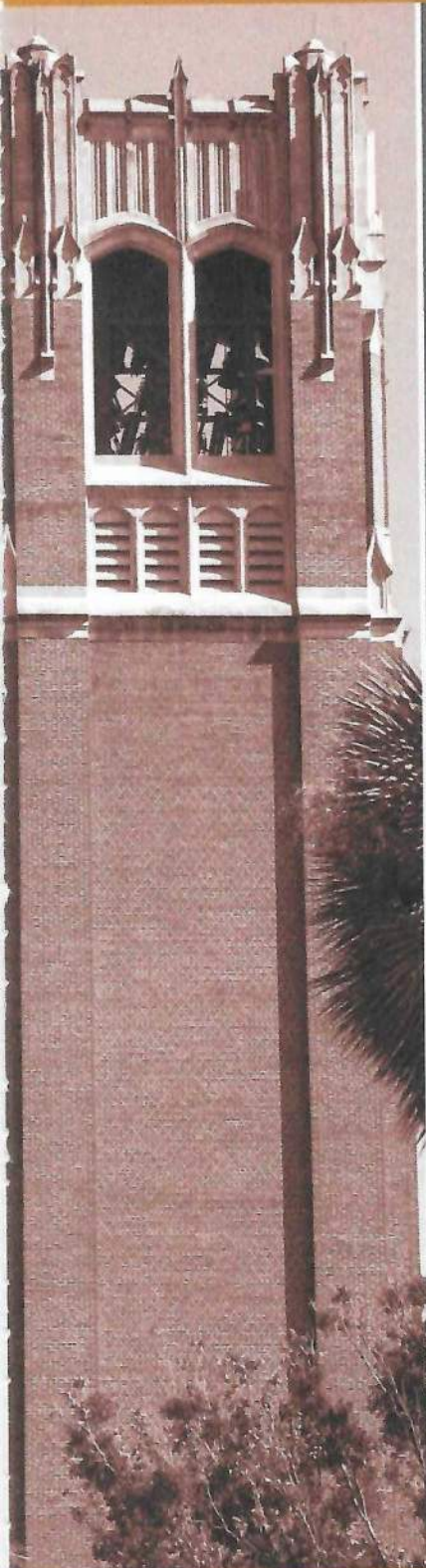




28102-13

# Masonry Tools and Equipment



## OVERVIEW

Masonry tools are the interface between masons and their work. The quality of the tool directly affects the quality of the work. Because masons do many different tasks, they have at their disposal many special-purpose tools. Some hand tools are virtually unchanged since ancient times, while some power tools use the most up-to-date technology. This module introduces the tools and equipment that you will need to lay masonry units. You will learn how to safely use hand tools, measuring tools, power tools, power equipment, lifting equipment, and scaffolds. By the end of this module, you will be able to identify each item and explain what it does.

## Module Three



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**Objectives**

When you have completed this module, you will be able to do the following:

1. Identify hand tools used in masonry.
  - a. Describe how to use trowels.
  - b. Describe how to use hammers and chisels.
  - c. Describe how to use jointers and brushes.
  - d. Identify other hand tools used in masonry.
2. Identify measures and measuring tools used in masonry.
  - a. Describe how to use rules.
  - b. Describe how to use levels.
  - c. Describe how to use chalk boxes, squares, plumb bobs, and laser levels.
  - d. Describe how to use corner poles, lines, and fasteners.
3. Identify mortar equipment used in masonry.
  - a. Describe how to use mortar boxes.
  - b. Describe how to use mixing accessories.
4. Identify power tools used in masonry.
  - a. Describe how to use masonry saws.
  - b. Describe how to use splitters.
  - c. Describe how to use grinders.
  - d. Describe how to use power drills and powder-actuated tools.
5. Identify power equipment used in masonry.
  - a. Describe how to use a mortar mixer.
  - b. Describe how to use a masonry pump, vibrator, and hydraulic grout placer.
  - c. Describe how to use pressurized cleaning equipment.
6. Identify lifting equipment used in masonry.
  - a. Describe how to use mounted and portable hoists.
  - b. Describe how to use hydraulic-lift materials trucks.
  - c. Describe how to use forklifts and pallet jacks.
7. Recognize scaffolds used in masonry.
  - a. Identify scaffold systems.
  - b. Describe how to assemble and disassemble tubular frame scaffold.

**Performance Tasks**

Under the supervision of your instructor, you should be able to do the following:

1. Demonstrate the proper use of a rule.
2. Demonstrate the proper use of a level.
3. Use the correct procedures for fueling and starting a mixer.
4. Assemble and disassemble tubular frame scaffold.

## Trade Terms

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Bed joint  
Corner pole  
Kickback  
Lead

Parge  
Pointing  
Tempering

## Industry-Recognized Credentials

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## Code Note

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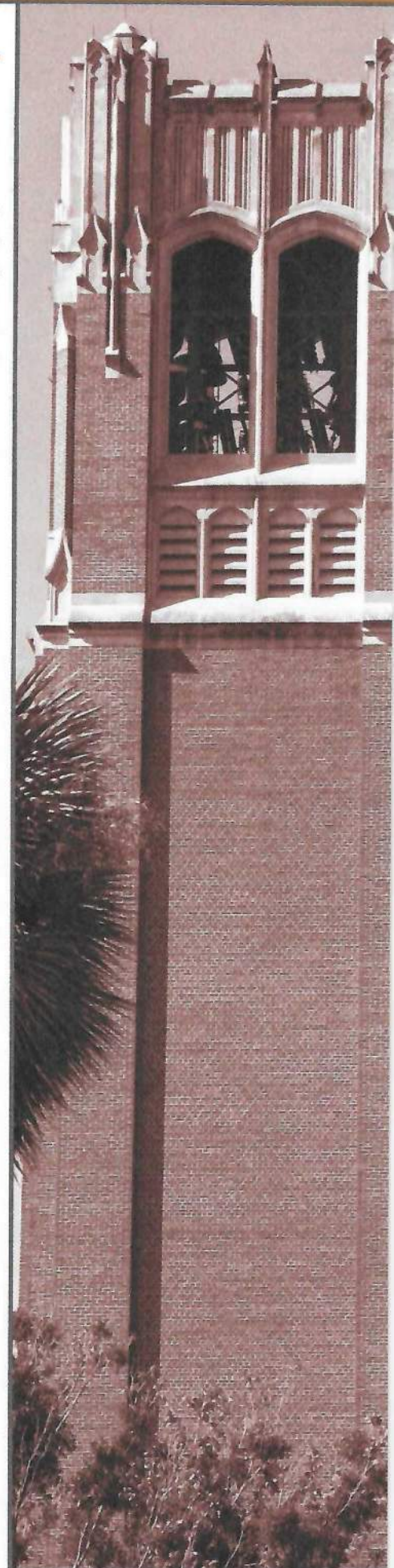
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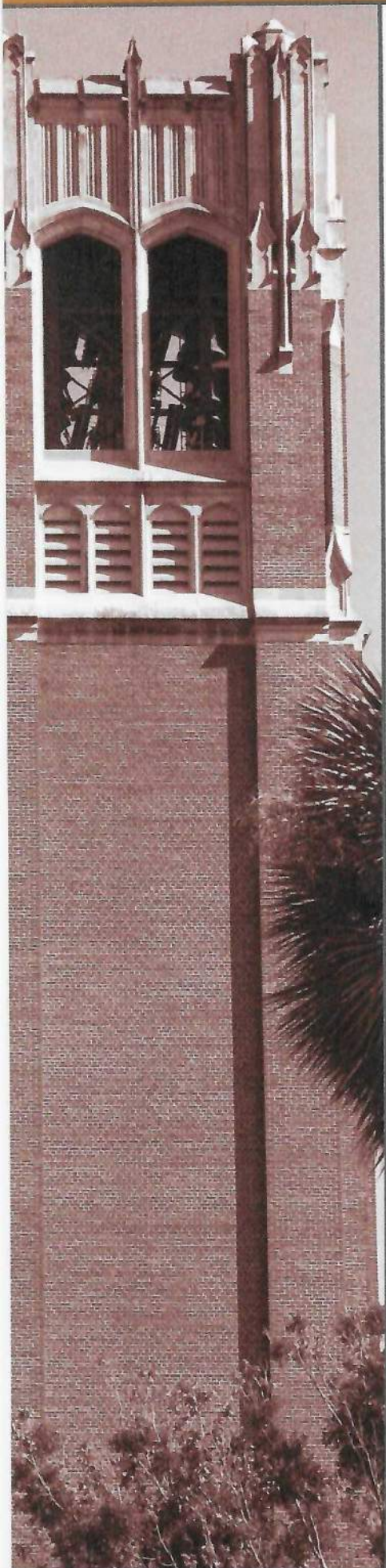
## Contents

*Topics to be presented in this module include:*

|              |  |           |
|--------------|--|-----------|
| <b>1.0.0</b> | <b>Hand Tools .....</b>  | <b>1</b>  |
| 1.1.0        | Using Trowels .....  | 1         |
| 1.2.0        | Using Hammers and Chisels .....                                  | 2         |
| 1.2.1        | Cutting Hammers .....  | 3         |
| 1.2.2        | Mashes and Mauls .....   | 4         |
| 1.2.3        | Chisels .....  | 5         |
| 1.3.0        | Using Jointers and Brushes .....                                 | 6         |
| 1.3.1        | Jointers .....   | 6         |
| 1.3.2        | Brushes .....  | 7         |
| 1.4.0        | Using Other Masonry Tools .....                                  | 7         |
| <b>2.0.0</b> | <b>Measures and Measuring Tools .....</b>                        | <b>11</b> |
| 2.1.0        | Using Rules .....  | 11        |
| 2.2.0        | Using Levels .....   | 12        |
| 2.3.0        | Using Chalk Boxes, Squares, Plumb Bobs, and Laser Levels .....   | 13        |
| 2.4.0        | Using Corner Poles, Lines, and Fasteners .....                   | 15        |
| <b>3.0.0</b> | <b>Mortar Equipment .....</b>                                    | <b>19</b> |
| 3.1.0        | Using Mortar Boxes .....   | 19        |
| 3.2.0        | Using Mixing Accessories .....                                   | 19        |
| 3.2.1        | Water Bucket and Barrel .....                                    | 20        |
| 3.2.2        | Barrows .....  | 21        |
| <b>4.0.0</b> | <b>Power Tools .....</b>   | <b>23</b> |
| 4.1.0        | Using Masonry Saws .....   | 23        |
| 4.2.0        | Using Splitters .....  | 25        |
| 4.3.0        | Using Grinders .....   | 25        |
| 4.4.0        | Using Power Drills and Powder-Actuated Tools .....               | 27        |
| <b>5.0.0</b> | <b>Power Equipment .....</b>                                     | <b>30</b> |
| 5.1.0        | Using a Mortar Mixer .....                                       | 30        |
| 5.2.0        | Using a Masonry Pump, Vibrator, and Hydraulic Grout Placer ..... | 31        |
| 5.3.0        | Using Pressurized Cleaning Equipment .....                       | 32        |
| 5.3.1        | Pressure Washing .....   | 32        |
| 5.3.2        | Sandblasting .....   | 32        |
| <b>6.0.0</b> | <b>Lifting Equipment .....</b>                                   | <b>34</b> |
| 6.1.0        | Using Mounted and Portable Hoists .....                          | 34        |
| 6.2.0        | Using Hydraulic-Lift Materials Trucks .....                      | 35        |
| 6.3.0        | Using Forklifts and Pallet Jacks .....                           | 35        |
| <b>7.0.0</b> | <b>Scaffold .....</b>  | <b>37</b> |
| 7.1.0        | Identifying Scaffold Systems .....                               | 37        |
| 7.1.1        | Steel Tower Scaffold .....                                       | 37        |
| 7.1.2        | Swing-Stage Scaffold .....                                       | 37        |
| 7.1.3        | Powered Scaffold .....   | 38        |
| 7.2.0        | Assembling and Disassembling Tubular Frame Scaffold .....        | 39        |
| 7.2.1        | Putlog .....   | 40        |





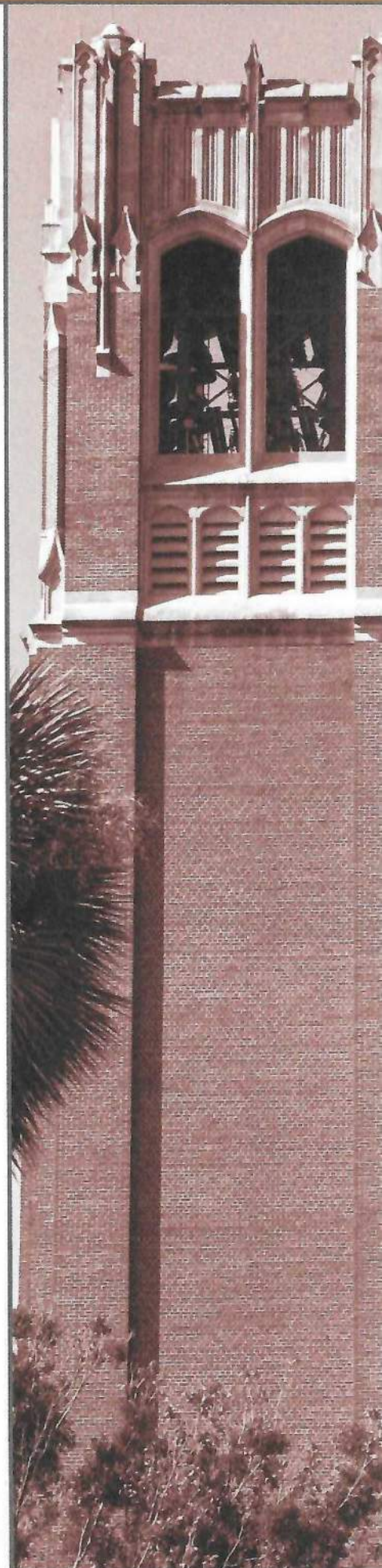


## Figures

|           |   |    |
|-----------|---|----|
| Figure 1  | Parts of a trowel.....  | 1  |
| Figure 2  | Brick trowel shapes .....   | 2  |
| Figure 3  | Different types of trowels .....                                    | 3  |
| Figure 4  | Brick hammers.....  | 3  |
| Figure 5  | Tile hammer.....  | 4  |
| Figure 6  | Stonemason's hammers .....  | 8  |
| Figure 7  | Mash .....  | 4  |
| Figure 8  | Toothed maul, or bushhammer.....                                    | 5  |
| Figure 9  | Rubber mallets.....   | 5  |
| Figure 10 | Mason's chisel.....   | 5  |
| Figure 11 | Brick set chisel .....  | 6  |
| Figure 12 | Rubber-grip mason's chisel.....                                     | 6  |
| Figure 13 | Tooth chisel and pitching tool .....                                | 7  |
| Figure 14 | Plugging, or joint, chisel .....                                    | 7  |
| Figure 15 | Tooled mortar joints .....  | 8  |
| Figure 16 | Jointers .....  | 8  |
| Figure 17 | Runner jointers .....   | 9  |
| Figure 18 | Rakers.....   | 9  |
| Figure 19 | Mason's brushes.....  | 9  |
| Figure 20 | Brick tongs .....   | 9  |
| Figure 21 | Common mason's hand tools.....                                      | 9  |
| Figure 22 | Mason's tool bag .....  | 10 |
| Figure 23 | Spacing rules .....   | 11 |
| Figure 24 | Folding rule and steel tape .....                                   | 12 |
| Figure 25 | An air bubble shows level or plumb.....                             | 12 |
| Figure 26 | Torpedo level and standard level.....                               | 12 |
| Figure 27 | Chalk box.....  | 13 |
| Figure 28 | Framing, or steel, square.....                                      | 14 |
| Figure 29 | Combination square and sliding T-bevel.....                         | 14 |
| Figure 30 | Cold beam laser level.....  | 14 |
| Figure 31 | Plumb bob.....  | 15 |
| Figure 32 | Corner pole or deadman.....   | 16 |
| Figure 33 | Line pin.....   | 16 |
| Figure 34 | Corner block.....   | 17 |
| Figure 35 | Wood line block .....   | 17 |
| Figure 36 | Line stretchers .....   | 17 |
| Figure 37 | Line trig, or twig .....  | 17 |
| Figure 38 | Mortarboard, mortar pan, and mortar box with wheels .....           | 19 |
| Figure 39 | Cubic-foot measuring box being emptied into a mortar container..... | 20 |
| Figure 40 | Mixing aids .....   | 20 |
| Figure 41 | Water bucket and barrel .....                                       | 21 |
| Figure 42 | Barrows for masonry units .....                                     | 21 |
| Figure 43 | Medium and large masonry saws.....                                  | 24 |
| Figure 44 | Small masonry saw and integral dust collector .....                 | 24 |



|  |    |
|--|----|
| Figure 45 Handheld masonry saw .....                   | 25 |
| Figure 46 Hand-operated masonry splitter .....         | 25 |
| Figure 47 Large foot-operated hydraulic splitter ..... | 26 |
| Figure 48 Tuckpoint grinder.....                       | 26 |
| Figure 49 Hammer drill.....                            | 27 |
| Figure 50 Powder-actuated tool .....                   | 27 |
| Figure 51 Mortar mixer.....                            | 30 |
| Figure 52 Masonry pump .....                           | 31 |
| Figure 53 Handheld vibrator .....                      | 31 |
| Figure 54 Hydraulic grout placer .....                 | 32 |
| Figure 55 Typical pressure washing operation.....      | 32 |
| Figure 56 Results of improper pressure washing.....    | 33 |
| Figure 57 Hoist .....                                  | 34 |
| Figure 58 Materials hoist .....                        | 35 |
| Figure 59 Mason's reach-type forklift.....             | 35 |
| Figure 60 Skid-steer forklift .....                    | 36 |
| Figure 61 Straight-mast forklift .....                 | 36 |
| Figure 62 Motorized buggy .....                        | 36 |
| Figure 63 Adjustable steel tower scaffold .....        | 37 |
| Figure 64 Examples of powered scaffold .....           | 38 |
| Figure 65 Scaffold frame types .....                   | 39 |
| Figure 66 Connecting scaffold sections.....            | 39 |
| Figure 67 Hook-mounted scaffold plank .....            | 40 |
| Figure 68 Completed tubular steel scaffold .....       | 42 |
| Figure 69 Putlog at base of scaffold .....             | 41 |







## SECTION ONE

### 1.0.0 HAND TOOLS

#### Objective

Identify hand tools used in masonry.

- Describe how to use trowels.
- Describe how to use hammers and chisels.
- Describe how to use jointers and brushes.
- Identify other hand tools used in masonry.

#### Trade Terms

**Bed joint:** A horizontal joint between two masonry units.

**Parge:** A thin coat of mortar or grout on the outside surface of a wall. Parging prepares a masonry surface for attaching veneer or tile, or parging can waterproof the back of a masonry wall.

