

## PART B - CONCRETE BLOCKS

Buildings are constructed with various sizes and kinds of concrete blocks that can be hollow or solid. The different types of blocks are made with heavyweight or lightweight materials and are normally referred to as such.

**2-3. Actual and Nominal Sizes.** Concrete blocks come in specific sizes. The 3/8-inch mortar joint has been adopted as the standard-size joint for joining blocks. The actual dimensions of the block are fractional; when combined with a 3/8-inch mortar joint, the dimensions will come out even in inches or nominal sizes. Therefore, a 15 5/8-inch stretcher block with a 3/8-inch mortar joint equals 16 inches. The same explanation holds true for heights and widths.

**2-4. Typical Sizes and Shapes.** Blocks come in both heavyweight and lightweight materials with full- and half-length sizes. The three-core block can also be obtained as two-core blocks. Figure 2-1, pages 2-3 and 2-4, illustrates some of the typical sizes and shapes of concrete blocks.

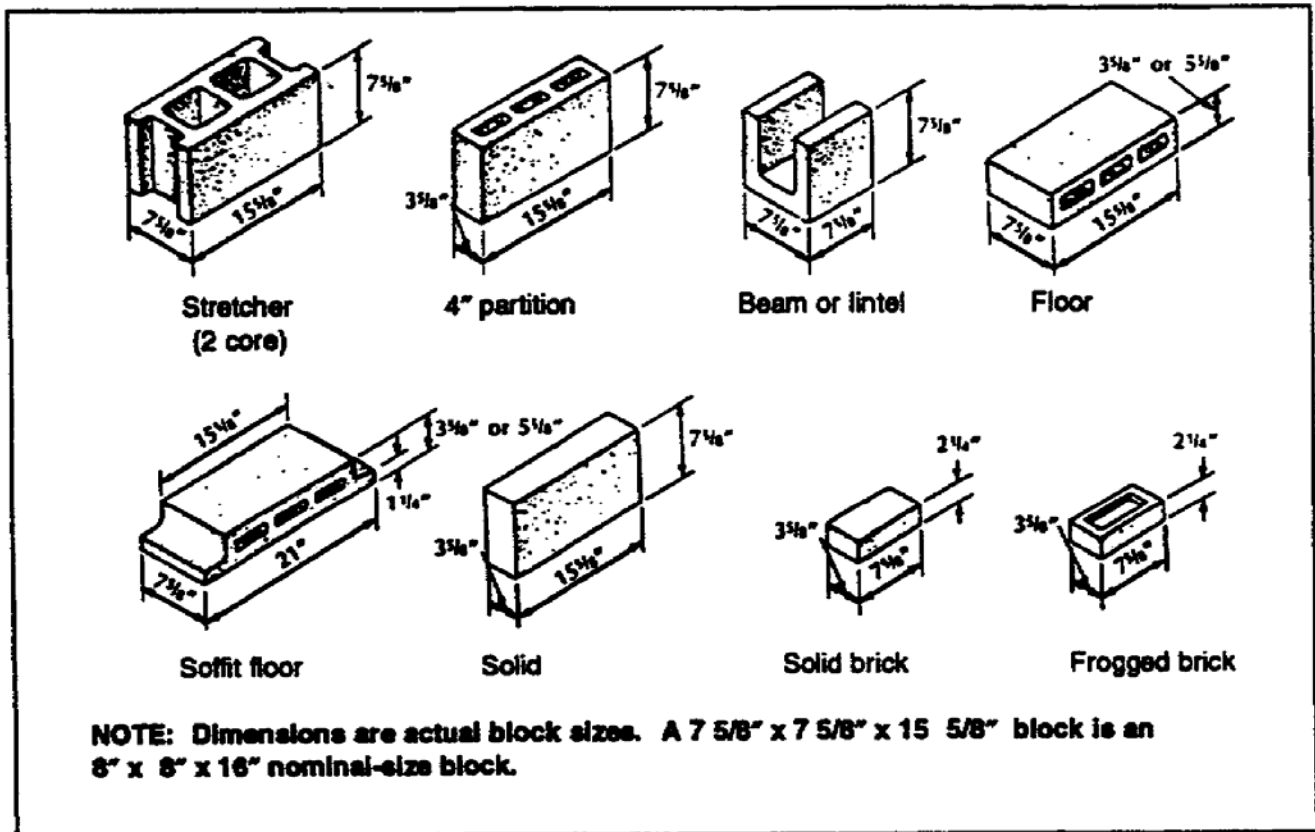


Figure 2-1. Types of concrete blocks

**2-5. Types.** Concrete blocks come in several different types.

a. **Stretcher.** A stretcher block is the most commonly used block in construction. It is laid with its length parallel to the face of the wall.

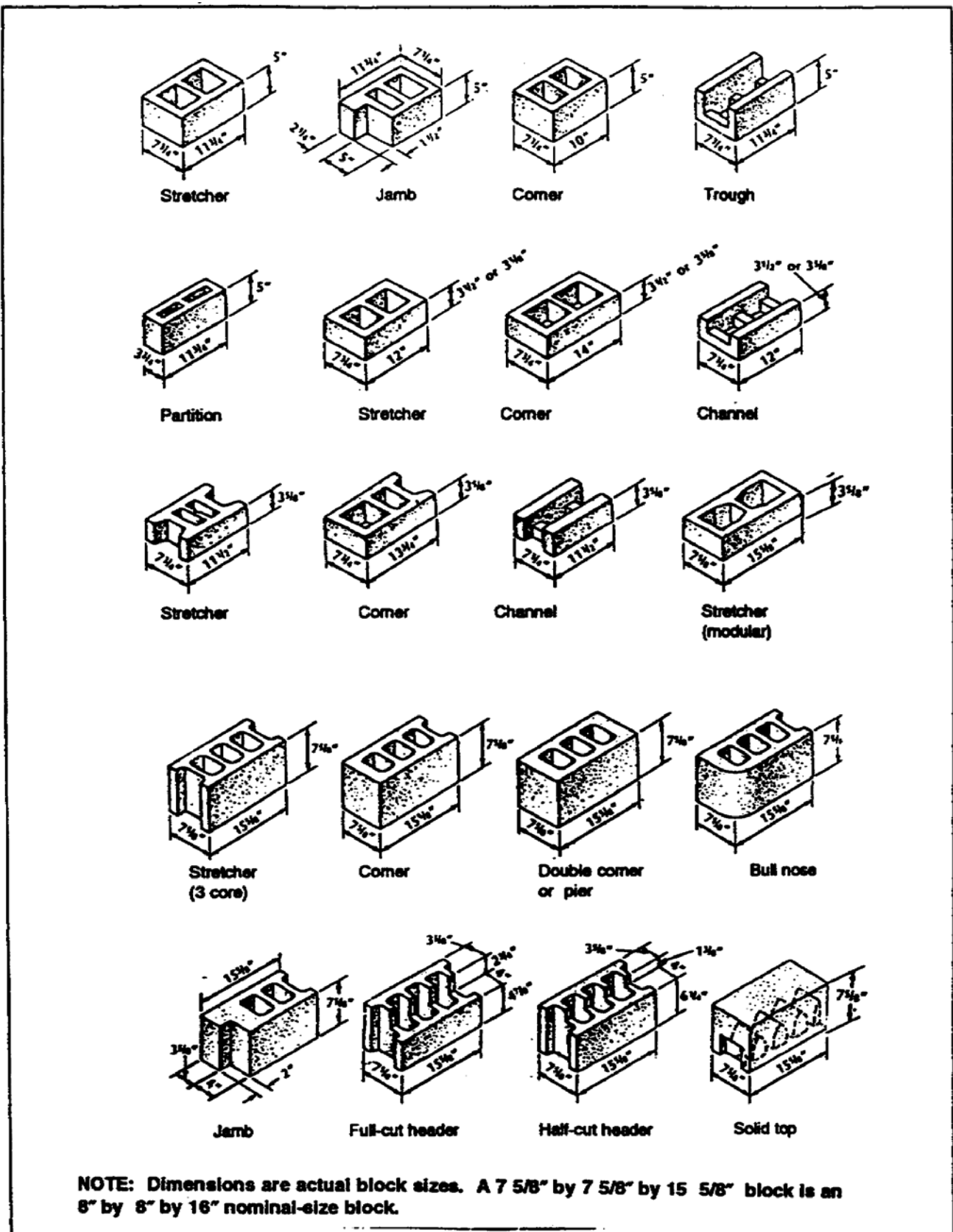
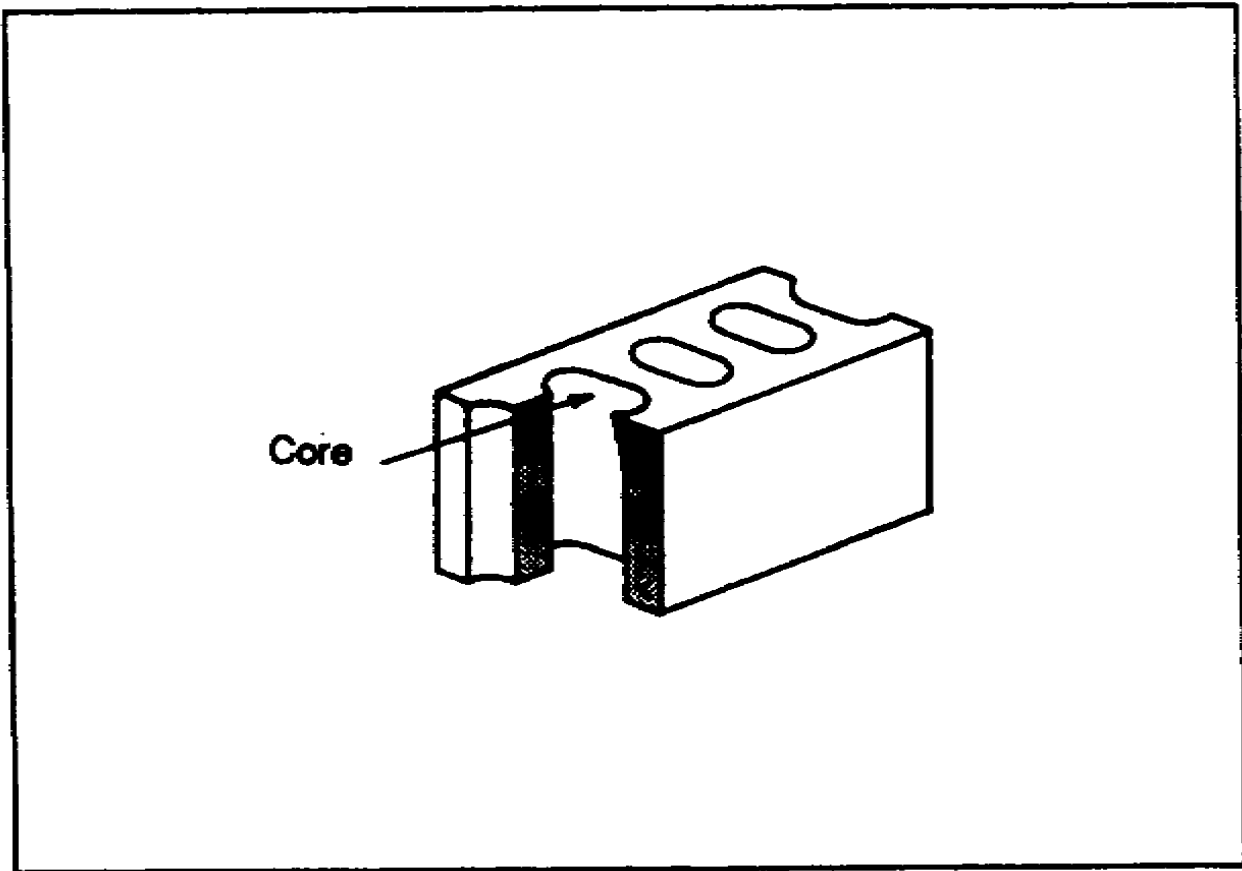


Figure 2-1. Types of concrete blocks (continued)

- b. Corner. A corner block is used for corners at simple window and door openings.
- c. Double Corner or Pier. A double-corner or pier block is used for constructing piers pilasters or for any other purpose where both ends of the block would be visible.
- d. Bull Nose. A bull-nose block serves the same purpose as a corner block, but it is used where round corners are desired.
- e. Jamb. A wood-sash jamb block is used with a stretcher and a corner block around elaborate window openings. The recess in the block allows room for the various casing members, as in a double-hung window.

