
University of California, San Diego

Englekirk Structural Engineering
Center (ESEC)

Site Safety Manual

REVISION HISTORY

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Approval List

- MD → Michael Dyson
- LB → Laurence Berman

**NOTICE: EMPLOYEES ARE RESPONSIBLE FOR FOLLOWING THE
CORRECT REVISION OF THE DOCUMENT**

GENERAL DESCRIPTION

These safe practice rules are intended for use in all laboratory activities. Furthermore, general safety orders as per California Code of Regulations, Title 8 are enforced in the laboratory. All employees are expected to adhere to applicable OSHA Standards outlined in 29 CFR Part 1910. ([Osha Standards 29 CFR Part 1910](#))

The term “employee/staff” used in this document refers to any individuals working in the laboratory.

PURPOSE OF MANUAL

The purpose of the Site Safety Manual is to help researchers, employees, and students recognize, evaluate, and control hazards in their laboratory.

FREQUENCY

These practices are to be performed at all times while at ESEC.

REFERENCES

OSHA Standards 29 Part 1910, 1926
California Code of Regulations, Title 8
UCSD electronic documents accessible on [Blink website](#).
Power Tool Institute, Inc. <http://www.powertoolinstitute.com/who.html>

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SECTION I Englekirk Center Site Safety Requirements

Chapter 1: General Site Safety

GENERAL RULES

1. All persons shall follow these safe practice rules; render every possible aid to safe operations and report all unsafe conditions or practices to their supervisor.
2. Supervisors shall insist on employees observing and following all safe practice rules and shall take such action as is necessary to obtain compliance.
3. All employees shall be given frequent accident prevention instructions. Safety practices shall be discussed at least every 10 working days.
4. Horseplay, scuffling and other acts that tend to have an adverse affect on employee health or safety shall be prohibited.
5. Work shall be well planned and supervised to prevent injuries in the handling of materials and in working with equipment.
6. No one shall knowingly be permitted or required to work while the employee's ability or alertness is so impaired by fatigue, illness or other causes that it might unnecessarily expose the employee or others to injury.
7. All employees must wear hard hats and steel toed shoes while on the premises. Visitors must wear hard hats and closed-toed shoes at all times while on the premises.
8. Employees shall not enter manholes, underground vaults, chambers, tanks, or similar places that receive little ventilation, unless it has been determined that by the employee's supervisor that it is safe to enter and Confined Space Entry Log has been completed.
9. Employees shall be instructed to insure that all guards and other protective devices are in proper places and adjusted. They shall report deficiencies promptly to their supervisor.

10. Workers shall not handle or tamper with any electrical equipment, machinery, air or water lines in a manner not within the scope of their duties, unless they have received proper instructions from their supervisor or designee.
11. All injuries shall be reported promptly to the supervisor so that arrangements can be made for medical or first aid treatment.
12. When lifting heavy objects up to 50# or more, use the large muscles of the leg instead of the back muscles which are much smaller. Keep your back straight and hold the load close to your body.
13. Materials, tools, or other objects shall not be thrown from buildings or structures until proper precautions are taken to protect others from the falling objects
14. Employees shall cleanse hands thoroughly after handling hazardous materials and follow precautions listed on the corresponding Material Safety Data Sheet. Use the following Internet link to access current Material Safety Data Sheets. ([MSDS LINK](http://blink.ucsd.edu/Blink/External/Topics/Policy/0,1162,4304,FF.html))
<http://blink.ucsd.edu/Blink/External/Topics/Policy/0,1162,4304,FF.html>
15. When using ladders arrange all work so that employees are able to face the ladder and use both hands while climbing.
16. Gasoline shall not be used for cleaning purposes.
17. No burning, welding or other source of ignition shall be applied to any enclosed space, until it has first been determined that no possibility of explosion exists. .
18. Any damage to scaffolds, falsework, ladders, or supporting structures shall be immediately reported to the supervisor. Do not use damaged supporting structures.
19. Ground straps must be applied to the receiving can for any transfer of flammable solvents into metal containers.
20. Maintain all work areas as clean and dry as possible. Wipe up spills promptly.

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21. All electrical work must be performed in compliance with the Electrical Safety Orders, Title 8, California Code of Regulations.
 22. Fall protection shall be used in accordance with OSHA standard 1926 Subpart M. Fall protection training is provided by the Department Safety Coordinator (or other competent staff) and recorded with the tool training log held on site.

MACHINERY AND VEHICLES

1. Only authorized persons shall operate machinery or equipment.
2. Loose or frayed clothing, long hair, dangling ties, loose jewelry, finger rings, etc., shall not be worn around moving machinery or other sources of entanglement.
3. Shields and work rests must be in place on all grinding wheels during use.
4. Machinery shall not be serviced, repaired or adjusted while in operation, nor shall lubricating of moving parts be attempted, except on equipment that is designed or fitted with safeguards to protect the person performing the work.
5. Lockout procedures shall be followed before repairing, adjusting or servicing equipment powered by hazardous energy sources.
6. Employees shall not work under vehicles supported by jacks or chain hoists without protective blocking that will prevent injury if jacks or hoists should fail.
7. Air hoses shall not be disconnected at compressors until the hose line has been bled.
8. Lab personnel are required to obtain a forklift operator's license prior to operating lift equipment. (A copy of all issued licenses are kept on file with the Department Safety Coordinator.)
9. Lab staff are the only operators approved for the use of overhead/mobile crane equipment. Staff is responsible for all rigging and lifting operations. Mobile crane operators shall be licensed to use, UCSD owned and maintained, mobile crane at Englekirk Center. Licensure shall be attained by the National Commission for the Certification of Crane Operators and a copy shall be kept on site with the Department Safety Coordinator.

10. Mobile crane use shall be in compliance with OSHA Standards outlined in 29 CFR 1910.180.

11. Lockout / Blockout Policy, University of California, San Diego

Purpose

This policy establishes specific written procedures for the protection of personnel from injury due to unexpected energization of equipment during service, operation, and repair. This will be accomplished by isolating the energy source serving the equipment in question, and apply a lockout / blockout device to the equipment and/or energy isolating control device. Multiple energy sources will require isolation and lockout/ blockout of each source individually.

Scope

This policy applies to all operations and maintenance activities involving hazardous machinery and/or energy sources (electrical, hydraulic, pneumatic, mechanical, thermal, chemical, nuclear, etc.). In this context, hazardous implies the ability to kill or injure personnel in the affected area.

Responsibility

Supervisors will provide all necessary equipment for performing the operation or maintenance duties safely, as well as all safety locks, keys, tags, and training to ensure the safety of employees. Supervisors will survey all hazardous energy sources, and implement this procedure for lockout / blockout at each location. Supervisors will periodically inspect for compliance with this policy, enforce its provisions, and maintain the necessary documentation of training, lock issue, etc. Employees will be responsible for knowing and following the procedures contained in this policy.

Authorization

California Code of Regulations Title 8, Section 3314
Code of Federal Regulations Title 29, Section 1910.147

Procedures

1. Prior to performing maintenance or service on equipment energized by a hazardous energy source that can endanger personnel, the energy isolating mechanism or mechanisms must be identified. After turning off all operational controls, the energy source or sources must then be isolated (disengage power at a breaker or disconnect switch, close shut-off valve, etc.) by an authorized employee knowledgeable in the specific hazards of the equipment being serviced. Note: Push buttons, selector switches, and other control-circuit type devices are not energy isolating devices.
2. If a lock can be applied to the energy-isolating device in the closed position, the authorized employee who will perform the maintenance or be exposed to the danger must apply one. In addition, a sturdy, prominent tag that states “Danger – Do Not Operate” must also be applied to the energy-isolating device. The tag must also identify the department, employee, and date the lockout was initiated. If a lock cannot be applied, then the tag described above will suffice. However, take any other feasible precautions to afford protection that approaches lockout level. A second tag must also be applied to the equipment being serviced in a position that is immediately obvious to personnel who might attempt to operate the equipment.
3. Locks must be sturdy with individual keys. Sharing of keys is not allowed. A spare key is acceptable if stored in a supervisor’s area for emergency use only. In addition, the locks must be conspicuous, easily recognized between all service personnel as lockout / blockout devices, and used for no other purpose.
4. Any stored energy in the equipment being serviced must be safely discharged and all moving parts returned to a safe resting position. Use appropriate blocks if a hazard still exists from equipment cycling or gravity.
5. Test the effectiveness of the lockout by attempting to operate the equipment while de-energized.
6. After maintenance is complete, clear all personnel and tools from the hazardous area and verify that all operational controls are in the off position. The lock and/or tag on the energy-isolating device can then be removed, but **only by the employee who applied them**. For shift changes or other unique applications, adopt an official method for transferring responsibility for lock removal to the incoming employee.
7. Engage energizing device or devices for normal operation.