**Pointing:** Troweling mortar or a mortar-repairing material, such as epoxy, into a joint after masonry is laid.

The quality and use of masonry hand tools greatly affect the quality of the final work. Hand tools are used to coat, cut, carry, clean, align, and level masonry units. The following sections describe masonry hand tools you will typically use to perform masonry construction.

As you learned in the module *Masonry Safety*, you are responsible for keeping your tools and equipment in good repair. Repair or replace defective tools and equipment immediately. Clean all tools and equipment that touch mortar or grout immediately after use. Use a bucket of water to soak tools that you will use again in a few minutes. Keep wooden handles out of the water. If mortar dries on a tool, it will harden and make the tool unusable.

Wash tools thoroughly with water and a wire brush. Be sure that you remove all mortar or grout completely. If you do not use tools regularly, coat them lightly with oil, grease, or other approved coating to prevent rust and corrosion. After clean-

### Check Tools Daily

Cleaning and checking your tools at the end of each day is a good habit. This will keep them in good working order and prevent loss.

ing, check that tool handles are secure and free from cracks or splinters. Oil the pivot joints and wooden parts of the tools. Sharpen blades and cutting edges when they become dull or nicked.

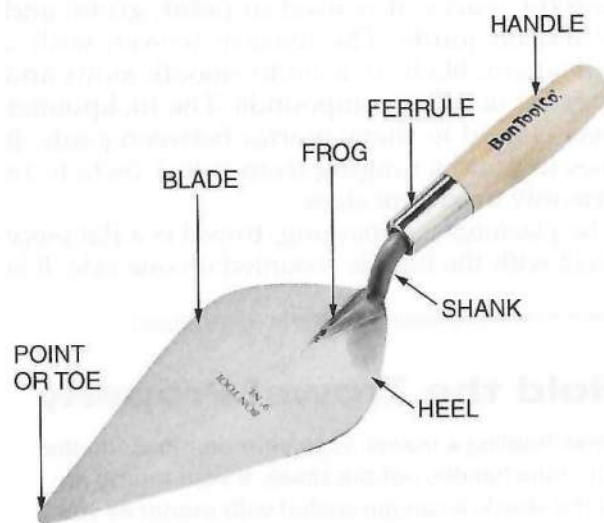
### 1.1.0 Using Trowels

The trowel is the mason's most commonly used tool. Trowels are used for placing mortar, an activity commonly called buttering. You were introduced to buttering in the module *Introduction to Masonry*. Masons use trowels to move and shape mortar between masonry units. Trowels are also used to mix, scrape, and shape mortar and clean mortar from masonry units and tools. The trowel's handle is often used to tap units into place.

The mason's trowel comes in many sizes and shapes. The typical trowel (*Figure 1*) consists of a steel blade ground to the proper balance, taper, and shape. The narrow end of the blade is the point, and the wide end is the heel. The blade is connected to the handle by a shank. The handle is made of wood or plastic, and it can be covered with leather or foam for a more comfortable grip. The wood handle has a band, or ferrule, on the shank end to prevent splitting.

The blade can come with a sharply angled heel (London pattern) or a square heel (Philadelphia pattern), as shown in *Figure 2*. Some masons prefer a wider heel, which can make buttering masonry units easier.

Trowels come in different shapes and sizes for different purposes. Trowels can range in width from about 4 to 7 inches and can be up to 13 inches long. *Figure 3* shows different types of trowels. Some trowels have specialized uses and will not

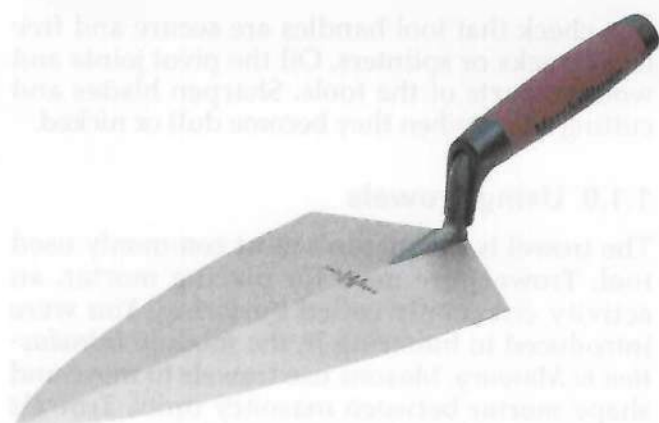


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Figure 1 Parts of a trowel.







LONDON PATTERN



PHILADELPHIA PATTERN

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Figure 2 Brick trowel shapes.

be used as often as a standard brick trowel. Some trowels are particular to certain parts of the country.

The standard trowel, or brick trowel, is the all-purpose model, used for cutting, buttering, and adjusting units. The small **pointing** trowel fits into tight spaces. It is used to point, grout, and tool mortar joints. The margin trowel, with a small square blade, is used to smooth joints and mix grout or other compounds. The tuckpointer trowel is used to shape mortar between joints. It comes in widths ranging from  $\frac{1}{8}$  to 1 inch, to fit commonly used joint sizes.

The plasterer's, or parging, trowel is a flat piece of steel with the handle mounted on one side. It is

## Hold the Trowel Properly

When holding a trowel, keep your thumb along the top of the handle, not the shank. If your thumb is on the shank, it can get coated with mortar as you work, causing skin irritation.

used to apply a thin coat, or **parge**, of mortar. The parge coat will hold tile or veneer to the masonry units. The duck bill trowel is narrow, with a long blade up to 13 inches long. It is primarily used for cleanup. The bucket trowel has straight sides and a square toe, which aid the mason in scraping the sides of the bucket. Tile-setting trowels have a wide blade to handle large amounts of mortar or grout.

## 1.2.0 Using Hammers and Chisels

Mason's hammers fall into two categories: cutting hammers and mauls. Using the right hammer for each job will ensure the most efficient use of your energy. Many types of hammers come with wooden handles. Inspect these handles every day to make sure they are not loose, splintered, or cracked. Chisel edges on hammers need to be inspected and sharpened, just as chisels do.

Masons use chisels to cut masonry units. For everyday work, masons use a hammer to cut brick or block, but for precise, sharp edges, they use a

## Stack Brick Safely

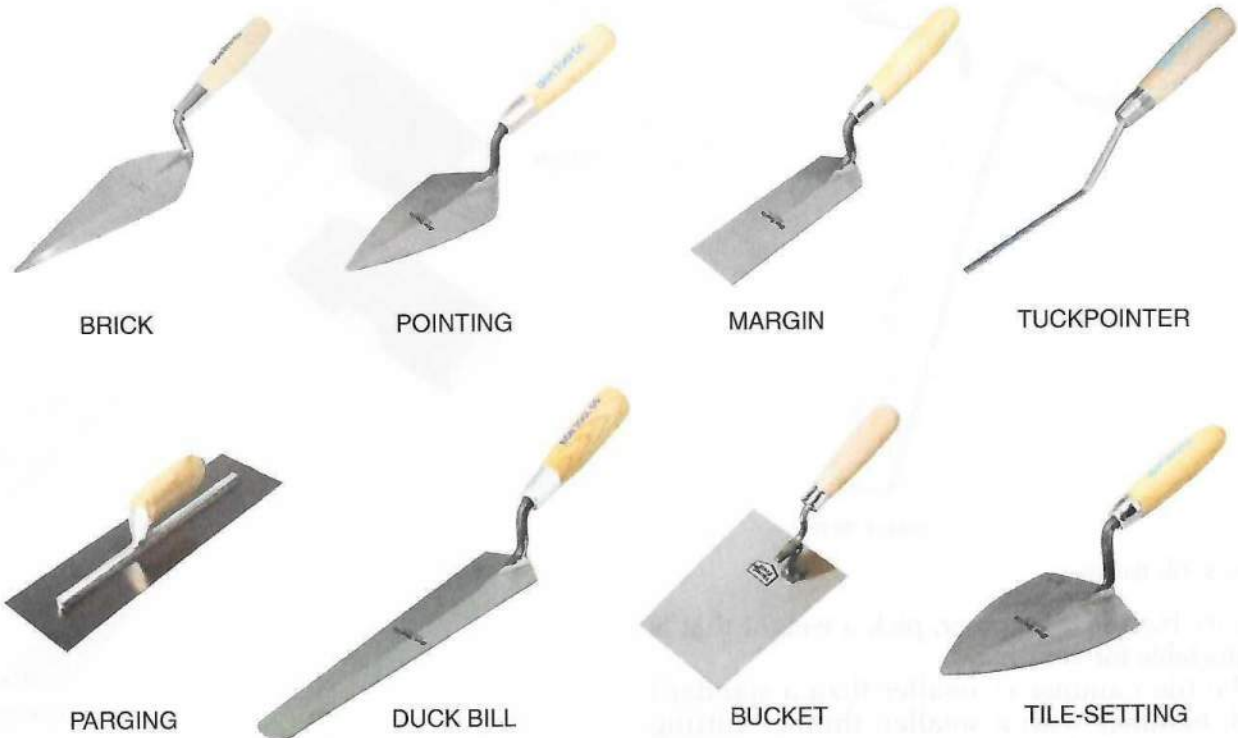
A neat brick stack is a safe stack. Stack materials by reversing direction on every other layer, so they will be less prone to tip. Keep the pile neat and vertical to avoid snagging clothes.



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**Figure 3** Different types of trowels.

chisel. There are several types of chisels. In this section, you will learn about the various types of hammers and chisels that you will use on the job.

**WARNING!**

If the wooden handle on a hammer becomes loose, replace it immediately. If the handle breaks, the head could fly off, causing serious damage or injury.

### 1.2.1 Cutting Hammers

The brick hammer is a double-headed hammer with a chisel head on one side, as shown in *Figure 4*. This is the most commonly used, everyday mason's hammer. The brick hammer drives nails and strikes chisels with one head. It can break, cut, or chip masonry material with the other head. Use it for cutting masonry units, setting line pins, and nailing wall ties.



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**Figure 4** Brick hammers.

Brick hammers are one-piece, drop-forged steel tools, or they can be steel heads on wooden or fiberglass shafts. Steel hammers need a comfortable grip sleeve over the shaft. The weight of this hammer usually ranges from 12 to 24 ounces. If

## Choose Wisely

A trowel should be sturdy, light, and balanced. It should have a comfortable grip and a flexible steel blade. There are many options to consider, so choose a tool that is right for you.





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**Figure 5** Tile hammer.

you are buying a hammer, pick a weight that is comfortable for your hand.

The tile hammer is smaller than a standard brick hammer with a smaller, thinner cutting head. *Figure 5* shows this hammer, which usually weighs about 9 ounces. Use it for cutting and trimming tile where you need more precision than you can get with a brick hammer. Do not drive nails, strike chisels, or do other heavy work with a tile hammer.

The stonemason's hammer, shown in *Figure 6*, resembles an ax. This heavy hammer has a cutting blade on one end of the head. Use this special-purpose hammer for dressing, cutting, splitting, or trimming stone.

**WARNING!**

Never strike the heads of two hammers together. A chip could fly off one of the heads.

### 1.2.2 Mashes and Mauls

Mashes (also called two-pound hammers) and mauls (also called bushhammers) are heavy club-headed hammers used for tooling. They usually have two striking heads.

The mason's mash is a drop-forged, one-piece tool with a grip sleeve over the shaft, as shown in *Figure 7*. It can also have a steel head mounted on a wooden handle. It resembles a short-handled, double-headed sledgehammer. The mash is most commonly used to strike chisels to cut masonry units. This hammer is too heavy to use for setting line pins or nailing wall ties.



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**Figure 6** Stonemason's hammers.



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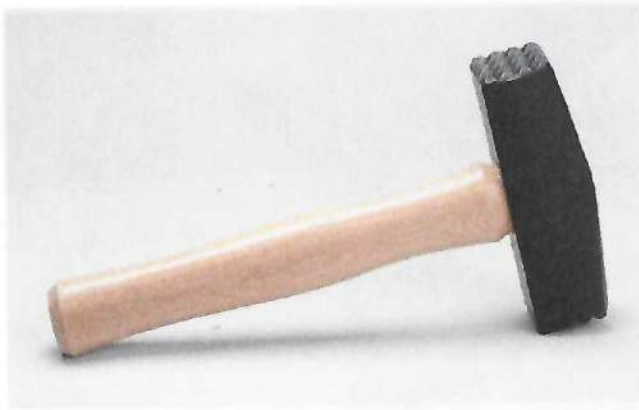
**Figure 7** Mash.

The maul is a square-ended, rectangular, double-headed sledgehammer. It has a heavy head with toothed ends and a long wooden handle, as shown in *Figure 8*. It is a stonemason's tool used to face block, stone, or concrete.

The rubber mallet (*Figure 9*) has a rubber head with two flat ends and a wooden handle. This hammer can tap or drive something without leaving marks. Use the rubber mallet for setting stone, marble, tile, or other finely finished units into place.







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Figure 8 Toothed maul, or bushhammer.



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Figure 9 Rubber mallets.

When working with wooden-handled hammers, be sure to inspect them daily. Check that the handle is securely seated in the head. If the handle is loose, replace it before using the hammer.

### 1.2.3 Chisels

Chisels become damaged after prolonged use. Cutting edges get notches or burrs from striking rough surfaces or metal. Chisels are cutting tools, so keep them sharp. The best way to keep chisels sharp is to take them to a blacksmith. Like the mason's hammer, tempered steel, such as that used for chisels, must be sharpened carefully so

it does not shatter. Blacksmiths are trained to do this properly.

Heads flatten after long use. The striking head mushrooms out, and metal burrs form at the edges of the head. These deformed edges can fly off and may cause injury. Inspect your chisels every day for dullness or deformation. To prevent injury, grind off the deformed part of the chisel head on a grinding wheel. As you grind, cool the chisel with water to keep it from overheating. If it gets overheated, the steel loses its temper and may unexpectedly shatter. Do not repair or sharpen the blade yourself; take it to a blacksmith.

#### WARNING!

Do not use a chisel with a deformed blade or a mushroomed head. Repair it or replace it immediately.

Figure 10 shows a mason's steel chisel, used for general cutting. It has a narrow blade of 1½ to 3 inches for a neat, clean cut. Use it to cut out masonry and make repairs. Use it for brick, block, and veined stone.

Figure 11 shows a brick set chisel. This is a wider chisel, up to 7 inches wide, with a thicker, beveled cutting blade. Traditionally, the brick set



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Figure 10 Mason's chisel.

## Protect Your Hands

Some brick chisels have a protective grip. The grip is made of rubber and has a rubber hood to protect your knuckles from misplaced hammer strikes.







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**Figure 11** Brick set chisel.

is as wide as the brick it cuts. A wider version of the brick set is called the blocking chisel, or bolster chisel. This is usually 8 inches wide and used for cutting block.

The rubber-grip mason's chisel is shown in *Figure 12*. This chisel has a rubber cushion on the handle to soften the impact of the hammer blow. It also has a wider cutting blade than the standard mason's chisel and is used for cutting brick, block, or stone.

The tooth chisel (*Figure 13*) has a toothed edge. This chisel is designed to cut soft stone and shape it to fit. It should not be used for hard stone. The pitching tool (also shown in *Figure 13*) is used for sizing, trimming, and facing hard stone.

The plugging chisel, or joint chisel, (*Figure 14*) has a sharply tapered blade. It is also called a tuckpointer's chisel. Use this chisel for cleaning mortar joints, for chipping mortar out of a joint, or for removing a brick or block from a wall. Each chisel is made for a specific job. Using the right tool for the job will make your work easier and more professional looking.

### 1.3.0 Using Jointers and Brushes

Before the mortar is set, it can be troweled or tooled. Special tools called jointers are used to finish, or point, the surface of the mortar joint. They are called jointers because they are designed to fit into the joint between brick or block. Brushes are used to remove any burrs or excess mortar from masonry work. Brushing is the finishing process for the wall or floor. In this section, you will learn about commonly used jointers and brushes.



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**Figure 12** Rubber-grip mason's chisel.

#### 1.3.1 Jointers

Jointers, slickers, rakers, beaders, and sled runners are used for finishing or pointing the surface of mortar joints. Also called joint tools or finishing tools, jointers are available to fit a range of joint sizes. The standard-size jointer will fit into the standard joint between brick or block. Jointers come in various shapes to give different effects to the finished joint. *Figure 15* shows how the final surface appearance is determined by the shape of the jointer used.

Jointing compresses the mortar and decreases moisture absorption at the surface, so it adds water protection. Struck and raked joints are not recommended for exterior walls as they do not offer good water protection.

The jointers are usually cast or forged, shaped steel rods with or without wooden handles. *Figure 16* shows some simple jointers for compressing and waterproofing joints. These convex, round, flat, and V-jointers are used on the short vertical or head joints. You can tell from the profile of the jointer what the tooled mortar joint will look like.







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Figure 13 Tooth chisel and pitching tool.



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Figure 14 Plugging, or joint, chisel.

The **bed joints**, or the long horizontal joints, are tooled after the head joints. Longer jointers with wooden handles are used for the horizontal joints. As shown in Figure 17, these sled runner jointers come in a variety of shapes also, to match the head joints.

Another type of jointer is the raker or rake-out jointer; these also come mounted on skate wheels. Figure 18 shows a skatewheel and a hand raker. The skatewheel raker is used for bed joints. The hand raker is used for joints the skatewheel raker will not reach. Note that the raking mechanism has an adjustable setscrew to rake different depths. The advantage of the skatewheel raker is the speed with which it forms a neat, hole-free joint.

All jointers need to be cleaned after they are used. If mortar hardens on them, they are not usable for smoothing.

### 1.3.2 Brushes

Brushing masonry work removes any burrs or excess mortar. This is the finishing process for the wall or floor. The brush should have stiff plastic or wire bristles. Figure 19 shows several brushes commonly used by masons.

A stove brush has a longer handle to keep fingers clear of the work area. Brushes are also useful for brushing off footings before laying masonry units and for cleaning the work area. For cleaning stains, brushes are used to apply proprietary cleaner to the face of masonry units. A cleaning brush may also have a scraper on one edge. Some brushes are designed to fit a long extension handle. Brushes for the application of proprietary cleaner are made of stiff plastic or fiber and have longer handles.

**WARNING!**

When applying proprietary cleaner, use a long-handled brush, and wear gloves and eye protection.

### 1.4.0 Using Other Masonry Tools

Brick tongs are designed to carry brick without chipping or breaking it, as shown in Figure 20. Most are made of an adjustable steel clamp with a locking nut and a handle. They can be adjusted for different sizes and will hold 6 to 11 masonry units. Some brick carriers are steel rods that fit into the holes in the brick. These carriers do not have a clamp and must be held upright. Smaller carriers are designed to carry larger individual block. With practice, the mason can carry loaded brick tongs in one hand, freeing the other hand for other activities.

