Lesson 6: Walls

Walls add to the structural integrity of the building and increase weather protection. This lesson will describe some basics of wall construction and types of walls in common use. The focus is on wood construction, although metal is generally used in the same manner for frame construction.

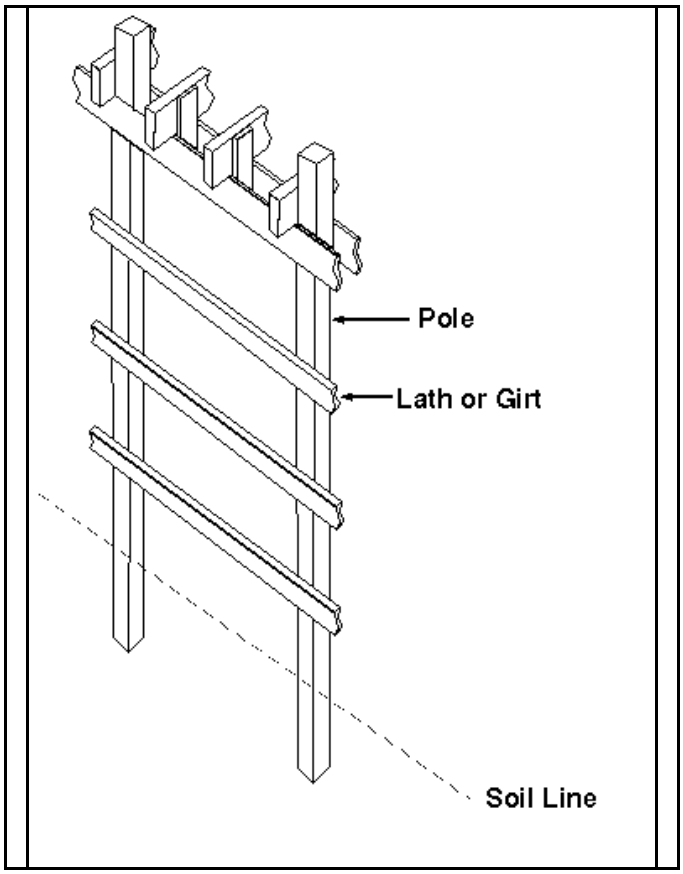
Three Purposes of Walls

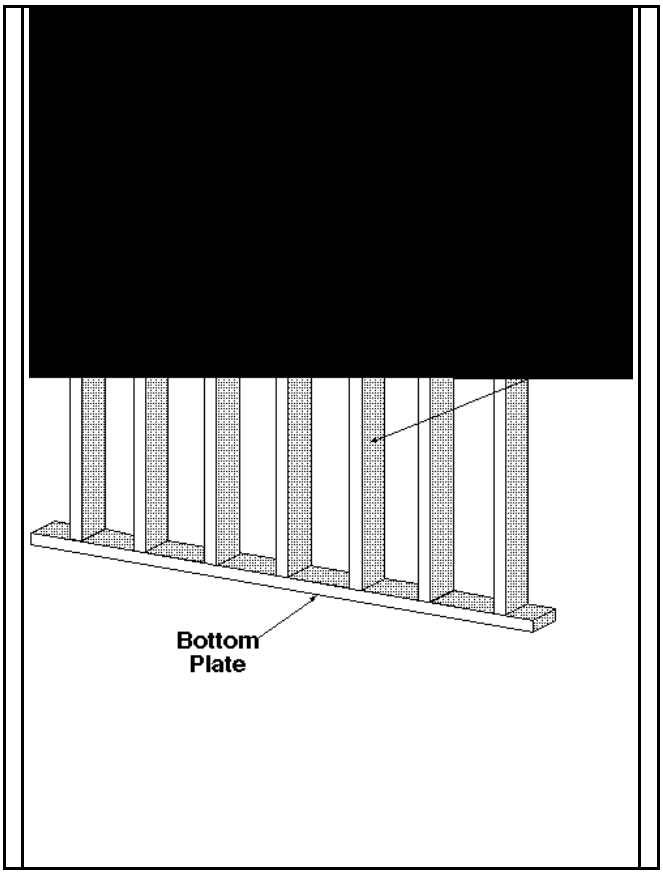
Although walls may serve many specific purposes, they have three main functions. They support vertical loads, which consist of pressure from the weight of the walls and the roof exerted downward due to gravity. Walls also resist lateral loads, or pressure exerted from the side. Lateral loads are produced by wind and other weather and by uneven settling of the building, which causes the wall not to be vertical. Finally, they provide protection from the weather. Walls are able to achieve these purposes because of the materials they are made from and how they are constructed.

