Introduction to Hand Tools

Objectives of this Lesson

1) Recognize and identify some of the basic hand tools used in the construction trade

2) How to use hand tools safely

3) Describe the basic procedures for taking care of the hand tools

1) Primitive Pete Video

Introduction 1.0.0

- Every profession has its tools.
- The construction trade has a whole collection of hand tools, such as hammers, screwdrivers, and pliers.
- You need to know how to handle, maintain and store these tools properly

Safety 1.1.0

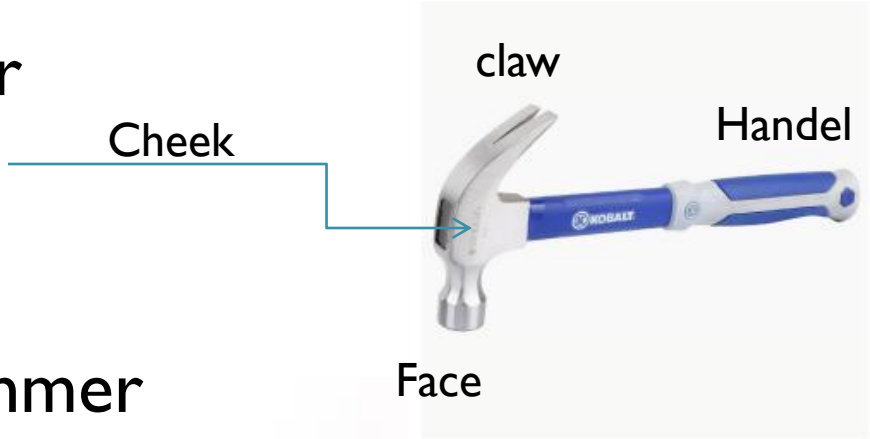
- You must always think about safety
- Before you use a tool you should know how it works and some of the possible dangers of using it the wrong way
- Read the owner and operator manual
- Make certain tools are in good working order
- Never use a worn or damaged tool

Warning

- Always protect yourself when you are using tools by wearing appropriate personal protective equipment (PPE), such as safety gloves and eye protection

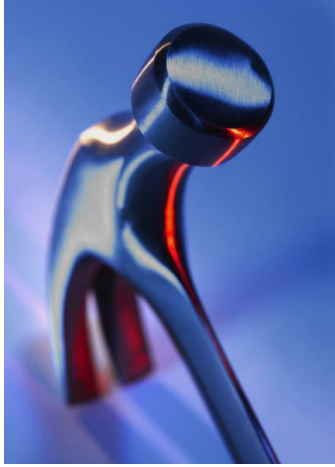
Hammers 2.0.0

- Hammers are made in different sizes and weights for specific types of work
- Most Hammers are classed by weight
- Two of the most common
  - Claw hammer



  - Ball peen hammer

The Claw Hammer 2.1.0



- The claw hammer
  - Has a steel head
  - Has a wood, steel, or fiberglass handle
  - Used to drive nails, wedges, and dowels
  - Use the claw to pull out nails out of wood
- Bell-faced claw hammer
  - A skilled worker can use this hammer to drive the nail head flush without damaging the surface of the work

How to use a claw hammer 2.1.1

- Use the proper hammer for the job
- Grip the handle of the hammer
- Hold the end of the handle even with the edge of the palm
- Rest the face of the hammer on the surface to be struck
- Draw the hammer back and give it a few light taps to start
- Hold the hammer level with the surface and strike it squarely
- Deliver the blow with your wrist, elbow and your shoulder

Claw Hammer 2.1.2

- Slip the claw of the hammer under the head of the nail
- Pull until the handle is nearly straight up
- Pull the nail straight up from the wood

The Ball Peen Hammer 2.2.0

- Has a flat face for striking and a rounded face for aligning brackets
- Used with chisels and punches
- In welding operations used to reduce stress in the weld by peening or the joint as it cools
- Classed by weight-16, 22, 32 oz
- Strongest and best hammers are drop forged
  - Do not use a hammer with a cast head
  - Never use the a hammer to strike the head of another hammer

Physics and the hammer

- The hammer is designed to produce a certain amount of force on the object it strikes
- If you hold the hammer incorrectly you cancel out the design factor
- The distance between your hand and the hammer head affects the force you use to drive a nail
- Make it easy hold the hammer probably

Safety and Maintenance 2.3.0

- No splinters in the handle
- The handle is set securely
- Replace cracked or broken handles
- Face of the hammer is clean
- Don’t hit with the cheek or side of the hammer
- Don’t use chipped or mushroomed
- Don’t hit hammer head together

GLASS

Mallets

- Mallets generally have short handles
- The heads are made of softer materials such as plastic, wood or rubber
- Used to drive another tool with great precision but less force
- Mallet is the best tool when it is important to avoid damaging the object you are striking

Sledgehammers 2.4.0

- Sledgehammer is a heavy-duty tool used to drive posts or other large stakes.
- The head is made of high-carbon steel
- Weighs between 2 to 20 pounds
- Can be long or short handled
- The shape of the head depends on the job the sledgehammer is designed to do

