CHAPTER TWELVE

# wood screws and screwdrivers

Wood screws are the most versatile of all fasteners because they can be used for so many purposes, such as fastening wood to wood, fastening metal to wood, or attaching all types of hardware and other metal fittings to a wood surface. They have a greater holding power than nails and enable a project to be dismantled at any time without damage to the surrounding wood.

## Wood screw specifications

Different types of wood screws have different distinguishing features or "specifications". Some of these are indicated below. It is necessary to refer to each of them when ordering wood screws.

(*a*) *Metal*
Wood screws for most uses are made of steel; these are often called *brights* because of their shining appearance. Screws are also made from copper and from brass, both of which are more resistant to corrosion than steel.

(*b*) *Size*
The size of a wood screw is determined by its length in millimetres and the diameter of the shank just below the head. This diameter is given in the American screw gauge size. The screw gauge differs from the standard wire gauge in that the 0 size indicates the smallest size. As the gauge size increases, so does the diameter of the screw. This is the reverse of the standard wire gauge. Screws vary in gauge from 0 to 24 and in length from 6 mm to 24 mm in steps of 3 mm, from 24 mm to 75 mm in steps of 6 mm, and from 75 mm to 125 mm in steps of 12 mm.

(*c*) *Shape of the head*
Although there are many wood screws made with various-shaped heads for decorative or other purposes, the three most commonly used shapes are the flat, the oval, and the round (see Figure 12:1).

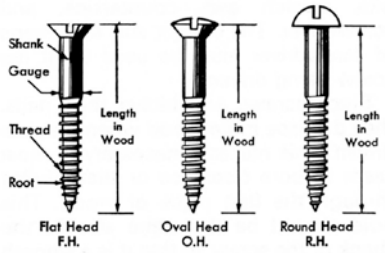



*Fig. 12:1* Types of Screws

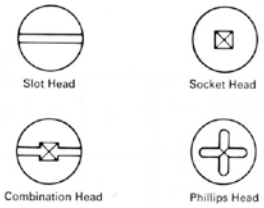



*Fig. 12:2* Impressions in the Heads of Wood Screws

(*d*) *Type of slot*
The type of screwdriver used on wood screws depends on the shape of the recess in the head. Four of these are shown in Figure 12:2.





(*e*) *Finish*
Wood screws are made with various finishes. They may, for example, be chrome-plated, nickel-plated, galvanized, or blued.

(*f*) *Quantity*
Screws are usually sold by the box, each containing one hundred.

Although screws are superior to nails because of their holding power, they are more expensive and require more time and care if they are to be properly installed.

Fastening with wood screws requires the use of some or all of the following tools: hand drill, straight-shanked drill bits, scratch awl, countersink, and screwdriver. The correct size and shape of screwdriver must be used to fit the screw being driven.

Since screws are thicker than nails, they displace more wood when they are driven. This makes it necessary in most cases to bore clearance or shank holes through the first piece of wood. This hole should be the same size as the shank of the screw so that it is a smooth fit. The pilot, or anchor, hole in the second piece is smaller to allow the threads of the screw to cut themselves firmly into the wood. If no pilot holes are bored, the screws may be too hard to turn or they may split the wood. In soft wood or end grain the pilot hole may be made with a scratch awl.

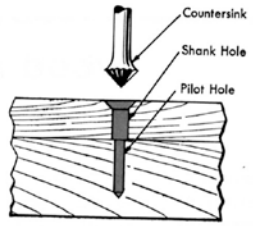



*Fig. 12:3* Pilot Hole for Wood Screw

The table below shows the recommended shank and pilot hole sizes for the commoner gauge sizes of screw. The position of these holes is shown in Figure 12:3.

The sizes listed in the table may not always be the correct ones because of the variation in the hardness of woods. It is a good idea to do a little experimenting with a scrap piece of wood before boring the holes in the finished work. Screws will drive more easily into hard wood if a little soap is rubbed on them.

**Wood Screw Table**

| Gauge No. | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|
| Diam. of Shank Hole (millimetres) | 3 | 3 | 4 | 4 | 5 | 5 | 5 | 12 | 12 |
| Diam. of Pilot Hole (millimetres) | 2 | 2 | 3 | 3 | 4 | 4 | 4 | 4 | 4 |

If flat-head screws are to be used, the top of the head should be set down flush with the surface of the wood. In Figure 12:3 a countersink, which is the tool used for this purpose, is shown.

