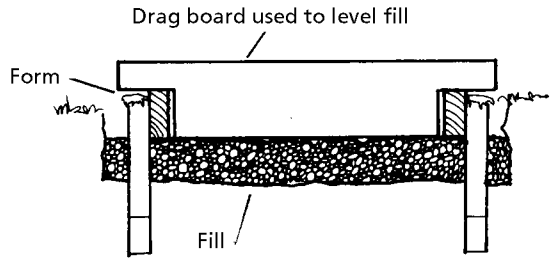
HOW-TO BOOKLET #3051

SETTING FLAGSTONES

TOOL & MATERIAL CHECKLIST

- ❑ Flagstone
- ❑ Sand
- ❑ Baby Sledge Hammer
- ❑ Brick Chisel
- ❑ Gloves
- ❑ Level
- ❑ Brick Trowel
- ❑ Mortar Mix
- ❑ Forming Materials
- ❑ Cold Chisel
- ❑ Tape Measure
- ❑ Safety Glasses
- ❑ Broom
- ❑ Concrete Joint Tool

Read This Entire How-To-Booklet for Specific Tools and Materials Not Noted in The Basics Listed Above.



A notched 1x6 can be used as a drag board for sand fill. After flags are set properly, you can remove the forms. Or, if fancy wood, leave them in.

Flagstone is a natural material so it looks good in almost any setting. Flagstone is especially suited to garden patios and walkways in a rustic atmosphere. The material's highly irregular shape and color are an advantage here where visual texture is desired. However, flagstone doesn't mix well with other materials mainly because of its irregular shape. When combined with more geometric materials, such as bricks, its distinctive irregular quality is reduced and cheapened.

As a material, flagstone is cut or "flagged" by separating the "layers" or stratifications of rock formations. The primary rocks used for this are limestone, slate, bluestone, and sandstone. The quality and color of these stones vary and these variances often become a retail pricing factor.

The hardness of the stones is important when choosing them for certain projects. Slate generally is the hardest of the flags and it is non-porous. Color ranges are green, gray, and purple. Limestone varies both in hardness—from dense to granular; color is widely varied: you can find lots of tones. Bluestone and sandstone range in color from a light beige to pink to red to a dark bluish tone. Both stones are fairly soft (as compared to slate) and are easy to cut.

MEASUREMENTS & MATERIALS

Most retailers sell flags by the square foot. And many retailers let you pick out what you want from the pile. Therefore, you ought to know approximately how many square feet of the material you'll need for your project, PLUS about 10 percent for sizing and shaping and waste. You will fracture some stone the wrong way. If possible, try to "pre-fit" the flags as you select them. Lay each piece down on the ground and try to match the pieces as they would go together. You'll be a bit sloppy doing this; the idea is to approximate matches so you'll have less cutting to do later.

The project you are creating with flags will also determine other materials. If you will set the flags on bare ground (in a warm, non-freezing climate), the thickness of the stones should be a tad more than if you will set the stones on a sand base. If the stones go on a concrete base, they can be thinner because the concrete will support the thinner size reducing breakage from weight on the stones' surface.

It is next to impossible to figure the amount of cement and sand needed for setting flags, so we'll give you a rule of thumb: buy 160 pounds of Portland cement and 525 pounds of mortar sand for every 50 square feet, of flagstone surface. This formula will be just about right, although you may be a little short or long—a problem easily corrected as the job progresses.

FORM BUILDING

We recommend that you build a light, easily disassembled form for the flags, although you can get by with a chalkline. The forms give the project an "outline" in which to work and if you are laying the stones on sand or concrete, the forms help contain this material as it is being used. When the job is completed, the forms can be easily stripped. Or, you may want to leave the forms in position for decorative purposes. Straight 2x4s are plenty big enough; you could even use 1x4s if you will strip the forms later.

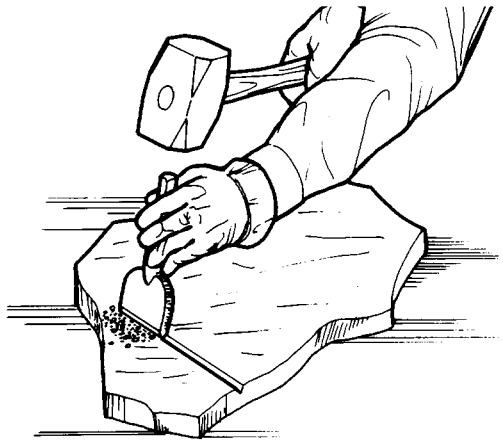
For form building excavation techniques, placing concrete and sand, see How-To Booklet Numbers 3062, 3063, 3064, 3067, and 3070.