Examples of Sledgehammers

- Double-face Long-handled

- Double-face Short-handled

- Crosspeen

How to use a sledgehammer 2.4.1

- Wear the proper PPE
  - Safety glasses
  - golves
- Inspect the sledgehammer
- Be sure no one is nearby
- Hold the sledgehammer in both hands
- Stand directly in front of the target
- Lift the sledgehammer straight up above the target
- Set the head of the sledgehammer on the target
- Begin delivering short blows to the target and gradually increase the length and force of stroke

Safety and Maintenance 2.4.2

- Wear proper PPE
- Replace cracked or broken handles
- Make sure handle is secure
- Use the right amount of force for the job
- Keep your hands away from the object you are driving
- Don’t swing until you have checked behind you to make sure you have enough room and no one is behind you

Review on hammers

- The most commonly used hammer is _____
  - [redacted]
- This is a heavy duty used to drive post or other large stakes is a
  - [redacted]
- Safest hammers are those with heads that are
  - [redacted]
- The claw of the claw hammer is for
  - [redacted]
- The _____ hammer can drive the nail head flush without damaging the work
  - [redacted]
- The rounded face of the ball peen hammer is used for
  - [redacted]

Ripping Bars & Nail Pullers, Pliers & Wire Cutters 3.0.0

Video-How to use prybar

Trade Term

- **Ripping bar**: A tool for heavy-duty dismantling of woodwork, such as tearing apart building frames or concrete forms.

Ripping Bars 3.1.0

- Also known as a pinch, pry, or wrecking bar.
- Can be 12” to 36” long
- Used for dismantling of woodwork, such as tearing apart building framework
- Typically has two specialized ends; one for prying and one for nail-pulling.

Typical Ripping Bar

Pry Bars

Trade Term

- **Nail puller**: A tool used to remove nails.

Nail Pullers 3.2.0

There are three main types of nail-pulling tools:

1. Cat's Paw (also called nail claws and carpenter's pincers)
2. Chisel Bars
3. Flat Bars

Trade Term

Cat's paw: A straight steel rod with a curved claw at one end that is used to pull nails that have been driven flush with the surface of the wood or slightly below it.

You use the cat's paw to pull nails to just above the surface of the wood so they can be pulled completely out with the claw of a hammer or pry bar.

Cat's Paw

Trade Term

Chisel bars: A tool with a claw at each end, commonly used to pull nails.

A chisel bar has an angled edge on both ends, called a bevel.

Trade Term

- **Bevel**: To cut on a slant at an angle that is not a right angle (90 degrees). The angle or inclination of a line or surface that meets another at any angle but 90 degrees.

Chisel Bar

Trade Term

- **Flat bar**: A prying tool with a nail slot at the end to pull nails out tightly enclosed areas. It can also be used as a small pry bar.

Flat Bar

Other Nail Pullers

How to use a Nail Puller cat's paw 3.2.1

- Wear your PPEs
- Drive the claw into the wood, grabbing the nail head
- Pull the handle of the bar to lift the nail out of the wood

Safety and Maintenance 3.3.0

- Wear PPE
- Use two hands to protect your back
- To prevent injury when pulling a nail be certain the piece is stabilized and will not come loose. That it is braced securely
- When using a pry tool keep balanced footing

Chisels and Punches 4.0.0

- Chisels are used to cut and shape:
  - Wood
  - Stone
  - Or Metal
- Punches are used to indent:
  - Metal
  - Drive pins
  - Align holes

Video-How to use Chisels

Chisels 4.1.0

- A chisel is a metal tool with a sharpened, beveled edge and is used to cut and shape wood, stone or metal
- Two types of chisels we will focus on
  - Wood chisel
  - Cold chisel
- Both types are made of steel and heat-treated to make it harder.
- A chisel can cut any material softer than the steel of the chisel

Examples of Chisels

Wood Chisel

Used to notch wood

Cold Chisel

Used to cut Metal

How to use a wood chisel 4.1.1

- Use a chisel to make opening or notches in wooden material

1. Wear proper PPE (Safety Glases)
2. Outline the opening
3. Set the chisel at one end of the outline with bevel facing into the cut
4. Strike the chisel head lightly with a mallet
5. Repeat at the other end
6. To trim away the notched wood hold the chisel bevel side down and slice inward from one end of recess to the other end