### How to fasten with screws

(a) Locate the position of the screw. Make a dent with a scratch awl at this point.

(b) Bore the correct size of clearance hole through the first piece. (See table on page 70 for correct size.) Use a straight-shanked drill bit in the hand drill or drill press.

(c) Place the first piece over the piece to be attached to it, and mark the location of the pilot hole with a scratch awl, as shown in Figure 12:4.

(d) Bore the pilot hole the correct diameter (see table). Care should be taken not to bore the hole too deep. It should be slightly shallower than the length of the screw.

(e) If necessary, countersink the hole for the screw head.

(f) Use a screwdriver that fits the slot of the screw snugly. Hold the screwdriver firmly and in line with the centre of the screw. This will tend to prevent it from

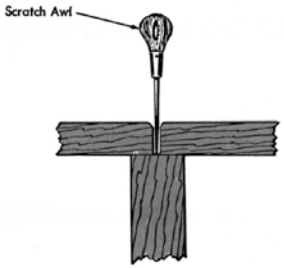



*Fig. 12:4* Locating the Pilot Hole

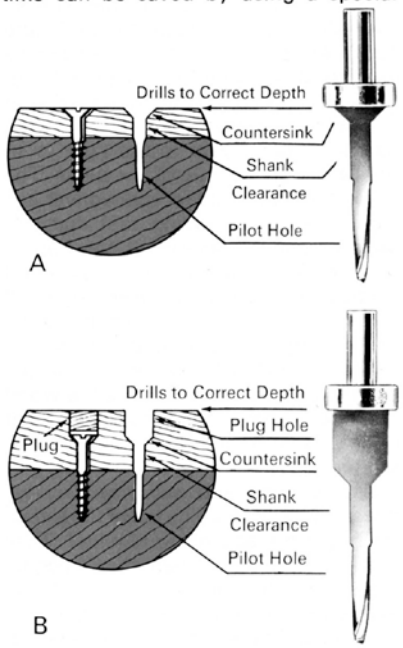
Stanley Tools

*Fig. 12:5* Screwdriver Bit

slipping out of the slot. If the screw is hard to turn or the slot is becoming burred, the pilot hole may not be big enough or deep enough. Remove the screw and enlarge the pilot hole or put a little soap on the screw to serve as a lubricant. A brace and screwdriver bit may be used on large screws where more leverage is required (see Figure 12:5).

If screws are to be completely concealed, they may be set below the surface and plugged, as shown in Figure 12:6.

When a large number of screws of the same size are to be used, much time can be saved by using a special




Stanley Tools

*Fig. 12:6* Boring Tools—Screw Mate Sets





boring tool that bores both the shank and pilot holes and countersinks the shank hole in one operation. Two of these boring tools are shown in Figure 12:6 (A and B). A different boring tool must be used for each length and gauge size of screw.

### Screwdrivers

There are many sizes and types of screwdrivers. The standard straight screwdriver used for slotted screws is shown in Figure 12:7.

The length of blade varies from 50 mm to 450 mm in 25 mm intervals. They have either wood or plastic handles. For driving or removing screws in a restricted area the stubby, or close quarters, screwdrivers are used. These have both a short blade and a short handle with an over-all length of 70 mm (see Figure 12:8). An offset screwdriver may also be used for this purpose (see Figure 12:9).

Many screwdrivers are equipped with a ratchet arrangement, allowing the handle to turn either to the right or to the left independently of the blade. The spiral automatic ratchet screwdriver is a labour- and time-saving tool that will drive or remove screws as the handle is moved up and down. Various sizes and shapes of tips can be used to fit all types of screws. Care must be taken when using this tool, as the blade can easily slip out of the screw slot on the downward stroke and damage the wood or the screw head. The automatic ratchet type is often referred to as the *Yankee screwdriver*.

Socket head and star head screwdrivers come in sets. The larger the screw, the larger the size of tip required. They are not repairable when they become worn. The straight screwdrivers, however, can be reground or filed to shape. If the tip becomes rounded or bevelled, it tends to rise out of the slot and spoil the screw head and often damages the



wood. Figure 12:11 shows a tip th requires grinding and one that is the co rect shape. Note the difference.

