Tools and their uses, Naval Education & Training manual (NAVEDTRA 14256), should be read for more detailed information on the proper use of each particular hand tool. For example, using a screwdriver as a cold chisel is extremely dangerous and a mark of poor workmanship and judgment. "The right tool for the right job" is an old proverb, but it is a time proven one.

Safety is paramount when using any tool. Special care should be used with a wood or metal cutting tool. Safety glasses must be in place before cutting tools are used. An organized tool control program will also increase safety for personnel and equipment. Never use the crash tool roll kit for general maintenance—always use the tools designated for divisional use.

Power tools can be dangerous and should only be used by a person who has been fully familiarized with the proper operation. Safety cannot be overemphasized in the use of hand tools or power tools. See Office of the Chief of Naval Operations Instruction (OPNAVINST) 5100.19 (current series) for safety precautions, as well as the manufacturer's safety precautions. Upon completion of this chapter, you will be able to select, use, and maintain tools required for maintenance of equipment; identify the uses for wire rope and various lines; and determine safe workload and breaking strength values of wire rope and various lines.

LEARNING OBJECTIVES
When you have completed this chapter, you will be able to do the following:

1. Identify the different types and proper care of hand tools.
2. Identify the different types of power tools.
3. Describe the uses of different types of power tools.
4. Describe the use of rules and tapes.
5. Describe the proper care of rules and tapes.
6. Describe the purpose of dynamometers.
7. List the safety precautions associated with portable electrical tools, extension cords, and pneumatic tools.
8. Identify the types of personal protective equipment.
9. Describe the types and uses of rigging equipment.
10. State the guiding principle of equipment stowage.

HAND TOOLS
Tools are designed to make a job easier and enable you to work very efficiently. Tools are a craftsman's best friend. (A craftsman is skillful in any one of a number of trades, such as machinist, carpenter, plumber, builder, or steelworker). If the tools are not used or cared for properly, their advantages will be lost.

Regardless of the type of work you have to do, you must use the correct tools to do your work quickly, accurately, and safely. When you do not use the proper tool, you waste time, reduce your efficiency,
and may injure yourself. This section explains the specific purposes, correct use, and proper care of hand tools.

**Screwdrivers**

Screwdrivers are frequently abused as a tool. They should only be used for driving and removing screws. They are not designed for scraping or mixing paint, cleaning padeyes, prying as a bar or chisel, or testing an electrical circuit.

**Standard Screwdriver**

Three main parts make up the construction of the standard screwdriver: the handle, the shank, and the end. The end (called the blade) fits into the screw slot. When you are using a screwdriver, select the proper size blade for the job intended. A blade too large or too small causes the screwdriver blade and the screw head to become damaged. For a proper fit, the blade should fill at least 75 percent of the slot. A standard screwdriver is shown in Figure 1-1.

**Phillips Head Screwdriver**

Phillips head screwdrivers (Figure 1-2) differ in construction from standard screwdrivers only in that the tip is shaped to fit the special cavity in the Phillips screw head. A standard screwdriver must never be used in a Phillips screw head, as damage will occur to the driver. For a proper fit, the blade should fill 100 percent of the cavity.

**Combination joint pliers**

Combination joint pliers (Figure 1-3) are manufactured with straight serrated jaws for gripping objects. The pivots with which the jaws are attached together are adjustable to fit different size objects. Pliers should not be used to grasp the shanks of screwdrivers to gain greater twisting force.

**Diagonal Pliers**

Diagonal pliers (Figure 1-3) are used only for cutting small material such as wire or cotter pins. They are designed specifically for cutting and should not be used for grasping objects such as nuts and bolts.

**Crescent Adjustable Wrenches**

Crescent adjustable wrenches are not intended to replace open-end wrenches, but they are useful in
working in restricted areas. In addition, they can be adjusted to fit odd-sized nuts or bolts. *Figure 1-4* shows one type of crescent adjustable wrench in use today. These wrenches are often referred to as "knuckle busters" because mechanics frequently suffer physical pain as consequences of improper usage of these tools. To avoid accidents, you should follow four simple steps. First, choose a wrench of the correct size; that is, do not pick a large 12-inch wrench and adjust the jaw for use on a 3/8-inch nut. This could result in a broken bolt and a bloody hand. Second, be sure the jaws of the correct size wrench are adjusted to fit snugly on the nut. Third, position the wrench around the nut until the nut is all the way into the throat of the jaws. If it is not used in this manner, the result is apt to be as bloody as before. Fourth, pull the handle toward the side having the adjustable jaw. This will prevent the adjustable jaw from springing open and slipping off the nut. If the location of the work not allow for all four steps to be followed when you are using an adjustable wrench, then select another type of wrench for the job.

### Adjustable Pipe Wrenches

Adjustable pipe wrenches (*Figure 1-5*) are primarily used for rotating round stock and/or various pipes and piping. The most common adjustable pipe wrench is the Stillson. It is equipped with two jaws that have serrated teeth to provide gripping ability. The largest jaw is a fixed jaw; the smallest jaw is adjustable and also the weakest of the two jaws. Whenever a Stillson wrench is used, it should be applied in such a manner that the fixed jaw provides the twisting force. These wrenches also come in varying lengths, which makes the jaw sizes vary. A Stillson wrench should never be used on soft metal such as brass or on chromium-plated or machined surfaces, as the teeth tend to mar or otherwise ruin the metal. The strap wrench (*Figure 1-5*) should be used instead of a Stillson to eliminate damage to soft metals. The strap wrench employs a heavy nylon strap, one end of which is attached to the wrench handle and the other is free to pass around the object to be rotated, and finally back through the locking device provided on the wrench handle.

### Hammers

The hammer shown in *Figure 1-6* most used by the ABH is the ball peen. The ball peen hammer is used for working metals such as chiseling rivets and shearing metal.

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*Figure 1-4 — Crescent adjustable wrench.*

*Figure 1-5 — Adjustable pipe wrenches.*

*Figure 1-6 — Hammers.*
**Hacksaws**

The hacksaw is a portable metal cutting tool that can be used for cutting sheet metal, bolts, and pipe. Hacksaws cut on the push stroke only; the blade should be installed in the frame with the teeth facing away from the handle. Figure 1-7 shows a hacksaw with the blade in the proper position.

*Tools and their uses*, NAVEDTRA 14256, illustrates the proper way to hold and use the hand hacksaw and describes the method used in selecting the most suitable blade for different metals.

**Wrecking Bars**

Three types of wrecking bars are shown in Figure 1-8. Wrecking bars are designed for prying boards from crates, for pulling spikes or heavy nails, and as a lever for moving heavy objects short distances. Longer and heavier bars, such as the Johnson bar (pry bar), are available in the Navy for damage control functions as well as crash and salvage functions. The wrecking bar is sometimes called the all-purpose tool.