**2-6. Most Common Block.** The most common concrete block is the hollow, load-bearing stretcher block, which is 8 by 8 by 16 inches nominal size, but 7 5/8 by 7 5/8 by 15 5/8 inches actual size. The heavyweight load-bearing stretcher block weighs from 40 to 50 pounds.

**Note:** In Figure 2-2, the cores taper toward the top of the block, providing a wider face shell. Always lay this block with the wider face up to allow for a greater area on which to lay a bed of mortar.



**Figure 2-2. Hollow load-bearing stretcher block**

## PART C - PLANNING THE CONCRETE-BLOCK WALLS

You should lay out concrete-block walls to make maximum use of full- and half-length blocks, since this minimizes cutting and fitting blocks on the job.

**2-7. Economical Construction.** The most economical concrete-block walls are made of standard stretcher and corner blocks (Figure 2-3).

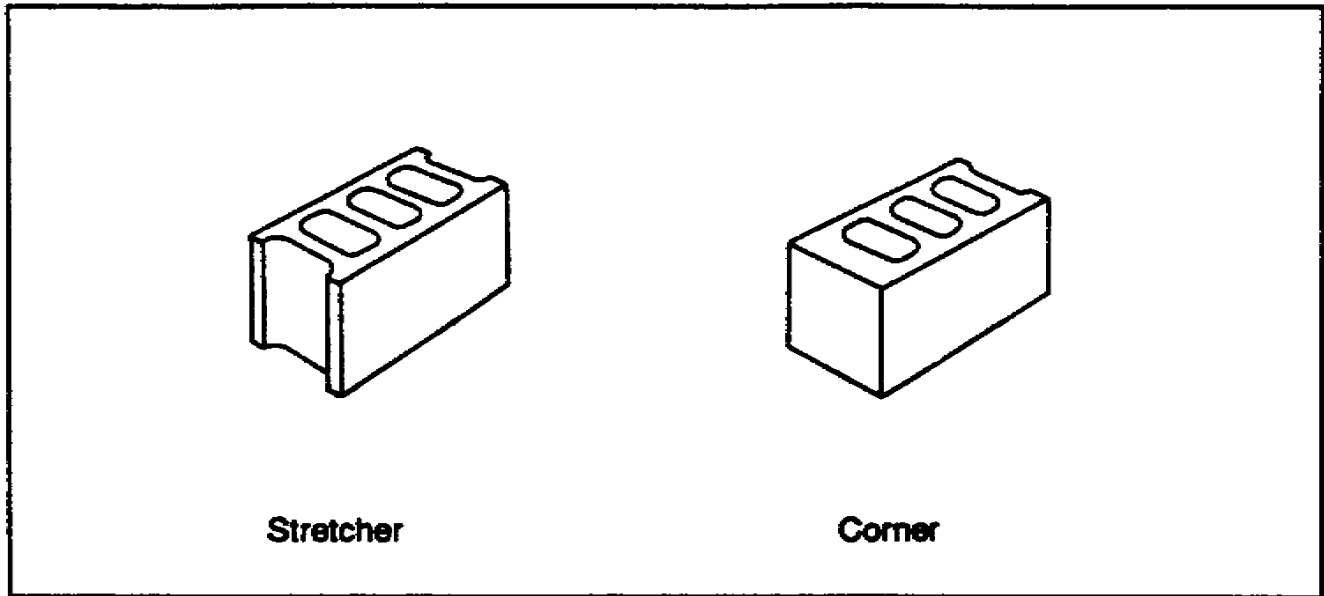


Figure 2-3. Standard blocks

To estimate how many full- and half-size blocks are required, plan the length and height of the wall, the width and height of the openings, and the wall area between doors, windows and corners (Figure 2-4).

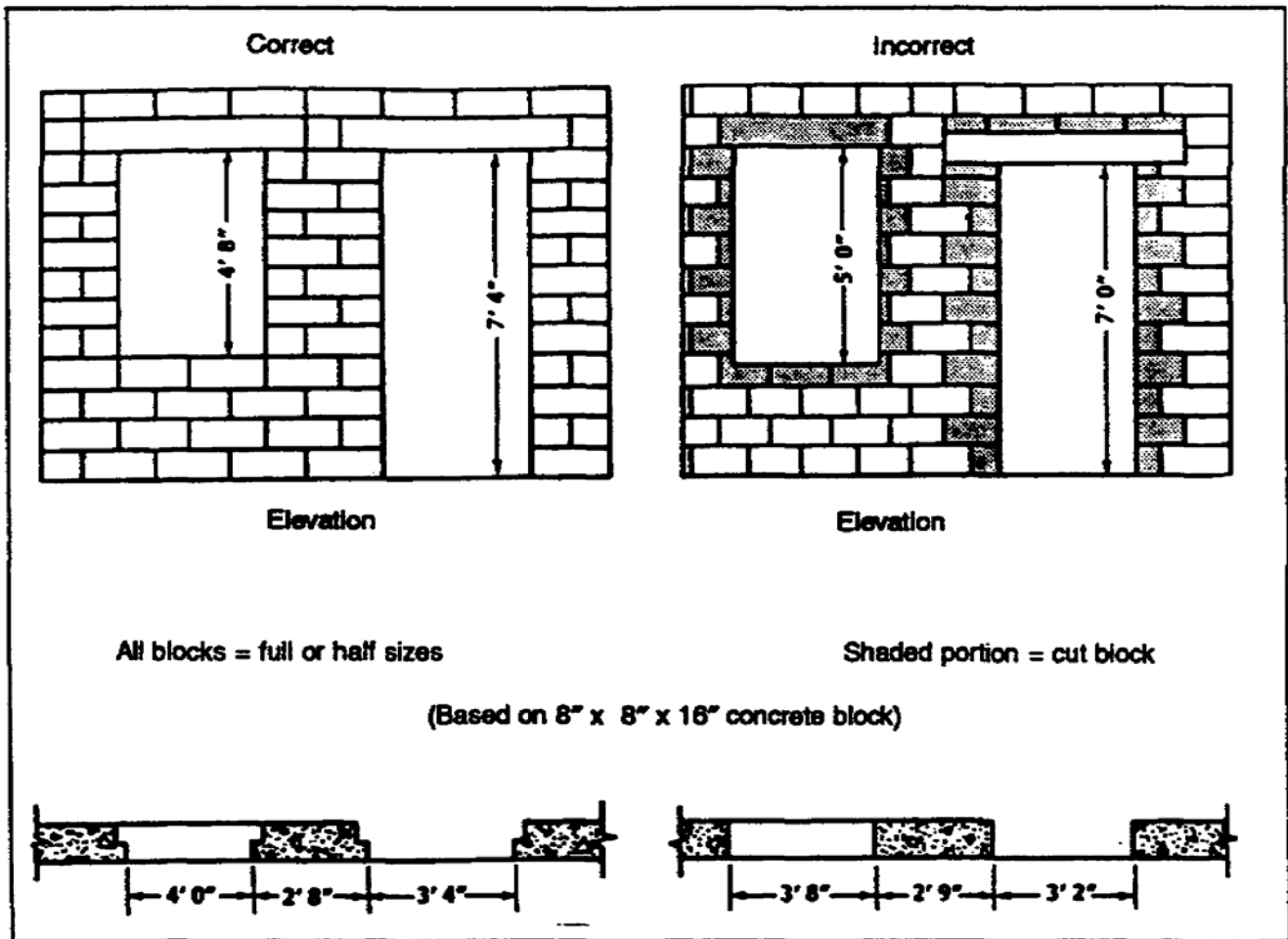


Figure 2-4. Planning concrete-wall openings

**2-8. Nominal Length and Height.** All horizontal dimensions should be in multiples of nominal full-length blocks. Both horizontal and vertical dimensions should be in multiples of 8 inches. Table 2-1, page 2-8, lists the nominal height of concrete-block walls by stretchers. Table 2-2, page 2-9, lists the nominal length of concrete-block walls by course.

Table 2-1. Nominal height of concrete-block walls

Number of Courses	Blocks 7 5/8" High and Bed Joints 3/8" Thick	Blocks 3 5/8" High and Bed Joints 3/8" Thick
1	8"	4"
2	1' 4"	8"
3	2' 0"	1' 0"
4	2' 8"	1' 4"
5	3' 4"	1' 8"
6	4' 0"	2' 0"
7	4' 8"	2' 4"
8	5' 4"	2' 8"
9	6' 0"	3' 0"
10	6' 8"	3' 4"
15	10' 0"	5' 0"
20	13' 4"	6' 8"
25	16' 8"	8' 4"
30	20' 0"	10' 0"
35	23' 4"	11' 8"
40	26' 8"	13' 4"
45	30' 0"	15' 0"
50	33' 4"	16' 8"
<p>Concrete blocks that are 3 5/8" by 7 5/8" are laid with 3/8" mortar joints. Height is measured from center to center of mortar joints.</p>		

Table 2-2. Nominal length of concrete-block walls

Number of Stretchers	Blocks 15 5/8" Long and Half Blocks 7 5/8" Long with Head Joints 3/8" Thick	Blocks 11 5/8" Long and Half Blocks 5 5/8" Long with Head Joints 3/8" Thick
1 1 ½ 2	1' 4" 2' 0" 2' 8"	1' 0" 1' 6" 2' 0"
2 ½ 3 3 ½	3' 4" 4' 0" 4' 8"	2' 6" 3' 0" 3' 6"
4 4 ½ 5	5' 4" 6' 0" 6' 8"	4' 0" 4' 6" 5' 0"
5 ½ 6 6 ½	7' 4" 8' 0" 8' 8"	5' 6" 6' 0" 6' 6"
7 7 ½ 8	9' 4" 10' 0" 10' 8"	7' 0" 7' 6" 8' 0"
8 ½ 9 9 ½	11' 4" 12' 0" 12' 8"	8' 6" 9' 0" 9' 6"
10 10 ½ 11	13' 4" 14' 0" 14' 8"	10' 0" 10' 6" 11' 0"
11 ½ 12 12 ½	15' 4" 16' 0" 16' 8"	11' 6" 12' 0" 12' 6"
13 13 ½ 14	17' 4" 18' 0" 18' 8"	13' 0" 13' 6" 14' 0"
14 ½ 15 20	19' 4" 20' 0" 26' 8"	14' 6" 15' 0" 20' 0"
Actual wall length is measured from the outside edge to the outside edge of blocks and equals the nominal length minus 3/8" (one mortar joint).		

## PART D - FIRST COURSE OF CONCRETE BLOCKS

Before mixing mortar and laying blocks, you should follow these steps:

- Locate the corners of the wall.
- Use a chalk line to mark the footing for aligning the first course of blocks.
- Check the wall layout by placing the blocks along the wall without mortar. Remember to leave a 3/8-inch gap between each block for the mortar joint (Figure 2-5). This will tell you if any cutting is necessary.