In the trade, socket head screws a often referred to as *Robertson* screw and the screws with the star-shape impression as *Phillips* screws because was these companies that developed an manufactured them. However, they a now produced and sold by many oth companies and under other trade name Socket-type wood screws are to a larg extent replacing the slotted head screw in woodworking, especially in industr


Stanley To

*Fig. 12:7* Standard Screwdriver

Millers Falls

*Fig. 12:8* Stubby-Type Screwdriver

Millers Falls

*Fig. 12:9* Offset Screwdriver

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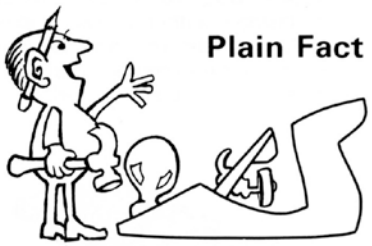
*Fig. 12:10* Automatic Ratchet Screwdrive



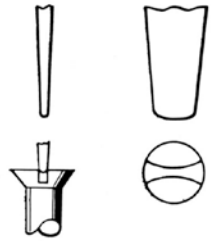
**Plain Fact**

TO PRODUCE NEAT WORK, SCREWDRIVER TIPS MUST BE CORRECTLY SHAPED TO FIT THE SCREW SLOT.

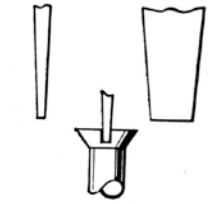
because there is less chance of the screwdriver slipping and burring the head or damaging the wood. The socket head screwdriver point is more adaptable to an electric screwdriver. Slot screws, however, are still the most popular for domestic use.

### Awls

Two aids for installing wood screws are the *brad awl* and the *scratch awl*, which is slightly larger and heavier. Either tool may be used for properly marking the exact screw location. For small screws, such as those used for attaching hardware, the awl may be used to make the pilot hole. The point must be kept sharp.



Improperly Shaped Screwdriver Tip.



Properly Ground Screwdriver Tip.

*Fig. 12:11*

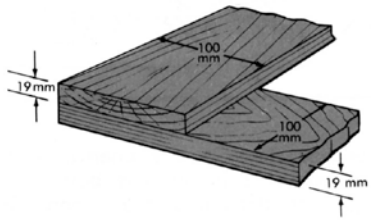
### ASSIGNMENT

1. Why are screws superior to nails as fastening devices?
2. From what metal are wood screws manufactured?
3. How does the American screw gauge differ from the standard wire gauge?
4. How is the size of a wood screw determined?
5. What are the three shapes of screw heads?
6. Why are some screws coated with galvanizing?
7. When ordering screws, what specifications must you list?
8. What hand tools are generally used to insert wood screws?
9. Why is it necessary to bore a clearance hole in the first piece of wood?
10. How does a pilot hole differ from a clearance hole?
11. When is it unnecessary to bore a pilot hole?





12. Give the shank and pilot sizes required for a No. 8 and a No. 10 wood screw.
13. List the first four steps in installing screws in hard wood.
14. What should be done if the screw is too hard to turn?
15. What is the advantage of using (a) a ratchet screwdriver? (b) an automatic screwdriver?
16. What may happen if an improperly shaped screwdriver point is used?
17. What use is made of the scratch awl when fastening with wood screws?
18. If three wood screws are to be used to fasten together the two pieces of softwood shown here, show the location of the screws and state what size screws should be used.



CHAPTER TE

# hammers and nail

## Claw hammers

The tool used for driving nails is the claw hammer, shown in Figure 10:1. It is so named because of the claw shape of the forged head. The claws add weight and balance to the hammer, but their main purpose is for drawing nails. Hammers are made with either a curved claw or a ripping (straight) claw. To prevent the wood from being damaged on the last blow when driving a nail, the driving face of the hammer is slightly rounded.

The size of a hammer is determined by the weight of the head, which may range from 70 g to 570 g. The 340 g size is the most popular light-weight hammer, while the 450 g is the one most used by carpenters. Good hammers are forged from a high grade of steel, and are carefully heat-treated to produce a very hard-wearing finish on the striking surface. The metal in the claws is treated to make them tough but more elastic than the head which allows nails to be drawn without danger of the claws breaking.