**Spanner Wrench**

Many special nuts are made with notches cut into their outer edge. For these nuts, a hook spanner (Figure 1-9) is required. This wrench has a curved arm with a lug or hook on the end. This lug fits into one of the notches of the nut, and the handle turns to loosen or tighten the nut. This spanner may be made for just one particular size of notched nut, or it may have a hinged arm to adjust it to a range of sizes. When you use a spanner wrench, you must ensure that the pins, lugs, or hooks make firm contact with the nut while the turning force is transferred from the wrench to the nut. If this is not done, damage will result to personnel, tools, or equipment.
Bolt Cutters

Bolt cutters (*Figure 1-10*) are giant shears with very short blades and long handles. The handles are hinged at one end. The cutters are at the ends of extensions, which are joined in such a way that the inside joint is forced outwards when the handles are closed, thus forcing the cutting edges together with great force.

Bolt cutters are made in lengths of 18 to 36 inches. The larger ones will cut mild steel bolts and rods up to one-half inch. The material to be cut should be kept as far back in the jaws as possible. Never attempt to cut spring wire or other tempered metal with bolt cutters; this causes the jaws to be sprung or nicked.

Adjusting screws near the middle hinges provides a means for ensuring that both jaws move the same amount when the handles are pressed together. Keep the adjusting screws just tight enough to ensure that the cutting edges meet along their entire length when the jaws are closed. The hinges should be kept well-oiled at all times.

When you are using bolt cutters, make sure your fingers are clear of the jaws and hinges. Be careful that the bolt heads or piece of rod that is cut off does not fly and injure you or someone else. If the cutters are brought together rapidly, sometimes a bolt head or piece of rod being cut off will fly some distance.

Bolt cutters are fairly heavy. Make sure that they are stored in a safe place where they will not fall and injure someone.

Hand-operated Grease Gun

To use a push-type, hand-operated grease gun (*Figure 1-11*), you connect the nozzle of the gun to its corresponding fitting at the lubrication point and work the handle in and out. To connect the gun, align the nozzle and the fitting end-to-end and push on the gun handle so the nozzle slips over the hydraulic fitting or into the flush fitting. At the same time that the nozzle mates with the fitting, the handle moves inward to build pressure inside the gun to force grease out of the nozzle and into the fitting. Then, let up on the handle a moment. A spring in the gun will then force the handle out a little way and prepare the gun for another inward stroke of the handle.

When you connect the push-type gun to a hydraulic fitting, the nozzle grips the fitting and is held firmly as long as the nozzle and fitting are aligned or until pulled free. In connecting the gun to a flush-type fitting, however, you must keep a steady pressure on the fitting because the nozzle doesn't grip the fitting.

Torque Wrenches

When a definite force must be applied to a nut or bolt head, a torque wrench must be used. For example, equal force must be applied to all the bolt heads of an engine; otherwise, one bolt may bear the brunt of the force of internal combustion and ultimately cause engine failure.
The three most commonly used torque wrenches are the micrometer setting, dial indicating, and deflecting beam types (Figure 1-12). When you are using the deflecting beam and the dial-indicating torque wrenches, the torque is read visually on a dial or scale mounted on the handle of the wrench.

![Torque Wrenches](image)

**Figure 1-12 — Torque wrenches.**

To use the micrometer-setting wrench, unlock the grip and adjust the handle to the desired setting on the micrometer scale, then relock the grip. Install the required socket or adapter to the square drive of the handle. Place the wrench assembly on the nut or bolt, and pull in a clockwise direction with a smooth, steady motion. A fast or jerky motion will result in an improper torque. When the torque applied reaches the torque value, which is indicated on the handle setting, a signal mechanism will automatically issue an audible click, and the handle will release or "break" and move freely for a short distance. The release and free travel is easily felt, so there is no doubt when the torque process is complete.

Manufacturers' and technical manuals generally specify the amount of torque to be applied. Use the wrench properly in accordance with the manufacturer's instructions.

You should use a torque wrench that reads about midrange for the amount of torque to be applied. Be sure that the torque wrench has been calibrated before you use it. Remember that the accuracy of torque measuring is determined with how the threads are cut and the cleanliness of the threads. Make sure you inspect and clean the threads. If the manufacturer specifies a thread lubricant, it must be used to obtain the most accurate torque reading. When using the deflecting beam or dial-indicating wrenches, you should hold the torque at the desired value until the reading is steady.

The torque wrench is a precision tool. It has a torque-indicating handle and appropriate adapters or attachments. It measures the amount of turning or twisting force applied to a nut or bolt in inches or foot-pounds. Certain aircraft-hoisting slings require torque values applied to successfully hoist the aircraft. For specific instructions, you should refer to NAVWEPS 17-1-108.

**Care of Hand Tools**

Tools are expensive and vital equipment. When the need for their use arises, common sense plus a little preventive maintenance prolongs their usefulness. The following precautions for the care of tools should be observed:

1. Clean tools after each use. Oily, dirty, and greasy tools are slippery and dangerous to use.
2. Never hammer with a wrench.
3. Never leave tools scattered about. When they are not in use, stow them neatly on racks or in toolboxes.

4. Apply a light film of oil after cleaning to prevent rust on tools.

5. Inventory tools after use to prevent loss.

PORTABLE POWER TOOLS

ABH's have a frequent requirement for the use of portable power tools in the maintenance of assigned areas that are exposed to the weather. A power tool, when used properly and efficiently, is an enormous time saver, especially when a large painted or rusted surface requires scaling and preservation. Before using electric portable tools, you should be sure the proper voltage is supplied. This information can be found on the nameplate, which is permanently attached to the tool. Electric tools of all types used in the Navy are required to have an up-to-date electrical safety tag and proper ground capability. The tool should be provided with a ground lead that connects the tool casing to the ship's structure. If doubt exists that a good ground has been established, you should request the services of an electrician's mate to check it out before applying power to the tool. Never vary the manufacturers recommended voltage. Safety is paramount.

Proper use of common power tools is discussed in detail in Chapter 52 of *Tools and Their Uses*, NAVEDTRA 14256. Wearing appropriate eye protection and hearing protection equipment is mandatory for Navy personnel when operating portable power tools.

When pneumatic tools are used, the air supply pressure specified on the nameplate should always be maintained. Insufficient air pressure causes the tool to function improperly. Excessive air pressure results in damage to the tool, and the person operating the tool may not be able to control it properly.

Remember that tools cut through rust, paint, metal, arms, and legs. Give your full attention while operating any power tool; never distract anyone who is using power equipment. Never attempt to change blades and bits or perform maintenance on any portable power tool without first disconnecting the tool from the power source.

**Portable Electric Drill**

The portable electric drill (*Figure 1-13*) is a versatile piece of equipment that is probably used more than any other portable electric tool. It can be used for drilling holes in wood or metals, mixing paint, and buffing small items with the proper attachments, as well as a variety of other uses.