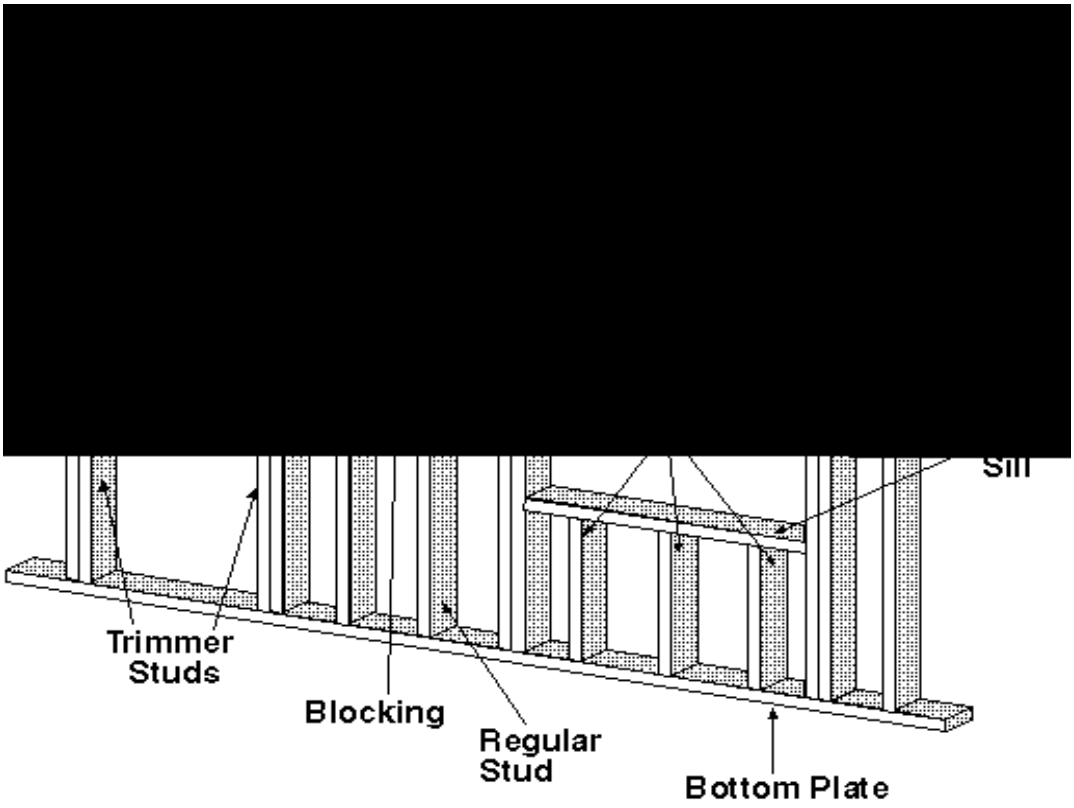
Types of Wall Construction

The two types of wall construction that are common in agricultural structures are pole frame and stud frame construction. Pole frame construction, which is illustrated in Figure 6.1, involves the use of fewer but heavier members. Poles or posts form the main structural members of the wall. Horizontal pieces of dimensional lumber called laths or girts are attached to the poles. Siding, usually metal sheets or dimensional lumber, is placed vertically on the structure by attaching it to the laths.

Stud frame walls use studs, which are the vertical wall members that provide the main support for the wall, in their construction. The methods of construction used for wood or metal stud frame walls are similar. The spacing and size of the members, material used for siding, and interior cover materials are the major differences. Figure 6.2 shows an example of a stud frame wall.







Components of a Frame Wall

Frame walls consist of a number of structural components. Figure 6.3 illustrates different wall members.

Top plate - The top plate is the horizontal member at the top of the wall. The trusses or rafters rest on the top plate.

Sole plate - This structural member forms the bottom of the wall. The studs are nailed to the sole plate.

Stud - As discussed in the preceding section, a stud is the vertical wall member that provides the main support for the wall. Studs, which may be made of metal or wood, are nearly always placed on 16 or 24-inch centers to take advantage of commercial sheathing material dimensions.

Rough sill - A rough sill is a horizontal framing member attached to the top of the jack studs to form a rough base for a window.

Diagonal brace - Diagonal braces temporarily add to the rigidity of the wall, making it stronger. The bracing is used during wall construction to keep the walls square and vertical. To form the brace, a 2" board is nailed diagonally from a top corner to the opposite bottom corner of the wall. The braces are removed later as the siding and sheathing are put on the wall.

Header - A header is a horizontal piece found above openings for doors and windows. It provides support for loads over the opening.