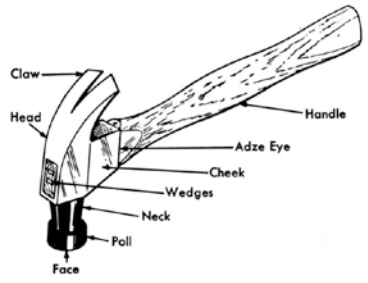



*Fig. 10:1* Claw Hammer

Most hammer handles are made fr
second-growth hickory because t
wood is strong and tough. Hickory a
has a certain amount of spring, whic
necessary for the easy driving of na
The handle is fitted snugly into the ac
eye and secured there by driving me
or wooden wedges into the end of t
handle, as shown in Figure 10:2.

Hammers are also manufactured w
unbreakable metal handles. The he
and the handle is a single forged me
part, while the handle grip is ma
of leather or neoprene, such as that
the hammer shown in Figure 10:3. The
hammers have one disadvantage in t
there is no spring to the solid me
handle. This is most noticeable wh
driving a number of spikes, for the w
becomes tired more quickly.

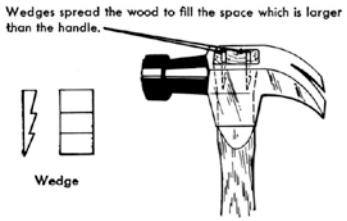



*Fig. 10:2*


*Fig. 10:3* Unbreakable Hammer





*Fig. 10:4* Block Used for Leverage When Drawing a Nail

## Use of the hammer

Although the hammer is one of the most common tools, it is often misused. It should be held at the end of the handle for easy and accurate nailing. (Do not "choke" the hammer.) The face of the hammer head should be kept free of oil, paint, glue, or other material. If this is not done, the striking power is reduced, often causing the hammer to glance off the nail and bend it or to damage the wood. The hammer head can be kept clean by rubbing it with sandpaper or emery cloth.

When you are drawing a nail with a claw hammer, a block of wood should be placed under the claw as shown in Figure 10:4. This protects the wood and provides more leverage. If the nail is a large one, a second block may be required after the nail has been partially withdrawn. The additional leverage gained will make the work much easier and may prevent the handle from breaking.

There are two general methods of nailing: *face nailing* and *toe nailing*. Most nails are driven at approximately 90° to the surface. This is called face nailing, and is illustrated in Figure 10:5. Where

*Fig. 10:5* Face Nailing

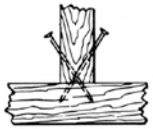


*Fig. 10:6* Toe Nailing

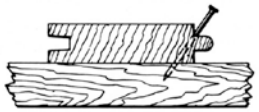


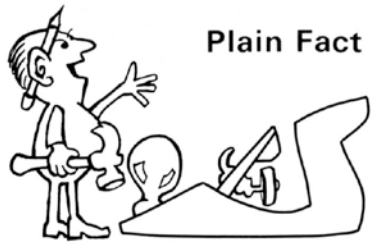
*Fig. 10:7* Edge Nailing

the end of a piece meets a flat surface of another it is often necessary to toe nail the two members together, as in Figure 10:6. Carpenters often use this method when building frame houses. Matched lumber, such as tongue-and-groove flooring, is generally held in place by *edge nailing*, as shown in Figure 10:7.

To prevent splitting, nails should not be driven too close to the edge or end of a board. Staggering the nails, rather than driving them in line with the grain, is a good idea. Drive nails with care and accuracy. Hammer marks on the face of the wood indicate that the job was done by an unskilled person.

## Nail set

If you wish to conceal the nails, a *nail set* should be used. (This tool should not be referred to as a punch.) The specific purpose of a nail set is to drive



**Plain Fact**

DO NOT USE LARGER NAILS THAN ARE NECESSARY TO DO THE JOB.

the nail head below the surface of the wood, so that the hole can then be filled and made almost invisible. Colour-coated panel nails are now being manufactured that resemble very closely the colour of popular prefinished plywoods and wallboards. These nails are driven flush with the surface of the wallboard, thus eliminating the need for setting the nails and filling the holes in the panelling.