The average size electric drill is equipped with a 1/4-inch capacity, three-fingered chuck, which is tightened by the use of a chuck key. The chuck key is usually secured to the electric cord about 18 inches from the drill itself to allow it to be used in the chuck without being removed from the cord. The capacity of the chuck is what determines the size of the drill. Heavier drills are larger in appearance and weight and are equipped with larger motors and chucks. In general, the larger the drill and motor, the slower the revolutions per minute (rpm). This provides the extra needed torque to twist large drill bits. Using a punch or an awl to make a small starting point on the object to be drilled will prevent the drill bit from bouncing or slipping away.

*Figure 1-13 — Portable electric drill.*
Portable Sander (electric or pneumatic)

The power sander (Figure 1-14) is one of the most desirable tools for the scaling of rust, removing paint, and smoothing flight decks prior to laying nonskid materials. The design of the portable power sander is much like that of the electric drill motor with the addition of the sanding disc attached at right angles. The average size disc sander used in the Navy is 7 or 9 inches. These tools produce sparks, so be sure to follow your command's established procedures.

Pneumatic Scaling Tools

Pneumatic scaling tools are discussed in the following text. The pneumatic chipping hammer (Figure 1-15) is another tool useful to the ABH for scaling large areas. Air pressure supply should be maintained to the manufacturer's recommended working pressure, which is found on the nameplate attached to the tool. Never point the pneumatic chipping hammer at another person or to you while tool is under pressure. Personal injury could occur if the chisel were expelled at high speed from the scaling hammer. Also, be aware of the type of metal to be worked. Softer metals, such as brass or aluminum, may become damaged.

Rotary Impact Scaler

The rotary impact scaler (Figure 1-16) is a scaling and chipping tool, sometimes called a "jitterbug." It is electric or pneumatic powered and has a bundle of cutters mounted on either side. In use, it is pushed along the surface to be scaled with the rotating chippers doing the work. Replacement bundles of cutters are available.

Needle Impact Scaler

The needle impact scaler (Figure 1-16 Slide 2) has needle-like attachments that fit into one end. This tool is used in conjunction with the rotary scaler but is able to clean out (scale) corners not reached by the other tool. Caution should be used with this tool on soft metal and on piping.
MEASURING TOOLS

In performing many jobs during your Navy career, you will be required to take accurate measurements of materials and objects. It is common practice in the Navy to fabricate material for installation on a ship or in the field. For example, suppose you need a box of a certain size to fit a space in a compartment. You would have to take measurements of the space and send them to a shop where the box would be built. This example suggests that the measurements you took and those taken in the process of building the box must be accurate. However, the accuracy of the measurements will depend on the measuring tools used and your ability to use them correctly.

Measuring tools are also used for inspecting a finished product or partly finished product. Inspection operations include testing or checking a piece of work by comparing dimensions of the work piece to the required dimensions given on a drawing or sketch. Again, the measurements taken must be accurate. Accuracy depends on your ability to use measuring tools correctly.

You should be able to select the appropriate measuring tool to use in doing a job and be able to operate properly a variety of measuring instruments. Measuring tools and techniques are discussed in detail in various chapters of Tools and their Uses, NAVEDTRA 14256.

Rules and Tapes

Many different types of measuring tools are in use in the Navy. Where exact measurements are required, a micrometer caliper is used. When properly used, this caliper gives measurements accurate to within 0.001 of an inch. Where accuracy is not critical, the common rule or tape will work well enough for most measurements. Figure 1-17 shows some of the types of rules and tapes commonly used in the Navy. Of all measuring tools, the simplest and most common is the steel rule. It is usually 6 or 12 inches long, although other lengths are available. Steel rules may be flexible or rigid, but the thinner the rule, the easier it is to measure accurately, because the division marks are closer to the work.

Generally, a rule has four sets of graduations, one on each edge of each side. The longest lines represent the inch marks. On one edge, each inch is divided into eight equal spaces; so each space represents one-eighth of an inch. The other edge of this side is divided into sixteenths. The 1/4-inch and 1/2-inch marks are commonly made longer than the smaller division marks to facilitate counting, but the graduations are not, as a rule, numbered individually, as they are sufficiently far apart to be counted without difficulty. The opposite side is similarly divided into 32 and 64 spaces per inch. It is common practice to number every fourth division for easier reading.

There are many variations of the common rule. Sometimes the graduations are on one side only. Sometimes a set of graduations is added across one end for measuring in narrow spaces. Sometimes only the first inch is divided into sixty-fourths, with the remaining inches divided into thirtyseconds and sixteenths.

A metal or wood folding rule may be used for measuring purposes. These folding rules are usually 2 to 6 feet long. The folding rules cannot be relied on for extremely accurate measurements because a certain amount of play develops at the joints after they have been used.
Steel tapes are made from 6 to 300 feet in length. The shorter lengths are frequently made with a curved cross section so that they are flexible enough to roll up but remain rigid when extended. Long, flat tapes require support over their full length when measuring, or the natural sag will cause an error in reading.

The flexible-rigid tapes are usually contained in metal cases into which they wind themselves when a button is pressed or they can be easily pushed. A hook is provided at one end to hook over the object being measured so you can handle it without assistance. On some models, the outside of the case can be used as one end of the tape when measuring inside dimensions.

Steel or fiberglass tapes are generally used for making long measurements. Secure the hook end of the tape. Hold the tape reel in the hand and allow it to unwind while walking in the direction in which the measurement is to be taken. Stretch the tape with sufficient tension to overcome sagging. At the same time, make sure the tape is parallel to an edge of the surface being measured. Read the graduation on the tape by noting which line on the tape coincides with the measurement being taken.

**Care of Rules and Tapes**

Rules and tapes should be handled carefully and kept lightly oiled to prevent rust. Never allow the edges of measuring devices to become nicked by striking them with hard objects. When not in use, they should preferably be kept in a wooden box.

To avoid kinking tapes, pull them straight out from their case and do not bend them backward. With the windup type, always turn the crank clockwise because turning it backward will kink or break the tape. With the spring wind type, guide the tape by hand. If it is allowed to snap back, it may become kinked, twisted, or otherwise damaged. Do not use the hook as a stop. Slow down as you reach the end.

**Dynamometer**

A dynamometer is an apparatus for measuring force or energy. It commonly embodies a spring to be compressed, combined with an index scale to show the amount of tension obtained. Uses for this type of measuring tool may include determining the breaking strength of flight or hangar deck padeye fittings in conjunction with the Preventative Maintenance System (PMS). Also for measuring tension on the pretensioning spring for the emergency shore-based E-28 arresting gear. Make sure the dynamometer is calibrated before you use it. *Figure 1-18* shows a common type of dynamometer.

**SAFETY PRECAUTIONS**

You are responsible for knowing and observing all safety precautions concerning your living and working spaces. Your continuous cooperation and vigilance are needed to see that the operating procedures and work methods are accomplished safely and without loss or damage to property.

