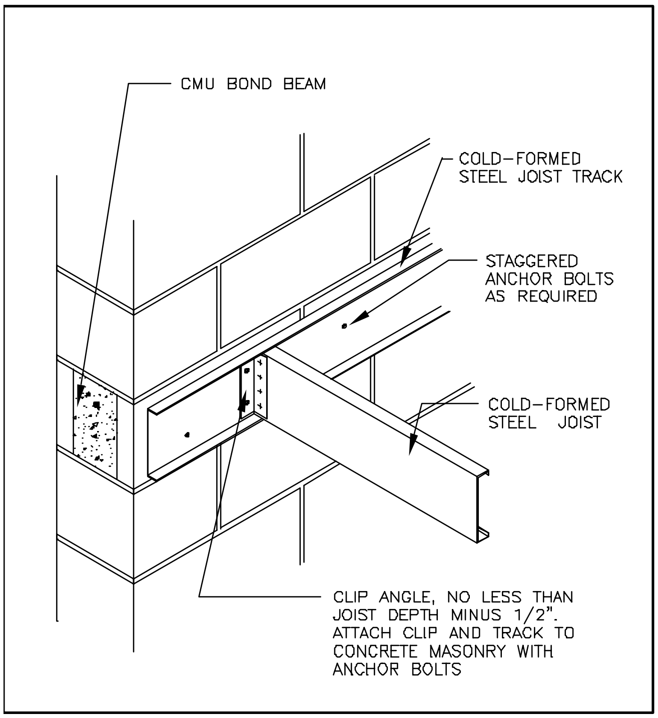

Figure 2-7: Cold-Formed Steel Floor Ledger Connection

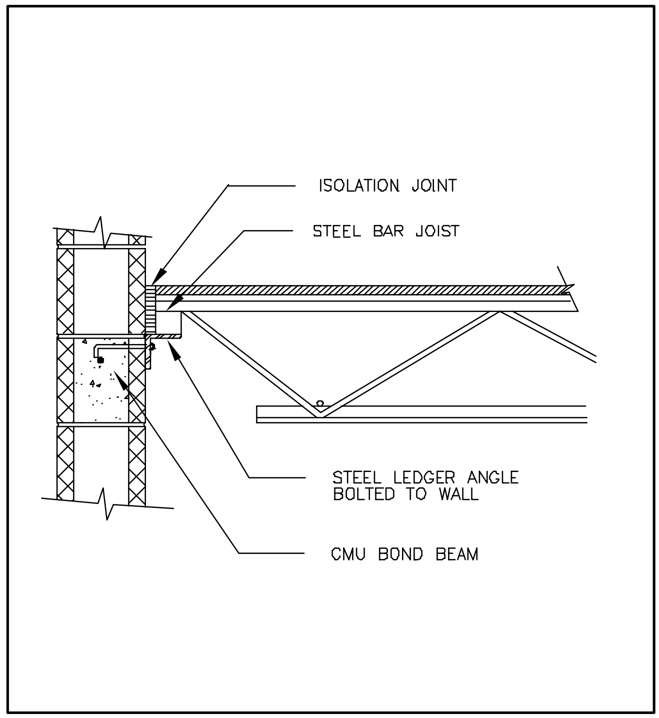

Figure 2-9: Steel Joist Floor Ledger Connection

Steel Bar Joists

Steel bar joists are open web joists that are capable of long spans. They are designed to bear directly onto or be pocketed into a concrete masonry wall. In some areas, a steel ledger angle is bolted to the masonry while the steel bar joists bear on the steel angle. The steel angle ledger connection typically eliminates the need for masons to form pockets in the wall; thereby reducing the cost of constructing the concrete masonry wall.

Figures 2-8 and 2-9 illustrate some recommended methods for connecting the steel bar joist to a concrete masonry wall. Steel bar joists typically require 3 to 4 inches of bearing and should be fastened to the wall to provide floor support.

CONCRETE MASONRY

A few currently available floor systems use concrete masonry while some rely on precast concrete joists or steel bar joists; however, other materials may be used in conjunction with the concrete masonry unit. One system currently available is the Block Joist® System. The Block Joist® System is a composite system that is constructed with concrete blocks placed side by side on patented steel bar joists. The bar joists rest on a ledge within the wall. Figure 2-10 illustrates how the block and steel bar joists interlock to form the finished floor. Some builders are using this type of floor system for heavy floor applications, such as a garage over a basement. Refer to the Resources section to obtain manufacturer information and installation instructions.