How to use a cold chisel 4.1.2

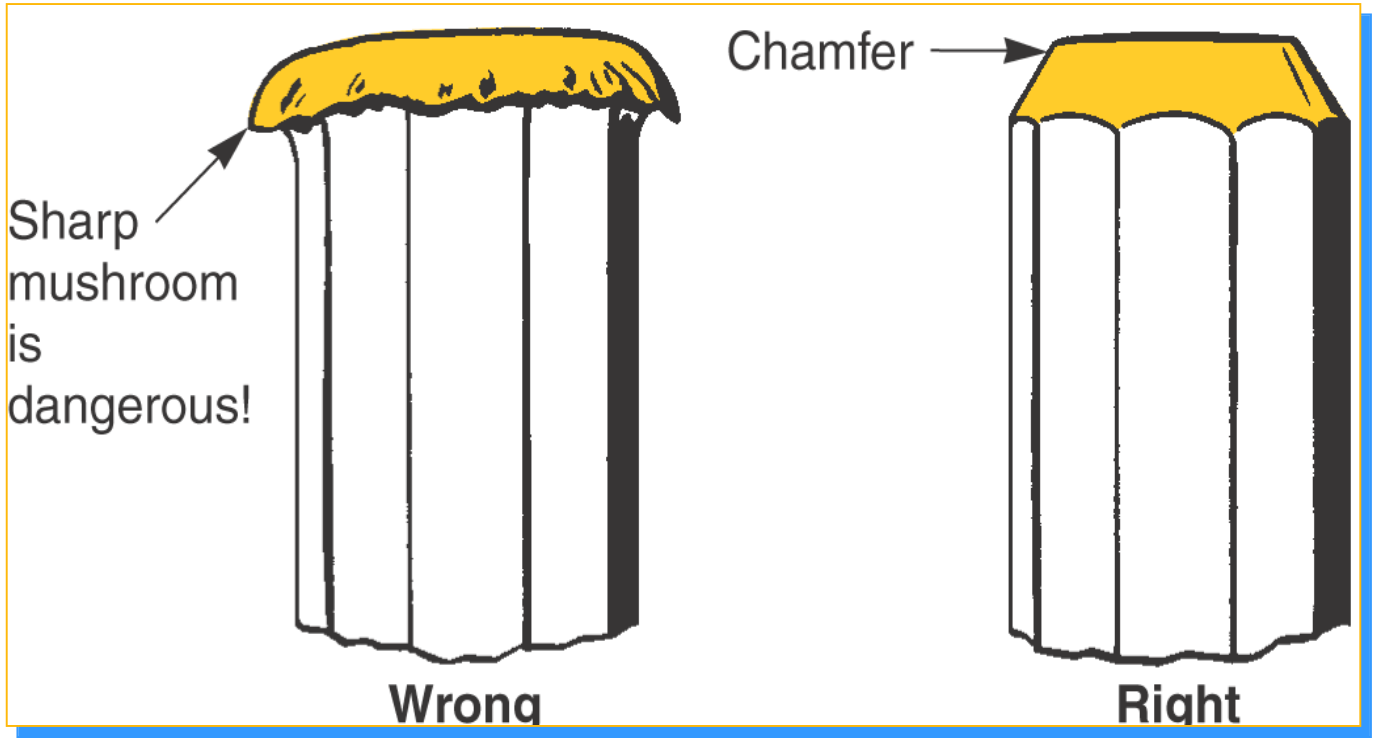
- Cold chisel used to cut metal

1. Wear proper PPE (safety glasses)
2. Secure the object to be cut in a vise if possible
3. Use a holding tool and place the blade of the chisel at the spot to be cut
4. Hit the chisel handle with a ball peen hammer to force into and through the material and repeat as necessary

Safety and Maintenance 4.1.3

- Always wear safety goggles
- Make sure the wood chisel blade is beveled at a 25 degree angle so it will cut well
- Make sure the cold chisel blade is beveled at a 60 degree angle so it will cut well
- Sharpen the cutting edge of a chisel on an oil-stone to produce a keen edge
- Don't use a chisel head or hammer that has become mushroomed or flattened. Looks like a mushroom

Chisel and Punch Rules



Grind off the mushroom and form a chamfer

Punches 4.2.0

- A punch uses the impact of a hammer to:
  - Indent metal before you drill a hole
  - To drive pins
  - To align holes
- Made of hardened and tempered steel
- Three common types of punches are:
  - Center punch
  - Prick punch
  - Straight punch

The center and prick punches are used to make small location points for drilling holes

