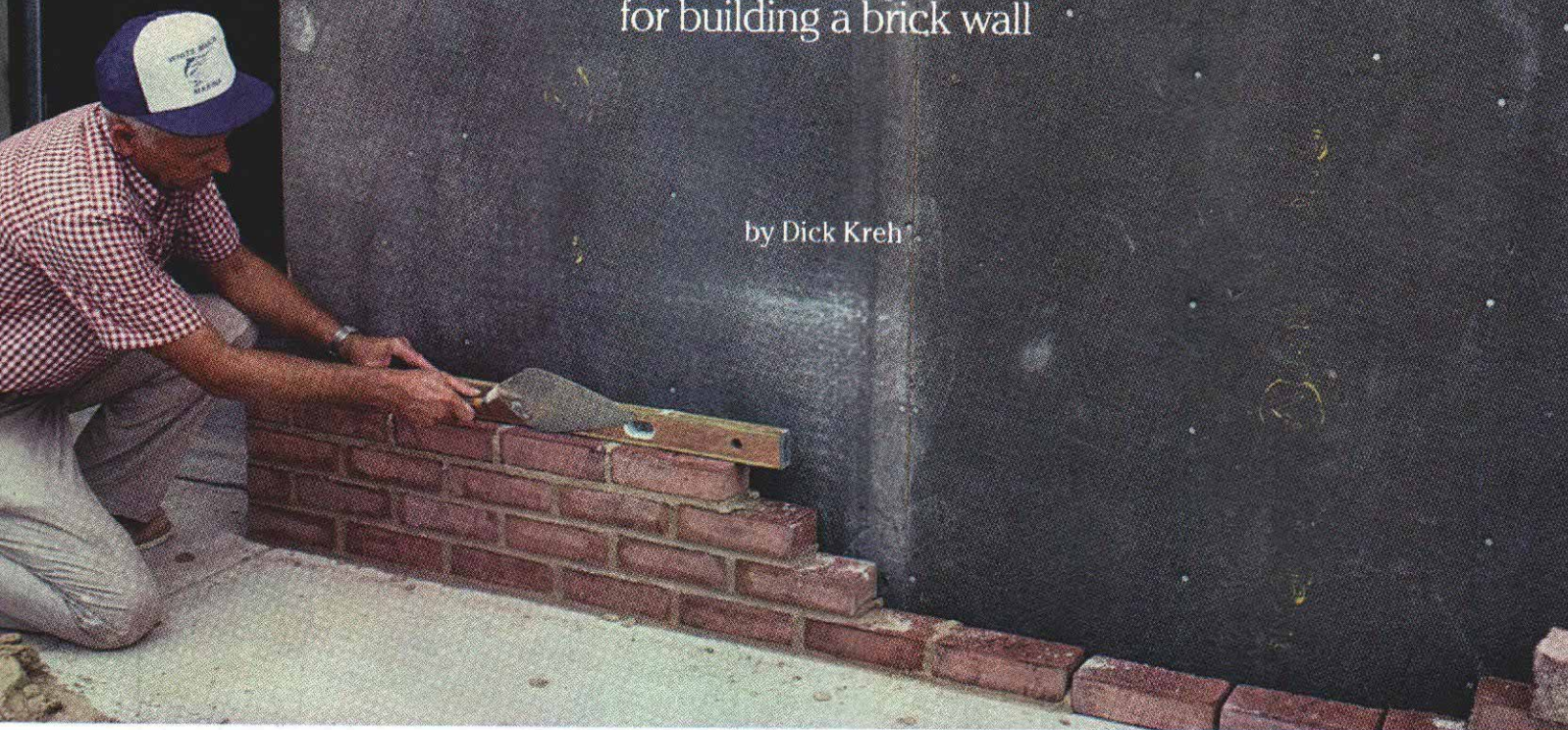


Bricklaying Basics

Tools, materials and techniques
for building a brick wall

by Dick Kreh



The art of laying bricks in mortar to form a wall dates back thousands of years, and the tools haven't changed much over the centuries. Whether your project is simple or complex, laying bricks can be one of the most creative and satisfying of all crafts. Bricklaying is not complicated; the key to good work is consistency, accuracy and repetition. This requires strict attention to details, such as the placement of your fingers when holding the trowel. With practice you develop a feel for the work.