Special Provisions

1. For complex systems, use a written checklist to ensure proper steps are taken for lockout, clearance, and startup.
2. For work involving more than one employee, use a hasp or other device that can accept numerous locks – one from each individual performing work on the equipment. Energization is not allowed until each employee removes his or her particular lock.
3. For work involving outside contractors working with UCSD employees, inform a responsible employee from each firm about this policy and require its application.
4. For equipment that must be serviced while energized, a written procedure must be adopted that affords effective protection to the personnel performing the work. Supervisors must supply any special tools required to ensure this protection.
5. The only exception to this policy is for equipment that has no stored energy, and can be de-energized from one point source that is under the direct control of the employee performing the repairs (i.e., an electrical cord that can be unplugged and kept at an employee's feet during repair).

Address questions about this policy to UCSD Environment, Health & Safety, General Safety Division, (858) 534-3660.

Lock-out/Tag-out For Hydraulic Lines

- a. In the event that hydraulic hoses need to be disconnected, the main electrical source for the hydraulic pumps will be locked and tagged with appropriate person(s) signing tags. Additionally, inline valves may be closed, locked, and tagged.
- b. The person(s) signing Tags will be responsible for assuring the hydraulic hoses are reconnected and in working order before the locks and tags are removed.

Chapter 2: Machine Shop and Tool Training

A. Introduction

- a. All employees will be provided with proper shop safety information such as tool training, personal protective equipment,...etc. from lab personnel.
- b. Standard operating procedures for machine and equipment will be trained by designated laboratory personnel.
- c. All machine maintenance will be conducted by designated laboratory personnel.

B. Responsibilities

- a. If you don't know how to do something, ASK!
- b. Do not leave machines running unattended.
- c. Operators need to inspect their machines before using them to make sure all guards are in place, all emergency stop devices work properly, and the machine is in generally safe condition.
- d. Do not slow down the machines by touching it.

C. Personal Protective Equipment

- a. All personnel must wear safety glasses when operating machines.
- b. Hearing protection (ear muffs or ear plugs) is available.

D. Clothes and Hair

- a. Anyone with long hair or a long beard, tie it up before operating machinery.
- b. No loose clothing, ties, scarves, etc. when working the shop area.
- c. Loose jewelry must be removed before operating machinery.

E. Controls

- a. All machine guards must be installed and functioning properly.

USE OF TOOLS AND EQUIPMENT

1. All tools and equipment shall be maintained in good condition.
2. Damaged tools or equipment shall be removed from service and tagged "DEFECTIVE".
3. Pipe or Stilton wrenches shall not be used as a substitute for other wrenches.
4. Only appropriate tools shall be used for the job.
5. Wrenches shall not be altered by the addition of handle extensions or "cheaters".
6. Files shall be equipped with handles and not used to punch or pry.
7. Wheelbarrows shall not be pushed with handles in an upright position.
8. Portable electric tools shall not be lifted or lowered by means of the power cord. Use ropes tightly secured to the tool instead.
9. Electric cords shall not be exposed to damage from vehicles.
10. In locations where the use of a portable power tool is difficult the tool shall be supported by means of a rope or similar support of adequate strength.

TOOL TRAINING

Purpose

The purpose of tool training is to instruct staff in the safe use of shop tools, identify hazards of specific tools, and create safety awareness during tool use.

Training Records

The Department Safety Coordinator at Englekirk Center will keep and maintain training records for all employees who use shop tools.

Common Sense

In all aspects of work employees should practice common sense, perhaps more so when hand and power tools are involved.

Common sense on the job is irreplaceable.

Points to consider

- Always wear the proper personal protective equipment.
- Don't over exert yourself – get help with heavy tasks.
- Don't over extend yourself when on ladders – and risk losing your balance.
- Always use the proper tool for the job.
- Concentrate on your work.
- Look for unsafe acts or unsafe working conditions – and then report them.
- Watch out for others – remember you are part of a team.
- Ask the following questions before you begin to work:
- Are the conditions safe to do the work?
- Are the methods we are going to use safe?
- Does everyone know what to do?
- Does everyone know how to do it?
- Can I fall, get struck by, get caught between or under, or get electrocuted on this job?

The Right Tool for the Right Job

One way to get injured on the job is using the wrong tool for the job. Two important points to remember when using hand tools is the selection of the tool for the job and the use of the tool for the job.

Some key points to remember:

- *Misuse Resulting From:*
- Ignorance.
- Poor attitudes.
- Production demands.
- *General Points:*
- Keep your tools clean and in good condition.
- Choose the right tool for a specific job.
- Never use a tool not designed for the job you are doing.
- Never carry tools in your pockets.
- When chipping or cutting, wear eye protection.
- Be wary of the effect of your actions on other nearby workers.
- Use a pulling motion to operate hand tools rather than a pushing method.
- Never leave hand tools in areas where they may be kicked off onto lower levels or where they may be a tripping hazard.
- Never improvise.
- Don't adapt or use "cheaters."
- Never remove an electrical cord by jerking it; pull it away from power by the plug.
- Always be sure that power tools are electrically safe

Hand Tools

All too frequently, hand tools are used improperly or when they are defective. Since we use hand tools continually, it is important they be used properly.

General Hand Tool Rules

- Always use the right tool for the right job.
- Use only tools in good condition.
- Keep tools sharpened.
- Store tools properly.
- When chipping, always wear safety glasses.
- Never throw tools to co-workers.
- Never use a tool in such a way that you will be injured if it slips.

Pre-Work Inspection

Chisels

- Be sure the heads are safe ended or dressed.
- Be sure the cutting edges are sharp and square.

Come-a-Long

- Check for hook and cable damage.
- Be sure you use within rated load limits.

Files

- The tangs should be protected with handles.
- The teeth should be sharp and clean.

Hammers

- Be sure the handles are tight, unbroken and clean.
- The face of the head should be smooth and not mushroomed.

Hammer/Smack Wrench

- Be sure you have the right size wrench.
- Always wear safety glasses.

Screwdrivers

- Be sure handles are smooth and clean.
- All bits should be sharp and square.

Tool Usage

Screwdrivers

The screwdriver is one of the most commonly misused hand tools. While it is designed to tighten or loosen screws, you can also find it being used as a pry bar, punch or chisel. When that happens, the screwdriver can slip. When it slips, it can cause an injury or ruins the tool.

Proper Care

- The handle should be tight, smooth and not slippery.
- The shank should be true and straight.
- The bit should be flat, with the end at a right angle with the shank.
- Keep the bit square edged.
- When sharpening, be use not to remove the bit temper.
- Keep the bit and handle clear and free of grease and oil.

Proper Use

- Always use the proper size bit to fit the screw head.
- Keep the bit square to the screw head.
- Never use pliers on a screwdriver; if possible, use a vise.
- Never use as a pry, chisel, punch or lever.
- Use only a standard screwdriver on a standard screw; Phillips head on a Phillips head screw.
- Select the right length for the job; don't try to improvise.
- Always use a screwdriver with an insulated handle for electrical work.

Wrenches

Proper Care

- Inspect on a regular basis
- Replace sprung jaws, cages and faces
- Replace all bent handles
- Keep the jaws sharp
- Keep the wrench clean and free of grease and oil.

Proper Use

- Always use the proper size wrench for the job.
- Never use a shim to make a wrong size wrench fit a nut.
- Never use a piece of pipe on the handle to increase your leverage. (Slip hazard.)
- Don't use a wrench as a substitute for a hammer.
- Don't pound on a wrench to try to loosen a frozen bolt. Use penetrating oil.
- Always pull a wrench toward you—never push away. (Slip hazard.)

- See that the wrench jaws are sharp and can bite the nut.

Hammers/Chisels

One of the most common causes of hand injuries is from the improper use of hammers and chisels. Both are responsible for a high number of eye injuries as a result of flying nails, metal or concrete chips.

Chisel Use

- Never use a chisel with a mushroomed head.
- Always wear eye protection.
- Hold the chisel between the thumb and forefingers – don't make a fist around the chisel.
- Do not grip a chisel if your hands are numb.
- If another worker is nearby, place yourself between the other worker and the chipping area.
- Always use sharp chisels.