As a petty officer, you are responsible for ensuring that your subordinates are instructed in and carry out applicable safety precautions.

**Portable Electrical Tools**

When portable electric tools are used, you should use the following procedures:

Before portable electrical tools are used for the first time after procurement, they should be inspected and approved for shipboard use by the ship's electrical safety officer.
Prior to the use of any portable electric tools, you should make sure the tools have a current ship's inspection mark. Additionally, visually examine the attached cable with the plug and any extension cords for cracks, breaks, or exposed conductors and damaged plugs. When any defects are noted, the tools should be turned in to the ship's electrical shop for repair before use. Before plugging in any tool, be sure the tool is turned off.

Personnel using portable electric tools are required to wear safety glasses/goggles.

1. Portable electric tools producing hazardous noise levels in excess of the limits set forth in OPNAVINST 5100.23 (current series) must have a warning tag. Personnel using tools designated as producing hazardous noise levels are required to wear proper ear protection, as issued by the divisional supply representative via the ship's supply department.
2. Only explosions-proof (class I, group D, or better) portable electric tools should be used where flammable vapors, gases, liquids, or exposed explosives are present.
3. Handheld portable electric tools authorized for use onboard ship shall be equipped with ON/OFF switches, which must be manually held in the closed ON position to maintain operation.
4. Insulated rubber gloves, approved by the ships electrical safety program must be worn when you are using portable electric tools under hazardous conditions; for example, wet decks, bilge areas, working over the side, in boats, and so forth.
5. Leather glove shells should be worn over rubber gloves when the work, such as sheet metal work, could damage the rubber gloves.

**Extension Cords**

You should use the following procedures when using extension cords:

1. Only three wire extension cords that have three pronged plugs and three slot receptacles should be used.
2. Because a metal hull ship is a hazardous location, personnel who must use portable electric devices connected in extension cords should take the time to plug the device into the extension cord before the extension cord is inserted into a live bulkhead receptacle. Likewise, the extension cord should be unplugged from the bulkhead receptacle before the device is unplugged from the extension cord.
3. Electrical cords shall be cared for as follows:
   a. Cords should not be allowed to come in contact with sharp objects. They should not be allowed to kink nor should they be left where they might be damaged by vehicle/foot traffic. When it is necessary to run electrical leads through doors and hatches, the cords must be protected to guard against accidental closing of the doors/hatches.
   b. Cords must not come in contact with oil, grease, hot surfaces, or chemicals.
   c. Damaged cords must be replaced. They are not to be patched with tape.
   d. Tools must be stored in a clean, dry place where the cords can be loosely coiled.
   e. Cords extending through walkways should be elevated so they do not become a tripping hazard or interfere with safe passage.
   f. Extension cords should be no longer than 25 feet in length (except repair locker and CV/CVN flight deck cords, which are 100 feet long). No more than two such cords should be connected together for the operation of portable equipment.
Pneumatic Tools

When using pneumatic tools, you should use the following procedures:

1. You should wear and use necessary personnel protective devices. Pneumatic tools shall not be connected to, or driven by, air pressure in excess of that for which the tools are designed. Wearing appropriate eye protection equipment is mandatory for Navy personnel when operating pneumatic tools.

2. You should be authorized and trained to operate pneumatic tools. If you have arthritis, neuritis, or circulatory disease, DO NOT use vibrating tools such as hammers, chisels, tampers, riveters, or caulkers.

3. Pneumatic tools should be laid down in such a manner that no harm could be done if the switch is accidentally tripped. No idle tools should be left in a standing position.

4. Pneumatic tools should be kept in good operating condition. They should be thoroughly inspected at regular intervals with particular attention given to the ON/OFF control valve trigger guard (if installed), hose connections, guide clips on hammers, and the chucks of reamers and drills.

5. Pneumatic tools and air hoses may be fitted with quick disconnect fittings. These should incorporate an automatic shutoff valve. This valve automatically shuts off the air at the hose before charging grinding wheels, needles, chisels, or other cutting or drilling bits.

6. The air hose must be suitable to withstand the pressure required for the tool. Leaking or defective hoses should be removed from service. The hose should not be laid over ladders, steps, scaffolds, or walkways in such a manner as to create a tripping hazard. Where the hose is run through doorways, the hose should be protected against damage by the door edges. The air hose should generally be elevated over walkways or working surfaces in a manner to permit clear passage and prevent damage to it.

7. A tool retainer shall be connected on each piece of equipment, which, without such a retainer, may eject the tool.

8. All portable pneumatic grinders and reciprocating saws must be equipped with a safety lock off device. A safety lock off device is any operating control that requires positive action by the operator before the tools can be turned on. The lock off device must automatically and positively lock the throttle in the OFF position when the throttle is released. Two consecutive operations by the same hand are required—first to disengage the lock off device and then to turn on the throttle. The lock off device should be an integrated component of the tool. It should not adversely affect the safety or operating characteristics of the tool, and it should not be easily removable. Devices, such as a "dead man control" or "quick disconnect," that do not automatically and positively lock the throttle in the OFF position when the throttle is released are not safety lock off devices.

For detailed information on safety precautions, see OPNAVINST 5100.19 (current series), Navy Safety Precautions for Forces Afloat, or NAVAIR A1-NAOSH-SAF-000/P-5100-1, Technical manual NAVAIROSH Requirements for the Shore Establishment.

PERSONAL PROTECTIVE EQUIPMENT

To protect you from danger, personal protective equipment (PPE) such as safety shoes, goggles, hard hats, and gloves are issued. Using PPE is mandatory on certain jobs. Be sure to use PPE on any job when required. The purpose of PPE is to protect you from harm.
Protective Clothing and Safety Equipment

The use of protective clothing and safety equipment is a must! The following requirements must be met:

1. Personnel involved in the operation of hazardous industrial tools or equipment shall wear protective clothing and safety equipment appropriate to the work being performed.

2. Loose or torn clothing, neckties, neck chains, unbuttoned long-sleeved shirts, rings, beads, or bracelets must not be worn around rotating machinery. Should clothing become caught in a tool or machine, the power supply must be secured immediately.

Foot Protection

Hazardous foot operations are those that have a high incidence of foot injuries. The ratings generally associated with a high incidence of injuries are those employed in construction, materials handling, maintenance, transportation, ship repair, aircraft handling, servicing and repair, weapons servicing and handling, and all shipboard personnel.

All personnel exposed to foot hazards are provided with and required to wear appropriate special foot protection. Safety shoes are designed to limit damage to your toes from falling objects operations. Personnel assigned working stations on the flight or hangar decks must wear steel-toe, flight deck-approved safety shoes.

Eye Protection

Proper eye protection is of the utmost importance for all personnel. All personnel operating power tools, both fixed and portable, must wear approved safety glasses with side shields, goggles, or face shields.

Personnel who wear corrective glasses while engaged in eye hazardous work must be protected by eye protection equipment of a type that can be worn over personal spectacles. Glasses with prescription ground safety lenses with side shields may be worn in lieu of cover goggles when such glasses provide suitable protection against the hazard involved.