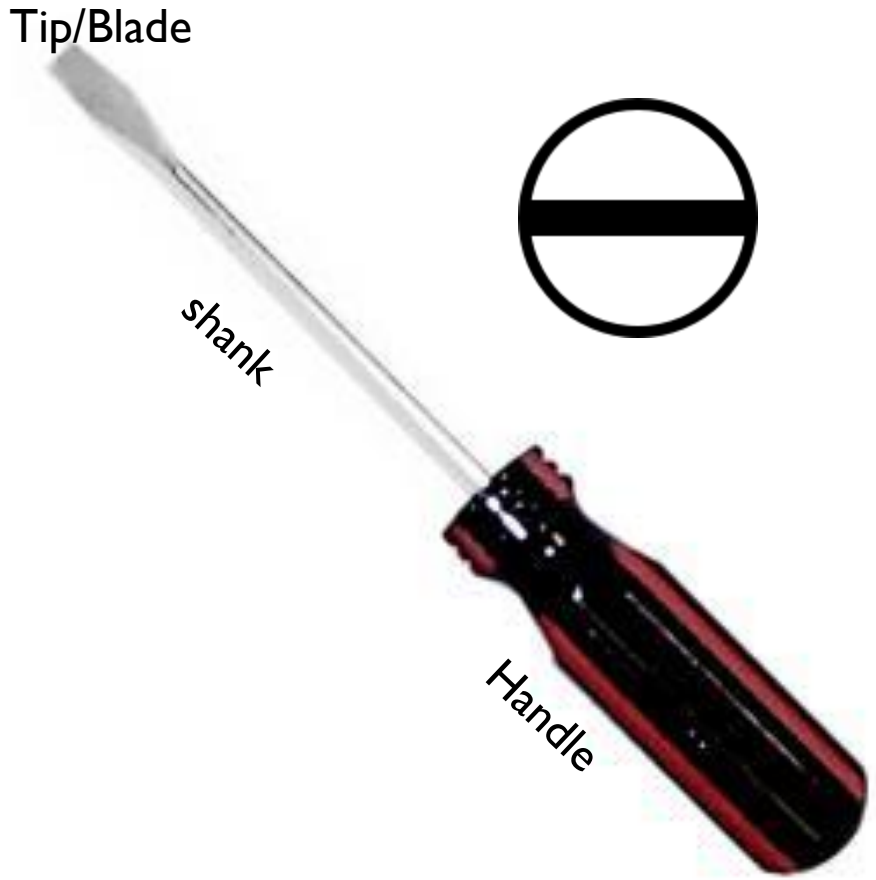
To punch holes in thin metal

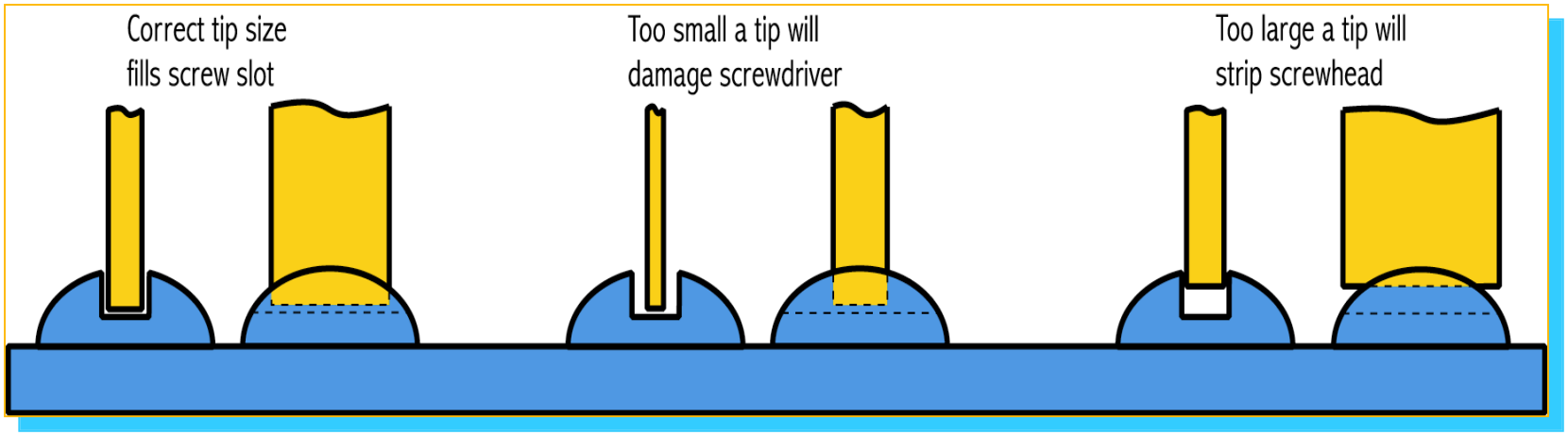
Screwdrivers 5.0.0

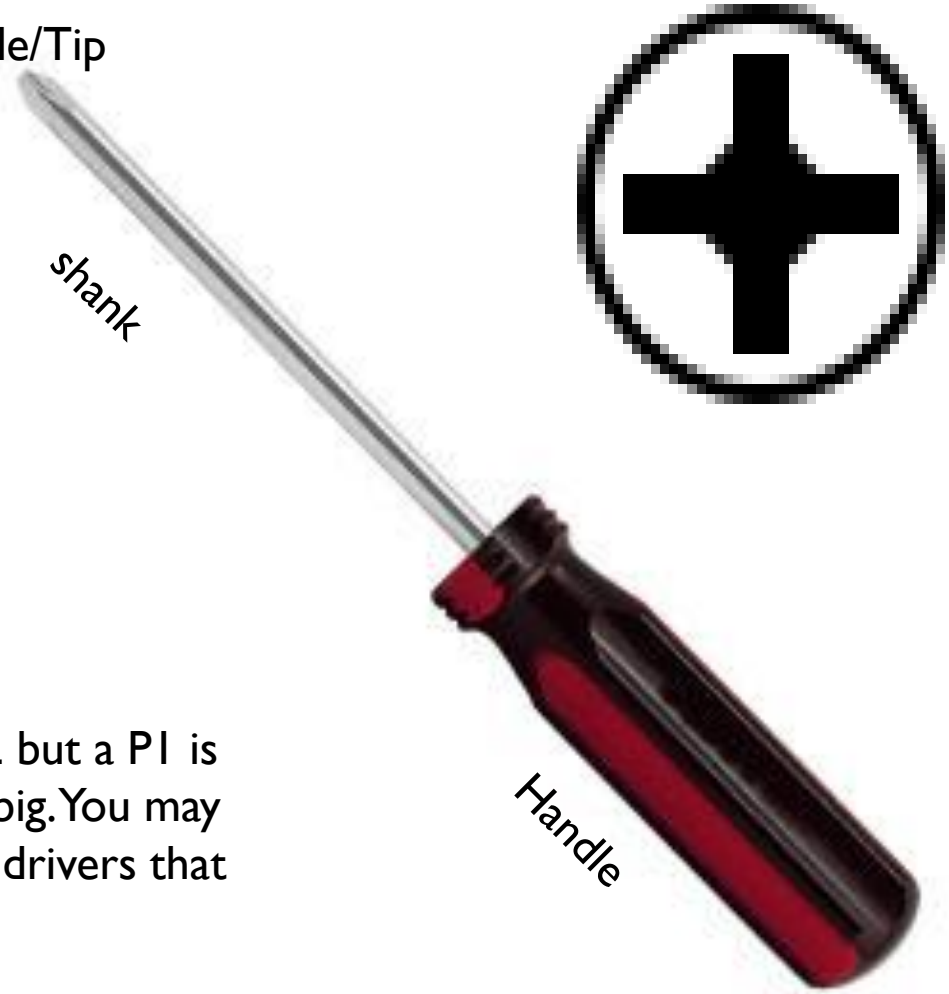
- Used to tighten or remove screws
- Identified by the type of screw it fits
- Six common types of screws
  - Slotted
  - Phillips
  - Clutch-drive
  - Torx
  - robertson
  - allen