You probably already have many of the tools you'll need—a steel measuring tape, a metal square, a ball of nylon line, a brush, a chalkbox and safety goggles or glasses. More specialized bricklaying equipment is described in the sidebar on pp. 52-53. For mixing mortar, you will need a wheelbarrow, a mixing box (for large batches), a water bucket, a 24-in. sq. mortarboard or pan, a mortar hoe (like a garden hoe, but it has two holes in the blade) and a hose with a spray nozzle. If a lot of mortar is to be mixed, utility drum mixers can be rented.

Mortar—A wall can be no stronger than the mortar it is built with. If the mortar is too weak, the wall will fail. If the mortar is too rich, it will be sticky and hard to handle with the trowel, and will be brittle when it hardens.

There are several kinds of mortar, but they are basically all composed of portland cement, lime, sand and certain additives that make them more workable. The simplest to use is prepackaged

mortar, which contains all the dry ingredients in the correct proportion; you add the water. Prepackaged mortar is fine for small jobs, but on a project of any size it is expensive. Mortar is mostly sand, and sand is inexpensive.

The most popular mortar for general use is made with masonry cement. It is sold in 70-lb. bags (with lime and certain additives included), and you add the sand and water when mixing. A good proportion to mix is 1 shovelful (part) of masonry cement to 3 shovelfuls (parts) of sand, with enough water to blend it to the desired stiffness. If you mix an entire bag at once (called a batch), use 1 bag of masonry cement to 18 shovelfuls of sand. Masonry-cement mortar is the most economical and has excellent handling properties.

With portland cement/lime mortar, you can adjust the strength of the mix by varying the ingredients. Building-supply stores sell portland cement in 94-lb. bags. The lime comes in 50-lb. bags and must be labeled "Hydrated" or "Mason's Lime," which means that it has been treated with water. This is stamped on the bag. Other types of lime are used for agricultural purposes.

The portland cement/lime mortar mix I use is 1 part portland cement to 1 part hydrated lime to 6 parts sand and water. This is known as Type N mortar and is the standard mix for brickwork. After curing 28 days, this mix will sustain pressures of 750 lb. per sq. in., which is more than ample for most brick masonry.

A word of caution about sand. Buy your sand from a regular building supplier and ask if it is washed. This is important, because with washed sand most of the loam and silt will have been removed. Silt or loam in the sand will prevent

the mortar mix from blending together properly; the resulting mortar will be weak and defective.

Store cementitious materials in a dry place and off the ground so moisture won't get in. If moisture has penetrated into the dry cement and hard lumps have formed, throw it away. If your project is large, it is better to make several trips to the supply house for cement than to keep a lot of it for six months or a year—mortar stored too long tends to lose its strength.

When measuring, proportion the materials carefully, and mix all the dry materials together well before adding clean water. Don't mix any more mortar than you can use in an hour. If the mortar starts to stiffen in the wheelbarrow, you can add enough water to temper (loosen) it, once—this should be only enough water to make it workable, not runny or thin.

Estimating materials—Over the years I have developed some rules of thumb for figuring how many bricks and how much cement, sand and lime to order. These may be of some help to you when you estimate your project.

Figure on using seven standard bricks (a standard brick is considered to be 8 in. long, $3\frac{1}{2}$ in. wide and $2\frac{1}{4}$ in. high) for every single thickness of 1 sq. ft. of wall area. This allows a small amount for waste, so don't add any more to it for cracked or broken bricks.

One bag of masonry-cement mortar will lay about 125 bricks. One bag of portland cement and one bag of mason's hydrated lime mixed with 42 shovels of sand will lay about 300 bricks. One ton of sand will make enough mortar to lay 1,000 bricks. If you store it on the ground, allow about 10% for waste.