In addition to their other tools, masons use bulk guns, grout bags, pinch bars, and bolt cutters (Figure 21). The bulk gun, also called a caulking gun, is used to add caulking to expansion joints.

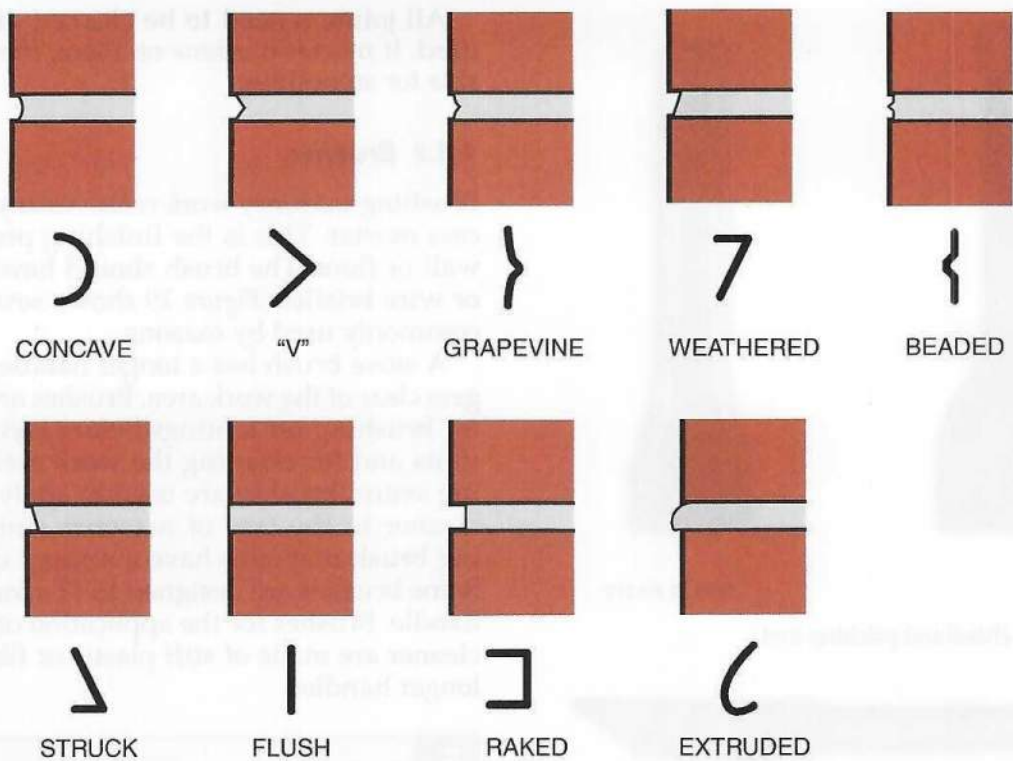
## Multipurpose Jointers

Some jointers have different heads on each end; for example, a round head on one end and a V-head on the other end. Using double-headed jointers allows you to do more joints with fewer tools.

The flat jointer is sometimes called a slicker. Either end of a slicker can be used to shape mortar; usually the ends are different sizes. The slicker is handy for working on inside corners or other tight places where a neat joint is needed. A bull horn is a common round jointer that is larger on one end and tapered on the other.

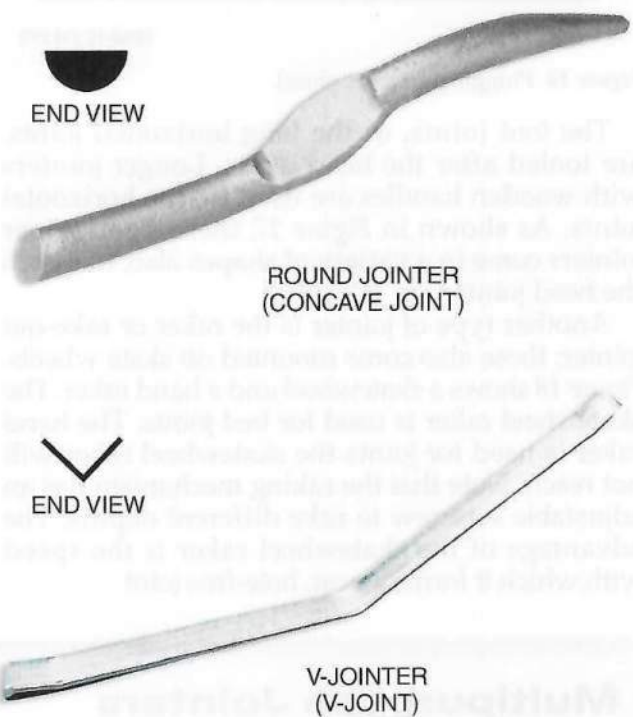
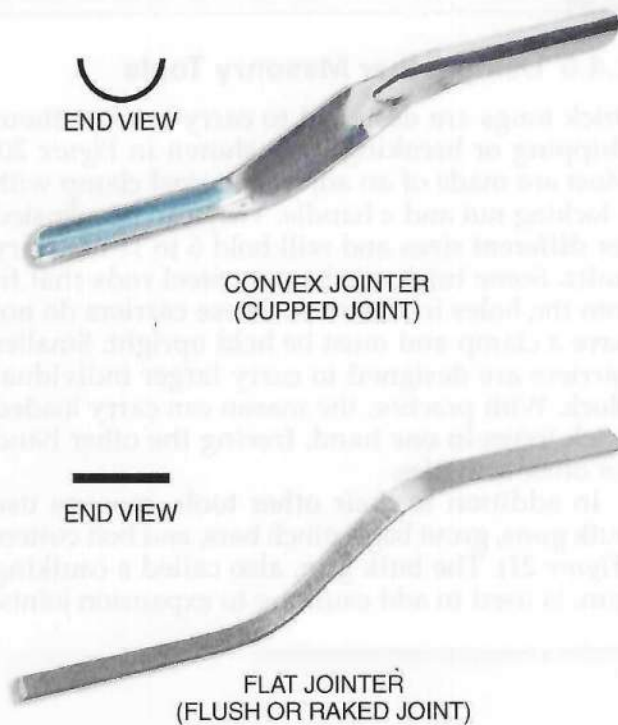






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Figure 15 Tooled mortar joints.



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Figure 16 Jointers.





END VIEW

CONVEX SLED RUNNER JOINTER



END VIEW

V-SLED RUNNER JOINTER

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Figure 17 Runner jointers.



SKATEWHEEL RAKER



HAND RAKER

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Figure 18 Rakers.



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Figure 19 Mason's brushes.

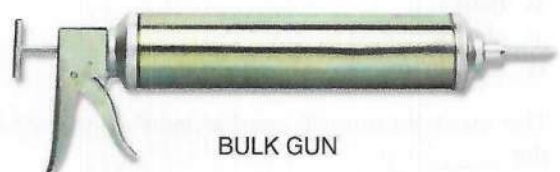


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Figure 20 Brick tongs.

The suction gun is used to propel abrasive material at masonry surfaces. The grout bag, with a metal or plastic tip, is squeezed to apply grout between masonry units. The pinch bar is used to pry out masonry units. The bolt cutter is used to cut reinforcing wire or ties. These and other hand tools will fit into the mason's tool bag.

Figure 22 shows a mason's canvas tool bag with leather straps, handles, and reinforced bottom. The tool bag keeps tools together and within reach as the mason moves around the job site. Buckets or other open containers will not keep tools dry. It is important to keep your tools dry and protect them from damage. Levels, rules, and



BULK GUN



BOLT CUTTERS



GROUT BAG



PINCH BAR

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Figure 21 Common mason's hand tools.







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Figure 22 Mason's tool bag.

squares must be properly maintained if they are to remain accurate.

Typically, a tool bag measures 14 to 18 inches across and has inside pockets for small items. The steel square and long level will fit under the leather straps on the outside of the bag. Some tool bag handles convert to shoulder straps, so masons will have hands free for climbing ladders or scaffold. A good tool belt can also keep tools handy and your hands free.

## Additional Resources

*Bricklaying: Brick and Block Masonry.* Reston, VA: Brick Industry Association.

*Concrete Masonry Handbook.* Skokie, IL: Portland Cement Association.

*Masonry Construction.* David L. Hunter, Sr. Upper Saddle River, NJ: Prentice-Hall.

## 1.0.0 Section Review

- The wide end of a mason's trowel is called the \_\_\_\_\_.
  - point
  - heel
  - shank
  - ferrule
- The most commonly used mason's hammer is the \_\_\_\_\_.
  - tile hammer
  - stonemason's hammer
  - two-pound hammer
  - brick hammer
- A joint that is *not* recommended for exterior walls is the \_\_\_\_\_.
  - concave joint
  - weathered joint
  - raked joint
  - extruded joint
- To pry out masonry units, use a(n) \_\_\_\_\_.
  - tong
  - extractor bar
  - lever
  - pinch bar



## SECTION TWO

### 2.0.0 MEASURES AND MEASURING TOOLS

#### Objective

Identify measures and measuring tools used in masonry.

- Describe how to use rules.
- Describe how to use levels.
- Describe how to use chalk boxes, squares, plumb bobs, and laser levels.
- Describe how to use corner poles, lines, and fasteners.

#### Performance Tasks 1 and 2

Demonstrate the proper use of a rule.  
Demonstrate the proper use of a level.

#### Trade Terms

**Corner pole:** Any type of post braced into a plumb position so that a line can be fastened to it. Also called a *deadman*.

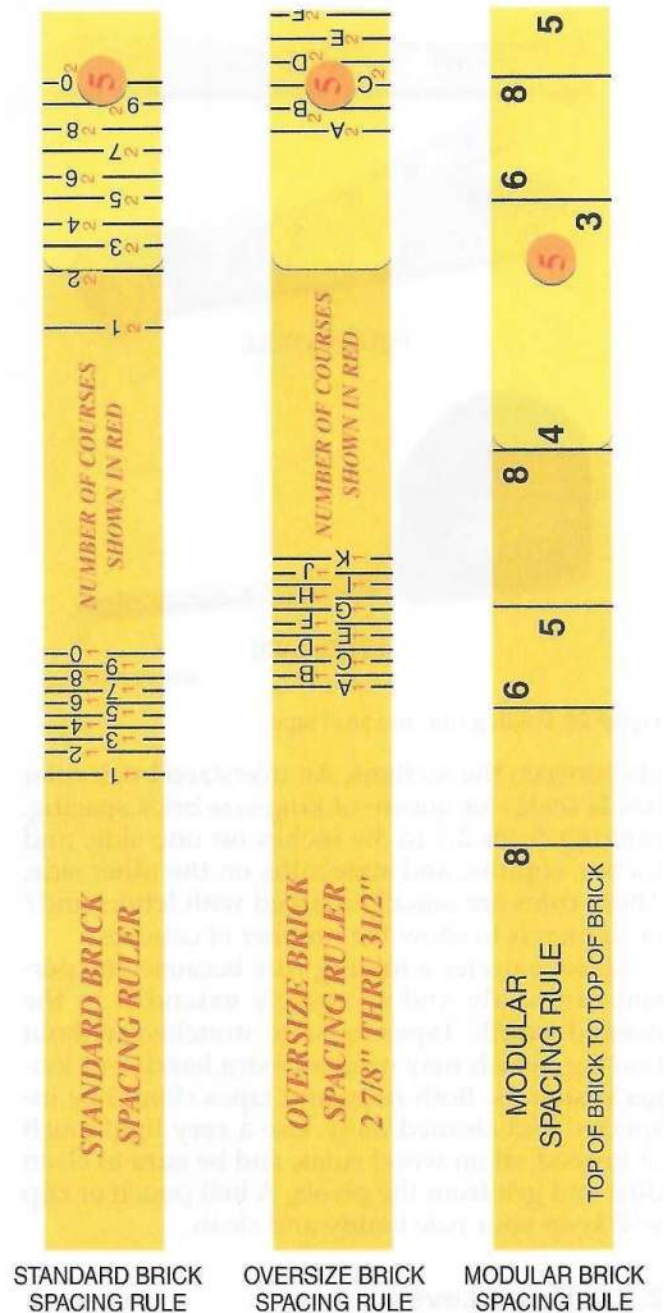
**Lead:** The two corners of a structural unit or wall, built first and used as a position marker and measuring guide for the entire wall.

Measuring is an important part of the work that masons do. Accuracy is important when making measurements, for reasons of safety as well as for aesthetics. Masons use a variety of tools for making measurements on the job, including rules and levels, chalk boxes, squares, plumb bobs, laser levels, **corner poles**, lines, and fasteners. Take the time to learn how to use these measuring tools well, because they are just as important as any other tool you will use.

#### 2.1.0 Using Rules

Masons use two kinds of rules, a 6-foot folding rule, and a 10-foot retractable tape. Mason's rules have special marking scales on them.

The brick spacing rule, as shown in Figure 23, has markings for different sizes of joints. It shows the course spacing for each joint size. This measure is also called the course counter rule. Use it to lay out and space standard brick courses to dimensions that are not modular. It is useful for spacing mortar joints around door tops, window tops, or other uneven spaces.



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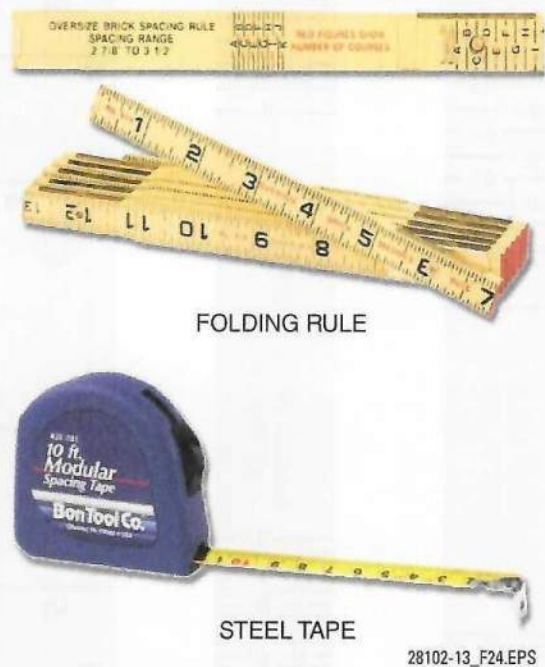
Figure 23 Spacing rules.

The modular spacing rule, as shown in Figure 23, is based on a module of 4 inches. It has six scales ranging from 8 to 2, with scale 6 representing the size of a standard brick. The modular rule can be used for block as well as brick. There is a slight disparity between the brick spacing rule and the modular spacing rule.

The mason's steel tape and folding rule are both marked with spacing measures. They are available with either the modular or the course markings. Figure 24 shows both these rules, which also have inch measurements. Folding rules are usually made of wood, with brass joints and piv-







FOLDING RULE

STEEL TAPE

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Figure 24 Folding rule and steel tape.

ots between the sections. An oversized brick ruler has 11 scales for queen- or king-size brick spacing, ranging from  $2\frac{7}{8}$  to  $3\frac{1}{2}$  inches on one side, and inches, eighths, and sixteenths on the other side. These rules are usually marked with letters and/or numerals to show the number of courses.

Masons prefer a folding rule because one person can easily and accurately extend it to the needed length. Tapes must be stretched without bowing, which may need an extra hand over longer distances. Both rules and tapes should be inspected and cleaned daily. Use a very light touch of linseed oil on wood rules, and be sure to clean dust and grit from the pivots. A belt pouch or clip will keep your rule handy and clean.

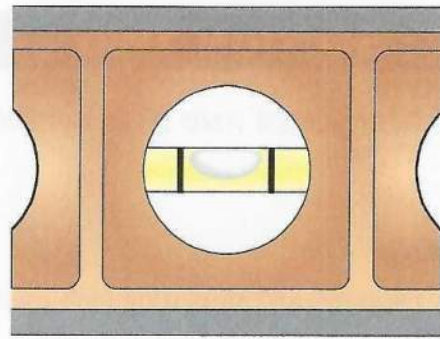
## 2.2.0 Using Levels

Levels were introduced in *Core Curriculum, Introduction to Hand Tools*. The level, sometimes called a plumb rule, establishes two measures:

- A plumb line that is vertical to the surface of Earth
- A level line that is horizontal to the surface of Earth

## Take Care of Your Tape

Steel tapes are wound with a spring, so they will retract into the housing. Never let a retractable steel tape snap back into the housing. The end tab can easily break off, making the tape useless. Always guide the tape back into the housing.



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Figure 25 An air bubble shows level or plumb.

The level contains air bubbles in sealed vials filled with oil or alcohol, as shown in Figure 25. When the bubble in the vial is centered between the vial's two markers, the object being checked is level or plumb.

Levels can come with single or double sets of bubble vials. Two common levels are shown in Figure 26. They are made of hardwood, metal, or plastic to make them as light as possible without sacrificing strength. Levels come in a wide range of sizes. A smaller 8-inch size, often called a torpedo level, is used for individual block or smaller spaces. Longer levels can be up to 72 inches for leveling wall sections or spanning distances. Masons use levels continually to check the plumb and level of individual masonry units and the entire length of a wall.



TORPEDO LEVEL

STANDARD LEVEL

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Figure 26 Torpedo level and standard level.





## String Line Level

A line level is only a few inches long and usually made of plastic. They are designed to hang on a string line to check the accuracy of guidelines.

The level is usually the most expensive of a mason's tools. Always check the action of the bubble vials against another level before purchasing a level. Check the accuracy of your level daily, especially if it is dropped or jarred. Do not tap a level with a hammer to level a brick. Some levels can be adjusted if they are no longer accurate.

Clean your level carefully at the end of the day to keep any mortar from hardening on it. Wipe off wooden levels with a rag dampened with linseed oil to preserve the wood. Clean a metal level with a dry cloth, so dust and grit do not stick to it. You may want to oil it occasionally as well.

### 2.3.0 Using Chalk Boxes, Squares, Plumb Bobs, and Laser Levels

A chalk box (*Figure 27*) is a metal or plastic case with finely ground chalk and about 50 feet of twisted cotton line wound on a spool inside. As the line is drawn out of the box, it picks up powdered chalk. The line can be stretched between two points and snapped. This will leave a chalk mark exactly under the line. Masons use chalklines to establish straight lines for the first course of brick in a wall. The chalkline can be snapped against the foundation slab or footing. Some chalk boxes can also be used as a plumb bob.

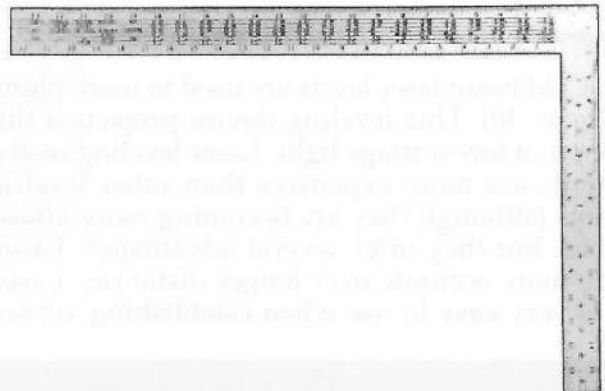
Masons use several types of squares. The framing, or steel, square (*Figure 28*), looks like a carpenter's square. Use this for laying out **leads** and other corners and for checking that corners are square.