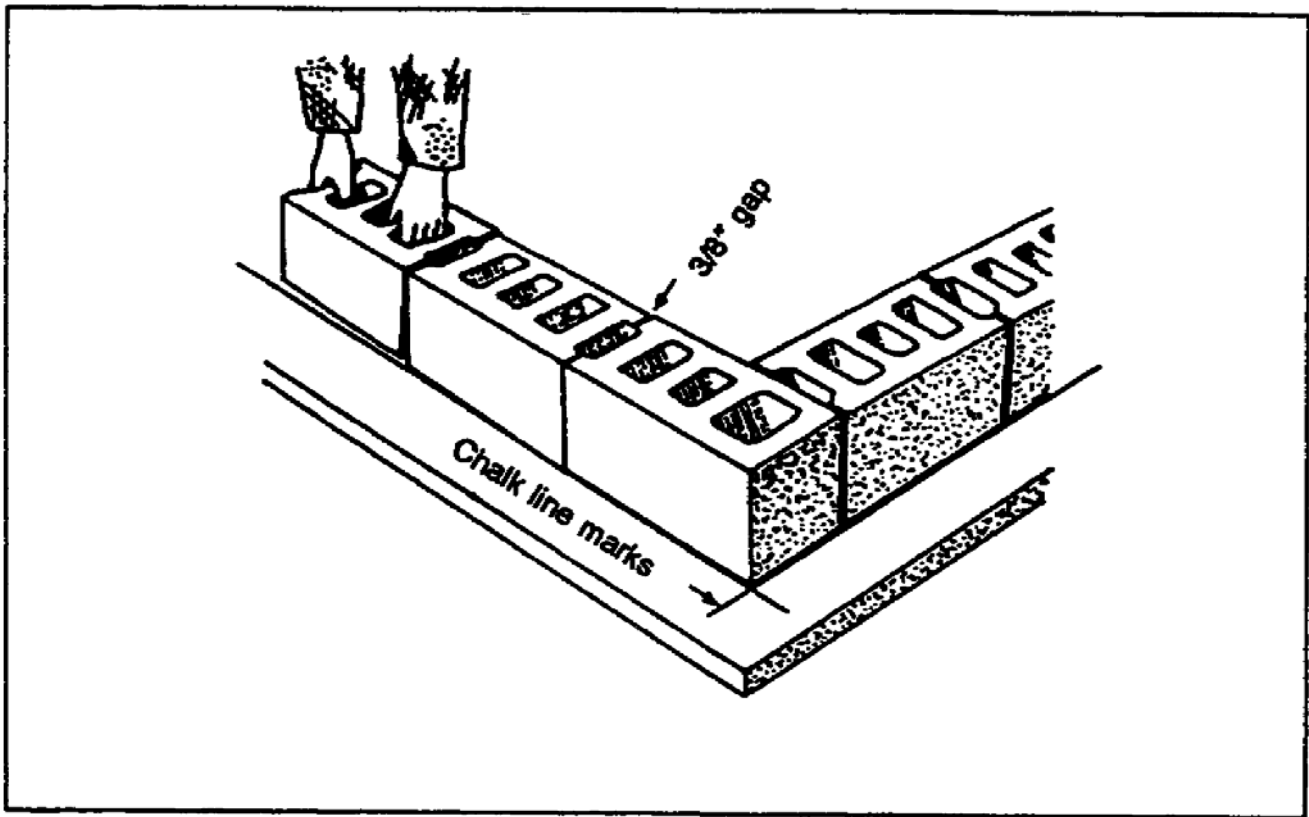
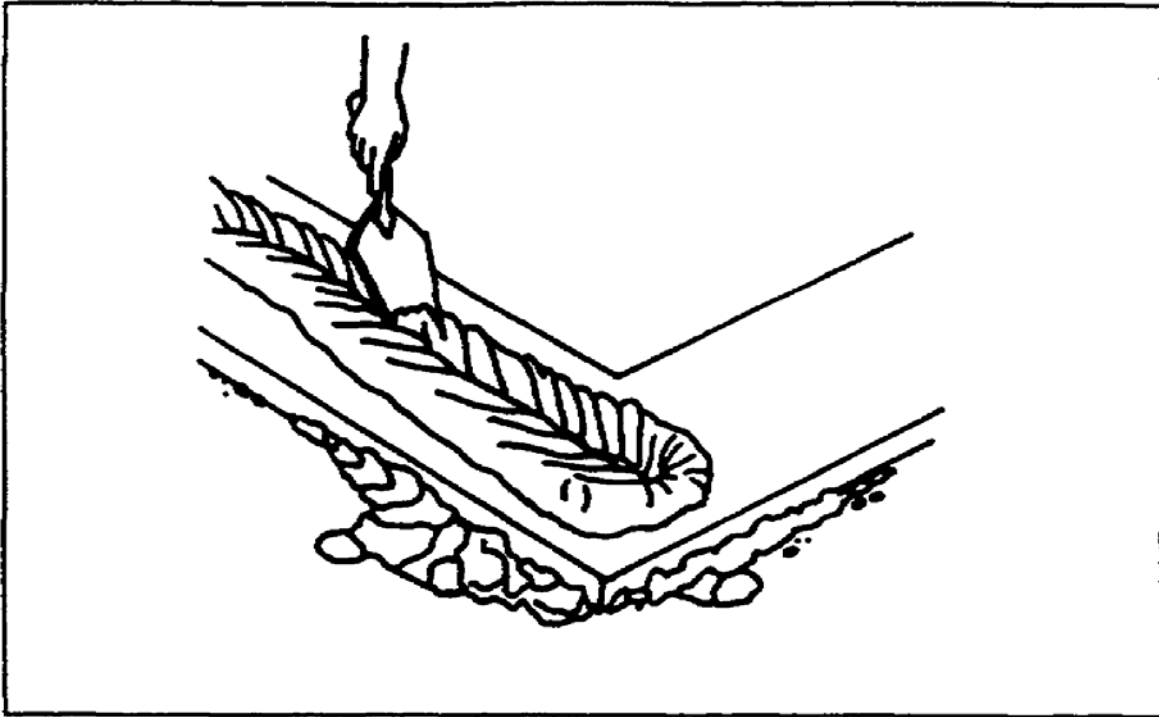


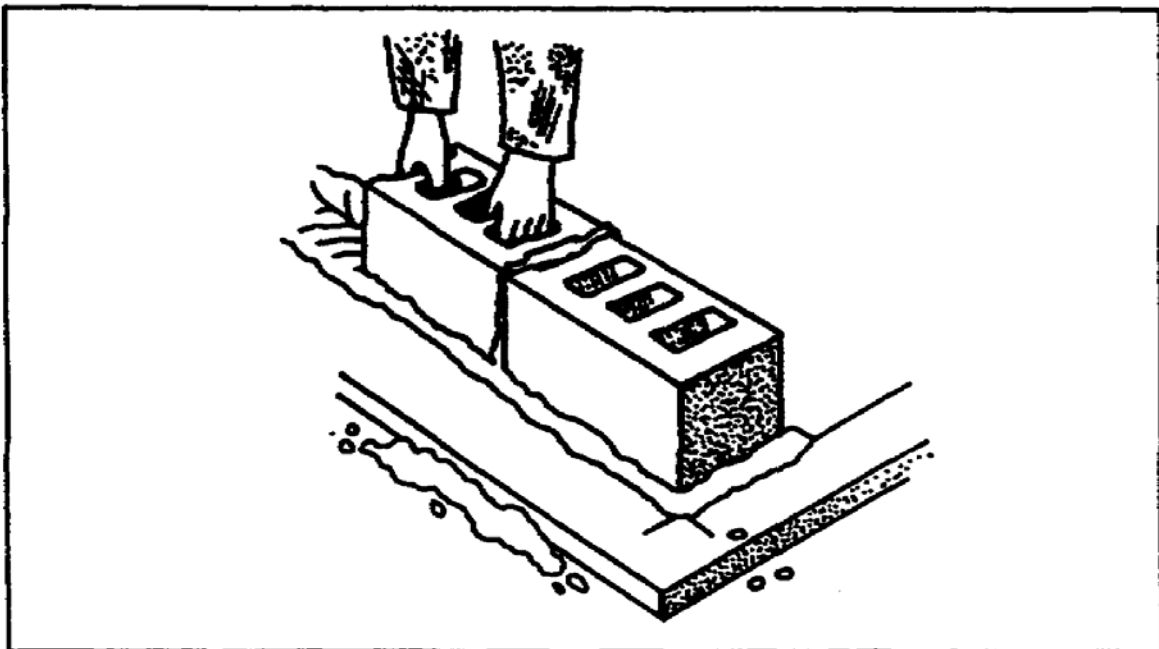
Figure 2-5. Laying out block without mortar

**2-9. Spreading the Mortar Bed.** Spread a full bed of mortar, and furrow it with a trowel. This will ensure that plenty of mortar is on the bottom of the blocks for the first course (Figure 2-6).



**Figure 2-6. Spreading and furrowing the mortar bed**

Lay the corner block first and carefully position it. Be sure to lay all blocks with the thicker side of the face shell up to provide a larger mortar bedding area (Figure 2-7).



**Figure 2-7. Positioning the corner block**

**2-10. Making Vertical Joints.** Apply mortar to the ends of the blocks for vertical joints. You can save time by placing several blocks on the ends and applying mortar to the vertical faces in one operation (Figure 2-8). Then place each block over its final position and push downward into the mortar bed and against the previously laid block to obtain a well-filled vertical joint (Figure 2-9).