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Layout—Since bricks vary somewhat in length, you can't just step off the bond (the pattern for layout that will be followed throughout the wall) with a tape measure. You have to lay out the first course brick by brick to a chalkline. This is done most effectively by spacing the bricks $\frac{3}{8}$ in. apart (the width of the head joint, or space between the ends of adjacent bricks) without using mortar—this is known as *dry bonding*. A quick way to lay out the head joints is to place the end of your little finger between the bricks. When the first course is aligned, if there is a small gap at the end, either open up all the joints or place a cut brick in the center of the wall or under a door or window. Try to have as few cut bricks as possible. Be sure to lay the face side of the brick out to the front of the wall. (The face side is usually the straightest side, and it always matches the ends of the brick in color.) Leave the bricks in position until the mortar is ready to spread. Then pick them up only two at a time so you don't lose the pattern or spacing. Only the first course is laid out dry. Subsequent courses will be laid following the pattern established by the first course.

Cutting a brick—Bricks can be cut by using either a brick set chisel or a brick hammer. Always check each brick to be cut. If it has a crack in it, discard it because it won't break true. To make an accurate cut, first mark the edge to be cut, and then place the flat side of the blade facing the finished cut. This will ensure a neat, accurate cut. Be careful not to place the fleshy part of your hand against the head of the chisel—the hammer knows no mercy if misdirected. It's a good idea, to wear a pair of gloves to prevent accidentally cutting or pinching your fingers.

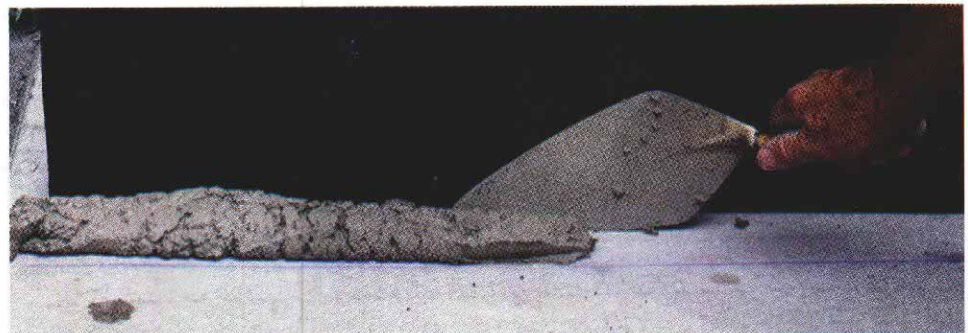
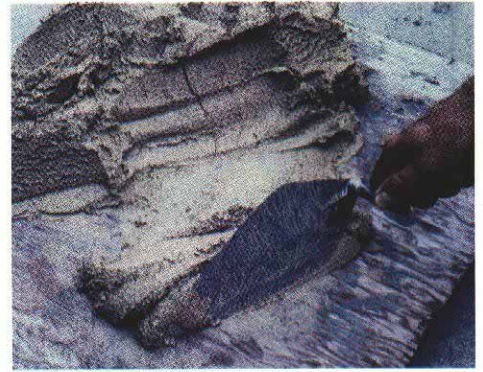
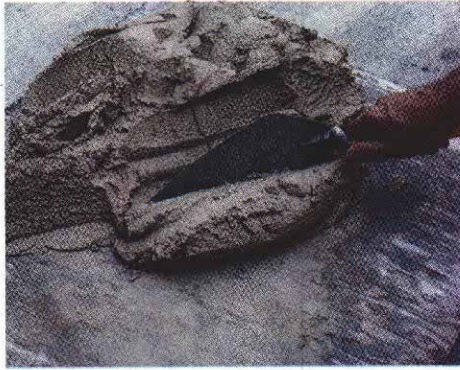
Most novices have trouble cutting bricks with the brick hammer, but as with so many things, practice makes perfect. Mark the cut with a pencil first, then score across the face of the brick with light pecking blows. Don't try to break the brick yet; the object here is to weaken the brick along the line.

Next, repeat the scoring of the brick across its widest side. It should break cleanly. If not, return to the face side, and repeat the scoring until the brick breaks at that point. Now trim the cut edge with the end of the blade to remove any protruding edges.

Troweling techniques—Cutting and spreading mortar are important skills to master. Of the many different methods used, I feel the easiest is the "cupping" method. It is accomplished in a series of steps or movements.

Start by holding the trowel with the thumb just a little over the end of the handle, near the blade (photo top left). This will provide you with good leverage and balance. It also keeps you from dipping your thumb in the mortar. Your fingers should be wrapped firmly around the handle, but not gripping tightly.