Video-Screwdrivers

The slotted Screwdriver is measure by the width of the Blade







The Phillips Head (PH) Screwdriver fits Threaded fasteners with a crosshead

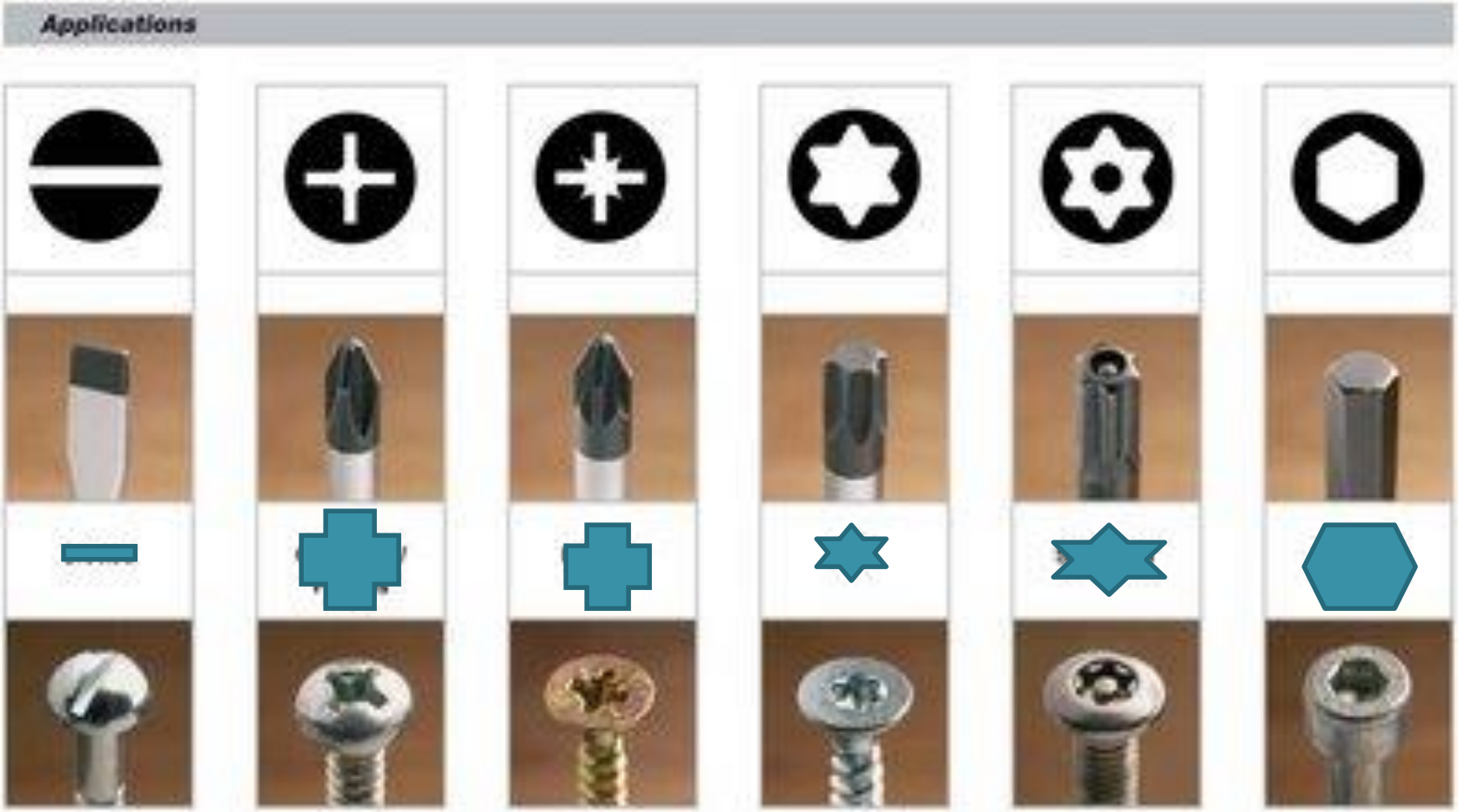
Most common size used is P2 but a P1 is really small and a P3 is really big. You may also find a need for precision drivers that may be extremely small