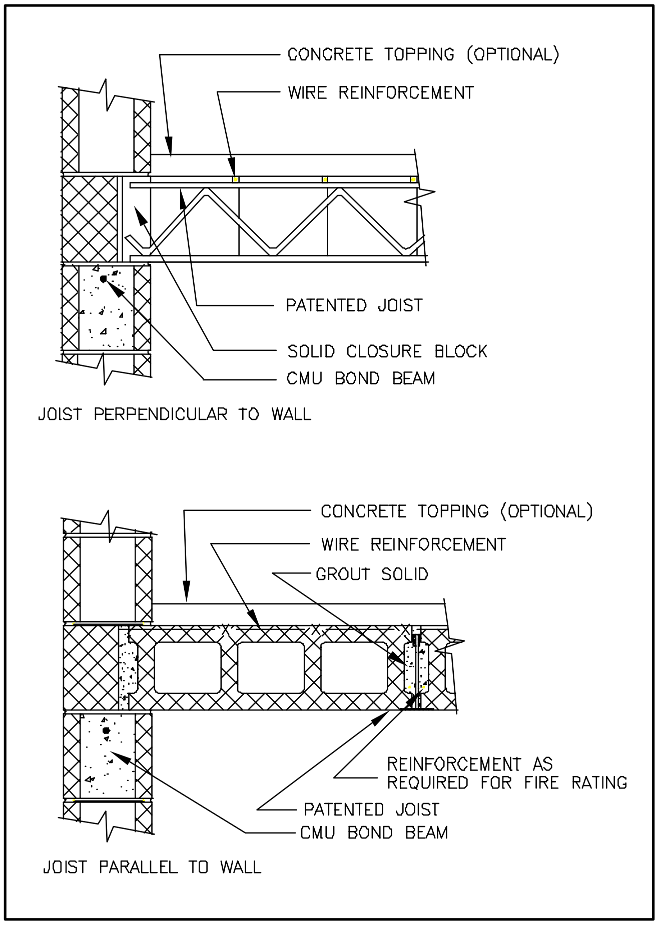

Figure 2-10: Block Joist® Floor System

CONCRETE

Concrete floors are common in residential construction as ground-level floors (i.e., slab on grade). Due to placement and cost concerns; however, elevated concrete floors in residential construction are not common.

Precast or cast-in-place concrete is typically used in commercial construction because it is fire-resistive, capable of long spans (i.e., greater than 16 feet), sound deadening, and is resistant to rot and termite attack. It is also used in multifamily housing.

Precast Concrete

Precast concrete floor systems come in concrete segments in a variety of widths, thicknesses, and lengths depending on clear span and design loading conditions. In residential construction, floor segments are most often 8-inch-thick hollow core panels 4 or 8 feet wide.

The precast concrete segments are often installed on continuous ledges in a concrete masonry wall that provides minimum bearing and does not create discontinuities in the exterior wall surface.

Figure 2-11 illustrates some recommended methods for connecting the precast concrete floor segments to a concrete masonry wall by using direct-bearing connections. Pocket connections are not feasible and ledger connections are not common; therefore, pocket and ledger connections are not discussed herein.