Working with stone is hot and heavy work. Be very careful lifting this material: it weighs a lot—even small pieces. Also, wear gloves and safety glasses when cutting the stone to size. Stone chips can fly fast and hard from hammers and chisels.

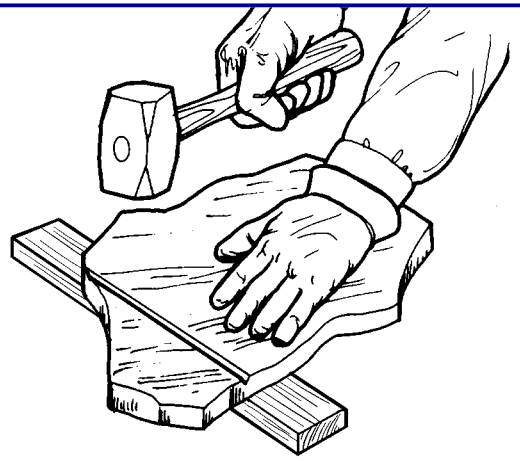
FLAGS OVER BARE GROUND

If you are laying flagstone over bare ground, here are the working procedures in sequence:

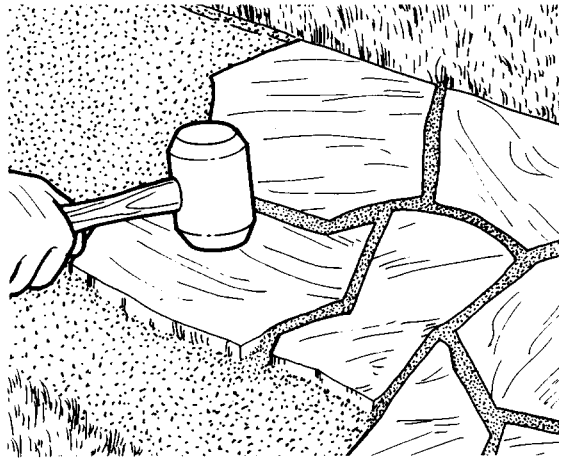
1. Flagstone should be laid only on bare ground that isn't subjected to freezing and thawing. The soil should be well-drained. The flagstone you use for this installation should be at least 2 inches thick—thicker if possible. We recommend bare ground installation for walkways; we do not recommend it for patios/porches.
2. Excavate the area to be paved slightly less than the thickness of the flags. Since thickness varies, determine the thickest stone and excavate to this thickness. The thinner flags can be "shimmied" to fit by compacting earth underneath them. This is easier than trying to dig out special areas for thicker stones.



With a brick chisel, score the flag where you want to fracture it. Just tap along the cut-off line with the chisel until it forms a "notch" in the stone. Wear gloves and safety glasses.



Lay the flagstone over a piece of 1x2, aligning the notch you cut in the stone with the edge of the 1x2. Then lightly tap along the notch with a sledge or rubber hammer to fracture the stone.



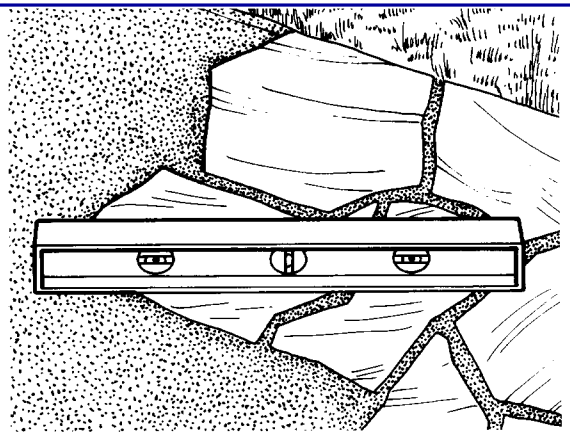
After fitting and cutting the flags, set them back down on the sand base and tap them into firm position with a rubber or wooden hammer. Leave approximately 1/2-to 3/4-in. at joints.

3. Lay out the stones in a 3x3-foot area at one time and try to match them to fit—like a jigsaw puzzle. Mark each stone that doesn't fit to your liking for cutting.
4. Remove just one stone at a time for cutting and shaping. Test it for fit as you go. When the fit is right, remove another stone and go through the same process; then move on to another 3x3-foot area. Cutting techniques are illustrated on page 2.
5. Joints between stones can be any width you want; a pleasing space is between 1/2- and 3/4-inch. The joint width, of course, will vary and this is okay. Just try to make the joints fairly uniform.
6. As you complete one area, check for level with a carpenter's level. Even though the surface of the stones may be slightly "off level," the area should be in the level "range," and tipped slightly toward one edge for drainage purposes.
7. As you complete one area and move to the next, stand back and look at the overall job to make sure you like the pattern. If not, make any adjustments at this time.
8. Complete the job by filling the joints with soil. It is suggested that you plant a hardy grass in this soil or use a creeper type planting that will withstand a goodly amount of foot traffic. The growth can be controlled with a lawnmower as you regularly cut the grass.