In any operations such as chipping, caulking, drilling, riveting, grinding, and pouring babbitt metal in which the eye hazard of flying particles, molten metal, or liquid chemical exists, personnel must be protected by suitable face shields or goggles.

Appropriate use of goggles limits eye hazards. Some goggles have plastic windows that resist shattering upon impact. Others are designed to limit harmful infrared and ultraviolet radiation from arcs or flames by appropriate filter lenses.

Remember that eye damage can be excruciatingly painful. PROTECT YOUR EYES.

Hand Protection

Use gloves when you are required to handle rough, scaly, or splintery objects.

When you are handling sharp materials, leather gloves must be worn except when the work involves rotating machinery.

When you are working with caustic or toxic chemicals, specified gloves must be worn. Rubber gloves will protect against some chemicals. Gloves of a special plastic may be needed for protection against other chemicals.

When it is necessary to work with portable electrical tools or equipment in damp locations or when it is necessary to work on live electrical circuits or equipment, electrical-grade insulating rubber gloves must be worn.

When rubber gloves could be subjected to cutting by sharp or abrasive objects, leather-shell gloves must be worn over electrical-grade rubber gloves.
When it is necessary to handle hot work, insulated gloves must be worn but only if tongs or other gripping/clamping tools are not available.

**Hearing Protection**

Personnel working with tools and machinery that produce hazardous noise levels must wear proper ear protection. All equipment that produces hazardous noise levels should have a warning tag to alert the operator to the requirement for PPE. Wearing hearing protection, such as insert earplugs or double hearing protection is frequently required. For more information on hearing conservation, refer to OPNAVINST 5100.23 (current series) and local instructions. For detailed information on personnel protective clothing and safety equipment, refer to chapter B4 of OPNAVINST 5100.19 (current series), *Navy Safety Precautions for Forces Afloat*; or NAVAIR A1-NAOSH-SAF-000/P-5100-1 technical manual, *NAVAIROSH Requirements for the Shore Establishment*.

**Head Protection**

During the course of flight operations on your flight deck, head protection is offered to the ABH by means of the cranial. The cranial is an essential piece of PPE, and its value has been time tested. The cranial saves lives and prevents injury. Oftentimes though, you will be involved in work that is not related to flight operations, but the necessary precautions must still be undertaken.

Personnel should not use flight quarters clothing for routine maintenance—use a hard hat. During periods of maintenance for your ship, hard hats are essential, if not required, as prescribed safety equipment. Head protection is mandatory anytime you are working up on a ladder, raised up in the crash basket, working on scaffolding, or working in the vicinity of an aircraft elevator during a stores on-load.

**RIGGING EQUIPMENT**

Basic seamanship is essential to the aircraft handling crews and line handlers during hoisting operations or in the preparation for hoisting operations.

Basic seamanship includes proper knot tying and splicing manila line. The basic skills can be obtained by reading *Seaman* (NAVEDTRA 14067). Some of the basic knowledge should include the bowline, becket bend, half hitch, and square knot. Skills should also include the back splice, eye splice, and short and long splice.

The bowline is used to secure tag lines during aircraft-hoisting operations and for securing components of the MK–1 life preserver. Eye splices and back splices are used in the fabrication of tag lines. Normally an eye splice retainer is a quick-disconnect hook for attaching to a securing device. The other end is back-spliced to prevent the line from unraveling. When a quick-disconnect hook is not used, a bowline is used to secure the tag line to the aircraft. The becket bend and half hitch are used to secure line to round stock or clevis hooks. Short and long splices are used to connect two pieces of line together. They could be used to add a length to tag lines and securing lines for yellow equipment.

In this section, you will learn the types and uses of wire rope, manila line, nylon rope, and the formulas for determining safe working (SW) loads and breaking strengths. Also covered are the various types of hoisting rigs and their uses. For detailed information on the use and types of wire and fiber rope and rigging, you should refer to Naval Sea Systems Command, *Naval Ships’ Technical Manual* (NSTM), Chapter 613.

**Blocks and Tackle**

As an ABH, you may be assigned to a detail that must load or move heavy parts by using a block and tackle or other hoisting rigs (for example, crash and salvage operations or to close/open the hangar deck elevator or divisional doors in an emergency). It is a good idea that you know a few terms and basic fundamentals of the block and tackle. A block consists of one or more sheaves (or pulleys)
fitted in a wood or metal frame (or shell) supported by a hook or shackle inserted in
the strap of the block. The name and location of the principal parts of a block are shown
Figures 1-19 and 1-20.

The sheave is a round, grooved wheel over which the rope runs. Ordinarily, blocks have
one, two, three, or four sheaves. Blocks are available, of course, with more than four
sheaves.

The straps (one inner and one outer) are
used to enclose the shell, hold the block
together, and support the pin on which the
sheaves rotate. The swallow of the block is
the opening through which the rope passes.
The breech is the bottom part of the block
opposite of the swallow.

The function of the block (or blocks) in a
tackle assembly is to change the direction of
pull or provide mechanical advantage, or
both.

**Construction of Blocks**

Blocks are constructed for use with fiber line
and wire rope. Wire rope blocks are heavily
constructed and have a large sheave with a
deep groove. Fiber line blocks are generally
not as heavily constructed as wire rope
blocks and have small sheaves with shallow,
wide grooves shown in Figure 1-19.

Blocks fitted with one, two, three, or four
sheaves are often referred to as single,
double, treble, and quadruple blocks,
respectively. Blocks are fitted with a varying
number of attachments, depending on their
particular use. Some of the most commonly
used fittings are hooks, swivel or loose side,
sister hooks, shackles, eyes, and rings.

All line used in rigging should be good grade manila or the equivalent, and all wire should be plow
steel or the equivalent.

**Parts of the Block and Tackle**

A tackle is an assembly of blocks and ropes used to gain a mechanical advantage in lifting or pulling. Figure 1-20 shows the name and location of various main parts of a tackle.

In working with tackle, it helps to understand the meaning of a few simple terms you hear used. The
term fall means a rope, either manila or wire, reeved through a pair of blocks to form a tackle. The
hauling part is the part of the fall leading from one of the blocks upon which the power is exerted. The
standing part is the end of the fall of the blocks. The movable (or running) block of a tackle is the
block attached to the object to be moved. The fixed (or standing) block is the block attached to a fixed

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**Figure 1-19 — Nomenclature of a block.**

**Figure 1-20 — Parts of the block and tackle.**
object or support. When a tackle is being used, the movable block moves up and down and the fixed block remains stationary.

**Mechanical Advantage**

The mechanical advantage of a tackle is the term applied to the relationship between the load being lifted and the power required to lift that load. In other words, if a load of 10 pounds requires 10 pounds of power to lift it, the mechanical advantage is 1. However, if a load of 50 pounds required only 10 pounds to lift it, then you have a mechanical advantage of 5 to 1, or 5 units of weight are lifted for each unit of power applied.