Cut the mortar away from the main pile with a downward slicing motion, pulling it toward the edge of the board (photo top left). Shape the mortar on both sides with the blade of the trowel until it is about the same width and length as



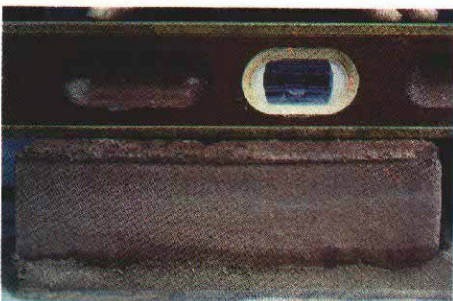
Troweling the mortar. With a downward slicing motion (top left), cut some mortar away from the pile in the middle of the mortar board, then push it into a rough box shape the size of the trowel blade (top right). Now slide the trowel under the mortar so that it fills the blade evenly (middle photo), snap your wrist down to set the mortar on the blade, and spread the first bed joint (above).

the trowel blade. One or two motions will do this (photo top right). Then, with a smooth forward motion, slide the trowel under the mortar (middle photo above). Lift the trowel, and at the same time, snap your wrist slightly down to set the mortar on the blade. This keeps the mortar on the blade for the spreading operation.

The mortar is now ready to spread to form the first bed joint (the joint between courses). Move the arm in a sweeping, spreading motion,

keeping the point of the trowel in a fairly straight line and turning the blade sideways at the same time. This is done with a flowing motion for best results. The mortar should roll off of the trowel blade, following the point, in a straight line (photo above). With practice, you will get the same depth of mortar, $\frac{3}{8}$ in., for the entire spread. Practice until you can spread about 16 in. at one time.

Mortar spread for the first course of brick on



Maintaining plumb and level. Check the first brick for vertical alignment with the modular scale rule (top), then level its top (middle photo) and plumb its face (above). Repeating this procedure at the opposite end of the wall gives two points to pull a line from.



A line block hooked over one end of the wall is held in position by a line block at the other end. A dry brick set on top of the line sets it in the plane of the face of the wall.

the base or footing should not be furrowed (indented) with the trowel. It should be solid to prevent water from leaking through.

The first course—Establishing and maintaining plumb and level are critical in any brickwork. Beginning at one end of the wall, lay the first brick, pressing it into the mortar bed with your hand as level and plumb as possible, by eye. Then check with the modular scale rule to see that the top of the brick aligns with 6 on the scale side of the rule (photo top left). Now level the brick from the measured end until the bubble is between the lines on the vial (photo second from top). Then plumb the face of the brick, being careful not to move it out of alignment with the layout line (photo third from top).

Repeat the procedure at the opposite end of the wall so that you have two points to pull a line from. Do this by attaching the line and block over the end of the brick on one end and pulling the line tightly over the end of the brick on the opposite end. Wrap the line around the brick so it won't slip loose. Block (push) the line out to the exterior face of the brick by laying another dry brick on top of it, as shown in the photo bottom left.

With the line in place, pick up two bricks at a time from the layout and spread mortar there. Butter a mortar head joint on one end of each brick as it is laid. This is done by picking up some mortar on the point of the trowel, setting it with a jerk of the wrist on the trowel, and then swiping it on the end of the brick. With practice, one swipe will do the job.

As the bricks are laid in the mortar bed joint, be sure to keep them about $\frac{1}{8}$ in. back from the line. This will prevent the wall from being pushed out of alignment by bricks riding against the line. If you lay the bricks too far back from the line, the wall will bow in the other direction. Bricks against the line are called "hard" and bricks back too far are called "slack," and neither is acceptable. After a little practice, you will get the hang of this.

Lay the bricks from each end of the wall to the center. If the spacing doesn't work out perfectly, either open up the head joints a little or you may have to cut a brick. The general rule for cuts in the center of the wall is not to make bricks smaller than 6 in. Sometimes you need to cut two bricks to make the wall look right. Locating the cut brick under a window or door makes it less conspicuous.

If a brick wall is going to leak, it will usually be at the spot where the last brick was laid. Therefore, to prevent this, butter each end of the bricks already in place and each end of the brick to be laid. This may seem time-consuming, but will pay off by preventing any future problems. This last brick is known in the trade as the "closure" brick.