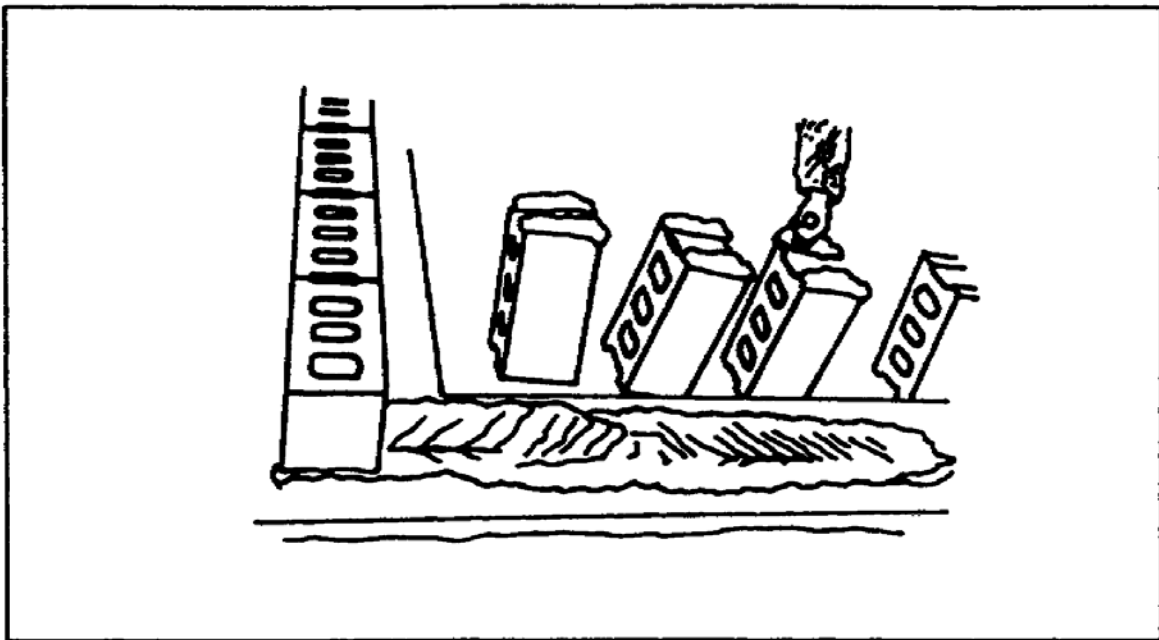


Figure 2-8. Applying mortar for vertical joints

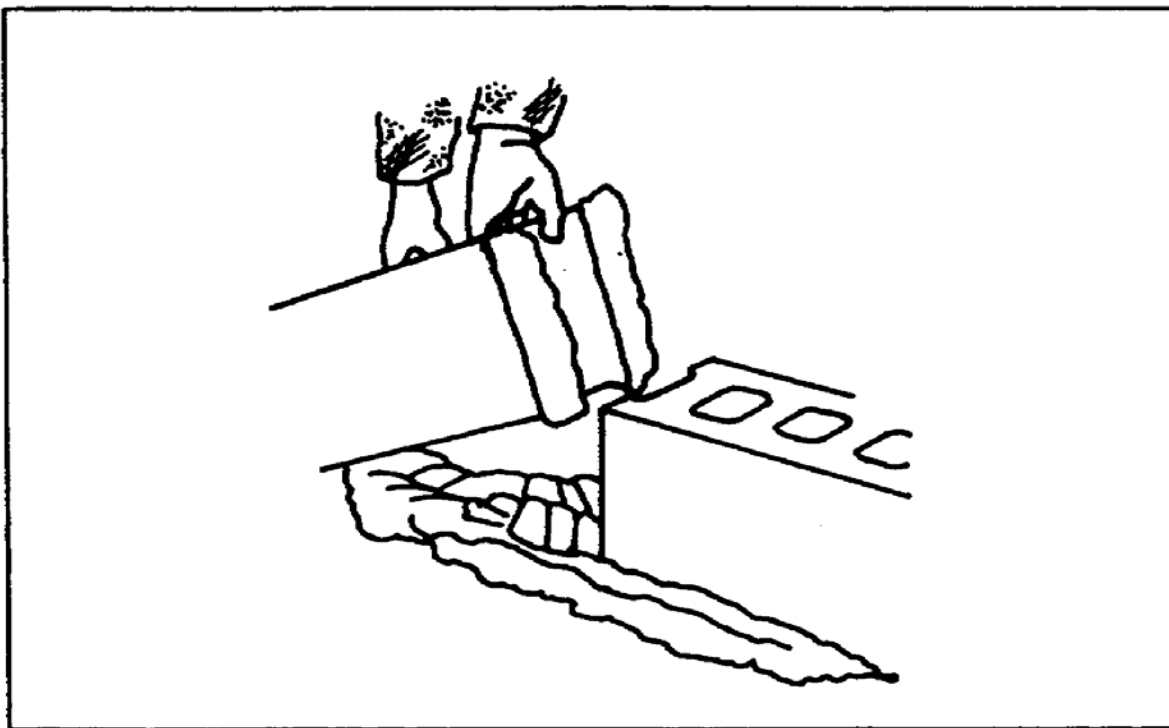
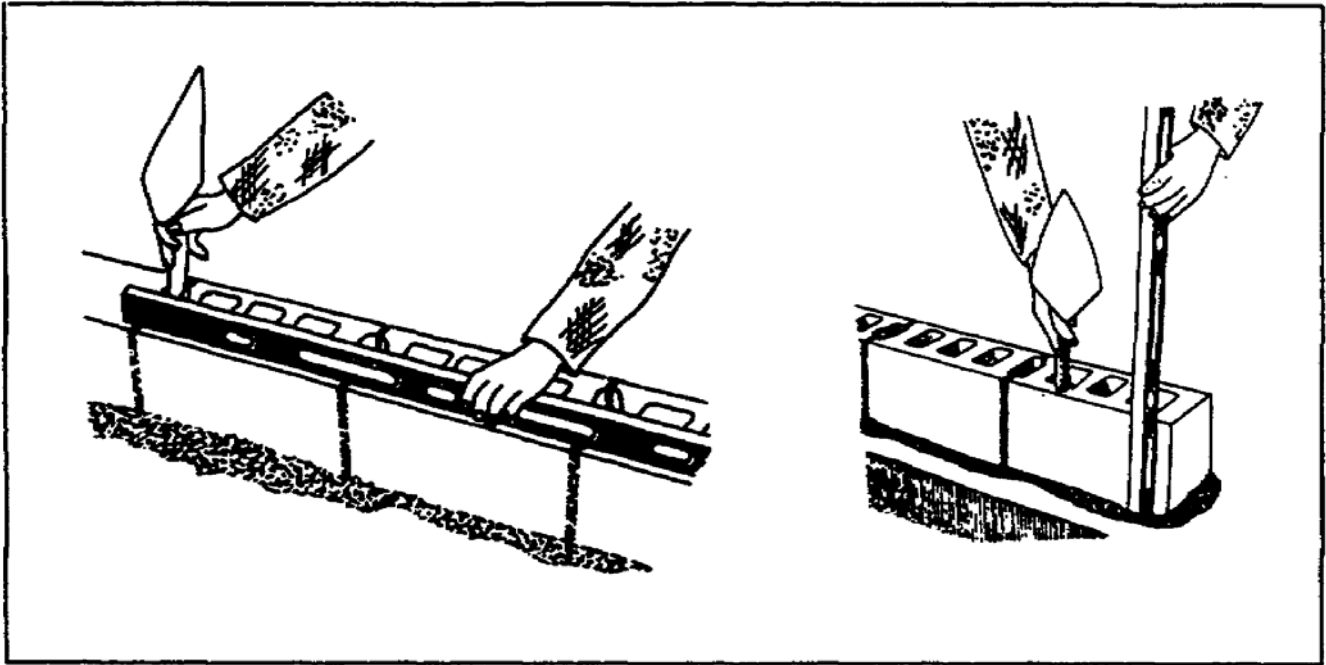


Figure 2-9. Positioning the block

**2-11. Aligning, Leveling, and Plumbing.** Lay the first course of blocks with great care to ensure that they are properly aligned, leveled, and plumbed. This will make the next course of blocks and the wall itself straight and true. After you have laid three or four blocks, use the mason's level as a straightedge to ensure correct alignment of the blocks. Check the first course of blocks carefully with the level, bringing them to the proper grade. Plumb the blocks by tapping them with the trowel handle (Figure 2-10).



**Figure 2-10. Leveling and plumbing the blocks**

## PART E - CONTROL JOINTS

Control joints are continuous vertical joints that are built into concrete-blocks walls to control cracking from unusual stress. They are usually spaced at 20- to 25-foot intervals in long walls and extend to the top course. A wall shorter than 20 feet does not normally require a control joint.

**2-12. Using Full- and Half-length Blocks.** Use full- and half-length blocks to form a continuous vertical joint which will permit slight wall movement without cracking. You should lay control joints up in mortar just like any other joint (Figure 2-11).

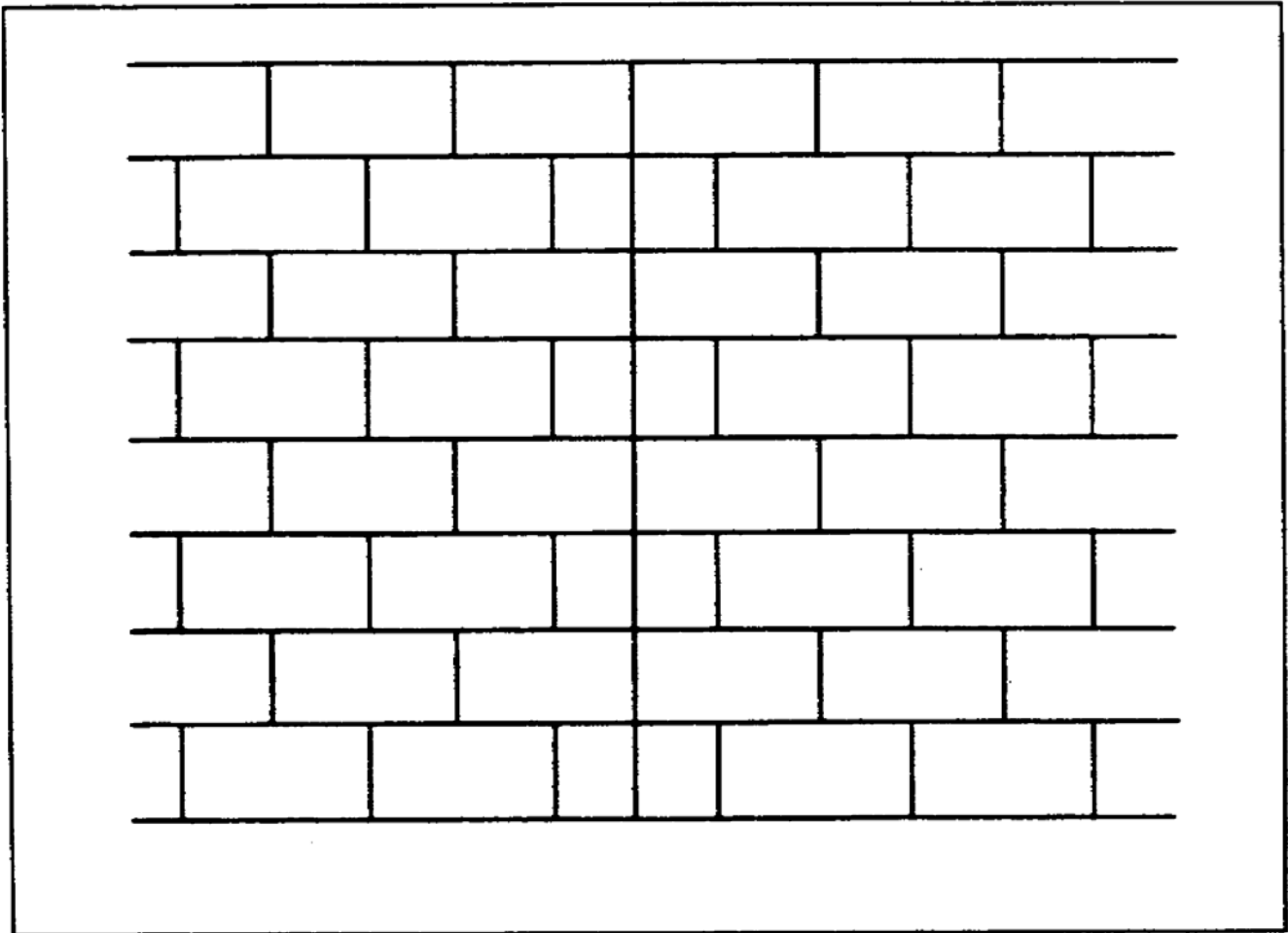
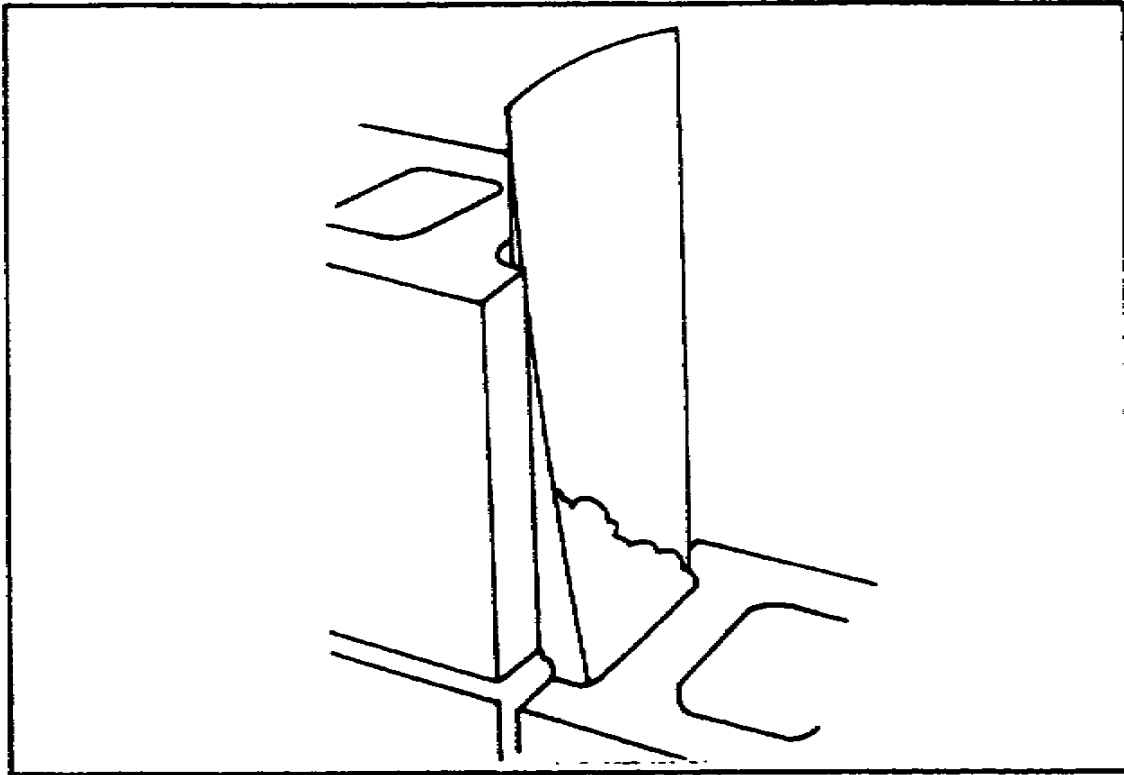