The easiest way to determine the mechanical advantage of a tackle is by counting the number of parts of the falls at the movable (or running) block. If there are two parts, the mechanical advantage is two times the power applied (less friction). A gun tackle, for instance, has a mechanical advantage of 2. Thus, to lift a 200-pound load with a gun tackle requires 100 pounds of power, disregarding friction (*Figure 1-21*).

![Mechanical Advantage](image)

*Figure 1-21 — Mechanical advantage.*

By inverting any tackle, a mechanical advantage of 1 is always gained because the number of parts at the movable block is increased. By inverting a gun tackle (*Figure 1-22*), a mechanical advantage of 3 is attained. When a tackle is inverted, the direction of pull is difficult. This can be easily overcome by adding a snatch block, which changes the direction of pull but does not increase the mechanical advantage.
Three Common Types of Tackle

Among the various types of tackle in common use are the gun tackle, single luff tackle, and twofold purchase (Figure 1-23).

In studying each type illustrated, note the direction in which the arrows are pointing for that particular tackle. The purpose of the arrows is to indicate the sequence and direction in which the standing part of the fall is led in reeving. A gun tackle is made up of two single sheave blocks. This tackle got its name in the old days by being used to haul muzzle-loading guns back into battery after the guns had been fired and reloaded. As discussed earlier, a gun tackle has a mechanical advantage of 2. A single luff tackle consists of a double and a single block. This type has a mechanical advantage of 3. A twofold purchase consists of two double blocks and has a mechanical advantage of 4.

Chain Ratchet (Come Along)

One piece of equipment you should be familiar with is the 3-ton capacity chain ratchet. In more common terms, it is usually referred to as a come along (Figure 1-24).

Chain ratchets have an operating handle similar to a ratchet wrench. They are normally light in weight and come in a variety of sizes, depending on the job to be done. A chain ratchet has a friction brake incorporated in its mechanism to hold the load when the handle is released. Chain ratchets are reversible so that the load may be raised, inspected, and lowered back into place. Some of the common types of chain ratchets use either sprocket (bicycle) chain or link chain.

Always lubricate a chain ratchet before stowing. Never apply more power than can be exerted by one man. Do not use extensions on the ratchet handle for additional leverage. Inspect chain ratchets regularly to ensure that the chain, hooks, and ratchet gears are in good condition. Never apply a strain greater than the SW load.

Line

Line used by the Navy is made from a variety of natural fibers like abaca, agave, sisal, hemp, jute, and cotton. It may also be made from various combinations of these fibers, depending upon its use.
In the manufacture of line, the fibers of the various plants are twisted together in one direction for the yarns. The yarns are twisted together in the opposite direction to form strands, and the strands are again twisted together in the opposite direction to form the line. Most of the line used is three-strand, although four-strand is sometimes used.

By far the greater part of the line now used is right laid, that is, the strands in the finished line spiral along in a right-handed direction as one looks along the line. Right-laid line must always be coiled down right-handed, or clockwise.

**Nylon Rope**

Nylon is a synthetic fiber and differs from natural fiber lines in that it will stretch under load and yet recover to its normal size when tension is removed. A stretch of one-third of its length is normal under SW loads. A stretch of 40 percent of its length is the critical point, and it will part at 50 percent stretch. This elongation at times may be a disadvantage, but doubling the lines can halve it. Nylon rope can stand repeated stretching with no serious effect.

Nylon rope that has been under heavy strain may develop glazed areas. Paint or the fusing of fibers may cause this condition. In either case, the effect on the rope's strength is negligible.

Nylon rope will hold a load even though a considerable amount of the yarns have been abraded. Where such a condition is excessive but located in only one area, the chafed section may be cut away and the ends spliced together for satisfactory reuse.

Nylon is spliced in a manner similar to manila, employing tape instead of seizing stuff for whipping the strands and rope. Because of its smoothness and elastic properties, nylon requires at least one tuck more than manila. For heavy-load applications such as towing, a back tuck should be taken with each strand. When nylon lines become iced over in use, they should be carefully thawed at moderate temperatures and dried before being stowed.

Since nylon rope, on parting, is stretched to 50 percent of its length, it parts with a decided snapback. Keep yourself and your personnel out of the direct line of pull when heavy strains are applied.

Pulling the end through the eye of the coil does not open a coil of nylon rope, unlike fiber line. It should be unreeeled in the same manner as wire rope.

**Size and Types**

Line 1 ¾ inches or larger in circumference is designated to size by its circumference in inches. Line is manufactured in sizes up to 16-inch hawser. A hawser is any line larger than a 5-inch line, which is used for towing or mooring. As a general rule, a 10-inch line is about the largest line issued by the Navy for general shipboard use.

Line less than 1 ¾ inches in circumference is referred to generally as small stuff and is designated to size by the number of yarns it contains (called threads in this case). To find the size of a piece of small stuff, a strand is opened out, the number of yarns it contains is counted, and the result multiplied by 3 for 3-strand stuff. The largest small stuff is 24-thread; it has 3 strands, each of which contains 8 yarns.
Certain small stuff used for special purposes is designated by name, with no reference to size. Marline is the most common stuff of this type. It is 2-strand, left-laid stuff, rather roughly made up, tarry a dark brown, and not much larger than ordinary package wrapping cord. A serving (smooth finish on line or wire made of close wrapped turns) is normally made with marline. It is inexpensive, fairly strong, and well-protected by its tarring against the weather.

Seizing stuff is small stuff laid up right-handed by machine, like regular line, but not much larger than fishing line. It is used for servings when a fancier job than can be done with marline is desired.

Applications

Besides the uses that have already been mentioned, line is used as tie-down's on aircraft equipment and loose gear. Line is also used for guide and steadying lines in hoisting aircraft and equipment.

Working lines, as used in this manual, are categorized as follows and should be made up in the minimum quantities as follows:

- **STABILIZING LINES** - 4 each, 50-foot lengths. They are intended for attachment between an aircraft and a crane to prevent oscillations while the load is suspended and in transit from the salvage site.
- **TAG LINES** - 4 each, 100-foot lengths. These are hand held stabilizing lines.
- **SECURING LINES** - Sufficient quantity and random lengths. These are used to secure equipment such as an aircraft to a dolly and a dolly to the flight deck during jettison operations.
- **TENDING LINES** - 4 each, 100-foot lengths. These are to be used primarily for personnel safety when a crewmember is operating in an area requiring the use of the safety harness.

Care

When line must be stowed wet, it should always be laid on gratings in long fakes (laid back over itself in single turns, one set forward of the other). This is so that it may dry as quickly as possible. It should never be covered.