Building the corner or lead—Once the first course has been laid out in mortar, the ends or corners (also called leads) should be built up about nine courses first, instead of trying to lay each course individually. Build the ends of the wall to the desired height, and then the line can be attached with line blocks and filled in be-

Tools and equipment

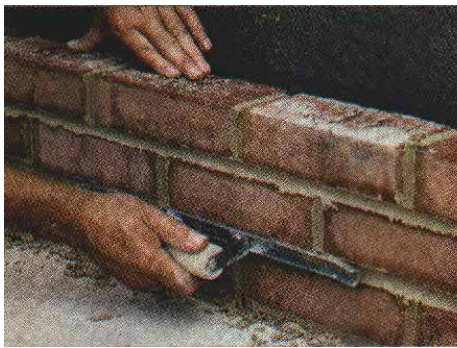
You won't need much equipment to lay bricks, so it makes sense to buy brand-name, good-quality tools, because they are better balanced and are a pleasure to handle. Bricklaying tools can be obtained at good hardware stores, building-materials suppliers or from mail-order catalogs. One tool company that I have dealt with over the years with complete satisfaction is Masonry Specialty Co. (4430 Gibsonia Rd., Gibsonia, Pa. 15044). Two others are Goldblatt Tool Co. (511 Osage, P.O. Box 2334, Kansas City, Kan. 66110) and Marshalltown Trowel Co. (Box 738, Marshalltown, Iowa 50158). When you need costly equipment or tools, the best solution is to rent them locally. Check the Yellow Pages in your phone book under Rental Service Stores and Yards.

I consider the following tools essential for brick masonry work.

Brick trowels—Trowels for applying mortar to bricks range in length from 10 in. to 12 in. Brick trowels 11 in. long work best. I like a narrow blade, which is called a narrow London pattern, with either a wood or plastic handle. A flexible blade is a must for spreading and applying mortar joints on the edges of the bricks. You can test a blade's flexibility by bending the point against a flat surface. It should flex about 1 in. to be effective. Two very good trowels are made by W. Rose Inc. (P.O. Box 66, Sharon Hill, Pa. 19079) and Marshalltown. However, you may want to pick your trowel out in the hardware store in order to test the flex of the blade.

Brick hammers—Brick hammers are used mainly for cutting bricks. Select a well-balanced brick hammer that weighs about 18 oz. Holding it by the handle, see if it feels comfortable and balanced. The handle may be wood, metal or fiberglass. I like a wood handle. There are many good brick hammers on the market. A few brands that I recommend are Stanley, True Temper and Estwing.

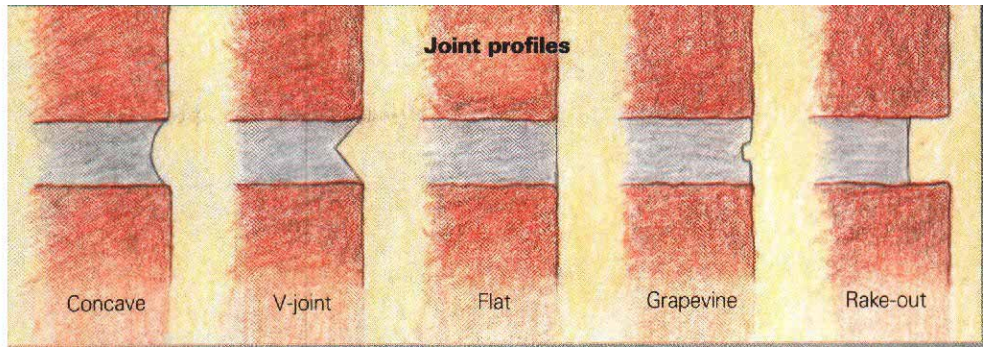
Levels—Of all the tools that you will need, the level is the most delicate and probably the most expensive. It is used to keep your work level and plumb. Levels may be metal, fiberglass or wood. I prefer a wooden level with alcohol bubbles because changes in temperature will not cause the bubble to shrink or expand. Levels come in various lengths. If you are going to get only one, buy a 48-in. level, which fits most situations. If you are going to buy two, also buy a 24-in. level. Any brand name will do, but be sure that the level is true before leaving the store. Do this by holding it in a plumb position alongside another level. The bubbles should read the same, top and bottom. Reverse the edges and check again. Now try the test holding the levels horizontal. Two good levels I like are the American (Macklanburg-Duncan, P.O. Box 25188, Oklahoma City, Okla. 73125) and Exact I Beam (Hyde Manufacturing Co., 54 Eastford Rd., Southbridge, Mass. 01550).