As shown in *Figure 29A*, the combination square, or T-square, has a movable crosspiece and a built-in 45-degree angle. Use this for marking right-angle and 45-degree angled cuts and



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*Figure 27* Chalk box.



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*Figure 28* Framing, or steel, square.

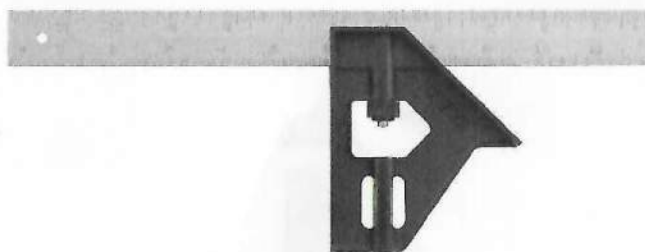
for checking these angles on cuts. The sliding T-bevel, as shown in *Figure 29B*, has a setscrew in the crosspiece. The screw fixes the angle of the crosspiece so that the same angle can be used for marking many cuts. The bevel is useful when the job calls for an odd angle other than 90 degrees or 45 degrees. Use the bevel for marking these kinds of cuts, for marking skewbacks, and for checking the angles on cuts.

## Check Your Squares

Squares may be damaged accidentally from time to time. Make sure that you periodically check your squares with a known straightedge. This will ensure accuracy and square walls. A small error is compounded over the length of a wall. This can result in serious error in the finished structure.







(A) COMBINATION SQUARE

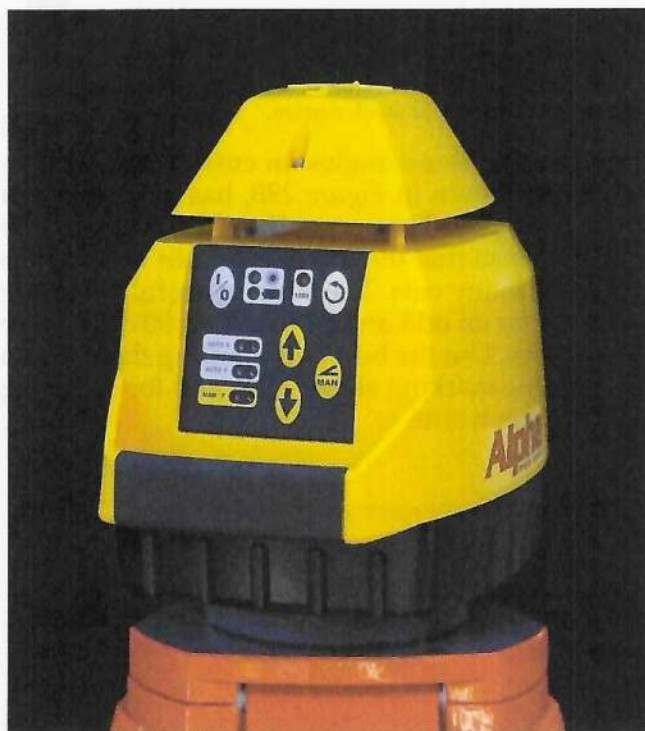


(B) SLIDING T-BEVEL

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Figure 29 Combination square and sliding T-bevel.

Cold beam laser levels are used to mark plumb (Figure 30). This leveling device projects a thin beam of low-wattage light. Laser leveling instruments are more expensive than other leveling tools (although they are becoming more affordable), but they offer several advantages. Lasers are more accurate over longer distances. Lasers are very easy to use when establishing vertical



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Figure 30 Cold beam laser level.

## Chalk Box Maintenance

Before using a chalkline, check that there is enough chalk in the reservoir and that the string is not frayed. Both of these parts should be replaced or refreshed periodically.

or horizontal lines and are used for measuring or laying out openings.

### CAUTION

Use cold beam lasers with extreme care. Although low-power lasers can be used, arcs can still be unpredictable. Always wear appropriate personal protective equipment and refer to the manufacturer's specifications.

Some laser level tools can project beams up to 1,500 feet to hit a specific point. They can have a variety of components designed to get the most accurate readings possible:

- Large vertical and horizontal indicator bubbles
- Lens refractors that show line or dot images
- Dual diodes for increased beam visibility
- Wall, floor, or tripod mounts, brackets, or clamps
- Built-in bump sensors that will automatically notify the user, or shut off the device, if the instrument has been bumped hard enough to affect the accuracy of its readings
- Electronic level vials that dampen vibrations from conditions at the job site, to ensure the stability of the laser beam over distance
- Remote control capability
- Optional receivers that increase the laser's operating range still more

Using this tool, you can tell immediately if something has been aligned. If you are installing gravity-flow pipelines, for instance, you can use this tool as an alignment guide and lay the pipe along the beam of light emitted by the laser. Other applications of cold beam lasers include installing and aligning such building elements as walls, partitions, and access floors.

Portable, handheld lasers that feature plumb (both up and down), level, and square capabilities can greatly enhance productivity, which saves time and money. Lasers can be set up more quickly than other leveling devices, and because of their accuracy, they require fewer repeat measures. The time saved when using a laser leads to cost savings. The initial expense of a laser is quickly made up in increased productivity.





These devices require relatively little maintenance. Like other levels, lasers should be cleaned off after use and stored in a safe, dry place. Once a year, the unit should be cleaned, checked, and adjusted by a professional. Heat, cold, and moisture—conditions common to plumbing sites—can affect a laser's operating performance. The degree to which these conditions affect the laser's stability and accuracy will depend on the quality of the instrument itself. Higher-quality lasers are generally more resilient to adverse environmental conditions. Some lasers are specifically designed and tested to endure shock, moisture, and temperature changes. The performance of all lasers, however, begins to deteriorate rapidly at temperatures of 110°F or higher.

The light emanating from a cold beam laser will not instantly injure humans, but long-term exposure could injure the eyes. Therefore, never point a laser level at another person. Only qualified and trained masons should use this equipment. Cold beam lasers must meet all of the Electronic Product Radiation Control provisions of the federal Food, Drug, and Cosmetic Act.

**WARNING!**

Never look directly into the laser beam or point the beam at a co-worker. Over time, exposure to the beam can injure eyes.

Sometimes plumb is marked with a plumb bob (Figure 31). The plumb bob is a pointed weight attached to a length of mason's line. The length of the line is easily changed. A plumb bob can establish vertical plumb points. Use it to mark a point directly under another measured point. A plumb bob is also useful for checking the plumb of a story pole or corner pole. Today, laser levels have largely replaced plumb bobs in the field, but because of their ease of use they are still sometimes used for simple tasks.

#### 2.4.0 Using Corner Poles, Lines, and Fasteners

The next in the series of course alignment measures is the corner pole, or deadman. The corner pole is any type of post braced into a plumb position so that a line can be fastened to it. This allows a wall to be built without building the corners first. This tool is useful when building a veneer wall. The corner pole can be braced against an existing part of a structure or the block foundation.

Corner poles can be made from dimensional lumber and braces. Commercial corner poles (Fig-



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Figure 31 Plumb bob.

ure 32) are metal with proprietary line blocks and supporting hardware. Commercial corner poles have masonry units marked on them. A handmade corner pole can be marked off in masonry units with a grease pencil, marker, or carpenter's pencil. If you make a deadman from scrap wood, make sure that the wood is straight and not badly warped. A corner pole with markings for different stories of a building is called a story pole.

While masons use levels to lay out structural masonry elements 4 feet in length or shorter, they use a mason's line to lay out masonry structures longer than 4 feet. The line itself is twisted or braided nylon cord. The typical line is about 150 pounds test and should be used at 20 percent of its test. This means it is good for a pull of up to 30 pounds. Braided line is preferred because it will not sag as much when pulled tight and will last longer.

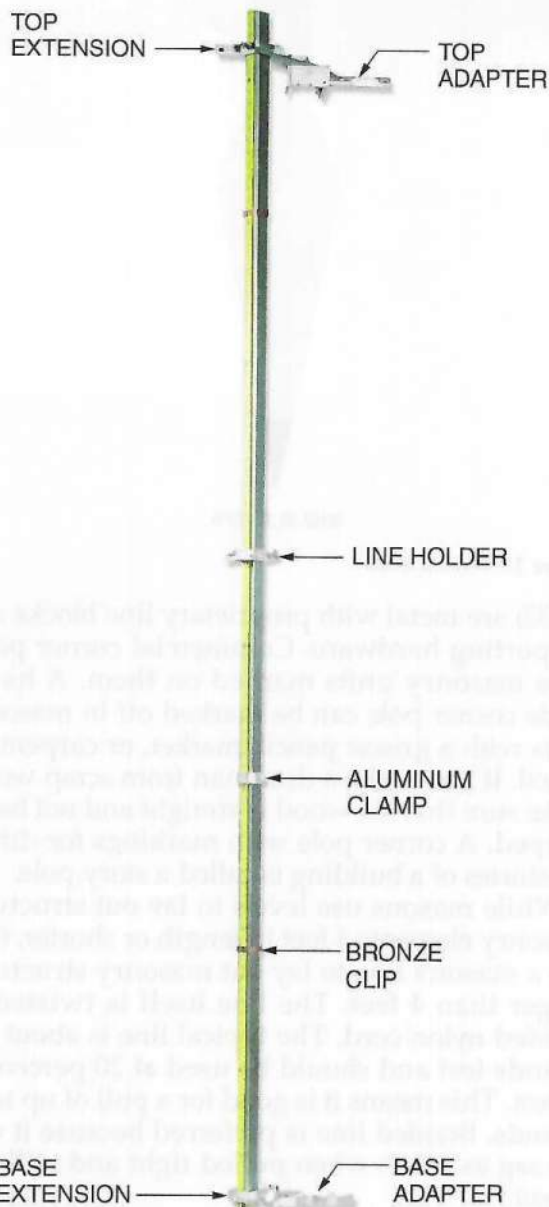
The line is stretched tight as it is strung between two fixed points. For most jobs, the fixed points are on the wall corners, or leads, which have already been laid. The line becomes the guide for laying the course of masonry units between the leads, or fixed points. Using the line properly will result in a wall without bulges or hollows. The

### Blowing in the Wind

When using a plumb bob outside, you must be aware that the wind may blow it out of true vertical. The longer the drop line, the more likely that wind will affect your measurement.







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Figure 32 Corner pole or deadman.

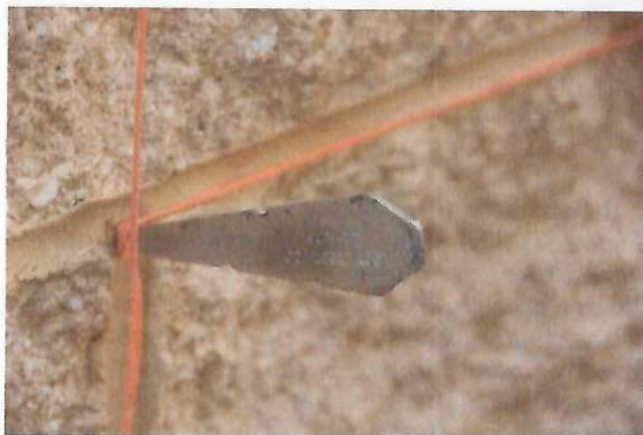
masonry units are laid under the line, and the line is moved up for each course.

There are three methods of fastening the line in place: pins, blocks, and stretchers. Line pins (Figure 33) are about 4 inches long and made of steel. Drive them into the wall or structure at the marked point, and string the line tightly between them. Line pins leave holes, and the string must be remeasured or retightened for each course. However, line pins are harder to accidentally knock off than line blocks.

**WARNING!**

When using line pins, remember that the line is under tension. Should the line snap or the line pin come out while the line is under tension, the line or the pin can whip around and cause injury.

Line blocks are also called corner blocks (Figure 34). They are made of wood, plastic, or metal; however, wood grips the corner better (Figure 35). The knotted line passes through the slit in the back of the block. The line tension between the two blocks holds the blocks in place.



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Figure 33 Line pin.

## Don't Tangle Your Line

Usually, the line is bought wound around a core. If it is rewound on a shuttle or holder, it will not tangle as it is used and re-used. Lines are made in several bright colors, so they can be easily seen.



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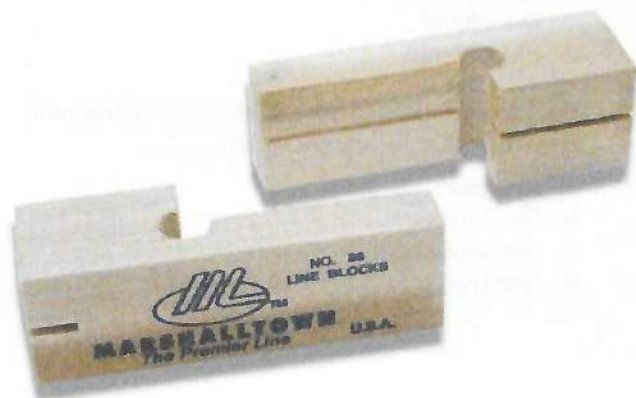






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Figure 34 Corner block.



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Figure 35 Wood line block.

Line stretchers are shown in Figure 36. They have a flatter profile and also use the line tension to hold them in place. They come in standard and adjustable sizes and fit more snugly to the lead than corner blocks.

Unlike pins, blocks and stretchers must have a corner to be held snugly against. They do not leave holes in brick or walls, but they do project slightly from the corners of the wall. They can be accidentally knocked off. Because of the tension on the line, a flying block or stretcher can severely injury someone in its path.

**WARNING!**

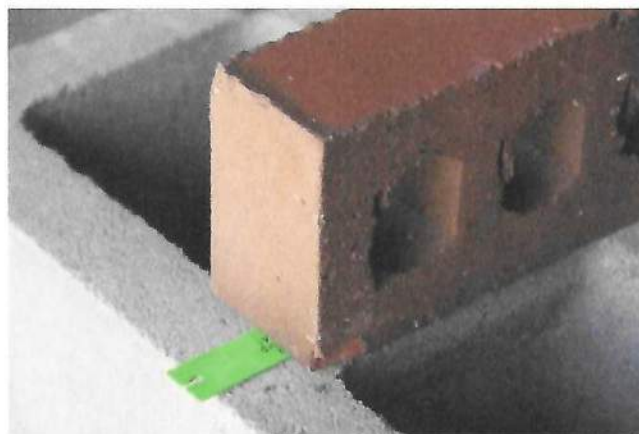
Use extra care working with corner blocks or stretchers to avoid knocking them off.

Once the line is in place, it may need more support. Line trigs (Figure 37), sometimes called twigs, are steel fasteners that hold the line in position and keep it from sagging. A very long line



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Figure 36 Line stretchers.



28102-13\_F37.EPS

Figure 37 Line trig, or twig.





may need several trigs, even if it is stretched tight. The trig slips over the line and rests on a masonry unit that has been put in place to support it. A half brick or piece of block can anchor the trig to ensure the line is not disturbed.

## Check with Your Supplier

Masonry materials suppliers sometimes give away trigs and wood line blocks with larger orders.

### Additional Resources

*Complete Masonry: Building Techniques, Decorative Concrete, Tools and Materials.* Des Moines, IA: Oxmoor House.

*Building with Masonry: Brick, Block, and Concrete.* Dick Kreh. Newtown, CT: Taunton Press.

### 2.0.0 Section Review

1. The number of scales on an oversized brick ruler for queen- or king-size brick spacing is \_\_\_\_\_.
  - a. 7
  - b. 9
  - c. 11
  - d. 13
2. Eight-inch levels are often called \_\_\_\_\_.
  - a. torpedo levels
  - b. standard levels
  - c. plumb levels
  - d. line levels
3. To lay out leads and check that corners are square, use a \_\_\_\_\_.
  - a. combination square
  - b. framing square
  - c. laser level
  - d. plumb bob
4. Steel fasteners that hold a line in position and keep it from sagging are called \_\_\_\_\_.
  - a. line pins
  - b. line blocks
  - c. line stretchers
  - d. line trigs



## SECTION THREE

### 3.0.0 MORTAR EQUIPMENT

#### Objective

Identify mortar equipment used in masonry.

- Describe how to use mortar boxes.
- Describe how to use mixing accessories.

#### Trade Term

**Tempering:** Adding water to mortar to replace evaporated moisture and restore proper consistency. Any tempering must be done within the first 2 hours after mixing.

Hand-powered mortar equipment is used on both small and large jobs. It complements the hand tools and completes the tool set needed to build a structural masonry unit.

#### 3.1.0 Using Mortar Boxes

Mortar is mixed in a wheelbarrow or mortar box. A mortar box can be steel or plastic and is about 32 inches × 60 inches. Some mortar boxes have wheels for easy movement (*Figure 38*). Make sure the box is set level so that water does not collect in one end. After it is mixed, the mortar may be moved to a mortar pan (also shown in *Figure 38*) or smaller mortarboard.

The mortar pan and mortarboard can be located next to the working mason. They can be placed on a stand, so they are convenient for working higher courses. The metal or plastic mortar pan fits more securely on the stand, but mortar tends to stick in the corners. Mortarboards are available in plastic or plywood and average about 2 feet on a side. A plywood board needs to be wetted thoroughly before mortar is put on it to keep the board from absorbing moisture and drying the mortar.

A cubic-foot measuring box (*Figure 39*) is sometimes used to prepare mortar. This box measures 1 cubic foot of sand or cement. It is used to measure ingredients by volume in order to proportion the mortar correctly. As prepackaged mortar has become more popular, use of the cubic-foot box is uncommon, but sometimes it is specified by architects for measuring sand.

Mortar containers and carriers should be cleaned out with water between loads of mortar. The mixing pan should be cleaned out after each batch and cleaned thoroughly at the end of each day.



MORTARBOARD



MORTAR PAN



MORTAR BOX WITH WHEELS

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*Figure 38* Mortarboard, mortar pan, and mortar box with wheels.

#### 3.2.0 Using Mixing Accessories

Several of the tools used in mixing mortar are shown in *Figure 40*. A long-handled pointed-end shovel is used to measure, shovel, and mix dry ingredients in the mortar box. A square-end, short-handled shovel is used to move mortar from the mixing box to a pan, stand, or hod. The square end helps you to scrape the bottom of the mixing pan.

A large hoe is used for mixing wet mortar and **tempering** mortar. The mortar hoe has a 10-inch blade with two holes in the blade to make it easier







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**Figure 39** Cubic-foot measuring box being emptied into a mortar container.

to pull the hoe through the mix. Some hoes have shorter handles for use in smaller spaces. Remember to clean mixing tools with a stiff brush and water immediately after use.