Deterioration of line may be through age, exposure, use, or abuse. Signs of deterioration through age or exposure are indicated by the gradual change in color of the inner parts of the strands. The bristling ends of broken or dislodged yards indicate deterioration from use or abuse. Where a line has been overstrained, it not only bristles, but also shows a decrease in diameter. Do not depend on it in any situation for more than a fraction of its normal working load.

Wire Rope

Wire rope is made up of single wires twisted together in one direction to form strands. These are, in turn, twisted together in the opposite direction to form the rope. The number of strands and the number of wires in the strand designate wire rope. For example, wire rope built up of 6 strands with 19 wires per strand is designated as 6 × 19. Wire rope size is determined by its diameter, which is measured from the high point of one strand to the high point of the next strand.
the high point on the strand on the opposite side. See *Figure 1-25*.

Wire rope made from iron or cast steel is used occasionally in manufacturing but is not strong enough for general use aboard ship. For wires in cranes, cargo gear, towing gear, and so forth, the Navy specifies a minimum tensile strength of 220,000 pounds per square inch (psi). Extra strong crucible steel, monitor steel, and plow steel meet Navy specifications. Plow steel wire is the type most generally in use.

Some wire that is used for special purposes is preformed. In preformed wire, each strand is shaped so that it lies in with the others the way a strand does in line. Preforming makes wire more flexible. It lasts longer in cranes, boat winches, and so forth. However, preformed wire is expensive, and most wire used in cargo gear, towing gear, mooring gear, and so forth, is nonpreformed. Nonpreformed wire is much stiffer than preformed. Its strands have a strong tendency to fly apart if they are not kept tightly whipped or seized.

Flexible wire rope called spring lay is often used for wires that require a good deal of handling, such as mooring wires. Each strand in spring lay is composed partly of wire and partly of fiber. This construction increases the flexibility but reduces the strength of spring lay considerably compared to that of an all steel wire rope. If available, the manufacturer's data on the strength of wire rope should be used. If this information is not known, the information shown in *Table 1-1* should be used to estimate the SW load.

**Care of Wire Rope**

All exposed wire must be periodically covered with surface coating for protection against the weather. For wire used in standing rigging, weather protection is the only consideration. However, wire rope used in running rigging (airplane cranes, winches, and so forth) must be slushed with a mixture that provides lubrication as well as protection against the weather. Graphite grease is normally used for this purpose. Wire that is kept well slushed deteriorates very little as a result of exposure. However, wire subject to long usage wears like any other metal item. The outer parts of the strands begin to flatten and the diameter of the wire decreases. As a consequence, individual wires begin to wear through and fishhooks appear. By this time the wire is definitely unsafe and must be replaced. Wire rope that has been overstrained will show fishhooks, as well as a marked decrease in diameter where the strain occurred. The wire is extremely unsafe at this point, and it should be replaced.

**Handling of Wire Rope**

Persons handling wire rope must always wear gloves. Even new wire contains an occasional fishhook, which, if allowed to slide through the unprotected hand, may inflict a severe gash.

The handling of wire rope requires attention to detail. Wire rope must not be coiled or uncoiled like manila line. Wire direct from the manufacturer, whether on a reel or not, has always been wound into a coil and must be unwound, never picked up in bights. The outside end always goes off first, never the inside end, as with line.

**Table 1-1 — Wire rope safe working loads.**

<table>
<thead>
<tr>
<th>Wire Size-Inches</th>
<th>Safe Working Loads-Pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
<td>Circumference</td>
</tr>
<tr>
<td>1/4&quot;</td>
<td>7/8&quot;</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>1-3/16&quot;</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>1-9/16&quot;</td>
</tr>
</tbody>
</table>
Some wire comes from the manufacturer in a plain coil, stopped together with wire stops. Some means must be found for unwinding the coil in such a manner that it will not kink. Rolling it along the deck is generally impracticable because of the weight of the wire and the tendency of the coil to come apart.

The best way to unwind a new coil of wire is to set it on a capstan, if available; run the machinery at slow speed, and walk away with the outside end of the wire as the capstan turns. If a capstan is not available, the coil may be slung like a reel and unwound. Some ships and stations have constructed special reels on which to place coils of wire to facilitate unwinding. Simply slinging the reel up on a piece of pipe or a crowbar and walking away with the end can unwind wire on a reel.

**Formulas**

The manufacturer's data concerning the strength of a fiber line or wire rope should be used, if available. If you do not have that information, there are formulas or THUMB RULES that can be used to compute the breaking strength and the SW load. These rules give results that only approximate the figures in the manufacturer's tables because they, of necessity, contain constants. In these thumb rules, constants are figures arbitrarily chosen as those that result in the most nearly accurate answers in the greatest number of circumstances. It is doubtful if results ever are completely accurate, but they are on the side of safety.

The thumb rules for the breaking strength (BS) and SW load for manila line, nylon line, and wire rope all use the circumference (C) and are as follows:

- **FORMULA 1 - BREAKING STRENGTH OF MANILA:**
  
  \[ BS = C^2 \times 900 \text{ pounds}. \]

- **FORMULA 2 - BREAKING STRENGTH OF NYLON:**
  
  \[ BS = C^2 \times 2,400 \text{ pounds}. \]

- **FORMULA 3 - BREAKING STRENGTH OF WIRE ROPE:**
  
  \[ BS = C^2 \times 8,000 \text{ pounds}. \]

C2 refers to the circumference of the line or wire in inches, multiplied by itself. If the circumference is not known, but the diameter is known (as is usually the case with wire), the circumference may be found by multiplying the diameter by 3.
It is necessary to establish limits within which line or wire can be used safely under specified circumstances or, in other words, to provide a margin for safety. Introducing into the problem elements called safety factors does this. In the case of rope, the safety factor used depends upon the rope’s condition. To compute the SW load, find the BS and divide by one of the following safety factors:

- **FACTOR 1**: New rope: 4.
- **FACTOR 2**: Good used rope: 6.
- **FACTOR 3**: Frequently used rope: 8.

**EXAMPLE**: The formula to find the SW load for a new piece of 2-inch circumference manila line is as follows:

\[ SW = \frac{BS}{4} \]
\[ SW = \frac{C2 \times 900}{4} \]
\[ SW = \frac{4 \times 900}{4} = 900 \text{ pounds} \]

The SW load of 2-inch manila equals 900 pounds.

The thumb rule for a SW load is designed for easy remembering and hasty, rough calculations only. However, they are well within the margin of safety for practically any line or wire rope used aboard ship. The exact safe working load of a line depends on the type of fiber used in its construction. A wire will be stronger or weaker depending on whether it is made of iron, cast steel, or plow steel. Manufacturers’ tables are available for both line and wire and you should refer to them when possible.

**STOWAGE OF EQUIPMENT**

"A place for everything and everything in its place." This is the definition often given for the word *shipshape*. To the ABH, this phrase has a special significance. Since a great deal of the equipment used by the ABH is for use in emergencies (aircraft crash, rescue, salvage, and firefighting equipment), it is imperative that it be in its assigned area, ready for use when required. Time spent in searching for a piece of needed equipment is costly.