Most nail sets are from 100 mm to 125 mm long, with a knurled centre part tapered to a point. The point is cup-shaped to prevent it from sliding off the nail head. There are various point sizes ranging from 1 mm to 4 mm. The nail set used should have a point slightly smaller than the head of the finishing nail being set.

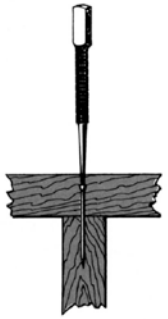


*Fig. 10:8* Using a Nail Set

### Ripping bar

For drawing spikes, or even smaller nails, from hard wood a *ripping bar* should be used. This tool is often called a *pinch bar* or *wrecking bar*. The greater leverage provided by this bar makes the job much easier.

*Fig. 10:9* Ripping Bar

### Nails

For centuries the most common method of fastening wood has been by means of nails. Nails are now such a familiar household article that it is difficult fc us to realize that they were once scarc and difficult to obtain. The first nails wer forged by hand. There are records c metal nails being used as long ago a 1100 B.C., but it was not until 1777 tha a machine was invented to manufacture nails. These nails were stamped out of sheet stock and were called *cut nails* (see Figure 10:11). This type of nail is still being used. In 1835 the first machine to make nails from wire was invented. This ushered in the era of the wire nail as we know it today. Many improvements have since been made in nail manufacture, and the production has been speeded up so that nails are now made at reasonable cost. Wire is fed into an automatic machine at a high speed, and in one operation the head and the point are formed, and the nail is ejected to make way for the next. In this way the machines are capable of producing more than 500 nails every minute.

Most nails are made from steel. However, some are manufactured from brass, copper, and aluminum. These nails are softer and bend more easily than steel nails. They are also more expensive, but do not rust as readily. For this reason they are often used for boat building or whenever there is danger of corrosion.

Nails are made in a great many sizes and shapes for various purposes. Five of the most-used types are shown in Figure 10:10.

*Common nails* are the general-purpose nails used for structural or other heavy work where the nail heads may be exposed. Common nails over 100 mm in length are usually referred to as spikes but are catalogued as common nails.

*Finishing nails*, as the name implies, are used for finishing work where the nail heads should not be exposed. They are generally set below the surface and the hole is filled with a wood filler. Finishing nails less than 25 mm long are called *brads*.

*Flooring nails* have a tapered head that will better fit at the tongue of the flooring board.



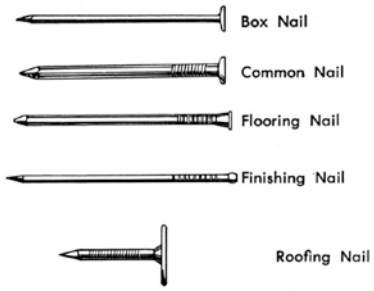



*Fig. 10:10* Types of Nails

*Roofing nails* have a large flat head. They are used on rolled-type roofing materials and are available in various lengths from 18 mm to 38 mm. A variation of these nails is the *shingle nail*, which is somewhat lighter with a smaller head. These are used for wood or asphalt shingles. Roofing nails are often coated with zinc, or galvanized to make them rust resistant.

*Box nails* are similar to common nails but are made from a lighter-gauge wire. They are often coated with a rosin cement, which gives them more holding power. These nails are used mainly for crating and packing boxes.

Nails are now being manufactured with small barbs that dig into the wood to increase their holding power. *Twist* or *spiral* nails are used extensively in building construction. The twisted shank of these nails causes them to thread themselves into the wood as they are driven, thus increasing their holding power. A 60 mm spiral common nail is made from lighter wire than the ordinary 60 mm

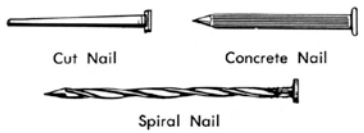



*Fig. 10:11* Special Nails

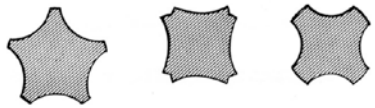


*Fig. 10:12* Sectional View of Deformed Swedish Nails

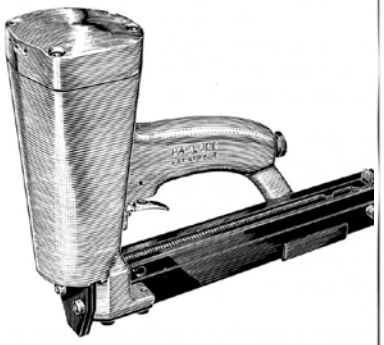
common nail. For this reason, spiral nails do not split the wood as easily as the conventional nail. There are also more nails to the kilogram. Spiral nails are not twisted as they are made, but are manufactured from wire that has already been twisted.