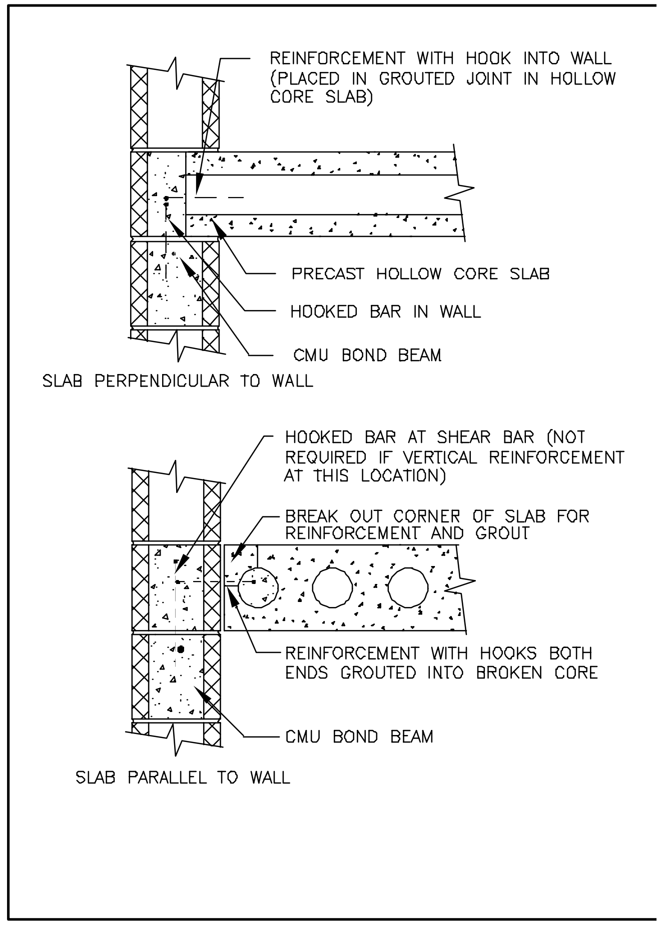

Figure 2-11: Precast Concrete Floor Direct-Bearing Connection

CONCLUSIONS

Good construction details are vital to the satisfactory performance of residential structures. Several floor systems are available today; however, there are only three basic floor-to-wall connections as discussed herein.

The foregoing construction details are a compilation of recommended practices that not only resist structural forces and loads but also address moisture, movement, and other related issues that can compromise the integrity of a well-constructed home. These recommended practices focus on some of the more common floor connections used in single- and multi-family construction.

RESOURCES

American Forest and Paper Association (AF&PA)
1111 19th St., NW, Suite 800
Washington, DC 20036
☎ 202.463.2700
💻 http://www.afandpa.org

American Plywood Association (APA)
P.O. Box 11700
Tacoma, Washington 98411
☎ 253.565.6600
💻 http://www.apawood.org

BLOCK JOIST ® Company, LLC
109 Ralston Road
Richmond, Virginia 23229
☎ 804.285.1250

NAHB Research Center, Inc.
400 Prince George's Boulevard
Upper Marlboro, Maryland 20774-8731
☎ 800.638.8556
http://www.nahbrc.org

National Concrete Masonry Association (NCMA)
2302 Horse Pen Road
Herndon, Virginia 20171-3499
☎ 703.713.1900
http://www.ncma.org

North American Steel Framing Alliance (NASFA)
1726 M Street, N.W., Suite 601
Washington, DC 20036-4523
☎ 202.785.2022
http://www.steelframingalliance.com

Portland Cement Association (PCA)
5420 Old Orchard Road
Skokie, Illinois 60077-1083
☎ 847.966.6200
http://www.portcement.org

Precast/Prestressed Concrete Institute (PCI)
175 West Jackson Boulevard, Suite 1859
Chicago, Illinois 60604
☎ 312.786.0300
http://www.pci.org

Steel Joist Institute (SJI)
3127 10th Avenue, North Ext.
Myrtle Beach, South Carolina 29577-6760
☎ 843.626.1995
http://www.steeljoist.com

U.S. Department of Housing and
Urban Development (HUD)
451 Seventh Street, S.W., Suite 8132
Washington, DC 20410
☎ 202.708.4370
http://www.hud.gov
Publications
☎ 800.245.2691
http://www.huduser.org

Wood Truss Council of America (WTCA)
6425 Normandy Lane
Madison, Wisconsin 53719-1133
☎ 608.274.4849
http://www.woodtruss.com

ACI 530/ASCE 5/TMS 402, *Building Code Requirements for Masonry Structures*. American Concrete Institute (ACI), American Society of Civil Engineers (ASCE), and The Masonry Society (TMS), 1999.

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International Residential Code. International Code Council, Inc. (ICC), Falls Church, Virginia, 2000 (pending completion).

National Design Standard for Metal Plate Connected Wood Truss Construction. Truss Plate Institute, Madison, Wisconsin, 1995.

Prescriptive Method for Residential Cold-Formed Steel Framing, Third Edition. NAHB Research Center, Inc., Upper Marlboro, Maryland, 1998.

Metal Plate Connected Wood Truss Handbook. Wood Truss Council of America (WTCA), Madison, Wisconsin, 1994.