As an example, suppose that an aircraft has crashed, a personnel rescue must be made, and the equipment necessary to make the rescue is not in its assigned location. The delay caused by having to search for this vital equipment could very well mean the difference in whether or not a successful rescue is made.

Serious damage to aircraft and injury to personnel may be caused when equipment such as chocks, towbars, and tie-downs are left lying loose about the flight or hangar decks. Flight operations are often conducted at night when this loose gear is particularly difficult to spot. As an ABH, you must not only be especially alert for loose gear, but you must also train the assigned crew to always return all gear and equipment not actually in use to the designated area and stow it properly.

Everything movable that is not in use should be kept in bins or racks or lashed securely into place. Sudden hard turns, rough weather, or vibration at high speeds can tumble material or throw it across a compartment, ruining equipment and possibly causing serious personnel injuries. There is not always time to secure loose gear before a sudden turn.

Material and equipment should be stowed as close as possible to the place where it will be used. Careful planning allows use of space that otherwise might be wasted because of its size, shape, or its accessibility. If the items to be stowed are pilferable, locks should be placed on the access doors or on the racks holding the material in place. Emergency equipment should NOT be locked up.
Review Questions

1-1. How many main parts make up the construction of the standard screwdriver?
   A. 1  
   B. 2  
   C. 3  
   D. 4

1-2. What makes a standard screwdriver different from a Phillips head screwdriver?
   A. End  
   B. Handle  
   C. Tip is shaped different  
   D. Shank

1-3. The Stillson adjustable wrench is equipped with how many jaws?
   A. 2  
   B. 3  
   C. 4  
   D. 5

1-4. What provides gripping ability on the Stillson adjustable wrench?
   A. Adjustable jaw  
   B. Handle grip  
   C. Nylon strap  
   D. Serrated teeth

1-5. When a definite force must be applied to a nut or bolt head, what tool must be used?
   A. Caliper slide  
   B. Dynamometer  
   C. Torque wrench  
   D. Strap wrench

1-6. The hinges on bolt cutters should be kept?
   A. Clean  
   B. Free of paint  
   C. Lightly greased  
   D. Well oiled
1-7. What tool can be used as a lever for moving heavy objects short distances?

A. Adjustable wrench  
B. Deflecting beam  
C. Hammer  
D. Wrecking bar

1-8. The term pneumatic describes what type of power source?

A. Air  
B. Electric  
C. Hydraulic  
D. Steam

1-9. Excessive air pressure when utilizing pneumatic tools will result in?

A. Completion of work in a faster time  
B. Environmental hazard  
C. Damage to the tool  
D. Making the job easier

1-10. The average size electric drill is equipped with what capacity, three-fingered chuck?

A. 1/2  
B. 1/3  
C. 1/4  
D. 7/16

1-11. The pneumatic chipping hammer is another tool useful to the ABH when scaling?

A. Bulkhead areas  
B. Large areas  
C. Overhead areas  
D. Small areas

1-12. Which power tools can be manufactured to be powered by air or electricity?

A. Drill and chipping hammer  
B. Drill and rotary impact scaler  
C. Rotary impact scaler and chipping hammer  
D. Rotary impact scaler or portable sander

1-13. Where exact measurements are required, what measuring tool is used?

A. Caliper  
B. Folding rule  
C. Tape rule  
D. Steel rule
1-14. On a steel or tape rule, the lone line represents?

A. Centimeter mark  
B. Foot mark 
C. Inch mark  
D. Height mark

1-15. What should be done to prevent tape or fiber glass rules from kinking?

A. Frequently used  
B. Kept lightly oiled 
C. Pulled straight from the case  
D. Kept in wooden box

1-16. A dynamometer is an apparatus used to determine?

A. Breaking strength  
B. Capacity 
C. Height  
D. Weight

1-17. Uses for the dynamometer may include determining the breaking strength of the tensioning system of what equipment on shore?

A. Aircraft  
B. Crash crane 
C. Ground support equipment  
D. E-28

1-18. Before portable electrical tools are used for the first time after procurement, they should be inspected by?

A. Electrical safety petty officer  
B. Electrical safety officer 
C. Safety officer  
D. Ships supply officer

1-19. Personnel operating power tools that produce excessive noise level are required to wear hearing protection issued by?

A. Divisional supply representative  
B. Medical 
C. Safety  
D. Supply

1-20. What class explosion proof electric tools should be utilized where exposed explosives are present?

A. 1  
B. 2 
C. 3  
D. 4
1-21. Handheld portable electric tools authorized for use onboard ship shall be equipped with?

A. Battery meter  
B. Manual/automatic switch  
C. ON/OFF switch  
D. Voltage gauge

1-22. Extension cords should be no longer than 25 feet in length except when used on what class ship?

A. CVNs  
B. DDGs  
C. LHA/LHDs  
D. LPDs

1-23. Which of the following are allowed to be worn around rotating machinery?

A. Bracelets  
B. Earrings  
C. Rings  
D. Unbuttoned long-sleeved shirts

1-24. It is required to wear leather gloves when handling ______.

A. chemicals  
B. electric equipment  
C. hot work  
D. sharp material

1-25. Tending lines are used for _____.

A. aircraft safety  
B. aircraft oscillation  
C. personnel safety  
D. securing aircraft

1-26. Generally, small stuff is line that is less than?

A. 1 ¾ inches  
B. 5 inches  
C. 10 inches  
D. 16 inches

1-27. What knot is used to secure components on the MK-1 life preserver?

A. Becket bend  
B. Bowline  
C. Eye splice  
D. Square knot
1-28. When would an ABH possibly require the use of a block and tackle?

A. Hold an object in place.
B. Gain force.
C. Overturn a crashed aircraft.
D. Raise aircraft elevator.

1-29. What is the mechanical advantage of the gun tackle?

A. 2.1
B. 3.1
C. 4.1
D. 5.1

1-30. It is imperative that equipment be stowed in its assigned area for what reason?

A. Identification
B. Inventory
C. Inspection
D. Ready for use
RATE TRAINING MANUAL – USER UPDATE

CNATT makes every effort to keep their manuals up-to-date and free of technical errors. We appreciate your help in this process. If you have an idea for improving this manual, or if you find an error, a typographical mistake, or an inaccuracy in CNATT manuals, please write or e-mail us, using this form or a photocopy. Be sure to include the exact chapter number, topic, detailed description, and correction, if applicable. Your input will be brought to the attention of the Technical Review Committee. Thank you for your assistance.

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       230 Chevalier Field Avenue
       Pensacola, FL 32508
       COMM: (850) 452-9700 utilize voice directory for ABH Rate Training Manager.
       DSN: 922-9700 utilize voice directory for ABH Rate Training Manager.

E-mail: Refer to NKO ABH rate training Web page for current contact information.

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<th>Chapter Number</th>
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