The holding power of nails depends to a large extent on the friction of the wood fibres on the surface of the nail. The nail displaces and compresses the wood fibres as it is driven. The tendency of the fibres to spring back into their original position creates friction, which holds the nail. With this principle in mind, nails are now being made with the largest possible outside area without increasing the gauge or wire size. A sectional view of some of these nails is shown in Figure 10:12. These nails are commonly called *Swedish nails* because of their origin.

*Concrete nails* (Figure 10:11) are extensively used in building construction for nailing wood members to masonry walls. They have been heat-treated to make the metal very hard and thus prevent them from bending. These nails are thicker than the corresponding length of common nail. They are serrated for the full length of the nail to provide more holding power. Although they will not bend easily, they have a tendency to break and fly back while being driven. Safety glasses should be worn when you are driving concrete nails.

Nails are specified by their length, metal, use, and type. They are also referred to by their *penny size*, abbreviated to the letter *d* after the number, e.g., 6 d, 7 d, and 8 d. The term "penny" is an old English one and referred to the weig of 1000 nails, e.g., 1 thousand 8 d na weighed 8 pounds (3.6 kg). The cha below lists the penny size and corre ponding length and gauge for comm nails today.

| *Penny Size* | *Length in Millimetres* | *Wire Gaug Size* |
|---|---|---|
| 2 d | 25 | 15 |
| 3 d | 30 | 14 |
| 4 d | 36 | $12\frac{1}{2}$ |
| 5 d | 44 | $12\frac{1}{2}$ |
| 6 d | 50 | $11\frac{1}{2}$ |
| 7 d | 56 | $11\frac{1}{2}$ |
| 8 d | 62 | $10\frac{1}{4}$ |
| 9 d | 68 | $10\frac{1}{4}$ |
| 10 d | 75 | 9 |
| 12 d | 82 | 8 |
| 16 d | 88 | 7 |
| 20 d | 100 | 6 |
| 30 d | 112 | 5 |
| 40 d | 125 | 4 |
| 50 d | 138 | 3 |
| 60 d | 150 | 2 |



Signode Corporati

*Fig. 10:13* Automatic Nailing Machine





Even the simple operation of driving nails has now been automated. There are several types of automatic nailing devices on the market that are extensively used in building construction and in factories. These range from the spring-operated stapler, used for such jobs as fastening insulation material or ceiling tile in homes, to the heavy compressed-air-operated gun nailers that will drive nails up to 75 mm in length. These guns are easily loaded by inserting strips of nails or staples into the magazine cartridge. They are simple to operate and relatively inexpensive, and save time when large quantities of nails are to be driven. Figure 10:13 illustrates one type of automatic nailing machine. There are many other sizes and types in use and still others are being developed.

## ASSIGNMENT

*Hammers*

1. (a) How is the size of a claw hammer determined? (b) Which size is most used by carpenters?
2. Make a drawing of a claw hammer and name the parts.
3. How is the hammer head secured to a wooden handle?
4. What advantage does a wooden hammer handle have over a metal one?
5. (a) Why should the head of a hammer be kept clean? (b) How can it be cleaned?
6. How can you secure more leverage when pulling nails?
7. Describe two methods of nailing.
8. What is meant by "staggering the nails"?
9. How and why are nail sets used?
10. What is the advantage of using a ripping bar rather than a claw hammer for drawing nails?

*Nails*

11. What are the advantages and disadvantages of copper nails?
12. Make a drawing of four of the most-used types of nails. State the use of each.
13. When should pilot holes be drilled for nails?
14. Why are galvanized nails used?
15. How do box nails differ from common nails?
16. What is the advantage of the spiral nail?
17. Explain why the Swedish-type nail should have a greater holding power than the conventional round nail of the same gauge.
18. In what way do concrete nails differ from common nails?
19. Explain how the wood fibres provide the holding power for the nails.
20. When ordering nails, how do you specify what you want?