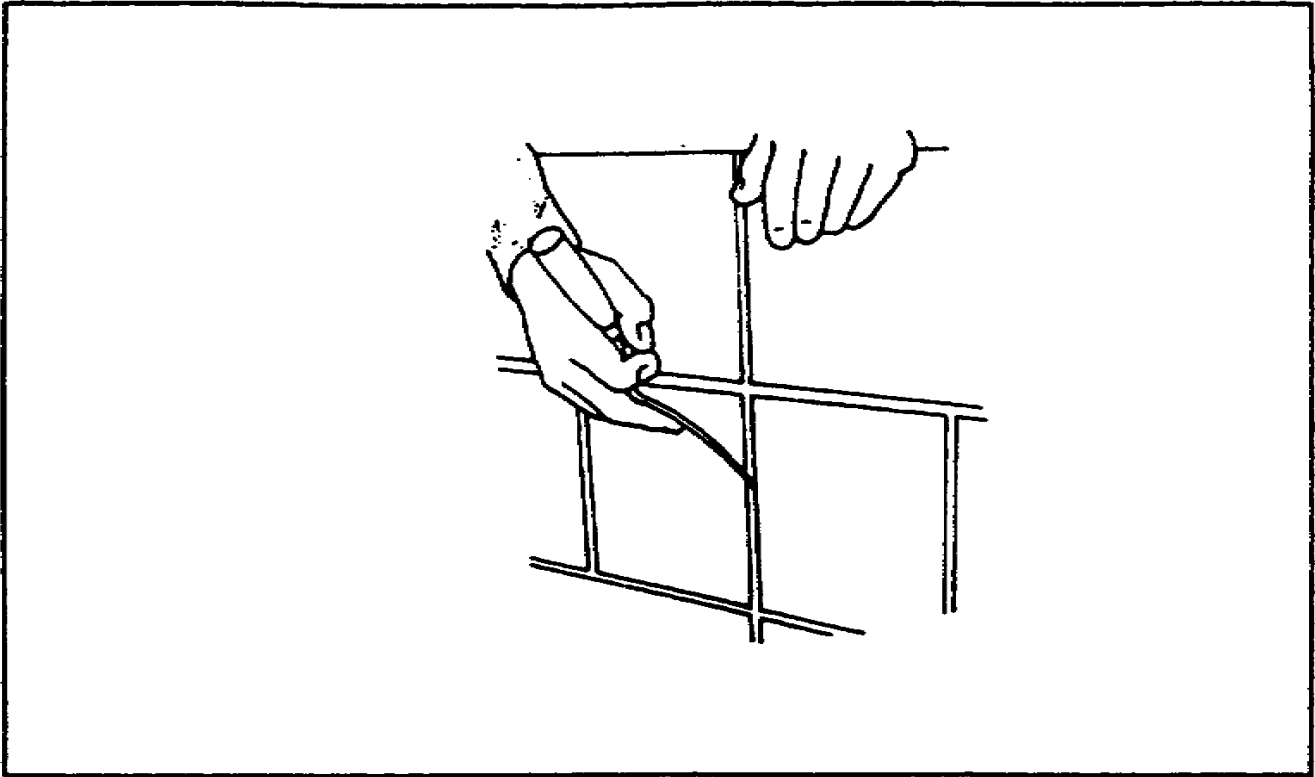
Figure 2-11. A control joint using full- and half-length blocks

**2-13. Using Paper and Felt.** You can make another type of control joint by inserting building paper or roofing felt in the end core of the block and extending it the full length of the control joint. Cut the paper or felt to convenient lengths. Make sure it is wide enough to extend across the joint to prevent the mortar from bonding on one side of the joint (Figure 2-12).



**Figure 2-12. Control joints using paper or felt**

**2-14. Caulking.** If the control joints are exposed to the weather or to view, you should caulk them. When the mortar in the control joint is stiff, rake it out to a depth of 3/4 inch to provide a recess for the caulking materials (Figure 2-13, page 2-16 ). Use a thin, flat caulking trowel to force the caulking compound into the joint.



**Figure 2-13. Raking mortar from the joints**

## PART F - LAYING UP THE CORNERS

After the first course of blocks are laid, build up the corners of the wall next, usually four or five courses higher than the first course. As you lay up the corners, cut each course back one-half block.

**2-15. Applying Mortar.** For the horizontal joints, apply mortar only to the tops of the blocks already laid. You may apply mortar for the vertical joints to the vertical end of the block to be laid, to the vertical end of the block previously laid, or to both.

**2-16. Using a Level.** As you lay each course at the corner, check it with a mason's level for alignment. Make sure that the corner is level and plumb (Figure 2-14). Check each block carefully, making certain that the faces of the blocks are all on the same plane. This will ensure true and straight walls.

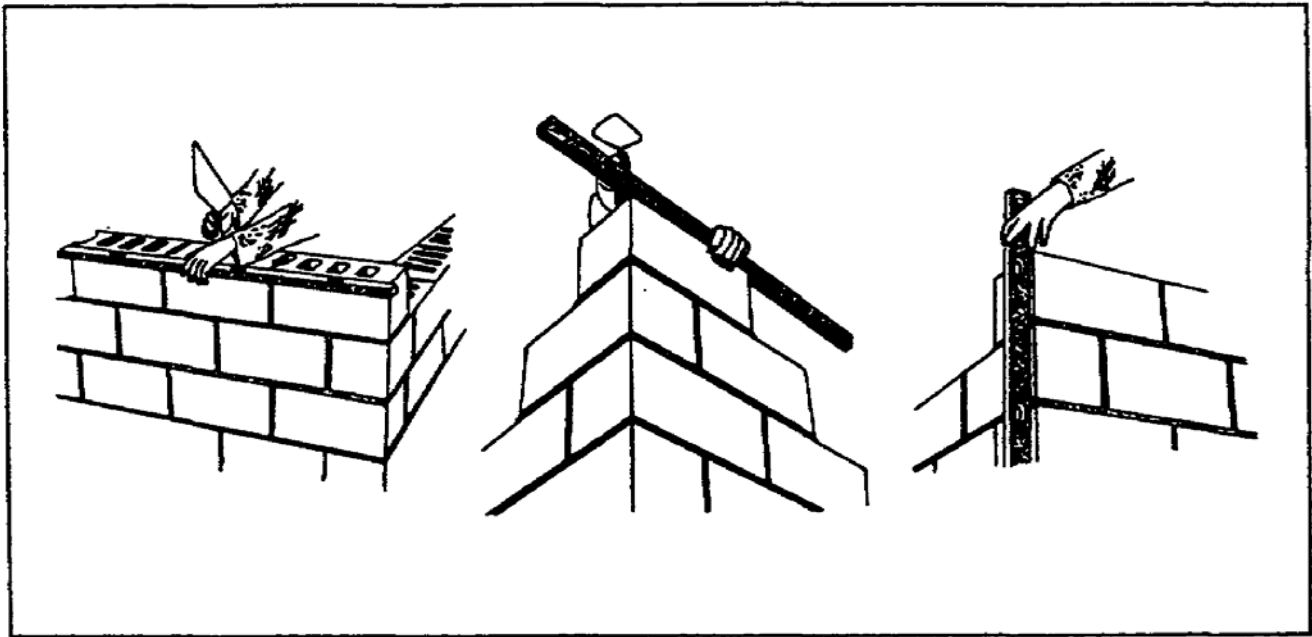
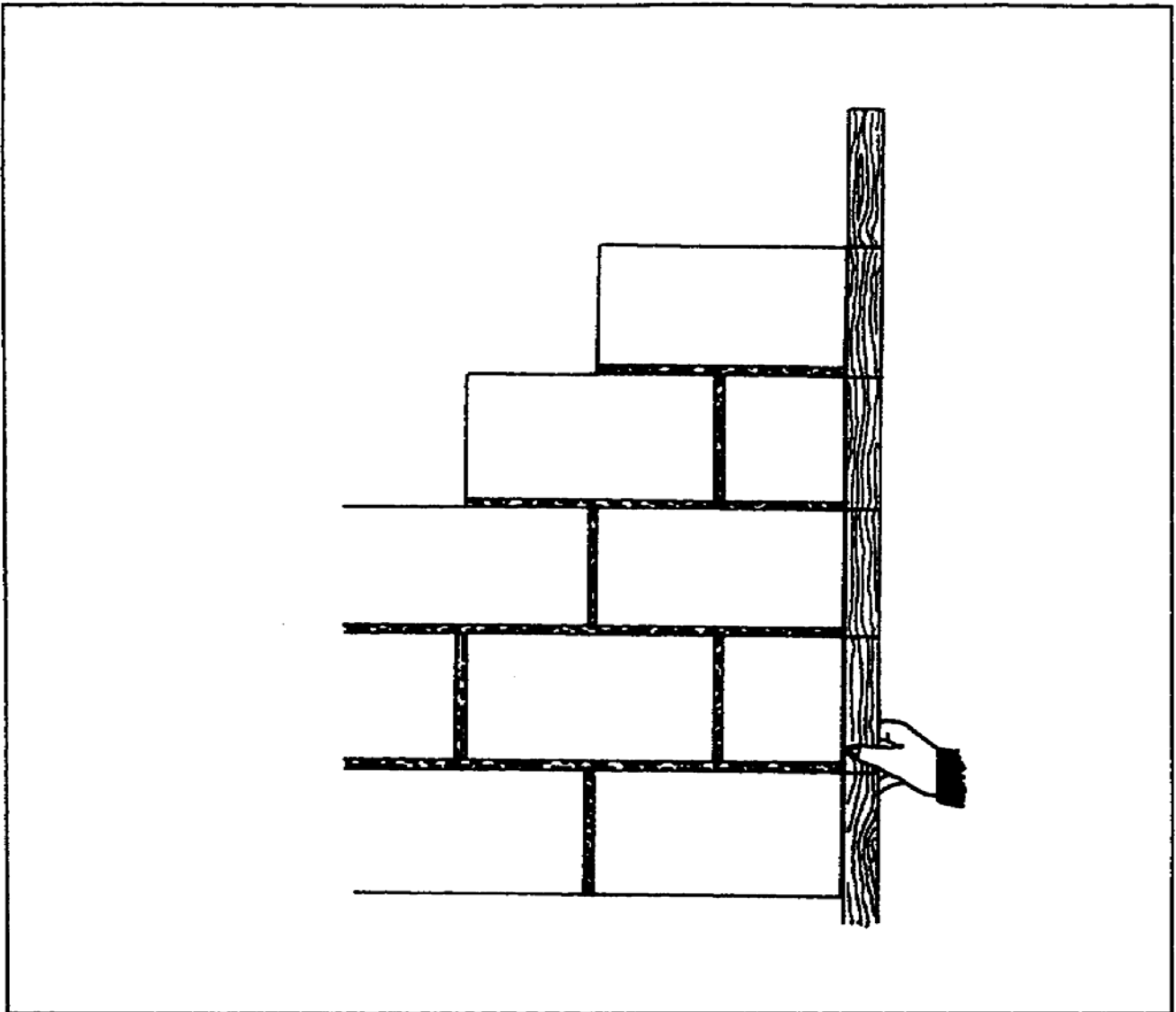


Figure 2-14. Aligning, leveling, and plumbing

**2-17. Using a Story Pole.** Use a story or course pole (a board with markings 8 inches apart) to determine the height of the wall for each course (Figure 2-15).