### 3.2.1 Water Bucket and Barrel

The water bucket and barrel (Figure 41) are essential in masonry. Made of steel, plastic, or galva-



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**Figure 40** Mixing aids.

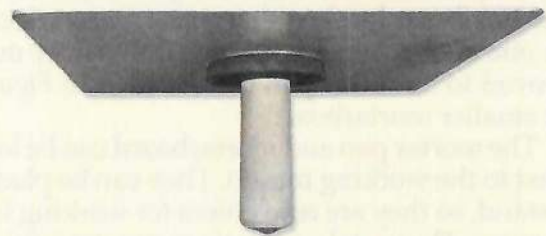
nized metal, both are necessary equipment. Half filled with water, the bucket provides a ready bath to clean mortar off hand tools. Masons frequently use 5-gallon buckets to measure water for mixing mortar. The bucket can also serve as a carrier for small amounts of mortar or grout. The barrel pro-

## Hawks and Hods

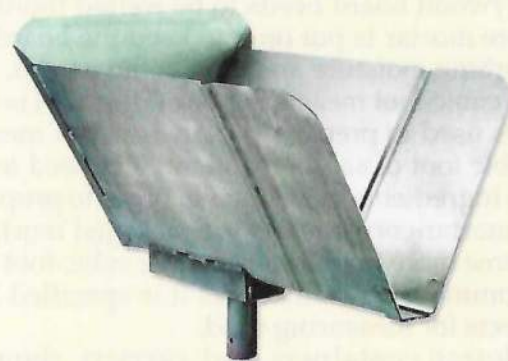
As a mason, you won't see hawks and hods on the job very often, but when you do, it's important to recognize how to use them.

The hawk is a smaller version of the mortarboard. This small board has a pole-grip handle underneath and is used to carry small amounts of mortar. A close relative of the plasterer's hawk, it is useful for tasks such as pointing. A wooden hawk needs to be wetted thoroughly before mortar is put on it.

The hod is used to carry mortar from the mixer to the mason. It is practical for moving material in tight spaces or on scaffold. It is an aluminum trough with a long pole handle. The mortar can be lifted up to a mason on a scaffold by using a hod.



HAWK



HOD

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**Figure 41** Water bucket and barrel.

vides a bath for larger tools and a ready supply of water for tempering mortar.

Be sure to wet the inside surface of the bucket before filling it with mortar or grout. Always wash empty buckets out immediately to prevent mortar from hardening inside. Wash the barrel out at the end of the day.

### 3.2.2 Barrows

Masons use two types of barrows (*Figure 42*). The standard contractor's wheelbarrow is made of steel with wooden handles. It can carry about 5 cubic feet of masonry or mortar. The second type of barrow is a pallet on wheels. Its wooden body has no sides, so it is convenient to unload masonry units from either side. However, it must be unloaded so that it does not become unbalanced and tip over. This brick barrow works well for moving bags of cement, piles of block, and other bulky materials.



CONTRACTOR'S WHEELBARROW



BRICK AND TILE BARROW

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**Figure 42** Barrows for masonry units.

Both types of barrows need large, air-filled tires to move over bumpy ground without tipping. Check the wheels before using any barrow.





## Brick Carts

A commercial cart is also very useful for moving packaged brick or block. Most carts have air-filled tires and can carry up to 100 standard brick.



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## Additional Resources

*Masonry Basics: The Tools You Need and How to Use Them.* Masonry Guild of Arizona.  
[www.masonryforlife.com/howtobasics.htm](http://www.masonryforlife.com/howtobasics.htm)

### 3.0.0 Section Review

1. When using a plywood mortarboard, be sure to keep the board from absorbing moisture and drying the mortar by \_\_\_\_\_.
  - a. placing mortar only in the center of the board
  - b. lining the board with a nonabsorbent plastic
  - c. ensuring the board remains level while using it
  - d. wetting the board thoroughly before putting mortar on it
2. Before filling a bucket with mortar or grout, be sure to \_\_\_\_\_.
  - a. wet the inside surface of the bucket
  - b. fill the bucket at least one-quarter of the way with water
  - c. ensure the inside of the bucket is completely dry
  - d. put a plastic liner inside the bucket to protect it from contamination





## SECTION FOUR

### 4.0.0 POWER TOOLS

#### Objective

Identify power tools used in masonry.

- Describe how to use masonry saws.
- Describe how to use splitters.
- Describe how to use grinders.
- Describe how to use power drills and powder-actuated tools.

#### Trade Term

**Kickback:** A reaction caused by a pinched, misaligned, or snagged tuckpoint grinder wheel that causes the wheel to stop momentarily, propelling the grinder away from the surface and toward the operator.

**P**ower tools bring time and labor savings to masonry work. Mechanical and power tools, most of which were developed after the 1920s, have become an integral part of masonry work.

When using power tools and equipment, always follow power-tool safety rules. Inspect items before using them to make sure they are clean and functional. Disconnect power cords, and turn off engines before inspecting or repairing power equipment. As you learned in the module *Masonry Safety*, there are certain safety guidelines that you should follow when using gasoline-powered tools:

- Be sure there is proper ventilation before operating gasoline-powered equipment indoors.
- Use caution to prevent contact with hot manifolds and hoses.
- Be sure the equipment is out of gear before starting it.
- Use the recommended starting fluid.
- Always keep the appropriate fire extinguishers near when filling, starting, and operating gasoline-powered equipment. OSHA requires that gasoline-powered equipment be turned off prior to filling.
- Do not pour gasoline into the carburetor or cylinder head when starting the engine.
- Never pour gasoline into the fuel tank when the engine is hot or when the engine is running.
- Do not operate equipment that is leaking gasoline.

CAUTION

Always be sure the power is off before the final cleaning at the end of the day.

#### 4.1.0 Using Masonry Saws

Masonry saws can make more accurate cuts than a mason's hammer or brick set. The saw does not weaken or fracture the material as hand tools do. Masonry saws are available in handheld or table-mounted models. Some larger table saws can be operated with a foot control, which leaves both hands free for guiding the piece to be cut. Masonry saws are available in gas-, electric-, and water-powered models.

Figure 43 shows a medium and a large masonry saw. Note that the large saw is used with a carrier or conveyor tray on tracks. The masonry unit to be cut is placed on the carrier tray, aligned, and carried against the blade.

WARNING!

Always keep your hands away from the cutting area behind the blade when operating a saw. The saw can jump backwards suddenly and could cut your hand.

An electrical masonry saw (Figure 44) is smaller and more portable than a large masonry saw. It is easily moved about and quickly set up at different areas of the job site. It is operated by hand controls. The blade on some smaller saws is mounted on a rotating arm. They are called chop saws because the blade is lowered (chopped) onto the brick.

Masonry table saws use diamond, silicon carbide (also called Carborundum™) or other abrasive blades. Diamond blades can be irrigated to prevent them from overheating and burning up. The irrigating water wets the masonry unit, cools the blade, and controls dust. The wet units must be allowed to dry before they can be laid. The dry abrasive blades cut slowly and cannot cut as thinly, but the masonry can go directly to the mortar bed. Dry cutting produces dust that must be vented away from workers and the work site.

#### Know Your Cutting Depth

A 14-inch blade has approximately a 5-inch cutting depth. To cut all the way through an 8-inch block, use a 20-inch blade.







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Figure 43 Medium and large masonry saws.

**WARNING!**

Inhaling dust or sand that contains silica, a natural crystal commonly found in sand, can cause silicosis, which is scarring and inflammation (swelling) of the lungs. Symptoms of silicosis include chronic coughing and shortness of breath, and low levels of oxygen in the blood. Silicosis can be caused by short-term exposure to large amounts of silica dust, or by long-term exposure to small amounts of silica dust.

When using handheld and table-mounted saws of any size, review the saw's control operations before starting to cut. The guidelines for the safe use of saws include the following:

- Wear a hard hat and eye protection to guard against flying chips.



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Figure 44 Small masonry saw and integral dust collector.

- Wear rubber boots and gloves to reduce the chance of electric shock.
- Wear earplugs and/or other ear protection.
- Wear a respirator when using a dry-cut saw.
- Check the guards to ensure they move and close freely. Never operate a saw with damaged or missing guards.
- Check all adjustment levers before cutting to make sure they are set at the correct bevel and depth.
- Always hold the saw firmly when operating and support the work being cut to prevent loss of control.
- In between cuts, always release the trigger and hold the saw until the blade comes to a complete stop.
- Check that the blade is properly mounted and tightened before starting to cut.
- Do not cut masonry with excessive pressure per pass. Make repeated passes using a light, forward pressure to achieve the desired depth.
- Clean masonry dust from the saw's air vents frequently. Always disconnect the saw's plug from the power source and let the blade come to a complete stop before cleaning the air vents.

Handheld masonry saws with 14-inch blades (Figure 45) are also known as rapid-cut saws.







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**Figure 45** Handheld masonry saw.

Handheld saws with 12-inch blades are sometimes called cutoff saws or target saws. These smaller saws can be powered by gasoline, electricity, or hydraulics. The diameter of a blade on a handheld saw can be up to 14 inches. Using a handheld saw calls for extra caution.

**WARNING!**

Make sure electrical saws are grounded, especially if you are using water to cool the blade and control dust.

## 4.2.0 Using Splitters

Masonry splitters are mechanical cutters for all types of masonry units. They do not have engines, but some use hydraulic power. Splitters range from small hand-operated units, such as the one shown in *Figure 46*, to massive foot-operated hydraulic splitters. These mechanical units offer more precision than a brick hammer or brick set. They are also faster, especially when many brick need to be cut.

Unlike saws, splitters do not create as much dust and do not have high-speed blades. Splitters do make cuts as neatly as saws. Larger units (*Figure 47*) can deliver as much as 20 tons of cutting



28102-13\_F46.EPS

**Figure 46** Hand-operated masonry splitter.

pressure but are precise enough to shave  $\frac{1}{4}$  inch off a brick or stone. Large hydraulic splitters can accommodate larger masonry units than most large saws.

## 4.3.0 Using Grinders

The tuckpoint grinder (*Figure 48*) is a handheld, electric grinding tool designed to grind out old bed and head joints in a masonry wall. It has shatterproof blades and a safety guard on the part of the machine facing the mason. Its abrasive wheels can be used to cut and score concrete, block, brick, and stone.

When using a grinder, use both hands to grip the handles and position your body and arms so that you can absorb **kickback** from the grinder. Kickback is a sudden jump that happens when the wheel is pinched, misaligned, or snagged. This causes the wheel to stop momentarily, propelling the grinder away from the surface and toward the operator. Kickback can also cause damage to the surface that is being ground, and in some cases can cause abrasive wheels to shatter with explosive force.

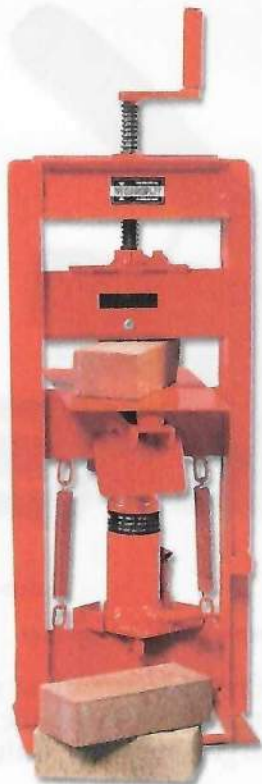
## Power Saw Safety

When using power saws of any size, always follow these rules:

- Wear a hard hat and eye protection to guard against flying chips.
- Wear rubber boots and gloves to reduce the chance of electric shock.
- Wear earplugs and/or other ear protection.
- Wear a respirator when using a dry-cut saw.
- Check that the blade is properly mounted and tightened before starting to cut.







28102-13\_F47.EPS

Figure 47 Large foot-operated hydraulic splitter.

**WARNING!**

Dry cement and wet concrete are harmful. Dry cement dust can enter open wounds and cause blood poisoning. Cement dust, when it comes in contact with body fluids, can cause chemical burns to the membranes of the eyes, nose, mouth, throat, or lungs. It can also cause a fatal lung disease known as silicosis.

Wet cement or concrete can also cause chemical burns to the eyes and skin. Always wear appropriate personal protective equipment when working with dry cement or wet concrete. If wet concrete enters waterproof boots from the top, remove the boots and rinse your legs, feet, boots, and clothing with potable water as soon as possible. Repeated contact with cement or wet concrete can also cause an allergic skin reaction known as cement dermatitis.

Before restarting a grinder, ensure that the wheel is centered in the kerf, or groove, but not bound in the material. Also, ensure that the wheel depth lever is secured, to prevent the grinder from digging too deep. Before adjusting the grinder, always ensure that the power cord has been disconnected from the power source and that the wheel has come to a complete stop.



28102-13\_F48.EPS

Figure 48 Tuckpoint grinder.

To change a wheel once it has come to a complete stop and the power has been disconnected, follow the manufacturer's instructions to remove the guard cover and push the spindle lock that keeps the wheel from rotating. Then loosen and remove the wheel locknut and the wheel. Clean the inside of the guard housing before installing the new wheel. Place the wheel on the spindle according to the manufacturer's directions, install the locknut, and replace the guard cover. Always allow the grinder to reach full speed before touching the wheel to the surface being ground. Always use appropriate personal protective equipment when operating a grinder, and follow the manufacturer's instructions when servicing it.

**WARNING!**

Wear a hard hat and eye protection when using a tuckpoint grinder.

You already learned the following rules for the safe use of a grinder in the module *Masonry Safety*, but they are worth repeating here:

- Be sure the grinding head is in good condition and has been properly secured.
- Wear gloves and other personal protective equipment when appropriate.
- Follow the manufacturer's instructions for installing shrouds and other dust-collection devices to help capture the dust created by the grinding process.
- Make sure the power switch is off before plugging in the grinder.
- Remove all safety keys before starting the grinder.
- Use the proper grinding head for the material being ground.





- Ensure that the wheel guard is able to move freely and close during operation.
- Grip the grinder tightly on the main and auxiliary handles when using the grinder. Hold the grinder only on the insulated gripping surfaces.
- Ensure that the grinder is clean before using it, and clean it periodically while using it. Always allow the grinder wheel to come to a complete stop and unplug the grinder before cleaning it.
- Never force the grinder along as you work or apply excessive pressure. Use smooth, straight strokes. Maintain a firm grip on the handles when operating.
- Be sure the grinder head has stopped turning before putting the grinder down.

#### WARNING!

When using a tuckpoint grinder as a cutter, use the appropriate blade for the material being cut. For grinding, use 1/4-inch dry-diamond segmented wheels.

### 4.4.0 Using Power Drills and Powder-Actuated Tools

Usually, masons set bolts to anchor metalwork or wood when the mortar is still pliable. When the mortar is hardened, a power drill or powder-actuated tool is needed. Drilling in masonry takes a combination of power, speed, and hammering, so a 1/4-inch drill is not adequate. A 3/8-inch or 1/2-inch hammer drill, such as the one shown in *Figure 49*, delivers enough power. Carbide-tipped



*Figure 49* Hammer drill.

drill bits are available in several standard sizes. Drills are used to attach wall ties or other anchors to a concrete wall.

Powder-actuated tools (*Figure 50*) are usually designed to drive a specific line of bolts, anchors, and other fasteners. These tools use a small explosive charge to drive a pin or stud into masonry. Specially hardened pins or studs are used. Different charge sizes are available. Manufacturers color-code the powder load charges to identify the strength of the charge. Be sure to learn the color code specific to your tool's manufacturer.

#### WARNING!

Most hammer drills have enough torque to break your wrist. Make sure that you have a firm grip on the side handle when using a hammer drill. You should never hold on to just the main handle. Use both hands to equalize the rotation of the drill.

Some models of powder-actuated tools use compressed air. Do not operate a powder tool without the proper training and credentialing. Always wear appropriate personal protective equipment when working with or around powder-actuated tools.

#### NOTE

OSHA requires that all operators of powder-actuated tools must be qualified or certified by the tool manufacturer. Operators must carry certification cards whenever using the tool.



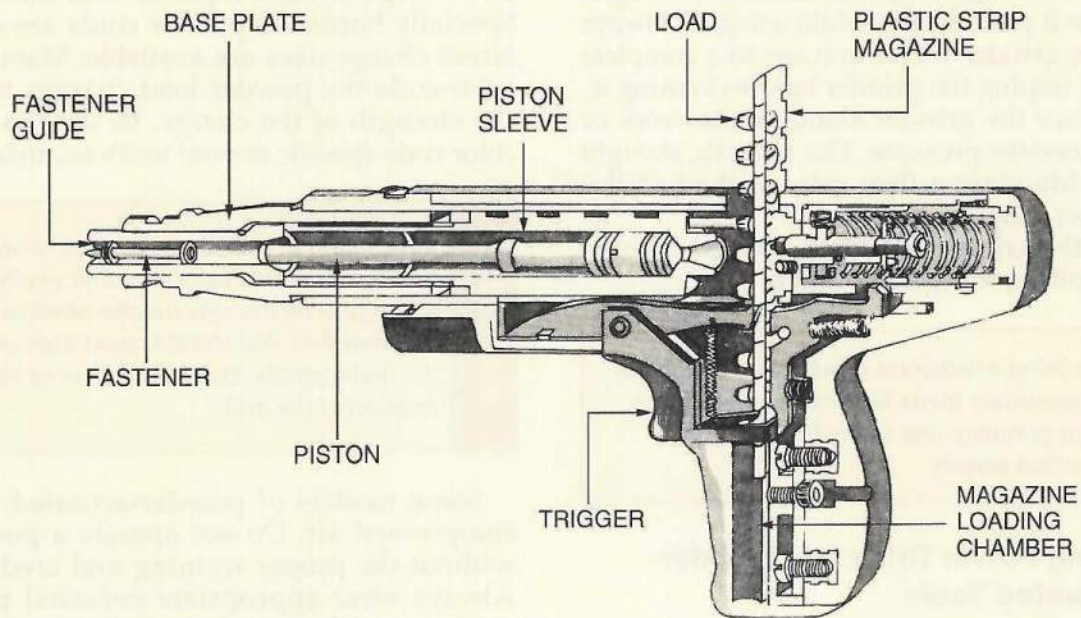
*Figure 50* Powder-actuated tool.





## Powder-Actuated Tools

A powder-actuated fastening tool is a low-velocity fastening system powered by gunpowder cartridges, commonly called boosters. Boosters often come in a strip called a magazine. This cut-away diagram of a powder-actuated fastening tool shows how the components work together.



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## Powder-Actuated Tool Safety

When using powder-actuated tools, always follow these rules:

- Do not use a powder-actuated tool unless you are certified.
- Follow all safety precautions in the manufacturer's instruction manual.
- Always wear safety goggles and a hard hat when operating a powder-actuated tool.
- Use the proper-size pin for the job you are doing.
- When loading the tool, put the pin in before the charge.
- Use the correct booster (powder load) according to the manufacturer's instructions.
- Never hold your hand behind or near the material you are fastening.
- Never hold the end of the barrel against any part of your body or cock the tool against your hand.
- Do not shoot close to the edge of concrete.
- Never attempt to pry the booster out of the magazine with a sharp instrument.
- Always wear ear protection.
- Always hold the muzzle perpendicular (90 degrees) to the work.