Hammer Use

- Use the right type of hammer for the job.
- Only use hammers in good condition.
- Use only hammers to drive objects.
- Always grip the hammer close to the end and grip it tightly.
- Whenever possible, wear eye protection, and ear protection.
- Always concentrate on the striking point.
- Strike blows as squarely as possible.
- Be sure there is an unobstructed back swing.
- Don't strike blows with the side of the hammer.
- Never strike a hammer or tempered tool with another hammer.
- Always keep your hammer free of grease and oil.
- Never allow someone else to hold a nail or chisel while striking it.

Nails Are Dangerous Too

You would think that nails are not a very important subject. However, many minor injuries on the job are a result of punctures, scrapes, and cuts resulting from nails that were not properly removed from lumber and other debris.

Driving Nails:

- Be sure your hammer is in good condition.
- Always hit the nail squarely, especially on the first blow.
- Always hit with the blow's 90 degrees to the nail head.
- Make sure the back swing is unobstructed; claws can hurt.
- Be consistent—"groove" your swing.

- Concentrate on the head of the nail.
- Pulling Nails:***
- Always pull or bend nails when stripping.
 - Use the right pulling device for the job.
 - If needed, use a block of wood as a fulcrum. It will make the job much easier.
 - Keep scrap materials in neat piles and out of walkways.

Come-a-Long

Come-a-Long is a common name for a ratcheting cable winch, used to pull or hoist heavy objects.

Proper Care

- The cables should be free of kinks and frays, remove from service if cable is frayed.

Proper Use

- Be sure you use within rated load.
- Be sure to secure the ends to something which will also carry the load as the come-a-long does.

Hammer/Smack Wrench

A hammer wrench or smack wrench is a wrench designed to be hit with a mallet or sledge hammer to achieve greater clamping force than a hand wrench would provide.

Proper Use

- Be sure you have the right size wrench.
- Assure no one or thing will be in your swing radius, especially if you miss with the hammer.
- Always wear safety glasses and ear protection.

Ladders

Injuries in the workplace because of ladder are commonplace. Falls from ladders can be as painful as a fall from a roof; about a third of all reported falls are falls from ladders. (*) Many of the fall related injuries result from the improper use or the use of a defective ladder. Step/extension ladders are made to access/egress upper levels, not to be used as work platforms. The following safe work rules should be observed when working with ladders.

(*) 1993-94 Study: 238 of 705 falls based on an OSHA study.

Inspection

- Look for missing or loose cleats at the bottom.
- Look for loose or missing screws, bolts or nails on job made ladders
- Look for cracked, broken, split, dented or badly worn rungs, cleats or side rails.
- Splinters on wood ladders.
- Corrosion on metal ladders.

Proper Ladder Use

- Always use the right ladder for the right job.
- Don't set your ladder in a walkway or door opening.
- Keep the area at the top and bottom of the ladder clear of tool cords, tools, material and garbage.
- Always set the ladder on solid footing.
- Use a twenty-five percent (25%) angle on the slope of the ladder.
- When using extension ladders, the three (3) top rungs must extend beyond the landing platform. (Or the top of an extension ladder must be 36" (3 feet) above the landing.
- Don't lean to the side when on a ladder or you may tip over.
- Do not carry tools or materials on a ladder. Use both hands when climbing a ladder to grab onto the side rails. If it is necessary to move material or tools up a ladder, first climb up, then pull up the work with a hand line.
- Only one person on a ladder at a time (*unless the ladder is double cleated*).
- Always secure the top of the ladder to prevent it from sliding.
- Never lean a step ladder; always fully open a step ladder.
- Always face the ladder.
- Always tie off the ladder. That way it stays where you put it.

Electric Power Tools

Electric power tools come in all shapes and sizes and are designed to do almost anything. The following rules should be remembered when using electrical power tools:

Inspect for the following:

- Be sure the cord is properly grounded and double insulated
- Broken or defective cords
- Defective terminal connections
- Defective plugs
- Defective or loose switches
- Brushes that spark excessively
- Never use a tool unless the guards are in place and in working order.

Before using the tool:

- Remove the chuck or adjusting key
- Firmly secure the work
- Be sure you have firm footing

Always use proper personal protective equipment and remove dangerous items:

- Do NOT wear gloves when operating machinery with rotating parts.
- Always wear safety glasses or goggles
- Do not wear loose clothing/jewelry
- Never adjust the tool when it is plugged in.
- Disconnect the tool when finished or when not using.
- Maintain good housekeeping.
- Avoid working in wet areas whenever possible. When you do, wear insulating materials such as rubber gloves or a rubber vest.

Electric Extension Cords

Extension cords need to be continuous with double insulation.

Inspect for the following:

- Broken or defective cords
- Defective terminal connections
- Defective plugs
- Spliced or taped cuts in any part of the insulation
- **If any defects are found; remove from service.**

Table Saws/Radial Arm Saw /Miter Saw

We all recognize how important our hands are to our employability. Table, Radial, and Miter saws are the surest and cleanest way to lose a finger or a hand. Much of this is a result of getting used to operating a saw and then losing respect for it. That is why it is so important that we review the common safety rules pertaining to the operation of a stationary saw.

Two common types of saws: Table saw; radial arm /miter saw.

General Operating Rules:

- Never operate without all guards in place, especially the blade guard.
- Be sure you stand in the correct position—always allow for kick back.
- Maintain good footing.
- Never allow other workers to work or rest when they are exposed to kick back.
- Maintain good housekeeping in the saw area.
- Never use your hands to run lumber through the blade or to clean off sawdust. Get a push-stick and a brush.
- Do NOT wear gloves when operating saws, the blade may grab the glove and pull your hand into the blades cutting radius.
- Never use a saw with a dull blade. (Note: When you go to change a blade, make sure the power is disconnected and you control the switch.)
- Don't crowd (i.e., pinch) a blade especially when cross-cutting.
- Don't wear loose clothing around a saw.
- Always wear eye protection.
- Be wary of warped lumber.
- Look for nails, screws or other contaminants if re-using wood.
- Be wary of "fly back" (also called kick back) when ripping.
- Keep the blade set so it just barely makes the desired cut.
- Keep your material supported, plan ahead for the support of the cut pieces.

Saw Blade Rules

- Always keep the blade sharp.
- Use the right blade for the materials being cut.
- Never change blades while the saw is plugged in.

Stationary Sander

The stationary sander is used to grind or sand wood and metal. It has a belt sander as well as a disc sander; each grinding surface is capable of pulling your work into itself if you are not careful. Each grinding surface is also capable of pulling *you* into the grinding surface if you are not careful.

General Safety Rules

- Do not wear gloves when operating rotating machinery.
- When grinding steel keep clear any flammable material such as solvents, paper, and rags; the sander does produce sparks which could easily start a fire.
- Use only grounded or double-insulated tools.
- Use only extension cords that are in good condition.
- Make sure there is an assured grounding program or ground fault interrupter (GFI) being used.
- Make sure all work areas are as dry as possible.
- Never do maintenance work on the sander while it is plugged in.
- Always remain alert.

Guard Rules

- Make sure all guards are operable before use.

Abrasive Saw

An abrasive saw is primarily used in cutting ferrous and non-ferrous metals. Special precautions are needed when cutting metal versus wood.

General Safety Rules

- Use only grounded or double-insulated tools.
- Use only extension cords that are in good condition.
- Make sure there is an assured grounding program or ground fault interrupter (GFI) being used.
- Make sure all work areas are as dry as possible.
- Never do maintenance work on the saw while it is plugged in.
- Make sure your material is clamped and supported at both ends to prevent kick up if a cut piece should fall.
- Always remain alert.
- Do NOT use the side of the blade as a grinder.
- Check the blade for damage prior to use.
- Keep clear any flammable material such as solvents, paper, and rags; the saw does produce sparks which may easily start a fire.

Guard Rules

- Make sure all guards are operable before use.

- Do not use the saw if it has a defective guard.
- Never block any of the guards open.

Stationary Grinder

The stationary grinder is used to grind metal. It has a turning wheel capable of pulling you and/or your work piece into itself. Damaged grinder wheels may shatter and cause serious injury

General Safety Rules

- Wear Safety glasses.
- Do not wear gloves when operating rotating machinery.
- Do not use the side of the grinder wheel, it is not designed for this purpose.
- Keep clear any flammable material such as solvents, paper, and rags; the grinder does produce sparks which may easily start a fire.
- Use only grounded or double-insulated tools.
- Make sure there is an assured grounding program or ground fault interrupter (GFI) being used.
- Make sure all work areas are as dry as possible.
- Never do maintenance work on the saw while it is plugged in.
- Always remain alert.