First Wave 9-12

Classifications of Screws

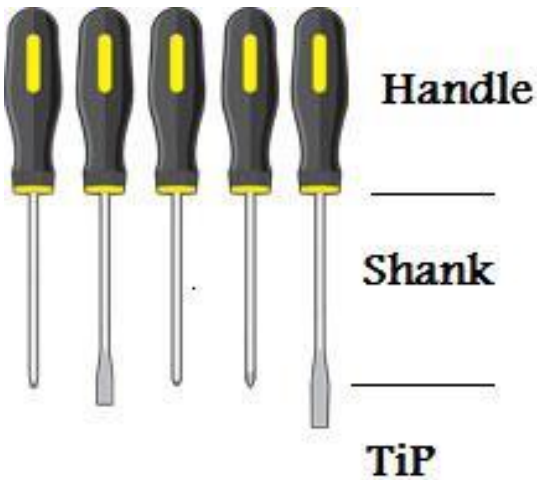
- Slotted-the most common type of screwdriver
- Phillips-the most common type of crosshead screwdriver
- Clutch-drive-has an hour-glass shaped tip used when you need extra holding power
- Torx-has a star-shaped tip that is widely used in automotive industry
- Robertson (square)-provides high torque
- Allen (hex)-works with an hex head wrenches

Some common types of screwdriver tips



Use a screwdriver for the purpose it is intended for. NEVER USE A SCREWDRIVER AS A CHISEL OR PRY BAR

Parts of a screwdriver



Handle- where a person places their hand when using the screwdriver

Shank- section between the handle and the tip. Often times it is round but can be almost any shape

Tip- the part that identifies the type of screwdriver. Whatever the screwdriver fits is the what the screwdriver is called

For safety's sake industrial screwdrivers have tempered steel tips

How to Use a Screwdriver 5.1.0

- The Right-Hand Rule.

- Use your right hand:
  - Make a loose fist.
  - Point your thumb in the direction the screw needs to move.
  - Turn the screw in the rotational direction your fingers are pointing.

- Left Hand Rule for left-hand threads.
- Use your left hand for left-hand threads.

Using a screwdriver 5.1.0

- Choose the right type of blade for the screw head
- Make certain is fits the screw correctly
- Position the shank at a right angle to you work
- Apply firm, steady pressure to the screw head and turn: clockwise to tighten and counter clockwise to loosen (righty-tighty-lefty loosey)

Screwdriver safety and Maintenance 5.2.0

- Keep free of dirt, grease and grit. The blade can slip and cause serious injury
- File the blade tip to restore a worn edge
- Don't ever use a screwdriver near live wires or as a tester
- Don't expose to excessive heat
- Don't use a screwdriver that has a worn or broken handle
- Don't point the screwdriver blade toward yourself or anyone else
- Keep blades turned down in tool pouch
- Do not angle the driver to compensate for an improper fit.

Screwdriver review

- A screwdriver is identified by
  - [redacted]
- The most common standard screwdriver is
  - [redacted]
- The most common crosshead screwdriver is
  - [redacted]
- For safety's sake industrial screwdriver blades are made of
  - [redacted]
- If you use the wrong screwdriver head for the job, you might
  - [redacted]

Pliers and Wire Cutters 6.0.0

- Specialized adjustable wrench
- Scissors-shaped tools with
- Have teeth to grip objects
- Adjustable because the two handles move on a pivot
- Generally used to hold, cut, and bend wire and soft metals
- "Never use pliers on nuts or bolts". They will round off the edges
- Pliers head style depends on their use

Different types of pliers

1. Slip Joint
2. Combination

1. Long Nose
2. Needle-Nose

1. Lineman
2. Side Cutters

1. Slip Joint
2. Tongue & Groove
3. Channel Lock

1. Locking Pliers
2. Vise grip

Slip Joint 6.1.0

- Use pliers to hold and bend wire and to grip and hold objects during assembly
- Have adjustable jaws
- Two Jaw settings
  - One for small settings
  - One for larger materials