## Additional Resources

"Tuckpointing and Repointing Tools: Specialized Tools for Removing and Replacing Mortar." Brett Martin. *Masonry Magazine*, September 2008.

[www.masonrymagazine.com/9-08/tools.html](http://www.masonrymagazine.com/9-08/tools.html)

"Using Masonry Saws." Norton Construction Products North America. [www.nortonconstructionproducts.com/solutions/masonry-saw.aspx](http://www.nortonconstructionproducts.com/solutions/masonry-saw.aspx)

## 4.0.0 Section Review

1. To prevent them from overheating and burning up, diamond blades can be \_\_\_\_\_.
  - a. sanded
  - b. lubricated
  - c. balanced
  - d. irrigated
2. To cut brick with more precision than a brick hammer or brick set, use a \_\_\_\_\_.
  - a. chop saw
  - b. tuckpoint grinder
  - c. masonry splitter
  - d. powder-actuated tool
3. The groove cut by a grinder is called a \_\_\_\_\_.
  - a. kerf
  - b. tuck
  - c. point
  - d. maul
4. Usually, masons set bolts to anchor metalwork or wood when \_\_\_\_\_.
  - a. the mortar is dry
  - b. the metalwork or wood is installed
  - c. the mortar is still pliable
  - d. holes have been drilled first





## SECTION FIVE

### 5.0.0 POWER EQUIPMENT

#### Objective

Identify power equipment used in masonry.

- Describe how to use a mortar mixer.
- Describe how to use a masonry pump, vibrator, and hydraulic grout placer.
- Describe how to use pressurized cleaning equipment.

#### Performance Task 3

Use the correct procedures for fueling and starting a mixer.

Power equipment, like power tools, bring speed and economy to the masonry building process. When using power equipment, follow the general rules for power-tool safety. Fuels such as gasoline, liquid propane (LP) gas, and diesel fuel are capable of causing a fire or explosion if not handled properly. In addition, LP gas is stored in cylinders under pressure, creating an explosion hazard if the cylinder is exposed to extreme heat or fire. It is very important to keep these fuels away from any source of fire and to keep the areas in which the forklift is used free of any flammable materials. There are specific precautions that must be taken to avoid the possibility of a fire or explosion.

The best way to prevent a fire is to make sure that the three elements needed for fire (fuel, heat, and oxygen) are never present in the same place at the same time. Here are some basic safety guidelines for fire prevention:

- Always work in a well-ventilated area, especially when you are using flammable materials.
- Never smoke or light matches when you are working with flammable materials.
- Keep oily rags in approved, self-closing metal containers.
- Store combustible materials only in approved containers.
- Know where to find fire extinguishers, what kind of extinguisher to use for different kinds of fires, and how to use the extinguishers.
- Keep open fuel containers away from any sources of sparks, fire, or extreme heat.
- Make sure all extinguishers are fully charged. Never remove the tag from an extinguisher; it

shows the date the extinguisher was last serviced and inspected.

- Don't fill a gasoline or diesel fuel container while it is resting on a truck bed liner or other ungrounded surface. The flow of fuel creates static electricity that can ignite the fuel if the container is not grounded.
- Always use approved containers, such as safety cans, for flammable liquids.

#### 5.1.0 Using a Mortar Mixer

On most commercial jobs, mortar is mixed in a powered mortar mixer. The mixer has an electric or gasoline engine and is usually on a set of wheels, as shown in *Figure 51*. The mixer portion consists of a drum with a turning horizontal shaft inside. Blades are attached to the shaft and revolve through the mix. The dump handle and drum release are used to empty the mortar onto a pan or board. Mixing mortar using a power mixer is explained later in the module entitled *Mortar*.

#### CAUTION

Check the oil, gas, and other fluid levels every time you use a mixer with a gasoline engine. Running out of gas with a batch of mortar in progress will spoil the batch and could damage the machine.

#### WARNING!

Always wear eye protection and other appropriate personal protective equipment when using a power mixer. Never place any part of your body in the mixer.



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Figure 51 Mortar mixer.





Mixers have capacities ranging from 1 to 12 cubic feet; the typical mixer holds about 4 cubic feet. The mixer drum needs to be washed out immediately after each use to keep mortar from hardening inside it.

**WARNING!**

Never place your hands inside the drum when the mortar mixer is starting or operating.

**WARNING!**

Never service a mixer when it is operating. Make sure that the mixer has stopped rotating and is disconnected from its power source and that the engine or motor has been allowed to cool before attempting to service the mixer.

### 5.2.0 Using a Masonry Pump, Vibrator, and Hydraulic Grout Placer

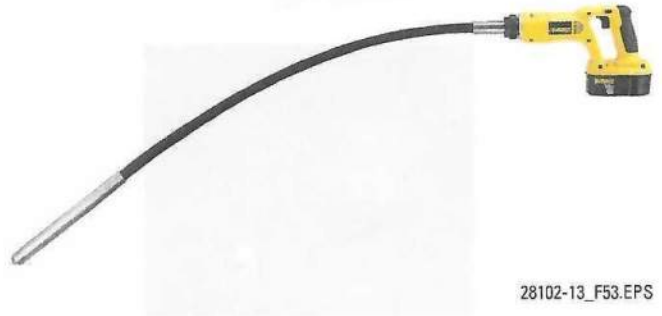
The masonry pump (Figure 52) is used to deliver mortar or grout to a high location. Grout is usually pumped when it is used to fill the cores in a block wall. Grout is pumped from the mixer to the intake hopper of the grout pump to the delivery hose.

At the deposit site, the mason guides the grout into the cores. After the grout is delivered, it is sometimes vibrated to eliminate air holes. A typical handheld vibrator is shown in Figure 53. The snake-like end of the vibrator is inserted into the core. The mason inserts the vibrator into each core to make sure that air pockets are removed and the



28102-13\_F52.EPS

Figure 52 Masonry pump.



28102-13\_F53.EPS

Figure 53 Handheld vibrator.

grout is consolidated. Steel reinforcement may also be placed in the cores before the grout is added.

A hydraulic grout placer uses a piston pump operated by a gasoline engine to pump grout, concrete, and other aggregate materials through a hose, which the mason directs (Figure 54). Hydraulic grout placers are used to pump grout to high elevations, over long distances, and around obstacles, which saves time and labor.

## Mortar Mixer Safety

When using a mortar mixer, always follow these rules:

- Always wear appropriate personal protective equipment when operating a mixer.
- Never operate a mixer without proper training first.
- Do not use accessories or attachments that were not designed for the particular make and model of mixer that you are using.
- Ensure that all emergency and safety devices are connected and working before operating the mixer.
- Never fill the oil level higher than what is specified in the manufacturer's instructions.
- Ensure that the belt, blades or paddles, and dumping mechanism are all in working order according to the manufacturer's instructions.
- Place the safety grate into position and ensure that it is fitted properly.
- Ensure that the air filters are clean and properly sized for the mixer.
- If the mixer is gasoline powered, ensure that the engine is properly ventilated to prevent the buildup of toxic exhaust gases. Never touch the manifold, cylinder, or muffler when hot.
- When cleaning the mixer, dispose of all excess mortar properly in accordance with the manufacturer's instructions and the standards and regulations of your jurisdiction.







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Figure 54 Hydraulic grout placer.

### 5.3.0 Using Pressurized Cleaning Equipment

Pressurized cleaning equipment has effectively replaced bucket-and-brush cleaning for masonry structures. Pressurized cleaning uses abrasive material under pressure to scour the face of the masonry. The generic equipment for pressurized cleaning includes an air compressor, a tank or reservoir for pressurizing, a delivery hose, and a nozzle or tip. There are two types of pressurized cleaning systems: pressure washing and sandblasting. The systems differ primarily in the type of abrading material they deliver. The following sections describe these two pressurized systems in detail.

#### WARNING!

Pressurized cleaning equipment creates dangerous conditions. Read the manufacturer's operating manual before using. Make sure that you know how to use all pressure-release valves and safety switches. Wear safety glasses and other appropriate personal protective equipment.

#### 5.3.1 Pressure Washing

Pressure washing (Figure 55) can be the gentlest method for cleaning masonry structures. Also



28102-13\_F55.EPS

Figure 55 Typical pressure washing operation.

called high-pressure water cleaning, this is a newer cleaning technique. The pressure washer uses a compressed air pump to pressurize water and to deliver it in a focused, tightly controlled area. Sometimes pressure washing is done after manual cleaning.

Pressure washing has the best results when the operator uses a fan-type tip, dispersing the water through 25 to 50 degrees of arc. The amount or volume of water has more effect than the amount of pressure. The minimum flow should be 4 to 6 gallons per minute (gpm). Usually, the compressor should develop from 400 to 800 pounds per square inch (psi) water pressure for the most effective washing. It is important to keep the water stream moving to avoid damaging the wall.

Pressure washing can be used in combination with various cleaning compounds. Training and practice are necessary to properly control the mix of proprietary cleaners, pressure, and spray pattern. Figure 56 shows what can happen when pressure washing is done incorrectly. Improper pressure washing technique can remove finish and even score brick, resulting in costly repairs.

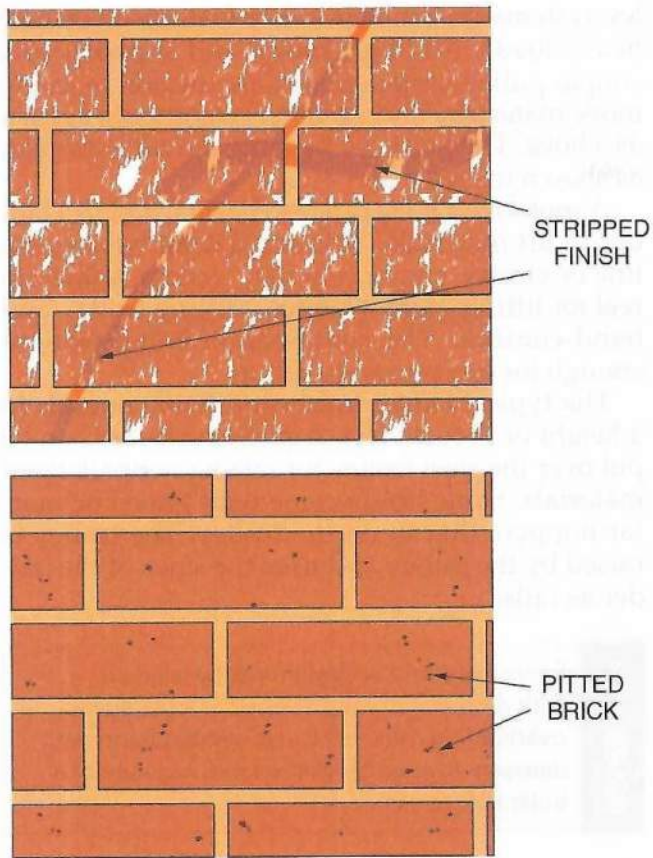
#### 5.3.2 Sandblasting

Sandblasting is the oldest method of pressurized cleaning. It has the most capability of damaging or scarring the brick face, and so it is rarely used. Because sandblasting can deface brick, it is best done by a trained operator.

Sandblasting employs abrasives, such as wet or dry grit, round or sharp-grained sand, crushed nut shells, rice hulls, egg shells, silica flour, ground corncobs, and other softer abrasives.







28102-13\_F56.EPS

Figure 56 Results of improper pressure washing.

## Additional Resources

"Gilson Mortar Mixers by Cleform Tool." 2005. Construction Complete. [www.youtube.com/watch?v=ppMp8Upibz4](http://www.youtube.com/watch?v=ppMp8Upibz4)

"Pressure Washing Tips, Tricks And Techniques." 2011. PowerWash.com. [www.powerwash.com/articles/pressure-washing-tips-tricks-and-techniques-2.html](http://www.powerwash.com/articles/pressure-washing-tips-tricks-and-techniques-2.html)

## 5.0.0 Section Review

1. Wash mixer drums \_\_\_\_\_.
  - a. immediately after each use
  - b. at the end of the workday
  - c. after every third or fourth use
  - d. within 2 hours of each use
2. To remove air bubbles from grout after it has been placed in a core, use a \_\_\_\_\_.
  - a. mixer
  - b. vibrator
  - c. grout pump
  - d. compressor
3. When pressure washing brick, the amount of pressure has less effect than \_\_\_\_\_.
  - a. the height of the wall being washed
  - b. the dispersal pattern of the water spray
  - c. the rating of the compressor
  - d. the amount or volume of water





## SECTION SIX

### 6.0.0 LIFTING EQUIPMENT

#### Objective

Identify lifting equipment used in masonry.

- Describe how to use mounted and portable hoists.
- Describe how to use hydraulic-lift materials trucks.
- Describe how to use forklifts and pallet jacks.

Once the mason's work reaches higher than 4 feet, it is not efficient to work standing on the ground. Lifting equipment provides the mason with an elevated work area, and in some cases can lift the mason, tools, and materials to the work location. An above-grade masonry workstation usually has a mortar pan or mortar-board, the mason's tools, and a stack of masonry units.

Typically, masonry units arrive at the job site bound, bundled, or palletized. Each bundled cube may contain 500 standard brick, or 90 standard block, depending on the manufacturer. Depending on the job, different types of equipment will move the cubes to the workstation. The following sections describe lifting equipment for material handling.

#### WARNING!

Material-handling procedures are some of the most hazardous activities on the job site. Stay clear of moving equipment and material in transport.

The following are some general rules for moving materials safely:

- Establish clear pathways for materials movement.
- Use a consistent set of signals to alert workers to materials movement.
- Do not ride on materials as they are moved.
- Stay out of the area between the moving materials and any wall or heavy equipment.

#### 6.1.0 Using Mounted and Portable Hoists

A pulley system, or block and tackle, is the oldest aid to moving materials. However, simple pul-

ley systems do not have safety features to control heavy loads. Adding a motor and supports to a simple pulley system allows the mason to safely move materials. This system is commonly known as a hoist. The hoist can be mounted on a scaffold, as shown in *Figure 57*.

A motorized hoist can also be attached to a ladder to lift materials. This small hoist has a gasoline or electric engine, a pulley system, a take-up reel for lifting cable, a ladder, a lifting trolley, and hand controls. The combination is lightweight enough for one person to set up.

The typical ladder hoist can lift 400 pounds to a height of 16 to 40 feet. A plywood board can be put over the steel trolley for raising nonpalletized materials. Some hoists come with gravel or mortar hoppers that fit on the trolley. The trolley is raised by the pulley and uses the sides of the ladder as rails.

#### WARNING!

Every hoist and scaffold must be marked with a capacity rating. A hoist can fail due to overloading. This will cause serious injury and damage. Always check the rated capacity of a hoist before use.

A portable materials hoist, also called a buck hoist, is used to lift materials up to a mason on a scaffold (*Figure 58*). The materials hoist includes a lift platform, lift cabling, and a gasoline, diesel, or electric motor. There is usually a pulley system



28102-13\_F57.EPS

Figure 57 Hoist.







28102-13\_F58.EPS

Figure 58 Materials hoist.

as well. The lift platform may have a cage around it. Materials hoists can lift from 1,000 to 5,000 pounds over a vertical distance of up to 300 feet.

Hoists can be mounted on wheels and towed to the job site. Portable hoists can also be mounted on a truck bed. The larger hoists are usually not portable but are attached to the side of the structure being built.

**WARNING!**

Never ride on a materials hoist. Do not use the materials hoist as a work platform. A materials hoist has no safety features or brakes.

Materials hoists are not for lifting people. Personnel hoists have guardrails, doors, safety brakes, and hand controls in addition to the features of the materials hoist. Personnel hoists can be used for materials, but material hoists cannot be used for personnel. A personnel hoist is also known as a man-lift.

## 6.2.0 Using Hydraulic-Lift Materials Trucks

The hydraulic-lift materials truck has a hydraulic boom arm for unloading masonry and other materials. The truck operator lowers stabilizing arms to prevent the truck from overturning. The hydraulic lift arm attaches to the load and swings out to unload each cube of masonry. If the masonry is not palletized, the cubes have openings in the bottom to accommodate the lift arm attachment prongs.

The hydraulic-lift materials truck generally is not used for lifting materials above ground level. It is used to stage materials close to the work site or into a stockpile.

## 6.3.0 Using Forklifts and Pallet Jacks

The most common method for lifting heavy materials on a job site is a forklift. Forklifts have hydraulic lifting arms that move up and down. They are called forklifts because of the fork shape of the prongs on the lifting arm. The prongs fit into the openings in a pallet, a large mortar pan, or the bottom of a cube of masonry. These mobile lifters are used to move masonry from a stockpile to a workstation. The most commonly used forklifts on masonry projects are reach-type forklifts (Figure 59) and skid-steer forklifts (Figure 60). You may also see straight-mast forklifts on occasion (Figure 61). Scissor lifts, boom lifts (also called cherry pickers), and mast lifts are other common types of forklift-style equipment for lifting materials and people.



28102-13\_F59.EPS

Figure 59 Mason's reach-type forklift.







28102-13\_F60.EPS

Figure 60 Skid-steer forklift.



28102-13\_F61.EPS

Figure 61 Straight-mast forklift.

Pallet jacks are specialized for masonry handling. They carry material from a stockpile to a workstation. Some pallet jacks have gasoline, diesel engines, or electric motors, with a hydraulic forklift. There is no seat for the operator, who stands. The load capacity of a typical pallet jack varies from one-half to one cube of masonry. If less than a full cube of masonry is needed, the materials must be stacked on a pallet. Make sure that the materials are secure before they are raised.

Motorized buggies carry mortar and masonry units around the job site. As shown in Figure 62, they are large, motorized wheelbarrows with two or four wheels in front and one wheel in back. The bin dumps its load mechanically. There is a shelf in the back for the operator to stand on as the buggy moves.



28102-13\_F62.EPS

Figure 62 Motorized buggy.

## Additional Resources

"Forklift Safety." 2009. EDG Safety Series.  
[www.youtube.com/watch?v=yx67JVlc2Gw](http://www.youtube.com/watch?v=yx67JVlc2Gw)  
*Forklift Safety Guide*, Publication F417-031-000 (04/07). 2007. State of Washington Department of Labor and Industries.  
[www.lni.wa.gov/IPUB/417-031-000.pdf](http://www.lni.wa.gov/IPUB/417-031-000.pdf)

## 6.0.0 Section Review

- The typical ladder hoist can lift \_\_\_\_\_.
  - 300 pounds
  - 400 pounds
  - 500 pounds
  - 600 pounds
- Hydraulic-lift materials trucks are generally used for lifting materials \_\_\_\_\_.
  - above ground level
  - on inclined surfaces
  - on roofs
  - at ground level
- Pallet jacks do *not* have \_\_\_\_\_.
  - engines
  - lifting arms
  - seats
  - wheels





## SECTION SEVEN

### 7.0.0 SCAFFOLDS

#### Objective

Recognize scaffolds used in masonry.