Guard Rules

- Make sure all guards are operable before use.
- The proper spacing of the tool rest shall not exceed 1/8 inch, and the spacing of the tongue guard shall not exceed 1/4 inch.
- There shall not be any alterations made to the manufacturers' guards which would result in its malfunction.

Changing/Facing Grinder Wheel

Changing the wheel

- Be sure to unplug the machine when changing the grinder wheel.
- Immediately before mounting the wheel, inspect for damage and PERFORM A RING TEST on the wheel.

Steps to perform a ring test:

1. Visually inspect wheel for damage
2. Hold wheel by the arbor and lightly tap side of wheel with non-metallic object, such as a screwdriver handle. You should hear a "ringing" sound if the wheel is *not* cracked or damaged.

-If you hear a dead sound the *wheel should not be used*.

- Check spindle speed before mounting wheel to be certain it does not exceed maximum operating speed marked on wheel.

Facing the wheel

- Use the facing tool to even the grinding surface to eliminate grooves which would increase the allowable gap of the tool rest.

14" Band Saw

Band saws may be used to cut wood or metals; however you need to be sure of the type of blade installed *before* you make a cut.

General Safety Rules

- Wear Safety glasses.
- Do not wear gloves when operating rotating machinery.
- Use only grounded or double-insulated tools.
- Use only extension cords that are in good condition.
- Make sure there is an assured grounding program or ground fault interrupter (GFI) being used.
- Make sure all work areas are as dry as possible.
- Never do maintenance work on the saw while it is plugged in.
- Always remain alert.

Guard Rules

- Make sure all guards are operable before use.
- Do not use the saw if it has a defective guard.
- Never block any of the guards open.
- Drive wheels shall be fully encased.
- All portions of the blade shall be fully enclosed, except for the working portion between the blade guides and the table.

Drill Press

A drill press makes drilling much easier, especially in metal. It is also a powerful piece of machinery which requires extra care when operating.

General Safety Rules

- Always wear safety goggles or safety glasses with side shields complying with current national standard, and a full face shield when needed.
- Wear hearing protection during extended periods of operation.
- Do not wear gloves, loose clothing, jewelry or any dangling objects that may catch in rotating parts or accessories. Tie back long hair.
- Remove material or debris from the area that might be ignited by hot chips.
- Make certain the chuck key is removed before starting the tool. The key can be thrown at high velocity if not removed.
- Be sure belt guards are installed and functioning properly.

- Never hold the workpiece by hand. To prevent the workpiece and backup material from spinning, set them against the left side of the drill support column. Secure the workpiece with a clamp or the appropriate fixture if it is too short to reach the column.
- Carefully set the drill press speed appropriate for both the type of material and bit size you are using.

Operating Safety Rules

- Do not touch the bit or chips. Drill bits and cuttings are hot immediately after drilling.
- If something goes wrong, never attempt to correct a problem with the drill operating. Shut it off and unplug it if possible.
- Never reach around or under the working head, or grab the chuck to stop a drill press. This can result in hand puncture or other serious injury.
- Always shut off, unplug if possible, and lock the press if a lock is available, and store the key.
- Use a vacuum, brush or rake to remove cuttings.
- Remove burrs and chips from a drilled hole. When making deep holes, clean out the hole frequently.
- Lubricate drill bit when drilling metal.
- Reduce the drilling pressure when the drill begins to break through the workpiece. This action prevents drill from pulling into the work and breaking.
- Keep drill bits clean and sharp. Dull drills are a common cause of breakage.
- Keep floor around the drill press free of oil and grease.
- Keep the working surface clean of scraps, tools and materials.
- Keep guards in place and in good working order.

Portable Electric Tools

The use of portable electric power tools is one of the most common occurrences on a construction project today. It is important to remember that electricity always seeks a path of least resistance and often that is through a defective cord into the worker's body. This is especially true if the worker is exposed to wet weather or has been sweating.

The following safety rules discuss the safe use of portable electric tools:

- Use only equipment that is in good condition.
- Be sure the tool is properly grounded.
- Always report the following:
 - Defective or broken cords;
 - Bad connections to power terminals;
 - Defective or broken plugs;
 - Defective or loose switches;
 - Brushes causing sparks.
- Never overstrain the tool thus overloading the motor.
- Never use an un-insulated tool without a grounding plug.
- Avoid working in wet areas unless a ground fault interrupter circuit is used.
- Never use a tool in the presence of flammable vapors or gases unless it is designed for such use.

Circular Saw

The circular saw is one of the most common power tools found in residential construction. It is also one of the most abused being tossed around, kicked out of the way, but depended on to get the job done.

General Safety Rules

- Use only grounded or double-insulated tools.
- Use only extension cords that are in good condition.
- Make sure there is an assured grounding program or ground fault interrupter (GFI) being used. (See Electrical section for more information.)
- Make sure all work areas are as dry as possible.
- Never do maintenance work on the saw while it is plugged in.
- Never ever use your leg as a sawhorse.
- Always remain alert.

Guard Rules

- Make sure all guards are operable before use.
- Do not use the saw if it has a defective guard.
- Never block any of the guards open.

- Always check before setting the saw down to be sure that the blade guard does not jam open.

Saw Blade Rules

- Always keep the blade sharp. Dull blades cause binding, stalling and possible kickback. Dull blades also waste power and reduce motor and switch life.
- Use the right blade for the materials being cut. Check this carefully: Does it have the proper size and shape arbor hole? Is the speed marked on the blade at least as high as the no load RPM on the saw's nameplate?
- Never change blades while the saw is plugged in.

Operating Safety Rules

- Before starting a circular saw be sure the power cord and extension cord are out of the blade path and are sufficiently long to freely complete the cut. A sudden jerk or pulling on the cord can cause loss of control of the saw and a serious accident.
- For maximum control, hold the saw firmly with both hands after securing the workpiece. Clamp workpieces. Check frequently to be sure clamps remain secure.
- Never hold a workpiece in your hand or across your leg when sawing.
- Avoid cutting small pieces of material which can't be properly secured, and material on which the base of the saw (shoe) cannot properly rest.
- When making a "blind" cut (you can't see behind what is being cut), be sure that hidden electrical wiring, water pipes or any mechanical hazards are not in the blade path. If wires are present, they must be disconnected at the power source by a qualified person or avoided. Contact with live wires could cause lethal shock or fire. Water pipes should be drained and capped. Always hold the tool by the insulated grasping surfaces.
- Set blade depth to no more than 1/8 in. to 1/4 in. greater than the thickness of the material being cut.
- When you start your saw allow the blade to reach full speed before the workpiece is contacted.
- Be alert to the possibility of the blade binding and kickback occurring, (see "Preventing Portable Circular Saw Kickback").
- If a fence or guard board is used, be certain the blade is kept parallel with it.
- NEVER overreach!
- Crowded, cluttered conditions that can cause tripping, or loss of balance are particularly dangerous.

- When making a partial cut, or if power is interrupted, release the trigger immediately and don't remove the saw until the blade has come to a complete stop.
- Never reach under the saw or workpiece.
- Portable circular saws are not designed for cutting logs, or roots, trimming trees or shrubs. These are very hazardous practices.
- Switch the tool off after a cut is completed, and keep the saw away from your body until the blade stops.
- Unplug, clean and store the tool in a safe, dry place after use.

Preventing Portable Circular Saw Kickback

Kickback is a sudden reaction to a pinched blade, causing an uncontrolled portable tool to lift up and out of the workpiece toward the operator. Kickback is the result of tool misuse and/or incorrect operating procedures or conditions.

Take these specific precautions to help prevent kickback when using any type of circular saw:

- Keep saw blades sharp. A sharp blade will tend to cut its way out of a pinching condition.
- Make sure the blade has adequate set in the teeth. Tooth set provides clearance between the sides of the blade and the workpiece, thus minimizing the probability of binding. Some saw blades have hollow ground sides instead of tooth set to provide clearance.
- Keep saw blades clean. A buildup of pitch or sap on the surface of the saw blade increases the thickness of the blade and also increases the friction on the blade surface. These conditions cause an increase in the likelihood of a kickback.
- Be very cautious of stock which is pitchy, knotty or warped. These are most likely to create pinching conditions and possible kickback.
- Always hold the saw firmly with both hands.
- Release the switch immediately if the blade binds or the saw stalls.
- Support large panels so they will not pinch the blade. Use a straight edge as a guide for ripping.
- Never remove the saw from a cut while the blade is rotating.
- Never use a bent, broken or warped saw blade. The probability of binding and resultant kickback is greatly increased by these conditions.
- Overheating a saw blade can cause it to warp and result in a kickback. Buildup of sap on the blades, insufficient set, dullness, and unguided cuts, can all cause an over heated blade and kickback.
- Never set a blade deeper than is required to cut the workpiece 1/8 in. to 1/4 in. greater than the thickness of the stock is sufficient. This minimizes

- the amount of saw blade surface exposed and reduces the probability and severity if any kickback does occur.
- Minimize blade pinching by placing the saw shoe on the clamped, supported portion of the workpiece and allowing the cut off piece to fall away freely.