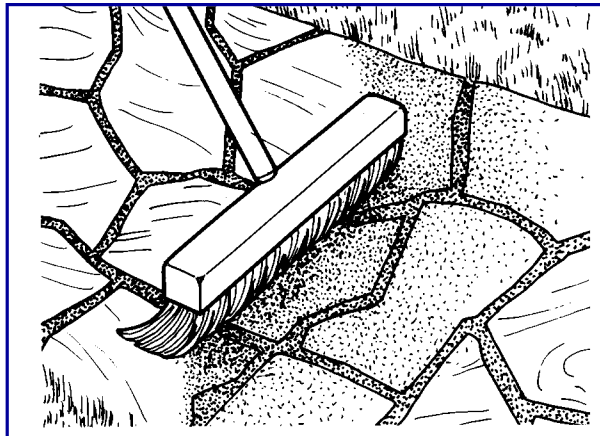
FLAGSTONE ON SAND

If you are laying flagstone over a sand base, here are the working procedures in sequence:

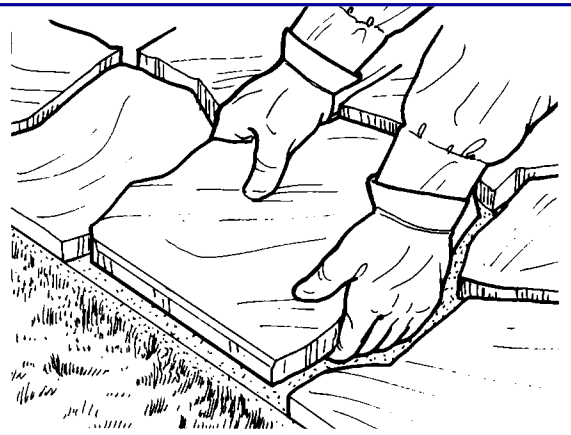
1. Excavate as necessary. Depth must include the measurements of a 2-inch-thick sand base and the thickness of the flagstones that go over the base.
2. We recommend forms to keep the sand confined. Set these as you would a concrete form and make a notched dragboard to level the sand (see drawing).
3. Spread the sand evenly. Then, lightly sprinkle the surface of the sand with water. Use the fine spray setting on the hose nozzle. Let the sand absorb the water and then sprinkle the surface once again. This helps compact the sand even though you will "rough" it somewhat when laying the stones.
4. Lay out the stones in a small area at one time and try to match them to fit—like a puzzle. Keep straight edges along the straight form edges. Mark each stone for fit, lift it out of the pattern, and cut it accordingly. If you're cutting off fairly large pieces of stone, save the pieces; you may need them for filler later.
5. Reposition the stone in the sand, and, with a rubber or wooden hammer, tap the stone down into the sand so about 1/2-inch thickness is buried in the sand.
6. After a small area of stone has been set, level it with a carpenter's level. It should be at "approximate" level and pitched slightly toward an edge for drainage. To level the stones, add sand to stones that are "low" or "tippy," and remove sand from those that are "high."
7. After the setting is complete, spread sand evenly over the project and sweep the sand into the joints until the joints are full. Sprinkle the joints with fine spray from a garden hose. Let the sand dry. Sprinkle again and again until the joints are hard and compacted.



Level the job as you progress with it. The flags should pitch slightly one way or another for drainage. If a flag is high, remove sand. If the flag is low, add sand. Test again for level.



When finished, sprinkle sand over the flags. Then, with a broom, work the sand into all of the joints. Sprinkle with water, fill again and again, sprinkling. Sand will "harden."



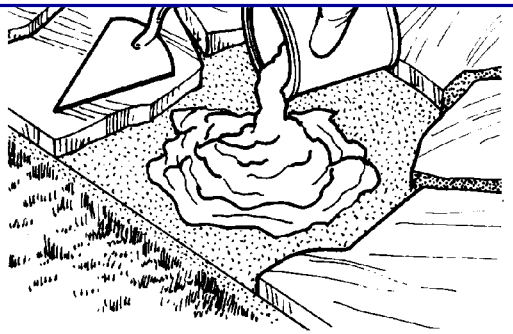
Over concrete, set flags in bed of stiff concrete. Then tap with trowel handle to level the flags. Work in a small area at one time and keep flag joints about 1/2 to 3/4-in. apart.