- Identify scaffold systems.
- Describe how to assemble and disassemble tubular frame scaffold.

#### Performance Task 4

Assemble and disassemble tubular frame scaffold.

**S**caffold is any elevated, temporary work platform. Most masonry jobs require some type of scaffold. As the working level rises above 4 feet, masons cannot work efficiently on the ground. It is cost- and time-effective to raise the mason and the materials close to the work. Masons sometimes erect the scaffold they work on, to make sure it is safe and stable.

All scaffold must be erected, moved, and disassembled under the supervision of a competent person. All scaffold must be assembled according to federal safety regulations. Safety regulations prohibit anyone from working on scaffold without first attending a safety class and obtaining a certification.

#### 7.1.0 Identifying Scaffold Systems

Scaffold can be classified into three broad categories:

- Supported scaffold, which has one or more platforms supported by rigid loadbearing members, such as frames, built on the ground
- Suspended scaffold, which is composed of one or more platforms suspended by ropes anchored to the roof
- Personnel hoists, and other machinery

This section looks at some of the types of scaffold that are most commonly used by masons. These include steel tower, swing-stage, and powered scaffold. When using scaffold of any kind, always follow the manufacturer's instructions and wear appropriate personal protective equipment to ensure that you and your fellow workers stay safe.

#### 7.1.1 Steel Tower Scaffold

Adjustable steel tower, or self-climbing, scaffold (*Figure 63*) is a type of supported scaffold built of vertical members braced or tied to the structure itself. The ties must be positioned 30 feet apart or less. The scaffold framing is attached to the vertical members. Metal planking is used for a working platform, which has guardrail and toe-board safety features, and a winch mechanism. The working platform can be raised as the work progresses. Because it requires attachment to the building, tower scaffold must be put up by specialized workers.

#### 7.1.2 Swing-Stage Scaffold

Swing-stage scaffold is a type of suspended scaffold used on multistory buildings. Steel beams are fastened to the roof, and steel cables are dropped to the ground. A steel cage is suspended from the cables with hangers, and a planking floor is added over the frame. Guardrails, toeboards, and an overhead canopy of plywood or metal mesh



28102-13\_F63.EPS

*Figure 63* Adjustable steel tower scaffold.





## Scaffold Safety

When using scaffold, always follow these rules:

- Platforms on all working levels must be fully decked between the front uprights and the guardrail supports.
- Never exceed the weight-bearing capacity of a scaffold or its components, which OSHA has specified as the ability to support, without failure, the scaffold's own weight plus at least 4 times the maximum intended load.
- The space between planks and the platform and uprights can be no more than 1 inch wide.
- Ensure that there is sufficient clearance between scaffolds and power lines.
- Platforms and walkways must be at least 18 inches wide; the ladder jack, top plate bracket, and pump jack scaffolds must be at least 12 inches wide.
- For every 4 feet of height, the scaffold must be at least 1 foot wide. If it is not, it must be protected from tipping by guying, tying, or bracing per the OSHA rules.
- Supported scaffold must sit on baseplates and mud sills or other steady foundations.
- Access to and between scaffold platforms more than 2 feet above or below the point of access must be made by the following:
  - Portable ladders, hook-on ladders, attachable ladders, scaffold stairways, stairway-type ladders (such as ladder stands), ramps, walkways, integral prefabricated scaffold access, or equivalent means; or
  - Direct access from another scaffold, structure, personnel hoist, or similar surface
- Never use cross braces to gain access to a scaffold platform.

complete the cage. A winch moves the cage up and down, so it is always at the level of the work.

Unlike the other types of scaffold, the swing stage is usually erected by specialists. This type of scaffold is also the safest because the mason is completely enclosed by steel, and there are redundant backup systems on the cabling and brakes.

### 7.1.3 Powered Scaffold

Powered scaffold allows the worker to position a platform in the proper location quickly and easily, perform the necessary work, and then move the platform to the next work location without having to disassemble and reassemble the supporting scaffold each time (*Figure 64*). Powered scaffold uses electrical and gasoline engines to power them.

Powered scaffold is designed for use on paved/slab surfaces, or off-slab. Off-slab lifts are fitted with truck-type tires, or even deep-tread mud-type tires. Some units have oscillating axles and four-wheel drive to maneuver more easily on rough terrain. These lifts have a wide variety of uses in construction and outdoor maintenance. It must be attached to the building at intervals of no more than 30 feet.

Some lifts designed for use on paved/slab surfaces are designed for indoor use and are small enough to fit through interior doorways. Lifts designed for indoor use are battery powered to avoid problems caused by exhaust fumes.



28102-13\_F64.EPS

*Figure 64* Example of powered scaffold.

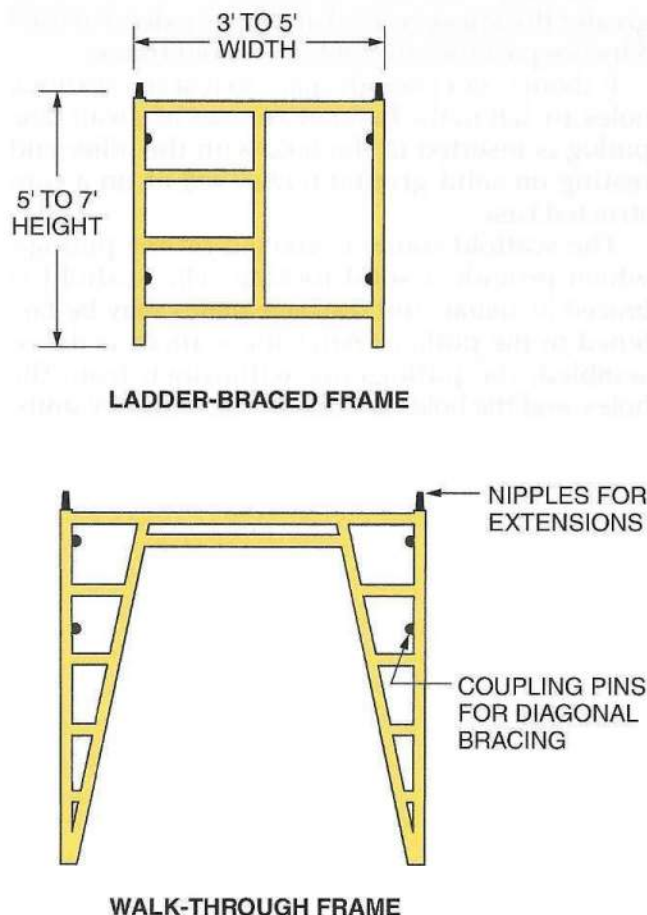
Powered scaffolds have two sets of controls, one on the work platform and a second on the base of the unit. The work platform controls are the primary control station. The base-mounted controls are primarily used in emergency situations. If the worker is injured, the base controls can be used to lower the worker to the ground to provide the necessary assistance. As an additional safety feature, all boom lifts can be lowered even when there is no power to the unit. Be sure to read and understand the manufacturer's operating manual before attempting to use any type of powered scaffold.



## 7.2.0 Assembling and Disassembling Tubular Frame Scaffold

Tubular steel sectional scaffold is the most common type of scaffold. It is strong, light-weight, durable, and easy to erect. The steel frame sections come in several heights, with a typical 4-foot or 5-foot width. As shown in *Figure 65*, two commonly used scaffold frame types are the ladder-braced and the walk-through frames. The walk-through allows the mason an easy passage along the scaffold planks. Tubular steel frame scaffold is used in accessible places with fairly level ground conditions.

Tubular frame scaffold components include frames, locking devices, braces, baseplates, putlogs, casters, platforms and planks, guardrails and gates, and ladders and stairs, and other components. These components may be assembled in a variety of arrangements to meet almost any design configuration. Each manufacturer offers a complete line of components. Never mix components from different manufacturers, because they may not be compatible, or they may be made from dissimilar metals. When dissimilar metals come



28102-13\_F65.EPS

Figure 65 Scaffold frame types.

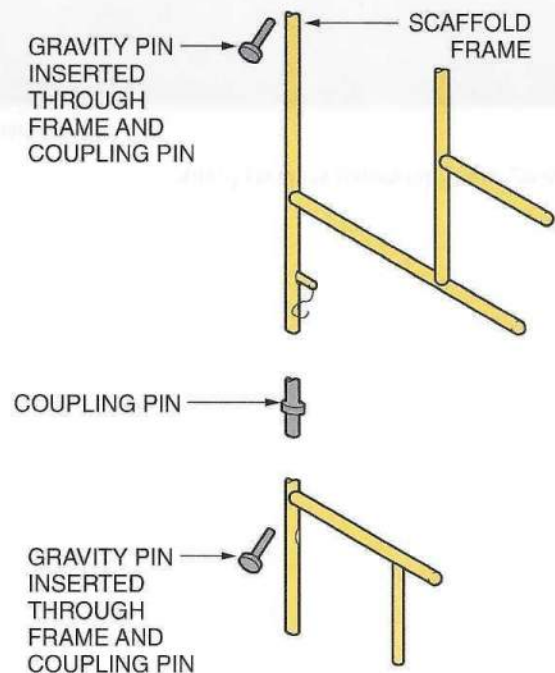
in contact with each other, they may corrode. When using tube-and-clamp scaffolds, always use dual-purpose clamps.

### WARNING!

Exceeding the weight limits of scaffold can cause the scaffold to fail, which can result in injury or death.

As tubular steel sectional scaffold is set up, each frame is connected to the next frame at ground level with a horizontal diagonal brace. In addition, frames are connected at upper levels by overlapping diagonal braces. These overlapping braces must be secured to the frames by a wing nut or bolt or by a lock device that fits over the frame coupling pin.

To connect each section of scaffold framing vertically, a steel pin, or nipple, is inserted into the hollow tubing at the top of the lower section. The bottom of the upper section fits over this pin and is secured with a slip bolt. Each level must be braced as it is installed. All connections must be secured as they are made. Coupling pins (*Figure 66*) must be secured to each of the scaffold frames. A rivet and locking pin is then run through the aligned holes in the scaffold legs and coupling pins. The frames also have attachment points for the diagonal braces. These braces must also be locked in place.



28102-13\_F66.EPS

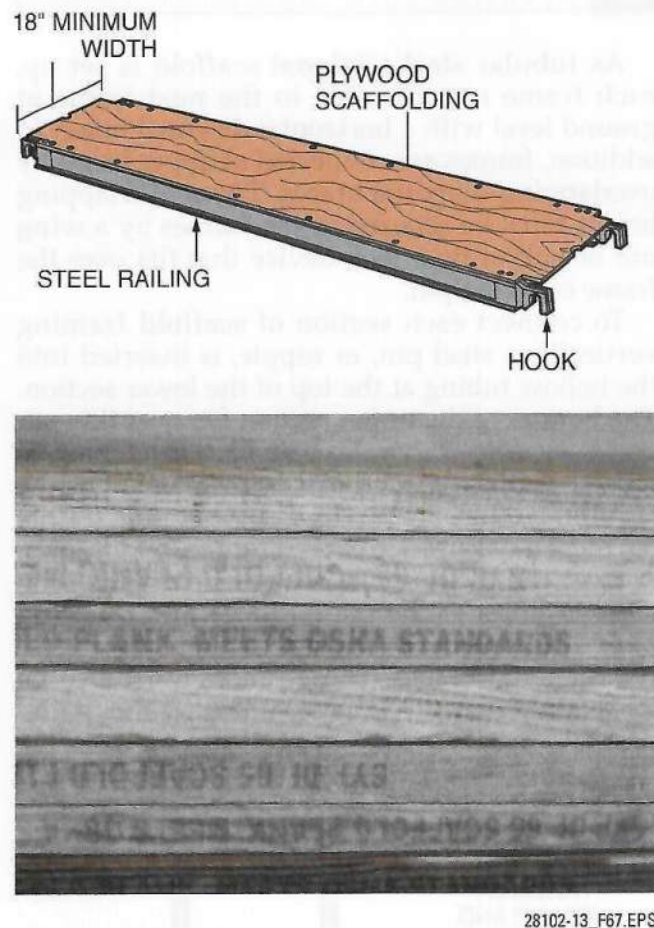
Figure 66 Connecting scaffold sections.





After bracing, the platform flooring or decking is put in place. Regular dimensional lumber planking can be used for the platforms or hook-mounted scaffold planks can be used (*Figure 67*).

Toeboards keep materials from sliding off the platform. Guardrails, to protect masons, must be placed and secured before work from the scaffold can start. Under some conditions, roofboards can



*Figure 67* Hook-mounted scaffold plank.

also be added. The finished product looks like *Figure 68*.

Note that screw jacks have been put under the baseplates. This is a good practice to level the framework after it is assembled. A sill board can be added for ground that is soft, damp, or liable to shift.

Tubular steel framing is very versatile and can be configured many ways with different accessories. Mason's side brackets, or extenders, extend the working area. Wheels are available and can be inserted into the bottom of framing members so that the structure becomes a rolling scaffold. Rolling scaffolds should only be used for pointing and striking joints, not for laying units. Even with wheel locks, they tend to move when heavily loaded with masonry units.

### 7.2.1 Putlog

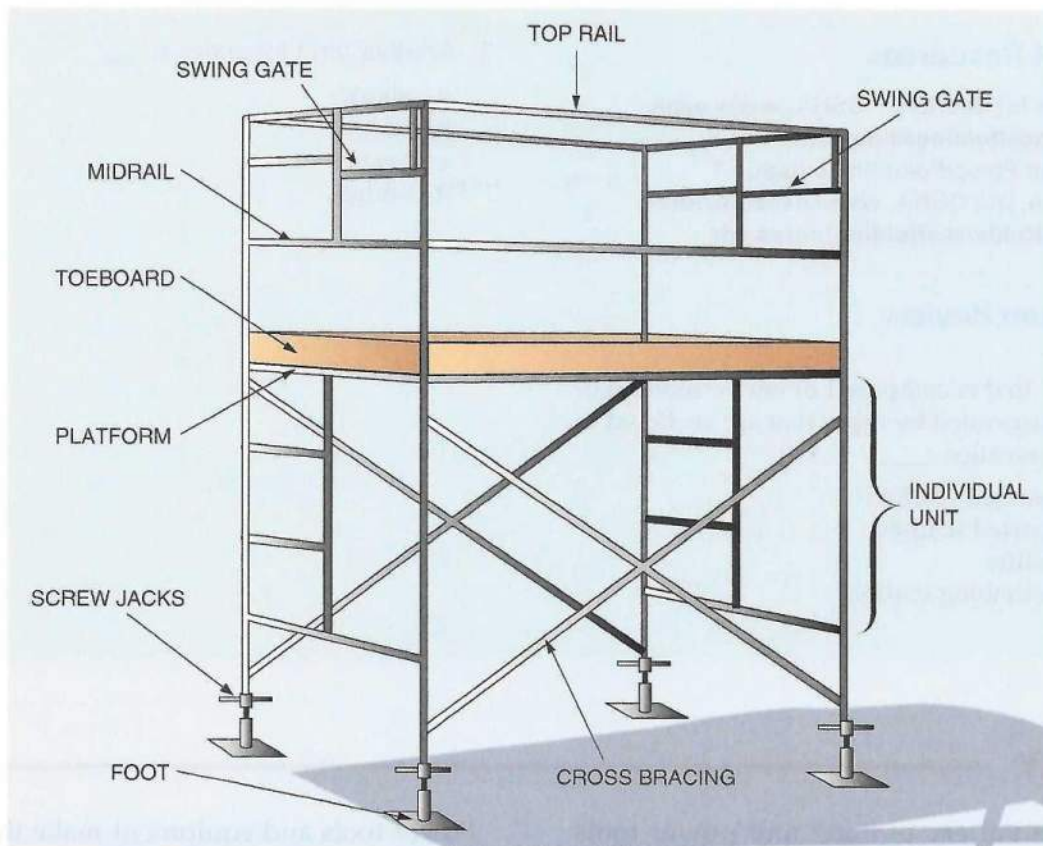
A putlog, sometimes called a bridge, is a wooden beam used to support scaffold. Putlogs are used where there is no solid base on which to set the scaffold frame. Because of grade conditions at the job site, one or more putlogs may be needed to stabilize scaffold. Putlogs are set with their greater thickness vertical and must extend at least 3 inches past the edge of the scaffold frame.

If there is not enough space to rest the scaffold, holes are left in the first few courses of a wall. The putlog is inserted in the hole with the other end resting on solid ground (*Figure 69*) or on a constructed base.

The scaffold frame is erected on the putlogs, which provide a solid footing. The scaffold is braced as usual, and the base plates may be fastened to the putlogs. After the scaffold is disassembled, the putlogs are withdrawn from the holes, and the holes are filled with masonry units.

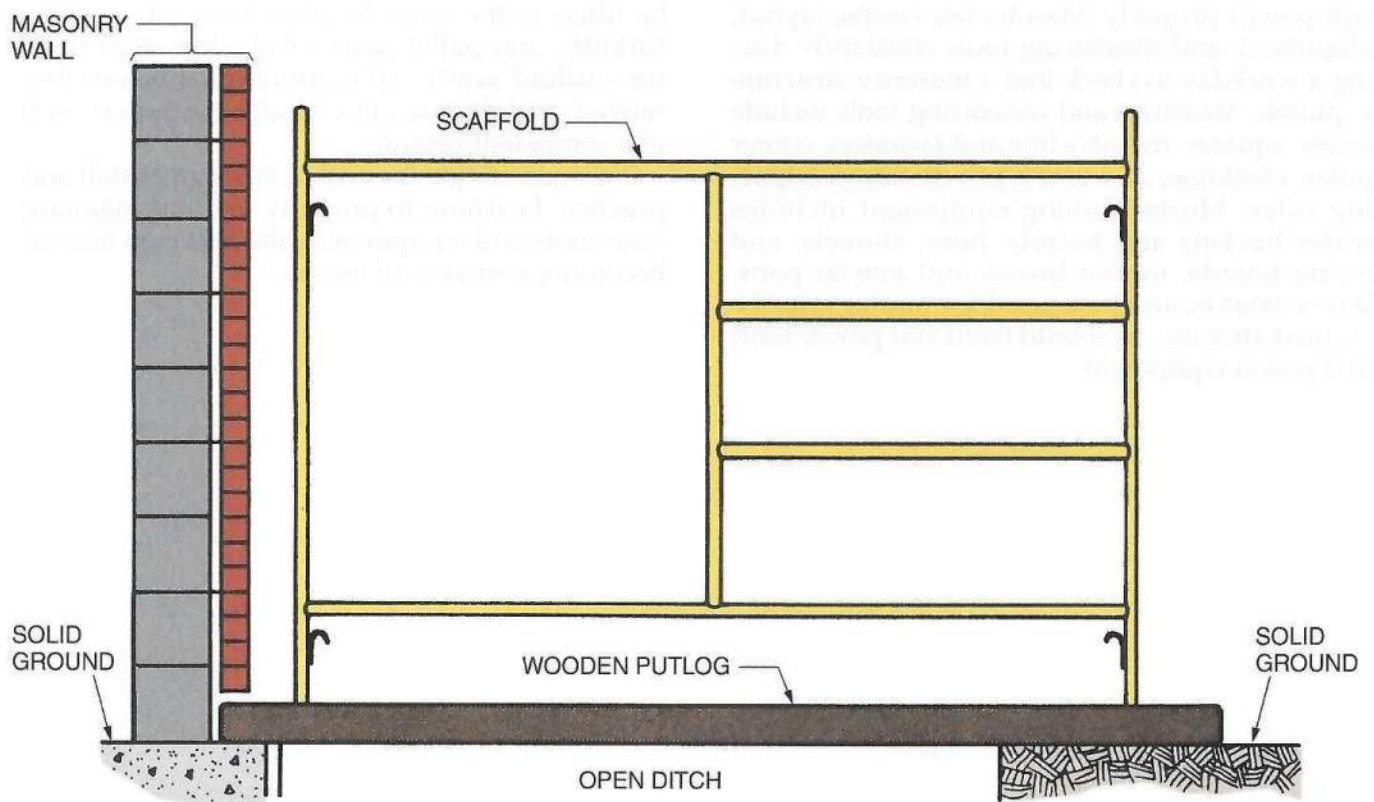






28102-13\_F68.EPS

Figure 68 Completed tubular steel scaffold.