Reciprocating Saws

The versatility of the reciprocating saw, in cutting metal, pipe, wood and other materials has made it a widely used tool. By design, it is a simple tool to handle. Its few demands for safe use, however, are very important.

General Safety Rules

- Blades can break. Always wear safety goggles or safety glasses with side shields complying with current national standard, and a full face shield when needed. Use a dust mask in dusty work conditions. Wear hearing protection during extended periods of operation.
- Do not wear loose clothing, jewelry or any dangling objects that may catch in moving parts or accessories. Tie back long hair.
- Use sharp blades. Dull blades can produce excessive heat, make sawing difficult, result in forcing the tool, and possibly cause an accident.

Operating Safety Rules

- Without exception, use the blade specifically recommended for the job being done. Check your owner/operators manual carefully concerning this.
- Position yourself to maintain full control of the tool, and avoid cutting above shoulder height.
- To minimize blade flexing and provide a smooth cut, use the shortest blade that will do the job.
- The workpiece must be clamped securely, and the shoe of the saw held firmly against the work to prevent operator injury and blade breakage.
- When plunge-cutting, use a blade designed for that purpose. Maintain firm contact between the saw's shoe and the material being cut.
- When making a "blind" cut (you can't see behind what is being cut), be sure that hidden electrical wiring, or water pipes are not in the path of the cut. If wires are present, they must be disconnected at their power source by a qualified person or avoided, to prevent the possibility of lethal shock or fire. Water pipes must be drained and capped.
- Always hold the tool by the insulated gripping surfaces.
- When making anything other than a through cut, allow the tool to come to a complete stop before removing the blade from the workpiece. This prevents breakage of the blade, and possible loss of tool control.

- Remember that the blade and blade clamp may be hot immediately after cutting. Avoid contact until they have cooled.
- You expose yourself to unnecessary hazards if these or any manufacturers' instructions are not followed. Keep hands away from blade and shoe.

Jig Saws

Portable jig/saber saws are light weight and generally easy to handle. For this reason, carelessness can easily enter the picture.

General Safety Rules

- Always wear safety goggles or safety glasses with side shields complying with current national standard, and a full face shield when needed. Use a dust mask in dusty work conditions. Wear hearing protection during extended periods of operation.
- Do not wear loose clothing, jewelry or any dangling objects that may catch in moving parts or accessories. Tie back long hair.
- The tool should be unplugged before checking or installing blades or accessories.

Operating Safety Rules

- Check carefully that the blades are adequately secured in position before plugging in. Make sure the cord is out of your way and not in the line of cut.
- Firmly position the tool's base plate/shoe on the workpiece before turning on the tool.
- Keep your hands and fingers well clear of moving parts.
- After making partial cuts, turn the tool off and remove the blade from the workpiece only after the blade has fully stopped.
- Know what is behind a cut before you make it. Be sure that hidden electrical wiring, water pipes, hazardous objects of any kind are not in the path of the cut. If wires are present, they must be disconnected by a qualified person at their power source to prevent the possibility of lethal shock. Water pipes must be drained and capped. Always hold the tool by the insulated grasping surfaces.
- When plunge (pocket) cutting, use a blade designed for that purpose and follow the manufacturer's recommended procedures.
- Maintain firm contact between the base and the material being cut, throughout cutting procedures.
- Remember that the blade and blade clamp may be hot immediately after cutting. Keep your hands away until cooled down.
- Never overreach. It can be hazardous with small tools.

- Do not leave saws unattended — unplug and secure the tool immediately after use. It is the type of tool that children can readily pick up and cause injury.

Portable Band Saw

The portable band saw is used to cut various metals though its capacities are limited. Be sure you can complete the cut before you begin.

General Safety Rules

- Use only blades which are 1,140 mm (44-7/8") long; 13 mm (1/2") wide; and 0.5 mm (0.020") thick.
- Check the blade carefully for cracks or damage before operation. Replace cracked or damaged blade immediately.
- Secure the workpiece firmly. When cutting a bundle of workpieces, be sure that all the workpieces are secured together firmly before cutting.
- Cutting workpieces covered with oil can cause the blade to come off unexpectedly. Wipe off all excess oil from workpieces before cutting.
- Never use cutting oil as a cutting lubricant, Use only Makita cutting wax.
- Do not wear gloves during operation.
- Hold the tool firmly with both hands.
- When cutting metal, be cautious of hot flying chips.
- Do not leave the tool running unattended.
- Do not touch the blade of the workpiece immediately after operation; they y be extremely hot and could burn your skin.

Installing or Removing Blade

- Always be sure that the tool is switched off and unplugged before installing or removing the blade.
- Oil on the blade can cause the blade to slip or come off unexpectedly. Wipe off all excess oil with a cloth before installing the blade.
- Use caution when handling the blades so that you are not cut by their sharp teeth.
- Insert the blade between the bearings of one blade guide first and then into the other blade guide. The blade back should contact the bearings in the lower portion of the blade guides.
- Position the blade around the wheels and insert the other side of the blade within the blade guard until the blade back contacts the bottom of the blade guard.
- Hold the blade in place and turn the blade tightening lever counterclockwise until it hits against the protrusion on the frame. This places proper tension on the blade. Make sure that the blade is correctly positioned within the blade guard and around the wheels.

- Start and stop the tool two or three times to make sure that the blade runs properly on the wheels.
- CAUTION: While making sure the blade runs on the wheels properly, keep your body away from the blade area.
- To remove the blade, follow the installation procedures in reverse.
- CAUTION: When turning the blade tightening lever clockwise to release the tension on the blade, the blade may come off unexpectedly. Be careful.

Operating Safety Rules

- CAUTION: Never use cutting oil or apply excessive amount of wax to the blade. It may cause the blade to slip or come off unexpectedly.
- When cutting cast iron, do not use any cutting lubricant.
- It is important to keep at least two teeth in the cut.
- Turn the tool on and wait until the blade attains full speed. Gently lower blade into the cut. The weight of the tool or slightly pressing the tool down will supply adequate pressure for the cutting. Do not force the tool.
- As you reach the end of a cut, release pressure and, without actually raising the tool, lift it slightly so that it will not fall against the workpiece.
- CAUTION: Applying excessive pressure to the tool or twisting of the blade may cause bevel cutting or damage to the blade.

Percussion Tools

Hammers, Rotary Hammer and Hammer Drills: This family of tools is primarily associated with masonry applications as varied as chipping, drilling, anchor setting and breaking of pavement. They range from pistol grip types to large demolition hammers.

General Safety Rules

- Normal operating modes include hammering, hammering with rotary motion and rotation or drilling only. Many models incorporate a varied combination of the above modes.
- Capacity is normally rated in maximum diameter displayed on the nameplate. Do not attempt to use a bit larger than that which is specified unless otherwise recommended in the owner/operators manual.
- Before operating, compare the date on the nameplate with the voltage source and be sure that the voltage and frequency are compatible.
- Always wear safety goggles or safety glasses with side shields complying with current national standard, and a full face shield when needed. Use a dust mask in dusty work conditions. Wear hearing protection during extended periods of operation.

- Do not wear gloves, loose clothing, jewelry or any dangling objects that may catch in rotating parts or accessories. Tie back long hair.

Operating Safety Rules

- For maximum control and to resist torque caused by unexpected stalls, use the auxiliary handles provided with the tool.
- Do not tamper with clutches on those models that provide them. Have the clutch settings checked at the manufacturer's service facility at the intervals recommended in the owner/operators manual.
- Check for subsurface hazards such as electrical conductors or water lines before drilling or breaking blindly into a surface. If wires are present, they must be disconnected at the power source by a qualified person, or be certain they are avoided to prevent the possibility of lethal shock or fire. Water pipes must be drained and capped. Always hold the tool by the insulated grasping surfaces.
- Do not force the tool. Percussion tools are designed to hit with a predetermined force. Added pressure by the operator only causes operator fatigue, excessive bit wear and reduced control.
- Keep the operators work area clear of debris.
- Always provide firm footing.

Portable Drills

Available in a wide variety of types and capacities, portable power drills are undoubtedly the most used power tools in the world. Because of their handiness and application to a very wide range of jobs, drills often receive very heavy usage. For this reason your safety demands that you carefully check capacity limitations and accessory recommendations of your drill. See the owner/operators manual.