FLAGS OVER CONCRETE

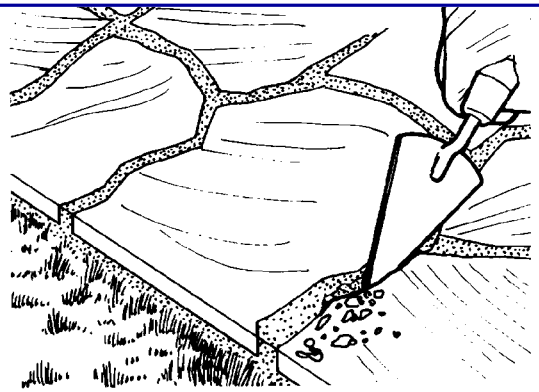
If you are laying flagstone over a concrete base, here are the working procedures in sequence:

1. The stones should be about 1/2- to 1-inch in thickness—no more than 1-inch is required because of the support provided by the concrete. Lay out the stones on the concrete surface in a small area and match, mark, and cut to size, leaving from 1/2- to 3/4-inch, between units.
2. In a mixing tub, stir up a batch of concrete. A good formula is 1 part cement to 4 parts sand with enough clean water added to make a stiff concrete mixture. A good way to tell a "stiff" mixture is to ball a small amount of concrete in a gloved hand. The mix should form and retain a ball—like a snowball.

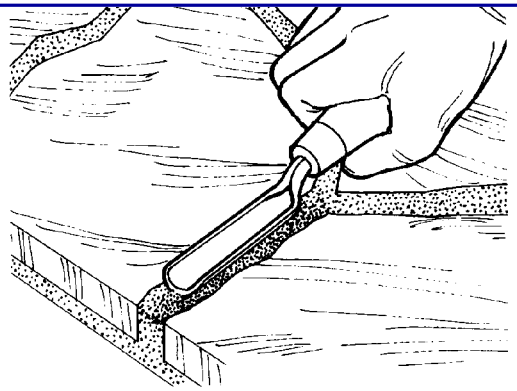
   In another mixing tub, sir up a batch of what masons call "concrete butter." This mixture is plain cement mixed with water to the consistency of soft butter. Not runny, but extremely soft. You should be able to hold a slice of it on a trowel.
3. Fill a bucket with water, and have a scrub brush or whisk broom handy.
4. Lift a couple of fitted flagstones from the concrete base. Then wet this area with water, spreading the water with the brush or broom.
5. With a bricklayer's trowel, spread a 1-inch-or-so thick layer of concrete. Immediately reset the stones in the concrete, tapping them in place and level with the handle of the trowel. The stones should be embedded about half their thickness in concrete. After you have set several stones, level them. The stones should, however, pitch just a tad for drainage.
6. Carefully lift each stone that has been set. With a trowel, spread out the cement butter over the concrete—sort of like buttering a piece of bread. You don't need much butter—a couple of ounces is usually plenty. The trick is not disturbing the concrete base into which the stone has been fitted. You may want to pour out the butter from a tin can and then trowel it.
7. Replace each stone after buttering it and tap it lightly into place with the handle of the trowel. Check the stones again for level and make any adjustment.
8. When a fairly large area of stones are in place, go back to the joints between the stones and remove the concrete in the joints. Use a pointed trowel for this; a tuckpointing trowel makes an excellent tool and it is inexpensive to buy. The joint when you finish should be the depth (thickness) of the stone. The bottom of the joint should match the bottom surface of the stone. Remove any concrete splatters on the flagstones.
9. Let the concrete set 36 hours.
10. Sweep the stones with a broom.
11. Mix up a batch of concrete grout. A good formula for grout is 1 part cement to 1 part fine, clean sand. Add enough water to make a stiff mixture. Better it is on the stiff side than the thin side.
12. With a bricklayer's trowel, fill the joints—a small area at a time—with the grout mixture. Pack it in as tight as you can, keeping the excess off the face of the stones at the joint line.
13. After you fill the joints in a fairly small area, strike the joints with a concave jointing tool—the kind mason's use to smooth joints in brick and block.
14. When you're finished, remove any excess grout from the face of the stones. Let the grout set for 36 hours. Sprinkle it lightly with water, keeping it moist during this time. You can now walk on the surface. However, we recommend that you let the job set about 1 week before you walk on it. And, we advise that you keep the grout moist with water from a sprinkler during this period. This makes the grout much more durable.



Butter the stiff concrete after you set stones and lift them. Spread butter mixture with a trowel. Then reset the stones in the butter, tapping them lightly and leveling as you go.



Remove mortar from joints, using the point of a bricklayer's trowel, or, better, a tuckpointing trowel. Depth of joint should match the bottom of the flagstones so grout holds tight in joints.



Fill joints with grout mixture. Pack it in as tight as you can. Then smooth the joint with a concave jointing tool, smoothing the edges of the grout with the edges of the flagstones.