How to use slip-joint pliers 6.1.1

- Wear proper PPE
- Place jaws on the object to be held
- Squeeze the handles until the pliers grip the object

Long-nose (needle-nose) pliers 6.2.0

- Used to get into tight places other pliers won't reach or to grip parts that are too small to hold with your fingers
- Useful for bending angles in wire or narrow metal strips
- Sharp wire cutter near the pivot

How to use Long-nose pliers 6.2.1

- Wear proper PPE
- Place your third or little finger inside the handles to keep them open
- To cut wire, squeeze the handles to cut at a right angle to the wire

Lineman (side cutters) 6.3.0

- Have wider jaws than slip-joint
- Used to cut heavy or large gauge wire and to hold work

How to use Lineman pliers 6.3.1

•Wear proper PPE

1. To cut wire always turn the piece t be cut downward
2. Squeeze the handles to cut at a right angle to the wire

Tongue and Groove Pliers 6.4.0

- Have serrated teeth that grip:
  - Flat
  - Square,
  - Round
  - hexagonal
- Can set the jaws in one of five positions by slipping the curved ridge into the desired groove
- Longer handle give more leverage

How to use Tongue-and-groove pliers 6.4.1

- Wear appropriate PPE

1. With pliers open to the largest position place the upper jaw on the object to be held
2. Determine which groove provides the proper position
3. Squeeze the handles unt the pliers grip the object

Locking Pliers 6.5.0

- Locking pliers clamp firmly onto objects the way a vise does
- A knob in the handle controls the width and tension of the jaws
- Squeeze the jaws to lock the pliers
- Release the pliers the lever to open

How to use the Locking Pliers 6.5.1

- Wear proper PPE

1. Place the jaws on the object to be held
2. Turn the adjusting screw in the handle until the pliers grip the object
3. Squeeze the handles together to lock the pliers
4. Squeeze the release lever when you want to remove the pliers

Safety and Maintenance 6.6.0

- Here are some guidelines for all pliers

1. Hold pliers close to the end of the hand to avoid pinching you fingers
2. Don't use cheaters on the handle. Get a bigger set of pliers
3. Wear appropriate PPE. Especially cutting wire
4. Hold the short ends of the wire to avoid flying metal pieces
5. Always cut at right angles
6. Oil pliers regularly to prevent rust and keeping them working smoothly
7. Don't use pliers around energized electrical equipment
8. Don't expose to heat
9. Don't use pliers on Nuts and Bolts
10. Don't use pliers as hammers

Wrenches 7.0.0

- Wrenches are used to turn screws, nuts, bolts and pipes
- Two wrench categories but many types
  - Adjustable-can be expanded to fit different size nuts and bolts
  - Non-adjustable-fit one size
- Come in both:
  - Metric
  - Standard

Non-adjustable wrenches 7.1.0

- Box-end wrenches form a continuous circle around the head of the bolt. Can have 6 or 12 points range from 3/8-15/16
- Open-end wrenches has an opening at each end to allow the wrench to fit in tight places where a box-end can't
- Striking or slugging wrenches are similar to box end, but they have a large area that can be struck by a hammer to loosen or tighten a bolt
- Hex key wrenches are L-shaped with 6 sides (hexagonal). Either end will fit the bolt
- Combination wrench (open-end, box-end)

Examples of Non-adjustable wrenches

1. Combination
2. Open end box end

ratcheting

Open end

1. Hexagonal
2. Allen

1. Slugging
2. Hammer

This list is in no way a complete list of wrenches

How to use a Nonadjustable wrench 7.1.1

- Use the correct size wrench for the nut or bolt
- Always pull the wrench toward you

Adjustable Wrenches 7.2.0

- Designed to fit a variety of sizes of nuts and bolts
- Have one fixed jaw and one movable
- Have an adjusting nut to move the movable jaw
- Come in a variety of sizes from 4” to 24” and open as wide as 2-7/16”

Adjustable wrenches

- Pipe Wrenches

Used for gripping pipe or round stock and the jaws are offset to allow readjustment without removing the tool

- Spud wrenches

Used to line up holes and has smooth jaws to fit smoothly on nuts and bolts

- Adjustable end wrenches

Have smooth jaws to grip nuts and bolts

How to use and adjustable wrench 7.2.1

1. Set the jaws to the proper size to fit the nut or bolt
2. Check to make certain the jaws are fully tightened on the work
3. Turn the wrench so force is applied to the fixed jaw
4. When possible always pull the wrench toward you. If you must push the wrench it may slip and cause injury
5. Keep your hand open to avoid getting pinched

Safety and Maintenance 7.3.0

- Focus on your work
- Pull the wrench toward you shoulder and not your face
- Keep wrenches clean
- Don’t use wrench as a hammer
- Don’t use a wrench beyond its rated capacity-never add an extension bar to increase leverage