General Safety Rules

- Be sure the trigger switch actuates properly. It should turn the tool "on" and return to the "off" position after release.
- If equipped with a lock-on, be sure it releases freely.
- Check carefully for loose power cord connections and frays or damage to the cord. Replace damaged tool and extension cords immediately.
- Be sure the chuck is tightly secured to the spindle. This is especially important on reversible type drills.
- Tighten the drill bit securely as prescribed by the owner/operators manual. The chuck key must be removed from the chuck before starting the drill. A flying key can be an injury inflicting missile.
- Check auxiliary handles, if part of the tool. Be sure they are securely installed. Always use the auxiliary drill handle when provided. It gives you

more control of the drill, especially if stalled conditions occur. Grasp the drill firmly by insulated surfaces.

- Always wear safety goggles or safety glasses with side shields complying with current national standard, and a full face shield when needed. Use a dust mask in dusty work conditions. Wear hearing protection during extended periods of operation.
- Do not wear gloves, loose clothing, jewelry or any dangling objects that may catch in rotating parts or accessories. Tie back long hair.

Operating Safety Rules

- Always hold or brace the tool securely. Brace against stationary objects for maximum control. If drilling in a clockwise (forward) direction, brace the drill to prevent a counter clockwise reaction.
- Don't force a drill — apply enough pressure to keep the drill bit cutting smoothly. If the drill slows down, relieve the pressure. Forcing the drill can cause the motor to overheat, damage the bit, and reduce operator control.
- If the drill binds in the work, release the trigger immediately—unplug the drill from the power source, and then remove the bit from the workpiece. If you suspect that the drill operation you are performing can potentially bind, then under no circumstances should you actuate any switch “lockon” that may be available to you.
- Never attempt to free a jammed bit by starting and stopping the drill. As you approach hole breakthrough, grip or brace the drill firmly, reduce pressure and allow the bit to pass through the hold easily.
- Always have firm footing when drilling. Brace or position yourself very carefully when working on ladders and scaffolding. Be sure of your balance and control before you start the job.
- Unplug the tool before changing bits, accessories or attachments.
- And remember — when drilling blindly (you can't see behind what is being cut), check carefully for possible electrical wiring or pipes in your path. If wires are present, they must be disconnected at their power source by a qualified person or avoided to prevent possibility of lethal shock. Water pipes must be avoided or drained and capped. Always hold the tool by the insulated grasping surfaces, if provided.
- Remove materials or debris from the area that might be ignited by hot chips.

Pneumatic Nail Gun

The most popular nailing device used in light and heavy construction is the pneumatic nail gun. It uses the force from compressed air to drive nails through hard surfaces.

General Safety Rules for Nail Gun Use

- Always wear safety glasses.
- Never use a nail gun with the nose guard safety spring missing.
- Never rest the gun against any part of your body, or try to climb a ladder with the gun cradled against your body.
- Do not hold the trigger down unless you're purposefully firing the tool. This is especially important when descending ladders.
- Keep people out of range of fire. Exercise extreme caution when using an air tool around another worker.
- Never point the tool at anyone. Treat the tool like a firearm. Never assume the tool is empty.
- Disconnect the air hose before clearing a jam or making adjustments.
- Do not fire the tool unless the nose is firmly pressed against a work piece.
- Use only compressed air to power the tool, not bottled gas. Do not exceed the manufacturer's specified air pressure for the tool.
- Keep your free hand safely out of the way of the tool.
- Do not operate the tool around flammables.
- Nail top to bottom when nailing wall sheathing in a vertical position.
- Nail from the eaves to the ridge when nailing roof sheathing, this way you will not back off the edge of the roof.
- Move forward, not backward, when nailing horizontal areas.
- Secure the hose when working on scaffolding, to prevent the weight of the hose from dragging the tool off the scaffold if you set the tool down.
- Other risks to guard against while using a nail gun include being hit by one of the nail gun's attachment or a fastener used with the tool and being hit by flying concrete, wood chips and nails.

Dywidag Systems Safety and Operating Instructions Post Tensioning Jacks

WARNING: Read all safety and operating instructions and warnings before starting any work or operation. NEVER stand or allow anyone to stand directly behind, or above, or below a jack when stressing operations are under way.

1. Equipment Covered Here:

- A. Jack: 1 – 3/4” Stressing System
- B. Pump OTC PE554 115 volt single phase, 30 amp.
- C. Hoses: 19,000 psi bursting pressure
- D. Pressure Gauges: 10,000 psi, 100 psi gradations

2. Safety Instructions

1. Observe all relevant OSHA standards e.g. use of protective clothing and devices, grounding of electrical equipment, control of work area, etc.
2. All system components must be in good working condition prior to use. Inspect daily for signs of wear or damage. Do not use if grippers are worn excessively, hoses are cracked, pressure gauge is inoperable, or other defects are observed.
3. After inspection, test-run system (see Operating Instructions) to insure that all components are in proper working order.
4. Stressing operations must be under the direct control of a superintendent experienced in such operations.
5. Operators must wear proper personal protective equipment (hard hats, safety glasses, shoes, gloves and long sleeves, etc.) while operating equipment.
6. Stressing unit should be securely tethered to the structure at all times. In the event a tendon breaks during the stressing operation, the tether will prevent the unit from falling.
7. Operating personnel must keep feet from becoming entangled in the hydraulic hoses while stressing.
8. No one should be allowed to stand behind, directly above, or below the jack when stressing operations are under way.
9. Never exceed the maximum allowable stressing pressure. (Check Calibrations accompanying equipment).
10. Make certain jack is in the fully closed position when moving from tendon to tendon. Do not activate pump while moving the jack.

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11. Do not attempt to service the equipment beyond that described in the operating instructions. All other servicing should be referred to qualified DSI service personnel.

3. Operating Instructions

A. Preparation

1. Proper and complete connection of the hydraulic lines is vital to the safe operation of the equipment. Connect hydraulic hoses from pump stress port to jack stress port, from pump return port to jack return port and from the pump seating port to ram seating port. Fully engage all fittings hand tight.

WARNING: Improper or incomplete coupling of hydraulic hoses may cause injury or death to personnel, or severe damage to equipment.

2. Visually inspect concrete around the anchor. It should be free of voids.
3. Be sure the jack is equipped for the bar size to be stressed. Check the wrench sleeve for fit over the hex or anchor nut. Be sure the pull rod, pull rod nut, and coupler are the correct size and in good condition.
4. Check that oil level in pump is adequate.
5. Connect the hydraulic pump to 115V AC 60HZ 30 amp power source. Extension cords should be 3 wire, 12 gauge minimum with a maximum length of 50 ft. Further distances will damage the pump motor and will interfere with stressing.
6. Proper lifting equipment must be available prior to commencing.
7. Lift equipment by lifting harness only. Never use hydraulic lines for moving, carrying or adjusting of equipment.

B. Bleeding the Jack (See stressing for operation of Jack)

1. Tilt jack so rear fitting is higher than front (approximately 30 degrees) and facing up.
2. Advance ram until piston is fully extended. When piston is fully extended, the gauge pressure will rise sharply. (DO NOT EXCEED 500 PSI).

C. Stressing

1. Put pump motor switch in "Remote" position.
2. Place pump valve handle in return position, position B.
3. Depress pendant switch and return piston fully.
4. Hand tighten anchor nut to bar until plate is contracted. Failure to do so can damage the internal components of the jack.

5. Be sure bar extension beyond anchor nut is at least $\frac{1}{2}$ coupler length plus 1 inch.
6. Engage pull rod coupler $\frac{1}{2}$ length on pull rod, using the proper size allen wrench tighten set screw.
7. Engage pull rod and coupler fully onto the bar.
WARNING: To avoid serious accidents, pull rod coupler must be fully engaged.
8. Place pump valve in Stress position, position A, close check valve on stressing line (if installed).
9. Extend piston between $\frac{1}{4}$ " and $\frac{1}{2}$ ".
10. Place jack over bar, nut, pull rod coupler and pull rod. Jack wrench sleeve must slide over hex on anchor and bearing nose must be flat on bearing plate.
11. Install pull not until in contact the ball plate on rear of the jack.
12. Depress remote pendant switch on pump and stress tendon to desired load. Never exceed the maximum gauges pressures (refer to calibration report for max pressure).
13. Measure total bar elongation between bearing plate and any fixed reference point on bar before and after stressing.
14. Use ratchet handle to tighten nut to plate. DO NOT use "cheater" bar. **CAUTION:** Tightening of anchor nut with ratchet should be performed while ram is in motion.
15. Switch valve to Position B. and slowly open the check valve. Once the pressure on the gauge is zero, activate the pump retracting the ram.