Trimmer stud - Trimmer studs are vertical framing members that form the sides of door and window openings as well as rough openings. They support the header.

Jack stud or cripple stud - Jack studs are studs that are shorter than full length used below windows and above windows and doors.

Blocking - Blocking refers to the wooden blocks that are used to fill in the space between framing members, providing support.

Siding - Siding is material placed on the outside of a building to seal and enclose the building from the weather, serving as insulation for the structure.

Interior covering - This covering consists of material placed on the inside of the wall. Generally sheetrock is used for houses, while barns and other buildings may use plywood.

Wall Construction

Walls are typically constructed one wall or section of a wall at a time, with the wall laying flat on the ground. To begin construction, the length of the wall is determined, and the top and bottom plates are cut to that length. The studs are nailed between the top and bottom plate using two nails at each end of the stud. They are spaced an equal distance apart, usually 16 inches. The spacing of the studs determines the overall strength of the wall and its ability to support the weight of additional floors or the roof. Buildings with less weight on the walls are sometimes constructed with the studs 24 inches apart. At the corners of a building, double studs are nailed side by side. These double studs allow the two walls that form the corner to be attached to each other by providing a wider base to which to nail the 2" × 4" stud from the other wall. Diagonal braces and blocking attached between the studs add to the rigidity of the wall, making it stronger. When the wall is finished, it is stood upright and attached to the foundation or subfloor using nails or bolts. Walls are then nailed together at the corners. Finally, the diagonal braces can be removed.

If the wall has windows or doors, they require additional components. Window framing usually requires a header as well as extra support from trimmer boards at the sides of the opening. Window openings generally also use jack studs and a rough sill, as shown in Figure 6.3. Like window framing, door framing involves the use of a header, extra supports on the sides, and sometimes jack studs.

Types of Siding

Dimensional lumber is sometimes used as siding. The siding may consist of 1" × 12" boards or other similar sizes. Dimensional lumber accepts paint or stains readily, allowing customization. The lumber will degrade due to weather. However, it can be treated to be weather resistant, increasing the life of the lumber.

Exterior plywood is also used as siding. Because it is sold in larger sheets, fewer seams will exist, aiding in insulating the building. The plywood is also easier to apply than dimensional lumber. The plywood is cheaper than other forms of siding, but it is also not as attractive.

Hardboard sheathing, also called Masonite, may be used for siding on buildings. This style of sheathing is sold in sheets that come in a number of colors. Hardboard siding provides some insulation and is relatively easy to apply. One disadvantage to this style of siding is that hardboard is somewhat brittle and does not easily withstand stress from impacts, temperature changes, and other factors.

Metal siding, which is commonly made of galvanized steel or aluminum, is frequently used on structures. The siding comes in sheets that are normally at least 3 feet wide and 8, 10, or 12 feet long. The advantage to this sizing is that there are fewer seams, allowing for better insulation and weatherproofing than with other types of siding. Metal siding lasts for a very long time and does not need to be replaced as often as wood. Metal siding can be painted but not stained.

Vinyl siding is commonly used on houses and garages. This style of siding consists of strips that overlap, sealing the building. The siding is available in a variety of colors. Vinyl siding has a relatively long life but is more expensive than other types of siding.

Masonry products like bricks and cinder blocks are sometimes used as siding. They have decorative value and last for an extremely long time. The cost of the materials is moderate, but masonry products are more difficult to apply.

Fiberglass, glass, and plastics are used as siding in certain situations. One common example is a greenhouse, where light in the building is desirable. These materials can be purchased with

varying levels of clarity, from totally clear to mostly opaque.

New siding materials are being developed and marketed. Many of these products are simply improved versions of traditional materials that might offer benefits such as a heavier weight or more weather resistance. Some products, like fiberglass/epoxy glazes that are sprayed or troweled on a surface, are the result of technological advancements.

When selecting siding, consider the grades and weights available, the fire resistance of the material, its expected life span, and its maintenance requirements. Manufacturers and retailers should have additional information on the specific advantages each type of siding may offer.

Summary

Walls serve to support the structure's vertical and lateral loads as well as to protect the inside of the building from the weather. Walls generally are constructed using either pole frame or stud frame construction. Stud frame construction is the more complicated of the two; frame walls consist of a number of components. While many siding options exist, most frequently some type of metal, vinyl, or wood product is used.

Credits

Huth, Mark W. *Construction Technology*. 2nd ed. Albany, N.Y.: Delmar Publishers, Inc., 1989.

Lindley, James A., and James H. Whitaker. *Agricultural Buildings and Structures.* Rev. ed. St. Joseph, Mich.: American Society of Agricultural Engineers, 1996.