Chisels—Chisels are useful for cutting bricks to length, and for removing hardened mortar. For most work, two basic chisels will suffice: a flat broad chisel with about a 3½-in. blade (called a brick set) and a standard mason's cutting chisel with a 1½-in. blade and a long narrow handle.

Jointers—Jointers, or strikers, are used to form, seal or finish the surface of mortar joints on brick, block or stone work. They can add a sense of design, depth or texture to the wall. Jointers should be made of good-quality steel and be reasonably priced. The sled-runner one I use costs about \$8.

Jointers for brickwork come in five common shapes (drawing, above right). Convex jointers, the most popular, form a half-rounded, indented profile (photo above left). V-jointers give an angled indented finish that



looks great on rough-textured brick or block work. Slickers form a flat, smooth finish and are used for paving steps or repointing old mortar joints. The grapevine profile has a raised bead of steel on its edge that forms a wavy line when passed through the center of the mortar joint. It is very popular for early American brickwork. The rake-out forms a neat raked mortar joint that looks good with sand-finish or rough-textured bricks. You can get one mounted on two skate wheels to keep you from skinning your knuckles. The raking is accomplished by a nail in the center; the depth of the rake is adjusted by a thumbscrew. Oiling around the wheels will keep the tool in good condition.

Mason's rules—Two types of masonry scale rules can be used for brickwork: the modular rule and the course counter rule. The modular rule is based on a 4-in. grid (the basic module for manufactured construction materials). On one side of the rule is the standard 72 in.; the other side has scales for bricks of various heights. The standard mortar joint of ⅜ in. is used for all sizes of bricks. You will probably use scale #6 the most, which means that six courses of standard bricks, including the mortar bed joints, will equal 16 in. in height. Scale #2 is for concrete blocks (8-in. increments). The other scales are used less often. The course counter rule is designed for

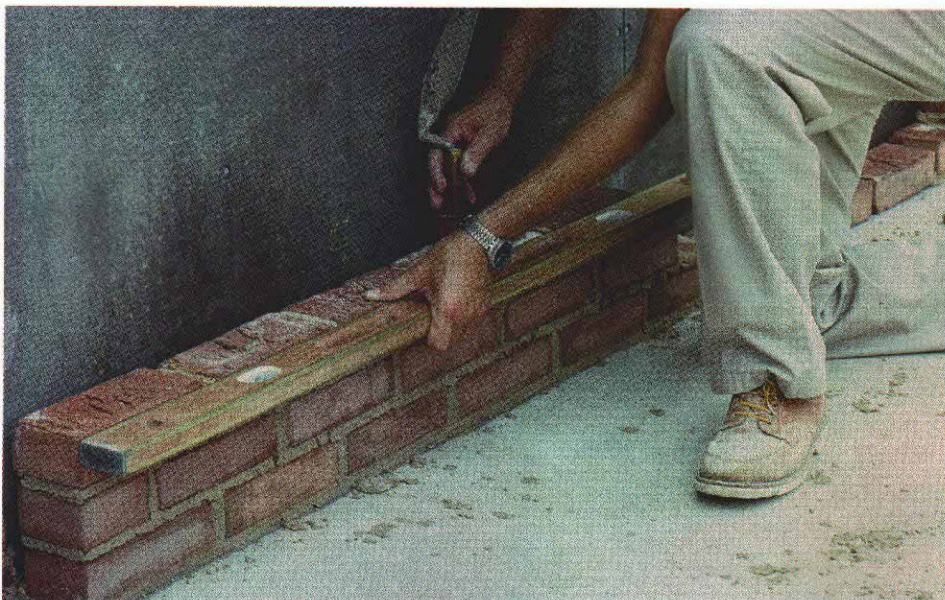
all standard-height bricks but allows the user to vary the thickness of the mortar bed joints. For most work, the modular rule will suffice.