WARNING: NEVER EXCEED 500 PSI IN RETRACT.

Chapter 3: Hazardous Material and Waste

ESEC uses hydraulic oil DTE 25 as manufactured by Mobil.

Reproduced from the following Internet link:

http://blink.ucsd.edu/Blink/External/Topics/How_To/0,1260,13036,00.html

Contact the Department Safety Coordinator, Environment, Health & Safety department (858-534-3660), or access the web link above for further information.

How to Store and Dispose of Hazardous Chemical Waste

Summary: Follow these guidelines for selecting containers and safely storing hazardous chemical waste until it's collected by Environment, Health & Safety (EH&S).


Are you in the right place? These guidelines are for hazardous **chemical** waste only.

- If your waste is **radioactive**, see [How to Store and Dispose of Radioactive Waste](#).
- If your waste is **biohazardous**, see [How to Package and Dispose of Biohazardous and Medical Waste](#).

Select a topic:

- [Hazardous or extremely hazardous?](#)
- [Storage area](#)
- [Labeling](#)
- [Containers](#)
- [Liquids](#)
- [Dry solids](#)
- [Empty containers](#)
- [Unknowns](#)
- [Time and quantity limits](#)

What to do	How to do it
<input checked="" type="checkbox"/> Determine if you have “hazardous” or “extremely hazardous” material.	<p>Guidelines are different for hazardous and extremely hazardous chemical waste.</p> <ul style="list-style-type: none"> • Check the list of Known Hazardous and Extremely Hazardous Wastes for your material. • If your material is listed as hazardous, use the guidelines on this page. • If your material is listed as extremely hazardous, proceed to How to Store and Dispose of Extremely Hazardous Chemical Waste.
<input checked="" type="checkbox"/> Designate a hazardous waste storage area.	<ul style="list-style-type: none"> • Select an area that is: <ul style="list-style-type: none"> ○ Near where the waste is generated ○ Under the control of lab personnel ○ Out of the way of normal lab activities • Label the area with a “Danger – Hazardous Waste” sign.

 <p>Hazardous waste sign</p>	<p>Request signs from EH&S Environmental Management Facility, (858) 534-2753.</p> <ul style="list-style-type: none"> • Make the area easily accessible and recognizable to EH&S waste technicians. • Note: Fume hoods may be used to temporarily store small quantities of waste materials, but should not serve as designated waste storage areas.
<p><input checked="" type="checkbox"/> Select appropriate containers.</p>	<ul style="list-style-type: none"> • Chemical compatibility: <ul style="list-style-type: none"> ○ Choose a container chemically compatible with the material it will hold. Chemicals must not react with, weaken, or dissolve the container or lid. ○ Follow these basic compatibility guidelines: <ul style="list-style-type: none"> ▪ Acids or bases: Do not store in metal. ▪ Hydrofluoric acid: Do not store in glass. ▪ Gasoline (solvents): Do not store or transport in lightweight polyethylene containers such as milk jugs. ○ Read Chemical Compatibility Guidelines for more detailed information. • Caps and closure: <ul style="list-style-type: none"> ○ Use waste containers with leak-proof, screw-on caps so contents can't leak if a container tips over. Corks, parafilm, and beakers are not acceptable. ○ If necessary, transfer waste material to a container that can be securely closed. Label the new container. ○ Keep waste containers closed except when adding waste. ○ Wipe down containers prior to your scheduled collection date. • Size: <ul style="list-style-type: none"> ○ Choose appropriately sized containers. Store smaller quantities in smaller containers. It's not cost effective to dispose of 50 milliliters of material in a 4 liter container. • Secondary containment: <ul style="list-style-type: none"> ○ Always place your container in a secondary container to: <ul style="list-style-type: none"> ▪ Capture spills and leaks from the primary container ▪ Segregate incompatible hazardous wastes, such as acids and bases ○ A secondary container must be chemically compatible and able to hold 110% of the volume of waste stored in the primary container(s). Lab trays and dishpans are frequently used for secondary containment. ○ EH&S provides free secondary containers for 20-liter (5-gallon) waste containers. Request these secondary containers from the EH&S Environmental Management Facility, (858) 534-2753.
<p><input checked="" type="checkbox"/> Label every waste container with a</p>	<ul style="list-style-type: none"> • Attach a completed hazardous waste tag to the container before you begin using the container to accumulate and store

	hazardous waste tag.	<p>waste.</p> <ul style="list-style-type: none"> • Cross out all other labels on the container. (Don't obliterate the original product label; waste technicians need to see what the container held before it was designated as a waste receptacle.)
<input checked="" type="checkbox"/>	<p>Read about liquid waste requirements.</p>	<ul style="list-style-type: none"> • Do not overfill liquid waste containers. Leave a sizable amount of head space in the container to allow for expansion and safe transportation — 10% head space is a good rule of thumb. • Do not mix solids with liquid waste. Containers found to contain solids during processing by EH&S hazardous waste technicians will be returned to the generator for separation. See guidelines for solid chemical waste below. • Liquid-filled small containers such as vials and Eppendorf tubes: <ul style="list-style-type: none"> ○ Double-bag containers in clear plastic bags to allow visual inspection by EH&S waste technicians. ○ Containers bagged together must contain liquids or liquid mixtures with the same chemical constituents. ○ Seal each bag individually. ○ Accurately list the bag's contents and chemical constituents on the hazardous waste tag. • Organic solvents: <ul style="list-style-type: none"> ○ Halogenated and non-halogenated organic solvents may be mixed together in the same waste container. Contact the EH&S Environmental Management Facility, (858) 534-2753, if you want to pour other chemical constituents in the same waste container. ○ Do not combine organic solvents with toxic metal waste! ○ Contact the EH&S Environmental Management Facility, (858) 534-2753, if you're using toxic metal compounds. Examples of metals include arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, copper, nickel, and zinc. • Oils: EH&S sends waste petroleum oils to be recycled. <ul style="list-style-type: none"> ○ Accumulate recyclable oil separately from oils contaminated with solvents, halogens, laboratory chemicals, or fuels. ○ Oils containing traces of mercury, lead, or other regulated metals are excluded from the recycling program. Notify EH&S on the hazardous waste tag if your oil waste may contain these materials.
<input checked="" type="checkbox"/>	<p>Read about requirements for dry, solid waste.</p>	<p>Chemically contaminated solid waste includes three categories that are packaged differently for disposal: lab trash, dry chemicals, and sharps and piercing objects.</p> <ul style="list-style-type: none"> • Lab trash: Examples include absorbent paper products, Kim Wipes, gloves, benchcoat, and other lab supplies. Follow these guidelines: <ul style="list-style-type: none"> ○ Double-bag the waste in clear plastic bags to allow visual inspection by EH&S waste technicians. If

		<p>contents cannot be visually inspected, EH&S cannot collect the bag.</p> <ul style="list-style-type: none"> ○ Seal each bag individually. ○ Accurately list the bag's contents and chemical constituents on the hazardous waste tag. <ul style="list-style-type: none"> ● Dry chemicals: <ul style="list-style-type: none"> ○ Dispose of solid reagent chemicals in the manufacturer's container. ○ Label the container with a hazardous waste tag. ● Sharps and piercing objects: Sharps are items capable of puncturing, piercing, or tearing regular waste bags. Examples include pipettes, pipette tips, and broken glass. Sharps require special packaging. <ul style="list-style-type: none"> ○ Read How to Dispose of Sharps and Piercing Objects for details.
<input checked="" type="checkbox"/>	<p>What to do with empty containers that once held hazardous chemicals.</p>	<p>Disposal of these containers depends on the container's size, what it's made of, and the hazardous material it once contained.</p> <ul style="list-style-type: none"> ● Read How to Dispose of Empty Hazardous Materials Containers for details.
<input checked="" type="checkbox"/>	<p>Follow these guidelines for "unknowns" or unidentified chemical waste.</p>	<p>Unknown or unidentified chemicals are considered hazardous waste. Processing and disposal of unknowns is particularly expensive because they must be handled with great care and caution. Please make every effort to avoid "unknowns" by diligently labeling and dating inventory.</p> <ul style="list-style-type: none"> ● Once found, ask others working in the area if they know what the material is. ● If the material can be identified: <ul style="list-style-type: none"> ○ Label it with a hazardous waste tag. ● If the material can't be identified: <ul style="list-style-type: none"> ○ Label it with a hazardous waste tag. ○ Write "Unknown" on the tag. ○ Write on the waste tag any known information. Include: <ul style="list-style-type: none"> ▪ Type of lab that material was found in (chemistry, organic or inorganic, biology, DNA research, etc.) ▪ Where the material was discovered in the lab (under a fume hood with other organics, on a shelf with inorganics or salts, etc.) ▪ Age of the material ● Request a hazardous waste collection. ● Contact the EH&S Environmental Management Facility, (858) 534-2753, if you need assistance with unknowns.
<input checked="" type="checkbox"/>	<p>Storage time and quantity limits before waste must be collected.</p>	<p>Keep UCSD in compliance. Request a hazardous waste collection before time or quantity limits are reached.</p> <ul style="list-style-type: none"> ● Time: All hazardous waste must be collected within 90 days

from when waste is first put into containers.