Sockets and Ratchets 8.0.0

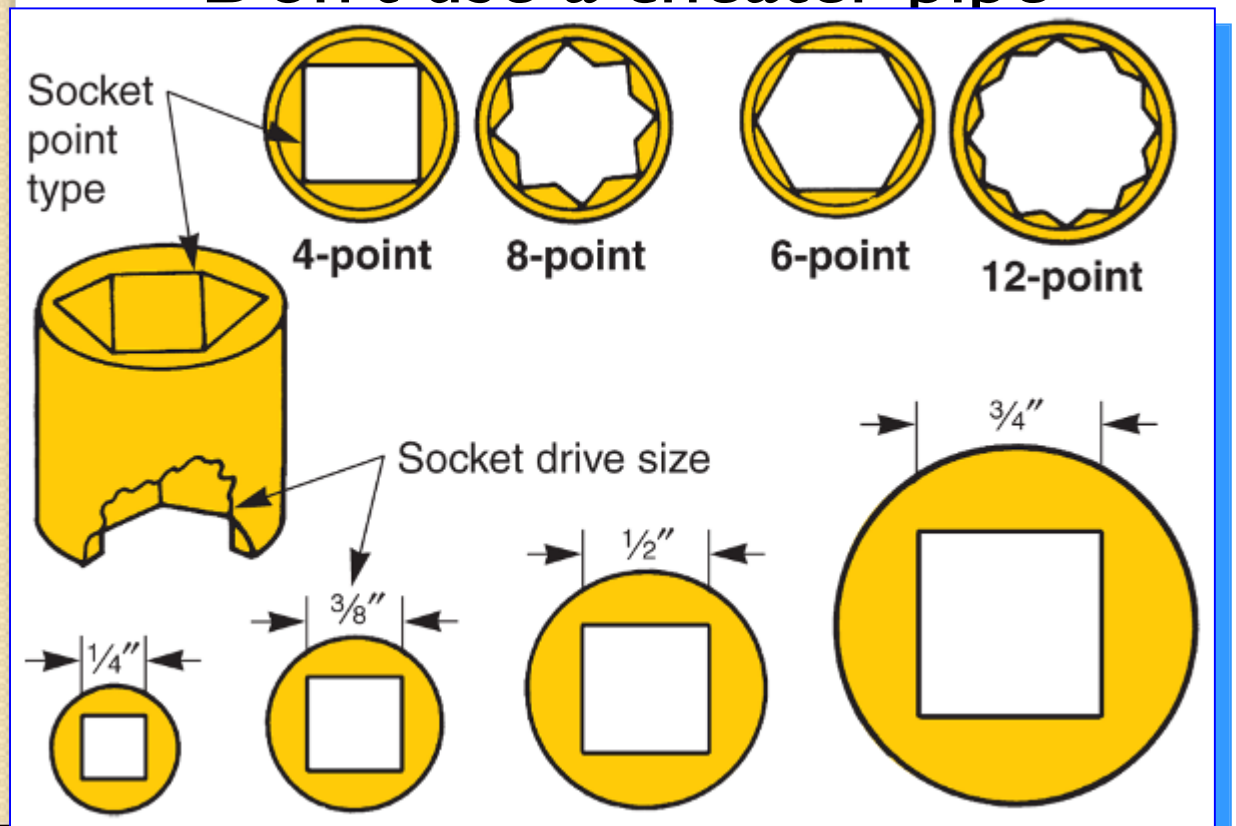
- Most sockets have 6 or 12 gripping points used to grip a nut or bolt
- The socket that fits the handle is square
- Long sockets are called deep well
- The ratchet handle has a small lever that you can use to change the turning direction.

How to use sockets and ratchets 8.1.0

1. Select a socket that fits the fastener you want to tighten or loosen
2. Place the square end of the socket over the spring loaded button on the ratchet shaft
3. Place the socket over the nut or bolt
4. Pull on the handle in the appropriate direction to turn the nut.

Safety and Maintenance 8.2.0

- Never force ratchet handle beyond hand tight
- Don't use a cheater pipe



Torque Wrenches 9.0.0

- Torque-resistance to turning
- Torque wrenches measure resistance to turning
- Used when fasteners must be tightened in sequence to prevent distortion
- Use a torque wrench when a fastener is to be tightened to a specific setting
- Torque is usually stated in inch pounds for small fittings and foot pounds for larger fittings

How to use a Torque Wrench 9.1.0

1. Determine the inch or foot pounds required
2. Set the controls on the wrench to the desired torque (varies with wrenches)
3. Place the torque wrench on the fastener
4. <u>Hold the head of the wrench for support and to make certain the wrench is properly aligned</u>
5. Watch the torque indicator or listen for click (depends on the wrench

Safety and Maintenance 9.2.0

- Follow Manufacturer's recommendations for safety, maintenance and calibration
- Always store in case
- Never use the torque wrench for anything other than what it is designed for.

micrometer torque wrench
twist the handle to setting
tighten until wrench clicks

electronic torque wrench
input setting on screen
tighten until wrench clicks

dial torque wrench
tighten until needle
reads desired torque