**Figure 2-15. Using a story or course pole**

## PART G - LAYING CONCRETE BLOCKS BETWEEN CORNERS

To ensure a good bond, do not spread mortar too far ahead of the actual laying of the block. When mortar is allowed to sit, it will stiffen and lose its plasticity. As each block is laid, cut off excess mortar with your trowel and work it back into the fresh mortar (Figure 2-16).

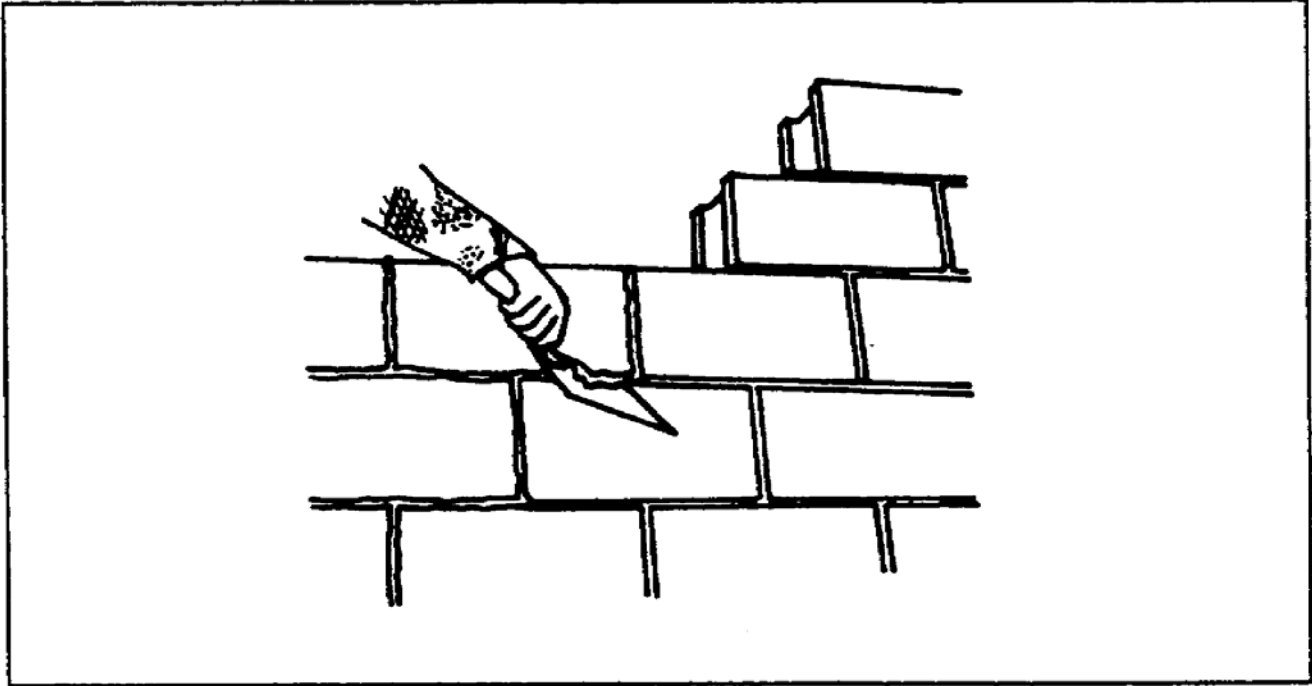
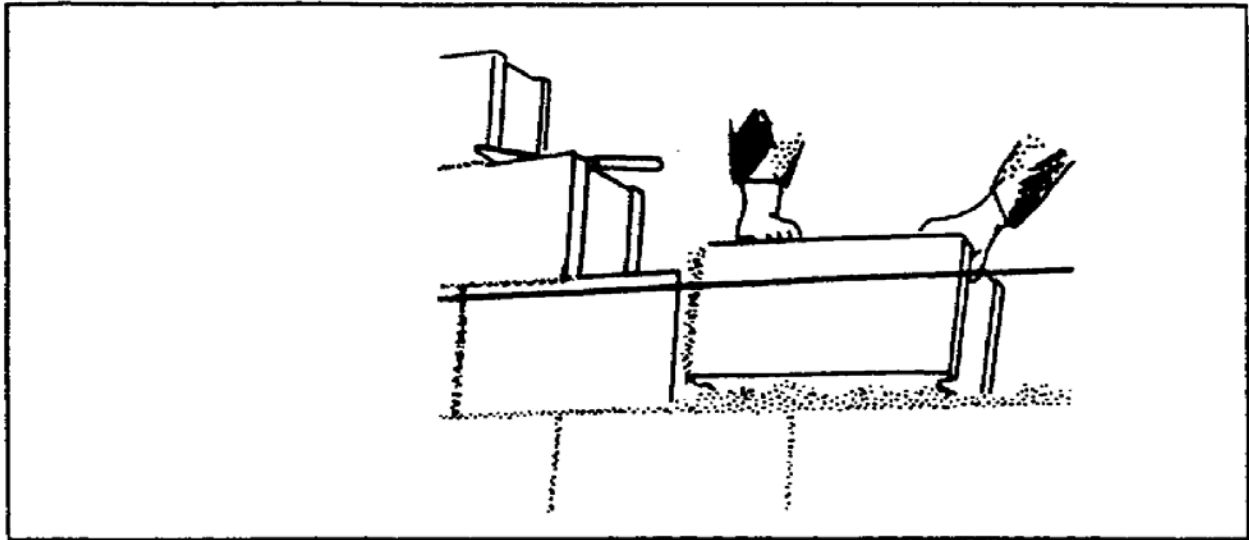


Figure 2-16. Cutting off excess mortar

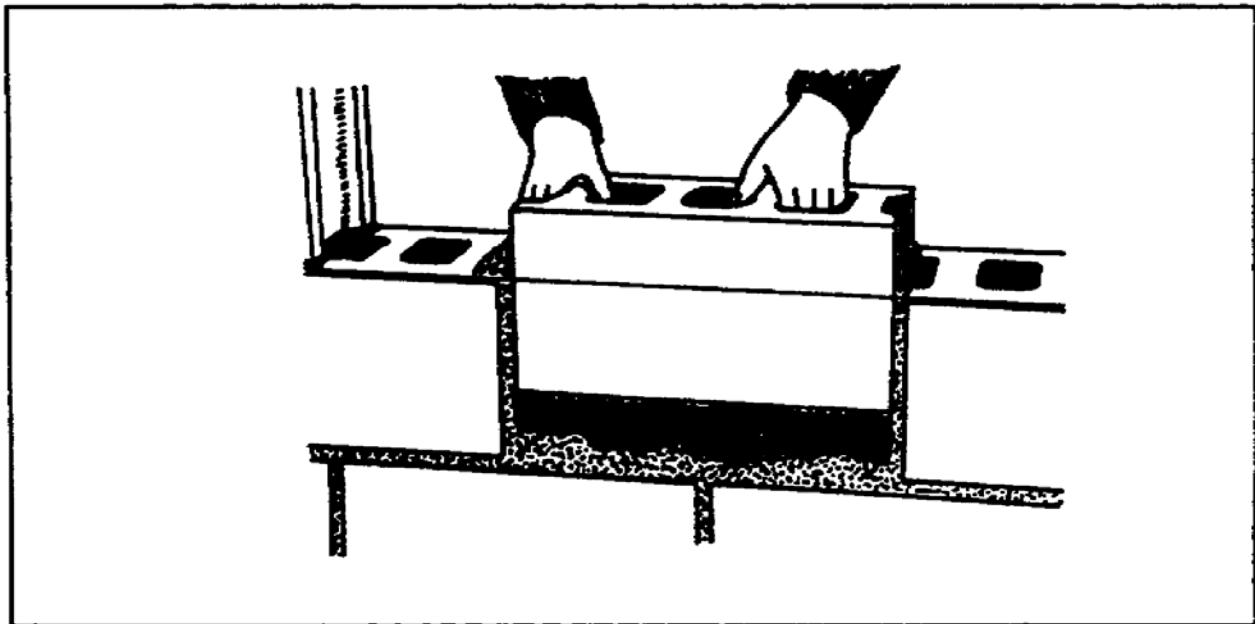
**2-18. Using a Mason's Line.** As you fill in the wall between the corners, stretch a mason's line from corner to corner for each course. Lay the top outside edge of each block to his line. Tip the block slightly toward you so you can see the edge of the course below, making sure that the lower edge of the block is directly over the course below (Figure 2-17, page 2-20).



**Figure 2-17. Laying the top outside edge of the block to the line**

**2-19. Making Adjustments.** You must make all adjustments to the final position of the block while the mortar is flexible. If you try to make adjustments after the mortar has stiffened, it will break the mortar bond and allow water to penetrate. Level and align each block to the mason's line by tapping it lightly with the trowel handle.

**2-20. Installing the Closure Block.** The last block to be installed in every course is called the closure block. When you install the closure block butter all edges of the opening in the wall and all four vertical edges of the closure block with mortar. Carefully lower the block into place. If any mortar falls out and leaves an opening in the joint, remove the block and repeat the procedures (Figure 2-18).



**Figure 2-18. Installing the closure block**

## PART H - TOOLING THE JOINTS

Proper tooling of mortar joints helps produce a weathertight, neat, and durable concrete-block wall. For exterior concrete, the mortar joints you make should be concave or V-joints (Figure 2-19). Tool the vertical jointer first, followed by the horizontal joints with a longer jointer.