Line blocks and pins—Line blocks are used to attach a line to the corners of a wall as a guide for laying bricks between them. They are paired wood or plastic blocks with a slot scored on one side and an end for passing the line through. They are held on the wall by the tension of the line pulled tightly between the corners. Building-supply houses often give them away as promotions.

Like line blocks, steel line pins can also hold the string line. They are driven in the mortar head joints, and then the line is wrapped around and pulled tightly from one end of the wall to the other. Line pins are also available on request from most building-supply houses. —D. K.

Tools for brick masonry





Plumbing and straightening. As the wall gets higher, bricks are continually checked for alignment (top). Adjustments are made by tapping with a trowel (above).

tween. Building the leads this way holds the ends of the line firmly in place.

As on the first course, maintaining plumb and level is a must. After laying each course, check the height with the scale rule, and then level out from that point (photo p. 50). Next, plumb the ends and front of each end of the course with the level (photo top left).

Now, holding the level horizontally against the face at the top edge, line up the course from one plumb point to the other. Whatever you do, don't change the original plumb points, but adjust the bricks between either in or out to meet the edge of the level. This is known as "straight-edging" the course (photo bottom left).

Laying bricks to the line—The heart of bricklaying is laying bricks to a line. It is by far the fastest and most accurate method of building a brick wall. The mortar has to be handled differently here than when mortaring the first course. First, be careful with the trowel blade when spreading mortar in back of the line; if you hit it, the sharp blade may cut the line. Also, if you are working with another person, and the line is constantly moving, it will be very difficult to see exactly where the line is.

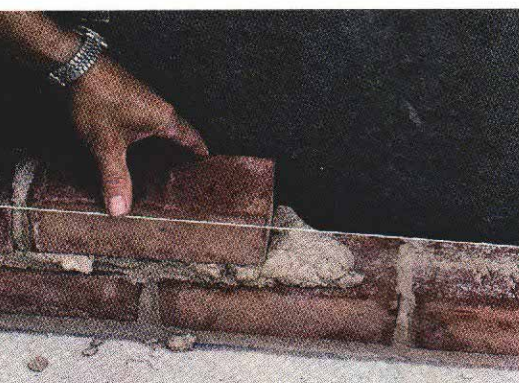
When laying one course of brick on top of another, you furrow the center of the mortar joint with the point of the trowel by hopping it up and down with a wrist action. Try not to punch all the way to the bottom of the brick below, but just make a good indentation. This is done for two reasons: it evens the thickness of the mortar on both sides, and the furrow creates a suction between the brick and the mortar. It is also much easier to press the brick into position to the line (photo facing page, top left).

After spreading the bed joint, cut or trim off the excess mortar from the front edge by holding the trowel on a slight angle (middle photo at left, facing page) to reduce smearing the face of the bricks below and to keep from tearing the mortar loose from the front of the joint. Return this mortar to your mortar board for future use.

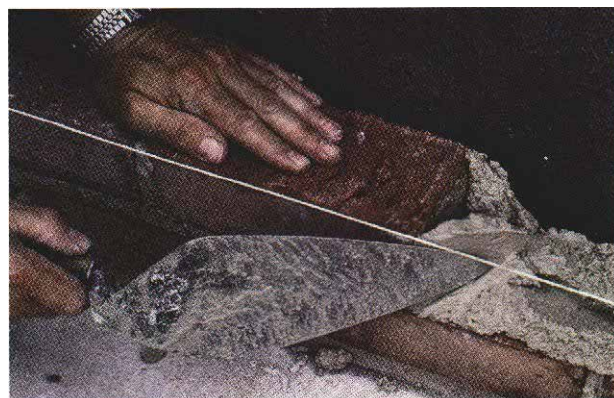
Now lay the brick in the mortar bed, holding your thumb on the top edge, letting the line slip under it. Squeeze the brick back against the one previously laid to form a full mortar joint (bottom left photo, facing page). Don't drop the brick in the mortar, but ease it down so it won't sink too deep. This is one of the most common problems for a beginning bricklayer.