- **Quantity:** Up to 55 gallons of any individual hazardous waste may be stored before it must be collected.
 - **When 55 gallons or more** of hazardous waste accumulates, the waste must be collected within three days.
- Read [How to Request a Hazardous Waste Collection](#) for details.

If you are a UCSD employee and have questions, contact the [EH&S Environmental Management Facility](#), (858) 534-2753.

Notice: Disposal of hazardous waste using sinks, intentional evaporation, or as regular trash is against the law. Campus laboratories must abide by strict state and federal waste disposal requirements. You may be held liable for violations of applicable laws.

Chapter 4: Injury, Illness, and Natural Hazards

In the event of a medical emergency alert coworkers and call 9-1-1

Injuries or Illness

What to Do if a Work-Related Injury or Illness Occurs

If you are injured or develop a job-related illness as a result of your UCSD employment, follow the procedures below.

1. **Notify your supervisor when an injury or illness occurs.**
 - a. Notify your supervisor immediately if you experience a work-related injury or illness.
 - b. Employee or supervisor: Follow the steps below to report the injury or illness to the Workers' Compensation Office.
2. **Report injury or illness to the UCSD Workers' Compensation Office.**
 - a. Print an Employee Injury Incident Report form ([PDF](#)) ([Word](#)). PDF link: http://www-hs.ucsd.edu/riskmgmt/forms/INCIDENT_REPORT_05.pdf
Word link: http://www-ehs.ucsd.edu/riskmgmt/forms/INCIDENT_REPORT_05.doc
 - b. Complete the information according to instructions on the form.

Note: Both the employee and the supervisor have a section of the form to complete. If the employee is unable to complete his or her section, the supervisor must complete it for the employee.
 - c. **Immediately fax** the completed sections of the form to the Workers' Compensation Office: (858) 534-5202.

Important: Supervisors must report all work-related deaths, catastrophes, and serious injuries or illnesses within 8 hours to the UCSD Workers' Compensation Office. Reporting delays could result in Cal/OSHA fines.

A serious injury or illness is one that requires inpatient hospitalization, or in which an employee suffers a loss of any member of the body or suffers any serious degree of permanent disfigurement.

3. If necessary, seek medical treatment.

- **24-hour walk-in service:**
 - [Thornton Hospital](#) Emergency Room, (858) 657-7600
 - [UCSD Medical Center](#) (Hillcrest) Emergency Room, (619) 543-6400
- **By appointment only:**
 - UCSD Center for Occupational & Environmental Medicine, (619) 471-9210

Natural Hazards

Due to the location of ESEC, we are at risk of contact with venomous snakes and spiders. If bitten by a venomous snake or spider seek immediate medical attention and have a coworker try to make a positive identification.

Below you will find steps to take until medical attention is provided.

Avoid snakes:

1. If a rattlesnake is found indoors, call 911 for assistance
2. Stay alert when walking near canyons or undeveloped land
3. If you see a snake, do not disturb it. Move away quickly
4. If you hear a rattlesnake, stand still until you are sure of its location, then move away quickly.
5. Never step or reach into an area you cannot see.

Rattlesnake bites:

1. **Remain calm.**
2. **Call 911** and get the victim to the hospital immediately.
3. **Immobilize the bitten limb.** Do not apply a tourniquet or constriction band and do not attempt to cut the wound or suck out the venom. Do not apply ice to the wound.
4. **Wash the skin over the bite** with soap and water. Cover the wound.

If bitten by a black widow spider or brown recluse spider:

1. Make a positive identification if possible. If the bite is on an arm or a leg, tie a snug bandage above the bite to help slow or halt the venom's spread. Ensure that the bandage is not so tight as to cut off circulation
2. Use a cold cloth or a cloth filled with ice at the location of the bite
3. Seek medical attention immediately

For more information, contact:

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- **Emergencies**
EH&S: (858) 534-3660 weekdays, 8 a.m. – 4:30 p.m.
Campus Police: (858) 534-4375
 - **Non-emergencies (typical response time: 1 working day)**
Campus and SIO facilities: (ehspest@ucsd.edu)
Medical Center facilities: (jhickman@ucsd.edu)

SECTION II: Facility Specific Safety Requirements

General safety during testing at all test facilities at Englekirk Center

All employees and visitors shall be removed to a designated safe viewing area while tests are performed. All tests shall be conducted by competent staff. All General Site Safety rules will be observed; in addition, facility specific safety procedures will be observed as outlined below.

Chapter 1: Blast Simulator Facility - Technical Support Working Group (TSWG)

The TSWG Blast Simulator is a unique test device that incorporates high pressure hydraulic oil and high pressure nitrogen to generate high velocity, high impact test conditions. The test machine incorporates unique procedures to insure safety to laboratory personnel and to laboratory visitors.

Blast Simulator Facility Specific Safety

1. Testing and maintenance

A. Safety Procedures

- a. Identify and mark debris fields based on potential projectiles, such as concrete, breakaway bolts, and instrumentation
- b. Establish and clearly mark personnel and visitor viewing areas
- c. Use radio communications between control room, viewing areas, and personnel in load rig/specimen area
- d. Monitor safety cameras around test equipment and debris fields

B. Charge Nitrogen Accumulators with Compressed Nitrogen

- a. Inspect Nitrogen tank and connections for damage
- b. Notify personnel that system will begin charging
- c. At terminal, monitor pressures and advise personnel

C. Emergency Shutdown

a. Emergency Stop Button Locations

1. On the Control Desk
2. In the pit
3. On the mezzanine
4. On the HPS Front Panel
5. Notify personnel and viewers once safe to approach
 - a. Advise of system status and residual pressure
 - b. Advise of continuation of hazard potential and safety equipment requirements

Chapter 2: Large High Performance Outdoor Shake Table (LHPOST) – Network for Earthquake Engineering /Simulation (NEES)/National Science Foundation (NSF)

LHPOST Facility Specific Safety

1. Before test

- A. General inspection and walk around.
 - a. ensure there are no persons in the pit (**no one** allowed below grade when hydraulic pressure is at high pressure).
 - b. ensure table will be unobstructed in its stroke pattern, both above and below table.

2. During test

- A. Monitor tub cameras for presence of people and hydraulic leaks.
- B. Monitor visitor activity (e.g. delivery men, observers, cleaning crew) to safeguard against entrance into pump house or dangerous areas around the shake table.
- C. Put up 'Danger Do Not Enter/Authorized Personnel Only' sign. No one is allowed to enter into pump house pit area while hydraulic pump are in high-pressure mode.

3. After test

- A. If experiment is stopped due to an unexpected incident, prohibit access of unauthorized personnel to the pump house and/or dangerous areas around the shake table indefinitely.

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- B. If experiment concludes successfully prohibit access of unauthorized personnel to: the pump house and/or dangerous areas around the shake table until pumps are off, a walk around above and below the table have been performed, spilled oil has been wiped up and the area around the table is generally safe.

4. Maintenance

- A. Maintenance shall only be done when the high-pressure hydraulics are shut off.
- B. Charging Nitrogen Accumulators with Compressed Nitrogen
- a. Inspect Nitrogen tank and connections for damage
 - b. Notify personnel that system will begin charging
 - c. Carry an Oxygen sensor to monitor for oxygen deficiency

**Chapter 3: Soil-Foundation-Structure-Interaction (SFSI) –
California Department of Transportation and Port of Los
Angeles Soil Pit**

Safety Procedures For Working on Soil Pit Test Set-up

1. Safety procedures pertaining to excavations will be followed according to **OSHA Standards 29 CFR 1926.650, .651, and .652.**

For more information contact the Department Safety Coordinator or access the following Internet link:

http://www.osha.gov/dts/osta/otm/otm_v/otm_v_2.html