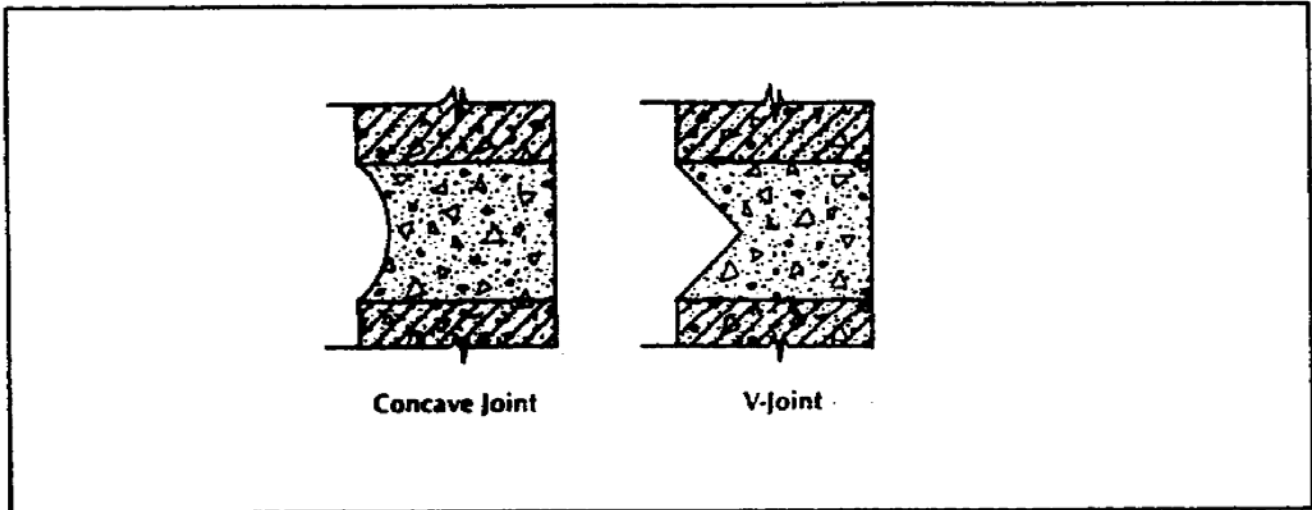


Figure 2-19. Mortar joints

2-21. **Jointers.** To finish mortar joints, you will use a jointer, also called a finishing tool (Figure 2-20).

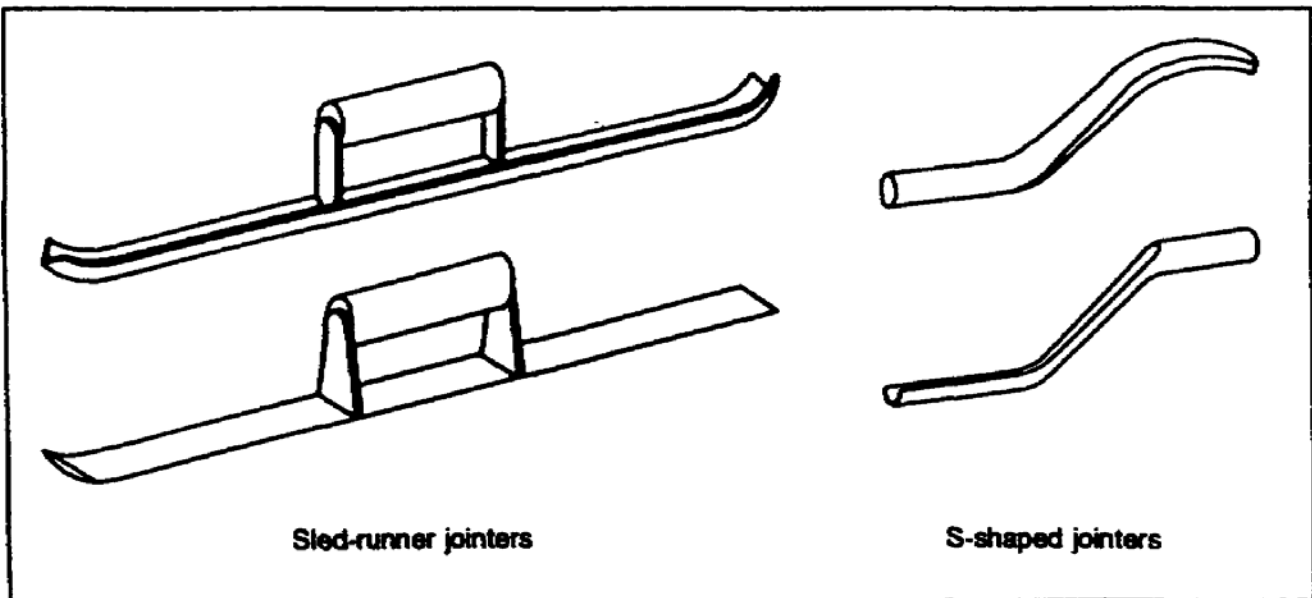


Figure 2-20. Jointers

a. Sled Runner. Use a sled-runner jointer to tool horizontal joint (Figure 2-21).

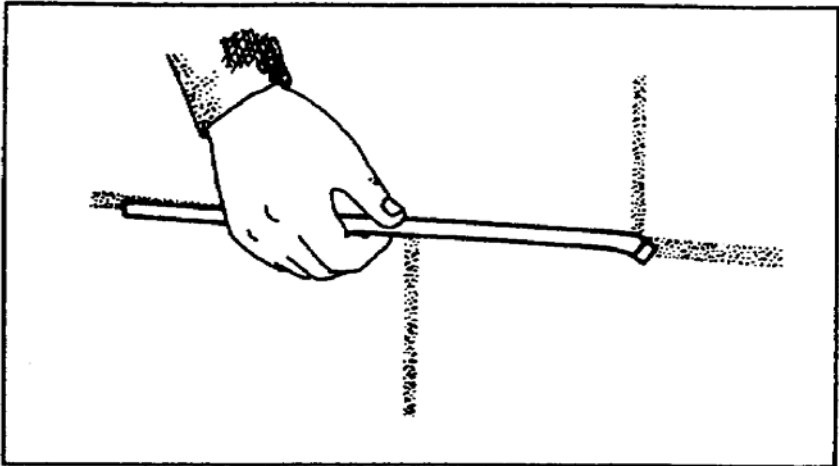


Figure 2-21. Tooling horizontal joints

b. S-shaped. Use the S-shaped jointer to tool vertical joints (Figure 2-22). This is called striking.

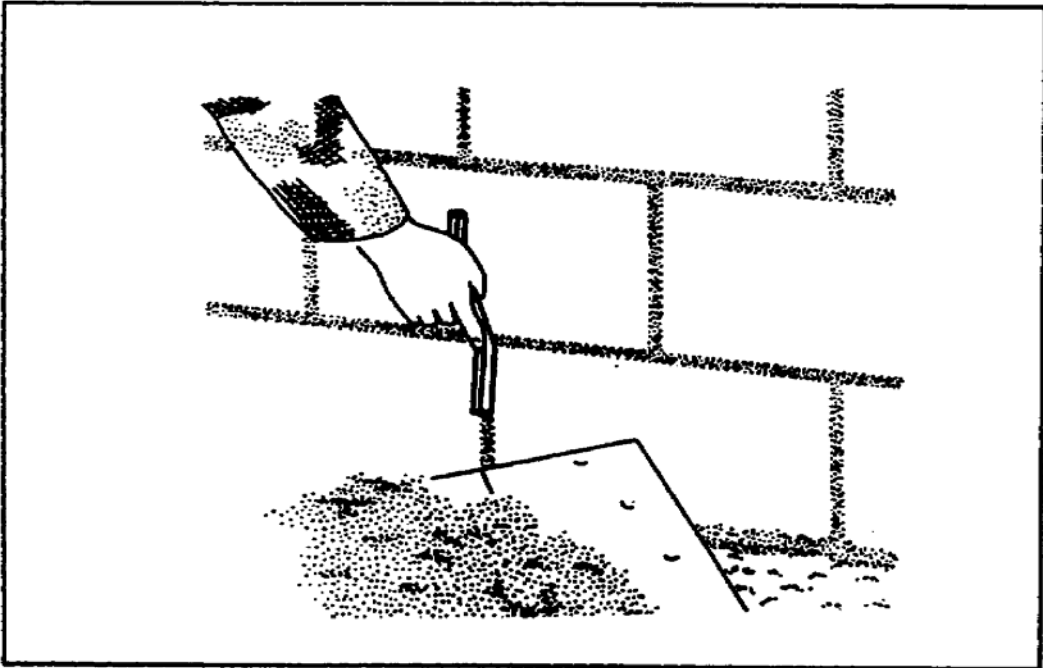


Figure 2-22. Striking vertical joints

**2-22. Burrs.** You can reduce burring by finishing the horizontal mortar joints before you finish the vertical joints. If mortar burrs remain on the wall after you have finished tooling, you should remove them. This will prevent small amounts of water from being lodged in the mortar joint.

## PART I - INTERSECTING WALLS

Depending on the type of wall, intersecting walls are tied together with tie bars or metal laths.

**2-23. Bearing Walls.** Bearing walls or blocks in intersecting load-bearing walls should not be interlocked in a bond. Instead, terminate one wall at the face of the other with a control joint at the point where they intersect.

a. **Placing Tie Bars.** Tie bearing walls together with a tie bar that has a right angle bend on each end. Place a metal lath over the core in the outside wall to support the concrete or mortar for the next course (Figure 2-23).

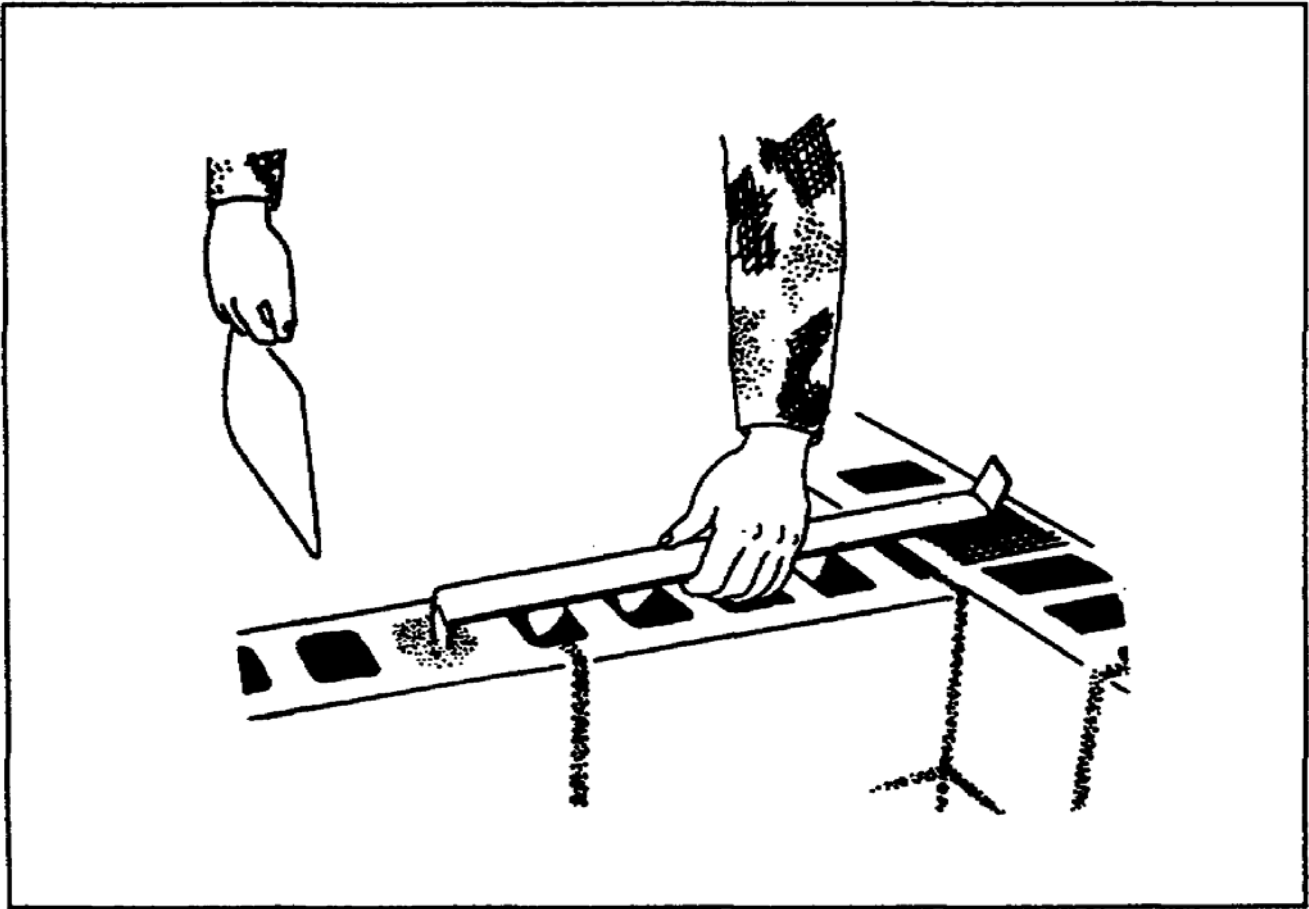


Figure 2-23. A tie bar and metal lath

b. Spacing Tie Bars. Space tie bars no more than 4 feet apart vertically. Fill the core of the block with mortar or concrete and embed the right angle bend of the tie bar in the core (Figure 2-24).