28102-13\_F69.EPS

Figure 69 Putlog at base of scaffold.





## Additional Resources

"Standards for Scaffold." OSHA. [www.osha.gov/SLTC/scaffolding/index.html](http://www.osha.gov/SLTC/scaffolding/index.html)

"Scaffold PowerPoint Presentation."  
Washington, DC: OSHA. [www.osha.gov/dte/library/scaffolds/scaffolding/notes.pdf](http://www.osha.gov/dte/library/scaffolds/scaffolding/notes.pdf)

2. Another term for *putlog* is \_\_\_\_\_.

- a. plank
- b. frame
- c. brace
- d. bridge

## 7.0.0 Section Review

1. Scaffold that is composed of one or more platforms suspended by ropes that are anchored to the roof is called \_\_\_\_\_.
  - a. suspended scaffold
  - b. supported scaffold
  - c. man-lifts
  - d. self-climbing scaffold

## SUMMARY

Masons use a variety of hand and power tools on the job, as well as power equipment, lifting equipment, and scaffold. It is up to you to learn to use and maintain these tools and pieces of equipment properly. Masons use course layout, alignment, and measuring tools constantly during a workday to check that a masonry structure is plumb. Measures and measuring tools include levels, squares, mason's line and fasteners, corner poles, chalkline, and two types of mason's spacing rules. Mortar mixing equipment includes water buckets and barrels, hoes, shovels, and mortarboards, mortar boxes, and mortar pans. Boxes, boards, and pans used for mortar must be cleaned after use, as should hand and power tools and power equipment.

Power tools and equipment make the mason's job easier. Power mixers quickly and thoroughly mix mortar. Power saws and hydraulic splitters are used to cut masonry units. Material needs to be lifted to the work location by hoists, cranes, forklifts, and pallet jacks. OSHA has strict rules for scaffold safety. All scaffold must be erected, moved, and disassembled under the supervision of a competent person.

The mason's job is one that takes great skill and practice. Learning to properly use and maintain your tools and equipment is the first step toward becoming a successful mason.





# Review Questions

- To tap masonry units into place, masons often use their \_\_\_\_\_.
  - brick hammer
  - trowel handle
  - gloved fist
  - brick set chisel
- A London-pattern trowel blade has a \_\_\_\_\_.
  - rounded heel
  - square heel
  - flared heel
  - sharply angled heel
- A duck bill trowel, used for cleanup, may have a blade length of up to \_\_\_\_\_.
  - 8 inches
  - 11 inches
  - 13 inches
  - 15 inches
- An example of a cutting hammer is the \_\_\_\_\_.
  - mash hammer
  - brick hammer
  - bushhammer
  - mallet
- A maul is used to \_\_\_\_\_.
  - face block, stone, or concrete
  - trim tile
  - strike chisels for cutting
  - drive line pins
- The wooden handle of a hammer should be inspected \_\_\_\_\_.
  - before each use
  - daily
  - twice each week
  - weekly
- Chisels used in masonry work are made of \_\_\_\_\_.
  - stainless steel
  - hardened aluminum
  - alloyed brass
  - tempered steel
- The thick, beveled blade of a brick set may be up to \_\_\_\_\_.
  - 5 inches wide
  - 6 inches wide
  - 7 inches wide
  - 8 inches wide
- The tooth chisel should be used only when working on \_\_\_\_\_.
  - soft stone
  - brick
  - hard stone
  - block
- Review Question Figure 1* shows a tooled mortar joint called a \_\_\_\_\_.
  - weathered joint
  - struck joint
  - V-joint
  - raked joint



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**Figure 1**

- The jointers used to tool long horizontal mortar joints are known as \_\_\_\_\_.
  - bedding jointers
  - ski-type jointers
  - extension jointers
  - sled runner jointers
- Masons' tool bags are typically made from \_\_\_\_\_.
  - nylon
  - canvas
  - reinforced polyester
  - fiberglass mesh





13. A brick spacing rule is also known as a(n) \_\_\_\_\_.  
a. course counter rule  
b. modular rule  
c. horizontal joint rule  
d. interval rule
14. Typically, the most expensive of a mason's hand tools is the \_\_\_\_\_.  
a. jointer  
b. brick spacing rule  
c. trowel  
d. level
15. The wooden parts of a folding wood rule should be coated periodically with \_\_\_\_\_.  
a. spar varnish  
b. mineral oil  
c. polyurethane  
d. linseed oil
16. In addition to checking for level, a mason's level is also used to \_\_\_\_\_.  
a. measure joint spacing  
b. check for plumb  
c. check brick height  
d. check squareness
17. The tool used for laying out a 45-degree angle cut is the \_\_\_\_\_.  
a. sliding T-bevel  
b. combination square  
c. chalk box  
d. framing square
18. Compared to a conventional level, the cold beam laser is \_\_\_\_\_.  
a. more difficult to use  
b. less accurate for plumb measurements  
c. less expensive  
d. more accurate over longer distances
19. Some laser levels can project an accurate beam up to \_\_\_\_\_.  
a. 750 feet  
b. 1,200 feet  
c. 1,500 feet  
d. 3,000 feet
20. In the field, the laser level has almost completely replaced the \_\_\_\_\_.  
a. framing square  
b. plumb bob  
c. torpedo level  
d. chalk box
21. Braided mason's line is preferable to twisted line because \_\_\_\_\_.  
a. it will sag less when pulled tight  
b. it abrades less easily  
c. it is less likely to tangle  
d. it costs less per foot
22. Corner block are held in place by \_\_\_\_\_.  
a. dabs of mortar  
b. tension of the mason's line  
c. anchor pins  
d. suction cups
23. A mortarboard is approximately \_\_\_\_\_.  
a. 1' x 2'  
b. 1.5' x 1.5'  
c. 2' x 2'  
d. 3' x 3'
24. A cubic-foot measuring box is sometimes used to measure \_\_\_\_\_.  
a. water  
b. prepackaged mortar mix  
c. sand  
d. aggregate
25. Mortar-mixing tools should be cleaned with \_\_\_\_\_.  
a. dilute muriatic acid  
b. a stiff brush and water  
c. water and coarse steel wool  
d. a strong hose stream
26. An advantage of using a foot control with a masonry saw is \_\_\_\_\_.  
a. use of blade guards can be eliminated  
b. higher productivity  
c. both hands are free to guide the piece being cut  
d. blade speed can be controlled
27. Handheld cutoff saws use blades with a diameter of \_\_\_\_\_.  
a. 7¼ inches  
b. 9 inches  
c. 12 inches  
d. 15 inches
28. A tuckpoint grinder scores or cuts stone and masonry materials using \_\_\_\_\_.  
a. abrasive wheels  
b. nitrile blades  
c. tempered steel blades  
d. fused silicon wheels





29. Large hydraulic splitters can exert a pressure of up to \_\_\_\_.
- 10,000 pounds
  - 10 tons
  - 20 tons
  - 50,000 pounds
30. Drilling in masonry or hardened mortar requires use of a powder-actuated tool or a(n) \_\_\_\_.
- water-cooled drill
  - hammer drill
  - high-speed drill bit
  - anchor setter
31. The tag must never be removed from a fire extinguisher because \_\_\_\_.
- the extinguisher can't be activated without it
  - it shows the expiration date for the contents
  - it contains the operating instructions
  - it shows when the extinguisher was last serviced and inspected
32. The minimum flow rate for a pressure washer should be \_\_\_\_.
- 1–3 gpm
  - 4–6 gpm
  - 7–9 gpm
  - 10–12 gpm
33. Materials hoists can raise a load of 1,000–5,000 pounds to a height of as much as \_\_\_\_.
- 2 floors
  - 160 feet
  - 10 floors
  - 300 feet
34. Powered lifts for indoor use run on battery power to \_\_\_\_.
- keep them small enough to fit through doorways
  - avoid the need for long extension cords
  - eliminate exhaust fumes
  - lower noise levels inside the building





# Trade Terms Quiz

Fill in the blank with the correct term that you learned from your study of this module.

1. Adding water to mortar to replace evaporated moisture and restore proper consistency is called \_\_\_\_\_.
2. A(n) \_\_\_\_\_ is any type of post braced into a plumb position so that a line can be fastened to it. Also called a *deadman*.
3. The act of troweling mortar or a mortar-repairing material, such as epoxy, into a joint after masonry is laid is called \_\_\_\_\_.
4. A(n) \_\_\_\_\_ is a horizontal joint between two masonry units.
5. A(n) \_\_\_\_\_ is a thin coat of mortar or grout on the outside surface of a wall that prepares a masonry surface for attaching veneer or tile.
6. The two corners of a structural unit or wall, built first and used as a position marker and measuring guide for the entire wall, are called the \_\_\_\_\_.
7. \_\_\_\_\_ is the reaction caused by a pinched, misaligned, or snagged tuckpoint grinder wheel that causes the wheel to stop momentarily, propelling the grinder away from the surface and toward the operator.

## Trade Terms

---

Bed joint  
Corner pole  
Kickback

Lead  
Parge  
Pointing

Tempering



## Kenneth Cook

Vice President  
Pyramid Masonry



Ken Cook went to his first masonry project site when he was six years old and has never looked back. Today he is vice president of operations for a major masonry contracting company.

### *Describe your job.*

As vice president of operations, I handle the day-to-day running of the business. I do sales and estimating work as well. I keep my hand in by spending as much time as I can on job sites. I make sure the work is being done to the client's specifications, and I do whatever is necessary to make sure the job stays on schedule and within budget.

### *How did you get started in the construction industry?*

My father was a mason, and he began teaching me the trade when I was just a child. I learned on the job, but I had a long time to learn and a patient teacher to bring me along. Not everyone can count on having the same opportunity, so it's best to learn the proper techniques through a training program before you go on a job.

### *What do you think it takes to become a success?*

In a word, teamwork. There are many tasks to do on the site: mixing mortar, laying block and brick, erecting and moving scaffolds, and keeping masons supplied with materials. Everyone has to do their part, and everyone has to pitch in and do what is needed to keep the job flowing smoothly. If there's one prima donna on a crew, it will drag down the entire crew.

### *What do you enjoy most about your career?*

I enjoy working directly with the crews on the job, especially teaching them proper technique and helping them improve their skills. A company is only as good as its employees, so it's important to make sure every employee is as effective and productive as possible.

### *What would you say to someone just entering the trade?*

Get training. Do it through an apprentice program if you can, but get training in any way possible. Also, listen to experienced people. They can pass on knowledge and tricks of the trade they learned from experience. After you've had a couple of years of experience, you may think you know everything there is to know about the trade. In reality, just about everyone you encounter on the job will have a different perspective. No matter how long you've been in the trade, you will meet people who have ideas and techniques you've never thought of.

### *What does craftsmanship mean to you?*

Craftsmanship is when a person practices a craft with great skill and feels pride upon completion. A craftsman finishes each step correctly before proceeding to the next step. Remember: planning, patience, and accuracy. Finish each step, and then finish the finish. "Close enough" is not an option for a true craftsman.





## Trade Terms Introduced in This Module

**Bed joint:** A horizontal joint between two masonry units.

**Corner pole:** Any type of post braced into a plumb position so that a line can be fastened to it. Also called a *deadman*.

**Kickback:** A reaction caused by a pinched, misaligned, or snagged tuckpoint grinder wheel that causes the wheel to stop momentarily, propelling the grinder away from the surface and toward the operator.

**Lead:** The two corners of a structural unit or wall, built first and used as a position marker and measuring guide for the entire wall.

**Parge:** A thin coat of mortar or grout on the outside surface of a wall. Parging prepares a masonry surface for attaching veneer or tile, or parging can waterproof the back of a masonry wall.

**Pointing:** Troweling mortar or a mortar-repairing material, such as epoxy, into a joint after masonry is laid.

**Tempering:** Adding water to mortar to replace evaporated moisture and restore proper consistency. Any tempering must be done within the first 2 hours after mixing, as mortar begins to harden after 2½ hours.



## Additional Resources

This module presents thorough resources for task training. The following reference material is suggested for further study.

*A Guide to Scaffold Use in the Construction Industry*. 2002. OSHA. <http://www.osha.gov/Publications/osh3150.pdf>

Brick Industry Association YouTube Channel. [www.youtube.com/user/BrickIndustry](http://www.youtube.com/user/BrickIndustry)

*Bricklaying: Brick and Block Masonry*. Reston, VA: Brick Industry Association.

*Building with Masonry: Brick, Block, and Concrete*. Dick Kreh. Newtown, CT: Taunton Press.

*Complete Masonry: Building Techniques, Decorative Concrete, Tools and Materials*. Des Moines, IA: Oxmoor House.

*Concrete Masonry Handbook*. Skokie, IL: Portland Cement Association.

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*Masonry Construction*. David L. Hunter, Sr. Upper Saddle River, NJ: Prentice-Hall.

"Standards for Scaffold." OSHA. [www.osha.gov/SLTC/scaffolding/index.html](http://www.osha.gov/SLTC/scaffolding/index.html)

"Pressure Washing Tips, Tricks And Techniques." 2011. PowerWash.com. [www.powerwash.com/articles/pressure-washing-tips-tricks-and-techniques-2.html](http://www.powerwash.com/articles/pressure-washing-tips-tricks-and-techniques-2.html)

"Scaffold PowerPoint Presentation." OSHA. [www.osha.gov/dte/library/scaffolds/scaffolding/notes.pdf](http://www.osha.gov/dte/library/scaffolds/scaffolding/notes.pdf)

"Tuckpointing and Repointing Tools: Specialized Tools for Removing and Replacing Mortar." Brett Martin. *Masonry Magazine*, September 2008. [www.masonrymagazine.com/9-08/tools.html](http://www.masonrymagazine.com/9-08/tools.html)

"Using Masonry Saws." Norton Construction Products North America. [www.nortonconstructionproducts.com/solutions/masonry-saw.aspx](http://www.nortonconstructionproducts.com/solutions/masonry-saw.aspx)





## Figure Credits

Courtesy of Bryan Light, SA01

Bon Tool Co., Figure 1, Figure 38 (middle)

Courtesy of Marshalltown Company, Figure 2

Bon Tool Company, Figures 3 – 11, Figure 13, Figure 14, Figures 16 – 22, Figure 24, Figure 26, Figure 28, Figure 32, SA02, SA03 (hod), Figure 40, Figure 42, SA04, Figure 43 (bottom), Figure 47, Figure 48

The Stanley Works, Figure 27, Figure 31

Courtesy of Irwin Tools, Figure 29

Laser Reference, Inc., Figure 30

Marshalltown Company, Figure 35

Courtesy Kraft Tool Co., Figure 36 (top), Figure 38 (bottom)

Courtesy of iQ Power Tools, Figure 44

Courtesy of Dennis Neal, FMA&EF, Figure 45, Figure 54 (bottom), Figure 61, Figure 64, Figure 67 (bottom)

Granite City Tools, Figure 46

Courtesy of DEWALT Industrial Tool Co., Figure 49, Figure 53

MULTIQUIP INC., Figure 51, Figure 52, Figure 54 (top)

Courtesy of Northern Tool + Equipment, Figure 55

Beta Max Hoists, Inc., Figure 57

Courtesy of Alimak Hek Group, Figure 58

CareLift Equipment Ltd, Figure 59

Courtesy of Bobcat Company. Bobcat®, the Bobcat logo and the colors applied to the Bobcat vehicle are registered trademarks of Bobcat Company in the United States and various other countries, Figure 60

Courtesy of Multiquip Inc., Figure 62

Photo Courtesy of Safway Group Holding LLC, Figure 63

Unidex, Inc, Figure 69



## Section Review Answer Key

| Answer               | Section Reference | Objective |
|----------------------|-------------------|-----------|
| <b>Section One</b>   |                   |           |
| 1. b                 | 1.1.0             | 1a        |
| 2. d                 | 1.2.1             | 1b        |
| 3. c                 | 1.3.1             | 1c        |
| 4. d                 | 1.4.0             | 1d        |
| <b>Section Two</b>   |                   |           |
| 1. c                 | 2.1.0             | 2a        |
| 2. a                 | 2.2.0             | 2b        |
| 3. b                 | 2.3.0             | 2c        |
| 4. d                 | 2.4.0             | 2d        |
| <b>Section Three</b> |                   |           |
| 1. d                 | 3.1.0             | 3a        |
| 2. a                 | 3.2.1             | 3b        |
| <b>Section Four</b>  |                   |           |
| 1. d                 | 4.1.0             | 4a        |
| 2. c                 | 4.2.0             | 4b        |
| 3. a                 | 4.3.0             | 4c        |
| 4. c                 | 4.4.0             | 4d        |
| <b>Section Five</b>  |                   |           |
| 1. a                 | 5.1.0             | 5a        |
| 2. b                 | 5.2.0             | 5b        |
| 3. d                 | 5.3.1             | 5c        |
| <b>Section Six</b>   |                   |           |
| 1. b                 | 6.1.0             | 6a        |
| 2. d                 | 6.2.0             | 6b        |
| 3. c                 | 6.3.0             | 6c        |
| <b>Section Seven</b> |                   |           |
| 1. a                 | 7.1.0             | 7a        |
| 2. d                 | 7.2.1             | 7b        |





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