When you press the brick into position to the line, let the palm of your hand rest half over the brick previously laid and half over the one you are laying. You will be able to feel when the brick is laid approximately level. At the same time, cut the protruding mortar off on an angle with the trowel (photo facing page, top right). Be sure that you maintain the $\frac{1}{8}$ -in. spacing from the line.

Apply the mortar cut off to the end of the brick, to serve as the head joint for the next brick to be laid (photo facing page, bottom right). This is done with a swiping action under the line against the end of the brick. Apply mortar to the front and back edge of the brick for a more waterproof joint. When laying the closure brick, always double-joint the ends.



Buttering the bricks. On all bed joints but the first, the mortar is furrowed with the point of the trowel to make it easier to press the bricks into position and to create suction between the brick and the mortar (top left). When the bed joint is spread, cut off the excess mortar from the front edge (middle left), then lay the brick and squeeze it back against its neighbor to form the joint (left). With the brick in place, again trim the bed joint (above), and apply this mortar to the end of the brick, so it can serve as the next head joint (right).



Tooling the joints—Neat, smooth mortar joints look good, are more waterproof, and improve the structural integrity of the wall. The mortar joints can be tooled (struck) with various jointing tools. In the top left photo on p. 53, I am using the convex jointer to form a concave joint (half-round) finish. I prefer the long sled-runner type over the small pocket-size striker, as it will form a much straighter joint.

Head joints should be tooled first to ensure a continuous, clean bed joint and better appearance. Always tool the joints as soon as they are "thumbprint" hard. If they get too hard, they may turn black when they come in contact with the metal tool. Press your thumb in the mortar joint. If it leaves an impression, it's time to strike the joint. Usually, the joints are ready to be tooled about ten minutes after being laid. But the dryness of the bricks and weather conditions are the determining factors. If you wait too long, the joint will require too much pointing, and the finish will not be smooth. Fill in any holes in the joint as the striking progresses.

After striking, trim off any excess mortar and smooth the edge of the bed joint at the bottom of the wall with the point of the trowel. When the mortar joints have dried (set) enough so they won't smear, brush them lightly with a soft

brush to remove any remaining particles of mortar. At this time, if necessary, restrike the joints to effect a crisp, clean appearance.

There are going to be times when you will need to apply a mortar joint to the long side of a brick, such as when laying a cap on top of a wall or when building brick steps. This is done with two distinct movements. Pick up mortar from the board and set it on the trowel blade with a slight snap of the wrist. Then, holding your fingers under the brick, swipe the mortar down across the side, sticking it to the brick.

Pick up another trowel of mortar the same way, and swipe it on the bottom half of the side. If done correctly, a full mortar cross joint will result, and it will be waterproof. These motions should be done with some force so the mortar will stick to the brick. As you may surmise, some practice is required to master this.

Cleaning brickwork—After tooling the joints, let the mortar cure at least a week before cleaning the wall. You can use the old standby, muriatic acid and water, or one of the many masonry cleaners now on the market. If you use muriatic acid (which is safe if used according to directions), mix 1 part muriatic acid to 10 parts water in a plastic or rubber pail. Always put the water

in first and then add the acid. Mix the solution outside to minimize inhaling the fumes. Muriatic acid is available from your local building-supply dealer in quarts or gallons, and is inexpensive. Sure Klean 600 Detergent (ProSoCo, Inc., 755 Minnesota Ave., Kansas City, Kan. 66117) is another good masonry cleaner. It, too, is available at most building-supply houses.

Whatever cleaner you use, always follow the directions on the container. If you do get any cleaner in your eyes or on your skin, flush immediately with plenty of water. Wear eye protection and rubber gloves while you work.

After covering nearby shrubbery or metal window frames in the area to be cleaned, begin by rubbing off any loose particles of mortar with a piece of wood or paddle. Next, soak the wall from top to bottom with a hose. Then scrub the cleaning solution on the brickwork from top to bottom with a good stiff bristle brush, like the ones used in farm dairies. Work in an area about 12 ft. square at a time. Stubborn spots or splatters of mortar can be removed by rubbing with a piece of brick and then scrubbing again. Be sure to flush off the cleaned areas top to bottom with water under pressure from a garden hose with a spray nozzle until the water runs clear. This also neutralizes the cleaning solution. □