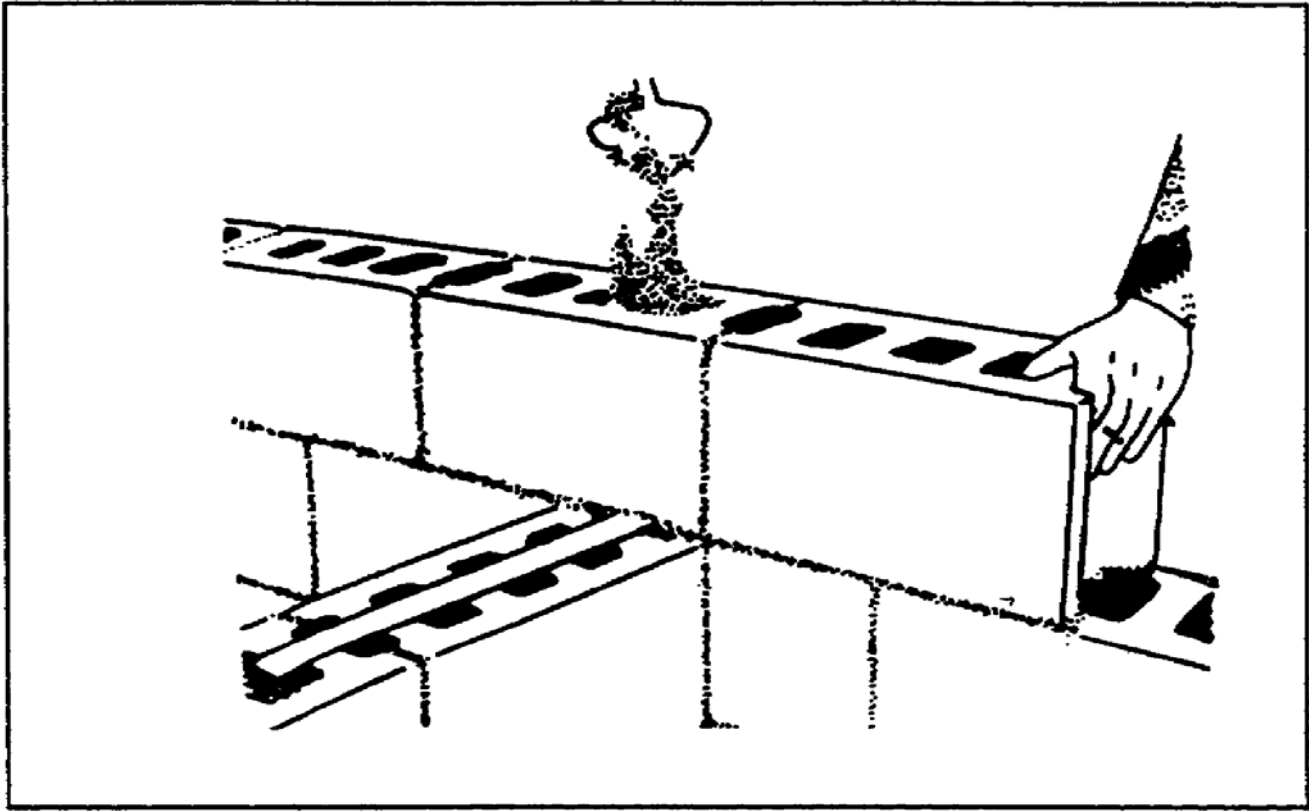


Figure 2-24. Filling the core with mortar

**2-24. Nonbearing Walls.** To tie nonbearing walls to other walls, place metal-lath strips across the joints in alternate courses between the two walls (Figure 2-25). If one wall is constructed first, build the metal laths into the first wall. Later, tie the metal laths into the mortar joints of the second wall and construct control joints where the two walls meet (Figure 2-26, page 2-26).

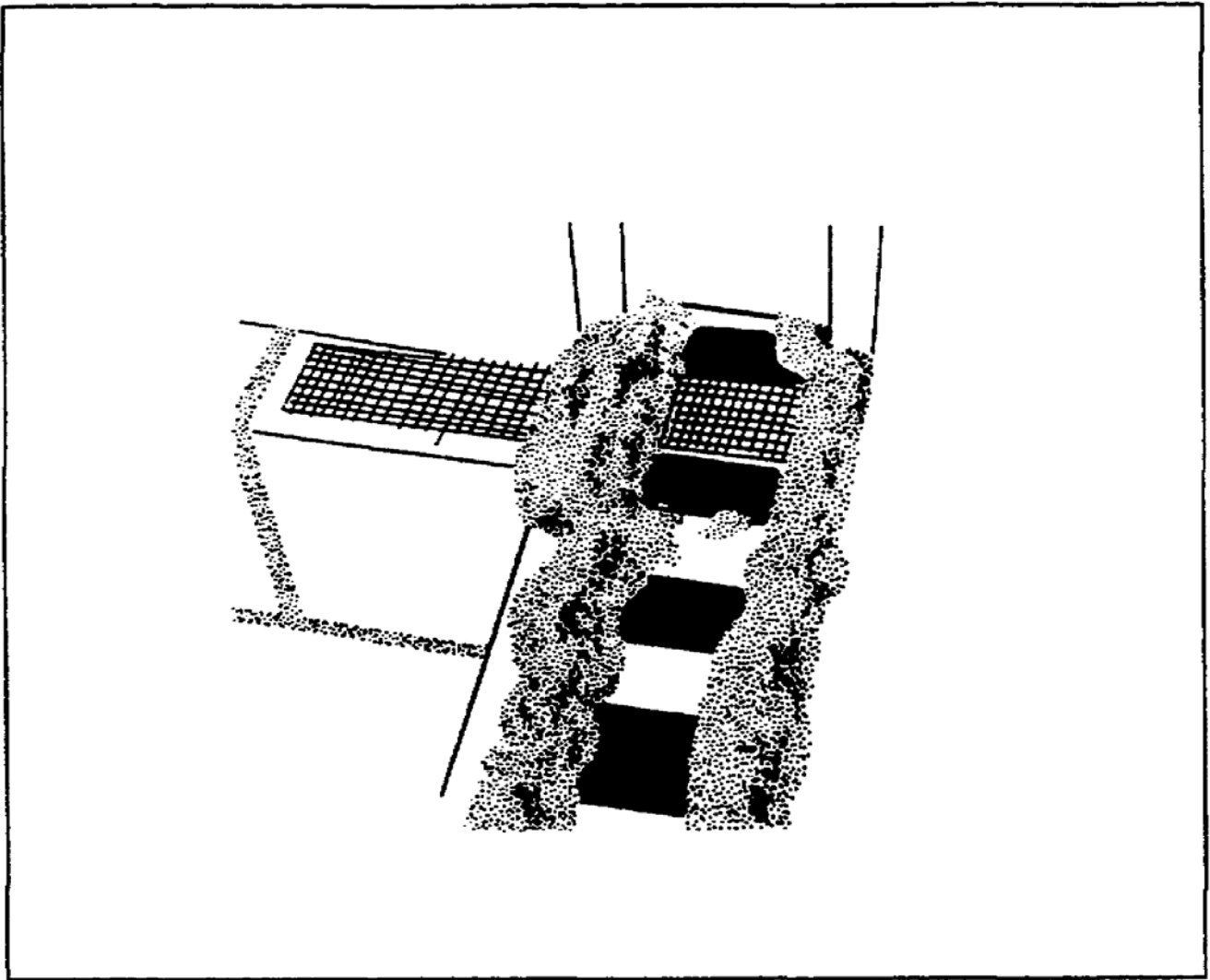


Figure 2-25. Metal lath spanning the joint

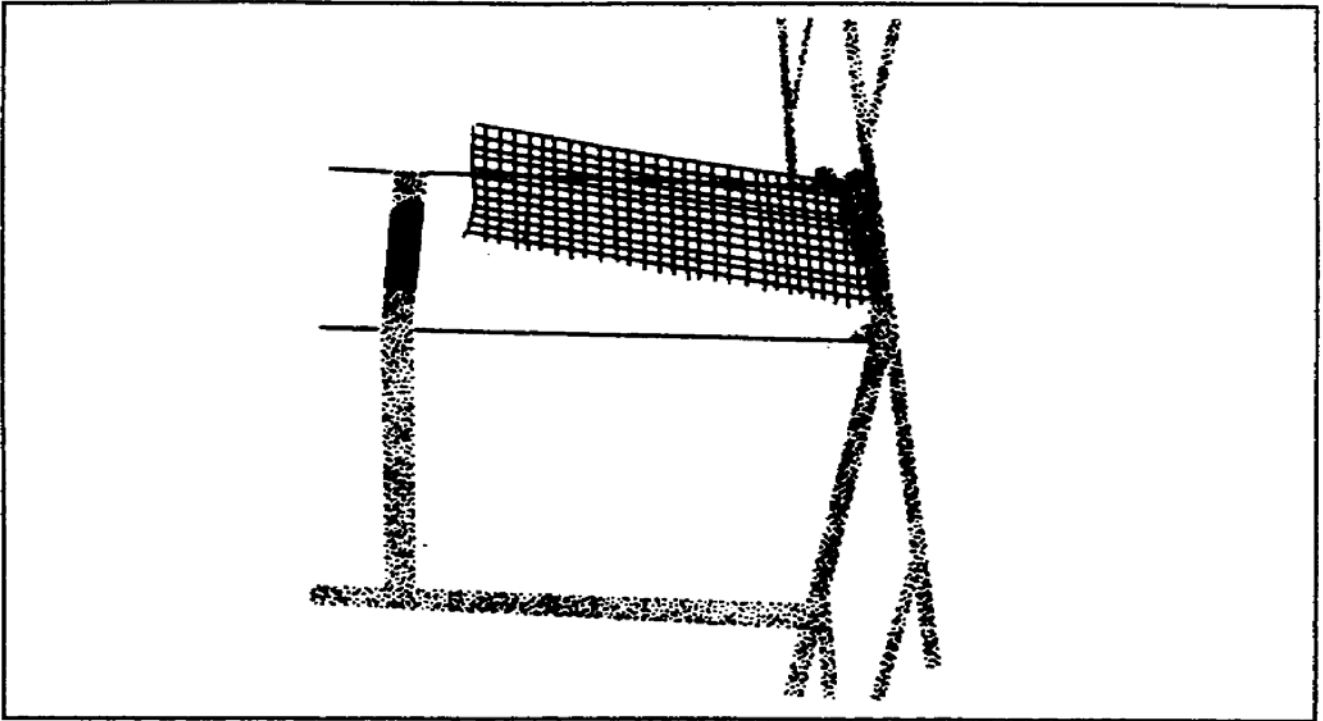


Figure 2-26. Metal lath built into the first wall